Allen-Bradley

PowerFlex® Communications

ControlNet Adapters

20-COMM-C (coax)
20-COMM-Q (fiber)

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.ab.com/manuals/gi**) 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 we use notes to make you aware of safety considerations.

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

Important: Identifies information that is especially important for successful application and understanding of the product.

Shock Hazard labels may be located on or inside the drive to alert people that dangerous voltage may be present.

The information below summarizes the changes made to this manual since its last release (November 2001):

Description of Changes	Page(s)
Added 20-COMM-Q ControlNet adapter (fiber optic network connections) and references to this manual. **NOTE:** The 20-COMM-C (coax) and 20-COMM-Q (fiber) adapters are functionally the same (same firmware), and differ only in the type of ControlNet media used.	Throughout this manual

Notes:

Table of Contents

About This Manual

Related Documentation

For:	Refer to:	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer DriveExplorer Online help (installed with the software)	—
DriveTools™ SP	http://www.ab.com/drives/drivetools DriveTools Online help (installed with the software)	—
HIM	*HIM Quick Reference*	20HIM-QR001…
PowerFlex® 70 Drive	*PowerFlex 70 User Manual* *PowerFlex 70/700 Reference Manual*	20A-UM001… PFLEX-RM001…
PowerFlex® 700 Drive	*PowerFlex 700 User Manual* *PowerFlex 70/700 Reference Manual*	20B-UM001… PFLEX-RM001…
PowerFlex® 700S Drive	*PowerFlex 700S User Manual* *PowerFlex 700S Reference Manual*	20D-UM001… PFLEX-RM002…
RSLinx™	*Getting Results with RSLinx Guide* Online help (installed with the software)	LINX-GR001…
RSLogix™ 5	*RSLogix 5 Getting Results Guide* Online help (installed with the software)	LG5-GR001…
RSLogix™ 500	*RSLogix 500 Getting Results Guide* Online help (installed with the software)	LG500-GR001…
RSLogix™ 5000	*RSLogix 5000 Getting Results Guide* Online help (installed with the software)	9399-RLD300GR
RSNetWorx™ for ControlNet™	*RSNetWorx for ControlNet Getting Results Guide* Online help (installed with software)	CNET-GR001…

Documentation can be obtained online at **http://www.ab.com/manuals**.

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the following format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name. For example **Parameter 01 - [DPI Port]**.
- 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.
- This manual provides information about the ControlNet adapter (20-COMM-C coax and 20-COMM-Q fiber versions) and using it with PowerFlex 7-Class drives. The adapter can be used with other products that support DPI. 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 7, 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

UK Customer Support Center:
E-mail: esupport2@ra.rockwell.com
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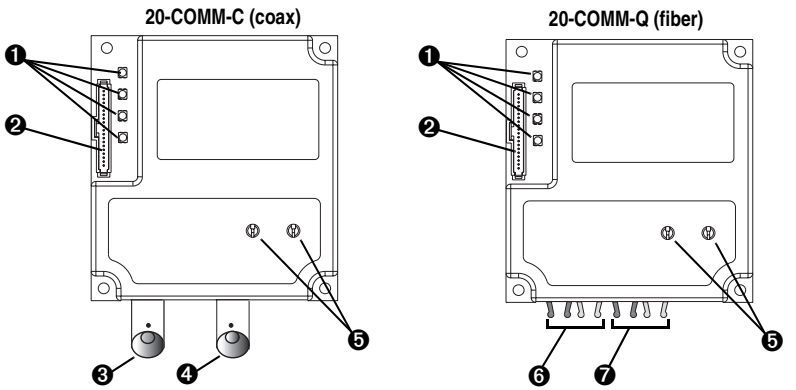
Notes:

Getting Started

The ControlNet adapters (20-COMM-C coax and 20-COMM-Q fiber versions) are communication options intended for installation into a PowerFlex 7-Class drive. They can also be used with other Allen-Bradley products that support an internal DPI™ (Drive Peripheral Interface) adapter.

Components

Figure 1.1 Components of the Adapter



Item	Part	Description
❶	Status Indicators	Four LEDs that indicate the status of the ControlNet channel(s), DPI, and the adapter. Refer to Chapter 7, Troubleshooting.
❷	DPI Connector	20-pin, single-row shrouded male header. An Internal Interface cable connects to this connector and a connector on the drive.
❸	Channel A Coax Receptacle	Channel A connection for the ControlNet cable.
❹	Channel B Coax Receptacle	Channel B is optional connection for redundant ControlNet cable.
❺	ControlNet Node Address Switches	Switches for setting the node address. Refer to Chapter 2, Installing the Adapter.
❻	Channel A Fiber Receptacles	Channel A connection for the ControlNet cable.
❼	Channel B Fiber Receptacles	Channel B is optional connection for redundant ControlNet cable.

Features

The ControlNet adapters feature the following:

- The adapter is mounted in the PowerFlex 7-Class drive. It receives the required power from the drive.
- A number of configuration tools can be used to configure the adapter and connected drive. The tools include the PowerFlex HIM on the drive, or drive-configuration software such as DriveExplorer (version 3.xx or higher) or DriveExecutive (version 1.xx or higher).
- Status indicators report the status of the drive, communications, adapter, and network. They are visible when the drive cover is opened or closed.
- I/O, including Logic Command/Reference and up to four pairs of Datalinks, may be configured for your application using parameters.
- Explicit messages are supported.
- User-defined fault actions determine how the adapter and PowerFlex drive respond to communication disruptions on the network.

Compatible Products

The ControlNet adapters are compatible with Allen-Bradley PowerFlex 7-Class drives and other products that support DPI. DPI is a second generation peripheral communication interface, and is a functional enhancement to SCANport (see Glossary). At the time of publication, compatible products include:

- PowerFlex 70 drives
- PowerFlex 700 drives
- PowerFlex 700S drives
- PowerFlex 7000 drives

Required Equipment

Equipment Shipped with the Adapter

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

- ❑ One ControlNet adapter
- ❑ A 2.54 cm (1 in.) and a 15.24 cm (6 in.) Internal Interface cable (only one cable is needed to connect the adapter to the drive)
- ❑ This manual

User-Supplied Equipment

To install and configure the ControlNet adapter, you must supply:

- ❑ A small flathead or Phillips screwdriver
- ❑ Configuration tool, such as:
  - PowerFlex HIM
  - DriveExplorer (version 2.01 or higher)
  - DriveExecutive (version 1.01 or higher)
  - RSNetWorx for ControlNet (version 3.00 or higher)
- ❑ Controller configuration software
  (Examples: RSLogix 5, RSLogix 500, or RSLogix 5000)
- ❑ A PC connection to the ControlNet network
  (Examples: 1784-PCC, 1770-KFC, or 1784-KTCX)

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 all power from the PowerFlex drive, and then verify power has been removed before installing or removing a ControlNet 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 a ControlNet adapter. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of equipment damage exists. The ControlNet 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 ControlNet 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 an adapter.

ATTENTION: Risk of injury or equipment damage exists. **Parameters 10 - [Comm Flt Action]** and **11 - [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 PowerFlex drive. You can set these parameters so that the PowerFlex 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

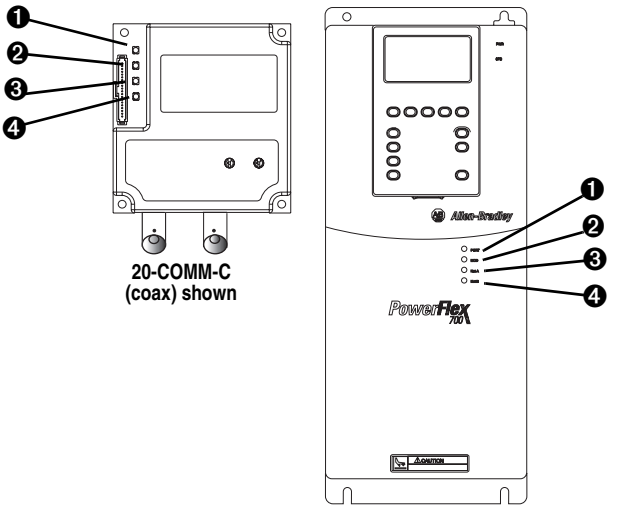
This section is provided to help experienced users quickly start using a ControlNet adapter. If you are unsure how to complete a step, refer to the referenced chapter.

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 screws to secure and ground the adapter to the drive.	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 7, Troubleshooting.	
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 master and other devices on the network.** Verify that the master and network are installed and functioning in accordance with ControlNet standards, and then apply power to them.	—
7	**Configure the scanner to communicate with the adapter.** Use a network tool such as RSNetWorx for ControlNet to configure the scanner on the network.	Chapter 4, RSNetWorx Configuration for PLC-5C Applications
8	**Create a ladder logic program.** Use a programming tool such as RXLogix 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, PLC-5C Applications Chapter 6, ControlLogix Applications

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. See 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	NET A	Green	Normal Operation. The adapter is properly connected and communicating on the network.
❹	NET B	Green	Normal Operation. The adapter is properly connected and communicating on the network.
		Off	Normal Operation if the network is not using redundant media.

(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 7, Troubleshooting.

Installing the Adapter

Chapter 2 provides instructions for installing the adapter in a PowerFlex 7-Class drive.

Preparing for an Installation

Before installing the ControlNet adapter:

- Verify that you have all required equipment. Refer to Chapter 1, Getting Started.

Commissioning the Adapter

To commission the adapter, you must set a unique node address on the network. (Refer to the Glossary for details about node addresses.)

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.

ATTENTION: Risk of equipment damage exists. The ControlNet 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.

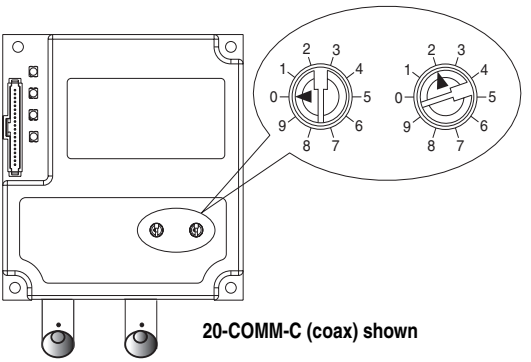
Important: To guard against device malfunction, you must wear a grounding wrist strap when installing the ControlNet adapter.

1. Set the ControlNet adapter's node address by rotating the node address switches to the desired value for each digit.

Important: Each node on the ControlNet network must have a unique address.

Important: 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 and then remove and reapply power to (or reset) the adapter.

Figure 2.1 Setting Adapter's Node Address



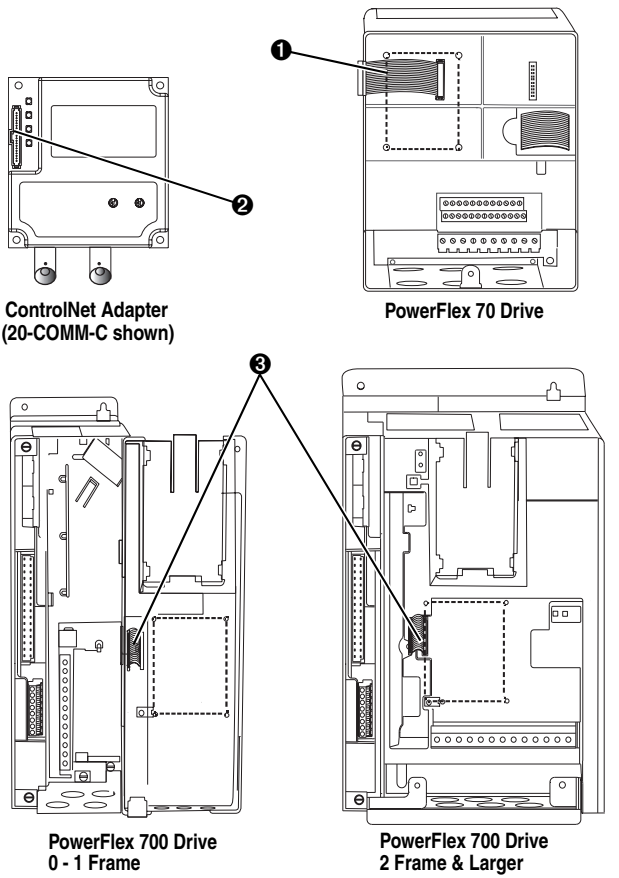
20-COMM-C (coax) shown

Setting	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 03 - [CN Addr Cfg]** for the node address. Refer to Chapter 3, Configuring the Adapter.

Connecting the Adapter to the Drive

1. Remove power from the drive.
2. Use static control precautions.
3. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the adapter.

Figure 2.2 DPI Ports and Internal Interface Cables

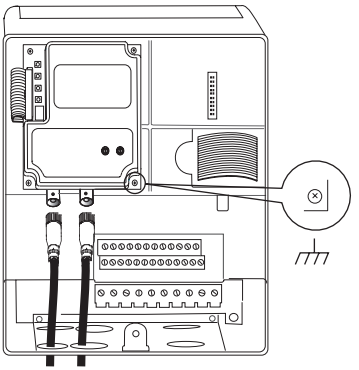


Item	Description
❶	15.24 cm (6 in.) Internal Interface cable
❷	DPI Connector
❸	2.54 cm (1 in.) Internal Interface cable

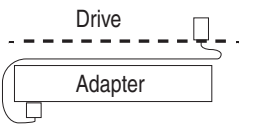
4. On a PowerFlex 70, fold the Internal Interface cable behind the adapter and mount the adapter on the drive using the four captive screws. On a PowerFlex 700 or PowerFlex 700S, just mount the adapter on the drive using the four captive screws to secure and ground it to the drive.

   Important: All screws must be tightened since the adapter is grounded through a screw. Recommended torque is 9.0 N-m (8.0 lb.-in.).

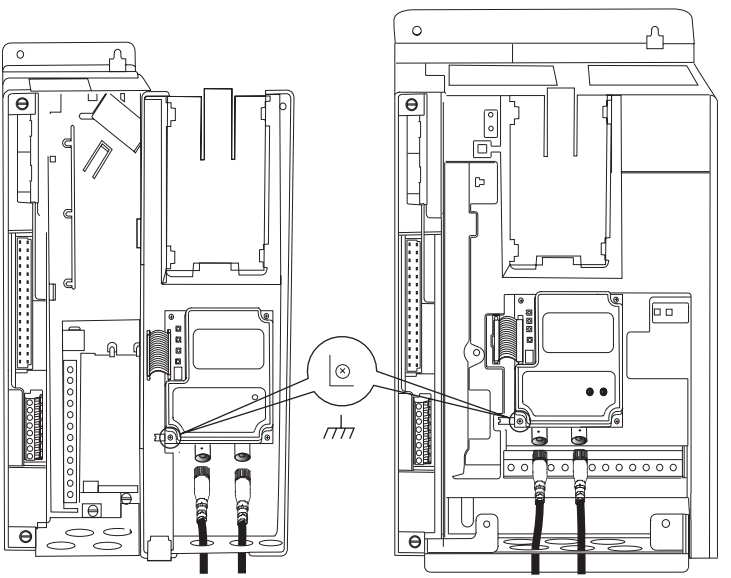
Figure 2.3 Mounting the Adapter (20-COMM-C coax adapter shown)



PowerFlex 70 Drive
Adapter mounts in drive.



Internal Interface cable folded behind the adapter and in front of drive.



PowerFlex 700 Drive (0 - 1 Frames)
Adapter mounts on door.

PowerFlex 700 Drive (2 Frame & Larger)
Adapter mounts in drive.

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 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. Route the ControlNet cable through the bottom of the PowerFlex drive. (See Figure 2.3.)
4. Connect the ControlNet cable to the adapter. A 1786-TPS (straight tap) is recommended for the 20-COMM-C (coax).

See Figure 2.4 and Figure 2.5 for examples of wiring to a ControlNet network.

Figure 2.4 Example Network Wiring (coax)

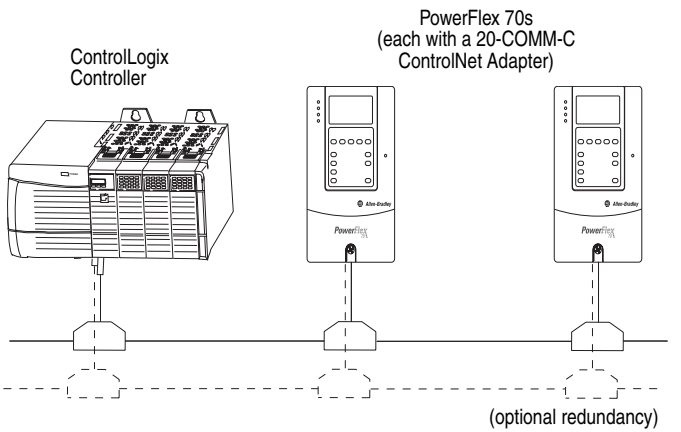
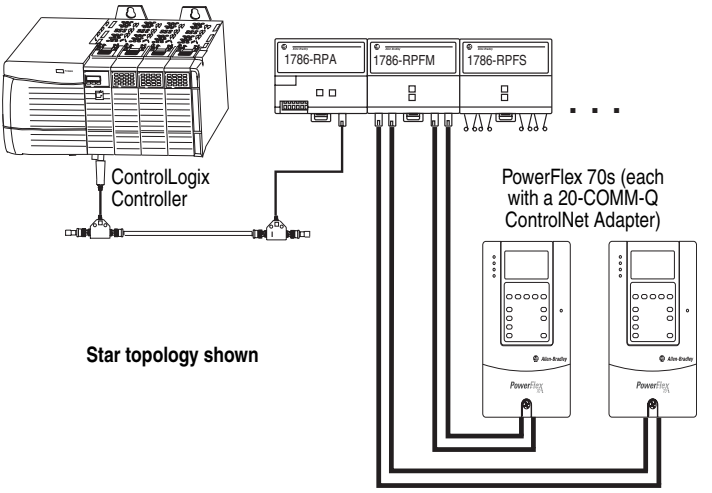


Figure 2.5 Example Network Wiring (fiber)



Refer to the ControlNet Coax Media Planning and Installation Guide (Publication # CNET-IN002…) or the ControlNet Fiber Media Planning and Installation Guide (Publication # CNET-IN001…) for information about network system design and component installation.

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. Close the door or reinstall the cover on the drive. 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 product for the first time, the status indicators should be green or off after an initialization. If the status indicators go red, there is a problem. Refer to Chapter 7, Troubleshooting.

3. Apply power to the master device (scanner) and other devices on the network.

Configuring the Adapter

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

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

All example screens shown in this chapter are based on the 20-COMM-C.

Configuration Tools

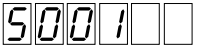
The ControlNet adapter stores parameters and other information in its own non-volatile memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters:

Tool	Refer to . . .
PowerFlex HIM	page 3-2
DriveExplorer Software (version 3.xx or higher)	http://www.ab.com/drives/driveexplorer, or DriveExplorer Online help (installed with the software)
DriveExecutive Software (version 1.xx or higher)	http://www.ab.com/drives/drivetools, or DriveExecutive Online Help (installed with the software)

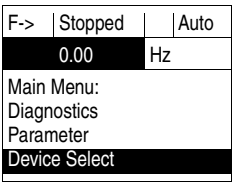
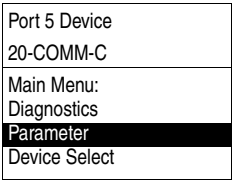
Using the PowerFlex HIM

If your drive has either an LED or LCD HIM (Human Interface Module), you can use it to access parameters in the adapter as shown below. It is recommended that you read through the steps for your HIM before performing the sequence. For additional HIM information, refer to your PowerFlex Drive User Manual or the HIM Quick Reference card.

Using an LED HIM

Step	Key(s)	Example Screens
1. Press ALT and then Sel (Device) to display the Device Screen.	Device ALT Sel	
2. Press the Up Arrow or Down Arrow to scroll to the ControlNet adapter. Letters represent files in the drive, and numbers represent ports. The adapter is usually connected to port 5.	OR	
3. Press the Enter key to enter your selection. A parameter database is constructed, and then the first parameter is displayed.		
4. Edit the parameters using the same techniques that you use to edit drive parameters.		

Using an LCD HIM

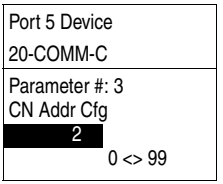
Step	Key(s)	Example Screens
1. In the main menu, press the Up Arrow or Down Arrow to scroll to **Device Select**.	OR	
2. Press Enter to enter your selection.		
3. Press the Up Arrow or Down Arrow to scroll to the ControlNet adapter (20-COMM-C shown in example screen).	OR	
4. Press Enter to select the ControlNet adapter. A parameter database is constructed, and then the main menu for the adapter is displayed.		
5. Edit the 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 “00,” the value of **Parameter 03 - [CN Addr Cfg]** determines the node address.

1. Set the value of **Parameter 03 - [CN Addr Cfg]** to a unique node address.

Figure 3.1 ControlNet Node Address Screen on LCD HIM



Default = 02

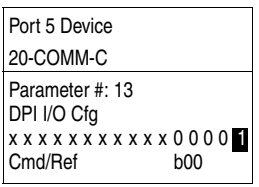
2. Reset the adapter. See Resetting the Adapter section in this chapter.

Setting the I/O Configuration

The I/O configuration determines the type of data that is sent to and from the drive. Logic Command/Status, Reference/Feedback, and Datalinks may be enabled or disabled. A “1” enables the I/O. A “0” disables it.

1. Set the bits in **Parameter 13 - [DPI I/O Cfg]**:

Figure 3.2 I/O Configuration Screen on an LCD HIM



Bit	Description
0	Logic Command/Reference (Default)
1	Datalink A
2	Datalink B
3	Datalink C
4	Datalink D
5 - 15	Not Used

Bit 0 is the right-most bit. In Figure 3.2, it is highlighted and equals “1.”

2. If you enabled Logic Command/Reference, configure the drive to accept the Logic Command and Reference from the adapter. For example, set **Parameter 90 - [Speed Ref A Sel]** in a PowerFlex 70 or 700 drive to “DPI Port 5” so that the drive uses the Reference from the adapter. Also, verify that the mask parameters in the drive (for example, **Parameter 276 - [Logic Mask]**) are configured to receive the desired logic from the adapter.

3. If you enabled one or more Datalinks, configure the drive to determine the source and destination of data in the Datalink(s). Also, ensure that the ControlNet adapter is the only adapter using the enabled Datalink(s).

4. Reset the adapter. See Resetting the Adapter section in this chapter.

Selecting Master-Slave

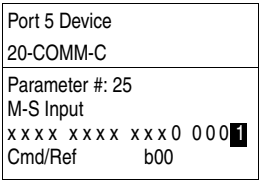
A hierarchy determines the type of device with which the adapter exchanges data. In a Master-Slave hierarchy, an adapter exchanges data with a scanner.

To set a Master-Slave hierarchy

1. Enable the desired I/O in **Parameter 13 - [DPI I/O Config]**. Refer to (Figure 3.2).

2. Set the bits in **Parameter 25 - [M-S Input]**. This parameter determines the data transmitted from the scanner to the drive. A “1” enables the I/O. A “0” disables the I/O.

