User Manual

Allen-Bradley

PowerFlex 525 DeviceNet Adapter

Catalog Number: 25-COMM-D

Important User Information

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

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

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

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

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

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Notes:

Overview

Recommended Documentation

All the recommended documentation listed in this section is available online at http://www.rockwellautomation.com/literature.

The following publications provide additional information:

For...	See...	Publication
DeviceNet	DeviceNet Network Configuration User Manual	DNET-UM004
	DeviceNet Media Design Installation Guide	DNET-UM072
	DeviceNet Starter Kit User Manual	DNET-UM003
PowerFlex®520-Series Drives	PowerFlex 525 Adjustable Frequency AC Drive User Manual	520-UM001
RSLinx® Classic	RSLinx Classic Getting Results Guide	LINX-GR001
RSNetWorx for DeviceNet	Getting Results with RSNetWorx for DeviceNet	DNET-GR001
RSLogix™ 5000	RSLogix 5000 online help(1)	–
CompactLogix™ 5370	CompactLogix 5370 Controllers User Manual (1769-L36ERM)	1769-UM021
MicroLogix™ 1100	MicroLogix 1100 Programmable Controllers User Manual	1763-UM001
MicroLogix™ 1400	MicroLogix 1400 Programmable Controllers User Manual	1766-UM001
Connected Components Workbench	Website containing information on the Connected Components Workbench software tool, and includes a link for free software download.	http://www.ab.com/support/abdrives/webupdate/software.html
	Connected Components Workbench online help(2)	–

(1) The online help is installed with the software.

Manual Conventions

This manual provides information about the DeviceNet adapter and using it with PowerFlex 525 drives for network communication.

The following conventions are used throughout this manual:

- Parameter names are shown in the format **axxx [*]**. The **a** represents the parameter group. The **xxx** represents the parameter number. The * represents the parameter name— for example **C175 [DSI I/O Cfg]**.
- 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.

- RSLinx Classic (version 2.51), RSNetWorx for DeviceNet (version 21), and RSLogix 5000 (version 20) were used for the screen captures in this manual. Different versions of the software may differ in appearance and procedures.
- The Studio 5000™ Engineering and Design Environment combines engineering and design elements into a common environment. The first element in the Studio 5000 environment is the Logix Designer application. The Logix Designer application is the rebranding of RSLogix 5000 software and will continue to be the product to program Logix 5000 controllers for discrete, process, batch, motion, safety, and drive-based solutions. The Studio 5000 environment is the foundation for the future of Rockwell Automation engineering design tools and capabilities. It is the one place for design engineers to develop all the elements of their control system.

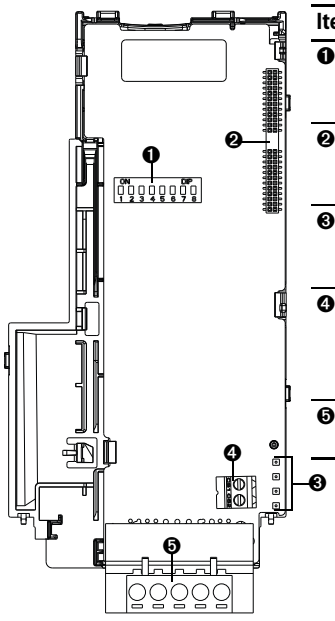
Getting Started

The DeviceNet adapter is a communication option intended for installation into a PowerFlex 525 drive. The Multi-Drive feature (Chapter 7) also provides a means for other supported PowerFlex drives and DSI Hosts to connect to a DeviceNet network.

Components

Components of the DeviceNet Adapter

25-COMM-D



Item	Part	Description
❶	Node Address/Rate switches	Switches for setting the node address and network data rate. Chapter 2, Installing the Adapter.
❷	Communication card-Drive header	A 40-pin, double-row shrouded female header. An interface connector is used to connect this header to a header on the drive.
❸	Status indicators	Three LEDs that indicate the status of the connected drive, adapter and network. See Chapter 8, Troubleshooting
❹	CS1/CS2 terminals	Provides a clean ground for the communication bus cable shields. CS1 or CS2 should be connected to a clean ground or PE ground on the drive.
❺	DeviceNet connector	A 5-pin connector to which a 5-pin linear plug can be connected.

Features

The features of the DeviceNet adapter include:

- Mounting onto a PowerFlex 525 Control Module back cover for installation into the drive. It receives the required power from the drive and from the DeviceNet network.
- Switches to set a node address and network data rate before applying power to the PowerFlex drive. Alternatively, you can disable the switches and use parameters to configure these functions.
- Compatibility with various configuration tools to configure the DeviceNet adapter and host drive. The tools include network software such as RSNetWorx for DeviceNet, and drive-configuration software such as RSLogix 5000 (version 17 or greater), Logix Designer (version 21 or greater), and Connected Components Workbench (version 3 or greater).
- Status indicators that report the status of the DeviceNet adapter and network communications.
- Parameter-configured 16-bit Datalinks in the I/O to meet application requirements (four Datalinks to write data from the network to the drive, and four Datalinks to read data to the network from the drive).
- Explicit Messaging and UCMM (Unconnected Message Manager) support.
- Master-Slave hierarchy that can be configured to transmit data to and from a controller on the network.
- Multi-drive mode which allows up to five drives to share a single DeviceNet address node.
- User-defined fault actions to determine how the DeviceNet adapter and its host PowerFlex 525 drive respond to:
  - I/O messaging communication disruptions (Comm Flt Action)
  - Controllers in idle mode (Idle Flt Action)
- Multiple data exchange methods, including Polled, Cyclic, and Change of State (COS), can be used to transmit data between the network and adapter.
- Faulted node recovery is supported. You can configure a device even when it is faulted on the network if you have a configuration tool that uses faulted node recovery and have properly set the adapter node address switches and data rate switches.

Understanding Parameter Types

This manual references two types of parameters:

- *Device* parameters are used to configure the adapter to operate on the network. These parameters reside on the adapter.
- *Host* parameters are used to configure the drive, including the datalink configuration for the datalinks used by the adapter. These parameters reside on the drive.

You can view adapter *Device* parameters and *Host* parameters with any of the following drive configuration tools:

- PowerFlex 4-class HIM (22-HIM-A3 or 22-HIM-C2S)
- Connected Components Workbench software – click the tab for the adapter at the bottom of the window, and click the Parameters icon in the tool bar.

Compatible Products

At the time of publication, the DeviceNet adapter is compatible with Allen-Bradley PowerFlex 525 drives.

Required Equipment

Equipment Shipped with the Drive

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

❑	One PowerFlex 520-series DeviceNet communications adapter (25-COMM-D) (installed in a PowerFlex 520-series drive control module back cover)
❑	One 5-pin inline DeviceNet plug (connected to the DeviceNet connector on the adapter)
❑	Two interface connectors (for connecting the Communication card-Drive header to the header on the drive)
❑	Installation leaflet (publication 520COM-IN001)

User-Supplied Equipment

The adapter parameters can be configured using the drive keypad interface (see Using the Drive Keypad Interface to Access Parameters on page 23). In addition, you must supply:

❑		DeviceNet cable (thin cable with an outside diameter of 6.9 mm (0.27 in.) is recommended)
❑		Controller configuration software, such as:
	–	RSNetWorx for DeviceNet
	–	RSLogix 5000 or Logix Designer
	–	Connected Components Workbench (version 3 or greater)

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 an 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 drive using this DeviceNet adapter. Failure to comply may result in injury and/or equipment damage.

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

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

ATTENTION: Risk of injury or equipment damage exists. *Device* parameters **15 [Comm Flt Actn]** and **16 [Idle Flt Actn]** let you determine the action of the adapter and drive if I/O communication is disrupted, the controller is idle, or explicit messaging for drive control is disrupted. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, 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 controller in idle state).

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

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

Quick Start

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

Step	Action	See...
1	**Review the safety precautions for the adapter.**	Throughout this manual
2	**Verify that the PowerFlex drive is properly installed.**	PowerFlex 525 Adjustable Frequency AC Drive User Manual (publication 520-UM001)
3	**Commission the adapter.** Set a unique node address and the appropriate data rate using the switches on the adapter. If desired, you can disable the switches and use parameter settings instead.	Chapter 2, Installing the Adapter
4	**Install the adapter.** Verify that the PowerFlex drive is not powered. Then, connect the adapter to the drive using the interface connector (included with adapter).	
5	**Connect the drive to the DeviceNet network.** Verify that the DeviceNet network is not powered. Then, connect the DeviceNet adapter to the network using a DeviceNet cable.	
6	**Apply power to the drive and to the network.** The adapter receives power from the drive and network. a. The status indicators should be green. If they flash red, there is a problem. See Chapter 8, Troubleshooting. b. Configure/verify key drive parameters.	
7	**Configure the adapter for your application.** Set DeviceNet adapter parameters for the following functions as required by your application: – Node address – Data rate – I/O configuration – Change of State, Cyclic, or polled I/O data exchange – Fault actions	Chapter 3, Configuring the Adapter
8	**Apply power to the DeviceNet master and other devices on the network.** Verify that the master and network are installed and functioning in accordance with DeviceNet standards, and then apply power to them.	DeviceNet Planning and Installation Manual (ODVA pub 27)
9	**Configure the scanner to communicate with the adapter.** Use a network tool such as RSNetWorx for DeviceNet to configure the scanner on the network. Make sure to: – Set up the scan list. – Map the adapter data to the scan list. – Save your DeviceNet configuration to the scanner and a file.	Chapter 4, Configuring the I/O
10	**Create a ladder logic program.** Use a controller configuration tool such as RSLogix 5000/Logix Designer to create a ladder logic program that enables you to: – Control the adapter and drive using I/O. – Monitor or configure the drive using Explicit messages.	Chapter 5, Using the I/O Chapter 6, Using Explicit Messaging

Notes:

Installing the Adapter

Chapter 2 provides instructions for installing the DeviceNet adapter in a PowerFlex 525 drive.

Preparing for an Installation

Before installing the adapter, do the following:

- Read the DeviceNet Media Design and Installation Guide, publication DNET-UM072.
- Read the DeviceNet Starter Kit User Manual, publication DNET-UM003.
- Verify that you have all required equipment. See Chapter 1, Getting Started.

Commissioning the Adapter

To commission the adapter, you must set a unique node address and the data rate that is used by the network. (See the Glossary for details about data rates and node addresses.).

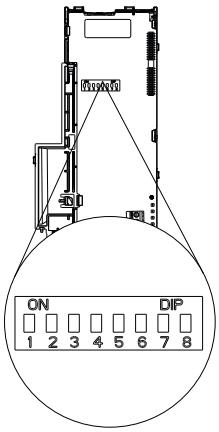
There are two methods for configuring the adapter's Node address and data rate:

- Using the onboard DIP Switches;
- Using adapter parameters – Use adapter parameters when you want more flexibility in setting up the node address. To set the Node address using adapter parameters, see Setting the Node Address on page 25.

IMPORTANT Regardless of the method used to set the adapter's node address, each node on the network must have a unique node address. To change a node address, you must set the new value and then cycle drive power.

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

Setting the Node Address and Data Rate Using the DIP Switches



Switch	Description	Default	
SW1	Least Significant Bit (LSB) of Node Address	1	Node 63
SW2	Bit 1 of Node Address	1	
SW3	Bit 2 of Node Address	1	
SW4	Bit 3 of Node Address	1	
SW5	Bit 4 of Node Address	1	
SW6	Most Significant Bit (MSB) of Node Address	1	
SW7	Least Significant Bit (LSB) of Data Rate	1	Autobaud
SW8	Most Significant Bit (MSB) of Data Rate	1	

Node Address Switch Settings (UP = ON = 1)

Switch Setting						Node Address
SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	
0	0	0	0	0	0	0
1	0	0	0	0	0	1
0	1	0	0	0	0	2
1	1	0	0	0	0	3
0	0	1	0	0	0	4
1	0	1	0	0	0	5
0	1	1	0	0	0	6
1	1	1	0	0	0	7
0	0	0	1	0	0	8
1	0	0	1	0	0	9
0	1	0	1	0	0	10
1	1	0	1	0	0	11
0	0	1	1	0	0	12
1	0	1	1	0	0	13
0	1	1	1	0	0	14
1	1	1	1	0	0	15
0	0	0	0	1	0	16
1	0	0	0	1	0	17
0	1	0	0	1	0	18
1	1	0	0	1	0	19
0	0	1	0	1	0	20
1	0	1	0	1	0	21
0	1	1	0	1	0	22
1	1	1	0	1	0	23
0	0	0	1	1	0	24
1	0	0	1	1	0	25
0	1	0	1	1	0	26
1	1	0	1	1	0	27
0	0	1	1	1	0	28
1	0	1	1	1	0	29
0	1	1	1	1	0	30
1	1	1	1	1	0	31

Switch Setting						Node Address
SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	
0	0	0	0	0	1	32
1	0	0	0	0	1	33
0	1	0	0	0	1	34
1	1	0	0	0	1	35
0	0	1	0	0	1	36
1	0	1	0	0	1	37
0	1	1	0	0	1	38
1	1	1	0	0	1	39
0	0	0	1	0	1	40
1	0	0	1	0	1	41
0	1	0	1	0	1	42
1	1	0	1	0	1	43
0	0	1	1	0	1	44
1	0	1	1	0	1	45
0	1	1	1	0	1	46
1	1	1	1	0	1	47
0	0	0	0	1	1	48
1	0	0	0	1	1	49
0	1	0	0	1	1	50
1	1	0	0	1	1	51
0	0	1	0	1	1	52
1	0	1	0	1	1	53
0	1	1	0	1	1	54
1	1	1	0	1	1	55
0	0	0	1	1	1	56
1	0	0	1	1	1	57
0	1	0	1	1	1	58
1	1	0	1	1	1	59
0	0	1	1	1	1	60
1	0	1	1	1	1	61
0	1	1	1	1	1	62
1	1	1	1	1	1	63

Data Rate Switch Settings (UP = ON = 1)

Switch Setting		Data Rate
SW 7	SW 8	
0	0	125 kbps
1	0	250 kbps
0	1	500 kbps
1	1	Autobaud

IMPORTANT If all switches are in the OFF position (all 0's), then the Node Address and Data Rate are determined by parameter settings (*Device* parameters **07 [Net Addr Cfg]** and **09 [Net Rate Cfg]**).

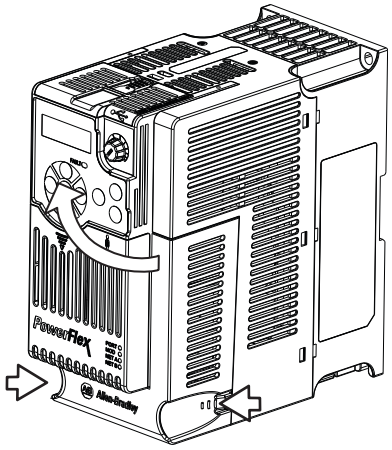
Setting Single-Drive or Multi-Drive Mode

To select between Single-Drive or Multi-Drive mode, see Parameter Configuration for Multi-Drive Mode on page 73.

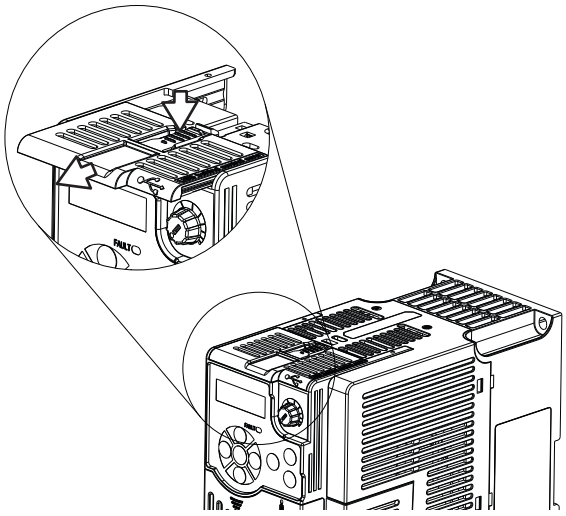
Connecting the Adapter to the Drive

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 connecting the DeviceNet adapter to the network.

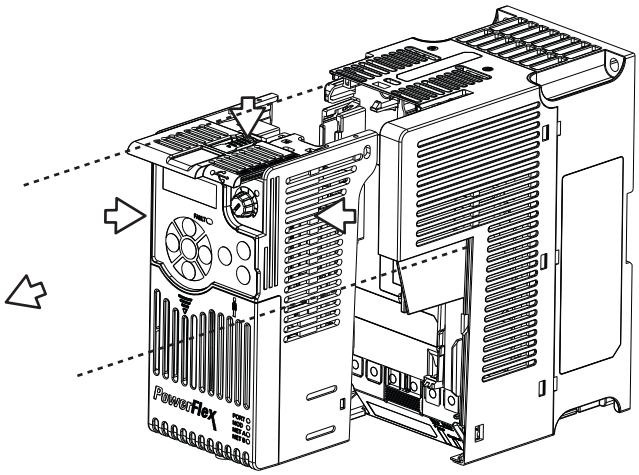
1. Remove power from the drive.
2. Use static control precautions.
3. Separate the drive's control module from the power module.
   a. Press and hold down the catch on both sides of the frame cover, then pullout and swing upwards to remove (Frames B...E only).



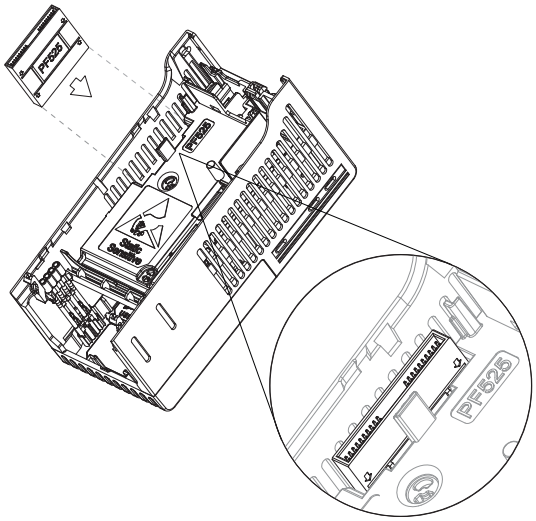
b. Press down and slide out the top cover of the control module to unlock it from the power module.



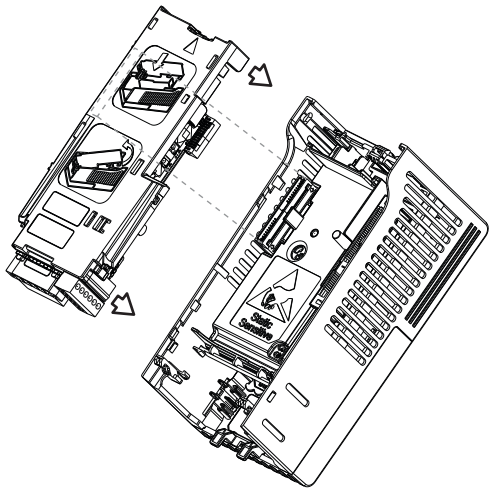
c. Hold the sides and top of the control module firmly, then pull out to separate it from the power module.



4. Insert the interface connector for the adapter into the header located at the back of the control module.



5. Align the Communication card-Drive header on the adapter with the interface connector. Then, press down firmly around the adapter. The adapter snaps into the back of the control module.



IMPORTANT The CS1/CS2 terminals on the adapter provide a clean ground for the communication bus cable shields. You should connect the CS1 or CS2 terminal to a clean ground or PE ground on the drive.

6. Attach the control module to the power module.

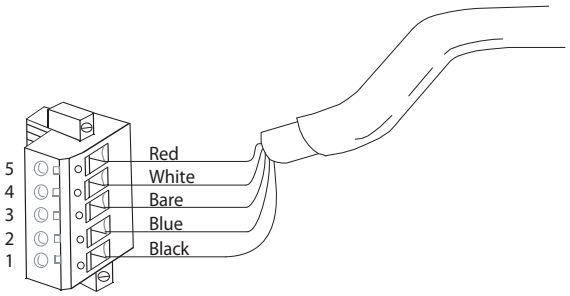
Connecting the Adapter to the Network

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 connecting the embedded EtherNet/IP adapter to the network.

1. Remove power from the network.
2. Use static control precautions.
3. Connect a DeviceNet cable to the network. A DeviceNet thin cable with an outside diameter of 6.9 mm (0.29 in.) is recommended.

IMPORTANT Maximum cable length depends on data rate. See the Glossary for Data Rate.

4. Connect the 5-pin linear plug to the DeviceNet cable.



Terminal	Color	Signal	Function
5	Red	V+	Power Supply
4	White	CAN_H	Signal High
3	Bare	SHIELD	Shield
2	Blue	CAN_L	Signal Low
1	Black	V-	Common

TIP A 5-pin linear plug is shipped with the adapter. If a replacement plug is needed, the replacement plug part number is 1799-DNETSCON.

IMPORTANT A 10-pin linear plug is not supported.

5. Insert the 5-pin linear plug into the mating socket on the adapter and secure it with the two screws. Verify that the colors of the wires on the plug match up with the color codes on the socket.

Applying Power

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

1. Make sure that the adapter will have a unique address on the network and is set at the correct data rate or to autobaud. If a new data rate or address is needed, reset its switches (see Commissioning the Adapter on page 15).
2. Apply power to the drive. The adapter receives its power from the connected drive and network.
3. If the parameter settings for the data rate and node address are to be used, a configuration tool such as Connected Components Workbench (version 3 or greater) can be used to adjust the respective parameters in the adapter. See Chapter 3, Configuring the Adapter.

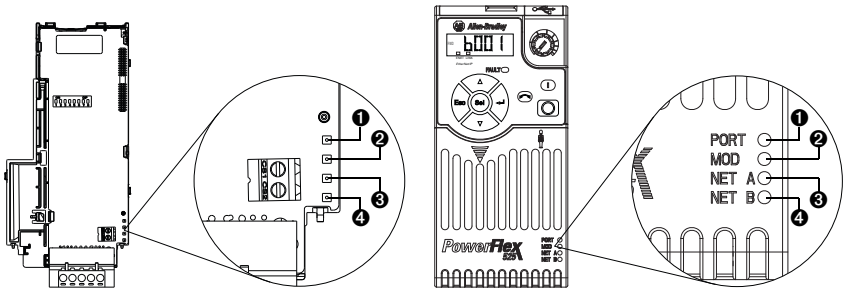
Start-Up Status Indication

After power has been applied, the status indicators can be viewed on the front of the drive. When you apply power to the product and network for the first time,

the status indicators should be green after an initialization. If the status indicators go red, there is a problem. See Chapter 8, Troubleshooting.

Drive and Adapter Status Indicators

25-COMM-D **PowerFlex 525 Frame A shown**



Item	Status Indicator	Status(1)	Description
❶	PORT	Green	Normal operation. The adapter is properly connected and is communicating with the drive.
		Flashing green	The adapter is in the process of establishing a connection to the drive. This status indicator will turn solid green or red.
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.
		Flashing green	The adapter is properly connected but is not communicating with any devices on the network.
❹	NET B	Off	Not used for DeviceNet.

(1) If all status indicators are off, the adapter is not receiving power. If any other conditions occur, see Chapter 8, Troubleshooting.

Configuring/Verifying Key Drive Parameters

The PowerFlex 525 drive can be separately configured for the control and Reference functions in various combinations. For example, you could set the drive to have its control come from a peripheral or terminal block with the Reference coming from the network. Or you could set the drive to have its control come from the network with the Reference coming from another peripheral or terminal block. Or you could set the drive to have both its control and Reference come from the network.

Configuring the *Host* parameters can be done using the drive's keypad, a HIM, Logix Designer or Connected Components Workbench. In the following example, the drive will receive the Logic Command and Reference from the network.

1. Set the value of *Host* parameter **P046** [**Start Source 1**] to **4** "Network Opt".

2. Set the value of *Host* parameter **P047 [Speed Reference1]** to 4 “Network Opt”.

TIP The PowerFlex 525 drive supports up to three control functions and three Reference functions.

For more information on how to set different combinations of the control and Reference functions, see the PowerFlex 525 drive user manual, publication 520-UM001.

Configuring the Adapter

Chapter 3 provides instructions and information for setting the parameters to configure the DeviceNet adapter.

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

Configuration Tools

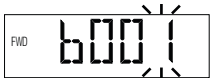
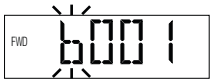
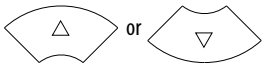
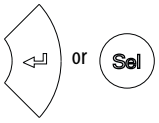
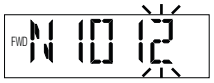
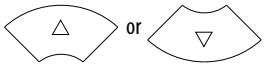
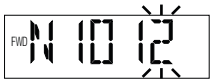
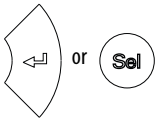
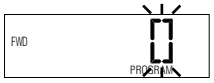
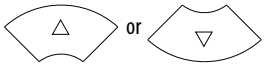
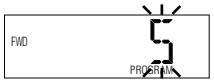
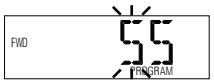
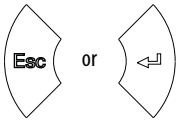
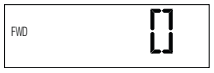
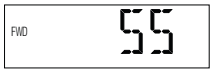
The adapter parameters can be configured using the drive keypad interface (see page 23) or a PowerFlex 4-class HIM (Human Interface Module, see page 25).

RSLogix 5000/Logix Designer, Connected Components Workbench (version 3 or greater), and RSNetWorx for DeviceNet (version 21 or greater) can also be used to access the adapter parameters.

Using the Drive Keypad Interface to Access Parameters

The following is an example of basic integral keypad and display functions. This example provides basic navigation instructions and illustrates how to program a parameter.

IMPORTANT The DeviceNet adapter *Device* parameters can be accessed on the drive keypad via the "N" (Network) group. Note that the parameters in the "N" group will appear offset from the *Device* parameter numbers referenced in this manual by 1000 (decimal) on the LCD display.

Step	Key(s)	Example Display
1. When power is applied, the last user-selected Basic Display Group parameter number is briefly displayed with flashing characters. The display then defaults to that parameter's current value. (Example shows the value of b001 [Output Freq] with the drive stopped.)		
2. Press Esc to display the Basic Display Group parameter number shown on power-up. The parameter number will flash.		
3. Press Esc to enter the parameter group list. The parameter group letter will flash.		
4. Press the Up Arrow or Down Arrow to scroll through the group list (b, P, t, C, L, d, A, f, N, M, and Gx).		
5. Press Enter or Sel to enter a group. The right digit of the last viewed parameter in that group will flash.		
6. Press the Up Arrow or Down Arrow to scroll through the parameter list.		
7. Press Enter to view the value of the parameter. Or Press Esc to return to the parameter list.		
8. Press Enter or Sel to enter Program Mode and edit the value. The right digit will flash and the word Program on the LCD display will light up.		
9. Press the Up Arrow or Down Arrow to change the parameter value.		
10. If desired, press Sel to move from digit to digit or bit to bit. The digit or bit that you can change will flash.		
11. Press Esc to cancel a change and exit Program Mode. Or Press Enter to save a change and exit Program Mode. The digit will stop flashing and the word Program on the LCD display will turn off.		 or 
12. Press Esc to return to the parameter list. Continue to press Esc to back out of the programming menu. If pressing Esc does not change the display, then b001 [Output Freq] is displayed. Press Enter or Sel to enter the group list again.		

