PowerFlex® 22-COMM-P Profibus Adapter

Series A FRN 1.xxx-3.xxx
Series B FRN 3.xxx and later

User Manual

AB *Allen-Bradley*

Allen-Bradley · Rockwell Software

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Important User Information

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

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

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

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

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

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

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.

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

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

The information below summarizes the changes made to this manual since its last release (December 2011):

Description of Changes	Page
In Chapter 3:	
• Added new setting "5" (Fault&ClrCmd) to **Parameters 9 - [Comm Fault Action]** and **10 - [Idle Fault Action]**.	3-5
• Added new section "Setting DSI Loss Action."	3-6
In Chapter 7, added more information throughout about Multi-Drive mode.	7-1 thru 7-5
In Appendix B:	
• Added new setting "5" (Fault&ClrCmd) to **Parameter 9 - [Comm Fault Action]**.	B-2
• Added new setting "5" (Fault&ClrCmd) to **Parameter 10 - [Idle Fault Action]**.	B-3
• Added new **Parameter 25 - [DSI Loss Action]**.	B-5

Table of Contents

About This Manual

Related Documentation

For…	See…	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer/, and DriveExplorer online help	—
DriveTools™ SP (includes DriveExecutive™)	http://www.ab.com/drives/drivetools/, and DriveExecutive online help	—
PowerFlex® 4-Class HIM (22-HIM-xx)	PowerFlex 4-Class HIM Quick Reference	22HIM-QR001
PowerFlex® 4 Drive	PowerFlex 4 User Manual PowerFlex 4 Quick Start	22A-UM001 22A-QS001
PowerFlex® 40 Drive	PowerFlex 40 User Manual PowerFlex 40 Quick Start	22B-UM001 22B-QS001
PowerFlex® 40P Drive	PowerFlex 40P User Manual PowerFlex 40P Quick Start	22D-UM001 22D-QS001
PowerFlex® 400 Drive	PowerFlex 400 User Manual PowerFlex 400 Quick Start	22C-UM001 22C-QS001
RSLinx™ Classic	Getting Results with RSLinx Guide, and online help	LINX-GR001
RSLogix™ 5 RSLogix™ 500	RSLogix 5 Getting Results Guide, and online help RSLogix 500 Getting Results Guide, and online help	LG5-GR002 LG500-GR002
Scanner	SST-PFB-SLC User's Guide	Version 2.03
SLC 500™	SLC 500 Modular Hardware Style User Manual SLC 500 Instruction Set	1747-UM011 1747-RM001

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To find your local Rockwell Automation distributor or sales representative, visit www.rockwellautomation.com/locations.

Documentation from SST / Woodhead can be obtained online at http://www.mysst.com/download.

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name—for example **Parameter 04 - [P-DP Addr Actual]**.

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

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

- This manual provides information about the Profibus adapter and using it with PowerFlex 40 drives. The adapter can be used with other products that support an internal DSI adapter. Refer to the documentation for your product for specific information about how it works with the adapter.

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Rockwell Automation offers support services worldwide, with over 75 sales/support offices, over 500 authorized distributors, and over 250 authorized systems integrators located through the United States alone. In addition, Rockwell Automation representatives are in every major country in the world.

Local Product Support

Contact your local Rockwell Automation, Inc. representative for:

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

Technical Product Assistance

For technical assistance, please review the information in Chapter 8, Troubleshooting first. If you still have problems, then access the Allen-Bradley Technical Support web site at www.ab.com/support/abdrives or contact Rockwell Automation, Inc.

Getting Started

The adapter is intended for installation into a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive and is used for network communication. The adapter can also be installed in a DSI External Comms Kit (22-XCOMM-DC-BASE). When operated in Multi-Drive mode (Chapter 7), the adapter provides the means for up to five (5) PowerFlex 4-Class drives to operate on the network and be represented as only one node.

Components

Figure 1.1   Components of the Adapter
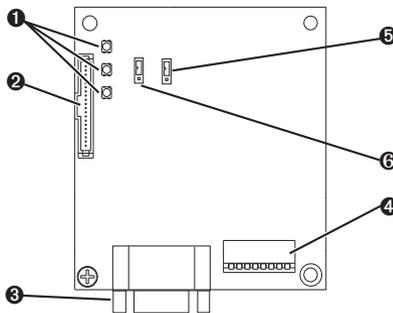
Series A adapter shown;
Series B adapter Jumper J2
and J3 locations are different

Item	Part	Description
❶	Status Indicators	Three LEDs that indicate the status of the adapter and network communications. See Chapter 8, Troubleshooting
❷	DSI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
❸	Profibus Connector	A 9-pin, female D-Sub connector.
❹	Node Address/ Firmware Update Switches	Switches SW1…SW7 to set the node address and SW8 for firmware updating. See Commissioning the Adapter on page 2-1.
❺	Mode Jumper (J2)	Selects Single mode or Multi-Drive mode of operation.
❻	SWAP Jumper (J3)	Determines the Intel or Motorola (SWAP) data format for the corresponding PLC.

Features

The adapter features include:

- Typical mounting in a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive. It can also be installed in a DSI External Comms Kit (22-XCOMM-DC-BASE).

- The low seven bits of 8-bit DIP switch let you set a node address, and the MSB bit provides write access for the Flash update of module firmware.

- Single mode or Multi-Drive mode of operation selected with the adapter Mode Jumper J2.

  - In Single mode (default), the adapter represents a single drive on one node and can support one additional external peripheral (HIM or 22-SCM-232) over DSI.

  - In Multi-Drive mode, the adapter represents up to 5 drives on one node daisy-chained over the RS-485 interface. In this case, the unit will not operate with DSI peripheral devices such as the HIM or the 22-SCM-232.

- Status indicators report the status of the drive communications, the adapter, and network.

- User-defined fault actions to determine how the adapter and connected drive respond to:

  - Communication disruptions (Comm Flt Action)
  - Controller in idle mode (Idle Flt Action)

- I/O messages (that is, Control/Status, Reference/Feedback) that are exchanged with the Profibus master in every bus cycle. The Synch & Freeze modes are supported. I/O configuration is fixed and no Datalinks is supported.

- Configuration and monitoring using Parameter Messaging for slave device's parameters on the Profibus network. Also, when operated in Single mode, the slave device's parameters on the Profibus network can be configured and monitored using drive software tools Drive Explorer or DriveTools SP via DSI.

Compatible Products

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

- PowerFlex 4 drives (when used with DSI External Comms Kit)
- PowerFlex 4M drives (when used with DSI External Comms Kit)
- PowerFlex 40 drives
- PowerFlex 40P drives
- PowerFlex 400 drives

When operated in Multi-Drive mode (Chapter 7), the adapter provides the means for up to five (5) PowerFlex 4-Class drives to operate on the network and be represented as only one node.

Required Equipment

Equipment Shipped with the Adapter

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

❑ One adapter

❑ One 15.24 cm (6 in.) Internal Interface cable

❑ One floppy disc with GSD file

❑ One *PowerFlex 4-Class DSI (Drive Serial Interface) Network Communication Adapter Installation Instructions* (publication 22COMM-IN002)

User-Supplied Equipment

To install and configure the adapter, you must supply:

❏ A small flathead screwdriver

❏ Profibus cable

– One 9-pin, male D-Sub PROFIBUS connector.
[**Note**: PROFIBUS connectors are available from a variety of sources and in various sizes. As such, there may be mechanical limitations that prohibit the use of some connectors.]

❏ Configuration tool, such as:

– PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S) – required to access adapter parameters when not using DriveExplorer software or DriveExecutive software

– DriveExplorer (version 3.01 or later) – uses 22-SCM-232 DSI serial converter (version 2.001 or later)

– DriveExecutive stand-alone software (version 3.01 or later) or bundled with the DriveTools SP suite (version 2.02 or later)

❏ Profibus configuration software

❏ Controller configuration software

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 product using a Profibus adapter. Failure to comply may result in injury and/or equipment damage.

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

ATTENTION: Risk of injury or equipment damage exists. **Parameters 9 - [Comm Flt Action]** and **10 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if communications are disrupted or the controller is idle. By default, these parameters fault the PowerFlex drive. You can set these parameters so that the PowerFlex drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a hazard of injury or equipment damage.

ATTENTION: Hazard 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: Hazard 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 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 designed to help experienced users start using the adapter. If you are unsure how to complete a step, see the referenced chapter.

Step	Action	See...
1	**Review the safety precautions for the adapter.**	Throughout manual
2	**Verify that the PowerFlex drive is properly installed.**	Drive User Manual
3	**Commission the adapter.** Set a unique node address using the DIP-switch for Bit 1 to 7 on the adapter.	Chapter 2, Installing the Adapter
4	**Install the adapter.** Verify that the PowerFlex drive and Profibus network are not powered. Then, connect the adapter to the network using a Profibus cable and to the drive using the internal Interface cable. Use the captive screws to secure and ground the adapter to the drive.	
5	**Apply power to the adapter.** The adapter receives power from the drive. Apply power to the drive. The status indicators should be green. If they flash red, there is a problem.	
6	**Set up the drive parameters.** Before starting, configuring, and working with the Profibus adapter, set the following drive parameters: • **P036 [Start Source]** to "5" (RS485 DSI port) if Start is controlled from the network. • **P038 [Speed Reference]** to "5" (RS485 DSI port) if the Speed Reference is controlled from the network.	Page 3-4
	For **Multi Drive mode**, the following additional drive parameters must be set: A103, A104, A107.	Page 7-8
7	**Configure the adapter for your application.** Set the following parameters for the adapter as required by your application: • Node address • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
8	**Apply power to Profibus master and other network devices.** Verify that the master and network are installed and functioning in accordance with Profibus standards, and then apply power to them.	
9	**Configure scanner to communicate with the adapter.** Use a network tool for Profibus to configure the master on the network.	Chapter 4, Configuring the Profibus Scanner
10	**Create a ladder logic program.** Use a programming tool such as RSLogix to create a ladder logic program that enables you to do the following: • Control the adapter and connected drive. • Monitor or configure the drive using Parameter Messaging.	Appendix D, SLC Ladder Logic Examples

Status of Operation

The adapter uses three status indicators to report its operating status. They can be viewed through the drive cover. See Figure 1.2.