Figure 3.3 Master-Slave Input Screen on an LCD HIM

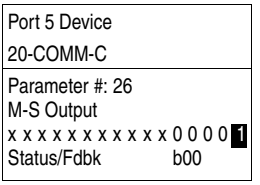


Bit	Description
0	Logic Command/Reference (Default)
1	Datalink A Input
2	Datalink B Input
3	Datalink C Input
4	Datalink D Input
5 - 15	Not Used

Bit 0 is the right-most bit. In Figure 3.3, it is highlighted and equals “1.”

3. Set the bits in **Parameter 26 - [M-S Output]**. This parameter determines the data transmitted from the drive to the scanner. A "1" enables the I/O. A "0" disables the I/O.

Figure 3.4 Master-Slave Output Screen on an LCD HIM



Bit	Description
0	Status/Feedback (Default)
1	Datalink A Output
2	Datalink B Output
3	Datalink C Output
4	Datalink D Output
5 - 15	Not Used

Bit 0 is the right-most bit. In Figure 3.4 it is highlighted and equals "1."

4. Reset the adapter. See Resetting the Adapter section in this chapter.

The adapter is ready to receive I/O from the master (i.e., scanner). You must now configure the scanner to recognize and transmit I/O to the adapter. Refer to Chapter 4, RSNetWorx Configuration for PLC-5C Applications.

Selecting Reference Adjust

Parameter 27 - [Reference Adjust] enables you to adjust the percent scaling factor for the Reference from the network. The factor can be set from 0-200%. This lets the drive's Reference either match the network Reference (=100%), scale below the network Reference (<100%), or scale above the network Reference (>100%).

Setting a Fault Action

By default, when communications are disrupted (for example, a cable is disconnected) or the scanner is idle, 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 10 - [Comm Flt Action]** and a different response to an idle scanner using **Parameter 11 - [Idle Flt Action]**.

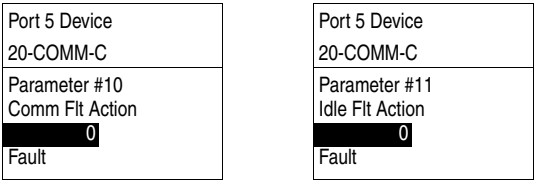
ATTENTION: Risk of injury or equipment damage exists. **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if communications are disrupted or the scanner is idle. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Some ControlNet scanners may operate differently when a controller is idle which could limit the Idle Fault Action's operating states. Precautions should be taken to ensure that 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 10 - [Comm Flt Action]** and **11- [Idle Flt Action]** to the desired responses:

Value	Action	Description
0	Fault (default)	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 after a communications disruption. This does not command a stop.
3	Hold Last	The drive continues in its present state after a communications disruption.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (Parameters 15 - [Flt Cfg Logic] through 24 - [Flt Cfg D2 In]).

Figure 3.5 Fault Action Screens on an LCD HIM



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

To set the fault configuration parameters

If you set **Parameter 10 - [Comm Flt Action]** or **11 - [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
15	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command.
16	Flt Cfg Ref	A 32-bit value (0 – 4294967295) sent to the drive as a Reference or Datalink. **Important:** If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.
17 – 24	Flt Cfg x1 In or Flt Cfg x2 In	

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

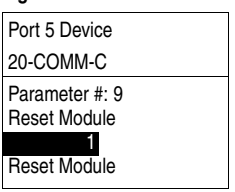
Resetting the Adapter

Changes to switch settings or 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 09 - [Reset Module]** to **Reset Module**:

Figure 3.6 Reset Screen on an LCD HIM

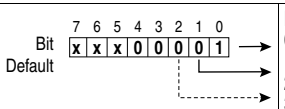


Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

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	DPI Port	The port on the drive to which the adapter is connected. Usually, it is port 5.
02	DPI Data Rate	The data rate used by DPI in the drive. It will be either 125 or 500 kbps (kilobits/sec). It is set in the drive, and the adapter detects it.
04	CN Addr Act	The node address used by the adapter. This will be one of the following values: • The address set by the rotary switches. • The value of Parameter 03 - [CN Addr Cfg]. • An old address of the switches or parameter if they have been changed and the adapter has not been reset.
06	CN Rate Act	The data rate used by the adapter.
07	Ref/Fdbk Size	The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
08	Datalink size	The size of the Datalinks. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
12	CN Active Cfg	Source from which the adapter node address is taken. This will be either switches or Parameter 03 - [CN Addr Cfg] in EEPROM. It is determined by the settings of the switches on the adapter.
14	DPI I/O Active	The Reference/Feedback and Datalinks used by the adapter. This value is the same as Parameter 13 - [DPI I/O Cfg] unless the parameter was changed and the adapter was not reset.
		 **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D 5 = Not Used 6 = Not Used 7 = Not Used

RSNetWorx Configuration for PLC-5C Applications

Chapter 4 provides information for using RSNetWorx for ControlNet to configure a PLC-5C controller to communicate with the ControlNet adapter. RSNetWorx for ControlNet is a 32-bit Windows application for configuring ControlNet networks. After installing and configuring the adapter, RSNetWorx is used to configure the controller to recognize and communicate with the adapter.

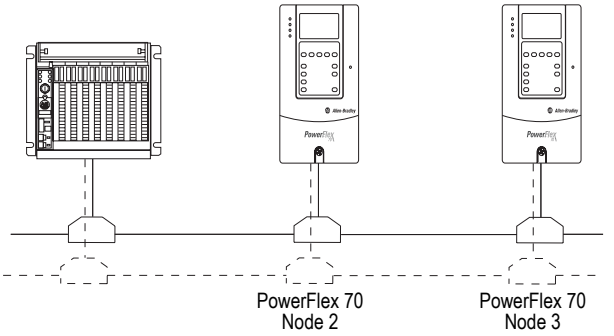
Before configuring the controller, your PC must be:

- Connected to ControlNet using a 1784-PCC, 1770-KFC, or similar device.
- Running RSNetWorx with RSLinx communications.

Example Network

In this example, we will be configuring two PowerFlex 70 drives to be Node 2 and Node 3 on a coax ControlNet network. This chapter describes the steps needed to configure a simple network like the network in
Figure 4.1.

Figure 4.1 Example ControlNet Network

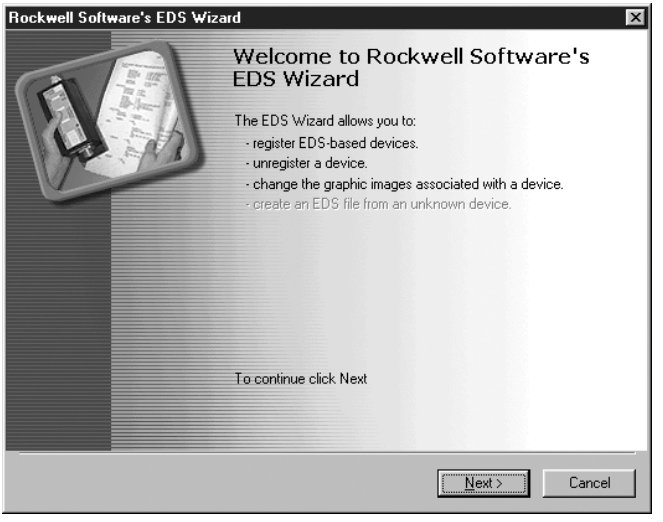


Installing and Registering EDS Files in RSNetWorx

This section needs to be performed only if new EDS files need to be added to RSNetWorx. The latest EDS files can be obtained at http://www.ab.com/networks/eds.

1. In the **Tools** menu, select **EDS Wizard** and click **Next** (Figure 4.2).

Figure 4.2 Rockwell Software EDS Wizard

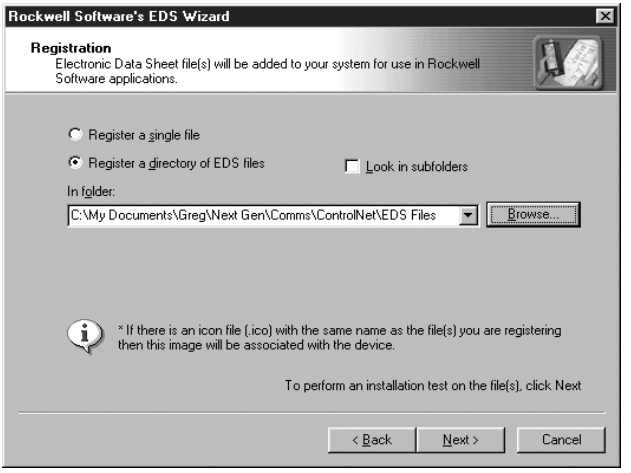


2. The EDS Wizard can be used to install (register) new EDS files to the RSNetWorx database, remove (unregister) EDS files from the RSNetWorx database, or change the graphic icon used to represent the device. Click **Next >** to continue (Figure 4.3).

Figure 4.3 EDS Wizard Option Screen

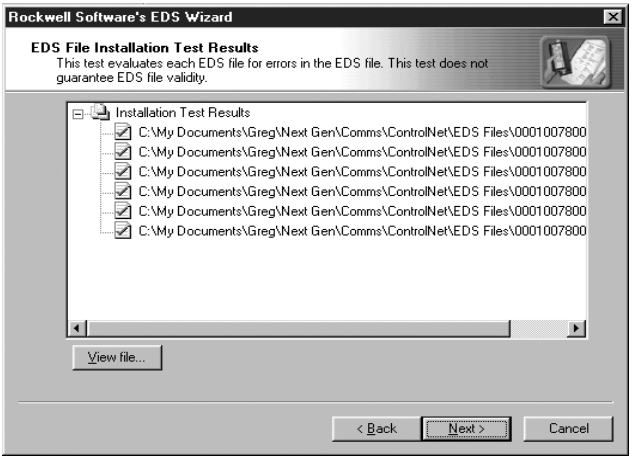
3. Select **Register an EDS file(s)** and click **Next >** to continue (Figure 4.4).

Figure 4.4 EDS Wizard Designation Screen



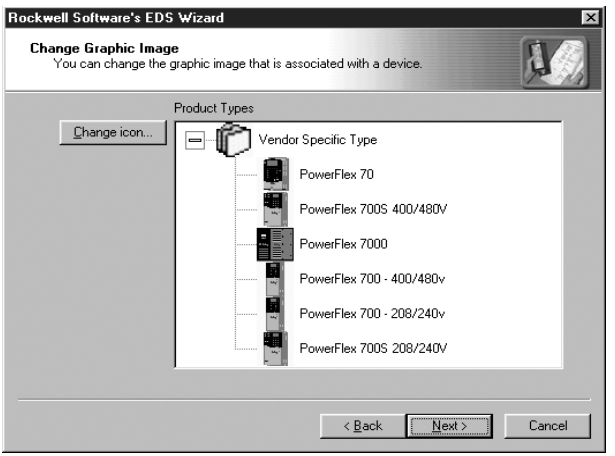
4. The EDS Wizard allows for registering single or multiple EDS files. Click **Browse** and locate where your EDS files are located. In our example (Figure 4.4), multiple EDS files are registered from a directory on the hard drive. Click **Next >** to continue (Figure 4.5).

Figure 4.5 EDS Files Installation Test Results Screen



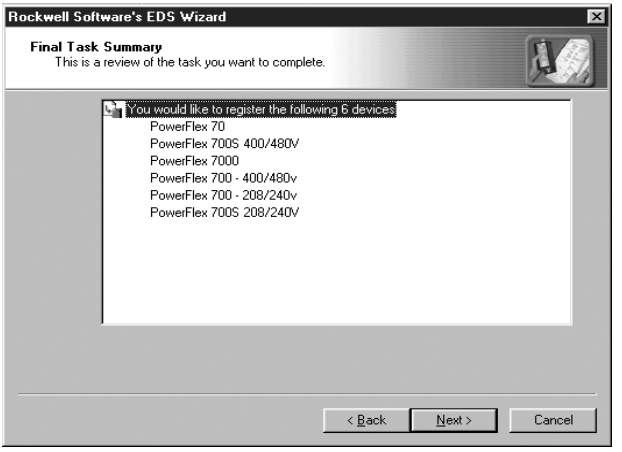
5. The EDS Wizard will install and test the EDS files. A green check mark next to each file indicates success. Click **Next >** to continue (Figure 4.6).

Figure 4.6 EDS Wizard Change Graphic Image Screen



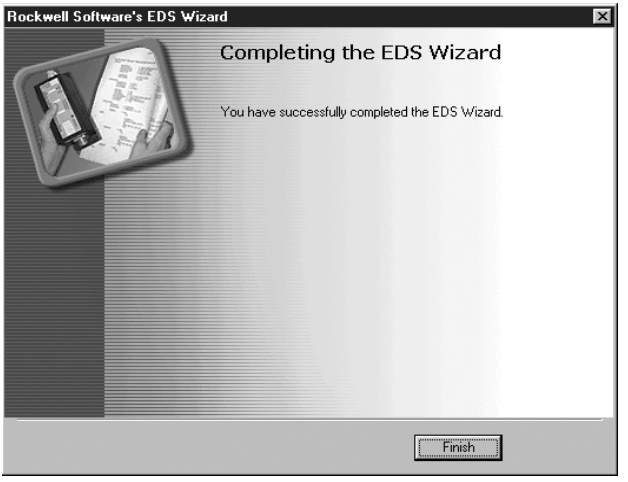
6. The graphic images for each EDS file are displayed and can be changed if desired. Click **Next >** to continue (Figure 4.7).

Figure 4.7 EDS Wizard Final Task Summary Screen



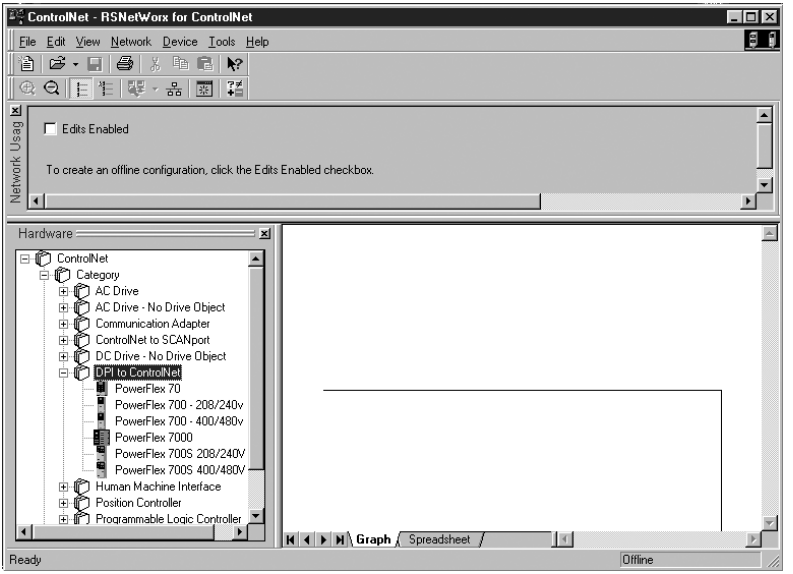
7. Click **Next >** to register the EDS files and continue (Figure 4.8).

Figure 4.8 EDS Wizard Completion Screen



8. The EDS files have been installed and registered. Click **Finish** to return to the main RSNetWorx screen (Figure 4.9).

Figure 4.9 RSNetWorx for ControlNet DPI to ControlNet Folder Example



9. Click on the **DPI to ControlNet** folder in the Hardware window (Figure 4.9) to view the EDS files that have been installed to the RSNetWorx database.

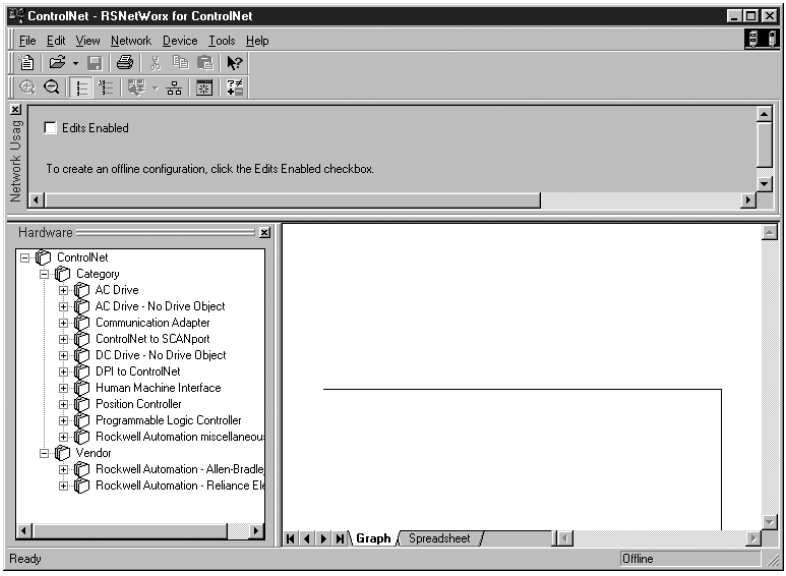
Configuring a Network with RSNetWorx

The main screen for RSNetWorx consists of several windows:

- The Network Usage View displays current and pending values associated with the ControlNet network configuration.
- A Hardware View displays a list of all network hardware currently available to RSNetWorx software.
- The Favorites View displays a list of hardware that is frequently used when working with the current RSNetWorx configuration.
- The Graph View shows a pictorial representation of all the hardware used in the current RSNetWorx configuration.
- The Message View displays a log of messages which are listed from top to bottom, newest to oldest. This view may contain informational, warning, and/or error messages.

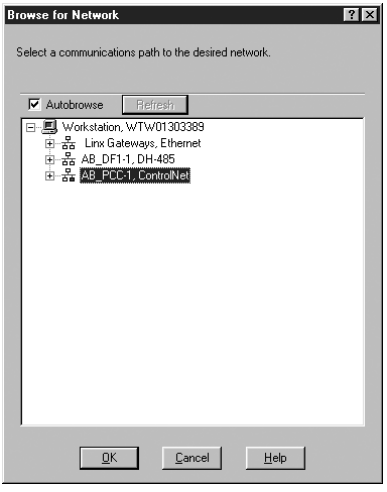
The various views can be displayed or closed by using the **View** menu. In Figure 4.10, the Network Usage, Hardware, and Graph views are displayed while the Message and Favorites views are closed.

Figure 4.10 RSNetWorx for ControlNet Screen



1. Click on the on-line icon  to browse the network. The Browse for Network dialog box appears (Figure 4.11).

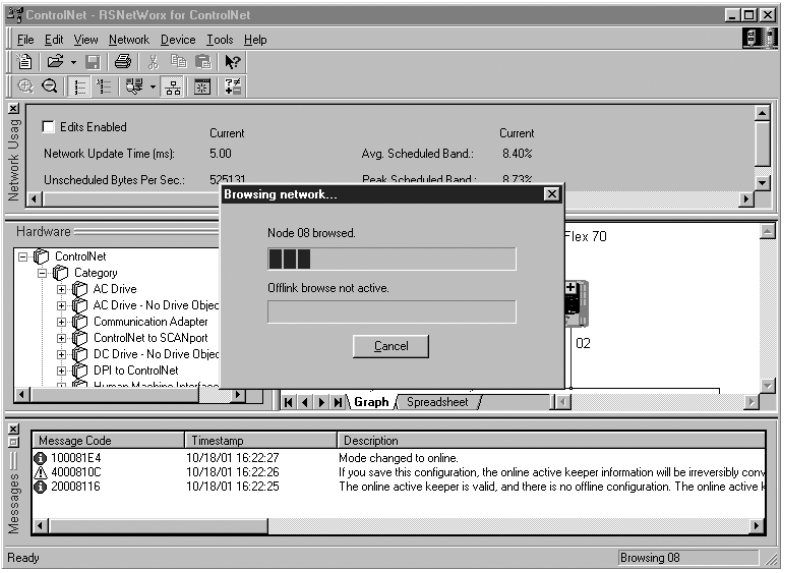
Figure 4.11 Example Browse for Network Dialog Box



2. Select the ControlNet network access method and click **OK**. In this example (Figure 4.11), RSNetWorx will use the 1784-PCC to access the ControlNet network.

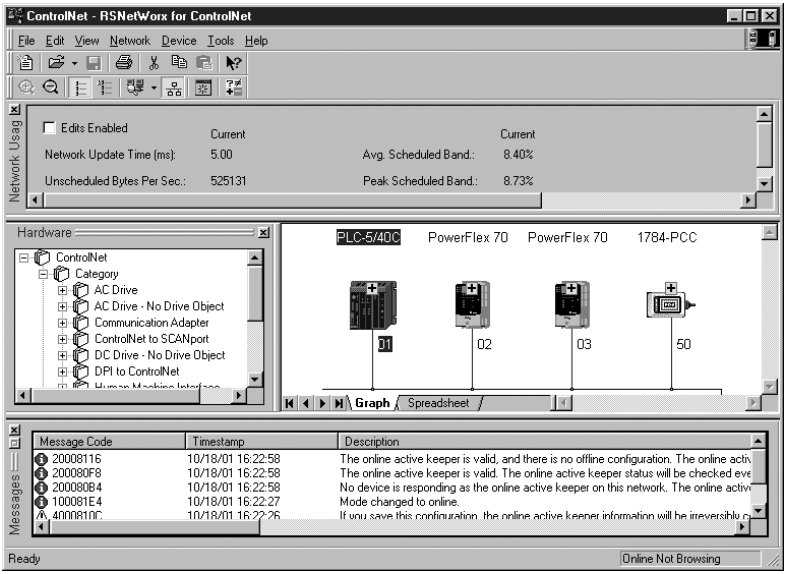
   RSNetWorx starts browsing the ControlNet network for nodes and builds the graphic representation of the network (Figure 4.12).

Figure 4.12 Example Network Displayed in RSNetWorx



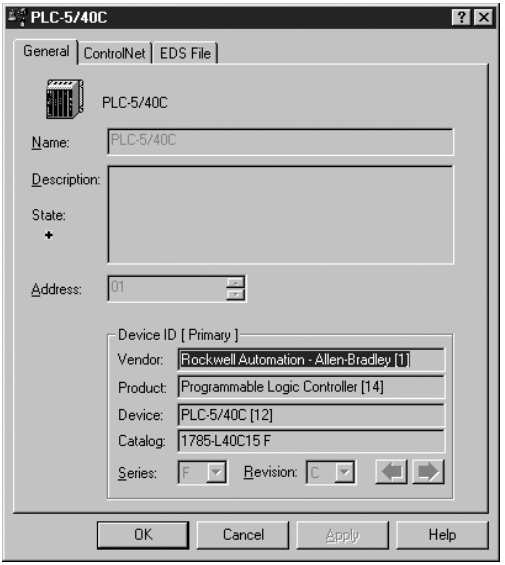
3. When the network browse is complete, a graphical view of the network is displayed. In this example (Figure 4.13), the ControlNet network consists of a PLC-5C/40C controller, two PowerFlex 70 drives, and a PC using a 1784-PCC ControlNet adapter. The  symbol indicates the device shown on the network does not exist in the configuration file, but it was found on the network.