Using the PowerFlex 4-Class HIM to Access Parameters

The PowerFlex 4-class HIM can be used to access parameters in the adapter (see basic steps shown below). It is recommended that you read through the steps for your HIM before performing the sequence. For additional HIM information, refer to the HIM Quick Reference card, publication 22HIM-QR001.

Step	Key(s)	Example Display
1. Power up the drive. Then connect the HIM to the DSI port of the drive. The Parameters tab for the drive will be displayed.		Parameters Groups Linear List Changed Params DIAG PARAM DSEL MEM SEL▶
2. Press Sel until the DSEL tab is selected.	Sel	Device Select DSI Devices DIAG PARAM DSEL MEM SEL▶
3. Select DSI Device in the DSEL tab if it is not already selected using the Up Arrow or Down Arrow. Press Enter to select DSI Device.	▲ and ▼ ↵	DSI Devices PowerFlex 525 25-COMM-D
4. Press the Up Arrow or Down Arrow to scroll to 25-COMM. Press Enter to reload the HIM to browse only the Communication Adapter (25-COMM-D) parameters.	Sel ↵	DSI Devices PowerFlex 525 25-COMM-D

To display the *Host* parameters, repeat steps 1 through 3 and select "PowerFlex 525" at step 3.

Setting the Node Address

The value of *Device* parameter **07 [Net Addr Cfg]** determines the node address if all the adapter DIP switches are in the OFF position (all 0's). We recommend that you do not use node address 63 because all new devices use it as the default address. Address 63 is also used for Automatic Device Recovery (ADR).

1. Set the value of *Device* parameter **07 [Net Addr Cfg]** to a unique node address.

2. Reset the adapter by power cycling the drive.

TIP If you are using RSNetWorx for DeviceNet, select **Network > Single Browse Path** to see the new address; then delete the old address.

Setting the Data Rate

The value of *Device* parameter **09 [Net Rate Cfg]** determines the DeviceNet data rate if all of the adapter DIP switches are in the OFF position (all 0's). The Autobaud setting will detect the data rate used on the network if another device is setting the data rate. Your application may require a different setting.

1. Set the value of *Device* parameter **09 [Net Rate Cfg]** to the data rate at which your network is operating.

Options	0	"125kbps" (Default)
	1	"250kbps"
	2	"500kbps"
	3	"Autobaud"

2. Reset the adapter by power cycling the drive.

Setting the I/O Configuration

The value of *Host* parameter **C175 [DSI I/O Cfg]** determines the number of drives that will be represented on the network as one node by the adapter. Up to five drives can be represented as one node by the adapter.

1. Set the value of *Host* parameter **C175 [DSI I/O Cfg]** to the number of drives you want to be represented as one node.

Options	0	"Drive 0" (Default)
	1	"Drive 0-1"
	2	"Drive 0-2"
	3	"Drive 0-3"
	4	"Drive 0-4"

Drive 0 is the PowerFlex 525 with the 25-COMM-D adapter installed. Drive 1 through 4 are other PowerFlex drives that daisy-chain to the RJ45 (RS-485) port on Drive 0. See Chapter 7, Using Multi-Drive Mode for further instructions.

2. Reset the adapter by power cycling the drive.

Using Master-Slave Hierarchy (Optional)

A hierarchy determines the type of device with which the adapter exchanges data. In a Master-Slave hierarchy, the adapter exchanges data with a master, such as a scanner (1769-SDN, 1756-DNB, 1771-SDN, 1747-SDN, and so forth).

Configuring a Master-Slave Hierarchy

The controller I/O image can have anywhere from zero to eight (four In and four Out) additional 16-bit parameters called Datalinks. They are configured using *Host* parameters **C161 [Opt Data In 1]** through **C164 [Opt Data In 4]**, and **C165 [Opt Data Out 1]** through **C168 [Opt Data Out 4]**. The number of Datalinks actively used is controlled by the connection size in the controller and the in/out parameters. See the respective controller example sections in Chapter 4 for more information on setting the connection size.

When using a ControlLogix or CompactLogix controller and the Generic Profile, or a MicroLogix 1100/1400 controller, configure the Datalink parameters now as described in this section.

Enabling Datalinks To Write Data

IMPORTANT	Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use *Host* parameters C161, C162, and C163 to configure three Datalinks to write data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

Host parameters **C161 [Opt Data In 1]** through **C164 [Opt Data In 4]** control which parameters in the drive receive values from the network. To configure these parameters, set them to the drive parameter number you want to write them to.

The following steps are required to enable Datalinks to write data:

1. Set the values of only the required number of contiguous controller-to-drive Datalinks needed to write data to the drive and that are to be included in the network I/O connection.
2. Reset the adapter by power cycling the drive.

After the above steps are complete, the adapter is ready to receive input data and transfer status data to the master (controller). Next, configure the controller to recognize and transmit I/O to the adapter. See Chapter 4, Configuring the I/O.

Enabling Datalinks To Read Data

IMPORTANT	Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use *Host* parameters C165, C166, and C167 to configure three Datalinks to read data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

Host parameters **C165 [Opt Data Out 1]** through **C168 [Opt Data Out 4]** configure which parameters in the drive, adapter, or any other connected

peripheral send values to the network. To configure these parameters, set them to the parameter number you wish to read over the network.

The following steps are required to enable Datalinks to read data:

1. Set the values of only the required number of contiguous drive-to-controller Datalinks needed to read data from the drive and that are to be included in the network I/O connection.
2. Reset the adapter by power cycling the drive.

After the above steps are complete, the adapter is ready to send output data to the master (controller). Next, configure the controller to recognize and transmit I/O to the adapter. See Chapter 4, Configuring the I/O.

Selecting COS, Cyclic, or Polled I/O

The data exchange (sometimes called allocation) is the method that the adapter uses to exchange data on the DeviceNet network. The adapter can be configured to use one of the following data exchanges:

- COS (Change of State)
- Cyclic
- Polled
- Polled and COS
- Polled and Cyclic

If "Polled and COS" or "Polled and Cyclic" is used, the adapter receives the I/O from the polled messages. It transmit its Logic Status and Feedback in COS or Cyclic messages. Other data is transmitted in Polled messages.

Cyclic and Polled data exchanges are configured in the scanner, so you only need to set the I/O configuration in the adapter. COS data exchange must be configured in both the adapter and the scanner. You need to set the I/O configuration and COS parameters in the adapter.

Using COS (Change of State) Data Exchange (Optional)

Set *Device* parameter **11 [COS Status Mask]** for the bits in the Logic Status word that should be checked for changes. For the Logic Status bit definitions, see Appendix D or the drive documentation.

1. Edit any of the bits as required.

Value	Description
0	Ignore this logic bit (Default)
1	Use the logic bit.

2. Set *Device* parameter **12 [COS Fdbk Change]** for the amount of change to the Feedback that is required to trigger a Change of State message.

The adapter is now configured for COS data exchange. You must configure the scanner to allocate it using COS. See Chapter 4, Configuring the I/O.

Setting a Fault Action

By default, when communications are disrupted (the network cable is disconnected) and/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:

- Disrupted I/O communication by using *Device* parameter **15 [Comm Flt Actn]**.
- An idle scanner by using *Device* parameter **16 [Idle Flt Actn]**.

ATTENTION: Risk of injury or equipment damage exists. *Device* parameters 15 [Comm Flt Actn] and 16 [Idle Flt Actn] respectively let you determine the action of the adapter and drive if communications are disrupted or the controller is idle. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, 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 (a disconnected network cable or a controller in idle state).

Changing the Fault Action

Set the values of *Device* parameters **15 [Comm Flt Actn]** and **16 [Idle Flt Actn]** to the desired responses:

Value	Action	Description
0	Fault	The drive is faulted and stopped. Datalink data is no longer sent to the drive. (Default)
1	Stop	The drive is stopped as per *Host* parameter P045 [Stop Mode] setting. Datalink data sent to the drive remains unchanged.
2	Zero Data	The drive is sent "0" values for all Reference and Datalink data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the Reference and Datalink data that you set in the fault configuration parameters (*Device* parameters 17 [Flt Cfg Logic], 18 [Flt Cfg Ref], and 19 [Flt Cfg DL 1] through 22 [Flt Cfg DL 4]).

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

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

Setting the Fault Configuration Parameters

When setting *Device* parameters **15 [Comm Flt Actn]** and **16 [Idle Flt Actn]** to 4 "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault and/or idle fault for drive control fault occurs. You must set these parameters to values required by your application.

***Device* Parameter**	**Description**
17 [Flt Cfg Logic]	A 16-bit integer value sent to the drive for Logic Command.
18 [Flt Cfg Ref]	A 16-bit integer value sent to the drive for Reference.
19 [Flt Cfg DL 1] through 22 [Flt Cfg DL 4]	A 16-bit integer value sent to the drive for a Datalink.

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

Resetting the Adapter

Changes to switch settings on 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 *Device* parameter **14** [**Reset Module**].

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

Set *Device* parameter **14** [**Reset Module**] to 1 "Reset Module".

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

When you enter 1 "Reset Module", the adapter will be immediately reset. An alternate method to reset the adapter is by power cycling the drive.

Restoring Adapter Parameters to Factory Defaults

Set *Device* parameter **14** [**Reset Module**] to 2 "Set Defaults".

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

When you enter 2 "Set Defaults", the adapter will set **all** of its parameters to their factory default values.

IMPORTANT When performing a Set Defaults action, the drive may detect a conflict and then not allow this function to occur. If this happens, first resolve the conflict and then repeat a Set Defaults action. Common reasons for a conflict include the drive running or a controller in Run mode.

After performing a Set Defaults action, you must enter 1 "Reset Module" or power cycle the drive so that the new values take effect. Thereafter, this parameter will be restored to a value of 0 "Ready".

Viewing the Adapter Status Using Parameters

The following *Device* parameters provide information about the status of the adapter. You can view these parameters at any time using the PowerFlex 22-HIM-A3 or 22-HIM-C2S HIM or Connected Components Workbench.

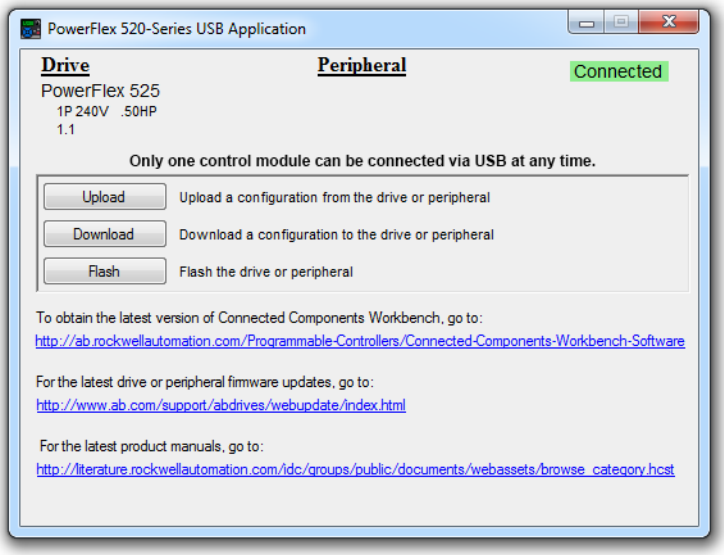
DeviceNet Adapter Status Parameters

Name	Description
03 [DLs From Net Act]	Displays the value of *Device* parameter **02 [DLs From Net Cfg]** at the time the adapter was reset. This is the number of actual contiguous controller-to-drive Datalinks that the adapter is expecting to receive from the controller.
05 [DLs To Net Act]	Displays the value of *Device* parameter **04 [DLs To Net Cfg]** at the time the adapter was reset. This is the number of actual contiguous drive-to-controller Datalinks that the controller is expecting to receive from the controller.
06 [Net Addr Src]	Displays the source from which the adapter's node address is taken. This will be either the Node Address switches (See Setting the Node Address and Data Rate Using the DIP Switches on page 16) or the value of *Device* parameter **07 [Net Addr Cfg]**.
08 [Net Addr Act]	Displays the actual network node address used by the adapter, which can be one of the following: • The address set with the Node Address switches (See Setting the Node Address and Data Rate Using the DIP Switches on page 16). • The value of *Device* parameter **07 [Net Addr Cfg]**. • An old address from the switches or parameter. (If either has been changed, but the adapter has not been reset, the new address will not be in effect.)
10 [Net Rate Act]	• Displays the actual network data rate being used by the adapter, which can be one of the following: • The data rate set by the data rate switches (See Setting the Node Address and Data Rate Using the DIP Switches on page 16). • The value of *Device* parameter **09 [Net Rate Cfg]**. • An old data rate of the switch or parameter. (If either has been changed, but the adapter has not been reset, the new data rate will not be in effect.)

Updating the Adapter Firmware

The adapter firmware can be updated over the network or through a direct connection from a computer to the drive using a USB cable.

When updating firmware through a direct USB connection from a computer to a drive, you will use the USB utility application.



When updating firmware over the network, you can use the Allen-Bradley ControlFLASH software tool.

To obtain a firmware update for this adapter, go to http://www.ab.com/support/abdrives/webupdate. This site contains all firmware update files and associated Release Notes that describe the following items:

- Firmware update enhancements and anomalies
- How to determines the existing firmware revision
- How to update the firmware using ControlFlash

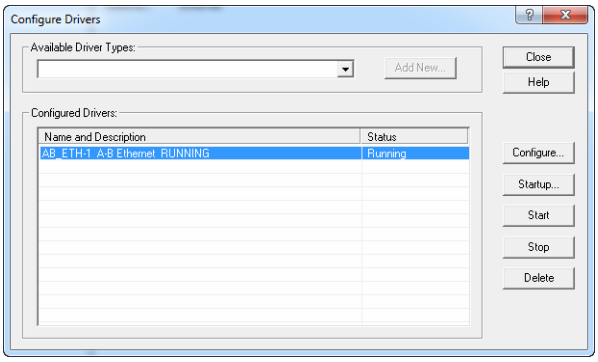
Configuring the I/O

This chapter provides instructions on how to configure a Rockwell Automation CompactLogix controller to communicate with the adapter and connected PowerFlex 525 drive.

Using RSLinx Classic

RSLinx Classic, in all its variations (Lite, Gateway, OEM, etc.), is used to provide a communication link between the computer, network, and controller. RSLinx Classic requires a driver to be configured before communications are established with network devices. In our example, we will use the embedded EtherNet/IP interface in the CompactLogix controller (1769-L36ERM) to configure the controller as well as a bridge to the DeviceNet network. To configure the RSLinx driver:

1. Start RSLinx and select **Communications** > **Configure Drivers** to display the Configure Drivers window.
2. From the Available Driver Types pull-down box, choose “EtherNet/IP Driver” and then click **Add New...** to display the Add New RSLinx Driver window.
3. Use the default name or type a name and click **OK**. The “Configure driver:” window appears.
4. Depending on your application, select either the browse local or remote subnet option, and click **OK**. The Configure Drivers window reappears with the new driver in the Configured Drivers list.

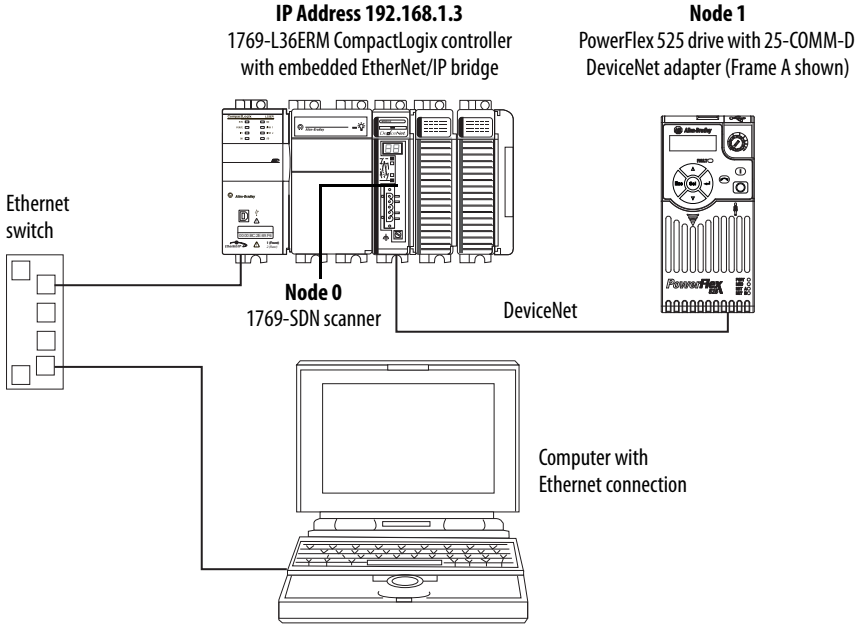


5. Click **Close** to close the Configure Drivers window. Keep RSLinx running.

6. Verify that your computer recognizes the drive. Select **Communications** > **RSWho** and, in the menu tree, click the "+" symbol next to the Ethernet controller.
7. Note that two other RSLinx drivers (Ethernet devices or Remote Devices through Linx Gateway) may be used. Use one of these drivers if the "EtherNet/IP Driver" cannot see your drive.

CompactLogix Example

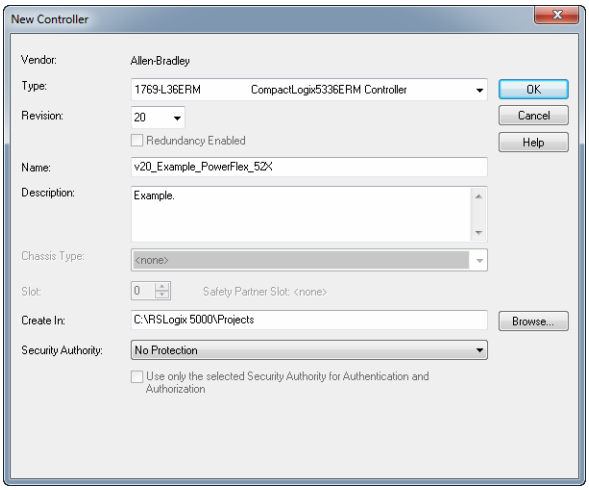
After the adapter is configured, the drive and adapter will be a single node on the network. This section provides the steps needed to configure a simple EtherNet/IP network. In our example, we will configure a 1769-L36ERM CompactLogix controller with 1769-SDN scanner to communicate with a drive using Logic Command/Status, Reference/Feedback, and eight Datalinks (four to read and four to write) over the network.



Adding the Controller to the I/O Configuration

To establish communications between the controller and adapter over the network, you must first add the CompactLogix controller and its embedded EtherNet/IP bridge to the I/O configuration.

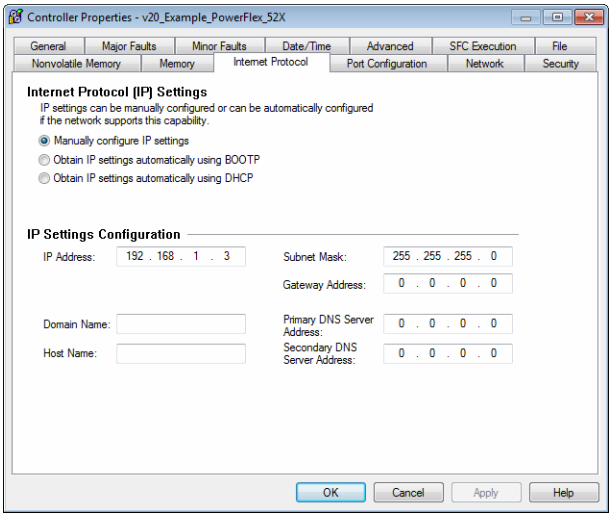
1. Start RSLogix 5000/Logix Designer. The application window appears. Select **File** > **New** to display the New Controller window.



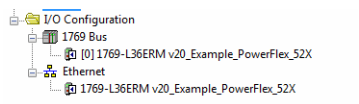
Select the appropriate choices for the fields in the window to match your application. Then click **OK**. The application window reappears with the treeview in the left pane.

Note: If you are using a controller without an embedded EtherNet/IP bridge, you will also need to add the bridge to the I/O configuration. See the user manual for your controller for details.

2. Configure the IP address/Network Settings on your controller or bridge. In this example, the Network Settings are set for a private network.



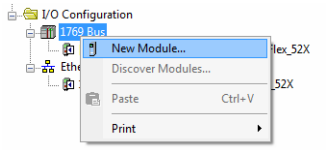
3. Click **OK**. The controller is now configured for the EtherNet/IP network. It appears in the I/O Configuration folder. In our example, a 1769-L36ERM controller appears under the I/O Configuration folder with its assigned name.



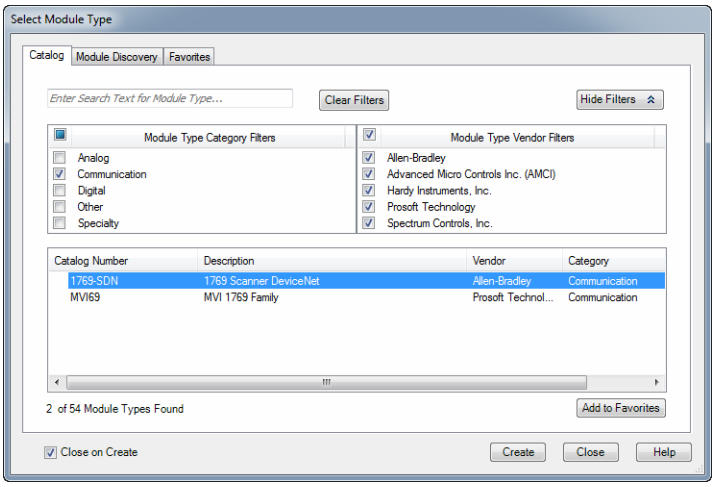
Adding the Scanner to the I/O Configuration

To establish communication between the controller and adapter over the network, you must add the scanner to the I/O configuration.

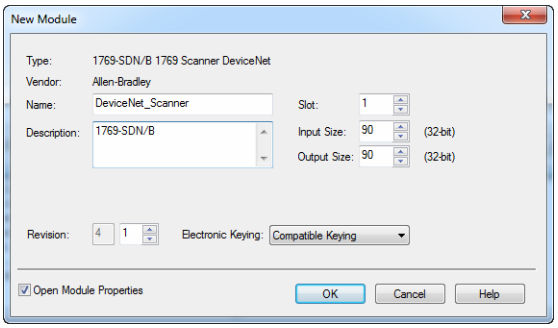
1. In the treeview, right-click the 1769 Bus icon under the I/O Configuration folder and choose **New Module...**. The Select Module dialog box appears.



2. Select the Communication group to display all of the available communication modules.



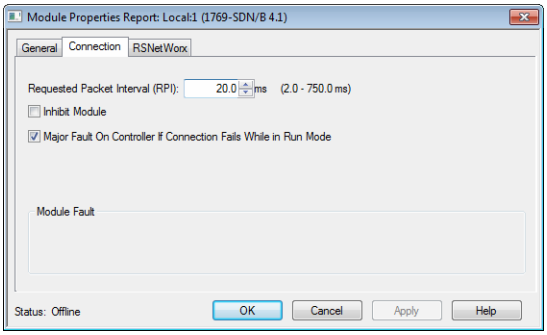
3. In the list, select the DeviceNet scanner used by your controller. In this example, we used a 1769-SDN DeviceNet scanner, so the 1769-SDN option is selected.
4. Click **Create**.
5. In the select Major Revision pop-up dialog box, select the major revision of its firmware.
6. Click **OK**. The scanner's New Module dialog box appears.



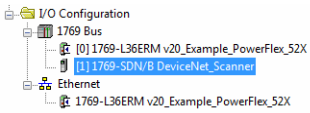
7. Edit the following:

Box	Setting
Name	A name to identify the scanner.
Description	Optional – description of the scanner.
Slot	The slot of the DeviceNet scanner in the rack.
Revision	The minor revision of the firmware in the scanner. (You already set the major revision by selecting the scanner series in step 7.)
Electronic Keying	**Compatible Keying**. The "Compatible Keying" setting for Electronic Keying verifies that the physical module is consistent with the software configuration before the controller and scanner make a connection. Therefore, ensure that you have set the correct revision in this window. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select "Disable Keying." "Disable Keying" is recommended.
Input Size	The size of the input data for the DeviceNet scanner. We recommend the default value of 90.
Output Size	The size of the output data for the DeviceNet scanner. We recommend the default value of 90.
Open Module Properties	When this box is checked, clicking OK opens additional module properties dialog boxes to further configure the scanner. When unchecked, clicking OK closes the scanner's New Module dialog box. For this example, uncheck this box.

8. Click **OK**. The Module Properties Report window now appears. In the Connection tab, set the appropriate Requested Packet Interval (RPI) for your application.



9. Click **OK**. The scanner is now configured for the DeviceNet network, added to the RSLogix 5000/Logix Designer project, and appears in the I/O Configuration folder.



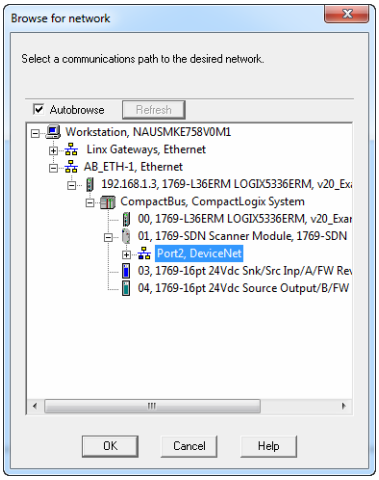
In our example, a 1769-SDN scanner appears under the I/O Configuration folder with its assigned name. For convenience, keep the project open. Later in this chapter the project will need to be downloaded to the controller.

Using RSNetWorx for DeviceNet Software to Configure and Save the I/O Configuration to the Scanner

After adding the scanner to the I/O configuration, you must configure and save the I/O to the scanner.

1. Start RSNetWorx for DeviceNet software.
2. From the File menu, choose **New** to start a new configuration.
3. From the Network menu, choose **Online** to display the Browse for Network dialog box.
4. Expand the communication path from your computer to the DeviceNet scanner.

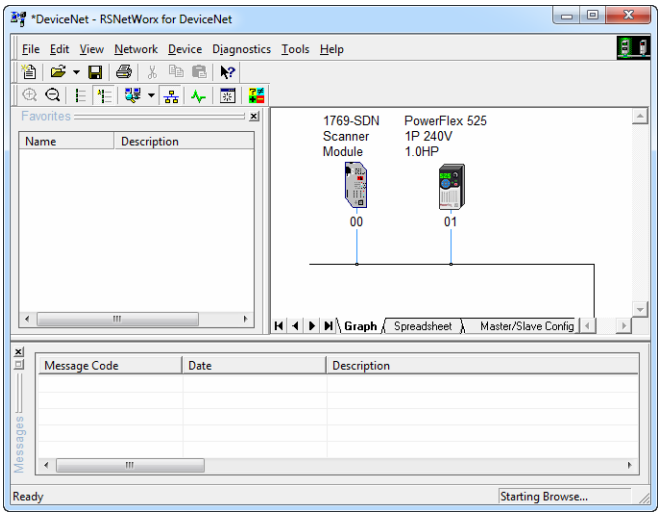
   The following dialog box shows our example navigating to devices on a DeviceNet network. Depending on the communication link you are using, the navigation path may be different.



5. Click **OK** after selecting a valid path to the DeviceNet network (for this example, Port 2, DeviceNet).

   If a message box appears about uploading or downloading information, click OK.

As the selected DeviceNet path is browsed, RSNetWorx for DeviceNet software creates a graph view window that shows a graphical representation of the devices on the network.