Figure 1.2   Status Indicators *(location on drive may vary)*
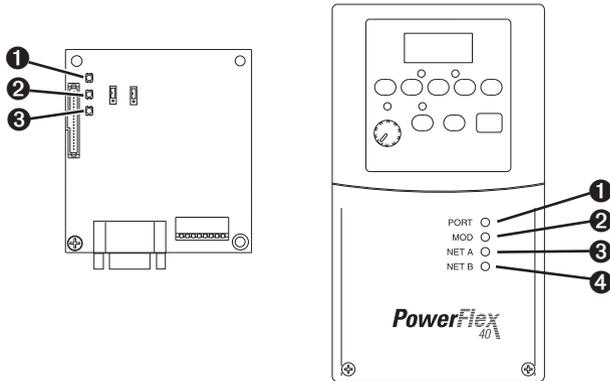
Item	Status Indicator	Status[1]	Description
❶	PORT	Green	Normal Operation. The adapter is properly connected and is communicating with the drive.
		Flashing Green	Not used
❷	MOD	Green	Normal Operation. The adapter is operational and is transferring I/O data.
		Flashing Green	Normal Operation. The adapter 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	Not used
❹	NET B	Off	Not used for Profibus adapter.

[1] If all status indicators are off, the adapter is not receiving power. See Chapter 2, Installing the Adapter, for instructions on installing the adapter. If any other conditions occur, see Chapter 8, Troubleshooting.

Notes:

Installing the Adapter

This chapter provides instructions for installing the adapter in a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive. This adapter can also be installed in a DSI External Comms Kit. In this case, refer to the *22-XCOMM-DC-BASE Installation Instructions* (publication 22COMM-IN001) supplied with the kit.

Preparing for an Installation

Before installing the adapter, verify that you have all required equipment. See Chapter 1, Required Equipment.

Commissioning the Adapter

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

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

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

1. Set the adapter Node Address / Firmware Update switches (see Figure 2.1).

   The Profibus Node Address/Firmware Update State is configurable using an 8-bit DIP switch. The low seven bits set a node address and the valid address allows binary coding of 1 through 125. A new node address setting is recognized only when power is applied to the adapter by power cycling the drive or after an adapter Reset Module command. The MSB bit provides write access for the module flash firmware update. In normal operating state, SW8 should be set to 1.

   Figure 2.1   Setting the Node Address/Firmware Update Switches, Byte Swap Jumper and Single/Multi-Drive Operation Jumper
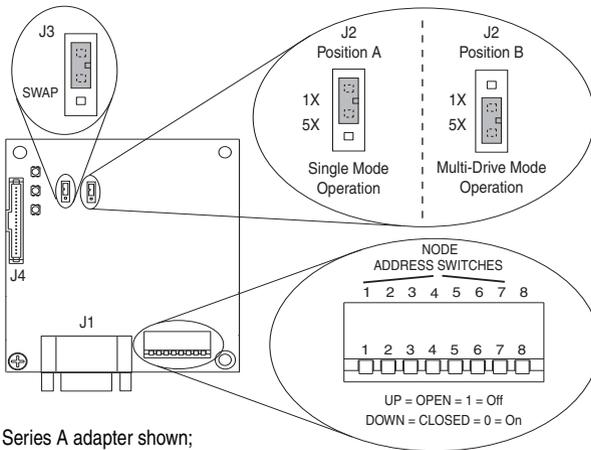
   Series A adapter shown;
   Series B adapter Jumper J2
   and J3 locations are different

Switches	Description	Default
SW 1	Least Significant Bit (LSB) of Node Address	1
SW 2	Bit 1 of Node Address	1
SW 3	Bit 2 of Node Address	1
SW 4	Bit 3 of Node Address	1
SW 5	Bit 4 of Node Address	1
SW 6	Bit 5 of Node Address	1
SW 7	Most Significant Bit (MSB) of Node Address	1
SW 8	SW8 Firmware Update	1

SW 8 Setting	Description
0	Write Access Firmware Update
1	Normal Operating State

Important: In normal operating state, SW8 should be set to 1.

Figure 2.2   Node Address Switch Settings (UP = OPEN = 1 = Off)

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Node Addr.
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1
0	1	0	0	0	0	0	2
1	1	0	0	0	0	0	3
0	0	1	0	0	0	0	4
1	0	1	0	0	0	0	5
0	1	1	0	0	0	0	6
1	1	1	0	0	0	0	7
0	0	0	1	0	0	0	8
1	0	0	1	0	0	0	9
0	1	0	1	0	0	0	10
1	1	0	1	0	0	0	11
0	0	1	1	0	0	0	12
1	0	1	1	0	0	0	13
0	1	1	1	0	0	0	14
1	1	1	1	0	0	0	15
0	0	0	0	1	0	0	16
1	0	0	0	1	0	0	17
0	1	0	0	1	0	0	18
1	1	0	0	1	0	0	19
0	0	1	0	1	0	0	20
1	0	1	0	1	0	0	21
0	1	1	0	1	0	0	22
1	1	1	0	1	0	0	23
0	0	0	1	1	0	0	24
1	0	0	1	1	0	0	25
⋮							⋮
0	0	0	0	1	1	1	112
1	0	0	0	1	1	1	113
0	1	0	0	1	1	1	114
1	1	0	0	1	1	1	115
0	0	1	0	1	1	1	116
1	0	1	0	1	1	1	117
0	1	1	0	1	1	1	118
1	1	1	0	1	1	1	119
0	0	0	1	1	1	1	120
1	0	0	1	1	1	1	121
0	1	0	1	1	1	1	122
1	1	0	1	1	1	1	123
0	0	1	1	1	1	1	124
1	0	1	1	1	1	1	125

2. Verify the Network Baud rate, which is set by the network master and depends on cable length (see Glossary).

   The 22-COMM-P adapter uses the Auto-Baud function, which enables the adapter to recognize the present baud rate and automatically sets itself to the transmission rate used by the master.

   The adapter supports the following data rates: 9.6 Kbps, 19.2 Kbps, 45.45 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps, and 12 Mbps. After detecting the correct baud rate, the baud rate that was found is monitored continuously.

3. Set the byte SWAP Jumper J3, which determines the Intel or Motorola (position SWAP) data format, depending on the corresponding PLC. (see Figure 2.1)

4. Verify the adapter Mode Jumper J2 is in "1X" for Single mode operation or in "5X" for Multi Drive mode operation (see Figure 2.1 and setting descriptions below). For complete details on Multi-Drive mode operation, see Chapter 7, Using Multi-Drive Mode.

J2 Jumper Setting	Description
Figure 2.1 Position A (or jumper missing)	Sets the adapter for Single mode of operation (default setting) using a single drive connection.
	Important: In this mode, connections to multiple drives must be removed since all powered and connected hosts will respond to any message sent by the adapter.
Figure 2.1 Position B	Sets the adapter for Multi-Drive mode of operation using up to 5 different drives. DSI peripherals do not operate with the adapter in this mode.

Connecting the Adapter to the Drive

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

1. Remove power from the drive, and remove the drive cover.

2. Use static control precautions.

3. Mount the adapter on the *required special* drive cover (ordered separately; see Figure 2.3 for part numbers).

   – Frame B: Do not use the adapter screw; snap the adapter in place.
   – Frame C: Use the adapter screw to secure the adapter to the cover.

   Important: To properly ground the adapter in Frame B drives, install the special drive cover onto the drive using both cover fasteners. To ground the adapter in Frame C drives, tighten the adapter's lower left screw (Figure 2.3). In either case, tighten the screw(s) to the recommended torque (0.9 N•m/8.0 lb•in) to properly ground the adapter.

Figure 2.3   Mounting and Grounding the Adapter – PowerFlex 40/40P Frames B and C, and PowerFlex 400 Frame C

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

PowerFlex 40/40P Frame B – Part No. 22B-CCB
PowerFlex 40/40P Frame C – Part No. 22B-CCC
PowerFlex 400 Frame C – Part No. 22C-CCC

R/L1 S/L2 T/L3 U/T1 V/T2 W/T3

BR+ BR-

0.9 N•m
(8.0 lb•in)

PowerFlex 40 Drive (Frame C
shown with cover removed)

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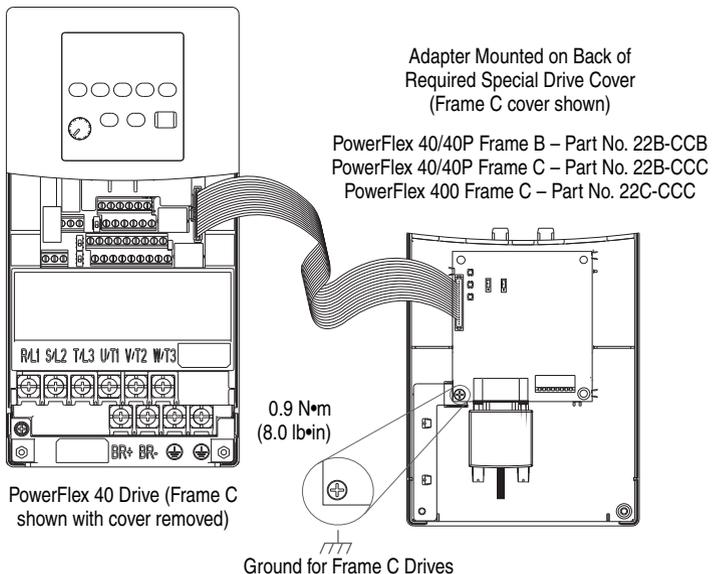
NOTE: For Frame B drives, the lower left adapter screw does not ground the adapter. To ground the adapter, install the special drive cover onto the drive using both cover fasteners.

4. Connect the Internal Interface cable to the DSI port on the drive and then to the mating DSI connector on the adapter.