Figure 4.13 Sample ControlNet Configuration Screen



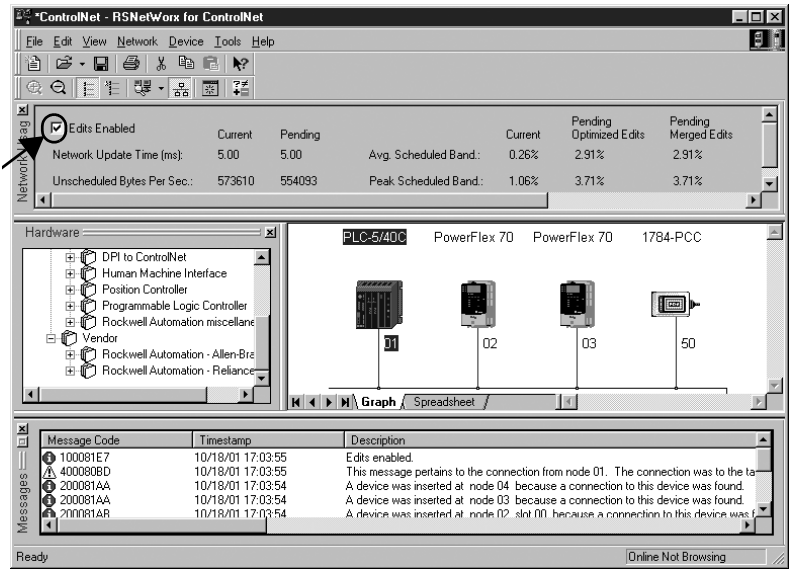
4. Double-click on the PLC-5C/40C icon. The ControlNet configuration box displays information about each node (Figure 4.14).

Figure 4.14 Sample ControlNet Configuration Box



5. Click **OK** (Figure 4.15).

Figure 4.15 Example of Product Line after Drive Connection is Selected



The communication adapter must be configured on the ControlNet network so the controller can communicate with it. Click the **Edits Enabled** check-box as shown in Figure 4.15.

6. If the On-line / Off-line Mismatch dialog box appears, click **OK** to use the on-line data (Figure 4.16). If prompted to save, save the data (Figure 4.17).

Figure 4.16 Online / Offline Mismatch Dialog Box

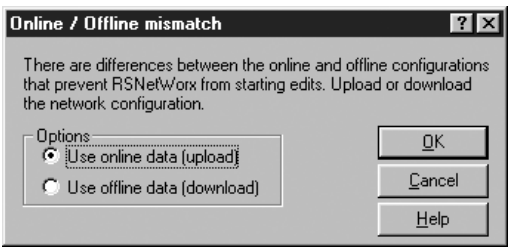
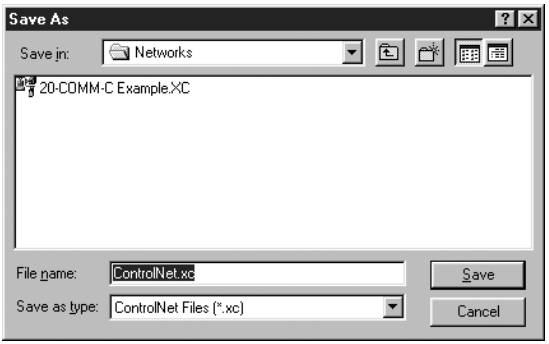


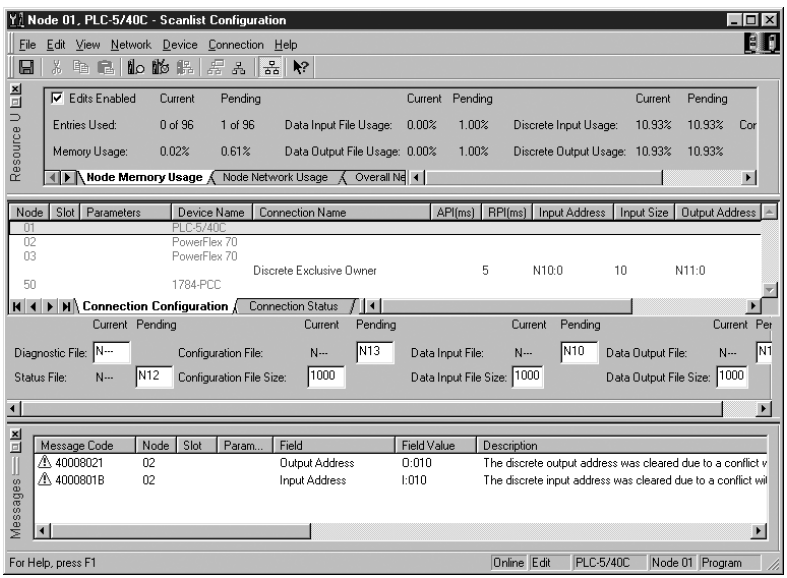
Figure 4.17 Save Dialog Box



Important: During the save process, RSNetWorx will execute the browse function. Allow RSNetWorx to complete the browse (1-99 nodes), even if you already see the entire network. Canceling the browse early may cause an improper scheduling of I/O.

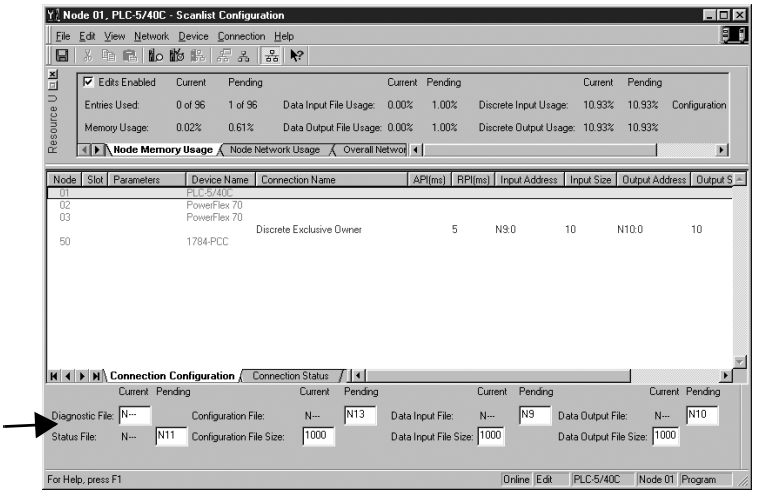
7. After Figure 4.15 reappears, right-click on the controller's icon (PLC-5C) and select **Scanlist Configuration**. The Scanlist Configuration screen (Figure 4.18) is used to configure the controller to communicate with the nodes.

Figure 4.18 Scanlist Configuration Screen



8. Enter the Integer files to be used for ControlNet communications (Figure 4.19). In this example: N9 is the Data Input File, N10 is the Data Output File, N11 is the Status File, and N13 is the Configuration File.

Figure 4.19 Integer Files for ControlNet Communications Screen



9. Double-click the Node 2 row (PowerFlex 70). Enter the input and output size for the node on the network. The number of words selected depends on the I/O to be communicated with the node. In this example, the Node 2 PowerFlex 70 is set for all I/O enabled which equates to 10 words of I/O (Figure 4.20):

Figure 4.20 Input / Output Table

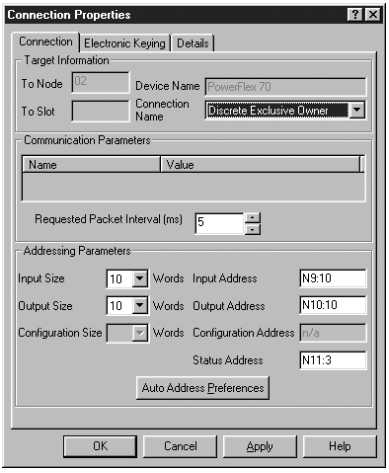
Words	Input to PLC-5C	Output to PLC-5C
0-1	Logic Command / Reference	Logic Status / Feedback
2-3	Datalinks A1 & A2 Out	Datalinks A1 & A2 In
4-5	Datalinks B1 & B2 Out	Datalinks B1 & B2 In
6-7	Datalinks C1 & C2 Out	Datalinks C1 & C2 In
8-9	Datalinks D1 & D2 Out	Datalinks D1 & D2 In

Important: The size of the Reference (**Parameter 7- [Ref/Fdbk Size]**) and Datalinks (**Parameter 8- [Datalink Size]**) will affect the size you configure for the network I/O. For example, 32-bit Datalinks requires twice as many words as 16-bit Datalinks. Depending on your application, the configured I/O size may vary.

Note the values in the Input Address and Output Address fields. These are needed to develop a ladder program.

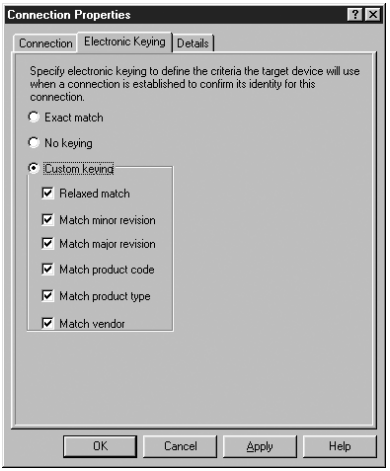
10. Enter the desired Requested Packet Interval (RPI) and note the value (Figure 4.21). Ensure that this value is equal to or greater than the value that will be set later for Network Update Time (NUT). The Actual Packet Interval (API) may vary from the Requested Packet Interval.

Figure 4.21 Communication Properties



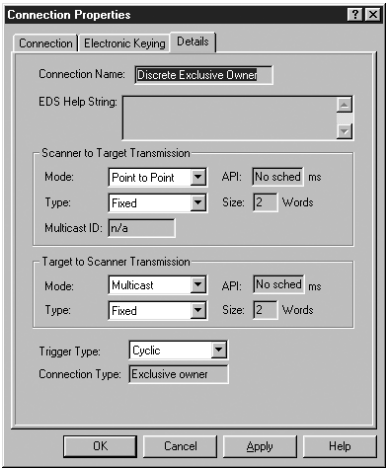
11. Click on the **Electronic Keying** tab (Figure 4.22). Electronic Keying is used to determine the criteria used in order for the scanner to establish a connection to a node. Select the settings according to your application needs.

Figure 4.22 Connection Properties - Electronic Keying Settings



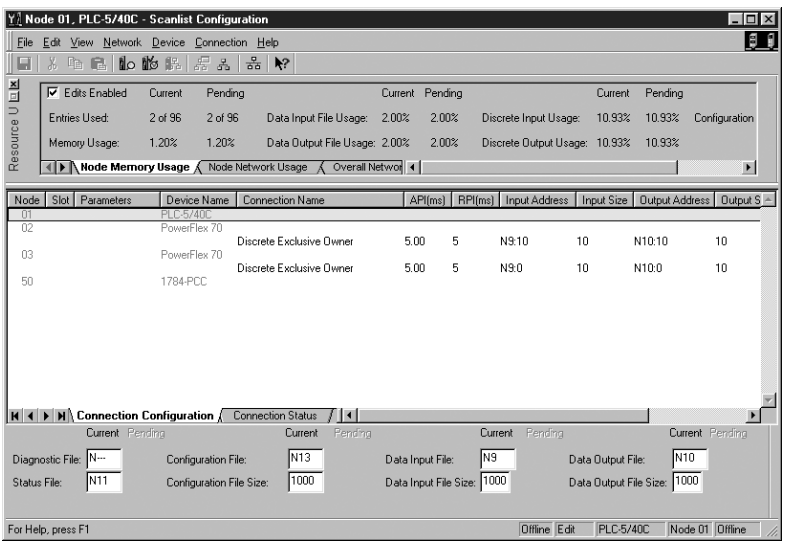
12. Click on the **Details** tab (Figure 4.23). The availability of choosing connection options are determined by the EDS file for the node. Click **OK**.

Figure 4.23 Connection Properties - Details Settings



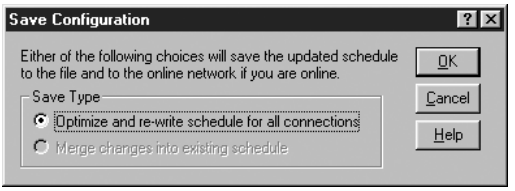
13. Repeat steps 9-12 for additional nodes. When complete, all of the nodes should be mapped (Figure 4.24).

Figure 4.24 Scanlist Configuration - Mapped Nodes



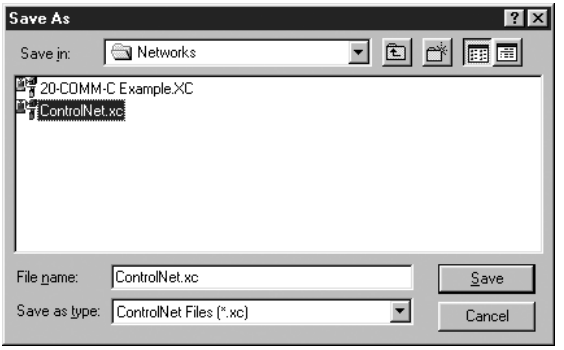
14. Select **File > Save** to save the project (Figure 4.25).

Figure 4.25 Save Configuration Dialog Box



If prompted to optimize and re-write schedule for all connections, click **OK** (Figure 4.26).

Figure 4.26 Save As File Box



15. Enter a file name and click **Save**. The project is now saved for future use.

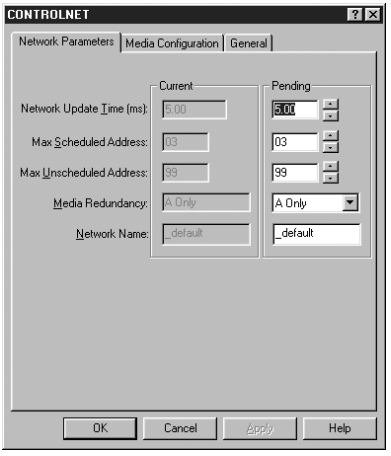
Verifying Network Properties

1. In the **Network** menu, select **Properties** to display the ControlNet dialog box (Figure 4.27). Verify:

- The number in the **Max Scheduled Address** field is higher than or equal to the highest node number that will perform I/O messaging.
- The number in the **Max Unscheduled Address** field is higher than or equal to the highest node number on the network.
- The correct type of media redundancy is selected in the **Media Redundancy** field.

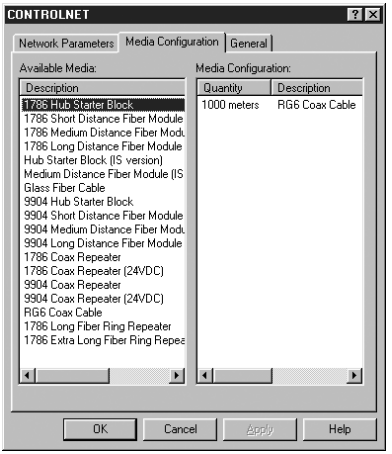
Important: The value in the **Network Update Time (ms)** field is 5 ms or greater. Do not set lower than 5 ms. The NUT must be set equal or lower than the RPI times set for the devices on the network.

Figure 4.27 ControlNet Dialog Box



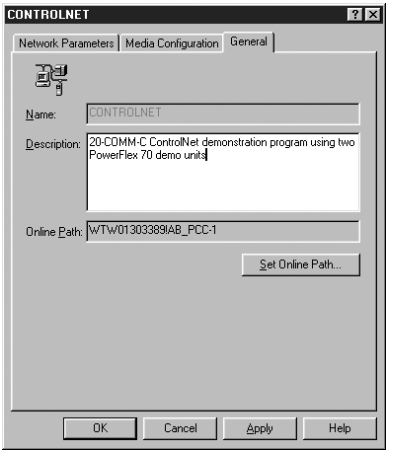
2. If a special media configuration is required (for example, repeater or fiber), select the **Media Configuration** tab (Figure 4.28) and make the appropriate changes. Refer to the RSNetWorx on-line help for more information.

Figure 4.28 ControlNet: Media Configuration Tab



3. If desired, select the **General** tab (Figure 4.29) and enter a name and description for the network. Click **OK**.

Figure 4.29 ControlNet: General Tab



4. In the **Network** menu, select **Save** the properties, and download them to the PLC. The adapter(s) are now mapped on the network and the controller will communicate with it.

Notes:

PLC-5C Applications

Chapter 5 provides information and examples that explain how to use I/O Messaging and Explicit Messaging to control, configure, and monitor a PowerFlex 7-Class drive using a PLC-5C.

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.

About I/O Messaging

On ControlNet, I/O messaging is used to transfer the data which controls the PowerFlex drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in PowerFlex drives.

The ControlNet adapter provides many options for configuring and using I/O, including:

- The size of I/O can be configured by enabling or disabling the Logic Command/Reference and Datalinks.
- A Master-Slave hierarchy can be set up.

Chapter 3, Configuring the Adapter and Chapter 4, RSNetWorx Configuration for PLC-5C Applications discuss how to configure the adapter and scanner 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 scanner.

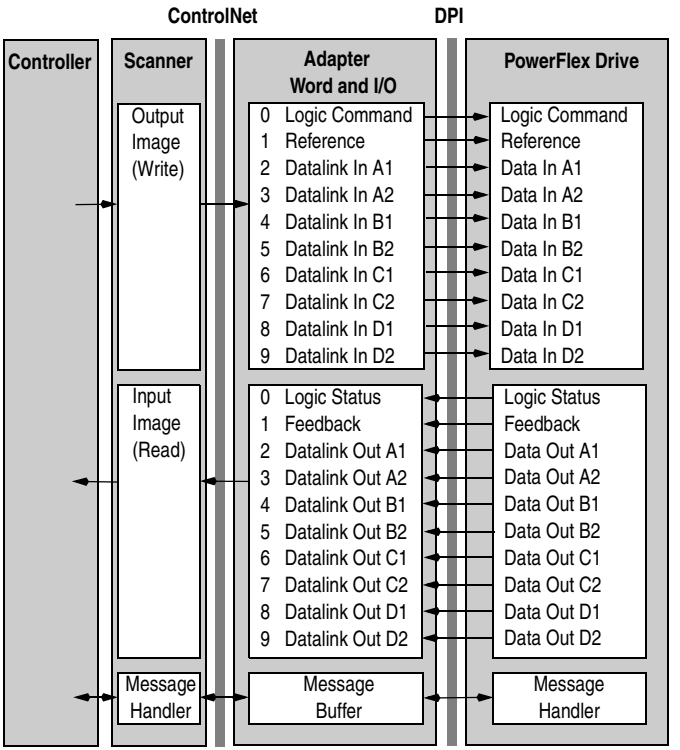
Understanding the I/O Image

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 ControlNet 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 following:

- Size (either 16-bit or 32-bit) of the Reference/Feedback words and Datalink words used by the drive.
- Configuration of I/O (**Parameter 25 - [M-S Input]** and **Parameter 26 - [M-S Output]**). If all I/O is not enabled, the image table is truncated. The image table always uses consecutive words starting at word 0.

Figure 5.1 illustrates an example of an I/O image with 16-bit words.

Figure 5.1 Example I/O Image with All I/O Enabled



In Figure 5.1, the configuration is shown using 10 words of output and 10 words of input. Depending on your application needs, this may vary. For example, an image that uses 32-bit words for Reference and Datalinks would change the I/O image in Figure 5.1 as follows:

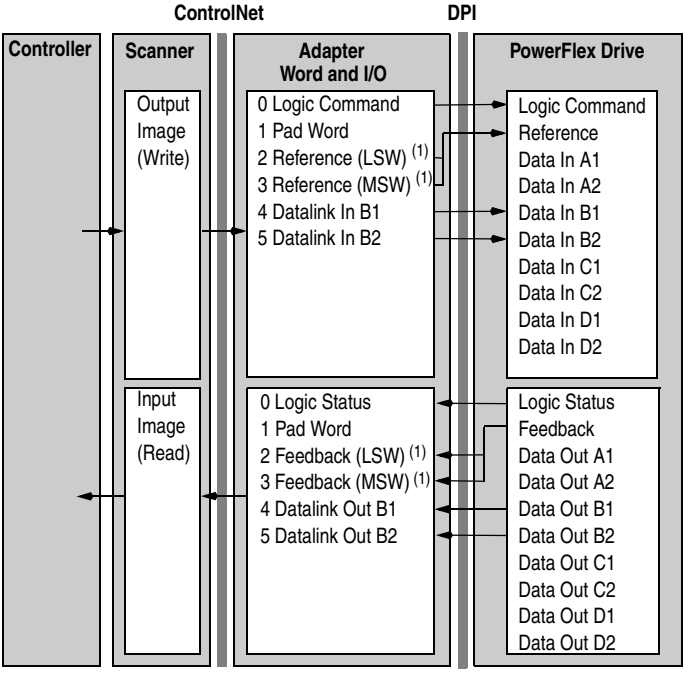
Word	Output I/O	Input I/O
0	Logic Command	Logic Status
1	Pad Word	Pad Word
2 - 3	Reference	Feedback
4 - 7	Datalink A1/A2	Datalink A1/A2
8 - 11	Datalink B1/B2	Datalink B1/B2
12 - 15	Datalink C1/C2	Datalink C1/C2
16 - 19	Datalink D1/D2	Datalink D1/D2

An image that uses a 16-bit Reference and 32-bit Datalinks would change the I/O image in Figure 5.1 as follows:

Word	Output I/O	Input I/O
0	Logic Command	Logic Status
1	Pad Word	Pad Word
2	Reference	Feedback
3	Pad Word	Pad Word
4 - 7	Datalink A1/A2	Datalink A1/A2
8 - 11	Datalink B1/B2	Datalink B1/B2
12 - 15	Datalink C1/C2	Datalink C1/C2
16 - 19	Datalink D1/D2	Datalink D1/D2

Figure 5.2 illustrates an example of an I/O image that does not use all of the I/O data. Only the Logic Command/Reference and Datalink B are enabled. In this example, the Reference is a 32-bit word, and Datalinks are 16-bit words.

Figure 5.2 Example I/O Image with Only Logic/Reference and Datalink B Enabled



(1) LSW is Least Significant Word (Bits 15 – 0). MSW is Most Significant Word (Bits 31 – 16).

Using Logic Command/Status

When enabled, the Logic Command/Status word is always word 0 in the output image and word 0 in the input image. The *Logic Command* is a 16-bit word of control produced by the scanner and consumed by the adapter. The *Logic Status* is a 16-bit word of status produced by the adapter and consumed by the scanner.

This manual contains the bit definitions for select PowerFlex products in Appendix D, Logic Command/Status Words. For other products, refer to their documentation.

Using Reference/Feedback

When enabled, Reference/Feedback begins at word 1 (16-bit) or word 2 (32-bit) in the I/O range. The *Reference* (16 bits or 32 bits) is produced by the controller and consumed by the adapter. The *Feedback* (16 bits or 32 bits) is produced by the adapter and consumed by the controller. The size of the Reference/Feedback is determined by the drive and displayed in **Parameter 07 - [Ref/Fdbk Size]** in the adapter.

Size	Valid Values	In I/O Image	Example
16-bit	-32768 to 32767	Word 1	Figure 5.1
32-bit	-2147483648 to 2147483647	Word 2 (LSW) and Word 3 (MSW)	Figure 5.2

The Reference value is a scaled value; it is not an engineering value. For example, in PowerFlex 70/700 drives, the reference is scaled based on the value of **Parameter 55 - [Maximum Freq]** where “32,767” equals the Parameter 55 frequency value, and “0” equals 0 Hz. Note that the commanded maximum speed can never exceed the value of **Parameter 82 - [Maximum Speed]**. Figure 5.3 shows example References and their results on a PowerFlex 70/700 drive that has its **Parameters 55 - [Maximum Freq]** set to 130 Hz and **82 - [Maximum Speed]** set to 60 Hz.