If the icon for the drive (for this example, PowerFlex 525) on the network appears as Unrecognized Device, use RSNetWorx for DeviceNet software to create the PowerFlex 520-series drive EDS file. See Create the EDS File from Online Device on the Network on page 39 or Download the EDS File from the Internet Web Site on page 40 for instructions on how to create the EDS file.

Create the EDS File from Online Device on the Network

1. Right-click the Unrecognized Device icon and select Register Device in the menu. The EDS Wizard appears.

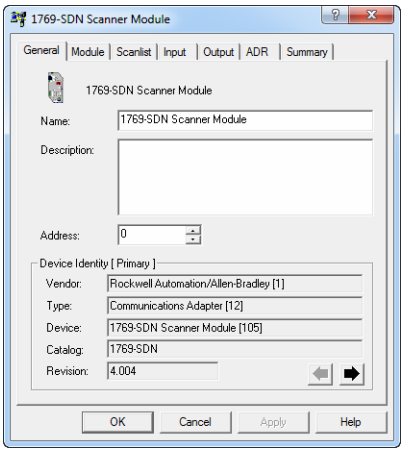
2. Click **Next** to start creating the EDS file.
3. Select **Create an EDS file**.
4. Click **Next**.
   If the EDS file is already downloaded and resides on your computer, select "Register an EDS file" and click **Next**. Then follow the screen prompts and disregard the remaining steps (5...13) in this procedure.
5. Enter a description (if desired).

6. Click **Next**.
7. Check the Polled box.
8. Enter "4" into the Input Size and Output Size boxes (which accounts for just the basic I/O).
9. Click **Next**.
   RSNetWorx for DeviceNet software will upload the EDS file from the drive.
10. Click **Next** to display the icon options for the node.
    We recommend using the icon for the PowerFlex 520-series drive. you can change icons by clicking **Change icon**.
11. Click **Next** to view a summary.
12. Click **Next** again to accept it.
13. Click **Finish** to finish creating the EDS file.
    A new icon represents your PowerFlex 520-series drive and communications adapter appears in the RSNetWorx for DeviceNet graph view window.

Download the EDS File from the Internet Web Site

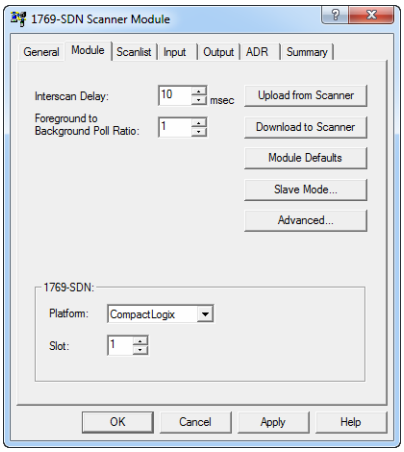
1. Go to the website http://www.rockwellautomation.com/resources/eds.
2. On the website search screen in the Network entry field, enter the type of network (for this example, DeviceNet), which enables the use of the other search fields.
3. In the Keyword entry field, enter the type of PowerFlex 520-series drive (for this example, PowerFlex 525), noting that this field is space sensitive.
4. Click **Search**.
   Due to the large number of EDS files, this search may take seconds or up to several minutes.
5. On the search results screen in the Details & Download Column, click the "Download" hyperlink for the EDS file.
6. Click **Save** on the File Download screen to save the EDS file to an appropriate location on your computer.
7. Launch the EDS Hardware Installation Tool by clicking on the Microsoft Windows Start button and choose **Programs** > **Rockwell Software** > **RSLinx Tools** > **EDS Hardware Installation Tool**.
   Then follow the screen prompts to add the EDS file for use with your project.
8. Reboot the computer and repeat steps 1 through 7 at the beginning of this subsection.
   The Unrecognized Device icon in the RSNetWorx for DeviceNet graph view window should have been replaced by a drive icon (for this example, the icon for a PowerFlex 525 drive).

9. In the graph view window, right-click the 1769-SDN icon and choose **Properties** to display its properties dialog box.



10. Click the Module tab to display the Scanner Configuration dialog box.

11. Click **Upload** to upload the 1769-SDN scanner configuration to the RSNetWorx for DeviceNet project and display the Module tab of the 1769-SDN Scanner Module dialog box.



12. Edit the following:

Box	Setting
Interscan Delay	Sets the scanner time delay between consecutive I/O scans on the network. For this example, we recommend using the default setting of 10 milliseconds. **TIP**: When numerous software packages are scanning the network (RSNetWorx for DeviceNet, Connected Components Workbench) and they have problems communicating, increasing this value may help.
Foreground to Background Poll Ratio	Sets the ratio of foreground to background polls. For this example, we recommend using the default setting of 1.
Slot	Sets the slot location in which the scanner is installed. for this example, Slot 1 is selected.

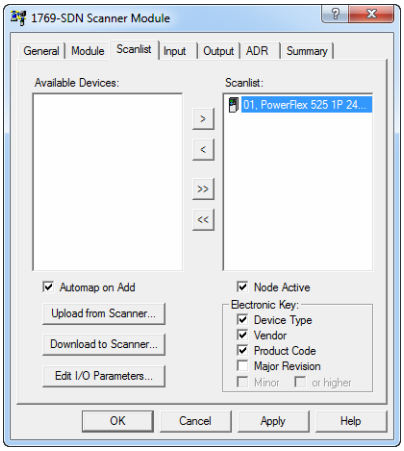
13. Click **Apply**.

14. Click the Scanlist tab to begin the drive I/O configuration.
The Available Devices left box shows devices that are presently on the DeviceNet network but are not yet configured. The Scanlist right box shows devices that are presently on the DeviceNet network and are configured.

    TIP The Automap on Add box is checked by default and allows RSNetWorx for DeviceNet software to automatically map the drive I/O into the scanner in the next available registers. The mapping is based on the minimum I/O requirements (four bytes for input and four bytes for output) that the scanner obtains from the drive EDS file.

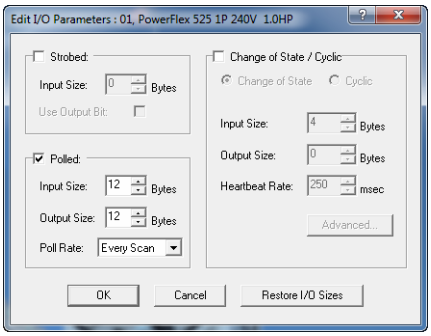
15. For this example, uncheck the Automap on Add.

16. Select the PowerFlex 525 drive in the Available Devices box and click > to move it to the scanlist window.



Box	Setting
Node Active	Activates/deactivates the scanlist in the 1769-SDN scanner for the selected device. For this example, keep the box checked.
Device Type	Electronic Key checkboxes select how specific the device in the scanlist must be for the 1769-SDN scanner to match its compatibility I/O operation. The more boxes that are checked, the more specific the device must be to operate. For this example, leave the default boxes (Device Type, Vendor, and Product Code) checked.
Vendor	
Product Code	
Major Revision	

17. Click **Edit I/O Parameters** to display the Edit I/O Parameters dialog box for the PowerFlex 525 drive used in this example.



a. Select the type or types of data exchange (Polled, Change of State, and/or Cyclic). For this example, Polled was selected, which we recommend.

b. Enter the number of bytes that are required for your I/O in the Input Size and Output Size boxes.
For the example in this manual, all four **[Opt DL Out 1...4]** and all four **[Opt DL In 1...4]** are used, resulting in an Input size of "12" and an Output size of "12". To determine the byte size for your application, either view adapter Diagnostic Items 23 (Input Size) and 24 (Output Size) or calculate them.

View Diagnostic Items 23 and 24 for Input/Output Byte Sizes

Use the PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S), or another drive configuration tool such as Connected Components Workbench to view Diagnostic Items 23 and 24. The adapter automatically calculates the number of bytes for the Input Size and Output Size based on the values of *Device* parameters **02 [DLs From Net Cfg]** and **04 [DLs To Net Cfg]** configured in Using Master-Slave Hierarchy (Optional) on page 26.

Calculate the Input/Output Byte Sizes

You can easily calculate the number of bytes for the Input size and Output Size. Since the option module always uses the 16-bit Logic Command, 16-bit Feedback, 16-bit Logic Status, and 16-bit Reference, at least four bytes must be set for both the Input Size and Output Size. (A 16-bit word is two bytes).) If any or all of the drives eight 16-bit Datalinks are used (see Using Master-Slave Hierarchy (Optional) on page 26), increase the Input and Output Size settings accordingly.

- Input Size: Multiply the number of Datalinks used to write data (value of *Device* parameter **02 [DLs From Net Cfg]**) by two bytes, and add this result to the minimum four bytes. For example, if *Device* parameter 02 has a value of '3', add '6' bytes (3 x 2 bytes) to the required minimum four bytes for a total of 10 bytes.
- Output Size: Multiply the number of Datalinks used to read data (value of *Device* parameter **04 [DLs To Net Cfg]**) by two bytes, and add this result to the minimum four bytes. For example, if *Device* parameter 04 has a value of '2', add '4' bytes (2 x 2 bytes) to the required minimum four bytes for a total of 8 bytes.

18. Set the scan rate for the selected data exchange method.

For more information about scan rates, see RSNetWorx for DeviceNet software online help.

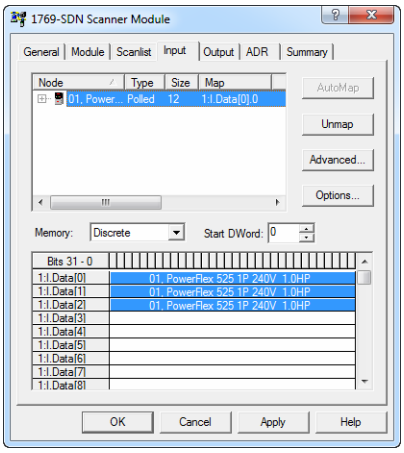
Data Exchange Method	Rate Field Pull-down Setting
Polled	Poll Rate
Change of State	Heartbeat Rate
Cyclic	Send Rate

19. Click **OK**.

If a Scanner Configuration dialog box appears, click **Yes** to continue. The Edit I/O Parameters dialog box closes and then the 1769-SDN Scanlist tab dialog box reappears.

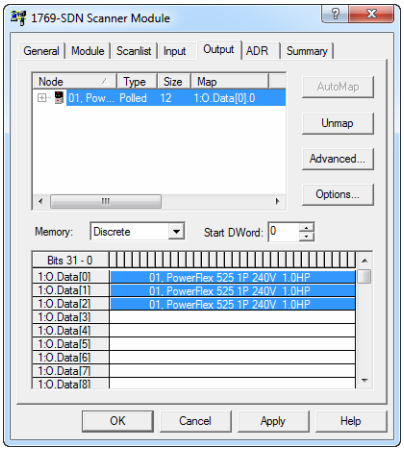
20. Click the Input tab to display the input registers for the 1769-SDN scanner.
21. Click **AutoMap** to map the drive input image to the 1769-SDN scanner as shown in the example dialog box below.

TIP If your RSLogix 5000/Logix Designer project requires a different staring DWord (double word, 32-bit) than the default value of '0' for the drive input image, set the Start DWord field to the appropriate value.



22. Click the Output tab to display the output registers for the 1769-SDN scanner.
23. Click **AutoMap** to map the drive output image to the 1769-SDN scanner as shown in the example dialog box below.

TIP If your RSLogix 5000/Logix Designer project requires a different staring DWord (double word, 32-bit) than the default value of '0' for the drive output image, set the Start DWord field to the appropriate value.



24. Click **OK**.

If the Scanner Configuration dialog box appears asking to download these settings to the 1769-SDN scanner, click **Yes**.

25. From the File menu, choose **Save**.

If this is the first time you saved the project, the Save As dialog box appears.

a. Navigate to a folder.

b. Type a file name.

c. Click **Save** to save the configuration as a file on your computer.

26. When configuring the I/O for additional PowerFlex 520-series drives on the network, repeat steps 14 through 25.

IMPORTANT When all Datalinks in each drive are used (6 DINTs of I/O per drive), a maximum of 15 PowerFlex 520-series drives can be mapped. This is due to the amount of I/O available in the 1769-SDN scanner, which is a maximum of 90 DINTs.

Setting Datalinks in the Drive (Optional)

After configuring the 1769-SDN scanner, Datalinks (if used) must be set to parameters that are appropriate for your application.

Use the 22-HIM-A3 or 22-HIM-C2S HIM, or another drive configuration tool such as Connected Components Workbench software to set the Datalinks in the drive. For this example, the following Datalink values are used.

***Host* Parameter**	**Value**	**Description**
C 161 [Opt Data In 1]	52	Points to drive parameter P052 [Average kWh Cost]
C 162 [Opt Data In 2]	41	Points to drive parameter P041 [Accel Time 1]
C 163 [Opt Data In 3]	42	Points to drive parameter P042 [Decel Time 1]
C 164 [Opt Data In 4]	410	Points to drive parameter A410 [Preset Freq 0]
C165 [Opt Data Out 1]	45	Points to drive parameter P045 [Stop Mode]
C166 [Opt Data Out 2]	41	Points to drive parameter P041 [Accel Time 1]
C167 [Opt Data Out 3]	42	Points to drive parameter P042 [Decel Time 1]
C168 [Opt Data Out 4]	410	Points to drive parameter A410 [Preset Freq 0]

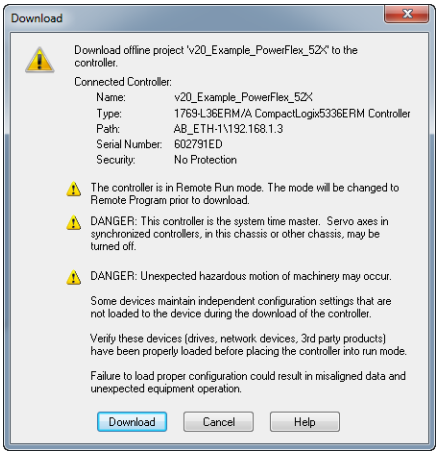
TIP The *Host* parameters [Opt Data In x] are inputs to the drive that come from controller outputs (data to write a drive parameter). The *Host* parameters [Opt Data Out x] are outputs from the drive that go to controller inputs (data to read a drive parameter).

Downloading the Project to the Controller and Going Online

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

1. From the Communications menu in the RSLogix 5000/Logix Designer dialog box, choose **Download**.

   The Download dialog box appears.



   TIP If a message box reports that RSLogix 5000/Logix Designer software is unable to go online, find your controller in the Who Active dialog box. From the Communications menu, choose Who Active. After finding and selecting the controller, click Set Project Path to establish the path. If your controller does not appear, you need to add or configure the DeviceNet drive with RSLinx software. See Using RSLinx Classic on page 33 and RSLinx online help for details.

2. Click **Download** to download the configuration to the controller.

   When the download is successfully completed, RSLogix 5000/Logix Designer software goes into the Online mode and the I/O OK box in the upper-left of the dialog box should be steady green.

3. From the File menu, choose **Save**.

   If this is the first time you saved the project, the Save As dialog box appears.

   a. Navigate to a folder.

   b. Type a file name.

   c. Click **Save** to save the configuration as a file on your computer.

4. To ensure that the present project configuration values are saved, RSLogix 5000/Logix Designer software prompts you to upload them. Click **Yes** to upload and save.

5. Place the controller in Remote Run or Run Mode.

Using the I/O

This chapter provides information and examples that explain how to control, configure, and monitor a PowerFlex 525 drive using the configured I/O.

ATTENTION?????I?????U?????TION?????I?????U?????Risk of 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 CIP-based networks, including DeviceNet, I/O connections are 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 520-series drives.

The adapter includes the Logic Command, Logic Status, Reference, and Feedback (all as 16-bit words). This requires four bytes for the Input Size and four bytes for the Output Size in the controller's I/O image. This basic I/O must be always configured in the DeviceNet scanner using RSNetWorx for DeviceNet software. Additional I/O, if needed, can be set using up to four Datalinks to write data and/or up to four Datalinks to read data. When using any combination of these Datalinks, add two bytes for **each** Datalink to the basic I/O Input Size and/or Output Size.

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

Understanding the I/O Image

The terms *input* and *output* are defined from the controller's point of view. Therefore, output I/O is data that is produced by the controller and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the controller. The I/O image will vary based on how many of the drive's 16-bit Datalinks (*Host* parameters **C161...C164 [Opt Data In 1...4]** and **C165...C168 [Opt Data Out 1...4]** are used. *Device* parameters **02 [DLs From Net Cfg]** and **04 [DLs To Net Cfg]** must also be configured accordingly if Datalinks are used.

If all available I/O is not used, the image is truncated. The image always uses consecutive words starting at word zero.

CompactLogix Controller I/O Image for PowerFlex 520-Series Drives on page 48 shows the I/O image when using all of the 16-bit Datalinks.

CompactLogix Controller I/O Image for PowerFlex 520-Series Drives (16-bit Logic Command/Status, Reference/Feedback, and Datalinks)

INT	Output I/O
0	Logic Command
1	Reference
2	Datalink 1
3	Datalink 2
4	Datalink 3
5	Datalink 4

INT	Input I/O
0	Logic Status
1	Feedback
2	Datalink 1
3	Datalink 2
4	Datalink 3
5	Datalink 4

Single drive mode is the typical configuration, where one node consists of a PowerFlex 525 drive with a 25-COMM-D adapter.

For Multi-Drive mode, where one node can consist of up to 5 drives, see Chapter 7, Using Multi-Drive Mode.

Using Logic Command/Status

The Logic Command is a 16-bit word of control data produced by the controller and consumed by the adapter. The Logic Status is a 16-bit word of status data produced by the adapter and consumed by the controller.

When using a CompactLogix/ControlLogix controller, the Logic Command word is always INT 0 in the output image and the Logic Status word is always INT 0 in the input image.

This manual contains the bit definitions for compatible products available at the time of publication in Appendix D, Logic Command/Status Words: PowerFlex 525 Drives.

Using Reference/Feedback

The Reference is a 16-bit INT (integer) produced by the controller and consumed by the adapter. The Feedback is a 16-bit INT produced by the adapter and consumed by the controller.

When using a CompactLogix/ControlLogix controller, the 16-bit INT Reference word is always INT 1 in the output image (see CompactLogix Controller I/O Image for PowerFlex 520-Series Drives on page 48) and the 16-bit INT Feedback is always INT 1 in the input image.

The Reference and Feedback 16-bit INT values represent drive speed. The scaling for the speed Reference and Feedback is 0.01 Hz. For example, a 16-bit INT Reference value of '3000' would equal a Reference of 30.00 Hz. Note that the commanded maximum speed can never exceed the value of *Host* parameter **P044 [Maximum Freq]**. PowerFlex 520-Series Drive Example Speed Reference/ Feedback Scaling on page 49 shows example References and their results for a PowerFlex 520-series drive that has its:

- *Host* parameter **P043 [Minimum Freq]** set to 10.00 Hz.
- *Host* parameter **P044 [Maximum Freq]** set to 50.00 Hz.

PowerFlex 520-Series Drive Example Speed Reference/Feedback Scaling

Network Reference Value	Speed Commanded Value	Output Speed	Network Feedback Value
10000	100.00 Hz	50.00 Hz(1)	5000
6500	65.00 Hz	50.00 Hz(1)	5000
3250	32.50 Hz	32.50 Hz	3250
0	0.00 Hz	0.00 Hz	0

(1) The drive runs at 50.00 Hz instead of 100.00 Hz or 65.00 Hz because *Host* parameter P044 [Maximum Freq] sets 50.00 Hz as the maximum speed.

IMPORTANT Attempting to write a negative value to the Speed Reference will result in the drive ramping to maximum speed due to overflow, the direction of the drive can only be controlled programmatically with the appropriate bits (bits 4 and 5) in the Command Word.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be read or written to without using an Explicit Message. When enabled, each Datalink occupies one 16-bit word in a ControlLogix, CompactLogix, or MicroLogix controller.

The following rules apply when using PowerFlex 525 drive Datalinks:

- Datalinks can not be used with Multi-drive mode.
- The target of a Datalink can be any appropriate *Host* parameter. For example, *Host* parameter **P041 [Accel Time 1]** can be the target of the DeviceNet adapter installed in the drive.
- The data passed through the drive's Datalink mechanism is determined by the settings of the following parameters
  - *Device* parameter **02 [DLs From Net Cfg]**
  - *Device* parameter **04 [DLs To Net Cfg]**
  - *Host* parameters **C161...C164 [Opt Data In 1...4]**

– *Host* parameters **C165...C168 [Opt Data Out 1...4]**

IMPORTANT A reset is always required after configuring Datalinks so that the changes take effect.

- When an I/O connection that includes Datalinks is active, those Datalinks being used are locked and cannot be changed until that I/O connection becomes idle or inactive.
- 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.

Datalinks for PowerFlex 525 drive peripherals (embedded EtherNet/IP adapter and option modules such as a communication module) are locked when the peripheral has an I/O connection with a controller. When a controller has an I/O connection to the drive, the drive does not allow a reset to defaults, configuration download or anything else that could change the makeup of the I/O connection in a running system. The I/O connection with the controller must first be disabled to allow changes to the respective Datalinks.

Depending on the controller being used, the I/O connection can be disabled by:

- Inhibiting the module in RSLogix 5000/Logix Designer
- Putting the controller in Program mode
- Placing the scanner in idle mode
- Disconnecting the drive from the network

Example Ladder Logic Program

The example ladder logic programs in the sections of this chapter are intended for PowerFlex 525 drives.

Functions of the Example Programs

The example programs enable you to:

- Receive Logic Status information from the drive.
- Send a Logic Command to control the drive (start, stop).
- Send a Reference to the drive and receive Feedback from the drive.
- Send/receive Datalink data to/from the drive.

Logic Command/Status Words

These examples use the Logic Command word and Logic Status word for PowerFlex 525 drives. See Appendix D, Logic Command/Status Words: PowerFlex 525 Drives to view details.

CompactLogix Example

Creating Ladder Logic Using the Logix Designer Generic Profile (all versions)

Adapter Parameter Settings for CompactLogix Controller Example

These adapter settings were used for example ladder logic program in this section.

Parameter	Value	Description
Adapter *Device* Parameters		
02 [DLs From Net Cfg]	4	Sets the number of Datalinks used to write data from the network controller.
04 [DLs To Net Cfg]	4	Sets the number of Datalinks used to read data to the network controller.
Adapter *Host* Parameters		
P046 [Start Source 1]	4	Sets the input for [Start Source 1] to 4 "Network Opt"
P047 [Speed Reference1]	4	Sets the input for [Speed Reference1] to 4 "Network Opt"
C161 [Opt Data In 1]	52	Points to drive parameter P052 [Average kWh Cost]
C162 [Opt Data In 2]	41	Points to drive parameter P041 [Accel Time 1]
C163 [Opt Data In 3]	42	Points to drive parameter P042 [Decel Time 1]
C164 [Opt Data In 4]	410	Points to drive parameter A410 [Preset Freq 0]
C165 [Opt Data Out 1]	45	Points to drive parameter P045 [Stop Mode]
C166 [Opt Data Out 2]	41	Points to drive parameter P041 [Accel Time 1]
C167 [Opt Data Out 3]	42	Points to drive parameter P042 [Decel Time 1]
C168 [Opt Data Out 4]	410	Points to drive parameter A410 [Preset Freq 0]

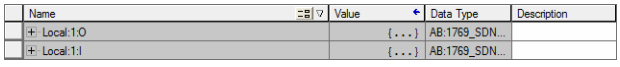
TIP The PowerFlex 525 drive supports up to three control functions and three Reference functions. There are several parameters in the drive that will override the start source and speed reference command if enabled. For details on these parameters, see the PowerFlex 525 drive's user manual, publication 520-UM001.

The *Host* parameters [Opt Data Out 1...4] are inputs into the drive that come from controller outputs (data to write a drive parameter). The *Host* parameters [Opt Data In 1...4] are outputs from the drive that go to controller inputs (data to read a drive parameter).

Controller Tags

When you add the adapter and drive to the I/O configuration (Chapter 4), Logix Designer automatically creates generic (non-descriptive) controller tags. In this example program, the following controller tags are used.

CompactLogix Controller Tags for Drive Generic Profile Ladder Logic Program Example



You can expand the Output and Input tags to reveal the output and input configuration (see CompactLogix Controller Tags for Drive Generic Profile Ladder Logic Program Example on page 51). For this example, the Input tag requires three 32-bit words of data and the Output tag requires three 32-bit words of data. This corresponds to six 16-bit words of data for input and six 16-bit words of data for output because the 1769-SDN is a 32-bit device.

Program Tags

In our example program, we will create 16-bit INT (integer) arrays for program tags and use "Copy" instructions to move this data to and from the 32-bit DINT (double integer) 1769-SDN scanner I/O tags.

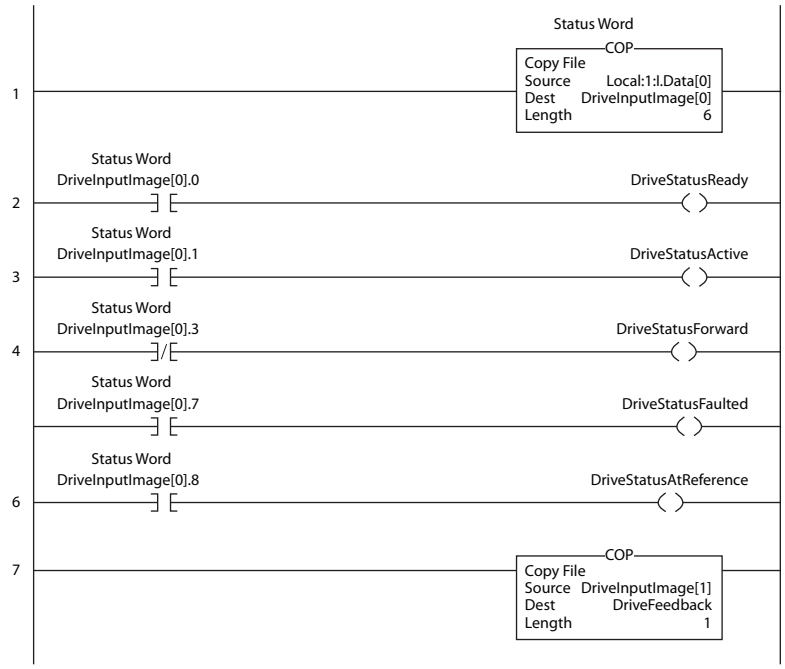
To use the Controller tags that are automatically created, you need to create the following Program tags for this example program.