Figure 2.4   Connecting DSI Ports with Internal Interface Cable
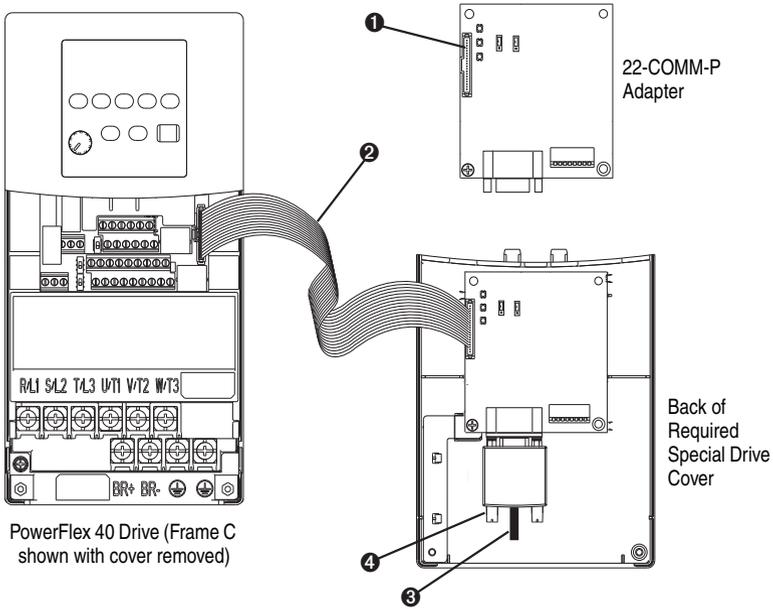
Item	Description
❶	DSI Connector
❷	15.24 cm (6 in.) Internal Interface cable
❸	Profibus cable
❹	Retaining screws

PowerFlex 400 Frames D, E, and F

1. Remove power from the drive, and open the drive cover.

2. Use static control precautions.

3. With the adapter board right side up, remove its mounting screw from the lower left hole. Save the screw for mounting in Step 6.

4. Connect the Internal Interface cable to the DSI port on the drive (see).

5. With the adapter board oriented bottom side up, route the Internal Interface cable under the adapter, and then to the mating DSI connector on the adapter.

6. Install the adapter, bottom side up, to the right side of the display board by snapping it into place. Then insert the adapter mounting screw into the lower left hole on the board.

   Important: Tighten the mounting screw in the adapter's lower left hole to the recommended torque (0.9 N•m/8.0 lb•in) to ground the adapter to the drive.

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

Adapter Installation (Side View)

Bottom of Adapter Board

LEDs

Connector

Internal Interface Ribbon Cable

PowerFlex 400 (Frame D shown with cover removed)
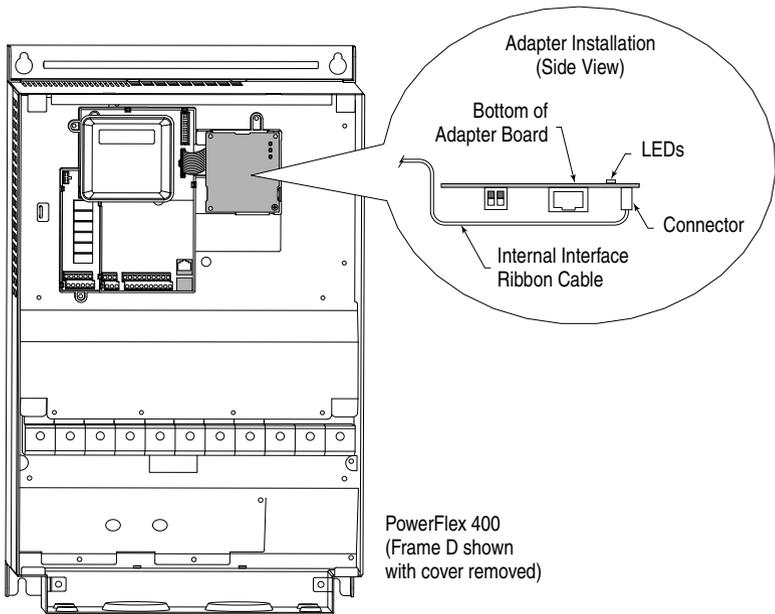
DSI External Comms Kit 22-XCOMM-DC-BASE

When connecting the adapter to a DSI External Comms Kit, use either an RS-485-rated cable with two connectors (from AK-U0-RJ45-TB2P kit) or an 8-conductor cable such as a standard ethernet patch cord or a 22-RJ45CBL-C20 cable.

Figure 2.6   Single Mode Example - With Adapter in DSI External Comms Kit
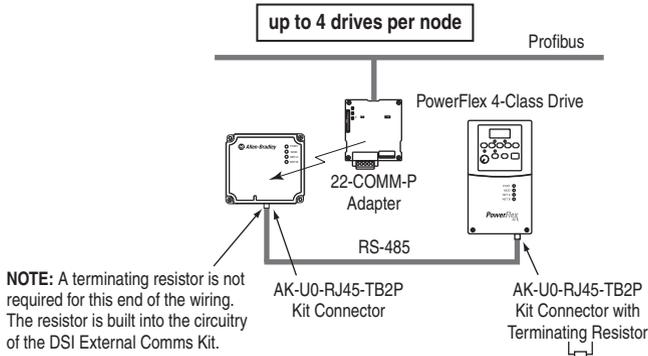
Connecting the Adapter to the Network

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

1. Remove power from the drive.

2. Use static control precautions.

3. Remove the drive cover

4. Connect a Profibus connector to the cable. (See Figure 2.7 and Figure 2.8). Only use cable that conforms to Profibus cable standards. Belden #3079A Profibus cable or equivalent is recommended.

    [**Note**: Profibus connectors are available from a variety of sources and in various sizes. As such, there may be mechanical limitations that prohibit the use of some connectors. ERNI Profibus vertical (Node Part # 103658 and Termination Part # 103659), or Phoenix

Subcon Plus M1 (Part # 2761826) are recommended for use with
PowerFlex 40, PowerFlex 40P, and PowerFlex 400 drives.]

Figure 2.7   Connecting to the Cable
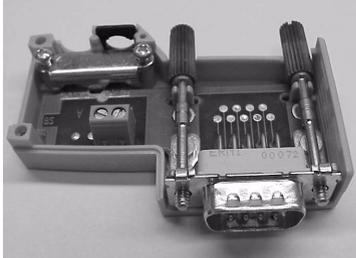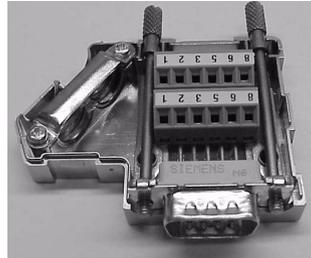
ERNI Connector   Phoenix Subcon Plus M1 Connector

Figure 2.8   Network Wiring Diagram
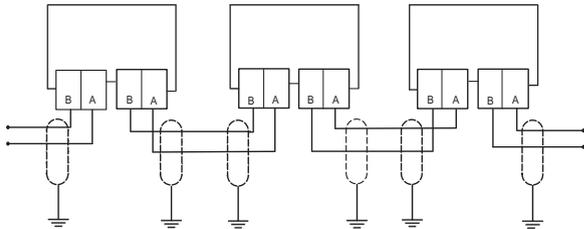
Figure 2.9   22-COMM-P DB-9 Pin Layout

Terminal	Signal	Function
Housing	Shield	
1 and 2	Not connected	
3	B-LINE	Positive RxD/TxD, according to RS485 specification
4	RTS	
5	GND BUS	Isolated GND from bus
6	+5V BUS	Isolated +5V from bus
7 and 9	Not connected	
8	A-LINE	Negative RxD/TxD according to RS485 specification

5. Connect the Profibus cable to the network, secure it with the two
retaining screws on the connector, and route it through the bottom of
the PowerFlex drive (see .)

Notes: a) The screws on some connectors tie the Profibus cable
ground/shield to the metal of the socket. In some cases,
Profibus will not operate correctly without this connector.

b) Keep wiring away from high noise sources such as motor
cables.

6. Depending on the switching frequency of the drive, it is optional to use the ferrite cable clamp around the communication cables next to the D-Sub connector, to reduce high frequency emission. See Figure 2.10.

Figure 2.10   Optional Clamp-On Ferrite Cable Clamp
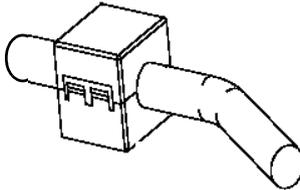
Install ferrite core within 10 cm (4 in.) of Profibus connector.

To meet the requirements of EN55011 Class A or B, the conditions listed below must be satisfied.

Switching Frequency of PowerFlex Drive	EN55011 Class A	EN55011 Class B
4 kHz	No ferrite required	Use one ferrite (Ferrishield part no. HI28B2039 or Fair-Rite part no. 0443164151)
6 kHz		
8 kHz		
16 kHz		Use three clip ferrites TDK, type ZCAT 3035-1330

Notes: 1) For the conditions to satisfy the essential requirements for CE compliance on PowerFlex drives, see the drive User Manual.

2) In applications where first environment, unrestricted distribution is requested (EN55011 group 1, class B), the installation requires a shielded enclosure. See the PowerFlex drive User Manual.

Termination

The first and last node on the Profibus network needs to be terminated by using a Profibus connector with terminating resistors (see Figure 2.11).

Some connector manufacturers offer standard terminating connectors, such as the yellow ERNI Profibus termination vertical connector (Part # 103659). Standard Profibus node connectors, such as the Phoenix Subcon Plus M1 (Part #2761826), can be configured as a terminating connector by adding resistors

Figure 2.11   Connection for Terminating Resistors
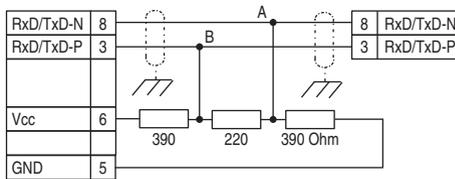
Applying Power

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

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

2. Ensure that the adapter will have a unique address on the network. If a new address is needed, reset its switches (see Commissioning the Adapter in this chapter).

3. Apply power to the drive. The adapter receives its power from the connected drive and network. When you apply power to the adapter 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. Refer to Chapter 8, Troubleshooting.

4. Apply power to the master device and other devices on the network.

Notes:

Configuring the Adapter

This chapter provides instructions and information for setting the parameters in the adapter.