Figure 5.3 Example Speed Reference and Feedback for a PowerFlex 70/700

Reference Value	Scale		Output Speed	Feedback Value
	Percent	Value		
32767 (1)	100%	130 Hz	60 Hz (2)	15123 (3)
16384	50%	65 Hz	60 Hz (2)	15123 (3)
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

(1) A value of 32767 is equivalent to the Parameter 55 frequency value. The effects of values greater than 32767 depend on whether the DPI host uses a bipolar or unipolar direction mode. Refer to the documentation for your DPI host.

(2) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because Parameter 82 - [Maximum Speed] sets 60 Hz as the maximum speed.

(3) The Feedback value is also scaled based on the value of Parameter 55 - [Maximum Freq], For example, 60/130 = 0.46 so 32767 x 0.46 = 15123.

For Reference/Feedback details about other DPI Hosts, refer to their respective User Manuals.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a parameter value to be changed without using an Explicit Message. When enabled, each Datalink occupies two 16-bit or 32-bit words in both the input and output image. **Parameter 08 - [Datalink Size]** will indicate whether the drive uses 16-bit or 32-bit words for Datalinks.

Rules for Using Datalinks

- Each set of Datalink parameters in a PowerFlex drive can be used by only one adapter. If more than one adapter is connected to a single drive, multiple adapters must not try to use the same Datalink.
- Parameter settings in the drive determine the data passed through the Datalink mechanism. Refer to the documentation for your drive.
- When you use a Datalink to change a value, the value is not written to the Non-Volatile Storage (NVS). The value is stored in volatile memory and lost when the drive loses power. Thus, use Datalinks when you need to change a value of a parameter frequently.

32-Bit Parameters using 16-Bit Datalinks

To read (and/or write) a 32-bit parameter using 16-bit Datalinks, typically both Datalinks of a pair (A, B, C, D) are set to the same 32-bit parameter. For example, to read **Parameter 09 - [Elapsed MWh]** in a PowerFlex 70, both Datalink A1 and A2 are set to "9." Datalink A1 will contain the least significant word (LSW) and Datalink A2 will contain the most significant word (MSW). In this example, the Parameter 9 value of 5.8 MWh is read as a "58" in Datalink A1.

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	9	58
A2	MSW	9	0

Regardless of the Datalink combination, x1 will always contain the LSW and x2 will always contain the MSW. In the following examples **Parameter 242 - [Power Up Marker]** in a PowerFlex 70 contains a value of 88.4541 hours.

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	242	32573
A2	- Not Used -	0	0

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	- Not Used -	0	0
A2	MSW	242	13

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A2	MSW	242	13
B1	LSW	242	32573

32-bit data is stored in binary as follows:

MSW	2^{31} through 2^{16}
LSW	2^{15} through 2^{0}

Example:

Parameter 242 - [Power Up Marker] = 88.4541 hours

MSW = $13_{decimal} = 1101_{binary} = 2^{19} + 2^{18} + 2^{16} = 851968$

LSW = 32573

851968 + 32573 = 884541

Function of the Example Program

The following example ladder logic program works with a PLC-5C controller and a PowerFlex 70 or PowerFlex 700 drive. This example program enables you to:

- Obtain Logic 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.
- Send/Receive Datalink data to/from the drive.

Example Adapter Settings

- Nodes 2 and 3
- See Chapter 4, RSNetWorx Configuration for PLC-5C Applications.

Example Parameter Settings

Device	Parameter	Name	Value	Description
PowerFlex 70 Drive	90	Speed Ref A Sel	22	'DPI Port 5' (20-COMM-C or Q)
	300	Data In A1	140	Points to Pr. 140 [Accel Time 1]
	301	Data In A2	142	Points to Pr. 142 [Decel Time 1]
	302	Data In B1	100	Points to Pr. 100 [Jog Speed]
	303	Data In B2	155	Points to Pr. 155 [Stop Mode A]
	310	Data Out A1	140	Points to Pr. 140 [Accel Time 1]
	311	Data Out A2	142	Points to Pr. 142 [Decel Time 1]
	312	Data Out B1	100	Points to Pr. 100 [Jog Speed]
	313	Data Out B2	155	Points to Pr. 155 [Stop Mode A]
20-COMM-C Adapter or 20-COMM-Q Adapter	13	DPI I/O Cfg	xxx1 1111	Enables Cmd/Ref, Datalinks A-D
	25	M-S Input	xxx1 1111	Configures the I/O Data to be transferred from the network to the drive.
	26	M-S Output	xxx1 1111	Configures the I/O Data to be transferred from the drive to the network.

Logic Command/Status Words

This example uses the Logic Command word and Logic Status word for PowerFlex 70 and PowerFlex 700 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 DPI product. Refer to the documentation for your drive.

Main Program (PLC-5C)

Figure 5.4 I/O Messaging

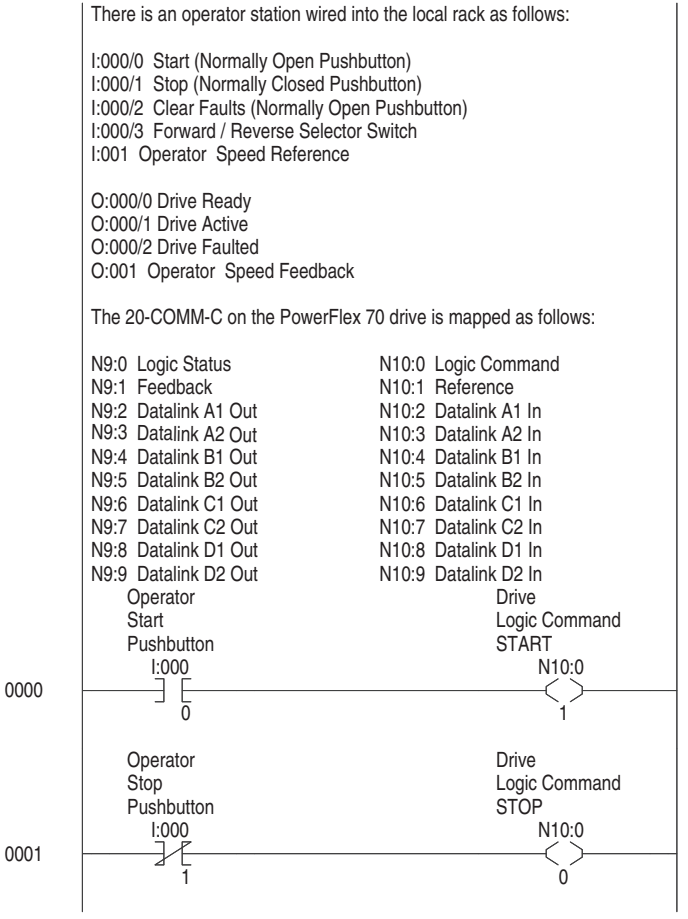


Figure 5.4 I/O Messaging (Continued)

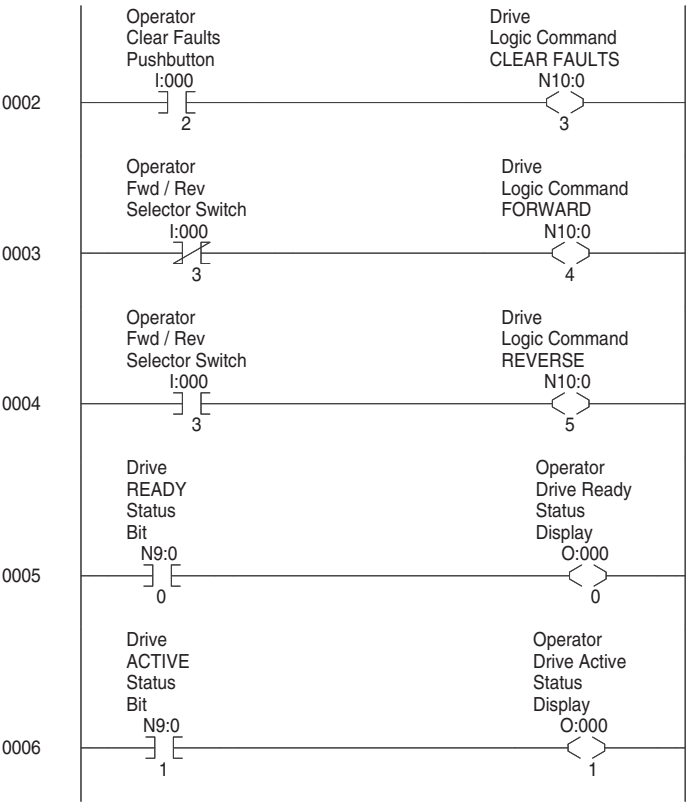
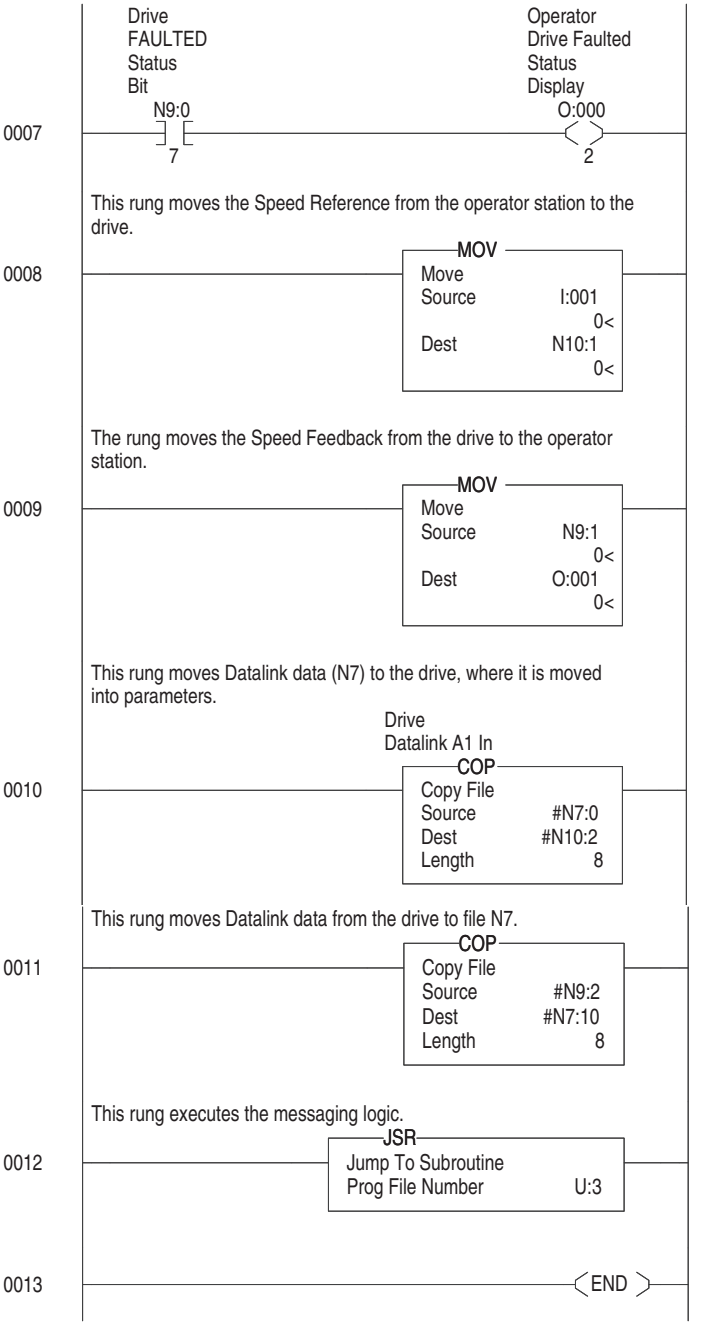


Figure 5.4 I/O Messaging (Continued)



About Explicit Messaging

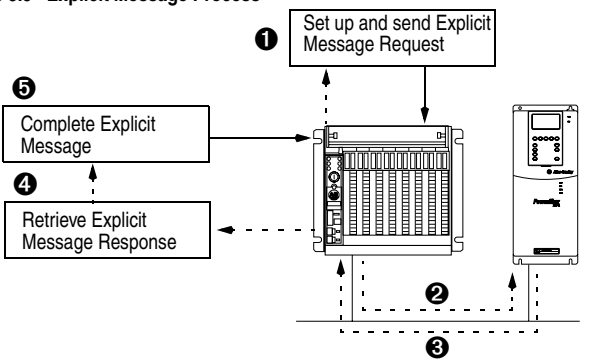
Explicit Messaging is used to transfer data that does not require continuous updates. With Explicit Messaging, you can configure and monitor a slave device's parameters on the ControlNet network.

Performing Explicit Messages

There are five basic events in the Explicit Messaging process. The details of each step will vary depending on the controller. 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 5.5 Explicit Message Process



Event

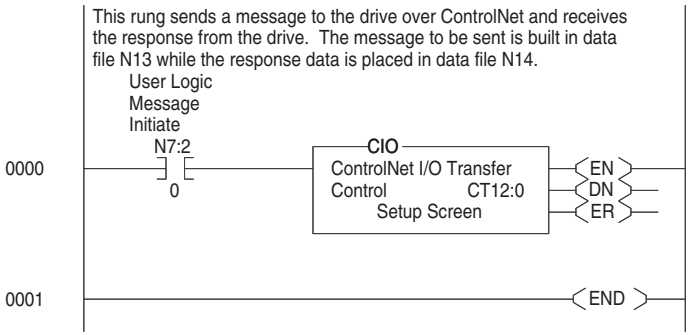
1. You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner module (download).
2. The scanner module transmits the Explicit Message Request to the slave device over the ControlNet network.
3. The slave device transmits the Explicit Message Response back to the scanner. 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: The scanner module may be integrated with the controller (e.g., PLC-5C).

The ControlNet I/O Transfer (CIO) instruction is used to send Explicit Messages. For PLC-5C controllers before Series F Revision C, the available services you should use are Get Attribute Single, Get Attribute All, Set Attribute Single, or Set Attribute All. Series F Revision C (or later) allow for more complex messages using a new Generic Bi-Directional communication command.

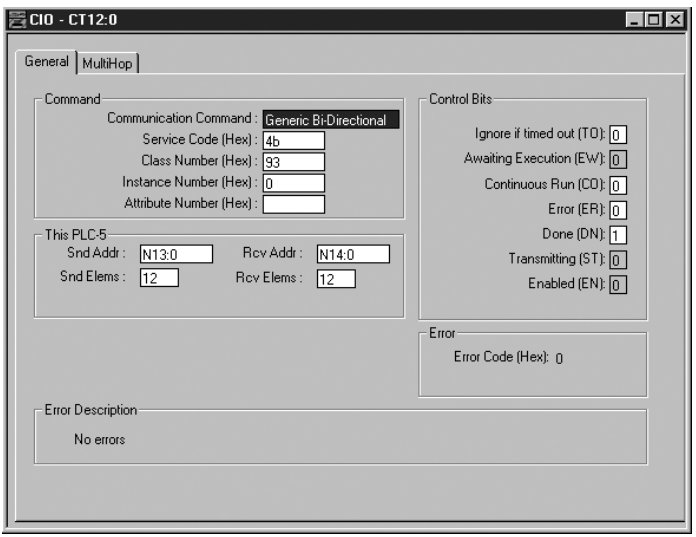
Explicit Messaging Example

Figure 5.6 Explicit Messaging



A Get Attributes Scattered message allows for reading multiple parameters that may or may not be in sequential order (Figure 5.7).

Figure 5.7 CIO Get Attributes Scattered Screen



Configuration	Value	Description	Refer to . . .
Service Code	4b (hex)	Get_Attributes_Scattered	C-18
Class Number	93 (hex)	DPI Parameter Object	C-15
Instance Number	0 (hex)	Class Attributes for Drive	C-15
Send Addr	N13:0	Request Message	C-19
Rcv Addr	N14:0	Response Message	C-19

Get Attributes Scattered Example request and response Data:

Request Data

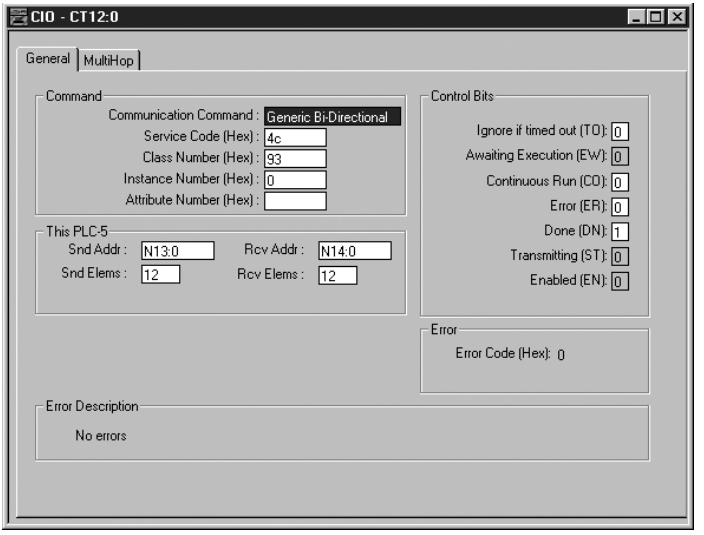
N13:0	12	Parameter Number = 12
N13:1	0	(Pad Word)
N13:2	0	(Pad Word)
N13:3	11	Parameter Number = 11
N13:4	0	(Pad Word)
N13:5	0	(Pad Word)
N13:6	10	Parameter Number = 10
N13:7	0	(Pad Word)
N13:8	0	(Pad Word)
N13:9	9	Parameter Number = 9
N13:10	0	(Pad Word)
N13:11	0	(Pad Word)

Response Data

N14:0	12	Parameter Number = 12
N14:1	3333	Value = 333.3Vdc
N14:2	0	(Pad Word)
N14:3	11	Parameter Number = 11
N14:4	0	Value = 0.0Hz
N14:5	0	(Pad Word)
N14:6	10	Parameter Number = 10
N14:7	148	Value = 14.8Hrs
N14:8		
N14:9	9	Parameter Number = 9
N14:10	23	Value = 2.3MWh
N14:11		

A Set Attributes Scattered message is used to write multiple parameters that may or may not be in sequential order (Figure 5.8).

Figure 5.8 CIO Set Attributes Scattered Screen



Configuration	Value	Description	Refer to . . .
Service Code	4c (hex)	Set_Attributes_Scattered	C-18

Set Attributes Scattered Example request and response Data:

Request Data

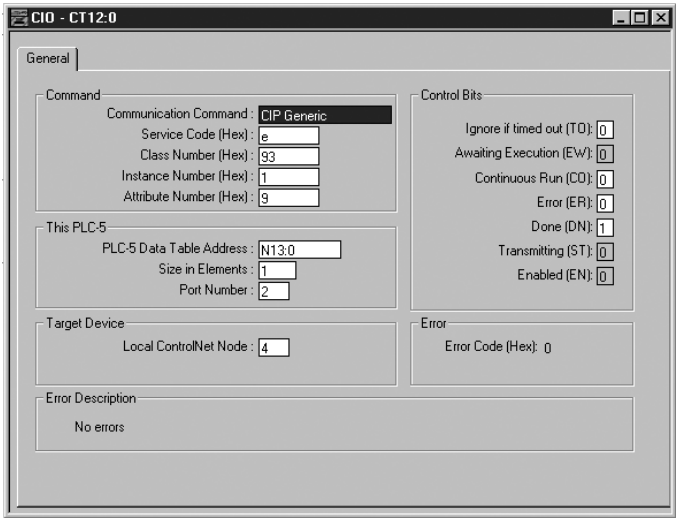
N13:0	45	Parameter Number = 45
N13:1	50	Value = 0.50HP
N13:2	0	(Pad Word)
N13:3	44	Parameter Number = 44
N13:4	1740	Value = 1740RPM
N13:5	0	(Pad Word)
N13:6	43	Parameter Number = 43
N13:7	600	Value = 60.0Hz
N13:8	0	(Pad Word)
N13:9	42	Parameter Number = 42
N13:10	16	Value = 1.6Amps
N13:11	0	(Pad Word)

Response Data

N14:0	45	Parameter Number = 45
N14:1	0	(Pad Word)
N14:2	0	(Pad Word)
N14:3	44	Parameter Number = 44
N14:4	0	(Pad Word)
N14:5	0	(Pad Word)
N14:6	43	Parameter Number = 43
N14:7	0	(Pad Word)
N14:8	0	(Pad Word)
N14:9	42	Parameter Number = 42
N14:10	0	(Pad Word)
N14:11	0	(Pad Word)

A Get Attribute Single message is used to read a single parameter (Figure 5.9).

Figure 5.9 CIO Get Attribute Single Screen



Configuration	Value	Description	Refer to . . .
Service Code	e (hex)	Get_Attribute_Single	C-18
Class Number	93 (hex)	DPI Parameter Object	C-15
Instance Number	1 (hex)	Drive Parameter 1	C-15
Attribute Number	9 (hex)	Parameter Value Attribute	C-16

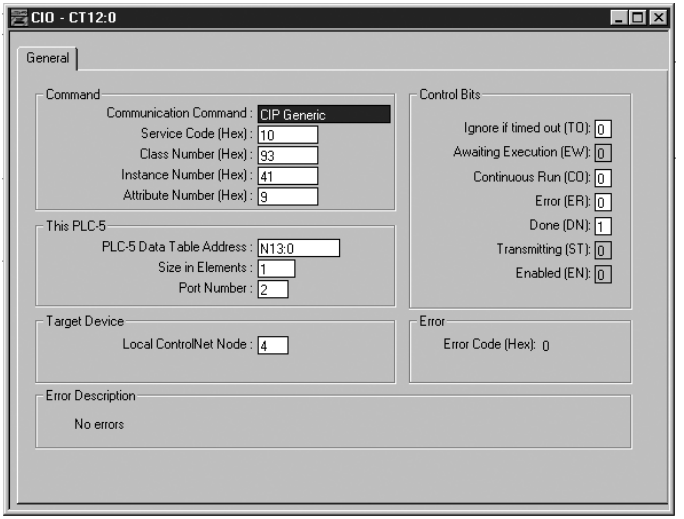
Get Attribute Single example response (reading PowerFlex 70 Parameter 1 in Figure 5.9):

Response Data

N13:0	0	Value = 0.0Hz

A Set_Attribute_Single message is used to write a single parameter (Figure 5.10).

Figure 5.10 CIO Set Attribute Single Screen



Configuration	Value	Description	Refer to . . .
Service Code	10 (hex)	Set_Attribute_Single	C-18
Class Number	93 (hex)	DPI Parameter Object	C-15
Instance Number	41 (hex)	Drive Parameter 41	C-15
Attribute Number	9 (hex)	Parameter Value Attribute	C-16

Set Attribute Single example request (writing PowerFlex 70 Parameter 41 in Figure 5.10):

Request Data

N13:0	2300	Value = 230.0Vac

The Response contains no data, just a status value.

Notes:

ControlLogix Applications

Chapter 6 provides information and examples that explain how to use I/O Messaging and Explicit Messaging to control, configure, and monitor a PowerFlex 7-Class drive using a ControlLogix.