CompactLogix Program Tags for Drive Generic Profile Ladder Logic Program Example

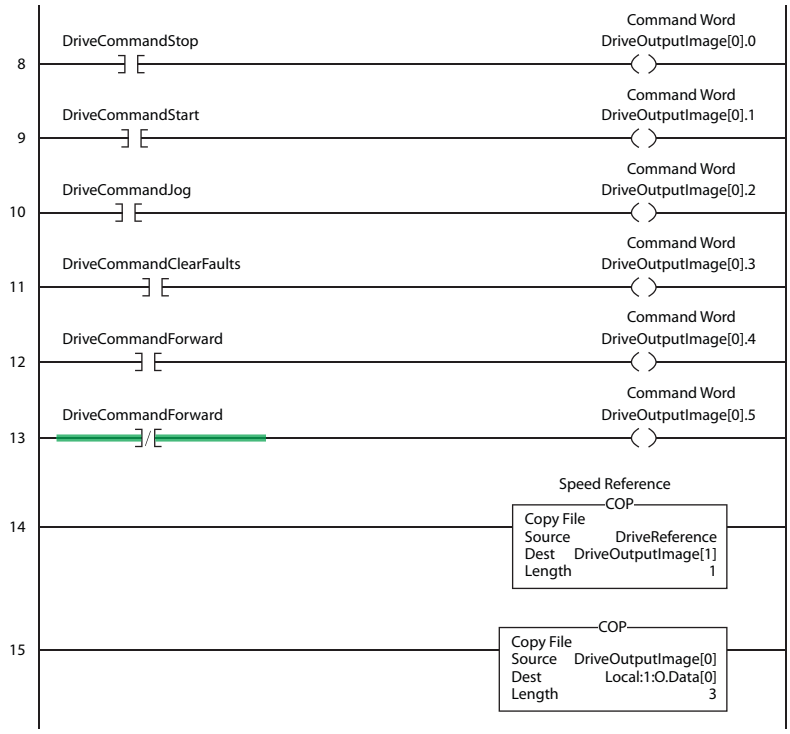
Name	Data Type	Description
DriveInputImage	INT[6]	
DriveOutputImage	INT[6]	
DriveStatusReady	BOOL	
DriveStatusForward	BOOL	
DriveStatusFaulted	BOOL	
DriveStatusAtReference	BOOL	
DriveStatusActive	BOOL	
DriveFeedback	INT	
DriveCommandStop	BOOL	
DriveCommandStart	BOOL	
DriveCommandJog	BOOL	
DriveCommandClearFaults	BOOL	
DriveCommandForward	BOOL	
DriveReference	INT	

Name	Data Type	Description
DriveInputImage	INT[6]	
DriveInputImage[0]	INT	Status Word
DriveInputImage[1]	INT	Speed Feedback
DriveInputImage[2]	INT	Opt Data In 1
DriveInputImage[3]	INT	Opt Data In 2
DriveInputImage[4]	INT	Opt Data In 3
DriveInputImage[5]	INT	Opt Data In 4
DriveOutputImage	INT[6]	
DriveOutputImage[0]	INT	Command Word
DriveOutputImage[1]	INT	Speed Reference
DriveOutputImage[2]	INT	Opt Data Out 1
DriveOutputImage[3]	INT	Opt Data Out 2
DriveOutputImage[4]	INT	Opt Data Out 3
DriveOutputImage[5]	INT	Opt Data Out 4

CompactLogix Example Ladder Logic Program Using a Drive Generic Profile for Logic Status/ Feedback

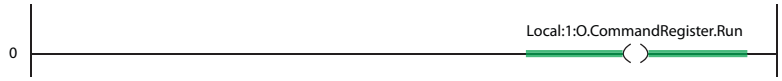


Compact Logix Example Ladder Logic Program Using a Drive Generic Profile for Logic Command/ Reference



Enable the DeviceNet Scanner

A rung in the ladder logic must be created and assigned to the 1769-SDN scanner Command Register Run bit. This rung enables the scanner to transfer I/O on the network.



IMPORTANT This rung must always be included in the ladder logic program.

Example Datalink Data

The Datalink data used in the example program is shown in (CompactLogix Controller Example Datalinks for Ladder Logic Program Using a Drive Generic Profile on page 54). Note that to describe the parameters to which the Datalinks are assigned, you may want to add descriptions to the generic tags or create a UDDT (user-defined data type). For this example, the Opt_Data_Out tags were created to describe the drive parameters to which these Datalinks are assigned. For example, Opt_Data_Out_01_Stop_Mode indicates that adapter *Host* parameter **C165[Opt Data Out 1]** is assigned to drive parameter **P045 [Stop Mode]**. This same method applies to the Opt_Data_In tags.

CompactLogix Controller Example Datalinks for Ladder Logic Program Using a Drive Generic Profile

Name	Value	Data Type
Opt_Data_In	{...}	Opt_Data_In
Opt_Data_In._1_Avg_kWh_Cost	0	INT
Opt_Data_In._2_Accel_Time_1	0	INT
Opt_Data_In._3_Decel_Time_1	0	INT
Opt_Data_In._4_Preset_Freq_0	0	INT
Opt_Data_Out	{...}	Opt_Data_Out
Opt_Data_Out._1_Stop_Mode	0	INT
Opt_Data_Out._2_Accel_Time_1	0	INT
Opt_Data_Out._3_Decel_Time_1	0	INT
Opt_Data_Out._4_Preset_Freq_0	0	INT

Using Explicit Messaging

This chapter provides information and examples that explain how to use Explicit Messaging to configure and monitor the adapter installed and connected to the PowerFlex 525 drive.

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.

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.

ATTENTION: If you need to make frequent parameter changes using Explicit Messages, set *Host* parameter C121 [Comm Write Mode] to 1 "RAM only".

See Chapter 5 for information about the I/O Image, using Logic Command/Status, Reference/Feedback, and Datalinks.

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 network.

IMPORTANT PowerFlex 525 drives have explicit messaging limitations. See Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives on page 55 for more information.

Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives

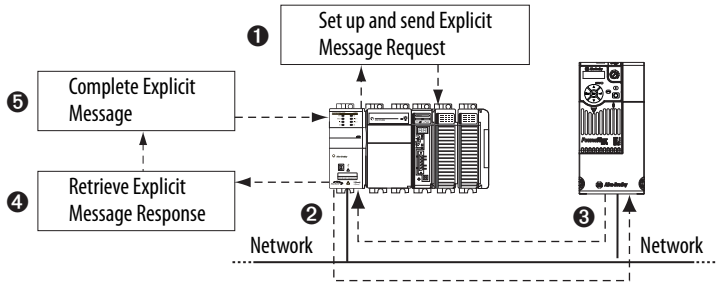
DeviceNet Object Class Code	Compatibility	Explicit Messaging Function
Parameter Object 0x0F	Yes	Single parameter reads/write
DPI Parameter Object 0x93	Yes with limitations	Single and scattered parameter reads/write

Performing Explicit Messaging

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

Explicit Messaging Process



Event	Description
❶	You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner or bridge module (download).
❷	The scanner or bridge module transmits the Explicit Message Request to the slave device over the network.
❸	The slave device transmits the Explicit Message Response back to the scanner. The data is stored in the scanner buffer.
❹	The controller retrieves the Explicit Message Response from the scanner's buffer (upload).
❺	The Explicit Message is complete.

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

CompactLogix Examples

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

For supported classes, instances, and attributes, see Appendix C, DeviceNet Objects.

IMPORTANT The explicit messaging examples in this section can be performed using any software version of RSLogix 5000/Logix Designer.

The read and write messaging examples in this section are for parameters which use Class Code 0x93.

The Message Configuration has a Service Type of "Parameter Read" which is Class code 0x0F, Parameter Object.

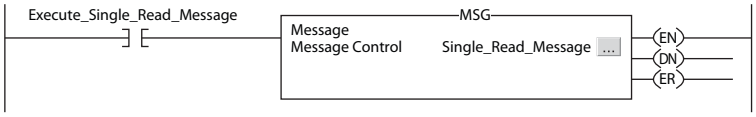
CompactLogix Example Ladder Logic Program to Read a Single Parameter

A Get Attribute Single message is used to read a single parameter. This read message example reads the value of the 16-bit parameter **b003 [Output Current]** in a PowerFlex 525 drive.

Example Controller Tags to Read a Single Parameter

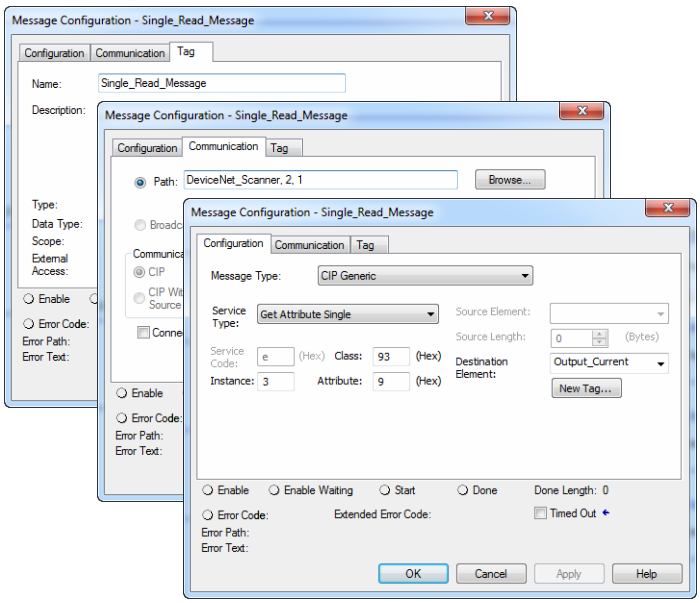
Operation	Controller Tags for Single Read Message	Data Types
XIC	Execute_Single_Read_Message	BOOL
MSG	Single_Read_Message	MESSAGE

Example Ladder Logic to Read a Single Parameter



CompactLogix – Formatting a Message to Read a Single Parameter

Get Attribute Single Message Configuration Screens



The following table identifies the data that is required in each box to configure a message to read a single parameter.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type[1]	Get Attribute Single	This service is used to read a parameter value.
Service Code[1]	e (Hex.)	Code for the requested service.
Class	93[3]	Class ID for the DPI Parameter Object.
Instance	3 (Dec.)	Instance number is the same as parameter number.[5]
Attribute	9 (Hex.)	Attribute number for the Parameter Value attribute.

Configuration Tab	Example Value	Description
Source Element	–	Leave blank (not applicable).
Source Length	0 bytes	Number of bytes of service data to be sent in the message.
Destination	Output_Current(4)	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path(2)	DeviceNet_Scanner, 2, 1	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Read_Message	The name for the message.

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

(2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, DeviceNet_Scanner). Then always type in a comma followed by a "2", which is the DeviceNet scanner port, followed by another comma, then followed by the DeviceNet node number of the drive (for this example, "1").

(3) See Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives on page 55 for limitations of PowerFlex 525 drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(4) In this example, Output Current is a 16-bit parameter requiring the Data Type field to be set to "INT" when creating the controller tag. See the drive documentation to determine the size of the parameter and its data type.

(5) This applies only in single-drive mode. For Multi-drive mode, see Chapter 7, Using Multi-Drive Mode for examples.

CompactLogix Example Ladder Logic Program to Write a Single Parameter

A Set Attribute Single message is used to write to a single parameter. This write message example writes a value to the 16-bit parameter **P041 [Accel Time 1]** in a PowerFlex 525 drive.

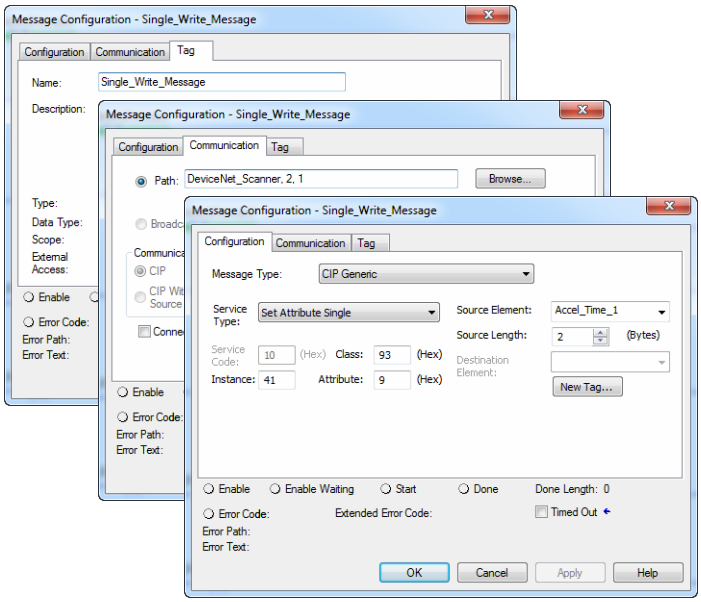
Example Controller Tags to Write a Single Parameter

Operation	Controller Tags for Single Write Message	Data Types
XIC	Execute_Single_Write_Message	BOOL
MSG	Single_Write_Message	MESSAGE

Example Ladder Logic to Write a Single Parameter

CompactLogix – Formatting a Message to Write a Single Parameter

Set Attribute Single Message Configuration Screens



The following table identifies the data that is required in each box to configure a message to write a single parameter.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type(1)	Write Attribute Single	This service is used to Set a parameter value.
Service Code(1)	10 (Hex.)	Code for the requested service.
Class	93(4)	Class ID for the DPI Parameter Object.
Instance	41 (Dec.)	Instance number is the same as parameter number.(6)
Attribute(2)	9 or A (Hex.)	Attribute number for the Parameter Value attribute.
Source Element	Accel_Time_1(5)	Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive.
Source Length	2 bytes	Number of bytes of service data to be sent in the message.
Destination	–	Leave blank (not applicable).
Communication Tab	**Example Value**	**Description**
Path(3)	DeviceNet_Scanner, 2, 1	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Write_Message	The name for the message.

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

(2) Setting the Attribute value to "9" will write the parameter value to the drive's Non-Volatile Storage (EEPROM) memory, so the parameter value will remain even after the drive is power cycled. **Important**: When set to "9," be very cautious as the EEPROM may quickly exceed its life cycle and cause the drive to malfunction. **Important**: If you need to make frequent parameter changes using Explicit Messages, set *Host* parameter C121 [Comm Write Mode] to 1 "RAM only".

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, DeviceNet_Scanner). Then always type in a comma followed by a "2", which is the DeviceNet scanner port, followed by another comma, then followed by the DeviceNet node number of the drive (for this example, "1").

(4) See Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives on page 55 for limitations of PowerFlex 525 drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(5) In this example, Accel Time 1 is a 16-bit parameter requiring the Data Type field to be set to "INT" when creating the controller tag. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for example, 2 bytes for an INT). See the drive documentation to determine the size of the parameter and its data type.

(6) This applies only in single-drive mode. For Multi-drive mode, see Chapter 7, Using Multi-Drive Mode for examples.

CompactLogix – Explanation of Request and Response Data for Read/Write Multiple Messaging

The data structures in Data Structures for Scattered Read Messages on page 61 and Data Structures for Scattered Write Messages on page 62 use 16-bit words and can accommodate up to 64 parameters in a single message. In the Response Message, a parameter number with Bit 15 set indicates that the associated parameter value field contains an error code (parameter number in response data will be negative).

The PowerFlex 525 Adjustable Frequency AC Drive User Manual, publication 520-UM001 lists the data type for each parameter.

Data Structures for Scattered Read Messages

	Request (Source Data)		Response (Destination Data)
INT 0	Parameter Number	INT 0	Parameter Number
1	Pad	1	Parameter Value
2	Parameter Number	2	Parameter Number
3	Pad	3	Parameter Value
4	Parameter Number	4	Parameter Number
5	Pad	5	Parameter Value
6	Parameter Number	6	Parameter Number
7	Pad	7	Parameter Value
8	Parameter Number	8	Parameter Number
9	Pad	9	Parameter Value
10	Parameter Number	10	Parameter Number
11	Pad	11	Parameter Value
12	Parameter Number	12	Parameter Number
13	Pad	13	Parameter Value
14	Parameter Number	14	Parameter Number
15	Pad	15	Parameter Value
16	Parameter Number	16	Parameter Number
17	Pad	17	Parameter Value
18	Parameter Number	18	Parameter Number
19	Pad	19	Parameter Value
20	Parameter Number	20	Parameter Number
21	Pad	21	Parameter Value
22	Parameter Number	22	Parameter Number
23	Pad	23	Parameter Value
24	Parameter Number	24	Parameter Number
25	Pad	25	Parameter Value
26	Parameter Number	26	Parameter Number
27	Pad	27	Parameter Value
28	Parameter Number	28	Parameter Number
29	Pad	29	Parameter Value
30	Parameter Number	30	Parameter Number
31	Pad	31	Parameter Value
32	Parameter Number	32	Parameter Number
33	Pad	33	Parameter Value
34	Parameter Number	34	Parameter Number
35	Pad	35	Parameter Value
⋮	⋮	⋮	⋮
62	Parameter Number	62	Parameter Number
63	Pad	63	Parameter Value

Data Structures for Scattered Write Messages

	Request (Source Data)		Response (Destination Data)
INT 0	Parameter Number	INT 0	Parameter Number
1	Parameter Value	1	Pad
2	Parameter Number	2	Parameter Number
3	Parameter Value	3	Pad
4	Parameter Number	4	Parameter Number
5	Parameter Value	5	Pad
6	Parameter Number	6	Parameter Number
7	Parameter Value	7	Pad
8	Parameter Number	8	Parameter Number
9	Parameter Value	9	Pad
10	Parameter Number	10	Parameter Number
11	Parameter Value	11	Pad
12	Parameter Number	12	Parameter Number
13	Parameter Value	13	Pad
14	Parameter Number	14	Parameter Number
15	Parameter Value	15	Pad
16	Parameter Number	16	Parameter Number
17	Parameter Value	17	Pad
18	Parameter Number	18	Parameter Number
19	Parameter Value	19	Pad
20	Parameter Number	20	Parameter Number
21	Parameter Value	21	Pad
22	Parameter Number	22	Parameter Number
23	Parameter Value	23	Pad
24	Parameter Number	24	Parameter Number
25	Parameter Value	25	Pad
26	Parameter Number	26	Parameter Number
27	Parameter Value	27	Pad
28	Parameter Number	28	Parameter Number
29	Parameter Value	29	Pad
30	Parameter Number	30	Parameter Number
31	Parameter Value	31	Pad
32	Parameter Number	32	Parameter Number
33	Parameter Value	33	Pad
34	Parameter Number	34	Parameter Number
35	Parameter Value	35	Pad
⋮	⋮	⋮	⋮
62	Parameter Number	62	Parameter Number
63	Parameter Value	63	Pad

CompactLogix Example Ladder Logic Program to Read Multiple Parameters

A Scattered Read message is used to read the values of multiple parameters. This read message example reads the values of these five 16-bit parameters in a PowerFlex 525 drive:

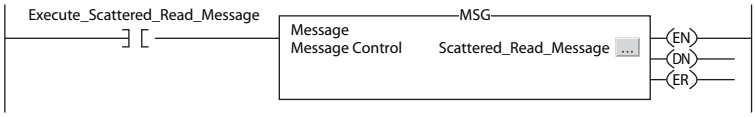
- *Host* parameter **b001[Output Freq]**
- *Host* parameter **b003 [Output Current]**
- *Host* parameter **b004 [Output Voltage]**
- *Host* parameter **b005 [DC Bus Voltage]**
- *Host* parameter **b017 [Output Power]**

See DPI Parameter Object on page 117 (Class code 0x93) for parameter numbering.

Example Controller Tags to Read Multiple Parameters

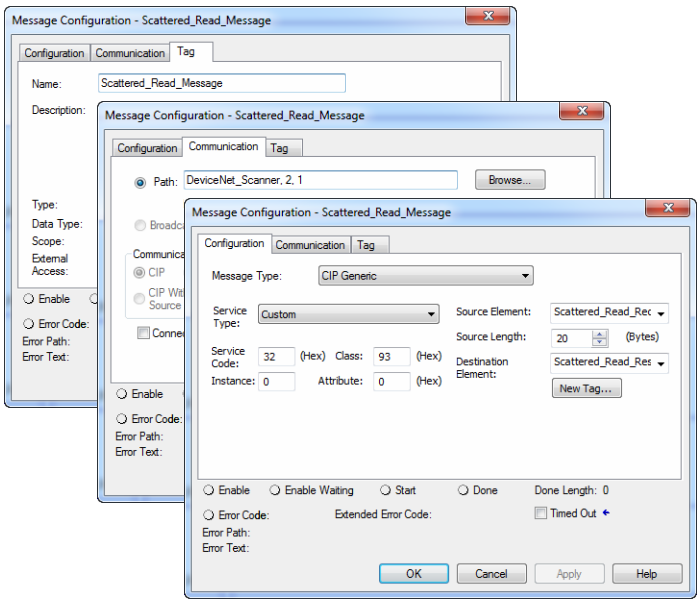
Operation	Controller Tags for Scattered Read Message	Data Types
XIC	Execute_Scattered_Read_Message	BOOL
MSG	Scattered_Read_Message	MESSAGE

Example Ladder Logic to Read Multiple Parameters



CompactLogix – Formatting a Message to Read Multiple Parameters

Scattered Read Message Configuration Screens



The following table identifies the data that is required in each box to configure a message to read multiple parameters.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type[1]	Custom	Required for scattered messages.
Service Code[1]	0x32 (Hex.)	Code for the requested service.
Class	93[3]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Read_Request[4]	Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive.
Source Length	20 bytes[4]	Number of bytes of service data to be sent in the message.
Destination	Scattered_Read_Response[5]	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path[2]	DeviceNet_Scanner, 2, 1	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Read_Message	The name for the message.

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

(2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, DeviceNet_Scanner). Then always type in a comma followed by a "2", which is the DeviceNet scanner port, followed by another comma, then followed by the DeviceNet node number of the drive (for this example, "1").

(3) See Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives on page 55 for limitations of PowerFlex 525 drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(4) In this example, we are reading five 16-bit parameters. Each parameter being read requires two contiguous INT registers. Therefore, a controller tag was created with its Data Type field set to "INT[10]." Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for this example, 20 bytes for an INT[10] array). Scattered read messages always assume that every parameter being read is a16-bit parameter, regardless of its actual size. Maximum message length is 256 bytes which can read up to 64 parameters, regardless of their size.

(5) The controller tag for "Scattered_Read_Response" must be the same size as the controller tag for "Scattered_Read_Request" (for this example, 20 bytes), but can be a different data type.

CompactLogix Example Scattered Read Request Data

In this message example, we use the data structure in Example Scattered Read Request Data on page 65 in the source tag named Scattered Read Request to read these five 16-bit parameters in a PowerFlex 525 drive:

- *Host* parameter **b001 [Output Freq]**
- *Host* parameter **b003 [Output Current]**
- *Host* parameter **b004 [Output Voltage]**
- *Host* parameter **b005 [DC Bus Voltage]**
- *Host* parameter **b017 [Output Power]**

See DPI Parameter Object on page 117 (Class code 0x93) for parameter numbering.

Example Scattered Read Request Data

Name	Value	Data Type	Description
Scattered_Read_Request	{...}	INT[10]	
Scattered_Read_Request[0]	1	INT	Parameter Number
Scattered_Read_Request[1]	0	INT	Pad
Scattered_Read_Request[2]	3	INT	Parameter Number
Scattered_Read_Request[3]	0	INT	Pad
Scattered_Read_Request[4]	4	INT	Parameter Number
Scattered_Read_Request[5]	0	INT	Pad
Scattered_Read_Request[6]	5	INT	Parameter Number
Scattered_Read_Request[7]	0	INT	Pad
Scattered_Read_Request[8]	17	INT	Parameter Number
Scattered_Read_Request[9]	0	INT	Pad

CompactLogix Example Scattered Read Response Data

The Scattered Read Request message reads the multiple parameters and returns their values to the destination tag (Scattered_Read_Response). Example Scattered Read Response Converted Data on page 65 shows the parameter values.

Example Scattered Read Response Converted Data

Name	Value	Data Type	Description
Scattered_Read_Response	{...}	INT[10]	
Scattered_Read_Response[0]	1	INT	Parameter Number
Scattered_Read_Response[1]	5000	INT	Value
Scattered_Read_Response[2]	3	INT	Parameter Number
Scattered_Read_Response[3]	1	INT	Parameter Value
Scattered_Read_Response[4]	4	INT	Parameter Number
Scattered_Read_Response[5]	1796	INT	Parameter Value
Scattered_Read_Response[6]	5	INT	Parameter Number
Scattered_Read_Response[7]	349	INT	Parameter Value
Scattered_Read_Response[8]	17	INT	Parameter Number
Scattered_Read_Response[9]	0	INT	Parameter Value

In this message example, the *Host* parameters have the following values:

PowerFlex 525 Drive Parameters	Read Value
b001 [Output Freq]	50.00 Hz
b003 [Output Current]	0.01 Amp (No load)
b004 [Output Voltage]	179.6V AC
b005 [DC Bus Voltage]	349V DC
b017 [Output Power]	0 kW (No load)

CompactLogix Example Ladder Logic Program to Write Multiple Parameters

A Scattered Write message is used to write to multiple parameters. This write message example writes the following values to these five 16-bit parameters in a PowerFlex 525 drive:

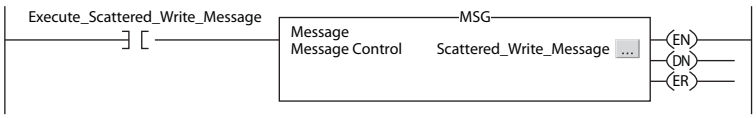
PowerFlex 525 Drive Parameters	Write Value
A442 [Accel Time 2]	11.10 Sec
A443 [Decel time 2]	22.20 Sec
A415 [Preset Freq 5]	33.30 Hz
A416 [Preset Freq 6]	44.40 Hz
A417 [Preset Freq 7]	55.50 Hz

See DPI Parameter Object on page 117 (Class code 0x93) for parameter numbering.

Example Controller Tags to Write Multiple Parameters

Operation	Controller Tags for Scattered Write Message	Data Types
XIC	Execute_Scattered_Write_Message	BOOL
MSG	Scattered_Write_Message	MESSAGE

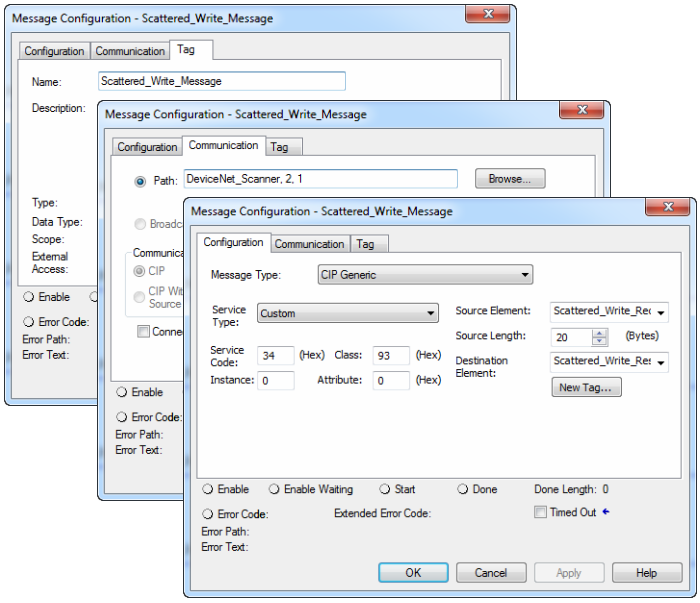
Example Ladder Logic to Write Multiple Parameters



IMPORTANT If you need to make frequent parameter changes using Explicit Messages, set *Host* parameter C121 [Comm Write Mode] to 1 "RAM only".

CompactLogix – Formatting a Message to Write Multiple Parameters

Scattered Write Multiple Message Configuration Screens



The following table identifies the data that is required in each box to configure a message to write multiple parameters.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type[1]	Custom	Required for scattered messages.
Service Code[1]	0x34 (Hex.)	Code for the requested service.
Class	93[4]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute[2]	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Write_Request[5]	Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive.
Source Length	20 bytes[5]	Number of bytes of service data to be sent in the message.
Destination	Scattered_Write_Response[6]	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**

Configuration Tab	Example Value	Description
Path(3)	DeviceNet_Scanner, 2, 1	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Write_Message	The name for the message.

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

(2) Scattered writes always write parameter values to the drive's Non-Volatile Storage (EEPROM) memory, so these values will remain even after the drive is power cycled. **Important**: Be very cautious as the EEPROM may quickly exceed its life cycle and cause the drive to malfunction. **Important**: If you need to make frequent parameter changes using Explicit Messages, set *Host* parameter C121 [Comm Write Mode] to 1 "RAM only".