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

Configuration Tools

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

Tool	See…
PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S)	page 3-2
DriveExplorer Software (version 3.01 or later)	http://www.ab.com/drives/driveexplorer, or DriveExplorer online help (installed with the software)
DriveTools SP Software (version 2.02 or later)	http://www.ab.com/drives/drivetools, or DriveExecutive online help (installed with the software)

Using the Optional, External PowerFlex 4-Class HIM

Adapter parameters cannot be accessed using the integral keypad on a PowerFlex 4-Class drive. You must use Drive Explorer or DriveExecutive software, or an optional, external PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S). Basic steps to access parameters in the adapter are shown in . For additional HIM information, refer to the *PowerFlex 4-Class HIM Quick Reference* (publication 22HIM-QR001).

Important: The optional, external PowerFlex 4-Class HIM will only operate when the adapter is set to Single mode. To access adapter parameters when the adapter is set to Multi-Drive mode, you must use DriveExplorer or DriveExecutive.

Table 3.A   Accessing Adapter Parameters Using the HIM

Step	Example Screens
1. Power up the drive. Then plug the external HIM into the bottom of the drive. The **Parameters** menu for the <u>drive</u> will be displayed.	Parameters Groups Linear List Changed Params DIAG PARAM DSEL MEM SEL ▶
2. Press Sel key once to display the **Device Select** menu.	Device Selected DSI Devices DIAG PARAM DSEL MEM SEL ▶
3. Press (Enter) key to display the **DSI Devices** menu. Press Arrow to scroll to 22-COMM-P.	DSI Devices PowerFlex 40 22-COMM-P
4. Press (Enter) key to select the Profibus adapter. The **Parameters** menu for the <u>adapter</u> will be displayed.	Parameters Linear List Changed Params DIAG PARAM DSEL MEM SEL ▶
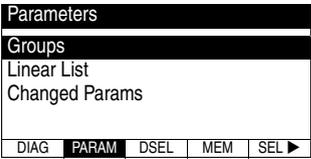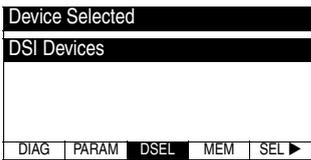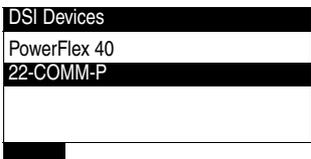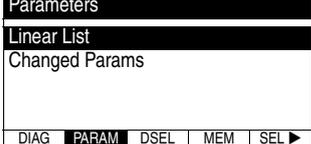
Table 3.A   Accessing Adapter Parameters Using the HIM (Continued)

Step	Example Screens
5. Press ⏎ (Enter) key to access the parameters. Edit the adapter parameters using the same techniques that you use to edit drive parameters.	Mode RO Parameter: # 001 Single Drv 0 VALUE LIMITS SEL ▶
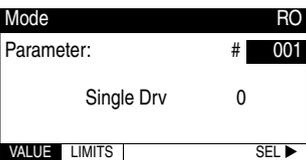
NOTE: All configuration procedures throughout this chapter use the optional, external PowerFlex 4-Class HIM to access parameters in the adapter and show HIM screens.

Using DriveExplorer via 22-SCM-232 or 1203-USB

DriveExplorer software (version 3.01 or later) and the 22-SCM-232 Serial Converter Module (revision 2.001 or later) or 1203-USB can be used to access parameters in the adapter.

1. Connect the 22-SCM-232 or 1203-USB to the drive (for example, PowerFlex 40) and to a PC serial COM port, and apply power to the drive.

2. Launch DriveExplorer and click the "Connect Serial" button in the toolbar. In the left window under Devices, "Node 1: PowerFlex 40" appears. There are three configurable devices: the PowerFlex 40 drive, Profibus adapter, and Serial Converter Module 22-SCM-232.

Figure 3.1   Example DriveExplorer Window to Access Adapter Parameters
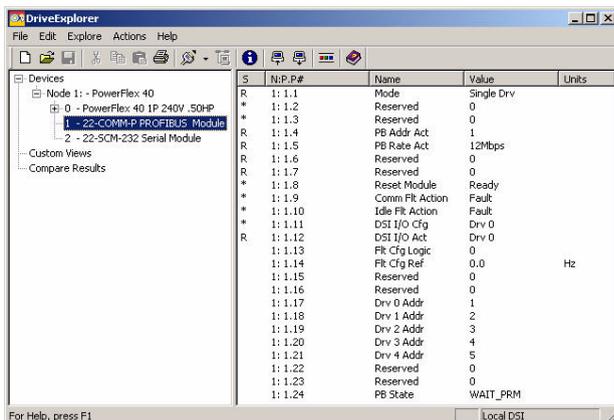
For additional information, see DriveExplorer online help.

Setting the Node Address

See page 2-2 for details to set the node address.

Setting the I/O Configuration

The I/O configuration determines the number of drives that will be represented on the network as one node by the adapter. If the Mode Jumper J2 is set to the "1x" (Single mode) default position, only one drive is represented by the adapter and **Parameter 11 - [DSI I/O Cfg]** has no effect. If the Mode Jumper J2 is set to the "5x" (Multi-Drive) position, up to five drives can be represented as one node by the adapter.

1. Set the value in **Parameter 11 - [DSI I/O Cfg]**.

Figure 3.2   Example DSI I/O Cfg HIM Screen

```
DSI I/O Cfg
Parameter:              #    011

           Drive 0      0

VALUE   LIMITS              SEL ▶
```

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

When the adapter is internally mounted in a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive, this drive is always Drive 0. Drives 1 through 4 are PowerFlex 4-Class drives that are daisy-chained to the RJ45 (RS-485) port on Drive 0. When the adapter is remotely mounted in a DSI External Comms Kit, Drives 0 through 4 are daisy-chained to the RJ45 (RS-485) port on the Comms Kit. Refer to Chapter7, Using Multi-Drive Mode for more information.

2. Configure the parameters in the drive to accept the Logic Command and Reference from the adapter. In a PowerFlex 40 drive, for example, set parameter P036 - [Start Source] and parameter P038 - [Speed Reference] both to "5" (Comm Port). When using the adapter in Multi-Drive mode, each daisy-chained drive requires that additional parameters be set. See Configuring the RS-485 (DSI) Network on page 7-8 for these parameters and their settings.

3. Reset the adapter. See Resetting the Adapter on page 3-8.

The adapter is ready to receive I/O from the master (that is, scanner). You must now configure the scanner to recognize and transmit I/O to the adapter. See Chapter4, Configuring the Profibus Scanner.

Setting a Fault Action

By default, when Profibus communication is disrupted (for example, a cable is disconnected) or the master is idle, the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruption using **Parameter 9 - [Comm Flt Action]** and a different response to an idle scanner using **Parameter 10 - [Idle Flt Action]**.

> ⚠️ **ATTENTION:** Risk of injury or equipment damage exists. **Parameters 9 - [Comm Flt Action]** and **10 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if communications are disrupted or the controller is idle. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage.

Changing the Fault Action

Set the values of **Parameters 9 - [Comm Flt Action]** and **10 - [Idle Flt Action]** to the desired responses:

Value	Action	Description
0	Fault (Default)	The drive is faulted and stopped, the last state of bits 0…3 in the Logic Command word is held, and the rest of the bits are cleared. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent 0 for output data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameters 13 - [Flt Cfg Logic]** and **14- [Flt Cfg Ref]**).
5 [1]	Fault&ClrCmd	The drive is faulted and stopped, and all of the bits (including bits 0…3) in the Logic Command word are cleared.

[1] This setting is available only with adapter firmware revision 3.xxx or later.

Figure 3.3 Example Fault Action HIM Screens

```
┌─────────────────────────────────┐   ┌─────────────────────────────────┐
│ Comm Flt Action                 │   │ Idle Flt Action                 │
│ Parameter:            #   009   │   │ Parameter:            #   010   │
│                                 │   │                                 │
│               Fault   0         │   │               Fault   0         │
│                                 │   │                                 │
│ VALUE  LIMITS           SEL ▶   │   │ VALUE  LIMITS           SEL ▶   │
└─────────────────────────────────┘   └─────────────────────────────────┘
```

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, Drive 0-1 to Drive 0-4).

Setting the Fault Configuration Parameters

If you set **Parameter 9 - [Comm Flt Action]** or **10 - [Idle Flt Action]** to the "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault occurs and/or the scanner is idle. You must set these parameters to values required by your application.

Number	Name	Description
13	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command.
14	Flt Cfg Ref	A 16-bit value (0 – 4000) sent to the drive as a Reference.

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

Setting DSI Loss Action

When the adapter detects that DSI communication with the drive has been lost, **Parameter 25 - [DSI Loss Action]** sets the action that the adapter will take for the Logic Status and Feedback words.

Important: **Parameter 25 - [DSI Loss Action]** is available only with adapter firmware revision 4.001 or later, and only applies when the adapter is operated in Single mode. When operated in Multi-Drive mode, the Logic Status and Feedback words are zeroed for any drive that loses DSI communication.

⚠️ **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 25- [DSI Loss Action]** lets you determine the action of the adapter when DSI communication with the drive has been lost. By default, this parameter maintains the Logic Status and Feedback word values sent to the controller at the time DSI communication between the adapter and drive was lost (that is, hold last state). Alternatively, you can set this parameter so that the Logic Status and Feedback word values are zeroed after a DSI communication loss. Whether the drive faults or takes a different action is determined by the setting of the following drive parameter:

Drive	Parameter Number/Name
PowerFlex 4, 40, and 40P	A105 - [Comm Loss Action]
PowerFlex 4M	C304 - [Comm Loss Action]
PowerFlex 400	C105 - [Comm Loss Action]

Precautions should be taken to ensure that the setting of adapter **Parameter 25** and drive parameter A105, C304 or C105 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 faulty drive DSI cable or excessive electrical noise interference).

Set the value of **Parameter 25- [DSI Loss Action]** to a desired response:

Value	Action	Description
0	Hold Sts/Fbk (Default)	Holds the last data in the Logic Status and Feedback words prior to the DSI communication loss fault.
1	Zero Sts/Fbk	Zeros the data in the Logic Status and Feedback words prior to the DSI communication loss fault.