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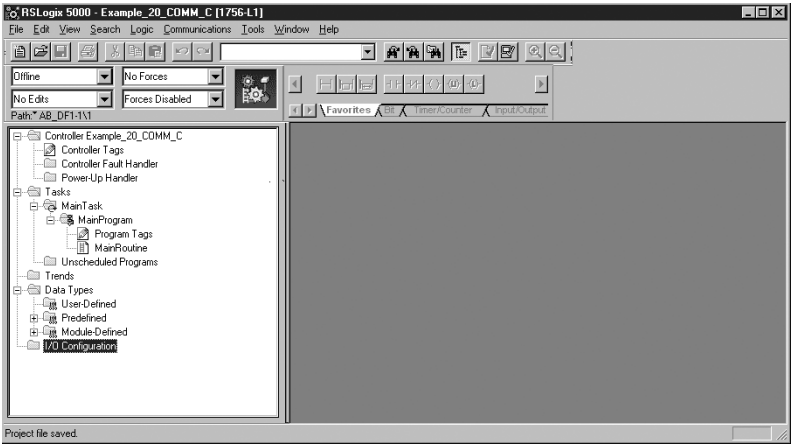
ATTENTION: Risk of equipment damage exists. If Explicit Messages are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses Explicit Messages to write parameter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

Configuring a ControlLogix CNB Scanner

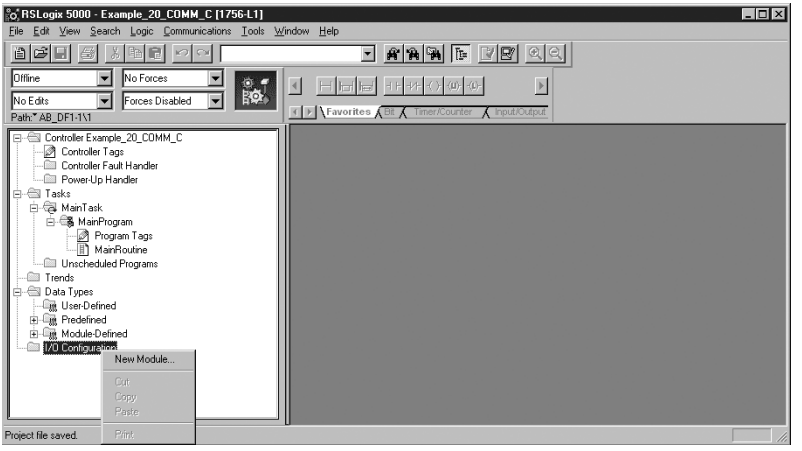
Configuring a ControlLogix CNB scanner, and the network, is mainly done using RSLogix 5000 software (Figure 6.1). RSNetWorx is still required, but only at the end of the configuration process. Start the RSLogix 5000 software to begin the configuration process.

Figure 6.1 RSLogix 5000: I/O Configuration Selection



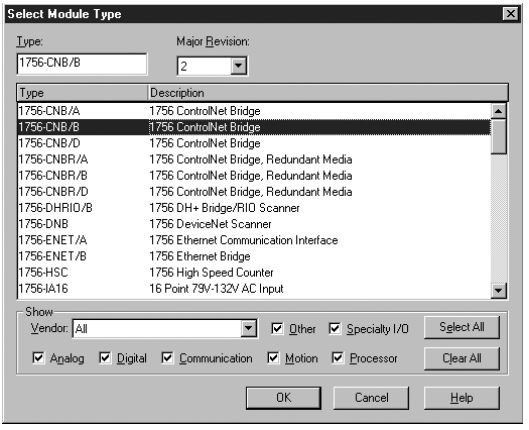
1. Right-click on the **I/O Configuration** folder and select **New Module** (Figure 6.2).

Figure 6.2 RSLogix 5000: New Module Selection



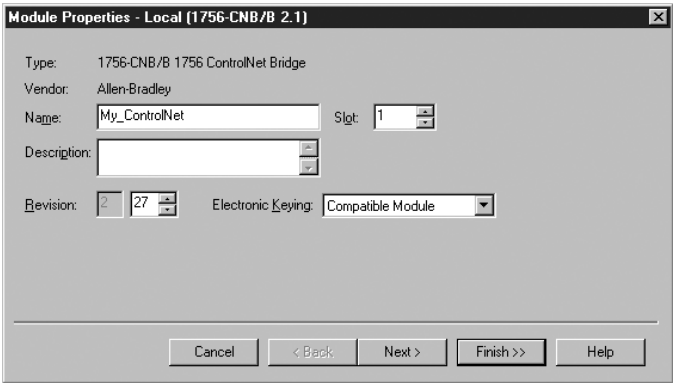
2. Select the ControlNet used by the controller (Figure 6.3). In this example, a 1756-CNB Series B ControlNet Bridge is selected. Click **OK**.

Figure 6.3 Select Module Type: 1756-CNB/B Selection



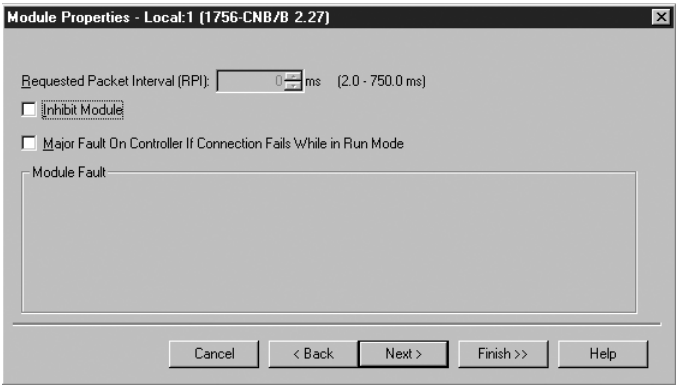
3. Enter a **Name**, **Slot** number, and **Revision** number (Figure 6.4). Click **Next >**.

Figure 6.4 Module Properties: Name Selection



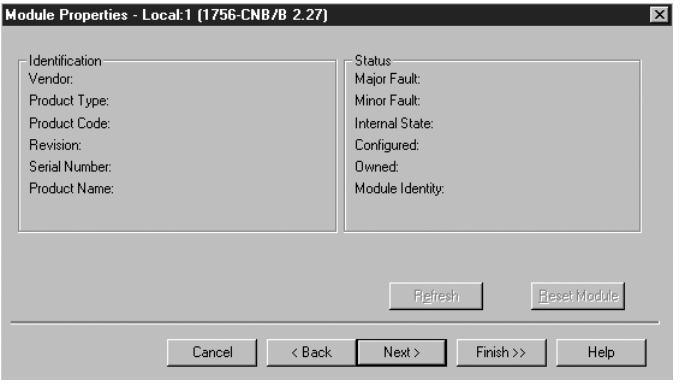
4. This step is used to define controller-to-module behavior (Figure 6.5). **Inhibit Module** inhibits/un-inhibits the connection to the module. The **Major Fault** check-box selects if a failure on the connection of this module causes a major fault on the controller if the connection for the module fails. Click **Next >**.

Figure 6.5 Module Properties: Controller to Module Behavior Screen



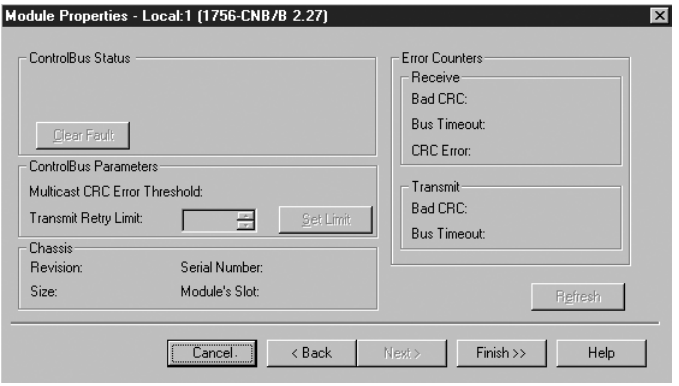
5. This window (Figure 6.6) is displayed for informational purposes only. Click **Next >**.

Figure 6.6 Module Properties: Identification/Status Screen



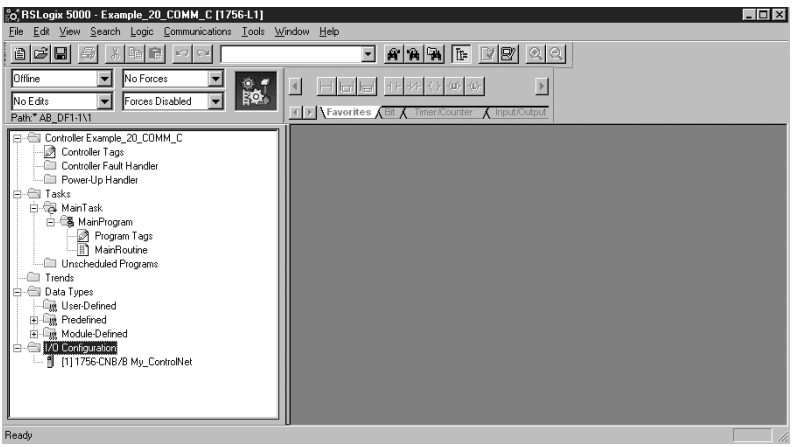
6. This window (Figure 6.7) is displayed for informational purposes only. Click **Finish >>**.

Figure 6.7 Module Properties: Informational Screen



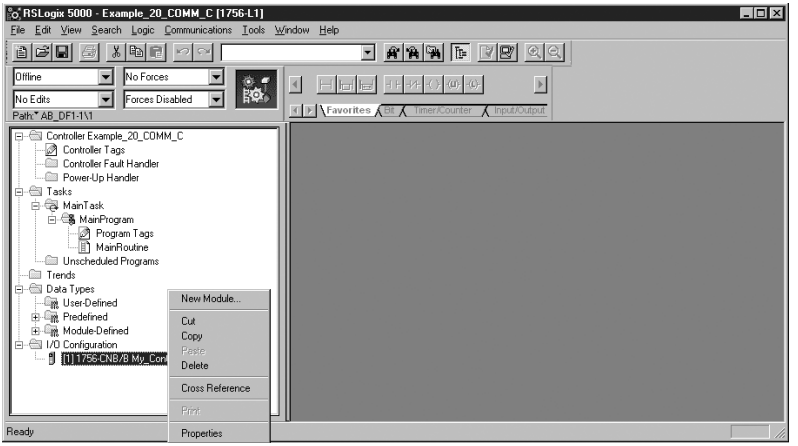
7. The 1756-CNB/B now appears in the I/O Configuration folder (Figure 6.8).

Figure 6.8 RSLogix 5000: I/O Configuration Folder



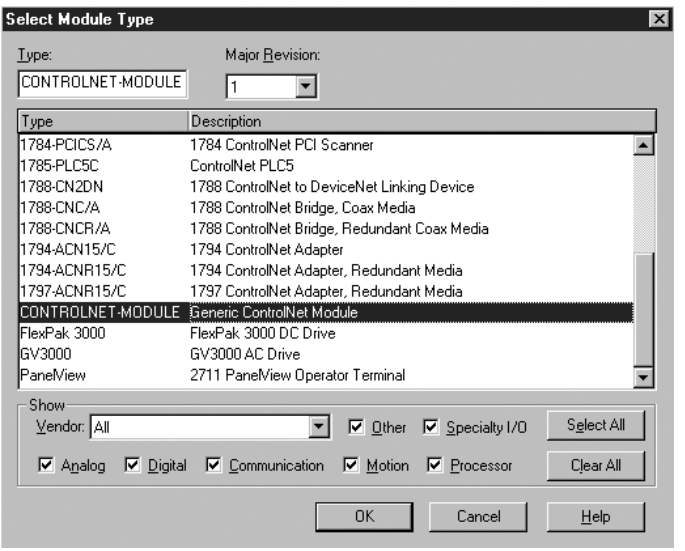
8. Right-click on the 1756-CNB and select **New Module** (Figure 6.9).

Figure 6.9 RSLogix 5000: New Module Selection Screen



9. To configure the ControlNet communication module (20-COMM-C or 20-COMM-Q), select the **CONTROLNET-MODULE** type (Figure 6.10) and click **OK**.

Figure 6.10 Select Module Type: Generic ControlNet Module Screen



10. Enter the **Name**, **Description** and **Node** number (Figure 6.11). The **Comm Format** selects the communication format for the module and must be set to **Data-INT**. **Input** Assembly Instance is the input connection point for the primary connection and should always be 1. **Output** Assembly Instance is the output connection point for the primary connection and should always be 2. **Configuration** Assembly Instance and Size specify the configuration assembly, and should be 6 and 0 respectively. The values entered will vary based on your application needs and the size (16-bit or 32-bit) of the Reference/Feedback and Datalinks in the drive. For example:

PowerFlex 70/700 (16-bit Ref/Fdbk and Datalinks)

Node configured for:	Input Size	Output Size
Logic Command/Reference and Logic Status/Feedback only	4	2
plus Datalink A	6	4
plus Datalink B	8	6
plus Datalink C	10	8
plus Datalink D	12	10

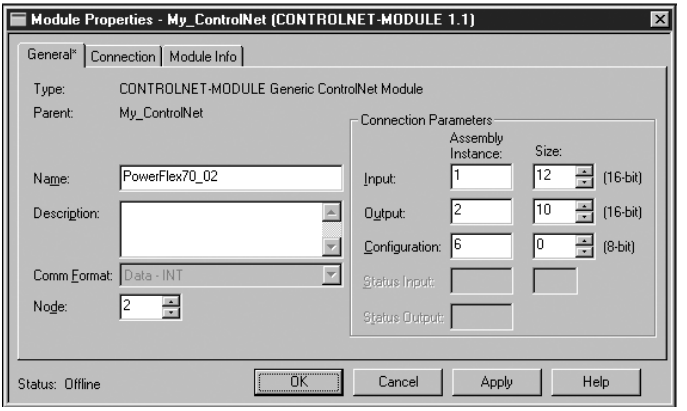
PowerFlex 700VC (16-bit Ref/Fdbk and 32-bit Datalinks)

Node configured for:	Input Size	Output Size
Logic Command/Reference and Logic Status/Feedback only	4	2
plus Datalink A	8	6
plus Datalink B	12	10
plus Datalink C	16	14
plus Datalink D	20	18

PowerFlex 700S (32-bit Ref/Fdbk and Datalinks)

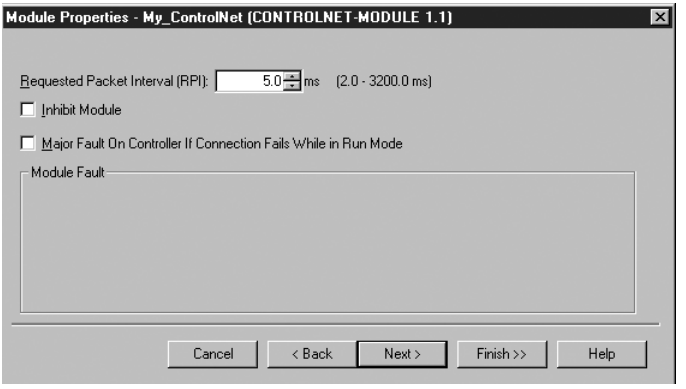
Node configured for:	Input Size	Output Size
Logic Command/Reference and Logic Status/Feedback only	6	4
plus Datalink A	10	8
plus Datalink B	14	12
plus Datalink C	18	16
plus Datalink D	22	20

Figure 6.11 Module Properties: ControlNet Module Parameters



After entering all required data, click **Apply** and then **OK** (Figure 6.12 appears).

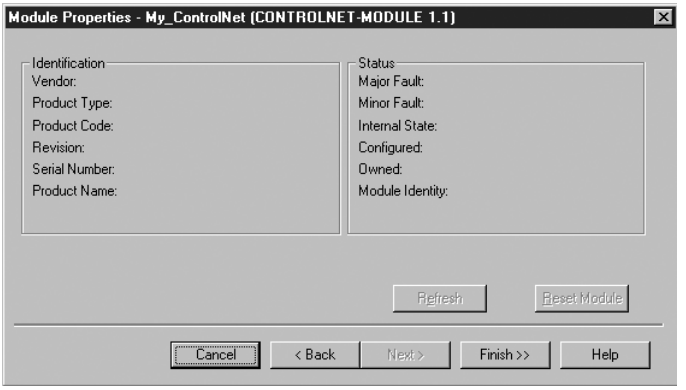
Figure 6.12 Module Properties: RPI Selection



11. The **Requested Packet Interval (RPI)** schedules the connection to move data to or from the adapter at least this often or the connection will fail with the RPI Not Valid error. Set this value to 5 ms or greater and click **Next >** (Figure 6.13 appears).

Important: The RPI time must be set greater than or equal to the Network Update Time (NUT).

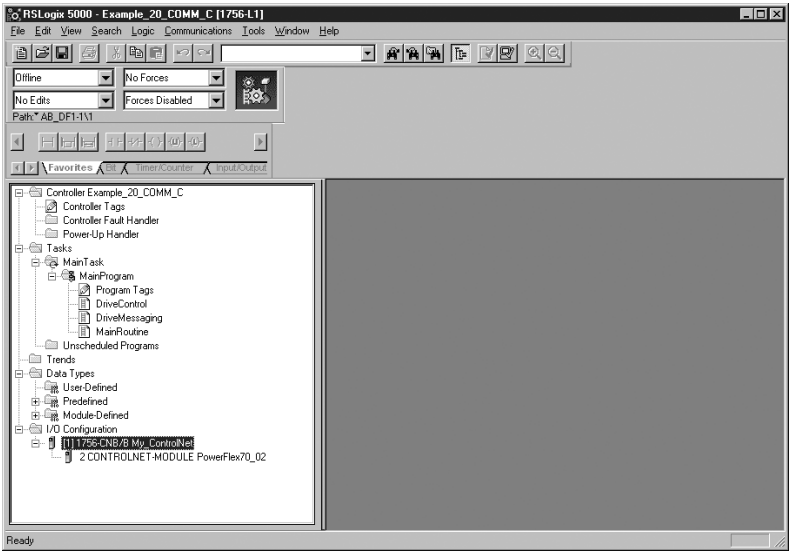
Figure 6.13 Module Properties: My_ControlNet



12. This window (Figure 6.13) is for informational purposes only. Click **Finish >>**.

13. The configured node ("PowerFlex 70_02" in this example) now appears under the 1756-CNB in the I/O Configuration folder (Figure 6.14).

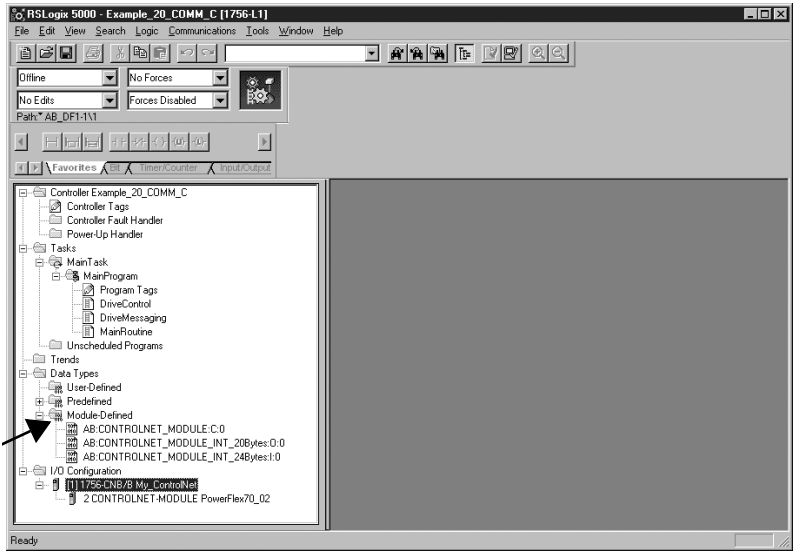
Figure 6.14 RSLogix: Configure Additional Nodes Screen



14. Repeat the previous steps for each additional node you need to configure.

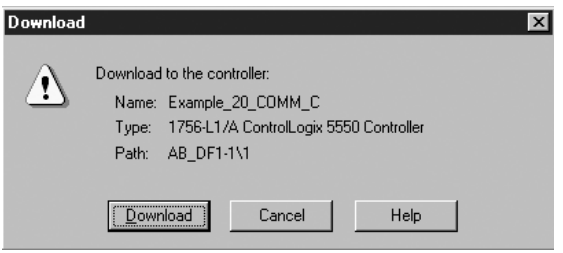
15. In the **Data Types** folder, click on the **Module-Defined** sub-folder (Figure 6.15). When you create a module, module-defined data types and tags are automatically created. These tags allow you to access the Input and Output Data of the module via the controller's ladder logic.

Figure 6.15 RSLogix 5000: Module-Defined Screen



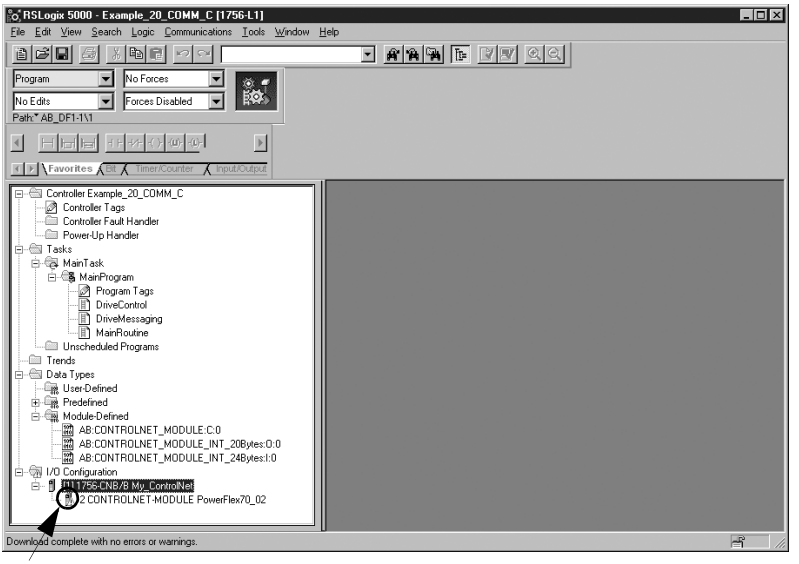
16. Select **Communications > Download** to download the configuration to the controller (Figure 6.16). Click **Download**. RSLogix automatically enters on-line mode when complete.

Figure 6.16 Download to the Controller Dialog Box



17. An Attention symbol is located next to the Node 2 (PowerFlex 70_02) icon, which indicates the ControlNet scanner needs to be configured.

Figure 6.17 RSLogix: Attention Symbol



18. Start RSNetWorx and perform the following:

A. Click the On-line icon and browse the network.

B. Select Edits Enabled and view the messages in the Message View for completion (Figure 6.18). The icon should disappear from the nodes in the Graphical View.

C. Select **File > Save** and save the project (Figure 6.19).

D. Close RSNetWorx.

This schedules the I/O that was configured in RSLogix 5000.