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, DeviceNet_Scanner). Then always type in a comma followed by a "2", which is the DeviceNet scanner port, followed by another comma, then followed by the DeviceNet node number of the drive (for this example, "1").

(4) See Explicit Messaging Class Code Compatibility with PowerFlex 525 Drives on page 55 for limitations of PowerFlex 525 drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(5) In this example, we are writing to five 16-bit parameters. Each parameter being written to requires two contiguous INT registers. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for this example, 20 bytes for an array of ten INTs). Scattered write messages always assume that every parameter being written to is a 16-bit parameter, regardless of its actual size. Maximum message length is 256 bytes which can write up to 64parameters, regardless of their size. For parameter numbering, see DPI Parameter Object on page 117 (Class code 0x93).

(6) The controller tag for "Scattered_Write_Response" must be the same size as the controller tag for "Scattered_Write_Request" (for this example, 20 bytes). An array of INTs is suggested to be able to read any error codes that are returned.

CompactLogix Example Scattered Write Request Data

In this message example, we use the source tag (Scattered_Write_Request) to write new values to these 16-bit parameters:

PowerFlex 525 Drive Parameters	Write Value
A442 [Accel Time 2]	11.10 Sec
A443 [Decel time 2]	22.20 Sec
A415 [Preset Freq 5]	33.30 Hz
A416 [Preset Freq 6]	44.40 Hz
A417 [Preset Freq 7]	55.50 Hz

See DPI Parameter Object on page 117 (Class code 0x93) for parameter numbering. Example Scattered Write Request Converted Data on page 67 shows the parameter values.

Example Scattered Write Request Converted Data

Name	Value	Data Type	Description
Scattered_Write_Request	{...}	INT[10]	
Scattered_Write_Request[0]	442	INT	Parameter Number
Scattered_Write_Request[1]	1110	INT	Parameter Value
Scattered_Write_Request[2]	443	INT	Parameter Number
Scattered_Write_Request[3]	2220	INT	Parameter Value
Scattered_Write_Request[4]	415	INT	Parameter Number
Scattered_Write_Request[5]	3330	INT	Parameter Value
Scattered_Write_Request[6]	416	INT	Parameter Number
Scattered_Write_Request[7]	4440	INT	Parameter Value
Scattered_Write_Request[8]	417	INT	Parameter Number
Scattered_Write_Request[9]	5550	INT	Parameter Value

CompactLogix Example Scattered Write Response Data

The results of the message appear in the destination tag named Scattered_Write_Response (Example Scattered Write Response Data on page 68). Values of "0" indicate no errors occurred.

Example Scattered Write Response Data

Name	Value	Data Type	Description
Scattered_Write_Response	{...}	INT[10]	
Scattered_Write_Response[0]	442	INT	Parameter Number
Scattered_Write_Response[1]	0	INT	Error Code
Scattered_Write_Response[2]	443	INT	Parameter Number
Scattered_Write_Response[3]	0	INT	Error Code
Scattered_Write_Response[4]	415	INT	Parameter Number
Scattered_Write_Response[5]	0	INT	Error Code
Scattered_Write_Response[6]	416	INT	Parameter Number
Scattered_Write_Response[7]	0	INT	Error Code
Scattered_Write_Response[8]	417	INT	Parameter Number
Scattered_Write_Response[9]	0	INT	Error Code

Using Multi-Drive Mode

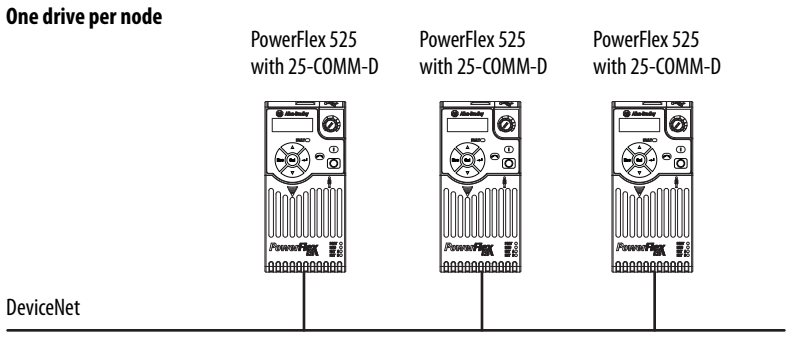
This chapter provides information and a ControlLogix ladder example to explain how to use Multi-Drive mode.

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.

Single-Drive Mode vs. Multi-Drive Mode

Single-drive mode is a typical network installation, where a single DeviceNet node consists of a single drive with a 25-COMM-D DeviceNet adapter.

Single-Drive Mode Example for Network

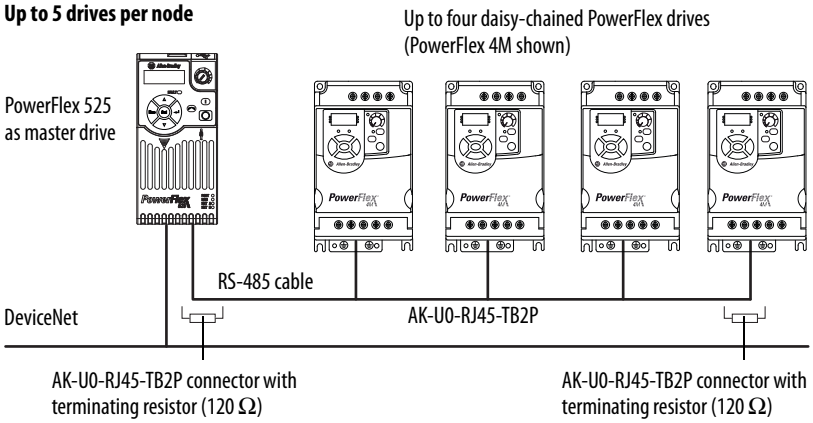


Multi-drive mode is an alternative to the typical network installation, where a single DeviceNet node can consist of one to five drives (see Multi-Drive Mode

Example for Network on page 70). The first drive must be a PowerFlex 525 drive. The remaining drives can be any PowerFlex drive which supports Multi-drive.

IMPORTANT For the examples in the chapter, we will use the PowerFlex 525 as a Master drive with four daisy-chained PowerFlex 4M drives.

Multi-Drive Mode Example for Network



Benefits of Multi-drive mode include:

- Lower hardware costs. No need to purchase additional communication adapters for daisy-chained drives.
- Reduces the network node count. For example, in Single-drive mode 30 drives would consume 30 nodes. In Multi-drive mode, 30 drives can be connected in 6 nodes.
- Controller can control, monitor, and read/write parameters for all five drives.

The trade-offs of Multi-drive mode include:

- If the PowerFlex 525 with DeviceNet adapter is powered down, then communications with the daisy-chained drives is disrupted and the drives will take the appropriate communications loss action set in each drive.
- Communications throughput to the daisy-chained drives will be slower than if each drive was a separate node on DeviceNet (Single-drive mode). This is because the DeviceNet adapter must take the DeviceNet data for the other drives and sequentially send the respective data to each drive over RS-485. The approximate additional throughput time for Logic Command/Reference to be transmitted and received by each drive is:

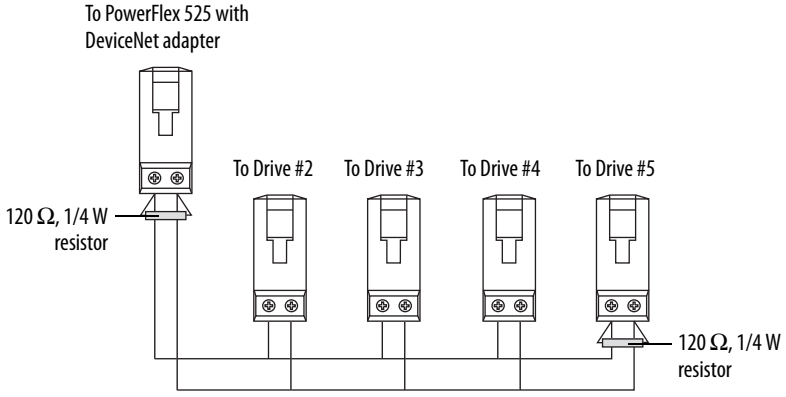
Drive	Additional Throughput Time versus Single-Drive Mode
PowerFlex 525	0 ms
PowerFlex 525 plus 1 drive	+24 ms
PowerFlex 525 plus 2 drives	+48 ms
PowerFlex 525 plus 3 drives	+72 ms
PowerFlex 525 plus 4 drives	+96 ms

- Automatic Device Replacement (ADR) cannot be used with any of the drives.
- The RSNetWorx Parameter editor cannot be used to access the *Host* parameters. It can only access the parameters on the DeviceNet adapter.
- Since the RS-485 ports are used for daisy-chaining the drives, there is no connection for a peripheral device such as a HIM or USB converter module (1203-USB). DSI Splitter cables cannot be used to add a second connection for a peripheral device.

System Wiring

To daisy-chain the drives of the PowerFlex 525, the AK-U0-RJ45-TB2P terminal block connector can be used for easy installation.

The wiring diagram for using AK-U0-RJ45-TB2P terminal block connectors is shown below.



The AK-U0-RJ45-TB2P comes with (5) terminal block connectors and (2) terminating resistors.

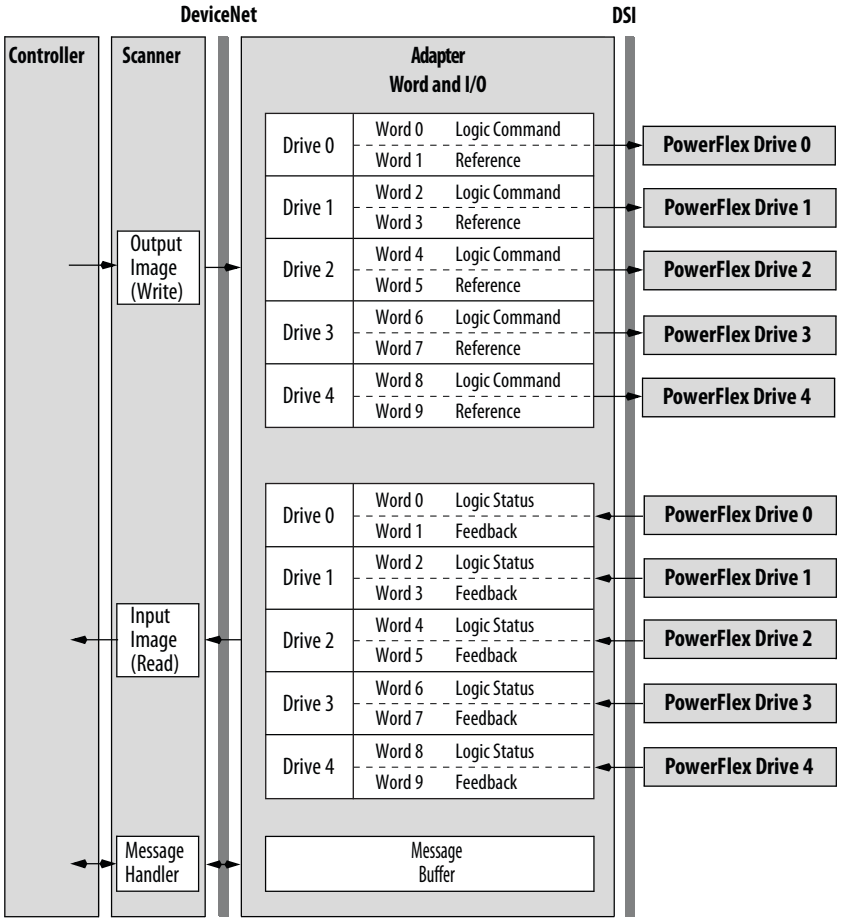
Understanding the I/O Image

The terms *input* and *output* are defined from the scanner's point of view. Therefore, Output I/O is data that is output from the scanner and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the scanner.

The I/O image table will vary based on the configuration of *Host* parameters **C169 [MultiDrv Sel]** and **C175 [DSI I/O Cfg]**. The image table always uses consecutive words starting at word 0.

The Multi-Drive Example of I/O Image on page 72 for an illustration of the Multi-drive I/O image with 16-bit words.

Multi-Drive Example of I/O Image



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

Configuring the RS-485 Network

The following parameters must be set in the daisy-chained PowerFlex 4M drives and **not** in the master drive:

Parameter	Value
P106 [Start Source]	5 “Comm Port”
P108 [Speed Reference]	5 “Comm Port”
C302 [Comm Data Rate]	4 “19.2K”
C303 [Comm Node Addr]	1...247 (must be unique)
C306 [Comm Format]	0 “RTU-8-N-1”

Note: The RS-485 Multi-drive network is fixed at 19.2K baud rate, 8 data bits, no parity, and 1 stop bit.

IMPORTANT Parameters [Comm Loss Action] and [Comm Loss Time] in the daisy-chained drives are still used in Multi-drive mode. If the RS-485 cable is disconnected or broken, the disconnected drive(s) will take the corresponding Comm Loss Action(s). On the DeviceNet side, *Device* parameters 06 [Comm Flt Actn] and 07 [Idle Flt Actn] in the DeviceNet adapter determine the action taken for ALL of the drives on the Multi-drive node.

The following Multi-drive parameters must be set in the master PowerFlex 525 drive:

Parameter Configuration for Multi-Drive Mode

Parameter	Value
P046 [Start Source 1]	4 "Network Opt"
P047 [Speed Reference1]	4 "Network Opt"
C169 [MultiDrv Sel]	0 "Disabled" 1 "Network Opt" 2 "EtherNet/IP" **Note**: Drive must be power cycled after setting this parameter.
C171 [Drv 1 Addr]	C124 [RS485 Node Addr] in Drive 1
C172 [Drv 2 Addr]	C124 [RS485 Node Addr] in Drive 2
C173 [Drv 3 Addr]	C124 [RS485 Node Addr] in Drive 3
C174 [Drv 4 Addr]	C124 [RS485 Node Addr] in Drive 4
C175 [DSI I/O Cfg]	0 "Drive 0" 1 "Drive 0-1" 2 "Drive 0-2" 3 "Drive 0-3" 4 "Drive 0-4"

IMPORTANT Parameters can be set using a DSI peripheral (22-HIM-A3 or 22-HIM-C2S) only when parameter C169 [MultiDrv Sel] is set to 0 "Disabled".

Multi-Drive Ladder Logic Program Example

The example ladder program demonstrates using Multi-drive mode with five drives. See Multi-Drive Mode Example for Network on page 70 for an example of a system layout diagram. See Multi-Drive Example of I/O Image on page 72 for the number of 16-bit input and output words to use for your application. In this example, the number of input words is 10 and the number of output words is 10.

Function of the Example Program

The example program provided is for the CompactLogix family, but other Logix-based controllers can also be used similarly. This example program enables you to:

- View status information from the drives such as Ready, Fault, At Speed, and Feedback.

- Control the drives using various Logic Command bits (Stop, Start, etc.) and Reference.
- Perform a single parameter read and write for each drive. The example uses PowerFlex 4M drive parameter **P109 [Accel Time 1]** for both so you can see (read) the change after a write is performed.

Drive 0 (PowerFlex 525) Settings for the Example Program

- Parameter **C169 [MultiDrv Sel]** is set to 1 "Network Opt".
- The following parameters are set:

Parameter	Value	Description
P046 [Start Source 1]	4	"Network Opt"
P047 [Speed Reference1]	4	"Network Opt"
C175 [DSI I/O Cfg]	4	"Drive 0-4" (5 drives on 1 node)
C171 [Drv 1 Addr](1)	1	Modbus address of Drive 1
C172 [Drv 2 Addr]	2	Modbus address of Drive 2
C173 [Drv 3 Addr]	3	Modbus address of Drive 3
C174 [Drv 4 Addr]	4	Modbus address of Drive 4

(1) The settings for these parameters must match the node address settings in the respective daisy-chained drives.

Drive 1...4 (PowerFlex 4M) Settings for the Example Program (in all drives)

The following parameters are set:

	Value			
Parameter	**Drive 1**	**Drive 2**	**Drive 3**	**Drive 4**
P106 [Start Source]	5	5	5	5
P108 [Speed Reference]	5	5	5	5
C302 [Comm Data Rate]	4	4	4	4
C303 [Comm Node Addr]	1	2	3	4
C304 [Comm Loss Action]	0	0	0	0
C305 [Comm Loss Time]	5.0 s	5.0 s	5.0 s	5.0 s
C306 [Comm Format]	0	0	0	0

IMPORTANT Cycle drive power after making these settings.

CompactLogix Example Using Generic Profile

The following common Tags are used:

Tag Name	Type	Description
Local:1:O	AB:1769_SDN_364Bytes:O:0	1769-SDN I/O
Local:1:I	AB:1769_SDN_496Bytes:I:0	
Accel_Time_1	INT	–
Drive_Input_Image	INT [10]	Input Image Table
Drive_Output_Image	INT [10]	Output Image Table

The following Tags are used for Drive 0:

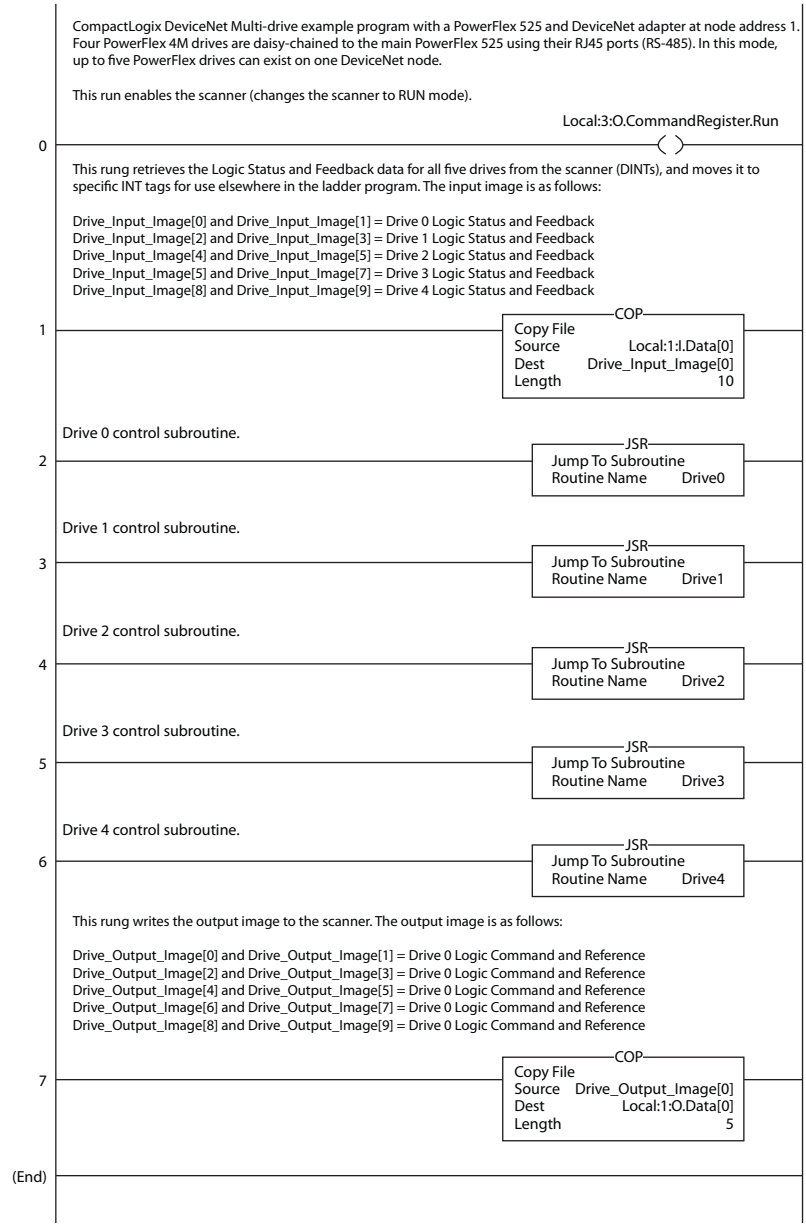
Tag Name	Type	Description
Drive_0_Command_Stop	BOOL	Logic Command bit 0 (STOP)
Drive_0_Command_Start	BOOL	Logic Command bit 1 (START)
Drive_0_Command_Jog	BOOL	Logic Command bit 2 (JOG)
Drive_0_Command_Clear_Faults	BOOL	Logic Command bit 3 (CLEAR FAULTS)
Drive_0_Command_Forward	BOOL	Logic Command bit 4 (FORWARD)
Drive_0_Reference	INT	Speed Reference
Drive_0_Status_Ready	BOOL	Logic Status bit 0 (READY)
Drive_0_Status_Active	BOOL	Logic Status bit 1 (ACTIVE)
Drive_0_Status_Forward	BOOL	Logic Status bit 2 (FORWARD)
Drive_0_Status_Faulted	BOOL	Logic Status bit 7 (FAULT)
Drive_0_Status_At_Reference	BOOL	Logic Status bit 8 (AT SPEED)
Drive_0_Feedback	INT	Speed Feedback
Perform_Parameter_Read_0	BOOL	Initiates the parameter read
Parameter_RD_Value_0	INT	Read value of the parameter
Parameter_RD_Message_0	MESSAGE	Get_Attribute_Single (Read)
Perform_Parameter_Write_0	BOOL	Initiates the parameter value
Parameter_WR_Value_0	INT	Write value to the parameter
Parameter_WR_Message_0	MESSAGE	Set_Attritbute_Single (Write)

The same type of Tags are also used for Drive 1 through Drive 4.

Main Routine

The Main Routine tells the scanner to run, reads the network Input Image from the scanner, calls the various drive control subroutines, and writes the network Output Image to the scanner. See Main Routine on page 76.

Main Routine

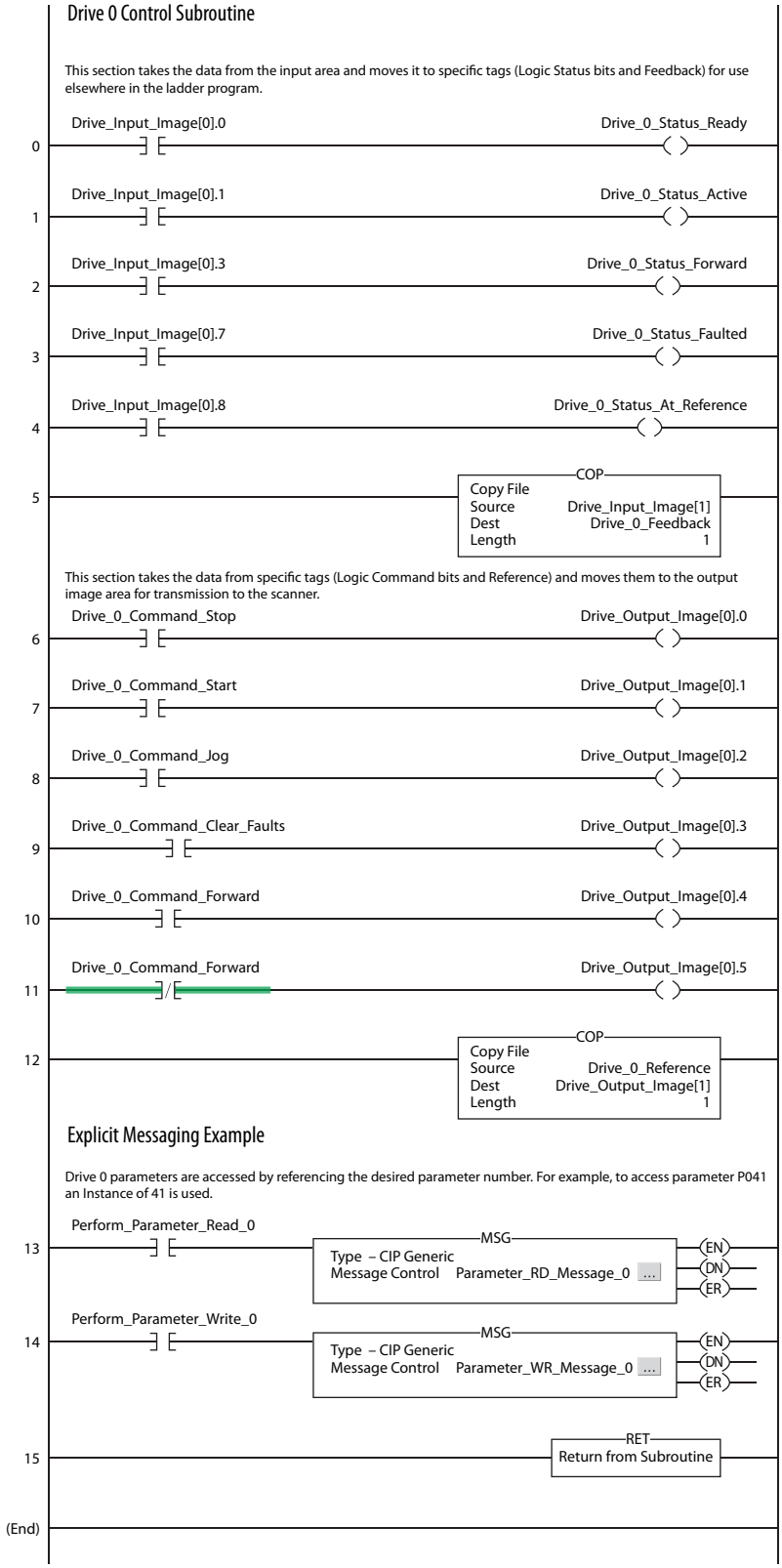


Drive 0...4 Control Routines

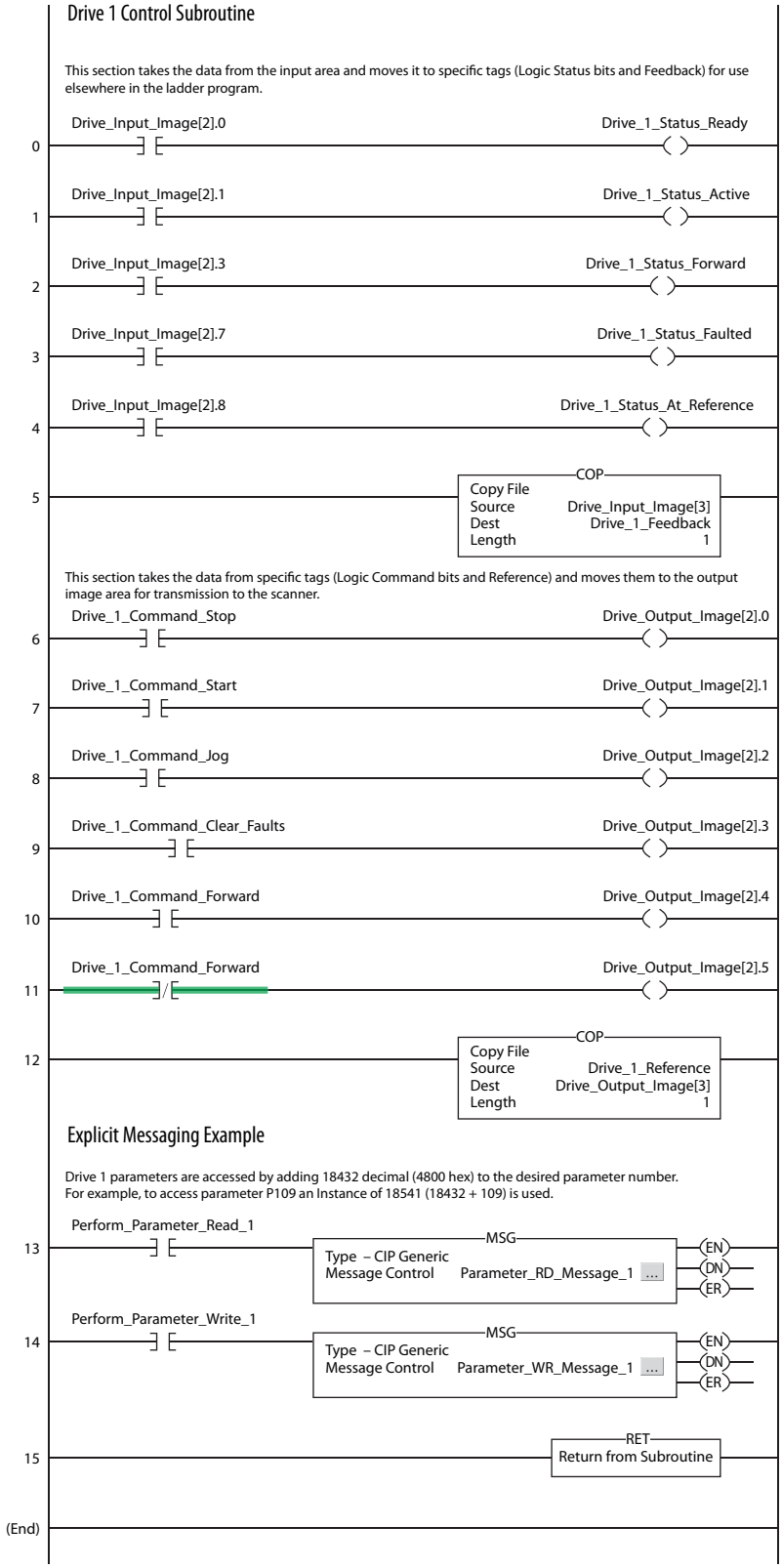
The following Drive Control routines provide status information (Logic Status and Feedback), control (Logic Command and Reference), and parameter read/write for each of the respective drives:

Control Routine	See page...
Drive 0	77
Drive 1	78
Drive 2	79
Drive 3	80
Drive 4	81

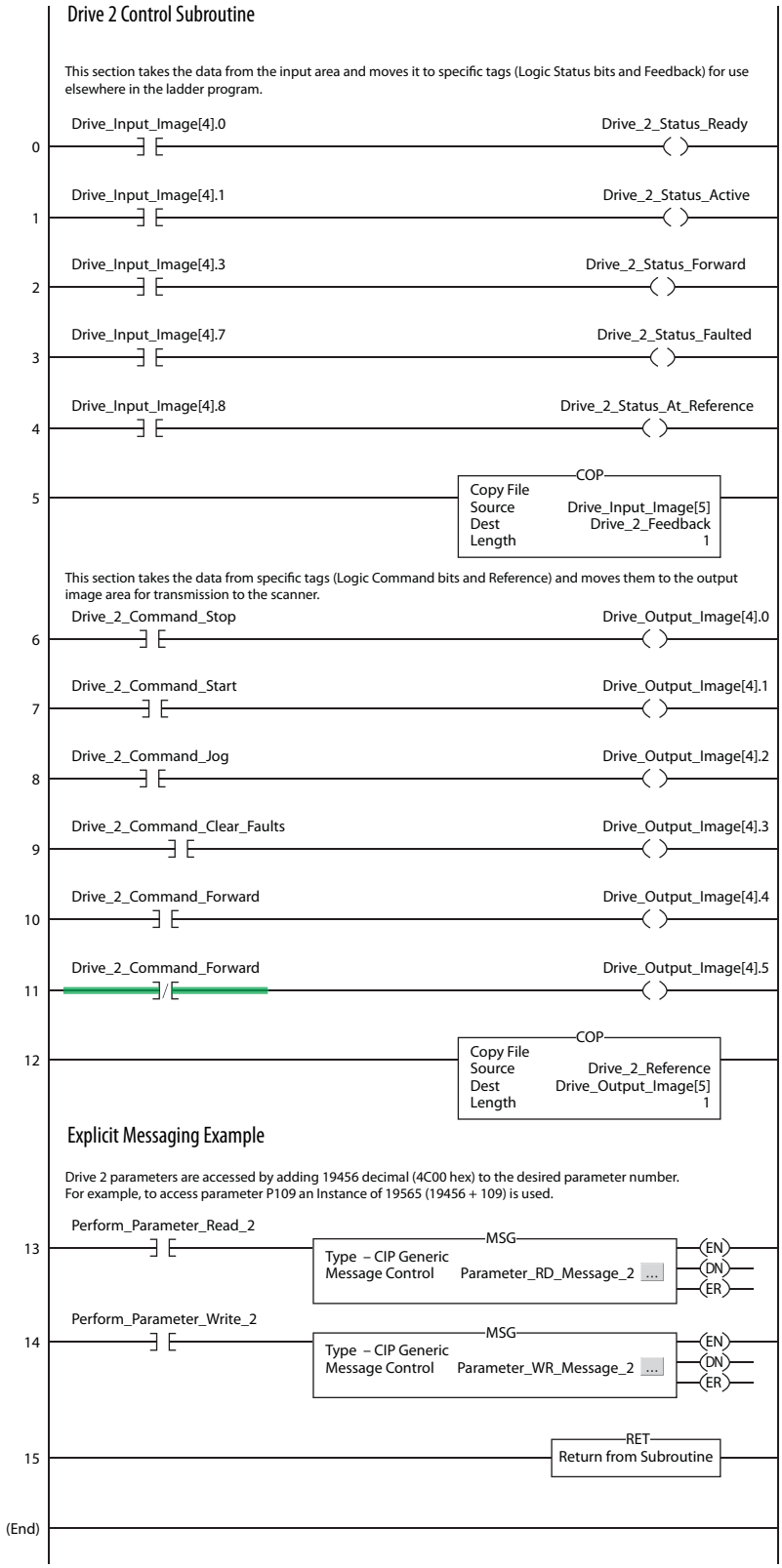
Drive 0 Control Routine



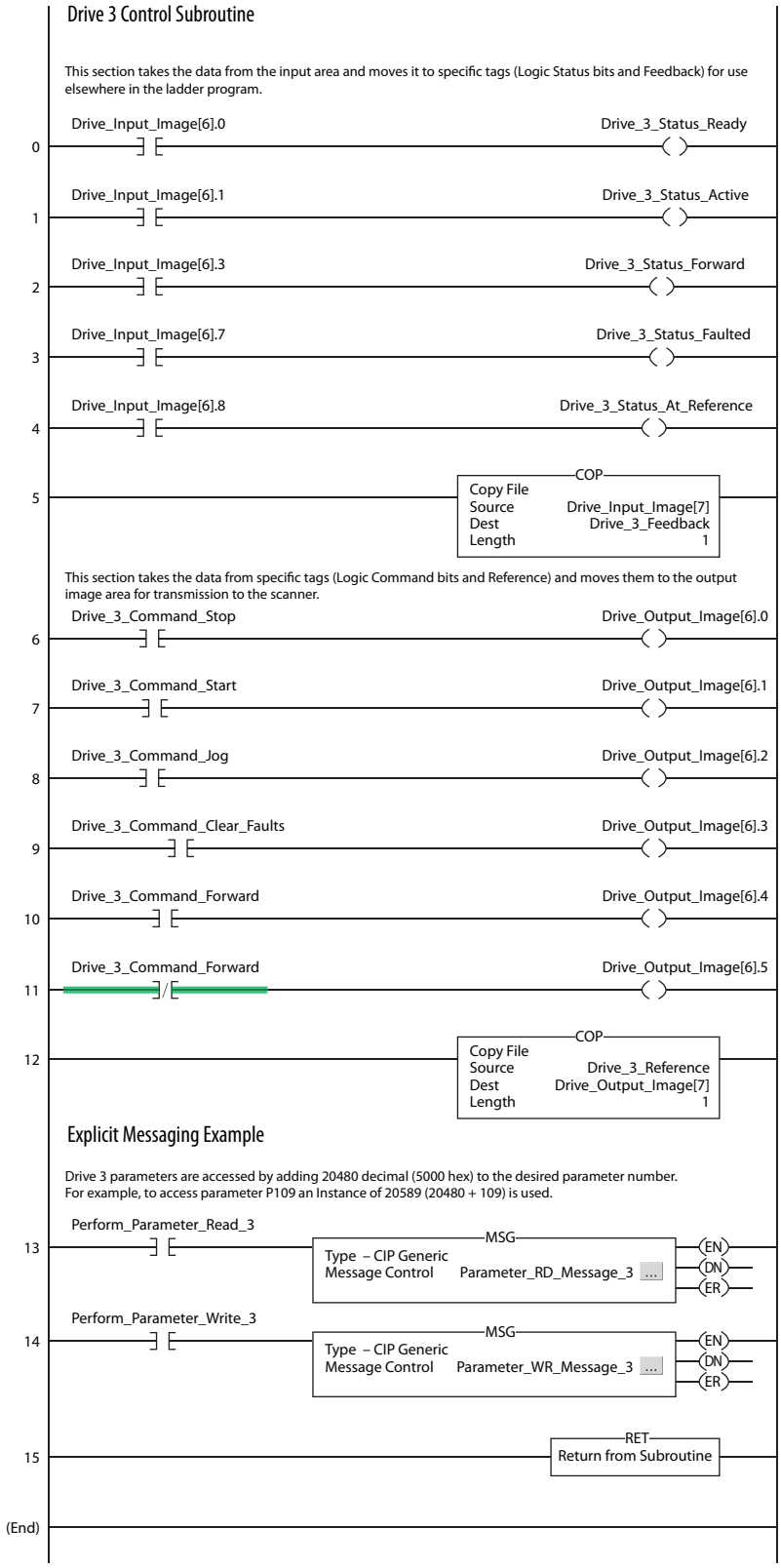
Drive 1 Control Routine



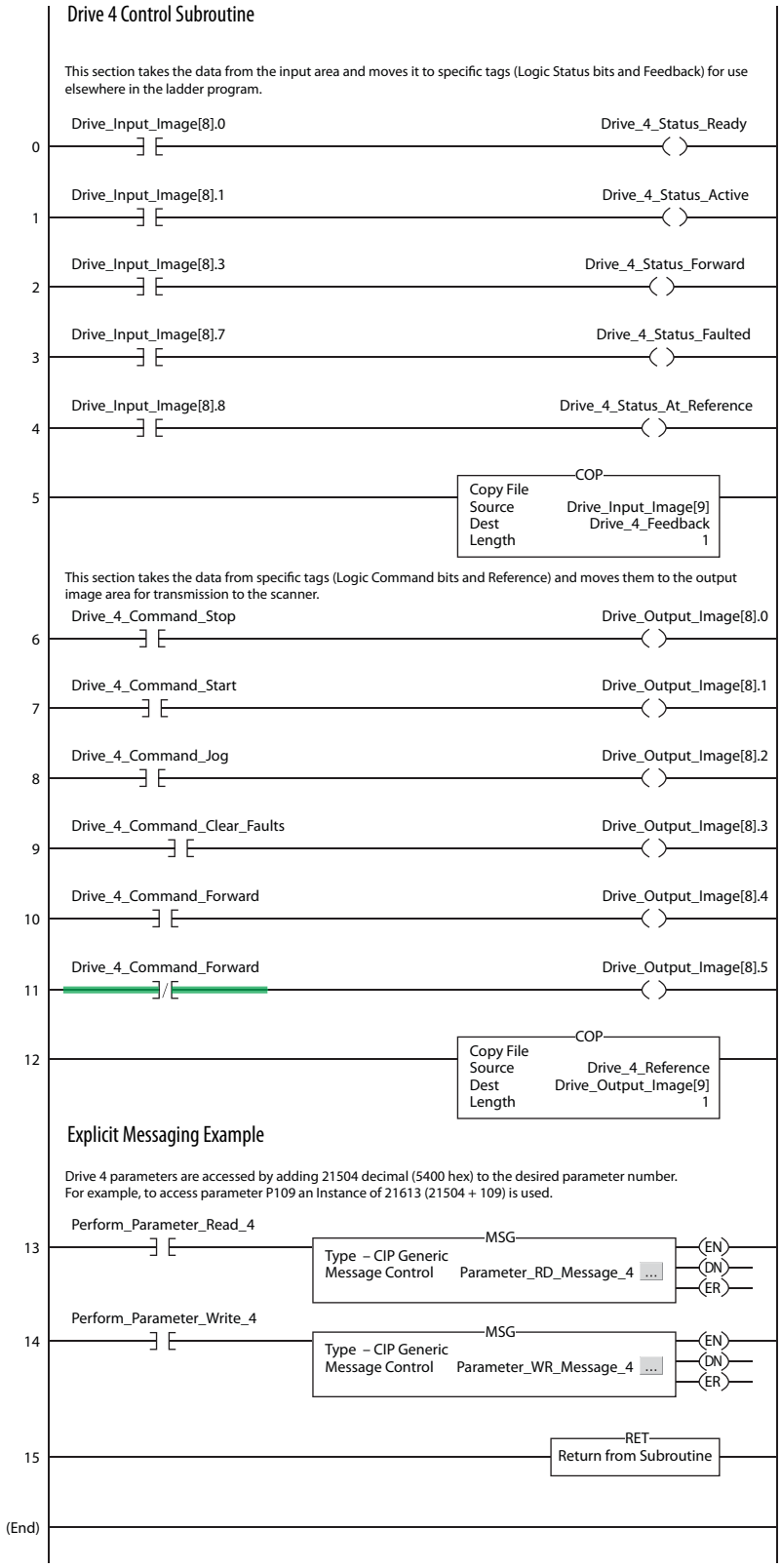
Drive 2 Control Routine



Drive 3 Control Routine



Drive 4 Control Routine



Multi-Drive Mode Explicit Messaging

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

Instance (Hex.)	Instance (Dec.)	Device	Parameter
0x0000...0x3FFF	0...16383	DeviceNet Adapter parameters	0...1023
0x4000...0x43FF	16384...17407	DeviceNet Adapter parameters	0...1023
0x4400...0x47FF	17408...18431	Drive 0	0...1023
0x4800...0x4BFF	18432...19455	Drive 1	0...1023
0x4C00...0x4FFF	19456...20479	Drive 2	0...1023
0x5000...0x53FF	20480...21503	Drive 3	0...1023
0x5400...0x57FF	21504...22527	Drive 4	0...1023
0x5800...0x5BFF	22528...23551	DeviceNet Adapter parameters	0...1023

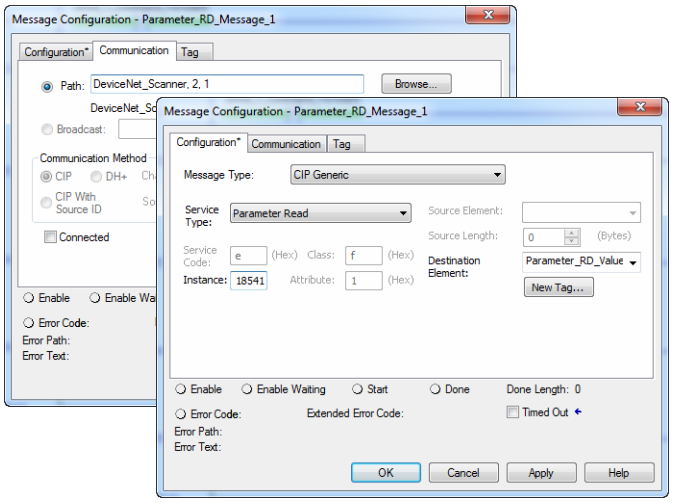
For example, to access [Accel Time 1] (parameter P041 in PowerFlex 525 and P109 in PowerFlex 4M) in each of the drives, the following Instances would be used:

- Drive 0 (PowerFlex 525) Instance = 17449 (17408 + 41)
- Drive 1 (PowerFlex 4M) Instance = 18541 (18432 + 109)
- Drive 2 (PowerFlex 4M) Instance = 19565 (19456 + 109)
- Drive 3 (PowerFlex 4M) Instance = 20589 (20480 + 109)
- Drive 4 (PowerFlex 4M) Instance = 21613 (21504 + 109)

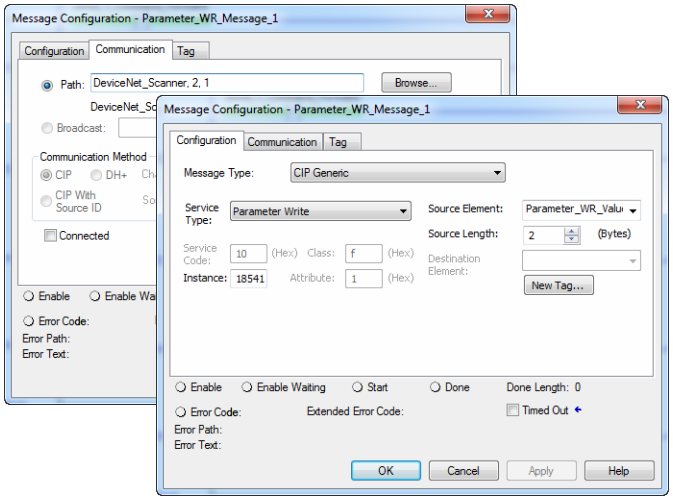
Drive 1 Explicit Message Example

The Explicit message examples in the ControlLogix example program perform a read and a write to PowerFlex 4M parameter P109 [Accel Time 1]. The configuration for the read is shown in Parameter Read Message Configuration on page 83 and the write is shown in Parameter Write Message Configuration on page 83.

Parameter Read Message Configuration



Parameter Write Message Configuration



The Class Code is “f” for the Parameter Object and the Instance Attribute is “1” to select retrieving the parameter value. See Appendix C, Parameter Object for more information. The Instance value is “18541” to access parameter **P109 [Accel Time 1]** in the first daisy-chained drive.

The Explicit message for Drive 1 to Drive 4 are identical except for the Instance values, see Multi-Drive Mode Explicit Messaging on page 82 for examples.

Additional Information

- When the PowerFlex 525 drive with the 25-COMM-D DeviceNet adapter (Drive 0) is powered up, all configured daisy-chained drives must be present before an I/O connection is allowed on DeviceNet (i.e. before the drives can be controlled).
- If the PowerFlex 525 drive with the 25-COMM-D DeviceNet adapter (Drive 0) is powered down, communications with the four daisy-chained drives (Drive 1 to Drive 4) are disrupted and the drives will take their corresponding Comm Loss Actions.

- If any of the daisy-chained drives (Drive 1 to Drive 4) are powered down, the respective Input Image (Logic Status and Feedback) will be set to zero, and the NET A and PORT LEDs on the adapter will flash red. Status information will not indicate there is a fault at the node, and the I/O connection will not be dropped.

Troubleshooting

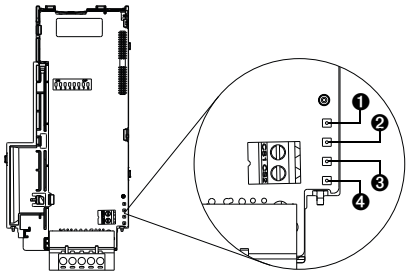
This chapter provides information for diagnosing and troubleshooting potential problems with the adapter and network.

Understanding the Status Indicators

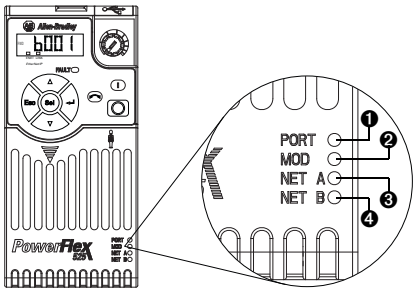
The DeviceNet adapter has three status indicators. They can be viewed on the adapter or through the drive cover.

Status Indicators

25-COMM-D



PowerFlex 525 Frame A shown



Item	Status Indicator	Description	Page
❶	PORT	DSI Connection Status	86
❷	MOD	Adapter Status	86
❸	NET A	DeviceNet Status	87
❹	NET B	Not used for DeviceNet	–

PORT Status Indicator

This red/green bicolor LED indicates the status of the adapter's connection to the drive as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered.	• Securely connect the adapter to the drive using the DeviceNet cable. • Apply power to the drive.
Flashing red	The adapter is not receiving communication from the drive, connected drive is faulted, or a drive is missing in Multi-drive mode.	• Clear any drive faults. • 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 DSI peripheral is using the same DSI port as the adapter.	**Important:** Cycle power to the drive after making the following correction: Verify that all DSI cables are securely connected and not damaged. Replace cables if necessary.
Flashing green	The adapter is establishing an I/O connection to the drive or *Host* parameter **C175 [DSI I/O Config]** is configured for all I/O disabled.	• No Action. This status indicator will turn solid green or red. • Verify *Host* parameter **C175 [DSI I/O Config]** settings. • Normal behavior if no DSI I/O is enabled.
Solid green	The adapter is properly connected and is communicating with the drive.	No Action.
Orange	Daisy-chained drives in Multi-drive mode are not all Allen-Bradley drives (PowerFlex 525/4/40).	Use Allen-Bradley PowerFlex 525/4/40's for the daisy-chained drives.

MOD Status Indicator

This red/green bicolor LED indicates the status of the option module as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not connected properly to the drive.	• Securely connect the adapter to the drive using the DeviceNet cable. • Apply power to the drive.
Flashing red	The adapter has failed the firmware test, connected drive is faulted, or a drive is missing in Multi-drive mode.	• Clear any drive faults. • 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. • For Multi-drive mode, determine which drive is missing or faulted. Check cabling and configuration settings (see Chapter 7, Configuring the RS-485 Network).
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 I/O controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller. • Normal behavior if no DSI /IO is enabled.
Solid green	The adapter is operational and transferring I/O data.	No Action.

NET A Status Indicator

This red/green bicolor LED indicates the status of the network connection as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter and/or network is not powered or adapter is not connected properly to the drive.	• Securely connect the adapter to the drive, and the adapter to the network using DeviceNet cables. • Correctly connect the DeviceNet cable to the DeviceNet plug. • Apply power to the drive and network.
Flashing red	A DeviceNet I/O connection has timed out.	• Place the scanner in RUN mode, or apply power to the peer device that will send I/O. • Check the amount of traffic on the network.
Solid red	Failed duplicate node detection test or bus off condition exists.	• Configure the adapter to use a unique node address on the DeviceNet network. • Configure the adapter to use the correct network data rate. • Make sure network has correct media installed.
Flashing green	The adapter is properly connected but is not communicating with any devices on the network.	• Place the controller in RUN mode, or apply power to the peer device that will send I/O. • Program a controller or peer device to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller or the I/O from the peer device.
Solid green	The adapter is properly connected and communicating on the network.	No Action.

Viewing Adapter Diagnostic Items

If you encounter unexpected communications problems, the adapter's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. The diagnostic parameters for the DeviceNet adapter can be viewed using the PowerFlex 22-HIM-A3/-C2S HIM.

DeviceNet Adapter Diagnostic Parameters

No.	Name	Description
01	Reserved	–
02	Drv 0 Logic Command	The present value of the Logic Command being transmitted to the drive (single drive mode) or drive 0 (multi-drive mode) by this adapter.
03	Drv 0 Reference	The present value of the Reference being transmitted to the drive (single drive mode) or drive 0 (multi-drive mode) by this adapter.
04	Reserved	–
05	Drv 0 Logic Sts	The present value of the Logic Status being received from the drive (single drive mode) or drive 0 (multi-drive mode) by this adapter.
06	Drv 0 Feedback	The present value of the Feedback being received from the drive (single drive mode) or drive 0 (multi-drive mode) by this adapter.
07	Drv 1 Logic Cmd	The present value of the Logic Command being transmitted to drive 1 (multi-drive mode) by this adapter.
08	Drv 1 Reference	The present value of the Reference being transmitted to drive 1 (multi-drive mode) by this adapter.
09	Drv 1 Logic Sts	The present value of the Logic Status being received from drive 1 (multi-drive mode) by this adapter.
10	Drv 1 Feedback	The present value of the Feedback being received from drive 1 (multi-drive mode) by this adapter.
11	Drv 2 Logic Cmd	The present value of the Logic Command being transmitted to drive 2 (multi-drive mode) by this adapter.
12	Drv 2 Reference	The present value of the Reference being transmitted to drive 2 (multi-drive mode) by this adapter.
13	Drv 2 Logic Sts	The present value of the Logic Status being received from drive 2 (multi-drive mode) by this adapter.
14	Drv 2 Feedback	The present value of the Feedback being received from drive 2 (multi-drive mode) by this adapter.

DeviceNet Adapter Diagnostic Parameters

No.	Name	Description
15	Drv 3 Logic Cmd	The present value of the Logic Command being transmitted to drive 3 (multi-drive mode) by this adapter.
16	Drv 3 Reference	The present value of the Reference being transmitted to drive 3 (multi-drive mode) by this adapter.
17	Drv 3 Logic Sts	The present value of the Logic Status being received from drive 3 (multi-drive mode) by this adapter.
18	Drv 3 Feedback	The present value of the Feedback being received from drive 3 (multi-drive mode) by this adapter.
19	Drv 4 Logic Cmd	The present value of the Logic Command being transmitted to drive 4 (multi-drive mode) by this adapter.
20	Drv 4 Reference	The present value of the Reference being transmitted to drive 4 (multi-drive mode) by this adapter.
21	Drv 4 Logic Sts	The present value of the Logic Status being received from drive 4 (multi-drive mode) by this adapter.
22	Drv 4 Feedback	The present value of the Feedback being received from drive 4 (multi-drive mode) by this adapter.
23	Input Size	The size of the input image in bytes transferred from the network to the drive.
24	Output Size	The size of the output image in bytes transferred from the drive to the network.
25	DL Fr Net 01 Val	The current datalink value being transmitted from this adapter to the drive (single drive mode).
26	DL Fr Net 02 Val	The current datalink value being transmitted from this adapter to the drive (single drive mode).
27	DL Fr Net 03 Val	The current datalink value being transmitted from this adapter to the drive (single drive mode).
28	DL Fr Net 04 Val	The current datalink value being transmitted from this adapter to the drive (single drive mode).
29	DL To Net 01 Val	The current datalink value being received from the drive by this adapter (single drive mode).
30	DL To Net 02 Val	The current datalink value being received from the drive by this adapter (single drive mode).
31	DL To Net 03 Val	The current datalink value being received from the drive by this adapter (single drive mode).
32	DL To Net 04 Val	The current datalink value being received from the drive by this adapter (single drive mode).
33	Opt Comm Errs	Number of errors that have been detected on the interface between the drive and the adapter.
34	Net Rx Errs	The present value of the DeviceNet CAN Receive Error Counter register.
35	Net Rx Errs Max	The maximum value of the DeviceNet CAN Receive Error Counter register.
36	Net Tx Errs	The present value of the DeviceNet CAN Transmit Error Counter register.
37	Net Tx Errs Max	The maximum value of the DeviceNet CAN Transmit Error Counter register.
38	CAN Errors	The number of errors reported by the DeviceNet hardware that did not appear in [Net Rx Errs Max] or [Next Tx Errs Max].
39	Boot Flash Count	The number of times the boot firmware in the adapter has been flash updated.
40	App Flash Count	The number of times the application firmware in the adapter has been flash updated.
41	Data Rate Sw	The present value of the data rate switches.
42	Net Addr Sw	The present value of the node address switches.