Figure 3.4   Example DSI Loss Action HIM Screen

```
┌─────────────────────────────────┐
│ DSI Loss Action                 │
│ Parameter:           #   025    │
│                                 │
│        Hold Sts/Fbk  0          │
│                                 │
│ VALUE  LIMITS            SEL ▶  │
└─────────────────────────────────┘
```

Changes to this parameter take effect immediately. A reset is not required.

Resetting the Adapter

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

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

Set **Parameter 08 - [Reset Module]** to "1" (Reset Module).

Figure 3.5   Example Reset HIM Screen

Reset Module
Parameter: #   008

              Ready   0

VALUE   LIMITS   SEL ▶

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

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

Viewing the Adapter Configuration

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

Adapter Parameter	Description
01 - [Mode]	Displays the adapter operating mode selected with the Mode Jumper J2. Values 0 = Single Drv operation 1 = Multiple Drv operation
04 - [P-DP Addr Actual]	Profibus Node Address actually used by the adapter.
05 - [P-DP Rate Actual]	Profibus actual operating data rate.
12 - [DSI I/O Act]	Indicates the Drives that are active.

Bit Definitions	
Single Mode	**Multi-Drive Mode**
Bit 0 = Drive Bits 1…7 = Not Used	Bit 0 = Drive 0 Bit 1 = Drive 1 Bit 2 = Drive 2 Bit 3 = Drive 3 Bit 4 = Drive 4 Bits 5…7 = Not Used

Notes:

Configuring the Profibus Scanner

Profibus scanners are available from several manufacturers, including SST. This chapter provides instructions on how to utilize the SST Profibus configuration software tool to:

- Install the 22-COMM-P GSD file in the software tool library
- Configure the SST-PFB-SLC Profibus Scanner.

Example Network

In this example, we will be configuring two **PowerFlex 40** drives, to be Station 1 and Station 2 on a Profibus network. This will be the configuration used throughout the manual. Apart from the node address and scanner mapping, they will have identical configurations. This chapter describes the steps to configure a simple network like the network in .

Figure 4.1   Example Profibus Network

SYS LED

COMM LED

Config Port

Front Label

Profibus Port

Station 0

PowerFlex 40
Station 1

PowerFlex 40
Station 2
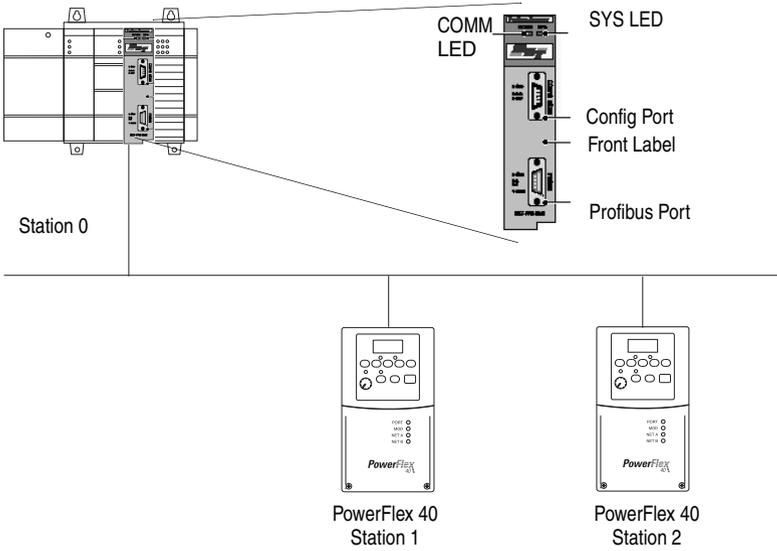
SST Profibus Configuration Software Tool

SST Profibus scanners come with a software tool for configuring the scanner (see Figure 4.2).

Figure 4.2   SST Profibus Configuration Software Tool

Device Library Window

Network Configuration Window

Online Browse Window
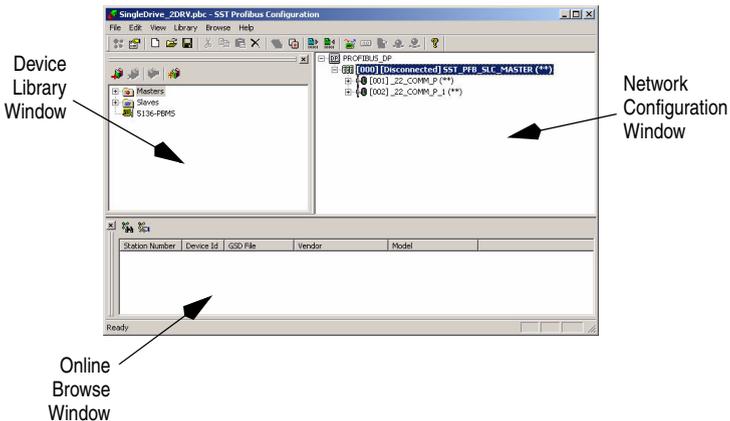
Installing 22-COMM-P GSD File in Software Tool Library

GSD files are used by software tools to configure the network, i.e. to map and define the I/O in a Profibus scanner. A GSD file is required for each type of adapter on the network. For example: The 22-COMM-P GSD file is "A_B_07FF.gsd" and a copy of the file is provided on a floppy disk with each 22-COMM-P. The file can also be downloaded from the Internet by going to: www.ab.com/support/abdrives/webupdate and also www.profibus.com.

Follow the steps outlined below only when a new GSD file needs to be added to the SST Profibus Configuration Software Tool. Typically, this is only done once, after the software tool is initially installed or if configuring a 22-COMM-P on the network for the very first time with this software tool.

1. The software tool comes with standard data files as shown in Figure 4.3. Additional data files, such as the 22-COMM-P GSD file, will need to be added to configure the 22-COMM-P in the scanner.

Figure 4.3   Standard Data Files
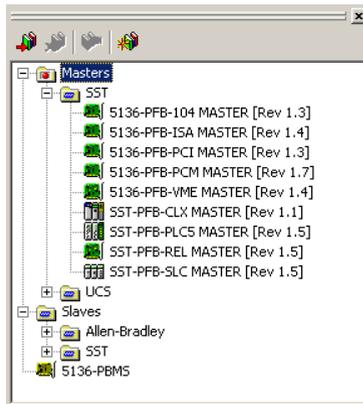
2. Click on the "New Device" icon 🔧 to add GSD files to the software library tool.

3. An "Add Profibus devices" Applet window will appear (Figure 4.4). Prompts for the location of the Profibus data files to be added to the library will follow.

Figure 4.4   Add Profibus Devices Applet Window
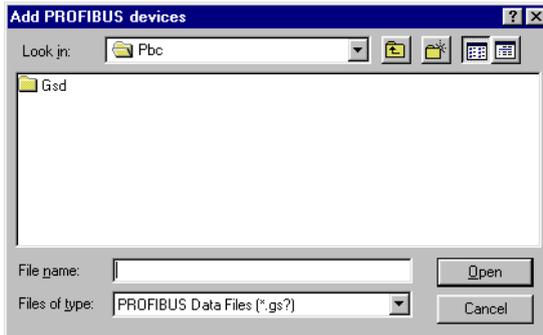
4. Find the directory location of the data file(s) you wish to add (typically, the source location is a floppy disk in drive A:). "A_B_07FF.gsd" is the GSD file for the 22-COMM-P as shown in Figure 4.5.

Figure 4.5   Adding the GSD File for the Adapter
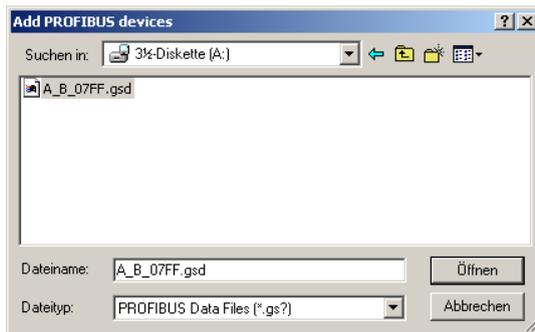
5. Select "A_B_07FF.gsd" for the 22-COMM-P and click **Open**.

6. Click on the (+) sign of the Slaves folder as shown in <u>Figure 4.6</u>.

Figure 4.6   Masters/Slaves Library Window
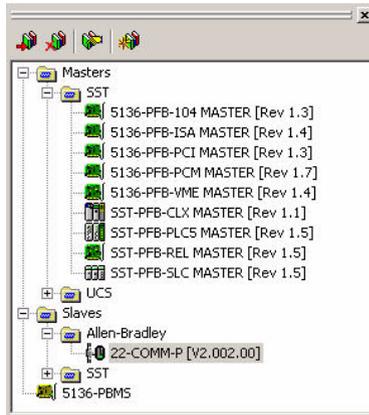
The software tool will automatically create an Allen-Bradley sub-folder (in the Slaves folder) if it does not already exist. The 22-COMM-P is now shown in the library and the software tool is now ready to configure a 22-COMM-P on a Profibus network.

Configuring the SST-PFB-SLC Profibus Scanner

The following steps are performed to configure the SST-PFB-SLC scanner using the SST Profibus Configuration Software Tool. In our example, the Profibus network will consist of a SLC master and two PowerFlex 40 drives working in Single Drive mode. The configuration example is:

- Drive 0: Ctrl/Stat & Ref/Fdbk enabled
  Parameter Access enabled
- Drive 1: Ctrl/Stat & Ref/Fdbk enabled
  Parameter Access enabled

The SLC processor must be in Program mode to configure the scanner.

1. Click on the (+) sign of the **Masters** folder in the Library window to open the **SST** sub-folder. Available Profibus DP masters are displayed in this sub-folder.

2. Click on the (+) sign of the **Slaves** folder in the Library window and the **Allen-Bradley** sub-folder to display the available Profibus DP slaves or the 22-COMM-P slave. Refer to <u>Figure 4.6</u>.

3. Double-click the **SST-PFB-SLC MASTER** in the Masters folder in the Library window to add the scanner to the network.

4. A user-defined **Name** and **Description** can be given to the scanner. In our example, the scanner will be **Station 0** on the network, as shown in Figure 4.7.