Figure 6.18 RSNetWorx for ControlNet Screen

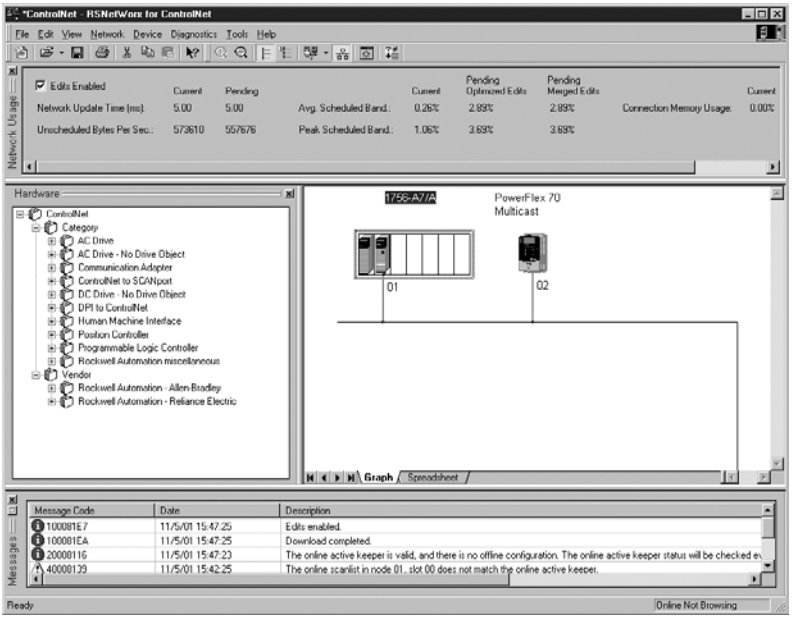
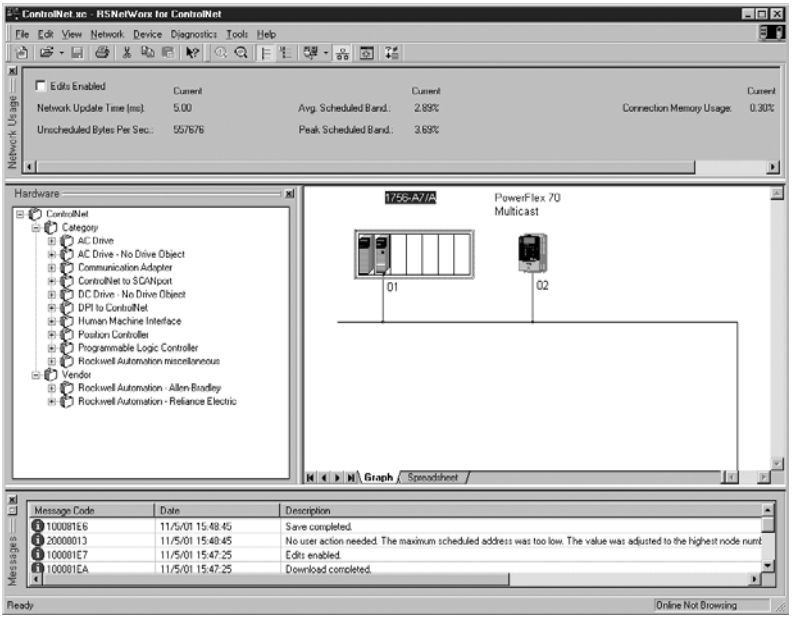
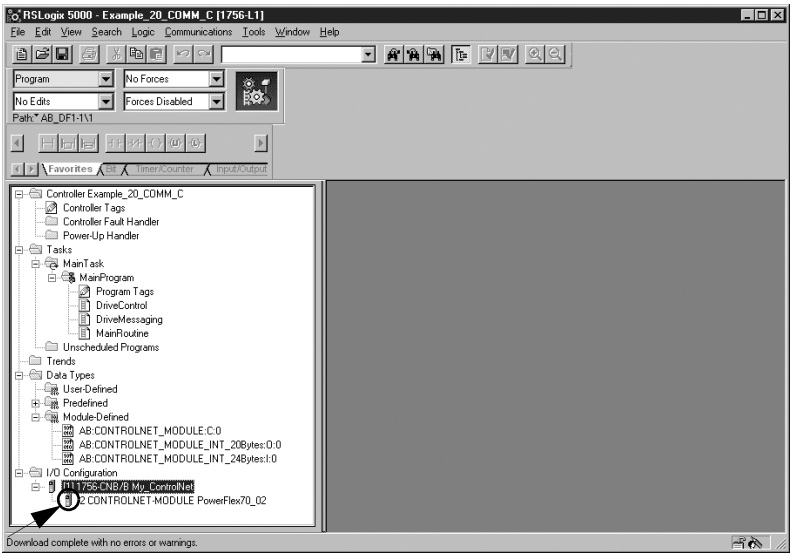


Figure 6.19 RSLogix 5000: Example without Attention Symbol



19. The Attention symbol on the RSLogix 5000 connection tree will disappear if the network has been configured properly (Figure 6.20). You are now ready to develop your ladder logic program.

Figure 6.20 RSLogix 5000: Connection Tree without Attention Symbol



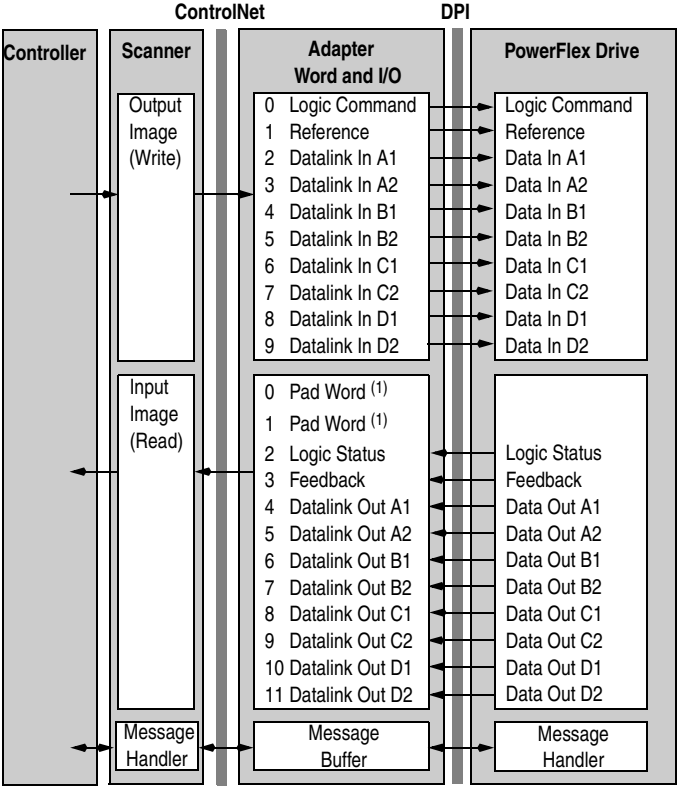
Understanding the I/O Image

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 ControlNet 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 following:

- Size (either 16-bit or 32-bit) of the Reference/Feedback words and Datalink words used by the drive.
- Configuration of I/O (**Parameter 25 - [M-S Input]** and **Parameter 26 - [M-S Output]**). If all I/O is not enabled, the image table is truncated. The image table always uses consecutive words starting at word 0.

Figure 6.21 illustrates an example of an I/O image with 16-bit words.

Figure 6.21 Example I/O Image with All I/O Enabled



(1) Required by ControlLogix. May or may not be required by other controllers.

In Figure 6.21, the configuration is shown using 10 words of output and 12 words of input. (The adapter adds two pad words at the beginning of the input). Depending on your application needs, this may vary. For example, an image that uses 32-bit words for Reference and Datalinks would change the I/O image in Figure 6.21 as follows:

Word	Output I/O
0	Logic Command
1	Pad Word
2 - 3	Reference
4 - 7	Datalink A1/A2
8 - 11	Datalink B1/B2
12 - 15	Datalink C1/C2
16 - 19	Datalink D1/D2

Word	Input I/O
0 - 1	Pad Word
2	Logic Status
3	Pad Word
4 - 5	Feedback
6 - 9	Datalink A1/A2
11 - 13	Datalink B1/B2
14 - 17	Datalink C1/C2
18 - 21	Datalink D1/D2

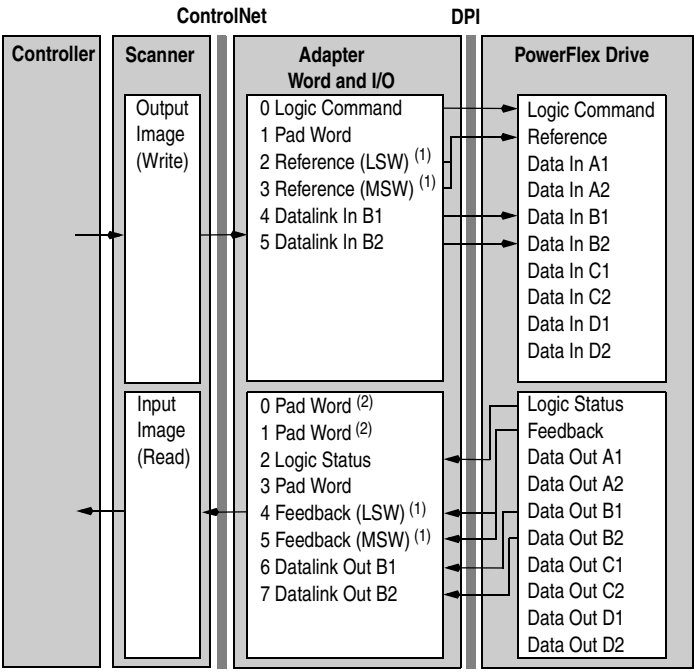
An image that uses a 16-bit Reference and 32-bit Datalinks would change the I/O image in Figure 6.21 as follows:

Word	Output I/O
0	Logic Command
1	Pad Word
2	Reference
3	Pad Word
4 - 7	Datalink A1/A2
8 - 11	Datalink B1/B2
12 - 15	Datalink C1/C2
16 - 19	Datalink D1/D2

Word	Input I/O
0 - 1	Pad Word
2	Logic Status
3	Pad Word
4	Feedback
5	Pad Word
6 - 9	Datalink A1/A2
11 - 13	Datalink B1/B2
14 - 17	Datalink C1/C2
18 - 21	Datalink D1/D2

Figure 6.22 illustrates an example of an I/O image that does not use all of the I/O data. Only the Logic Command/Reference and Datalink B are enabled. In this example, the Reference is a 32-bit word, and Datalinks are 16-bit words.

Figure 6.22 Example I/O Image with Only Logic/Reference and Datalink B Enabled



(1) LSW is Least Significant Word (Bits 15 – 0). MSW is Most Significant Word (Bits 31 – 16).

(2) Required by ControlLogix. May or may not be required by other controllers.

Using Logic Command/Status

When enabled, the Logic Command/Status word is always word 0 in the output image and word 2 in the input image. The *Logic Command* is a 16-bit word of control produced by the scanner and consumed by the adapter. The *Logic Status* is a 16-bit word of status produced by the adapter and consumed by the scanner.

This manual contains the bit definitions for select PowerFlex products in Appendix D, Logic Command/Status Words. For other products, refer to their documentation.

Using Reference/Feedback

When enabled, Reference/Feedback begins at word 1 (16-bit) or word 2 (32-bit) in the I/O range. The *Reference* (16 bits or 32 bits) is produced by the controller and consumed by the adapter. The *Feedback* (16 bits or 32 bits) is produced by the adapter and consumed by the controller. The size of the Reference/Feedback is determined by the drive and displayed in **Parameter 07 - [Ref/Fdbk Size]** in the adapter.

Size	Valid Values	In I/O Image	Example
16-bit	-32768 to 32767	Word 1	Figure 6.21
32-bit	-2147483648 to 2147483647	Word 2 (LSW) and Word 3 (MSW)	Figure 6.22

The Reference value is a scaled value; it is not an engineering value. For example, in PowerFlex 70/700 drives, the reference is scaled based on the value of **Parameter 55 - [Maximum Freq]** where “32,767” equals the Parameter 55 frequency value, and “0” equals 0 Hz. Note that the commanded maximum speed can never exceed the value of **Parameter 82 - [Maximum Speed]**. Figure 6.23 shows example References and their results on a PowerFlex 70/700 drive that has its **Parameters 55 - [Maximum Freq]** set to 130 Hz and **82 - [Maximum Speed]** set to 60 Hz.

Figure 6.23 Example Speed Reference and Feedback for a PowerFlex 70/700

Reference Value	Scale		Output Speed	Feedback Value
	Percent	Value		
32767 (1)	100%	130 Hz	60 Hz (2)	15123 (3)
16384	50%	65 Hz	60 Hz (2)	15123 (3)
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

(1) A value of 32767 is equivalent to the Parameter 55 frequency value. The effects of values greater than 32767 depend on whether the DPI host uses a bipolar or unipolar direction mode. Refer to the documentation for your DPI host.

(2) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because Parameter 82 - [Maximum Speed] sets 60 Hz as the maximum speed.

(3) The Feedback value is also scaled based on the value of Parameter 55 - [Maximum Freq], For example, 60/130 = 0.46 so 32767 x 0.46 = 15123.

For Reference/Feedback details about other DPI Hosts, refer to their respective User Manuals.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a parameter value to be changed without using an Explicit Message. When enabled, each Datalink occupies two 16-bit or 32-bit words in both the input and output image. **Parameter 08 - [Datalink Size]** will indicate whether the drive uses 16-bit or 32-bit words for Datalinks.

Rules for Using Datalinks

- Each set of Datalink parameters in a PowerFlex drive can be used by only one adapter. If more than one adapter is connected to a single drive, multiple adapters must not try to use the same Datalink.
- Parameter settings in the drive determine the data passed through the Datalink mechanism. Refer to the documentation for your drive.
- When you use a Datalink to change a value, the value is not written to the Non-Volatile Storage (NVS). The value is stored in volatile memory and lost when the drive loses power. Thus, use Datalinks when you need to change a value of a parameter frequently.

32-Bit Parameters using 16-Bit Datalinks

To read (and/or write) a 32-bit parameter using 16-bit Datalinks, typically both Datalinks of a pair (A, B, C, D) are set to the same 32-bit parameter. For example, to read **Parameter 09 - [Elapsed MWh]** in a PowerFlex 70, both Datalink A1 and A2 are set to "9." Datalink A1 will contain the least significant word (LSW) and Datalink A2 will contain the most significant word (MSW). In this example, the Parameter 9 value of 5.8 MWh is read as a "58" in Datalink A1.

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	9	58
A2	MSW	9	0

Regardless of the Datalink combination, x1 will always contain the LSW and x2 will always contain the MSW. In the following examples **Parameter 242 - [Power Up Marker]** in a PowerFlex 70 contains a value of 88.4541 hours.

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	242	32573
A2	- Not Used -	0	0

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	- Not Used -	0	0
A2	MSW	242	13

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A2	MSW	242	13
B1	LSW	242	32573

32-bit data is stored in binary as follows:

MSW	2^{31} through 2^{16}
LSW	2^{15} through 2^{0}

Example:

Parameter 242 - [Power Up Marker] = 88.4541 hours

MSW = $13_{decimal} = 1101_{binary} = 2^{19} + 2^{18} + 2^{16} = 851968$

LSW = 32573

851968 + 32573 = 884541

Function of the Example Program

The following example ladder logic program works with a ControlLogix controller and a PowerFlex 70 or PowerFlex 700 drive. This example program enables you to:

- Obtain Logic 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.
- Send/Receive Datalink data to/from the drive.

Example Adapter Settings

- Nodes 2 and 3

Example Parameter Settings

Device	Parameter	Name	Value	Description
PowerFlex 70 Drive	90	Speed Ref A Sel	22	'DPI Port 5' (20-COMM-C or Q)
	300	Data In A1	140	Points to Pr. 140 [Accel Time 1]
	301	Data In A2	142	Points to Pr. 142 [Decel Time 1]
	302	Data In B1	100	Points to Pr. 100 [Jog Speed]
	303	Data In B2	155	Points to Pr. 155 [Stop Mode A]
	310	Data Out A1	140	Points to Pr. 140 [Accel Time 1]
	311	Data Out A2	142	Points to Pr. 142 [Decel Time 1]
	312	Data Out B1	100	Points to Pr. 100 [Jog Speed]
	313	Data Out B2	155	Points to Pr. 155 [Stop Mode A]
20-COMM-C Adapter or 20-COMM-Q Adapter	13	DPI I/O Cfg	xxx1 1111	Enables Cmd/Ref, Datalinks A-D
	25	M-S Input	xxx1 1111	Configures the I/O Data to be transferred from the network to the drive.
	26	M-S Output	xxx1 1111	Configures the I/O Data to be transferred from the drive to the network.

Logic Command/Status Words

This example uses the Logic Command word and Logic Status word for PowerFlex 70 and PowerFlex 700 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 DPI host. Refer to the documentation for your drive.

RSLogix 5000 Ladder Logic Example Program

Figure 6.24 I/O Messaging

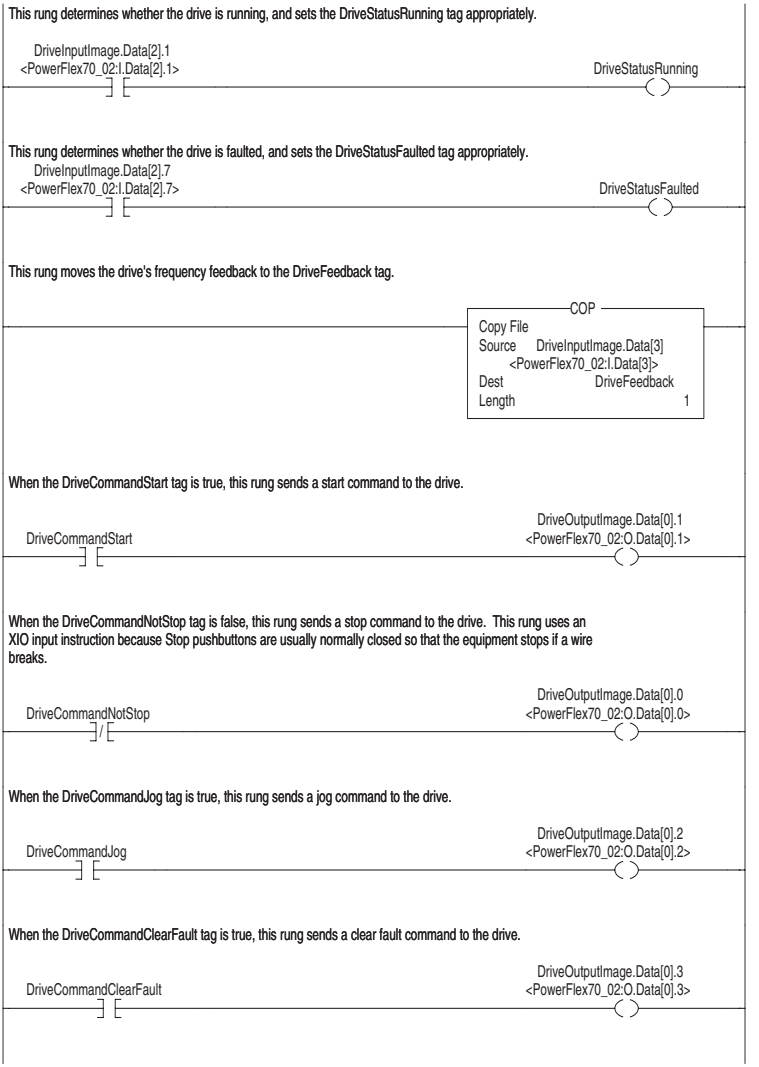
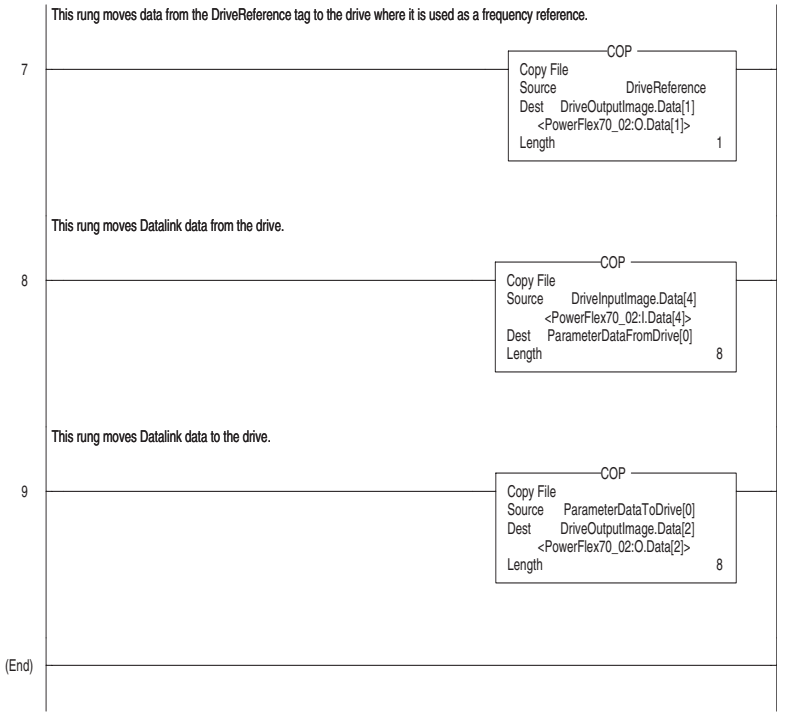


Figure 6.24 I/O Messaging (Continued)



About Explicit Messaging

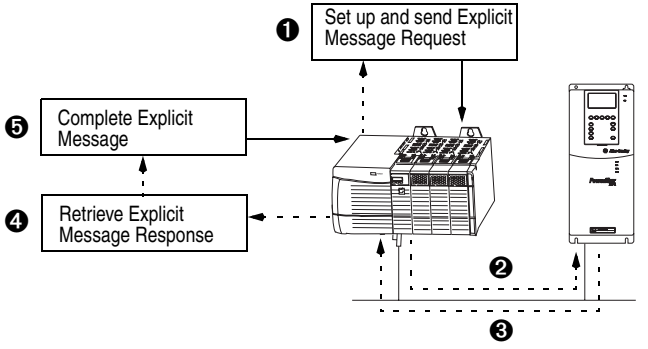
Explicit Messaging is used to transfer data that does not require continuous updates. With Explicit Messaging, you can configure and monitor a slave device's parameters on the ControlNet network.

Performing Explicit Messages

There are five basic events in the Explicit Messaging process. The details of each step will vary depending on the controller. 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 6.25 Explicit Message Process

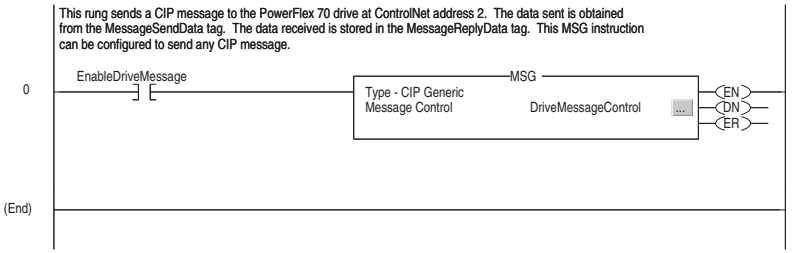


Event

1. You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner module (download).
2. The scanner 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. 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.