Viewing and Clearing Events

The adapter has an event queue to record significant events that occur in the operation of the adapter. When such an event occurs, an entry consisting of the event's numeric code and a timestamp is put into the event queue. You can view the event queue using the PowerFlex 22-HIM-A3/-C2S HIM or Connected Components Workbench.

The event queue can contain up to 32 entries, which are stored in RAM—making the event queue volatile, meaning a power cycle will clear the event queue. If the event queue becomes full, a new entry replaces the oldest entry. Only a power cycle, event queue clear operation, or the corruption of the RAM group containing the event queue will clear the event queue contents.

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:

Adapter Events

Code	Event	Description
Adapter Events		
1	No Event	Text displayed in an empty event queue entry.
2	Device Power Up	The adapter was powered up normally.
3	Device Reset	The adapter was commanded to reset from the network or DSI.
4	EEPROM CRC Error	The EEPROM checksum/CRC is incorrect. The functionality of the adapter will be limited. Default parameter values must be loaded to clear this condition.
5	App Updated	The adapter application firmware was flash updated.
6	Boot Updated	The adapter boot firmware was flash updated.
7	Watchdog Timeout	The software watchdog detected a failure and reset the adapter.
DSI Events		
10	DSI Detected	The adapter detected that the DSI device is connected.
11	DSI Removed	The adapter detected that the DSI device was disconnected.
12	DSI Logon	The adapter has established communications with the DSI device.
13	DSI Timeout	The adapter has lost communications with the DSI device.
14	DSI Brand Flt	The brand of the DSI device is different from the adapter.
15	Host 0 Logon	The adapter has established communications with host 0.
16	Host 1 Logon	The adapter has established communications with host 1.
17	Host 2 Logon	The adapter has established communications with host 2.
18	Host 3 Logon	The adapter has established communications with host 3.
19	Host 4 Logon	The adapter has established communications with host 4.
20	Host 0 Timeout	The adapter has lost communications with host 0.
21	Host 1 Timeout	The adapter has lost communications with host 1.
22	Host 2 Timeout	The adapter has lost communications with host 2.
23	Host 3 Timeout	The adapter has lost communications with host 3.
24	Host 4 Timeout	The adapter has lost communications with host 4.
25	Host 0 Brand Flt	The brand of host 0 is different from the adapter.
26	Host 1 Brand Flt	The brand of host 1 is different from the adapter.
27	Host 2 Brand Flt	The brand of host 2 is different from the adapter.
28	Host 3 Brand Flt	The brand of host 3 is different from the adapter.
29	Host 4 Brand Flt	The brand of host 4 is different from the adapter.
30	Manual Reset	The adapter was reset manually.
Network Events		
40	Net Link Up	24V power was regained on DeviceNet. DeviceNet communication can be re-established.
41	Net Link Down	24V power was lost on DeviceNet. DeviceNet communication is impossible.
42	Net Dup Address	The adapter uses the same IP address as another device on the network.
43	Net Comm Fault	The adapter detected a communications fault on the network and has performed the “Comm Flt” action specified by the user.
44	Net Sent Reset	The adapter received a reset from the network.

Adapter Events

Code	Event	Description
45	Net IO Close	An I/O connection from the network to the adapter was closed.
46	Net Idle Fault	The adapter detected a network idle condition on the network and has performed the "Idle Flt" action specified by the user.
47	Net IO Open	An I/O connection from the network to the adapter has been opened.
48	Net IO Timeout	An I/O connection from the network to the adapter has timed out.
49	Net IO Size Err	The adapter received an incorrectly sized I/O packet.
50	PCCC IO Close	The device sending PCCC Control messages to the adapter has set the PCCC Control Timeout to zero.
51	PCCC IO Open	The adapter has begun receiving PCCC Control messages (the PCCC Control Timeout was previously set to a non-zero value).
52	PCCC IO Timeout	The adapter has not received a PCCC Control message for longer than the PCCC Control Timeout.
53	Msg Ctrl Open	The timeout attribute in either the CIP Register or Assembly object was written with a non-zero value, allowing control messages to be sent to the adapter.
54	Msg Ctrl Close	The timeout attribute in either the CIP Register or Assembly object was written with a zero value, disallowing control messages to be sent to the adapter.
55	Msg Ctrl Timeout	The timeout attribute in either the CIP Register or Assembly object elapsed between accesses of those objects.
58	Net Bus Off	The network has experienced a Bus Off condition.
59	Net Poll Timeout	A Polled I/O connection has timed out.
60	Net IO Frag Err	A network I/O fragment was received out of sequence. Possible line noise problem.
61	Net COS Timeout	A Change of State (COS) connection has timed out.
62	Net Poll Alloc	A Polled connection has been allocated.
63	Net COS Alloc	A Change of State (COS) I/O connection has been allocated.
64	Net Poll Close	A Polled I/O connection was explicitly closed.
65	Net COS Close	A Change of State (COS) I/O connection was explicitly closed.
Adapter Specific Events		
69	Module Defaulted	The adapter has been set to defaults.

Specifications

Appendix A presents the specifications for the adapter.

Communication

Network	
Protocol	DeviceNet
Data Rates	125 Kbps, 250 Kbps, 500 Kbps, or Autobaud (default)
Drive	
Protocol	DSI

Electrical

Consumption	
Drive	150 mA @ 5V supplied through the drive
Network	60 mA @ 24V supplied through DeviceNet Use the 60 mA value to size the network current draw from the power supply.

Mechanical

Dimensions	
Height	21 mm (0.83 in.)
Length	141.8 mm (5.58 in.)
Width	48.4 mm (1.9 in.)
Weight	39 g (1.38 oz.)

Environmental

Temperature	
Operating	-10...50 °C (14...149 °F)
Storage	-40...85 °C (-40...185 °F)
Relative Humidity	-5...95% noncondensing

Regulatory Compliance

See the PowerFlex 525 Adjustable Frequency AC Drive User Manual, publication 520-UM001 for regulatory compliance information.

Notes:

Adapter Parameters

Appendix B provides information about the adapter parameters.

The adapter parameters are displayed in a **Numbered List** view order.

Device Parameters

Parameter No.	Name and Description	Details	
01	**[MultiDrv Sel]** Sets the configuration of the drive that is in multi-drive mode. A reset or power cycle is required after selection is made.	Default: Values: Type: Reset Required:	0 = Disabled 0 = Disabled 1 = Network Opt 2 = EtherNet/IP Read Only No
02	**[DLs From Net Cfg]** Sets the number of contiguous controller-to-drive Datalinks (additional parameters) that are included in the network I/O connection. Logic Command and Reference are always included in the I/O connection. This parameter controls how many of the contiguous *Host* **[Opt Data Out x]** parameters (four maximum) are active. For example, if this parameter value is set to '4', then *Host* parameters **C165 [Opt Data Out 1]** through **C168 [Opt Data Out 4]** will be updated.	Default: Minimum: Maximum: Type: Reset Required:	0 0 4 Read/Write Yes
03	**[DLs From Net Act]** Displays the value of *Device* parameter **02 [DLs From Net Cfg]** at the time the drive was reset. This is the number of actual contiguous controller-to-drive Datalinks that the drive is expecting.	Minimum: Maximum: Type: Reset Required:	0 4 Read Only No
04	**[DLs To Net Cfg]** Sets the number of contiguous drive-to-controller Datalinks (additional parameters) that are included in the network I/O connection. Logic Status and Feedback are always included in the I/O connection. This parameter controls how many of the contiguous *Host* **[Opt Data In x]** parameters (four maximum) are active. For example, if this parameter value is set to '4', then *Host* parameters **C161 [Opt Data In 1]** through **C164 [Opt Data In 4]** will be updated.	Default: Minimum: Maximum: Type: Reset Required:	0 0 4 Read/Write Yes
05	**[DLs To Net Act]** Displays the value of *Device* parameter **04 [DLs To Net Cfg]** at the time the drive was reset. This is the number of actual contiguous drive-to-controller Datalinks that the controller is expecting.	Minimum: Maximum: Type: Reset Required:	0 4 Read Only No
06	**[Net Addr Src]** Displays the source from which the adapter's node address is taken. This will be either the Node Address switches (See Setting the Node Address and Data Rate Using the DIP Switches on page 16) or the value of *Device* parameter **07 [Net Addr Cfg]**.	Values: Type: Reset Required:	0 = Switches 1 = Parameters Read Only No

Parameter No.	Name and Description	Details	
07	**[Net Addr Cfg]** Sets the network node address for the adapter when *Device* parameter **06 [Net Addr Src]** is set to 1 "Parameters".	Default: Minimum: Maximum: Type: Reset Required:	63 0 63 Read/Write Yes
08	**[Net Addr Act]** Displays the actual network node address used by the adapter.	Minimum: Maximum: Type: Reset Required:	0 63 Read Only No
09	**[Net Rate Cfg]** Sets the network data rate at which the adapter communicates when the Data Rate switch (See Setting the Node Address and Data Rate Using the DIP Switches on page 16) is set to position '3'. (Updates *Device* parameter **10 [Net Rate Act]** after a reset.)	Default: Values: Type: Reset Required:	0 = 125kbps 0 = 125kbps 1 = 250kbps 2 = 500kbps 3 = Autobaud Read/Write Yes
10	**[Net Rate Act]** Displays the actual network data rate being used by the adapter.	Values: Type: Reset Required:	0 = 125kbps 1 = 250kbps 2 = 500kbps 3 = Autobauding Read Only No
11	**[COS Status Mask]** Sets the mask for the 32-bit Logic Status word. Unless they are masked out, the bits in the Logic Status word are checked for changes when the adapter is allocated using COS (Change of State). If a bit changes, it is reported as a change in the Change of State operation. If the mask bit is '0' (Off), the bit is ignored. If the mask bit is '1' (On), the bit is checked. **Important:** The bit definitions in the Logic Status word for PowerFlex 520-Series drives are shown in Appendix D.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 1111 1111 1111 1111 Read/Write No
12	**[COS Fdbk Change]** Sets the amount of acceptable error (positive or negative) that the Feedback word can change before it is reported as a change in the COS (Change of State) operation.	Default: Minimum: Maximum: Type: Reset Required:	0 0.000 3.40282×10^{38} Read/Write No
13	**[COS/Cyc Interval]** Displays the amount of time that a scanner will wait to check for data in the adapter. When COS (Change of State) data exchange has been configured, this is the maximum amount of time between scans. Scans will occur sooner if data changes. When Cyclic data exchange has been configured, this interval is the fixed time between scans.	Minimum: Maximum: Type: Reset Required:	0.000 s 65.535 s Read Only No
14	**[Reset Module]** No action if set to 0 "Ready". Resets the adapter if set to 1 "Reset Module". Restores the adapter to its factory default settings if set to 2 "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 the adapter.

Parameter No.	Name and Description	Details
15	**[Comm Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that I/O communication has been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When communication is re-established, the drive will automatically receive commands over the network again.	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. *Device* parameter **15 [Comm Flt Actn]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. you can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).	
16	**[Idle Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that the controller is in program mode or faulted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When the controller is put back in Run mode, the drive will automatically receive commands over the network again.	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. *Device* parameter **16 [Idle Flt Actn]** 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 disconnected drive).	
17	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • *Device* parameter **15 [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • *Device* parameter **16 [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. **Important:** The bit definitions in the Logic Command word for PowerFlex 520-Series drives are shown in Appendix D.	Default: 0000 0000 0000 0000 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 1111 1111 1111 1111 Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details	
18	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • *Device* parameter **15 [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • *Device* parameter **16 [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle.	Default: Minimum: Maximum: Type: Reset Required:	0 -3.40282×10^{38} 3.40282×10^{38} Read/Write No
19	**[Flt Cfg DL 1]**	Default:	0
20	**[Flt Cfg DL 2]**	Default:	0
21	**[Flt Cfg DL 3]**	Default:	0
22	**[Flt Cfg DL 4]** Sets the data that is sent to the Datalink in the drive if any of the following is true: • *Device* parameter **15 [Comm Flt Actn]** is set to 4 "Send Flt Cfg" and the I/O Communication is disrupted. • *Device* parameter **16 [Idle Flt Actn]** is set to 4 "Send Flt Cfg" and the controller is set into Program or Idle mode.	Default: Minimum: Maximum: Type: Reset Required:	0 0 4294967295 Read/Write No
23	**[DSI I/O Act]** Indicates which drives the 25-COMM-D is communicating with, in both single-drive and multi-drive modes.	Values: Type: Reset Required:	0 = Drive 0 Actv 1 = Drive 1 Actv 2 = Drive 2 Actv 3 = Drive 3 Actv 4 = Drive 4 Actv Read Only No

DeviceNet Objects

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

TIP See the DeviceNet specification for more information about DeviceNet objects. Information about the DeviceNet specification is available on the ODVA web site (http://www.odva.org).

Supported Data Types

Data Type	Description
BOOL	8-bit value – low bit is true or false
BOOL[x]	Array of n bits
CONTAINER	32-bit parameter value - sign extended if necessary
DINT	32-bit signed integer
INT	16-bit signed integer
LWORD	64-bit unsigned integer
REAL	32-bit floating point
SHORT_STRING	Struct of: USINT length indicator (L); USINT[L] characters
SINT	8-bit signed integer
STRINGN	Struct of: UINT character length indicator (W); UINT length indicator (L); USINT[W x L] string data
STRING[x]	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

Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Services

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

Instances (Single-Drive)

Instance	Description
0	Class
1	Host Drive
2	22-SCM-232 or 22-HIM-* (when present)
3	25-COMM-D

Instances (Multi-Drive)

Instance	Description
0	Class
1	25-COMM-D

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
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	149
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	UNIT	Bit 0 = Owned Bit 2 = Configured Bit 10 = Recoverable fault Bit 11 = Unrecoverable fault
6	Get	Serial Number	UDINT	Unique 32-bit number

Attribute ID	Access Rule	Name	Data Type	Description
7	Get	Product Name	SHORT_STRING	Product name and rating
9	Get	Configuration Consistency Value	WORD	Checksum of configuration information
102	Get	Subminor Revision	UDINT	Further revision information

Assembly Object

Class Code

Hexadecimal	Decimal
0x04	4

Services

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

Instances

Instance	Description
1	Status Data – All I/O data being read from the DSI device (read-only)
2	Command Data – All I/O data written to the DSI device (read/write)

Class Attributes

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

Instance Attributes

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

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

IMPORTANT Setting instance attribute 3 can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Connection Object

Class Code

Hexadecimal	Decimal
0x05	5

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	No(1)	Yes	Get_Attribute_Single
0x10	No(1)	Yes	Set_Attribute_Single

(1) This service does not support class access.

Instances

Instance	Description
1	Master-Slave Explicit Message Connection
2	Polled I/O Connection
4	Change of State/Cyclic Connection
6...10	Explicit Message Connection

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	State	USINT	0 = Nonexistent 1 = Configuring 2 = Waiting for connection ID 3 = Established 4 = Timed out
2	Get	Instance Type	USINT	0 = Explicit Message 1 = I/O Message
3	Get	Transport Class Trigger	USINT	The Transport Class Trigger for this instance
4	Get	Produced Cnxn ID	USINT	CAN Identifier to transmit on
5	Get	Consumed Cnxn ID	USINT	CAN Identifier to receive on
6	Get	Initial Comm Char	USINT	Defines the DeviceNet message groups that the tx/rx Cnxn's apply
7	Get	Produced Cnxc Size	UINT	Max bytes to transmit across this connection
8	Get	Consumed Cnxn Size	UINT	Max bytes to receive across this connection
9	Get/Set	EPR	UINT	Expected Packet Rate (timer resolution = 2 msec.)
12	Get/Set	Watchdog Action	USINT	0 = Transition to timed out 1 = Auto delete 2 = Auto reset
13	Get	Produced Path Length	UINT	Number of bytes of data in the produced connection path

Attribute ID	Access Rule	Name	Data Type	Description
14	Get	Produced Connection Path	Array of UINT	Byte stream which defines Application objects whose data is to be produced by this Connection object
15	Get	Consumed Path Length	UINT	Number of bytes of data in the consumed connection path
16	Get	Consumed Connection Path	Array of USINT	Byte stream which defines Application objects whose data is to be consumed by this Connection object

Register Object

Class Code

Hexadecimal	Decimal
0x07	7

Services

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

Instances (Single-Drive)

Instance	Description
1	Status Image – All I/O data being read from the adapter (read-only)
2	Command Image – All I/O data written to the adapter (read/write)
3	Logic Status and Feedback (read-only)
4	Logic Command and Reference (read/write)
5	Datalink To Net 1 (read only)
6	Datalink From Net 1 (read/write)
7	Datalink To Net 2 (read only)
8	Datalink From Net 2 (read/write)
9	Datalink To Net 3 (read only)
10	Datalink From Net 3 (read/write)
11	Datalink To Net 3 (read only)
12	Datalink From Net 4 (read/write)
13	Logic Command (Masked)(1) (read/write)
14	Logic Command (Masked)(1) (read/write)
15	Logic Command (Masked)(1) (read/write)
16	Logic Command (Masked)(1) (read/write)
17	Logic Command (Masked)(1) (read/write)
18	Logic Command (Masked)(1) (read/write)
19	Logic Status (read-only)
20	Logic Command (read/write)
21	Feedback (read-only)
22	Reference (read/write)
23	Logic Status (read-only)
24	Logic Command (read/write)
25	Feedback (read-only)
26	Reference (read/write)
27	Logic Command (read/write)
28	Logic Status (read-only)
29	Reference (read/write)
30	Feedback (read-only)
31	Logic Command (read/write)
32	Logic Status (read-only)
33	Reference (read/write)
34	Feedback (read-only)
35	Logic Command (read/write)

Instance	Description
36	Logic Status (read-only)
37	Reference (read/write)
38	Feedback (read-only)

(1) The mask command DWORD is set to the value of the first DWORD of the data where there are ones in the second DWORD of the data. Only the bits of the Logic Command that have the corresponding mask bit set are applied.

Instances (Multi-Drive)

Instance	Description
1	Status Image – All I/O data being read from the embedded adapter (read-only)
2	Command Image – All I/O data written to the embedded adapter (read/write)
3	Logic Status and Feedback 0 (read-only)
4	Logic Command and Reference 0 (read/write)
5	Logic Status and Feedback 1 (read-only)
6	Logic Command and Reference 1 (read/write)
7	Logic Status and Feedback 2 (read-only)
8	Logic Command and Reference 2 (read/write)
9	Logic Status and Feedback 3 (read-only)
10	Logic Command and Reference 3 (read/write)
11	Logic Status and Feedback 4 (read-only)
12	Logic Command and Reference 4 (read/write)
13	Logic Command, all drives (Masked)(1) (read/write)
14	Logic Command 0 (Masked)(1) (read/write)
15	Logic Command 1 (Masked)(1) (read/write)
16	Logic Command 2 (Masked)(1) (read/write)
17	Logic Command 3 (Masked)(1) (read/write)
18	Logic Command 4 (Masked)(1) (read/write)
19	Logic Status 0 (read-only)
20	Logic Command 0 (read/write)
21	Feedback 0 (read-only)
22	Reference 0 (read/write)
23	Logic Status 1 (read-only)
24	Logic Command 1 (read/write)
25	Feedback 1 (read-only)
26	Reference 1 (read/write)
27	Logic Command 2 (read/write)
28	Logic Status2 (read-only)
29	Reference 2 (read/write)
30	Feedback 2 (read-only)
31	Logic Command 3 (read/write)
32	Logic Status 3 (read-only)
33	Reference 3 (read/write)
34	Feedback 3 (read-only)
35	Logic Command 4 (read/write)
36	Logic Status 4 (read-only)
37	Reference 4 (read/write)
38	Feedback 4 (read-only)

(1) The mask command DWORD is set to the value of the first DWORD of the data where there are ones in the second DWORD of the data. Only the bits of the Logic Command that have the corresponding mask bit set are applied.

Class Attributes

Attribute ID	Access Rule	Description
1	Read	Revision
2	Read	Maximum Instance
3	Read	Number of Instance
100	Read/Write	Timeout

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 data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Produce Register (drive to network) 1 = Consume Register (network to drive)
3	Get	Size	UINT	Size of register data in bits
4	Conditional(1)	Data	Array of Bits	Data to be transferred

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

IMPORTANT Setting the "Data" instance attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Parameter Object

Class Code

Hexadecimal	Decimal
0x0F	15

Services

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

Instances (Single-Drive)

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

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

Instances (Multi-Drive)

Instance	Description
0	Class instance for adapter
1	Adapter Parameter 1
⋮	⋮
n	Adapter Parameter n(1)

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

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

Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
16384...17407	Instances 0...1023 in the adapter	Instances 0...1023 in the adapter
17408...18431	Instances 0...1023 in the drive	Instances 0...1023 in Drive 0
18432...19455	Instances 0...1023 in the DSI device	Instances 0...1023 in Drive 1
19456...20479	Instances 0...1023 in the adapter	Instances 0...1023 in Drive 2
20480...21503	Not supported	Instances 0...1023 in Drive 3
21504...22527	Not supported	Instances 0...1023 in Drive 4
22528...23551	Not supported	Instances 0...1023 in the adapter

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	Number of parameters
8	Get	Parameter Class Descriptor	WORD	0 = False, 1 = True Bit 0 = Supports parameter instances Bit 1 = Supports full attributes Bit 2 = Must do NVS save command Bit 3 = Parameters are stored in NVS
9	Get	Configuration Assembly Instance	UINT	0
10	Get	Native Language	USINT	1 = English 2 = French 3 = Spanish 4 = Italian 5 = German 6 = Japanese 7 = Portuguese 8 = Chinese Simplified 9 = Reserved 10 = Reserved 11 = Korean 12 = Polish 13 = Reserved 14 = Turkish 15 = Czech

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 = Link specified
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	C3 = INT C7 = UINT D2 = WORD (16-bit)
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	0
10	Get	Minimum Value	(1)	(3)
11	Get	Maximum Value	(1)	(3)

Attribute ID	Access Rule	Name	Data Type	Description
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) See the DeviceNet specification for a description of the connection path.

Parameter Group Object

IMPORTANT This object is supported only in single-drive mode.

Class Code

Hexadecimal	Decimal
0x10	16

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Atribute_Single

Instances

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

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

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 parameter groups in drive
8	Get	Native Language	USINT	1 = English 2 = French 3 = Spanish 4 = Italian 5 = German 6 = Japanese 7 = Portuguese 8 = Chinese Simplified 9 = Reserved 10 = Reserved 11 = Korean 12 = Polish 13 = Reserved 14 = Turkish 15 = Czech

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Group Name String	SHORT_STRING	Group name
2	Get	Link Path Size	UINT	Number of parameters in group.
3	Get	1st Parameter Number in Group	UINT	(1)
4	Get	2nd Parameter Number in Group	UINT	(1)
n	Get	n Parameter Number in Group	UINT	(1)

(1) Value varies based on group instance.

PCCC Object

Class Code

Hexadecimal	Decimal
0x67	103

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x4B	Yes	Yes	Execute_PCCC
0x4C	No	Yes	Execute_DH+
0x4D	Yes	Yes	Execute_Local_PCCC

Instances

Supports Instance 1.

Class Attribute

Not supported.

Instance Attributes

Not supported.

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 request
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 CMDs.
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 request
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_STS	USINT	Extended Status. Not used for all CMDs.
PCCC_results	Array of USINT	CMD/FNC specific result data

Message Structure for Execute_Local_PCCC

Request		
Name	**Data Type**	**Description**
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code. Not used for all CMDs.
PCCC_params	Array of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended Status. Not used for all CMDs.
PCCC_results	Array of USINT	CMD/FNC specific result data

The DeviceNet adapter supports the following PCCC command types:

CMD	FNC	Description
0x06	0x03	Identify host and some status
0x0F	0x95	Encapsulate the other protocol
0x0F	0x00	Word range read
0x0F	0x01	Word range write

For more information regarding PCCC commands, see DFI Protocol and Command Set Manual (publication 1770-6.5.16).

N-Files (Single-Drive)

N-File	Description	
N41	This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true: • The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner. • The value of N42:3 is set to a non-zero value.	
	Write	*Read*
N41:0	Logic Command Word	Logic Status Word
N41:1	Unused	Unused
N42:2	Reference	Feedback
N42	This N-file lets you read and write some values configuring the port	
N42:3	Time-out (read/write): Time (in seconds) allowed between messages to the N41 or N44 file. If the adapter does not receive a message in the specified time, it performs the fault action configured in parameter C143 [EN Comm Flt Actn].	
N42:7	Adapter Port Number (read only): DSI port on the drive to which the adapter is connected.	
42:8	Peer Adapters (read only): Bit field of devices having DPI Peer capabilities.	

N-Files (Multi-Drive)

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

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

Services

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

Instances

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

Instances (Hex.)	Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0x0000...0x3FFF	0...16383	Instances 0...1023 in the drive	Instances 0...1023 in Drive 0
0x4000...0x43FF	16384...17407	Instances 0...1023 in the adapter	Instances 0...1023 in the adapter
0x4400...0x47FF	17408...18431	DSI	Instances 0...1023 in Drive 1
0x4800...0x4BFF	18432...19455	Option	Instances 0...1023 in Drive 2
0x4C00...0x4FFF	19456...20479	Not supported	Instances 0...1023 in Drive 3
0x5000...0x53FF	20480...21503	Not supported	Instances 0...1023 in Drive 4
0x5400...0x57FF	21504...22527	Not supported	Instances 0...1023 in the Option

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	USINT	0x00 = DSI Peripheral 0x09 = Single-Drive Mode 0x0B = Multi-Drive Mode 0x1E = 25-COMM-X Option Module 0xFF = HIM
1	Get	Family Text	STRING[16]	Text identifying the device.
2	Set	Language Code	USINT	1 = English 2 = French 3 = Spanish 4 = Italian 5 = German 6 = Japanese 7 = Portuguese 8 = Chinese Simplified 9 = Reserved 10 = Reserved 11 = Korean 12 = Polish 13 = Reserved 14 = Turkish 15 = Czech

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Product Series	USINT	1 = A 2 = B …
4	Get	Number of Components	USINT	Number of components (for example, main control board, I/O boards) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name.
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	USINT	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	UINT	0x0001 = Allen-Bradley
11	Get	NVS Checksum	UINT	Checksum of the Non-Volatile Storage in a device.
12	Get	Class Revision	UINT	2 = DSI
13	Get	Character Set Code	USINT	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)
14	Get	Product Option Support	BOOL[64]	—
15	Get	Languages Supported	STRUCT of: USINT USINT[n]	 Number of Languages Language Codes (see Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: UINT USINT USINT	 Year Month Day
17	Get	Product Revision	STRUCT of: USINT USINT	 Major Firmware Release Minor Firmware Release
18	Get	Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
29	Get	Extended Product Option Support Bits	BOOL[64]	–
30	Get	International Status Text	STRINGN	Text describing the status of device with support for Unicode.
31	Get/Set	International User Definable Text	STRINGN	Text identifying the device with a user-supplied name with support for Unicode.
34	Get	Key Information	STRUCT of: UDINT UDINT UINT UINT UINT USINT USINT USINT USINT USINT[16]	 Rating Code Device Serial Number Customization Code Customization Revision Brand Code Family Code Config Code Language Code Major Revision Minor Revision Customer-Generated Firmware UUID
35	Get	NVS CRC	UDINT	A 32-bit CRC of the Non-Volatile Storage in a device.
38	Set	ADC Configuration Signature	USINT[16]	Value stored by the device and zeroed if its configuration changes.

Instance Attribute

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: USINT USINT	 Major Revision Minor Revision
8	Get	Component Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
9	Get	International Component Name	STRING	Name of the component with support for Unicode.