Figure 4.7   SST-PFB-SLC Master (General) Dialog Box
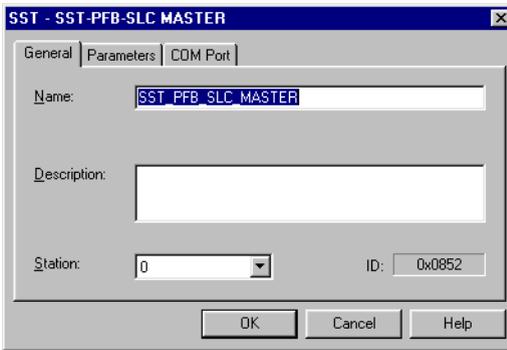
5. Click on the Parameters tab to view the Scan Cycle Times. In our example, use the default settings as shown in Figure 4.8.

Figure 4.8   Scan Cycle Times Dialog Box
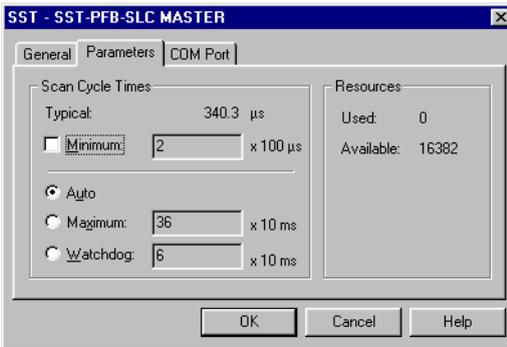
Connection and Baud Rate settings configure how the software tool will communicate with the CONFIG RS232 port on the scanner.

6. Click on the COM Port tab.

7. Accept the settings in our example (COM1 on the PC @ 115200 bps baud rate), as shown in Figure 4.9.

Figure 4.9   COM Port Default Settings
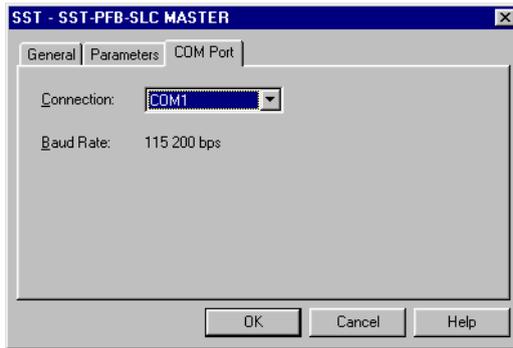
8. The scanner will appear in the network window as shown in
Figure 4.10. Double-click on the scanner in the network window.

Figure 4.10   Scanner Network Window

9. Double-click on the **22-COMM-P** listed in the Allen-Bradley
22-COMM-P library folder. A user-defined **Name** and **Description**
can be given to this 22-COMM-P.

In our example, this device will be **Station 1** on the network. Other
stations may be chosen by using the arrow to display a drop-down
list in the **Station** window.

Figure 4.11   Allen-Bradley Library Dialog Box
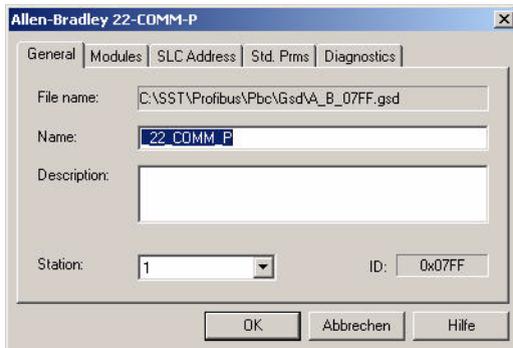
Logic Command/Status, Reference/Feedback and Parameter Access
(Parameter Data) modules are added using the Modules tab.

10. Click on the **Modules** tab. Click **A̲dd** to view the choice of modules.

Figure 4.12   Available Modules: Ctrl/Stat & Ref/Fdbk Window
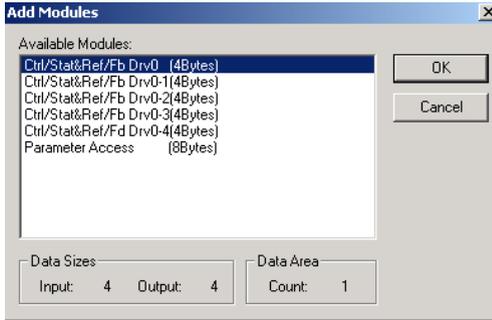
In our example, Station 1 will be controlled using Logic Command/ Status and Reference/Feedback. The Parameter Access will also be used. Because the Mode Jumper J2 on the Adapter is set to "1X" for Single Drive (default) and **Parameter 11 - [DSI I/O Cfg]** is set to **Drive 0,** Logic command/Reference uses 4 bytes and Logic Status/ Feedback uses 4 bytes.

Table 4.A   Input/Output Size Configurations

Input Size	Output Size	Logic Cmd/ Status	Reference/ Feedback	Parameter 1 - [Mode]	Parameter 11 - [DSI I/O Cfg]
4	4	✔	✔	Single Drv	Drive 0
8	8	✔	✔		Drives 0…1
12	12	✔	✔	Multiple Drv	Drives 0…2
16	16	✔	✔		Drives 0…3
20	20	✔	✔		Drives 0…4

11. Select Drive 0 "Ctrl/Stat & Ref/Fdbk (2+2bytes)" from the "Available Modules" list as shown in . Click **OK.** The Drive 0 "Ctrl/ Stat & Ref/Fdbk" (2+2 bytes) module has now been added.

Figure 4.13   Modules: Drive 0 Viewing Window
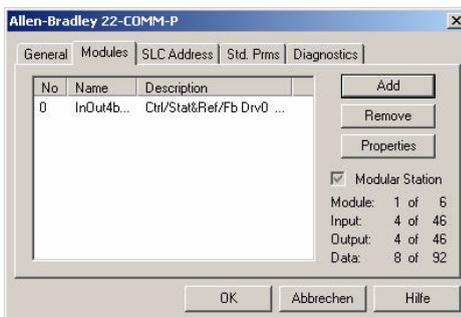
12. Click **Add** to continue adding modules. Select "Parameter Access" and click **OK**.

Figure 4.14   Add Modules: Parameter Access Selection Window
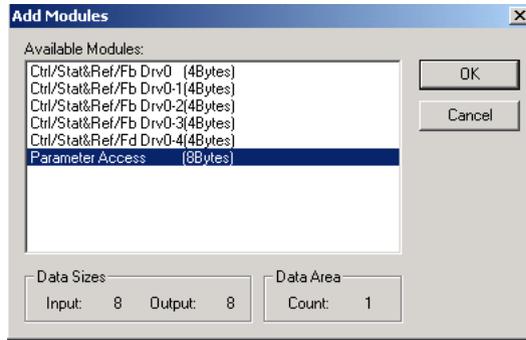
13. The "Parameter Access" module has now been added as shown in Figure 4.15.

Figure 4.15   Modules: Parameter Access Viewing Window
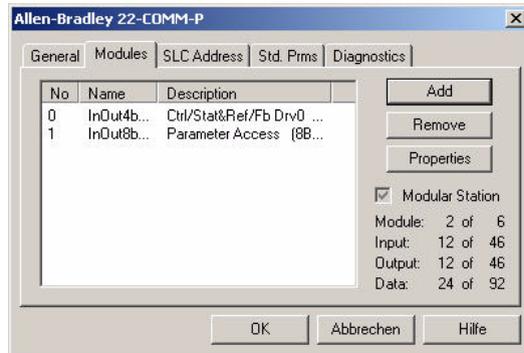
14. Click on the **SLC Address** tab as shown in Figure 4.16. Settings can be chosen to map Station modules to SLC addresses. In our example M1/M0 files are used for Input / Output.

Note that the Reference/Feedback Drive 0 (Ctrl/Stat & Ref/Fdbk) starts at word 0.

Figure 4.16   SLC Address: M1/M0 (Ctrl/Stat & Ref/Fdbk)
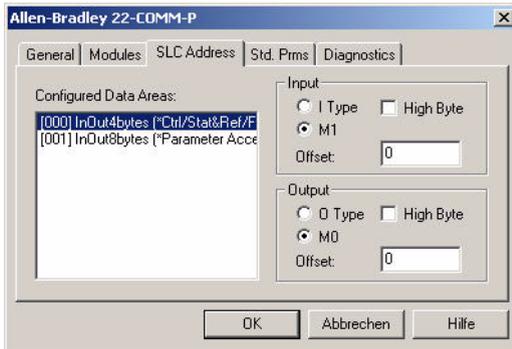
15. Parameter Access starts at word 2 in the M1/M0 files. Note that Parameter Access utilizes 4 words. Click **OK** when finished.

Figure 4.17   SLC Address: M1/M0 (Parameter Access)
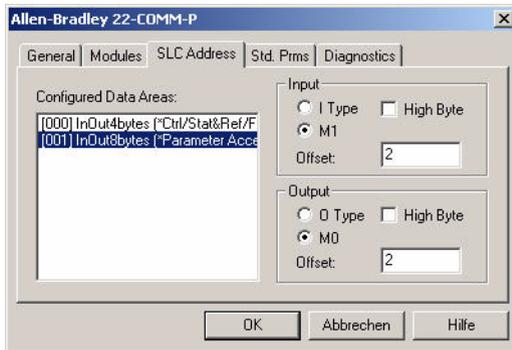
16. Station 1 is now displayed in the network window.

Figure 4.18   Station 1 Network Window

Station 1 is configured as follows:

Module	M1/M0 Offset
Ctrl/Stat & Ref Fdbk Drive 0	0
Parameter Access	2

Note that Station 1 occupies 6 words.

17. The same steps for configuring Station 1 will be used for configuring Station 2. See previous steps (starting at step 9, Page 4-7) for Configuring the SST-PFB-SLC Profibus Scanner-Station 2 (see Figure 4.19).

Figure 4.19   Station 2 Network Window

Station 2 is configured as follows:

Module	M1/M0 Offset
Ctrl/Stat & Ref Fdbk Drive 0	6
Parameter Access	8

Note that Station 2 occupies 6 words.

18. Use the null modem cable that came with the scanner to connect COM1 on the PC and the CONFIG RS232 port on the scanner.

Note: The processor needs to be in program mode before proceeding.

19. Right-click on the scanner in the network window and select "Connect". Then right-click again on the scanner in the network window and select "Load Configuration". If a minimum cycle time attention window pops up, click **OK** to continue. After the configuration has been loaded into the scanner, "Configured Program" will be displayed in the message window (see Figure 4.20).