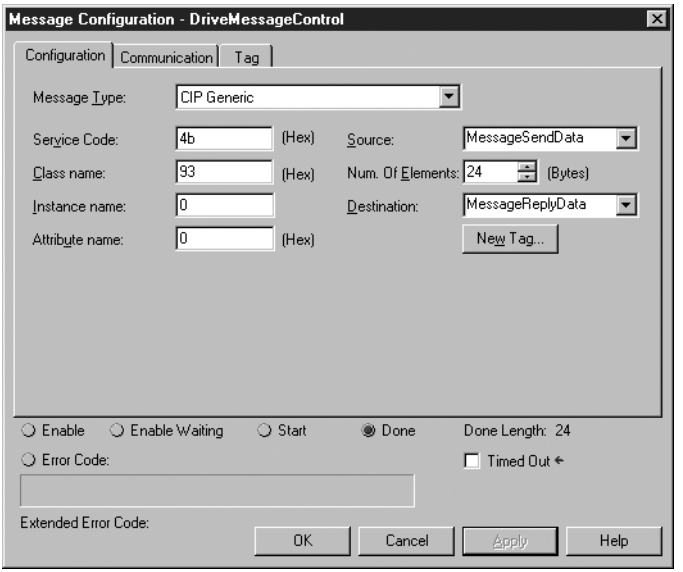
Explicit Messaging Example

Figure 6.26 Explicit Messaging



A Get_Attributes_Scattered Message allows for reaching multiple parameters that may or may not be in sequential order (Figure 6.27).

Figure 6.27 Get_Attributes_Scattered Message Screen



Configuration	Value	Description	Refer to . . .
Service Code	4b (hex)	Get_Attributes_Scattered	C-18
Class name	93 (hex)	DPI Parameter Object	C-15
Instance name	0 (hex)	Class Attributes for Drive	C-15
Attribute name	0 (hex)	Class Instances for Drive	C-15
Source	Message Send Data	Request Message	—
Destination	Message Reply Data	Response Message	—

Get Attributes Scattered example request and response data:

(Source) Request Data

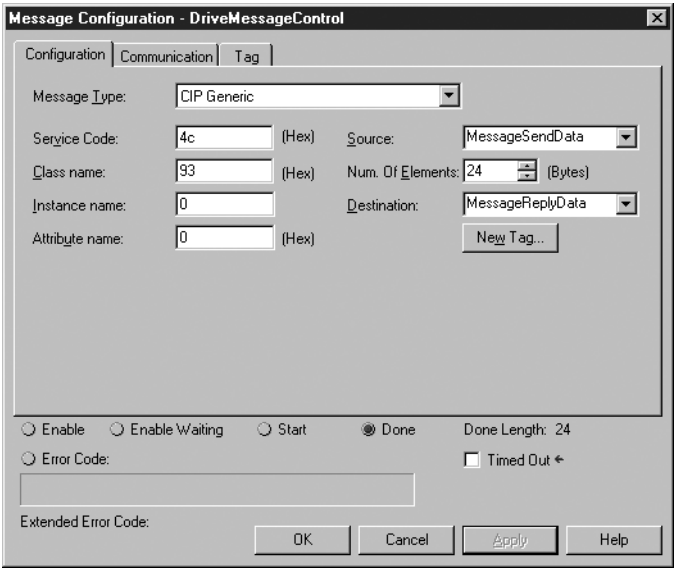
Offset	Value	Description
0	12	Parameter Number = 12
1	0	(Pad Word)
2	0	(Pad Word)
3	11	Parameter Number = 11
4	0	(Pad Word)
5	0	(Pad Word)
6	10	Parameter Number = 10
7	0	(Pad Word)
8	0	(Pad Word)
9	9	Parameter Number = 9
10	0	(Pad Word)
11	0	(Pad Word)

(Destination) Response Data

Offset	Value	Description
0	12	Parameter Number = 12
1	3333	Value = 333.3VDC
2	0	(Pad Word)
3	11	Parameter Number = 11
4	0	Value = 0.0Hz
5	0	(Pad Word)
6	10	Parameter Number = 10
7	148	Value = 14.8Hrs
8	0	
9	9	Parameter Number = 9
10	23	Value = 2.3MWh
11	0	

A Set_Attributes_Scattered message is used to write multiple parameters that may or may not be in sequential order (Figure 6.28).

Figure 6.28 Set_Attributes_Scattered Message Screen



Configuration	Value	Description	Refer to . . .
Service Code	4c (hex)	Set_Attributes_Scattered	C-18

Set_Attributes_Scattered example request and response data:

(Source) Request Data

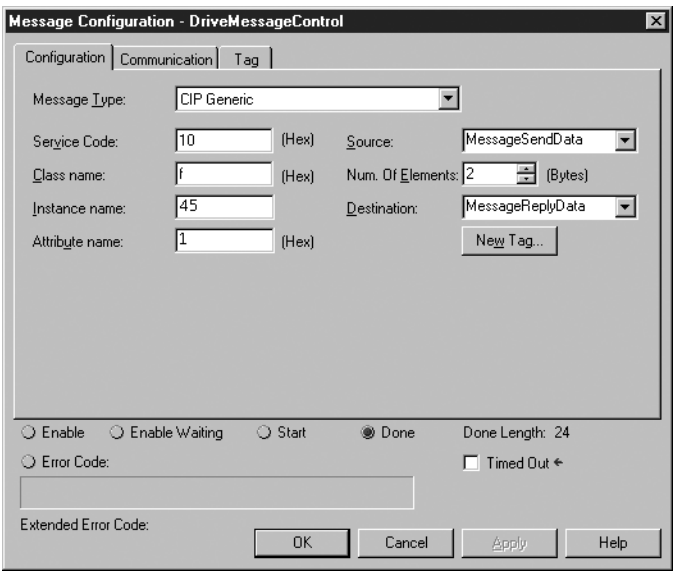
Offset	Value	Description
0	45	Parameter Number = 45
1	50	Value = 0.5HP
2	0	(Pad Word)
3	44	Parameter Number = 44
4	1740	Value = 1740RPM
5	0	(Pad Word)
6	43	Parameter Number = 43
7	600	Value = 60.0Hz
8	0	(Pad Word)
9	42	Parameter Number = 42
10	16	Value = 1.6Amps
11	0	(Pad Word)

(Destination) Response Data

Offset	Value	Description
0	45	Parameter Number = 45
1	0	(Pad Word)
2	0	(Pad Word)
3	44	Parameter Number = 44
4	0	(Pad Word)
5	0	(Pad Word)
6	43	Parameter Number = 43
7	0	(Pad Word)
8	0	(Pad Word)
9	42	Parameter Number = 42
10	0	(Pad Word)
11	0	(Pad Word)

A Set_Attribute_Single message is used to write a single parameter (Figure 6.29).

Figure 6.29 Set_Attribute_Single Message Screen



Configuration	Value	Description	Refer to . . .
Service Code	10 (hex)	Set_Attribute_Single	C-7
Class name	f (hex)	Parameter Object	C-5
Instance name	45 (decimal)	Drive Parameter 45	C-5
Attribute name	1 (hex)	Parameter Value Attribute	C-6

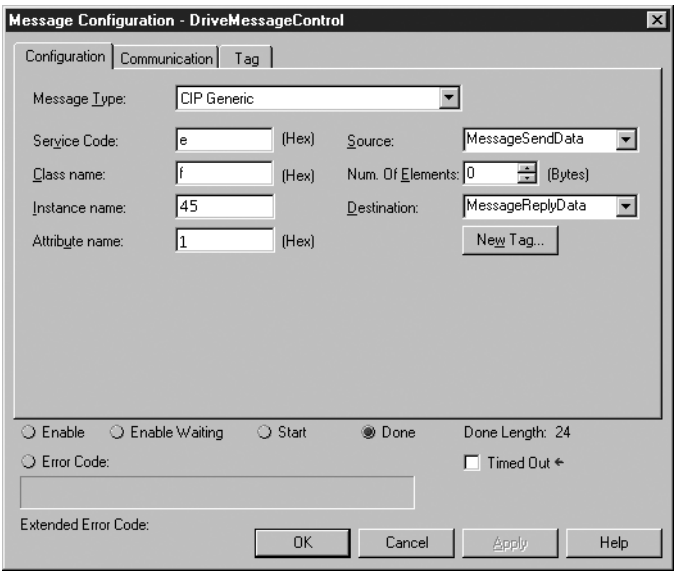
Set_Attribute_Single example (writing PowerFlex 70 Parameter 45 in Figure 6.29):

Send Data

Offset	Value	Description
0	50	Value = 0.50HP

A Get_Attribute_Single message is used to read a single parameter (Figure 6.30).

Figure 6.30 Get_Attribute_Single Message Screen



Configuration	Value	Description	Refer to . . .
Service Code	e (hex)	Get_Attribute_Single	C-7
Class name	f (hex)	Parameter Object	C-5
Instance name	45 (decimal)	Drive Parameter 45	C-5
Attribute name	1 (hex)	Parameter Value Attribute	C-6

Get Attributes Single example (reading PowerFlex 70 Parameter 45 in Figure 6.30):

Reply Data

Offset	Value	Description
0	50	Value = 0.50HP

Notes:

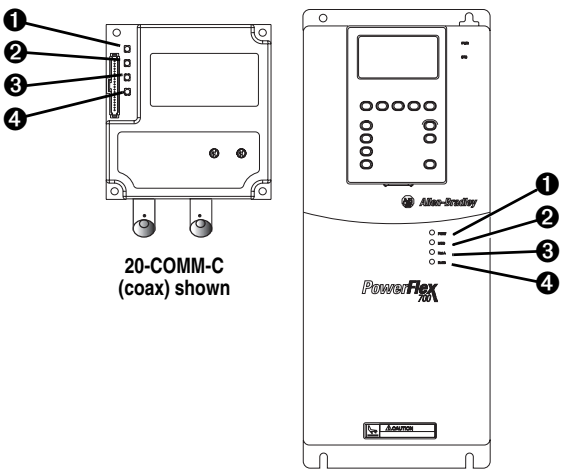
Troubleshooting

Chapter 7 provides information for diagnosing and troubleshooting potential problems with the adapter.

Locating the Status Indicators

The ControlNet adapter has four status indicators. They can be viewed on the adapter or through the drive cover. See Figure 7.1.

Figure 7.1 Status Indicators (location on drive may vary)



Item	Status Indicator	Description	Page
1	PORT	DPI Connection Status	7-2
2	MOD	Adapter Status	7-3
3	Net A	ControlNet A Status	7-4
4	Net B	ControlNet B Status	7-4

PORT Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or is not connected properly to the drive.	• Securely connect the adapter to the drive using the Internal Interface cable. • Apply power to the drive.
Flashing Red	The adapter is not receiving a ping message from the drive.	• Verify that cables are securely connected. • Cycle power to the drive.
Solid Red	The drive has refused an I/O connection from the adapter. Another DPI peripheral is using the same DPI port as the adapter.	**Important:** Cycle power to the drive after making any of the following corrections: • Verify that all DPI cables are securely connected and not damaged. Replace cables if necessary. • Verify that the DPI Host supports Datalinks. • Configure the adapter to use a Datalink that is not already being used by another peripheral.
Orange	The adapter is connected to a product that does not support Allen-Bradley DPI communications.	Connect the adapter to a product that supports Allen-Bradley DPI communications (for example, PowerFlex drives).
Flashing Green	The adapter is establishing an I/O connection to the drive.	No action required. Normal behavior if no DPI I/O is enabled.
Solid Green	The adapter is properly connected and is communicating with the drive.	No action required.

MOD Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered.	• Securely connect the adapter to the drive using the Internal Interface cable. • Apply power to the drive.
Flashing Red	The adapter has failed the firmware test. The adapter is being flash upgraded.	• Clear faults in the adapter. • Cycle power to the drive. • If cycling power does not correct the problem, the 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. • 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. • Normal behavior if no DPI I/O is enabled.
Solid Green	The adapter is operational and transferring I/O data.	No action required.

Net A and B Together

Status	Cause	Corrective Actions
Both LEDs are off.	A reset occurred or there is no power.	Apply power to the adapter.
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 Rockwell Automation, Inc. 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 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 Rockwell Automation, Inc. 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.

Viewing Adapter Diagnostic Items

The following adapter diagnostic items can be viewed using DriveExplorer (version 2.01 or higher) or DriveExecutive (version 1.01 or higher) software, or an LCD PowerFlex HIM (Diagnostic/Device Items).

No.	Name	Description
1	Common Logic Cmd	Current value of the common Logic Command being transmitted to the drive by this adapter.
2	Prod Logic Cmd	Current value of the product-specific Logic Command being transmitted to the drive by this adapter.
3	Reference	Current value of the product-specific Reference being transmitted to the drive by this adapter.
4	Common Logic Sts	Current value of the common Logic Status being received from the drive by this adapter.
5	Prod Logic Sts	Current value of the product-specific Logic Status being received from the drive by this adapter.
6	Feedback	Current value of the product-specific Feedback being received from the drive by this adapter.
7	Datalink A1 In	Current value of respective Datalink In being transmitted to the drive by this adapter. (If not using a Datalink, this parameter should have a value of zero).
8	Datalink A2 In	
9	Datalink B1 In	
10	Datalink B2 In	
11	Datalink C1 In	
12	Datalink C2 In	
13	Datalink D1 In	
14	Datalink D2 In	
15	Datalink A1 Out	Current value of respective Datalink Out being received from the drive by this adapter. (If the drive indicates a 16-bit datalink size, the value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits are zero).
16	Datalink A2 Out	
17	Datalink B1 Out	
18	Datalink B2 Out	
19	Datalink C1 Out	
20	Datalink C2 Out	
21	Datalink D1 Out	
22	Datalink D2 Out	
23	DPI Rx Errors	Current value of the DPI Receive error counter.
24	DPI Rx Err Max	Maximum value (since reset) of the DPI Receive error counter.
25	DPI Tx Errors	Current value of the DPI Transmit error counter
26	DPI Tx Err Max	Maximum value (since reset) of the DPI Transmit error counter.
27	Node Address SW	Current value of the node address switches.
28	Boot Flash Count	Number of times the boot firmware in the adapter has been flash updated.
29	App Flash Count	Number of times the application firmware in the adapter has been flash updated.
30	M-S Input Size	Size of data transferred from the network to the drive.
31	M-S Output Size	Size of data transferred from the drive to the network.

Viewing and Clearing Events

The adapter maintains an event queue that reports the history of its actions. You can view the event queue using an LCD PowerFlex HIM, DriveExplorer software (2.01 or higher), or DriveExecutive software (1.01 or higher).

To view and clear events

Step	Keys	Example Screen
Viewing Events		
1. Access parameters in the adapter. Refer to Using the PowerFlex HIM in Chapter 3.		
2. Press the Up Arrow or Down Arrow to scroll to **Diagnostics**.	OR	Main Menu: Diagnostics Parameter Device Select
3. Press Enter to display the Diagnostics menu in the adapter.		
4. Repeat steps 2 and 3 to enter the **Events** option and then **View Event Queue** option.		
5. Press the Up Arrow or Down Arrow to scroll through the events. The most recent event is Event 1.	OR	Event Q: 1 E3 Ping Time Flt
Clearing Events		
1. Access parameters in the adapter. Refer to Using the PowerFlex HIM in Chapter 3.		
2. Press the Up Arrow or Down Arrow to scroll to **Diagnostics**.	OR	
3. Press Enter to display the Diagnostics menu in the adapter.		
4. Repeat steps 2 and 3 to enter the **Events** option and then the **Clear Event** option or **Clr Event Queue** option. A message will pop up to confirm that you want to clear the message or queue.		Dgn: Events View Event Queue Clear Event Clr Event Queue
5. Press Enter to clear all events out of the event queue. All event queue entries will then display “No Event.”		

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
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus-off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The adapter is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed.
6	Host Sent Reset	The drive sent a reset event message.
7	EEPROM Sum Flt	The EEPROM in the adapter is corrupt.
8	Online @ 125 kbps	The adapter detected the drive communicating at 125 kbps.
9	Online @ 500 kbps	The adapter detected the drive communicating at 500 kbps.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	Dup Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The adapter has logged in for Type 0 control.
13	Type 0 Time Flt	The adapter has not received a Type 0 status message within the specified time.
14	DL Login	The adapter has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The adapter has not received a Datalink message within the specified time.
17	Reserved	Not used.
18	Control Disabled	The adapter has sent a “Soft Control Disable” command to the drive.
19	Control Enabled	The adapter has sent a “Soft Control Enable” command to the drive.
20	Message Timeout	A Client-Server message sent by the adapter was not completed.
21	Flt Cfg Error	Flt Cfg for the Reference or Datalinks is set to a value greater than 65,535 and the drive requires a 16-bit value.
22	App CRC Flt	Startup sequence detected corrupt application firmware.
23	App Updated	Statup sequence detected new application firmware.
24	CN Comm Flt	The adapter detected a communications fault on the network.
25	CN Sent Reset	The adapter received a reset from the network.
26	CN Close Flt	An I/O connection from the network to the adapter was closed.
27	CN Idle Flt	The adapter is receiving “Idle” packets from the network.
28	CN Open	An I/O connection to the adapter from the network has been opened.

Code	Event	Description
29	Net Timeout Flt	An I/O connection from the network to the adapter has timed out.
30	PCCC IO Close	The device sending PCCC control messages to the adapter has sent the PCCC Control Timeout to a value of zero.
31	PCCC IO Open	The adapter has begun receiving PCCC control messages (the PCCC Control Timeout was previously set to a non-zero value).
32	PCCC IO Time Flt	The adapter has not received a PCCC control message within the specified PCCC Control Timeout interval.
22	Watchdog T/O Flt	The software watchdog detects a failure.
34	EEPROM Init	Startup sequence detected a blank EEPROM map revision. Intended to happen in factory test.
35	DPI Fault Clear	The drive issued this because a fault was cleared.
36	Normal Startup	The adapter successfully started up.
37	Manual Reset	The adapter was reset by the user.

Specifications

Appendix A presents the specifications for the 20-COMM-C (coax) and 20-COMM-Q (fiber) adapters. The specifications are identical, except where the adapters are identified separately.

Communications

Network	
Protocol	ControlNet
Data Rates	5M baud
Media	coax (20-COMM-C) fiber (20-COMM-Q)
Drive	
Protocol	DPI
Data Rates	125 kbps or 500 kbps

Electrical

Consumption	
Drive	275 mA @ 5 VDC supplied through the drive
Network	None

Mechanical

Dimensions	
Height	16 mm (.624 inches)
Length	103 mm (4 inches)
Width	80 mm (3.125 inches)
Weight	85g (3 oz.)

Environmental

Temperature Operating Storage	 -10 to 50° C (14 to 149° 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

UL	UL508C
cUL	CAN/CSA C22.2 No. 14-M91
CE	EN50178 and EN61800-3

Adapter Parameters

Appendix B provides information about the ControlNet adapter parameters.

About Parameter Numbers

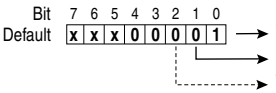
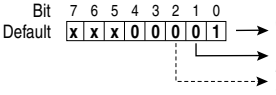
The parameters in the adapter are numbered consecutively. However, depending on which configuration tool you use, they may have different numbers.

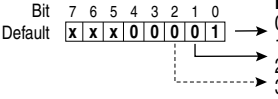
Configuration Tool	Numbering Scheme
• HIM • DriveExplorer • DriveExecutive	The adapter parameters begin with parameter 01. For example, Parameter 01 - [DPI Port] is parameter 01 as indicated by this manual.
• Explicit Messaging • RSNetWorx for ControlNet	The adapter parameters are appended to the list of drive parameters. For example, with a drive with 300 parameters, Parameter 01 - [DPI Port] is parameter 301.

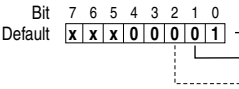
Parameter List

Parameter No.	Name and Description	Details	
01	**[DPI Port]** Displays the port to which the adapter is connected. This will usually be port 5.	Default: Minimum: Maximum: Type:	5 0 7 Read Only
02	**[DPI Data Rate]** Displays the data rate (kilobits per second) used by the drive. This data rate is set in the drive, and the adapter detects it.	Default: Values: Type:	0 = 125 kbps 0 = 125 kbps 1 = 500 kbps Read Only

Parameter No.	Name and Description	Details	
03	**[CN Addr Cfg]** Configures the ControlNet node address if the Node Address Switches are set to "00." (Updates Parameter 04 - [CN Addr Act] after reset.)	Default: Minimum: Maximum: Type: Reset Required:	2 1 99 Read/Write Yes
04	**[CN Addr Act]** Displays the ControlNet node address actually used by the adapter.	Default: Minimum: Maximum: Type:	2 1 99 Read Only
05	**[CN Rate Cfg]** Configures the ControlNet data rate (megabits per second) at which the adapter communicates. (Updates Parameter 06 - [CN Rate Act] after a reset.)	Default: Values Type: Reset Required:	0 = 5 Mbps 0 = 5 Mbps Read/Write Yes
06	**[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
07	**[Ref/Fdbk Size]** Displays the size of the Reference/Feedback. The drive determines the size of the Reference/ Feedback.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
08	**[Datalink Size]** Displays the size of each Datalink word. The drive determines the size of Datalinks.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
09	**[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.		
10	**[Comm Flt Action]** Sets the action that the adapter will take if it detects a network failure. 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 10 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if the 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 disconnect cable).		

Parameter No.	Name and Description	Details
11	**[Idle Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that the scanner is idle because the controller was switched to program mode. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	 **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 11 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive if the scanner is idle. 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 faulted controller).	
12	**[CN Active Cfg]** Displays the source from which the adapter node address is taken. This will either be switches or Parameter 03 - [CN Addr Cfg] in EEPROM. It is determined by the settings of the Node Address Switches on the adapter.	Default: 0 = Switches Values: 0 = Switches 1 = EEPROM Type: Read Only
13	**[DPI I/O Cfg]** Sets the I/O that is transferred through the adapter. 	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D 5 = Not Used 6 = Not Used 7 = Not Used
14	**[DPI I/O Active]** Displays the I/O that the adapter is actively transmitting. The value of this parameter will usually be equal to the value of Parameter 13 - [DPI I/O Cfg]. 	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read Only **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D 5 = Not Used 6 = Not Used 7 = Not Used

Parameter No.	Name and Description	Details
15	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • Parameter 10 - [Comm Flt Action] is set to "Send Flt Cfg" and communications are disrupted. • Parameter 11 - [Idle Flt Action] is set to "Send Flt Cfg" and the scanner is idle. The bit definitions will depend on the product to which the adapter is connected.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No
16	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • Parameter 10 - [Comm Flt Action] is set to "Send Flt Cfg" and communications are disrupted. • Parameter 11 - [Idle Flt Action] is set to "Send Flt Cfg" and the scanner is idle.	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses a 16-bit Reference, the most significant word of this value must be set to zero (0) or a fault will occur.
17 18 19 20 21 22 23 24	**[Flt Cfg A1]** **[Flt Cfg A2]** **[Flt Cfg B1]** **[Flt Cfg B2]** **[Flt Cfg C1]** **[Flt Cfg C2]** **[Flt Cfg D1]** **[Flt Cfg D2]** Sets the data that is sent to the Datalink in the drive if any of the following is true: • Parameter 10 - [Comm Flt Action] is set to "Send Flt Cfg" and communications are disrupted. • Parameter 11 - [Idle Flt Action] is set to "Send Flt Cfg" and the scanner is idle.	Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses 16-bit Datalinks, the most significant word of this value must be set to zero (0) or a fault will occur.
25	**[M-S Input]** Sets the Master-Slave input data. This data is produced by the scanner and consumed by the adapter.  	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A Input 2 = Datalink B Input 3 = Datalink C Input 4 = Datalink D Input 5 = Not Used 6 = Not Used 7 = Not Used

Parameter No.	Name and Description	Details
26	**[M-S Output]** Sets the Master-Slave output data. This data is produced by the adapter and consumed by the scanner.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes
		**Bit Definitions** 0 = Cmd/Ref 1 = Datalink A Output 2 = Datalink B Output 3 = Datalink C Output 4 = Datalink D Output 5 = Not Used 6 = Not Used 7 = Not Used
27	**[Ref Adjust]** Sets the percent scale factor for the Reference from the network.	Default: 100.00 Minimum: 0.00 Maximum: 200.00 Type: Read/Write Reset Required: No

ATTENTION: To guard against equipment damage and/or personal injury, note that changes to **Parameter 27 - [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.