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.)	Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0x0000...0x3FFF	0...16383	Instances 0...1023 in the drive	Instances 0...1023 in Drive 0
0x4000...0x43FF	16384...17407	Instances 0...1023 in the adapter	Instances 0...1023 in the adapter
0x4400...0x47FF	17408...18431	DSI	Instances 0...1023 in Drive 1
0x4800...0x4BFF	18432...19455	Option	Instances 0...1023 in Drive 2
0x4C00...0x4FFF	19456...20479	Not supported	Instances 0...1023 in Drive 3
0x5000...0x53FF	20480...21503	Not supported	Instances 0...1023 in Drive 4
0x5400...0x57FF	21504...22527	Not supported	Instances 0...1023 in the Option

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	UINT	Number of parameters in the device
1	Set	Write Protect Password	UINT	0 = Password disabled n = Password value
2	Set	NVS Command Write	USINT	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 4 = Partial defaults 5 = System defaults
3	Get	NVS Parameter Value Checksum	UINT	Checksum of all parameter values in a user set in NVS
5	Get	First Accessible Parameter	UINT	First parameter available if parameters are protected by passwords. A “0” indicates all parameters are protected.
7	Get	Class Revision	UINT	2 = DSI

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DSI Offline Read Full	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Offline Minimum value
			CONTAINER	Offline Maximum value
			CONTAINER	Offline Default value
			STRING[16]	Parameter name
			STRING[4]	Offline parameter units
			UINT	Online minimum parameter instance
			UINT	Online maximum parameter instance
			UINT	Online default parameter instance
			UINT	Multiplier parameter instance
			UINT	Divisor parameter instance
			UINT	Base parameter instance
			UINT	Offset parameter instance
			USINT	Formula number
			USINT	Pad byte (always zero)
			UINT	Help instance
			UINT	Pad word (always a value of zero)
			CONTAINER	Parameter value
			UINT	Multiplier
			UNIT	Divisor
			UNIT	Base
			INT	Offset
7	Get	DSI Online Read Full	STRUCT of:	
			BOOL[32]	Descriptor (see page 120)
			CONTAINER[(1)]	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Next parameter
			UINT	Previous parameter
			STRING[4]	Units (for example, Amps, Hz)
			UINT	Multiplier[(2)]
			UINT	Divisor[(2)]
			UINT	Base[(2)]
			INT	Offset[(2)]
			USINT[3]	Link (source of the value) (0 = no link)
			USINT	Always zero (0)
			STRING[16]	Parameter name
8	Get	DSI Descriptor	BOOL[32]	Descriptor (see page 120)
9	Get/Set	DSI Parameter Value	Various	Name of the component with support for Unicode.
10	Get/Set	DSI RAM Parameter Value	Various	Parameter value in NVS. [(3)]
14	Get	DSI Parameter Name	STRING[16]	Parameter name
18	Get	International DSI Offline Parameter Text	Struct of:	
			STRINGN	International parameter name
			STRINGN	International offline units
19	Get	International DSI Online Parameter Text	Struct of:	
			STRINGN	International parameter name
			STRINGN	International online units

Attribute ID	Access Rule	Name	Data Type	Description
20	Get	International DSI Online Read Full	Struct of:	
			BOOL[32]	Descriptor
			CONTAINER	Parameter value
			CONTAINER	Online minimum value
			CONTAINER	Online maximum value
			CONTAINER	Online default value
			UINT	Next
			UINT	Previous
			UINT	Multiplier
			UINT	Divisor
			UINT	Base
			INT	Offset
			USINT[3]	Link
			USINT	Pad word (always zero)
			BOOL[32]	Extended descriptor
			STRINGN	International parameter name
			STRINGN	International online parameter unit
21	Get	DSI Extended Descriptor	UDINT	Extended Descriptor (see page 121)
22	Get	International DSI Offline Read Full	Struct of:	
			BOOL	Descriptor
			CONTAINER	Offline minimum value
			CONTAINER	Offline maximum value
			CONTAINER	Offline default value
			UINT	Online minimum parameter instance
			UINT	Online maximum parameter instance
			UINT	Online default parameter instance
			UINT	Multiplier parameter instance
			UINT	Divisor parameter instance
			UINT	Base parameter instance
			UINT	Offset parameter instance
			USINT	Formula number
			USINT	Pad word (always zero)
			UINT	Help instance
			UINT	Pad word (always a value of zero)
			CONTAINER	Parameter value
			UINT	Multiplier
			UINT	Divisor
			UINT	Base
			INT	Offset
			BOOL[32]	Extended DSI descriptor
			STRINGN	International DSI parameter name
			STRINGN	International DSI offline parameter units

(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. See Formulas for Converting on page 122.

(3) Do NOT continually write parameter data to NVS. See the attention on page 55.

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = USINT used as an array of Boolean 001 = UINT used as an array of Boolean 010 = USINT (8-bit integer) 011 = UINT (16-bit integer) 100 = UDINT (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 = May be the sink end of a link 1 = May not be the sink end of 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 = Read only 1 = Read/write
10	Instance	0 = Writable when enabled (e.g., drive running) 1 = Not writable when enabled
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
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 4)	Bit 16 is the least significant bit. 000 = Reserved 001 = UDINT used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 5)	
18	Extended Data Type (Bit 6)	
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field used to control access to parameter data.
23	Access Level (Bit 2)	
24	Access Level (Bit 3)	
25	Writable ENUM	ENUM text: 0 = Read Only, 1 = Read/Write
26	Not a Link Source	0 = May be the source end of a link 1 = May not be the source end of a link
27	Enhanced Bit ENUM	Parameter supports enhanced bit ENUMs.
28	Enhanced ENUM	Parameter supports enhanced ENUMs.
29	Uses DSI Limits Object	Parameter uses the DSI Limits Object. Intelligent offline tools make use of the Limits Object to select limits and units.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DSI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

Extended Descriptor Attributes

Bit	Name	Description
0	Indirect Mode	0 = Analog (selects entire parameters) 1 = Digital (selects individual bits within parameters)
1	Indirect Type 0	Analog input list (Instance 0xFFFF)
2	Indirect Type 1	Digital input list (Instance 0xFFFE)
3	Indirect Type 2	Feedback list (Instance 0xFFFD)
4	Indirect Type 3	Analog output list (Instance 0xFFFC)
5	Indirect Type 4	Digital output list (Instance 0xFFFB)
6	Indirect Type 5	Undefined (Instance 0xFFFA)
7	Indirect Type 6	Undefined (Instance 0xFFF9)
8	Indirect Type 7	Undefined (Instance 0xFFF8)
9	Indirect Type 8	Undefined (Instance 0xFFF7)
10	Indirect Type 9	Undefined (Instance 0xFFF6)
11	Indirect Type 10	Undefined (Instance 0xFFF5)
12	Indirect Type 11	Undefined (Instance 0xFFF4)
13	Indirect Type 12	Undefined (Instance 0xFFF3)
14	Indirect Type 13	Undefined (Instance 0xFFF2)
15	Indirect Type 14	Parameter-specific list
16	FP Max Decimals Bit 0	These four bits are used on REAL parameters only. They indicate the maximum number of decimal places to be displayed for small values. A value of 0 indicates to not limit the number of decimal places used.
17	FP Max Decimals Bit 1	
18	FP Max Decimals Bit 2	
19	FP Max Decimals Bit 3	
20	Extended Parameter Reference	0 = Not an Extended Parameter Reference 1 = Extended Parameter Reference An Extended Parameter Reference contains a reference to another parameter. The value is formatted the same as an analog mode Indirect Selector parameter (SSpppp, where SS = slot number of device to which this Extended Parameter Reference is pointing, and pppp = number of the parameter or diagnostic item to which this Extended Parameter Reference is pointing). Note that an Extended Parameter Reference can only select parameters unlike an Indirect Selector. An Extended Parameter Reference could be used to configure a Datalink or show the source of a Reference (among other uses).
21	Uses Rating Table Object	This parameter has rating-dependent defaults and limits that can be obtained from the Rating Table Object. The Offline Read Full will include the default value for the smallest rating and limits that will accommodate the full range of values allowed in the family of devices using this particular combination of Family Code and Config Code. The Online Read Full will include the rating-dependent default and limit values for this particular combination of Family Code, Config Code, and Rating Code.
22	Writable Referenced Parameter	This bit must be zero unless the parameter is an Extended Parameter Reference. If the parameter is an Extended Parameter Reference, then: 0 = The referenced parameter may be read-only or writable. 1 = The referenced parameter must always be writable (including while running).
23	Disallow Zero	This bit must be zero unless the parameter is an Indirect Selector or Extended Parameter Reference. If the parameter is an Indirect Selector or Extended Parameter Reference, then: 0 = Allow zero 1 = Disallow zero If this bit is cleared (indicating that a value of zero is allowed), the device must support the “Zero Text” parameter attribute so that a software tool or HIM can obtain text from the Zero Text parameter attribute. If this bit is set (indicating that a value of zero is disallowed), a software tool or HIM will not allow the user to enter a value of zero.
24	Datalink Out	This bit is used by offline tools and indicates that this is a Datalink Out parameter. Bit 20 must also be set.
25	Datalink In	This bit is used by offline tools and indicates that this is a Datalink In parameter. Bits 20 and 22 must also be set.
26	Not Writable While IO Active	This parameter cannot be written if the I/O data being exchanged between the Host and the peripheral is valid.
27	Command Parameter	This parameter commands the drive to take an action, such as “Reset Defaults” or “Autotune,” and then returns to a value of zero. Offline software tools will not allow setting this parameter to anything other than a value of zero. If an offline file contains a Command Parameter with a non-zero value, the offline software tool will change the value to zero. Note that command parameters cannot have values that do not return to zero.
28	Current Value Is Default	This bit identifies a parameter that will not change if a “Reset Defaults” is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the “Disallow Zero” bit is set, this bit must be cleared. If the “Disallow Zero” bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30...31	Reserved	Reserved

Formulas for Converting

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

Common Services

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

Object Specific Services

	Implemented for:			Allocation Size (in bytes)	
Service Code	**Class**	**Instance**	**Service Name**	**Par. Number**	**Par. Value**
0x32	Yes	No	Get_Attributes_Scattered	4	4
0x34	Yes	Yes	Set_Attributes_Scattered	4	4

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

Name	Data Type	Description
Parameter Number	UDINT	Parameter to read or write
Parameter Value	UDINT	Parameter value write (zero when reading)

The response data appears in the following format:

Name	Data Type	Description
Parameter Number	UDINT	Parameter read or write(1)
Parameter Value	UDINT	Parameter value read (zero when writing)(2)

(1) If an error occurred, bit 15 will be turned on in the response.
(2) If an error occurred, the error code will appear instead of the value.

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.

Services

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

Instances

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

Instances (Hex.)	Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0x0000...0x3FFF	0...16383	Instances 0...1023 in the drive	Instances 0...1023 in Drive 0
0x4000...0x43FF	16384...17407	Instances 0...1023 in the adapter	Instances 0...1023 in the adapter
0x4400...0x47FF	17408...18431	DSI	Instances 0...1023 in Drive 1
0x4800...0x4BFF	18432...19455	Option	Instances 0...1023 in Drive 2
0x4C00...0x4FFF	19456...20479	Not supported	Instances 0...1023 in Drive 3
0x5000...0x53FF	20480...21503	Not supported	Instances 0...1023 in Drive 4
0x5400...0x57FF	21504...22527	Not supported	Instances 0...1023 in the Option

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of faults/events that the device can record in its queue
3	Set	Fault Command Write	USINT	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Get	Fault Trip Instance Read	UINT	Fault that tripped the device. For adapters, this value is always 1 when faulted.
6	Get	Number of Recorded Faults	UINT	Number of faults/events in the queue. A “0” indicates the fault queue is empty.
7	Get	Fault Parameter Reference	UINT	Reserved

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of UINT STRUCT of: USINT USINT STRING[16] STRUCT of: LWORD BOOL[16] UINT CONTAINER[n]	Fault code Fault source DSI port DSI Device Object Fault text Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15]: Not used Reserved Reserved
1	Get	Basic Information	STRUCT of UINT STRUCT of: USINT USINT STRUCT of: LWORD BOOL[16]	Fault code Fault source DSI port DSI Device Object Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15]: Not used
2	Get	International Fault Text	STRINGN	Text describing the fault with support for Unicode.

DPI Diagnostic Object

Class Code

Hexadecimal	Decimal
0x99	153

Services

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

Instances

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

Instances (Hex.)	Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0x0000...0x3FFF	0...16383	Instances 0...1023 in the drive	Instances 0...1023 in Drive 0
0x4000...0x43FF	16384...17407	Instances 0...1023 in the adapter	Instances 0...1023 in the adapter
0x4400...0x47FF	17408...18431	DSI	Instances 0...1023 in Drive 1
0x4800...0x4BFF	18432...19455	Option	Instances 0...1023 in Drive 2
0x4C00...0x4FFF	19456...20479	Not supported	Instances 0...1023 in Drive 3
0x5000...0x53FF	20480...21503	Not supported	Instances 0...1023 in Drive 4
0x5400...0x57FF	21504...22527	Not supported	Instances 0...1023 in the Option

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of diagnostic items that the device can record in its queue
3	Get	ENUM Offset	UINT	DPI ENUM object instance offset

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of:	
			BOOL[32]	Descriptor (see page 120)
			CONTAINER(1)	Value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Pad Word
			UINT	Pad Word
			STRING[4]	Units (for example, Amps, Hz)
			UINT	Multiplier(2)
			UINT	Divisor(2)
			UINT	Base(2)
			INT	Offset(2)
			UDINT	Link (source of the value) (0 = no link)
			STRING[16]	Diagnostic name text
1	Get/Set	Value	Various	Diagnostic item value
2	Get	International Diagnostic Item Text	STRUCT of:	
			STRINGN	Diagnostic name text
			STRINGN	Diagnostic units text
3	Get	International Full Read All	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Pad Word
			UINT	Pad Word
			UINT	Multiplier
			UINT	Divisor
			UINT	Base
			INT	Offset
			UDINT	Pad
			BOOL[32]	Extended descriptor
			STRINGN	Diagnostic name text
			STRINGN	Diagnostic units text

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

(2) This value is used in the formulas used to convert the value between display units and internal units. See Formulas for Converting on page 122.

Logic Command/Status Words: PowerFlex 525 Drives

Appendix D presents the definitions of the Logic Command and Logic Status words that are used for PowerFlex 525 drives.

Logic Command Word

Velocity Bit Definitions

Comm Logic Command – C122 = 0 "Velocity"

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start(1)	0 = Not Start 1 = Start
													x			Jog 1(2)	0 = Not Jog 1 = Jog
												x				Clear Fault(3)	0 = Not Clear Fault 1 = Clear Fault
										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = No Command
									x							Keypad	0 = Not Force Keypad Control 1 = Force Keypad Control
								x								MOP Increment	0 = Not MOP Increment 1 = MOP Increment
						x	x									Accel Time	00 = No Command 01 = Use Accel Rate 1 (P041 [Accel Time 1]) 10 = Use Accel Rate 2 (A442 [Accel Time 2]) 11 = Hold Accel Rate Selected
				x	x											Decel Time	00 = No Command 01 = Use Decel Rate 1 (P042 [Decel Time 1]) 10 = Use Decel Rate 2 (A443 [Decel Time 2]) 11 = Hold Decel Rate Selected
			x													Ref Select 1	000 = No Command 001 = Freq. Source = P047 [Speed Reference1] 010 = Freq. Source = P049 [Speed Reference2] 011 = Freq. Source = P051 [Speed Reference3] 100 = A410 [Preset Freq 0] 101 = A411 [Preset Freq 1] 110 = A412 [Preset Freq 2] 111 = A413 [Preset Freq 3]
		x														Ref Select 2	
	x															Ref Select 3	
x																MOP Decrement	0 = Not MOP Decrement 1 = MOP Decrement

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

(2) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Jog condition will jog the drive. A transition to a "0" will stop the drive.

(3) To perform this command, the value must switch from "0" to "1."

Position Bit Definitions

Comm Logic Command – C122 = 1 "Position"

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start(1)	0 = Not Start 1 = Start
													x			Jog 1(2)	0 = Not Jog 1 = Jog
												x				Clear Fault(3)	0 = Not Clear Fault 1 = Clear Fault
										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = No Command
									x							Logic Input 1	1 = Logic In 1
								x								Logic Input 2	1 = Logic In 2
					x	x	x									Frequency and Position Steps	000 = Frequency and Position Step 0 001 = Frequency and Position Step 1 010 = Frequency and Position Step 2 011 = Frequency and Position Step 3 100 = Frequency and Position Step 4 101 = Frequency and Position Step 5 110 = Frequency and Position Step 6 111 = Frequency and Position Step 7
				x												Find Home	1 = Find Home
			x													Hold Step	1 = Hold Step
		x														Redefine Position	1 = Pos Redefine
	x															Enable Sync	1 = Sync Enable
x																Disable Travel	1 = Travel Disable

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

(2) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Jog condition will jog the drive. A transition to a "0" will stop the drive.

(3) To perform this command, the value must switch from "0" to "1."

Logic Status Word

Velocity Bit Definitions

Comm Logic Status – C122 = 0 "Velocity"

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Run Ready	0 = Not Ready to Run 1 = Ready to Run
														x		Active	0 = Not Active 1 = Active (Running)
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Rotating Reverse 1 = Rotating Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Reserved	–
								x								Fault	0 = Not Faulted 1 = Faulted
							x									At Speed	0 = Not at Reference 1 = At Reference
						x										Main Frequency	0 = Not Controlled by Active Com 1 = Controlled by Active Com
					x											Operation Command	0 = Not Controlled by Active Com 1 = Controlled by Active Com
				x												Parameters	0 = Not Locked 1 = Locked
			x													Digital Input 1 Status	–
		x														Digital Input 2 Status	–
	x															Digital Input 3 Status	–
x																Digital Input 4 Status	–

Position Bit Definitions

Comm Logic Status – C122 = 1 "Position"																	
Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Run Ready	0 = Not Ready to Run 1 = Ready to Run
														x		Active	0 = Not Active 1 = Active (Running)
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Rotating Reverse 1 = Rotating Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Travel Position	0 = Reverse Travel Position 1 = Forward Travel Position
								x								Fault	0 = Not Faulted 1 = Faulted
							x									At Speed	0 = Not at Reference 1 = At Reference
						x										At Position	0 = Not at Position 1 = At Position
					x											Drive Home	0 = Not at Home 1 = At Home
				x												Commanded Home	0 = Not Drive Homed 1 = Drive Homed
			x													Sync Hold	0 = Not Sync Hold 1 = Sync Hold
		x														Sync Ramp	0 = Not Sync Ramp 1 = Ramp Sync
	x															Traverse	0 = Traverse Off 1 = Traverse On
x																Traverse Decel	0 = Not Traverse Decel 1 = Traverse Decel

Notes:

The following terms and abbreviations are used throughout this manual.For definitions of terms not listed here, see the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

Adapter Devices such as drives, controllers, and computers usually require an adapter to provide a communication interface between them and a network such as DeviceNet. 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 25-COMM-D DeviceNet adapter connects PowerFlex 525 drives to a DeviceNet network. Adapters are sometimes also called 'cards', 'embedded communication options', 'modules', and 'peripherals'.

ADR (Automatic Device Replacement) A means for replacing a malfunctioning device with a new unit, and having the device configuration data set automatically. The DeviceNet scanner is set up for ADR using RSNetWorx for DeviceNet software. The scanner uploads and stores a device's configuration. Upon replacing a malfunctioning device with a new unit (node 63), the scanner automatically downloads the configuration data and sets the node address.

Bridge A network device that can route messages from one network to another. A bridge also refers to a communications module in a ControlLogix or CompactLogix controller that connects the controller to a network. See also Scanner.

Bus Off A bus off condition occurs when an abnormal rate of errors is detected on the Control Area Network (CAN) bus in a device. The bus-off device cannot receive or transmit messages on the network. This condition is often caused by corruption of the network data signals due to noise or data rate mismatch.

CAN (Controller Area Network) CAN is a serial bus protocol on which DPI is based.

Change of State (COS) I/O Data Exchange A device that is configured for Change of State I/O data exchange transmits data at a specified interval if its data remains unchanged. If its data changes, the device immediately transmits the change. This type of exchange can reduce network traffic and save resources since unchanged data does not need to be transmitted or processed.

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

Connected Components Workbench Software

The recommended tool for monitoring and configuring Allen-Bradley products and network communication adapters. It can be used on computers running various Microsoft Windows operating systems. You can obtain a free copy of Connected Components Workbench software at http://www.ab.com/support/abdrives/webupdate/software.html.

Class

A class is defined by the DeviceNet specification as 'a set of objects that all represent the same kind of system component. A class is a generalization of an object. All objects in a class are identical in form and behavior, but may contain different attribute values.'

ControlFLASH

A free software tool used to electronically update the firmware of Allen-Bradley products and network communication adapters. ControlFLASH software is downloaded automatically when the firmware revision file for the product being updated is downloaded from the Allen-Bradley updates website to your computer.

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.

Cyclic I/O Data Exchange

A device configured for Cyclic I/O data exchange transmits data at a user-configured interval. This type of exchange ensures that data is updated at an appropriate rate for the application and allows data to be sampled at precise intervals for better determinism.

Data Rate

The speed at which data is transferred on the DeviceNet network. The available data rates depend on the type of cable and total cable length used on the network.

Cable	Maximum Cable Length		
	125 Kbps	250 Kbps	500 Kbps
Thick Trunk Line	500 m (1,640 ft)	250 m (820 ft)	100 m (328 ft)
Thin Trunk Line	100 m (328 ft)	100 m (328 ft)	100 m (328 ft)
Maximum Drop Length	6 m (20 ft)	6 m (20 ft)	6 m (20 ft)
Cumulative Drop Length	156 m (512 ft)	78 m (256 ft)	39 m (128 ft)

Each device on a DeviceNet network must be set for the same data rate. You can set the DeviceNet adapter to 125 Kbps, 250 Kbps or 500 Kbps. Or you can set it to Autobaud if another device on the network has set the data rate.

Datalinks A Datalink is a type of pointer used by PowerFlex 525 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 16-bit Datalink in a PowerFlex 525 drive consumes 4 bytes in the input image table and/or 4 bytes in the output image table of the controller.

DeviceNet Network An open producer/consumer Controller Area Network (CAN) which connects devices (for example, controllers, drives, and motor starters). Both I/O and explicit messages can be transmitted over the network. A DeviceNet network can support a maximum of 64 devices. Each device is assigned a unique node address and transmits data on the network at the same data rate.

A cable is used to connect devices on the network. It contains both the signal and power wires. Devices can be connected to the network with drop lines, in a daisychain connection, or a combination of the two.

General information about DeviceNet and the DeviceNet specification are maintained by the Open DeviceNet Vendor's Association (ODVA). ODVA is online at http://www.odva.org.

EDS (Electronic Data Sheet) Files Simple text files that are used by network configuration tools such as RSNetWorx for DeviceNet software to describe products so that you can easily commission them on a network. EDS files describe a product device type and revision. 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 devices over the network.

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 controller 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 its PowerFlex 525 drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive using specific fault configuration parameters in the adapter. When a fault action parameter is set to use the fault configuration data and a fault occurs, the data from these parameters is sent as the Logic Command, Reference, and/or Datalink(s).

Faulted Node Recovery This DeviceNet feature lets you change a configuration of a device that is faulted on the network. For example, if you add a device to a network and it does not have a unique address, it will fault. If you have a configuration tool that supports faulted node recovery and your adapter is using parameters to set its node address and data rate, you can change the node address.

Heartbeat Rate The heartbeat rate is used in Change of State (COS) data exchange. It is associated with producing data once every EPR (Expected Packet Rate) duration. There may be four heartbeats before a time-out happens.

HIM (Human Interface Module) A device that can be used to configure and control a drive. The PowerFlex 22-HIM-A3 or 22-HIM-C2S HIM can be used to configure PowerFlex 525 drives and their connected peripherals.

Hold Last When communication is disrupted (for example, a cable is disconnected), the adapter and its PowerFlex 525 drive can respond by holding last. Hold last results in the drive receiving the last data received through the network connection before the disruption. If the drive was running and using the Reference from the adapter, it will continue to run at the same Reference.

Idle Action An idle action determines how the adapter and its PowerFlex 525 drive act when the controller is switched out of run mode.

I/O Data I/O data, sometimes called "implicit messages" or "input/output," is time-critical data such as a Logic Command and Reference. The terms "input" (To Net) and "output" (From Net) are defined from the controller's point of view. Output is produced by the controller and consumed by the adapter. Input is produced by the adapter and consumed by the controller.

Logic Command/Logic Status The Logic Command is used to control the PowerFlex 525 drive (for example, start, stop, direction). It consists of one 32-bit word of output to the adapter from the network. The definitions of the bits in this word are shown in Appendix D.

The Logic Status is used to monitor the PowerFlex 525 drive (for example, operating state, motor direction). It consists of one 32-bit word of input from the adapter to the network. The definitions of the bits in this word are shown in Appendix D.

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 DeviceNet adapters) are slave devices.

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

Node Address A DeviceNet network can have as many as 64 devices connected to it. Each device on the network must have a unique node address between 0 and 63. Node address 63 is the default used by non-commissioned devices. Node addresses are sometimes called 'MAC IDs'.

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."

Objects The DeviceNet specification defines an object as "an abstract representation of a particular component within a product."

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 DriveExecutive) also use PCCC to communicate.

Polled I/O Data Exchange A device that is configured for polling I/O data exchange sends data immediately after it receives a request for the data. For example, an adapter receives a Logic Command from the scanner and then sends back the Logic Status of the connected PowerFlex drive.

PowerFlex 525 Drives The Allen-Bradley PowerFlex 525 drives are part of the PowerFlex 520-Series of drives.

Product/Consumer Network On producer/consumer networks, packets are identified by content rather than an explicit destination. If a node needs the packet, it will accept the identifier and consume the packet. Therefore, the source sends a packet once and all the nodes consume the same packet if they need it. Data is produced once, regardless of the number of consumers. Also, better synchronization than Master-Slave networks is possible because data arrives at each node at the same time.

Reference/Feedback The Reference is used to send a setpoint (for example, speed, frequency, torque) to the drive. It consists of one 32-bit word of output to the adapter from the network.

Feedback is used to monitor the speed of the drive. It consists of one 32-bit word of input from the adapter to the network.

RSLogix 5000 Software RSLogix 5000 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. See also Studio 5000 environment.

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

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.

Stop Action When communication is disrupted (for example, a cable is disconnected), the adapter and drive can respond with a stop action. A stop action 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.

Studio 5000 Environment The Studio 5000 Engineering and Design Environment combines engineering and design elements into a common environment. The first element in the Studio 5000 environment is the Logix Designer application. The Logix Designer application is the rebranding of RSLogix 5000 software and will continue to be the product to program Logix 5000 controllers for discrete, process, batch, motion, safety, and drive-based solutions.

The Studio 5000 environment is the foundation for the future of Rockwell Automation engineering design tools and capabilities. It is the one place for design engineers to develop all the elements of their control system.

UCMM (UnConnected Message Manager) UCMM provides a method to create connections between DeviceNet devices.

UDDT (User-Defined Data Type) A structure data type that you define during the development of an application (for example, to convert 32-bit REAL parameter data to correctly write and read their values).

Update The process of updating firmware in a device. The adapter can be updated using various Allen-Bradley software tools. See Updating the Adapter Firmware on page 31 for more information.

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.

Rockwell Automation Support

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

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

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

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

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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