Figure 4.20   Network Window Scanner Selection

20. Click **File** and **Save As** from the tool bar, as a unique File **Name**. The configuration of the scanner is now complete. Note that cycling power to the scanner is recommended (see Figure 4.21).

Figure 4.21   Save As Dialog Window
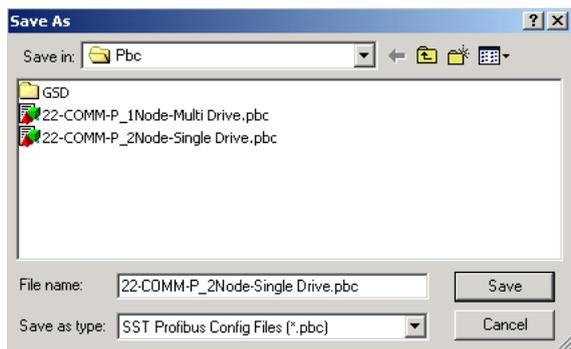
Summary of the example scanner configuration:

Module	M0 / M1 Addressing	
	Station 1	Station 2
Logic Command / Status	0	6
Reference / Feedback	1	7
Parameter Access	2	8

Using I/O Messaging

This chapter provides information that explains how to use I/O Messaging to control a PowerFlex 40 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 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

I/O messaging is used to transfer the data which controls the PowerFlex drive and sets its reference.

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

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

Understanding the I/O Image

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

• Configuration of the Mode Jumper (J2) on the adapter and **Parameter 11 - [DSI I/O Cfg]**. The image table always uses consecutive words starting at word 0.

Figure 5.1 illustrates an example of an I/O image (16-bit words) for the adapter operated in Single mode.

Figure 5.1   Example of I/O Image for Adapter in Single Operating Mode
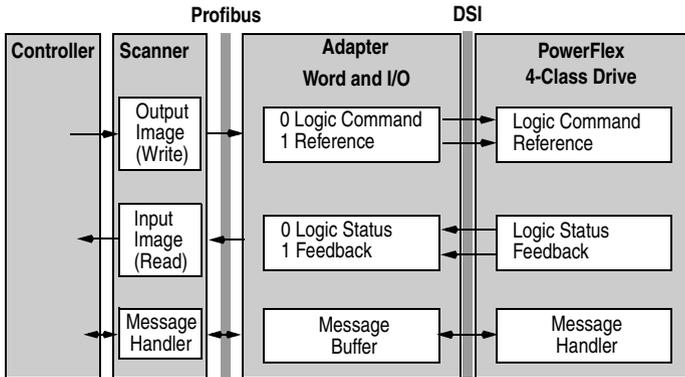
Single operating mode is the typical configuration, where one node consists of a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive with a 22-COMM-P adapter.

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

Using Logic Command/Status

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

This manual contains the bit definitions for compatible products available at the time of publication in Chapter C, PowerFlex 4-Class Drives Logic Command/Status Words. For other products, refer to their documentation.

Using Reference/Feedback

The *Reference* (16 bits) is produced by the controller and consumed by the adapter. The *Feedback* (16 bits) is produced by the adapter and consumed by the controller. When enabled, Reference/Feedback begins at word 1 in the I/O image.

Size	Drive	Valid Values [1]	Word in I/O Image
16-bit	PowerFlex 4 and 4M	-240.0…240.0 Hz	Word 1 (see Figure 5.1)
	PowerFlex 40 and 40P	-400.0…400.0 Hz	
	PowerFlex 400	-320.00…320.00 Hz	

[1] The Reference/Feedback for a PowerFlex 4-Class drive is set in Hz and not in engineering units like PowerFlex 7-Class drives. For example, "300" equates to 30.0 Hz (the decimal point is always implied) for all PowerFlex 4-Class drives except PowerFlex 400 for which "3000" equates to 30.00 Hz. In all cases, a minus value equates to reverse motor direction, and a plus value equates to forward motor direction.

Notes:

Using the Parameter Messaging

This chapter provides information that explains how to use Parameter Messaging to monitor and configure the adapter and connected PowerFlex 4-Class drive, as well as other peripherals.

> ⚠ **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 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 Parameter Messaging is 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 Parameter Messaging to write parameter data to NVS.

About the Parameter Messaging

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

To be able to use the parameter protocols in the 22-COMM-P, the Parameter Access module must be added to the master configuration when configuring the network. Refer to step 13, page 4-9 to view the procedure for adding the "Parameter Access" module to a configuration. This maps 4 words input and output to the end of the I/O configuration, which is used as the request/response in the parameter message format (Figure 6.2).

Running the Parameter Messaging

There are five basic events in the Parameter Data Exchange process defined below. The details of each step will vary depending on the controller. Refer to the documentation for your controller.

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

Figure 6.1   Parameter Data Exchange Process
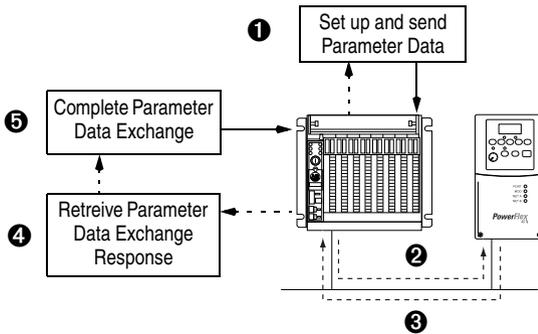
Event	Description
❶	You format the required data and set up the ladder logic program to send a Parameter Data Exchange request to the scanner module (download).
❷	The scanner module transmits the Parameter Data Exchange Request to the slave device over the Profibus network.
❸	The slave device transmits the Parameter Data Exchange Response back to the scanner. The data is stored in the scanner buffer.
❹	The controller retrieves the Parameter Data Exchange Response from the scanner buffer.
❺	The Parameter Data Exchange is complete.

Parameter Protocol

This protocol uses 4 words in the Profibus I/O area. Requests and responses are a handshake procedure and cannot be batched, meaning that if the master sends a request, it has to wait for the response before sending a new request.

With this protocol you can:

- Read 8-bit or 16-bit parameters from any DSI port
- Write 8-bit or 16-bit parameters to any DSI port
- Read the Adapter Fault Code
- Read Events
- Read Diagnostic Items

Figure 6.2   Parameter Message Format

	Request			Response		
Bit	15-12	11	10-0	15-12	11	10-0
Parameter Access Word 1 (PCA)	RC	SPM	PNU	RC	SPM	PNU
Parameter Access Word 2 (IND)	Subindex			Subindex		
Parameter Access Word 3 (PVA)	Spare			Spare		
Parameter Access Word 4 (PVA)	Parameter value			Parameter value		

See and for a description of the data that is required in each word.

Parameter Message Request

Word	Description
1	**PNU - Parameter Number** (Bit 0-10) The parameter number determines which parameter to access, in the selected peripheral. Parameters 1 - 1023 can be accessed. Parameter numbers 1024 - 2047 are used to access the fault object. Parameter 1024 is equal to the latest fault, 1025 to the prior fault, and so on. <u>Bit definitions</u> 1-1023 Parameters (Drive or Adapter) 1024 Adapter Fault Code 1025-1056 Adapter Events 1280-1289 Diagnostic Items (Single Drive) 1280-1304 Diagnostic Items (Multi Drive)
	SPM - Spontaneous Message (Bit 11) Reserved - Should always bet set to 0.
	RC - Request/Response Code (Bit 12-15) One of the following codes have to be used: 0 = No request 1 = Request parameter value 2 = Change parameter value (8-bit & 16-bit word) 3 = Spare 4 = Parameter minimum 5 = Parameter maximum 6 = default value 7 -15 = Reserved
2	**IND - Index** The IND is used to specify which drive we intend to send a message 0 - 2 bits = DSI port <u>Bit definitions</u> 0 0 0 Drive 0 single mode 0 0 1 Drive 0-1 multi-drive mode 0 1 0 Drive 0-2 multi-drive mode 0 1 1 Drive 0-3 multi-drive mode 1 0 0 Drive 0-4 multi-drive mode 1 0 1 Adapter 3 - 15 = Reserved
3	**PVA - Parameter value** Spare
4	**PVA - Parameter value** (8-bit & 16-bit word) Read Request: Not used Write Request: Contents the write value for a 8-bit or 16-bit parameter.

Parameter Message Response

Word	Description
1	**PNU - Parameter Number** (Bit 0-10) Requested parameter number.
	SPM - Spontaneous Message (Bit 11) Reserved - is always set to 0.
	RC - Request/Response Code (Bit 12-15) One of the following codes will be sent:
	0 = No request
	1 = Transfer parameter value (8-bit & 16-bit word)
	2 = Spare
	3-6 = Reserved
	7 = Request rejected (including Adapter Fault Code and Parameter Message Fault Code, see table below)
	9-15 = Reserved
2	**IND - Index** Port ID of requested parameter
3	**PVA - Parameter value** Spare
4	**PVA - Parameter value** (8-bit & 16-bit word) Read Response: Contents the value from a 8-bit or 16-bit parameter, or the Fault Code (if RC = "7"). Write Response: Confirms the write value for a 8-bit or 16-bit parameter, or the Fault Code (if RC = "7")

Adapter Fault Code

Code	Description
51	DSI port watchdog
52	Profibus network loss
53	Not compatible product
54	DSI time-out or additional DSI master connected

Parameter Message Fault Code

Code	Description
101	Service not supported (i.e., set service to a read-only parameter)
102	Service not valid
104	Parameter does not exist (i.e., parameter number > max number of parameters)
106	Data value out of range (i.e., set value is out of range)
107	State conflict (i.e., parameter is not changeable while the product is in an operating state)

Notes:

Using Multi-Drive Mode

This chapter provides information to explain how to use Multi-Drive mode.

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Single Mode versus Multi-Drive Mode

The DSI interface provides a means to connect up to five drives on one node daisy-chained over the RS-485 interface. Two adapter operating modes, Single or Multi-Drive, are possible.

Single mode is a typical network installation, where a single Profibus node consists of a single drive with a 22-COMM-P adapter (Figure 7.1). In this mode, the adapter can talk to one host, and the host can support one additional external peripheral (HIM or 22-SCM-232 or 1203-USB) over DSI.