Notes:

ControlNet Objects

Appendix C presents 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 5 for PLC-5 in Explicit Messaging Example section.
- Chapter 6 for ControlLogix in Explicit Messaging Example section.

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

Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Instances

The number of instances depends on the number of components in the device connected to the adapter. This number of components can be read in Instance 0, Attribute 2.

Instance	Description
0	Class
1	DPI host
2 - 7	DPI Peripherals on ports 1 - 6

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
2	Get	Max Instance	UINT	Total number of instances

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	UINT	1 = Allen-Bradley
2	Get	Device Type	UINT	120
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

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x05	Yes	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single

Register Object

Class Code

Hexadecimal	Decimal
0x07	7

Instances

Instance	Description
1	All I/O data being read from the DPI device (read-only)
2	All I/O data written to the DPI device (read/write)
3	Logic Status and Feedback data (read-only)
4	Logic Command and Reference data (read/write)
5	Datalink A (input data from device to scanner) (read only)
6	Datalink A (output data from scanner to device) (read/write)
7	Datalink B (input data from device to scanner) (read only)
8	Datalink B (output data from scanner to device) (read/write)
9	Datalink C (input data from device to scanner) (read only)
10	Datalink C (output data from scanner to device) (read/write)
11	Datalink D (input data from device to scanner) (read only)
12	Datalink D (output data from scanner to device) (read/write)
13	Logic Status and Feedback Data (read-only)
14	Mask (1) (read/write)

(1) The mask command word is set to the value of the first word of the data where there are ones in the second word of the data. Command = (word 1 and not word 2) or (word 1 and word 2). This only controls specified bits in the Logic Command data to the DPI product and does not change the Reference value.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
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 may contain invalid, bad or otherwise corrupt data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Producer Register (Drive to ControlNet) 1 = Consumer Register (ControlNet 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 only be accomplished through a connection with a non-zero control timeout attribute.

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

Parameter Object

Class Code

Hexadecimal	Decimal
0x0F	15

Instances

The number of instances depends on the number of parameters in the DPI drive. The adapter parameters are appended to the list of drive parameters. The total number of parameters can be read in Instance 0, Attribute 2.

Instance	Description
0	Class Attributes
1	Drive Parameter 1 Attributes
⋮	⋮
n	Last Drive Parameter Attributes
n + 1	Adapter Parameter 1 Attributes
⋮	⋮
n + 27	Last Adapter Parameter Attributes

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	Bits that describe parameters.
9	Get	Configuration Assembly Instance	UINT	0
10	Set	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	1 = WORD (16-bit) 2 = UINT (16-bit) 3 = INT (16-bit) 4 = BOOL 5 = SINT (8-bits) 6 = DINT (32-bits) 8 = USINT (8 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	(1)	(3)
11	Get	Maximum Value	(1)	(3)
12	Get	Default Value	(1)	(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 Object *(Continued)*

Services

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

Parameter Group Object

Class Code

Hexadecimal	Decimal
0x10	16

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	Last Drive Group Attributes
n + 1	Adapter Group Attributes

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 *(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	⋮	UINT	(1)

(1) Value varies based on group instance.

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x01	Yes	No	Set_Attribute_Single

PCCC Object

Class Code

Hexadecimal	Decimal
0x67	103

Instances

Not supported

Class Attributes

Not supported.

Instance Attributes

Not supported.

Services

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

PCCC Object *(Continued)*

Message Structure for Execute_PCCC

Request		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code. Not used for all CMD's.
PCCC_ params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_ST S	USINT	Extended status. Not used for all CMD's.
PCCC_ results	ARRAY of USINT	CMD/FNC specific result data

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

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 (Hex.)	(Dec.)	Device
0x0000 – 0x3FFF	0 – 16383	Host
0x4000 – 0x43FF	16384 – 17407	Adapter
0x4400 – 0x47FF	17408 – 18431	DPI Port 1
0x4800 – 0x4BFF	18432 – 19455	DPI Port 2
0x4C00 – 0x4FFF	19456 – 20479	DPI Port 3
0x5000 – 0x53FF	20480 – 21503	DPI Port 4
0x5400 – 0x57FF	21504 – 22527	DPI Port 5
0x5800 – 0x5BFF	22528 – 23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Drive Component 1
2	Drive Component 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Component 1
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	BYTE	0x00 = Communications Adapter 0x30 = PowerFlex 70 0x34 = PowerFlex 700H 0x38, 0x39, or 0x3A = PowerFlex 700 0x40 = PowerFlex 7000 0x48, 0x49, or 0x4A = PowerFlex 700S 0x5A = SMCFlex 0x68, 0x69, or 0x6A = PowerFlex 700VC 0xFF = HIM
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
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.

DPI Device Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
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 drive.
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 a device.
12	Get	Class Revision	WORD	2 = DPI
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
19	Set	Language Selected	BYTE	0 = Default (HIM will prompt at start up) 1 = Language was selected (no prompt)
20	Set	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware flashed into the device.
128	Get	Customization Code	WORD	Code identifying the customized device.
129	Get	Customization Revision Number	WORD	Revision of the customized device.
130	Get	Customization Device Text	STRING[32]	Text identifying the customized device.

DPI 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

Services

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

DPI 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 (Hex.)	(Dec.)	Device
0x0000 – 0x3FFF	0 – 16383	Host
0x4000 – 0x43FF	16384 – 17407	Adapter
0x4400 – 0x47FF	17408 – 18431	DPI Port 1
0x4800 – 0x4BFF	18432 – 19455	DPI Port 2
0x4C00 – 0x4FFF	19456 – 20479	DPI Port 3
0x5000 – 0x53FF	20480 – 21503	DPI Port 4
0x5400 – 0x57FF	21504 – 22527	DPI Port 5
0x5800 – 0x5BFF	22528 – 23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Drive Parameter 1 Attributes
2	Drive Parameter 2 Attributes
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Parameter 1 Attributes
⋮	⋮

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 = DPI
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.)

DPI Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
7	Get	DPI 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 (see pages C-17 – C-18) 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	DPI Descriptor	BOOL[32]	Descriptor (see pages C-17 – C-18)
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. (3)
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory.
11	Get/Set	DPI 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	DPI Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	 Descriptor (see pages C-17 – C-18) Parameter value Minimum value Maximum value Default value Parameter name Units (e.g., Amp, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer supplied parameter name. Only supported by PowerFlex 700S at time of publication.
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-18.

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

DPI 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)	

DPI Parameter Object *(Continued)*

Descriptor Attributes (Continued)

Bit	Name	Description
19	Parameter Exists	Reserved
20	Not Used	Reserved
21	Formula Links	Reserved
22	Access Level (Bit 1)	Reserved
23	Access Level (Blt 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

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

Object Specific Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x4B	Yes	No	Get_Attributes_Scattered
0x4C	Yes	No	Set_Attributes_Scattered

DPI Parameter Object *(Continued)*

Format for Get_Attributes_Scattered Service

The structure shown below can get up to twenty-two parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated parameter value field actually contains an error code.

	Request		Response
Word 0	Parameter Number	**Word 0**	Parameter Number
1	Pad Word	1	Parameter Value LSW
2	Pad Word	2	Parameter Value MSW
3	Parameter Number	3	Parameter Number
4	Pad Word	4	Parameter Value LSW
5	Pad Word	5	Parameter Value MSW
6	Parameter Number	6	Parameter Number
7	Pad Word	7	Parameter Value LSW
8	Pad Word	8	Parameter Value MSW
9	Parameter Number	9	Parameter Number
10	Pad Word	10	Parameter Value LSW
11	Pad Word	11	Parameter Value MSW
12	Parameter Number	12	Parameter Number
13	Pad Word	13	Parameter Value LSW
14	Pad Word	14	Parameter Value MSW
15	Parameter Number	15	Parameter Number
16	Pad Word	16	Parameter Value LSW
17	Pad Word	17	Parameter Value MSW
18	Parameter Number	18	Parameter Number
19	Pad Word	19	Parameter Value LSW
20	Pad Word	20	Parameter Value MSW
21	Parameter Number	21	Parameter Number
22	Pad Word	22	Parameter Value LSW
23	Pad Word	23	Parameter Value MSW
...		...	
63	Parameter Number	63	Parameter Number
64	Pad Word	64	Parameter Value LSW
65	Pad Word	65	Parameter Value MSW

DPI Parameter Object *(Continued)*

The PLC data in this example is for a Get_Attributes_Scattered of PowerFlex 70 parameters 1 - [Output Freq], 3 - [Output Current] and 6 - [Output Voltage] from a device at node address 1.

Request Data for Get_Attributes_Scattered

Word	Value (hex)	Description
0	0001	Parameter Number 1
1	0000	Pad Word
2	0000	Pad Word
3	0003	Parameter Number 3
4	0000	Pad Word
5	0000	Pad Word
6	0006	Parameter Number 6
7	0000	Pad Word
8	0000	Pad Word

Response Data for Get_Attributes_Scattered

Word	Value (hex)	Description
0	0001	Parameter Number 1
1	0258	Value = 600 (258 hex) = 60.0 Hz
2	0000	
3	0003	Parameter Number 3
4	0001	Value = 1 (1 hex) = 0.1A
5	0000	
6	0006	Parameter Number 6
7	0864	Value = 2148 (864 hex) = 214.8V AC
8	0000	

DPI Parameter Object *(Continued)*

Format for Set_Attributes_Scattered Service

The structure shown below can get up to twenty-two parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated pad word field contains an error code.

	Request		Response
Word 0	Parameter Number	**Word 0**	Parameter Number
1	Parameter Value LSW	1	Pad Word or Error Code
2	Parameter Value MSW	2	Pad Word
3	Parameter Number	3	Parameter Number
4	Parameter Value LSW	4	Pad Word or Error Code
5	Parameter Value MSW	5	Pad Word
6	Parameter Number	6	Parameter Number
7	Parameter Value LSW	7	Pad Word or Error Code
8	Parameter Value MSW	8	Pad Word
9	Parameter Number	9	Parameter Number
10	Parameter Value LSW	10	Pad Word or Error Code
11	Parameter Value MSW	11	Pad Word
12	Parameter Number	12	Parameter Number
13	Parameter Value LSW	13	Pad Word or Error Code
14	Parameter Value MSW	14	Pad Word
15	Parameter Number	15	Parameter Number
16	Parameter Value LSW	16	Pad Word or Error Code
17	Parameter Value MSW	17	Pad Word
18	Parameter Number	18	Parameter Number
19	Parameter Value LSW	19	Pad Word or Error Code
20	Parameter Value MSW	20	Pad Word
21	Parameter Number	21	Parameter Number
22	Parameter Value LSW	22	Pad Word or Error Code
23	Parameter Value MSW	23	Pad Word
...		...	
63	Parameter Number	63	Parameter Number
64	Parameter Value LSW	64	Pad Word or Error Code
65	Parameter Value MSW	65	Pad Word

DPI Parameter Object *(Continued)*

The PLC data in this example is for a Set_Attributes_Scattered of PowerFlex 70 parameters 140 - [Accel Time 1], 142 - [Decel Time 1] and 100 - [Jog Speed] to a device at node address 1.

Request Data for Set_Attributes_Scattered

Word	Value (hex)	Description
0	008C	Parameter Number 140 (8C hex)
1	0032	Value = 50 (32 hex) = 5.0 seconds
2	0000	
3	008E	Parameter Number 142 (8E hex)
4	0032	Value = 50 (32 hex) = 5.0 seconds
5	0000	
6	0064	Parameter Number 100 (64 hex)
7	0064	Value = 100 (64 hex) = 10.0 Hz
8	0000	

Response Data for Set_Attributes_Scattered

Word	Value (hex)	Description
0	008C	Parameter Number 140 (8C hex)
1	0000	
2	0000	
3	008E	Parameter Number 142 (8E hex)
4	0000	
5	0000	
6	0064	Parameter Number 100 (64 hex)
7	0000	
8	0000	

DPI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

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

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 (Hex.)	(Dec.)	Device
0x0000 – 0x3FFF	0 – 16383	Host
0x4000 – 0x43FF	16384 – 17407	Adapter
0x4400 – 0x47FF	17408 – 18431	DPI Port 1
0x4800 – 0x4BFF	18432 – 19455	DPI Port 2
0x4C00 – 0x4FFF	19456 – 20479	DPI Port 3
0x5000 – 0x53FF	20480 – 21503	DPI Port 4
0x5400 – 0x57FF	21504 – 22527	DPI Port 5
0x5800 – 0x5BFF	22528 – 23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Most Recent Drive Fault
2	Second Most Recent Drive Fault
⋮	⋮
16384	Class Attributes (Adapter)
16385	Most Recent Adapter Event
⋮	⋮

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
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

DPI Fault Object *(Continued)*

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
				DPI port
				DPI 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
				DPI port
				DPI 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

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	No	Set_Attribute_Single

DPI Alarm Object

Class Code

Hexadecimal	Decimal
0x98	152

Products such as PowerFlex drives use this object for alarms or warnings. Adapters do not support this object.

Instances

The number of instances depends on the maximum number of alarms supported by the queue. The maximum number of alarms can be read in Instance 0, Attribute 2.

Instances (Hex.)	(Dec.)	Device
0x0000 – 0x3FFF	0 – 16383	Host
Only host devices can have alarms.		

Example	Description
0	Class Attributes (Drive)
1	Most Recent Alarm
2	Second Most Recent Alarm
⋮	⋮

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 alarms that the device can record in its queue
3	Set	Alarm Command Write	BYTE	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device
4	Get	Fault Data List	STRUCT of: BYTE BYTE WORD[n]	Reserved
5	Get	Number of Recorded Alarms	WORD	Number of alarms in the queue. A “0” indicates the alarm queue is empty.

DPI Alarm Object *(Continued)*

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]
				
				Alarm code
				Alarm source
				DPI port
				DPI Device Object
				Alarm text
				Alarm 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] Reserved
				Reserved
				Reserved

1	Get	Basic Information	STRUCT of
			  WORD
			STRUCT of:
			  BYTE
			  BYTE
			STRUCT of:
			  LWORD
			  BOOL[16]
				
				Alarm code
				Alarm source
				DPI port
				DPI Device Object
				Alarm 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] Reserved

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	No	Set_Attribute_Single

DPI Time Object

Class Code

Hexadecimal	Decimal
0x9B	155

Instances

The number of instances depends on the number of timers in the device. Instance 1 is always reserved for a real time clock although a device may not support it. The total number of timers can be read in Instance 0, Attribute 2.

Instances (Hex.)	(Dec.)	Device
0x0000 – 0x3FFF	0 – 16383	Host
0x4000 – 0x43FF	16384 – 17407	Adapter
0x4400 – 0x47FF	17408 – 18431	DPI Port 1
0x4800 – 0x4BFF	18432 – 19455	DPI Port 2
0x4C00 – 0x4FFF	19456 – 20479	DPI Port 3
0x5000 – 0x53FF	20480 – 21503	DPI Port 4
0x5400 – 0x57FF	21504 – 22527	DPI Port 5
0x5800 – 0x5BFF	22528 – 23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Real Time Clock (Predefined) (Not always supported)
2	Timer 1
3	Timer 2
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	Revision of object
2	Get	Number of Instances	WORD	Number of timers in the object, excluding the real time clock that is predefined.
3	Get	First Device Specific Timer	WORD	Instance of the first timer that is not predefined.
4	Set	Time Command Write	BYTE	0 = No Operation 1 = Clear all timers (Does not clear the real time clock or read only timers)

DPI Time Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Read Full	STRUCT of: STRING[16] LWORD or STRUCT BOOL[16]	 Name of the timer Elapsed time in milliseconds unless timer is a real time clock (See attribute 2) See Attribute 3
1	Get	Timer Text	STRING[16]	Name of the timer
2	Get/Set	Timer Value	LWORD or STRUCT of: WORD BYTE BYTE BYTE BYTE BYTE BYTE	Elapsed time in milliseconds unless the timer is a real time clock. Real Time Clock Data: Milliseconds (0 – 999) Seconds (0 – 59) Minutes (0 – 59) Hours (0 – 23) Days (1 – 31) Months (1 = January, 12 = December) Years (since 1972)
3	Get	Timer Descriptor	BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used

Services

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

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 ControlNet 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 70 and PowerFlex 700 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 = Hold Direction Control
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						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 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

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

PowerFlex 70 and PowerFlex 700 Drives

Logic Status Word

Logic Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Status**	**Description**
															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	x	x										Local Control	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

PowerFlex 700S Drives

Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start (1)	0 = Not Start 1 = Start
													x			Jog 1	0 = Not Jog using [Jog Speed 1] 1 = Jog using [Jog Speed 1]
												x				Clear Fault	0 = Not Clear Fault 1 = Clear Fault
										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Reserved	
								x								Jog 2	0 = Not Jog using [Jog Speed 2] 1 = Jog using [Jog Speed 2]
							x									Current Limit Stop	0 = Not Current Limit Stop 1 = Current Limit Stop
						x										Coast Stop	0 = Not Coast to Stop 1 = Coast to Stop
					x											Reserved	
				x												Reserved	
			x													Reserved	
		x														Reserved	
	x															Reserved	
x																Reserved	

(1) A Not Stop condition (logic bit 0 = 0, logic bit 8 = 0, and logic bit 9 = 0) must first be present before a 1 = Start condition will start the drive.

PowerFlex 700S 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	Enabled	0 = Not Enabled 1 = Enabled
														x		Running	0 = Not Running 1 = Running
													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							Jogging	0 = Not Jogging 1 = Jogging
								x								Fault	0 = No Fault 1 = Fault
							x									Alarm	0 = No Alarm 1 = Alarm
						x										Flash Mode	0 = Not in Flash Mode 1 = In Flash Mode
					x											Run Ready	0 = Not Ready to Run 1 = Ready to Run
				x												At Limit (1)	0 = Not At Limit 1 = At Limit
			x													Tach Loss Sw	0 = Not Tach Loss Sw 1 = Tach Loss Sw
		x														At Zero Spd	0 = Not At Zero Speed 1 = At Zero Speed
	x															At Setpt Spd	0 = Not At Setpoint Speed 1= At Setpoint Speed
x																Reserved	

(1) See Parameter 304 - [Limit Status] in the PowerFlex 700S drive for a description of the limit status conditions.

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 device. It also reads data in the device and transmits it to the network.

The ControlNet adapter (20-COMM-C or 20-COMM-Q) connects PowerFlex drives to a ControlNet network. Adapters are sometimes also called “cards,” “embedded communication options,” “gateways,” “modules,” and “peripherals.”

C

CAN (Controller Area Network)

A CAN is a serial bus protocol on which DPI is based.

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.

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.

ControlNet

An open producer-consumer communication network with features, such as redundant medial 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 5M bit/s).

Datalinks

A Datalink is a type of pointer used by some PowerFlex drives to transfer data to and from the controller. Datalinks allow specified

parameter value(s) to be accessed or changed without using explicit messages. When enabled, each Datalink consumes either four bytes or eight bytes in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI (Drive Peripheral Interface)

DPI is a second generation peripheral communication interface used by various Allen-Bradley drives and power products, such as PowerFlex 70 and PowerFlex 700 drives. It is a functional enhancement to SCANport.

DPI Peripheral

A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as “adapters” and “modules.” The 20-COMM-C or 20-COMM-Q adapter and PowerFlex 7-Class HIMs (20-HIM-xxx) are examples of DPI peripherals.

DPI Product

A device that uses the DPI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex 7-Class drive is a DPI product. In this manual, a DPI 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 Microsoft Windows 95, Windows 98, Windows NT (version 4.0 or higher), Windows 2000, and Windows CE (version 2.01 or higher) 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 Microsoft Windows 98, Windows NT (4.0 or higher), and Windows 2000 operating systems. This software suite provides a family of tools that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. DriveTools SP (version 1.xx) can be used with PowerFlex drives. Information about DriveTools SP can be accessed at http://www.ab.com/drives/drivetools.

E

Electronic Data Sheet (EDS) 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 communications are 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 in the fault configuration parameters (**Parameters 15- [Flt Cfg Logic]** through **24- [Flt Cfg D2 In]**). When a fault action parameter is set to use the fault configuration and a fault occurs, the data from these parameters is sent as the Logic Command, Reference, and/or Datalink(s).

Flash Update

The process of updating firmware in the adapter. The adapter can be flash updated using the ControlFLASH tool or the X-modem protocol and a 1203-SSS Smart Self-powered 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 7-Class drive. PowerFlex 7-Class HIMs (20-HIM-xxx) can be used to configure connected peripherals.

Hold Last

When communications are 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 ControlNet 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 transmitted by the scanner and consumed by the adapter. Input is transmitted by the adapter and consumed by the scanner.

L

Logic Command/Logic Status

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

M

Master-Slave Hierarchy

An adapter configured for a master-slave hierarchy exchanges data with the master device. Usually, a network has one scanner which is the master device, and all other devices (for example, drives connected to ControlNet adapters) are slave devices.

On a network with multiple scanners (called a multimaster hierarchy), each slave device must have a scanner specified as its master.

N

Node Address

The legal range of ControlNet addresses is 1-99. The ControlNet adapter includes two rotary switches to allow the ControlNet address to be set. The ControlNet 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 Command)

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

Ping

A ping is a message that is sent by a DPI product to its peripheral devices. They use the ping to gather data about the product, including whether it can receive messages and whether they can log in for control.

PowerFlex 7-Class Drives

The Allen-Bradley PowerFlex 7-Class family of drives includes PowerFlex 70, PowerFlex 700, PowerFlex 700S, and PowerFlex 7000 drives. These drives can be used for applications ranging from 0.37 kW (0.5 HP) to 3,000 kW (4,000 HP). All PowerFlex 7-Class drives support DPI, allowing them to use the ControlNet adapter (20-COMM-C or 20-COMM-Q). This manual focuses on using the adapter with PowerFlex 7-Class drives. Other products that implement DPI can also use the adapter.

R

Reference/Feedback

The Reference is used to send a Reference (for example, speed, frequency, torque) to the drive. It consists of one word of input to the adapter from the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

Feedback is used to monitor the speed of the drive. It consists of one word of output from the adapter to the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

RSLogix

RSLogix software is a tool for configuring and monitoring controllers to communicate with connected devices. It is a 32-bit application that runs on various 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 Windows application that runs on Microsoft Windows 95, Windows 98, and Windows NT. 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, Reference, and Datalink data. If the drive was running and using the Reference from the adapter, it will stay running but at zero Reference.

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