Figure 7.1   Single Mode Example - With Adapter in Drive

1 drive per node

Profibus

PowerFlex 40/40P/400
Drive with 22-COMM-P

PowerFlex 40/40P/400
Drive with 22-COMM-P

PowerFlex 40/40P/400
Drive with 22-COMM-P
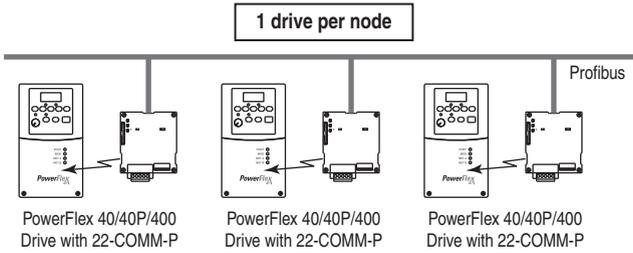
When the adapter cannot be installed in the drive (for example, a
PowerFlex 4 or PowerFlex 4M drive) but operated in Single mode, the
adapter can be installed in a DSI External Comms Kit (Figure 7.2).

Figure 7.2   Single Mode Example - With Adapter in DSI External Comms Kit

up to 4 drives per node

Profibus

PowerFlex 4-Class Drive

22-COMM-P
Adapter

RS-485

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

AK-U0-RJ45-TB2P
Kit Connector

AK-U0-RJ45-TB2P
Kit Connector with
Terminating Resistor
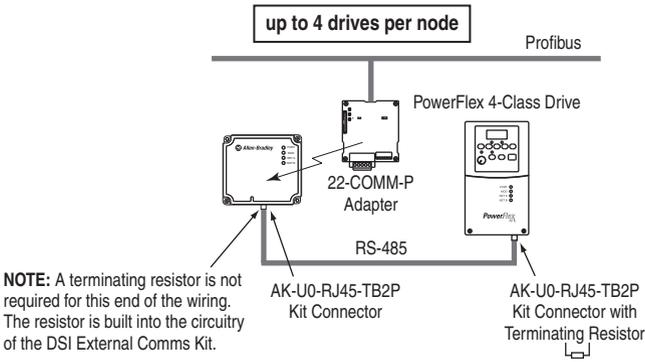
Figure 7.3 shows that the Single operating mode provides the possibility
of connecting one additional external peripheral.

Figure 7.3   DSI Peripheral Devices for Single Operating Mode Connection

**Single Mode
(up to 1 other DSI peripheral allowed)**

HIM

22-SCM-232
or
1203-USB
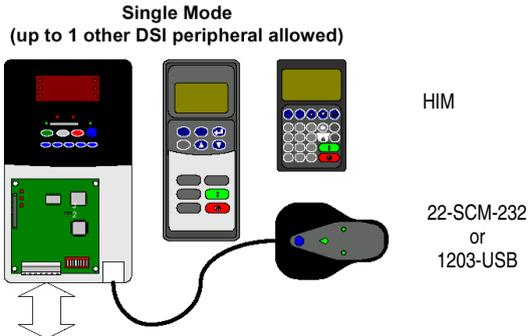
Multi-Drive mode is an alternative to the typical network installation, where a single Profibus node can consist of one to five drives. In Figure 7.4, the 22-COMM-P adapter is internally mounted in a PowerFlex 40, PowerFlex 40P or PowerFlex 400 drive, and the remaining PowerFlex 4-Class drives are daisy-chained from the RS-485 port on the first drive.

Figure 7.4   Multi-Drive Mode Example - With Adapter in Drive
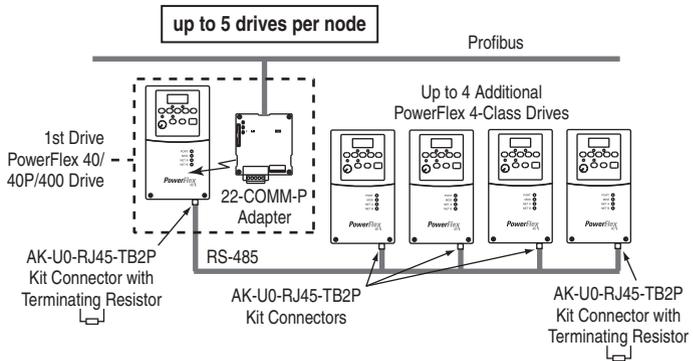
In this case, the unit will not operate with DSI peripheral devices such as the HIM or the 22-SCM-232 or 1203-USB and the application of any other peripheral will be prohibited.

In Figure 7.5, the 22-COMM-P adapter is remotely mounted in a DSI External Comms Kit (22-XCOMM-DC-BASE), and all PowerFlex 4-Class drives are daisy-chained from it.

Figure 7.5   Multi-Drive Mode Example - With Adapter in DSI External Comms Kit
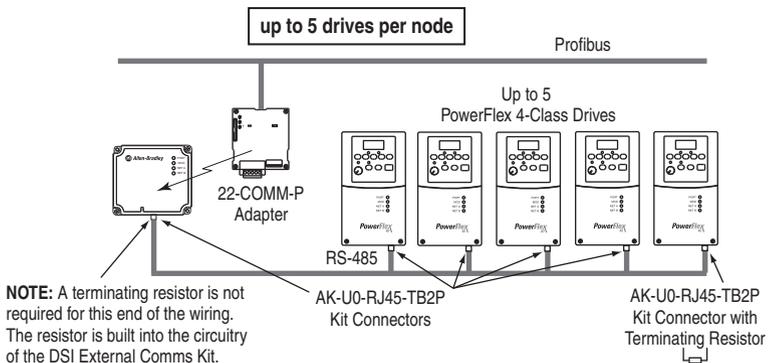
Benefits of Multi-Drive mode include:

- Lower hardware costs. Only one adapter is needed for up to five drives. Any PowerFlex 4-Class drive can be daisy-chained.

- Reduces the network node count. For example, in Single mode 30 drives would consume 30 nodes. In Multi-Drive mode, 30 drives can be connected in 6 nodes.

- Provides a convenient way to put more than one PowerFlex 4-Class drive on the network using only one adapter (PowerFlex 4 and PowerFlex 4M drives do not have an internal communications adapter slot).

- Controller can independently control, monitor, and read/write parameters for all five drives.

Trade-offs of Multi-Drive mode include:

- When a PowerFlex 40/40P/400 drive with an internal-mounted adapter is powered down, communications with the daisy-chained drives is disrupted and the drives will take the appropriate communications loss action set in each drive. However, communications will not be disrupted when the adapter is used in a DSI External Comms Kit and a daisy-chained drive is powered down.

- Communications throughput to the daisy-chained drives will be slower than if each drive was a separate node on the network (Single mode). This is because the adapter must take the network data for the other drives and sequentially send the respective data to each drive over RS-485. The maximum additional throughput time for Logic Command/Reference to be transmitted and received by each drive in Multi-Drive mode is:

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

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

Additional Information

- When the adapter—mounted in a PowerFlex 40/40P/400 drive or a DSI External Comms Kit— is powered up, all configured daisy-chained drives must be present before an I/O connection is allowed on the network (that is, before the drives can be controlled). If the adapter PORT indicator is steady green, the adapter is properly communicating with all drives on the Multi-Drive node. If the PORT indicator is steady red, one or more of the drives on the RS-485 network is not communicating.

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

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

  Important: Status information from the scanner will not indicate there is a fault at the node, and the I/O connection will not be dropped. If your application requires an action to be taken when DSI communication is lost with one or more drives, monitor adapter **Parameter 12 - [DSI I/O Act]** to verify that the adapter is communicating with all connected drives.

System Wiring

The AK-U0-RJ45-TB2P kit contains 6 two-position terminal block connectors (Figure 7.6) which can be used to conveniently daisy-chain the PowerFlex 4-Class drives. Two terminating resistors are also included with the AK-U0-RJ45-TB2P kit.

Figure 7.6   AK-U0-RJ45-TB2P Terminal Block Connector

Figure 7.7 and Figure 7.8 show wiring diagrams for using AK-U0-RJ45-TB2P terminal block connectors and terminating resistors.

Figure 7.7   Connector Wiring Diagram - With Adapter in Drive
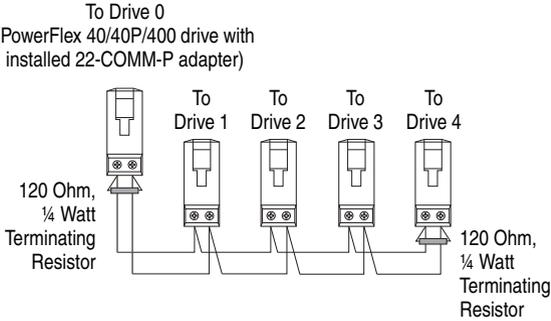
Figure 7.8   Connector Wiring Diagram - With Adapter in DSI External Comms Kit
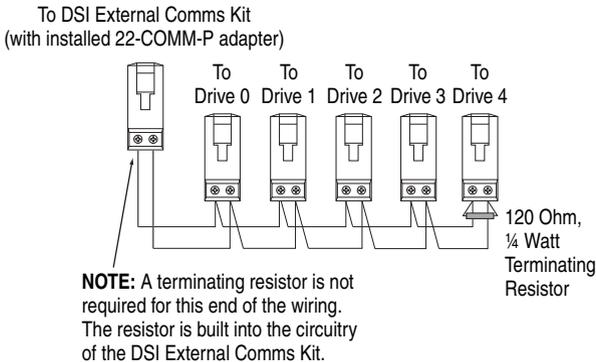
NOTE: When connecting the drives in a Multi-Drive configuration, the order in which the drives are connected does not matter. That is, Drive 0 can be any of the drives, and Drive 0 does not have to be the drive in which the adapter is installed (or the drive to which the DSI External Comms Kit is plugged into).

Understanding the I/O Image

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

The I/O image table will vary based on the configuration of the adapter Mode Jumper (J2) and adapter **Parameter 11 - [DSI I/O Cfg]**. The image table always uses consecutive words starting at word 0.

Figure 7.9 illustrates an example of an I/O image (16-bit words) for the adapter operated in Multi-Drive mode.

Figure 7.9   Multi-Drive Example of I/O Image
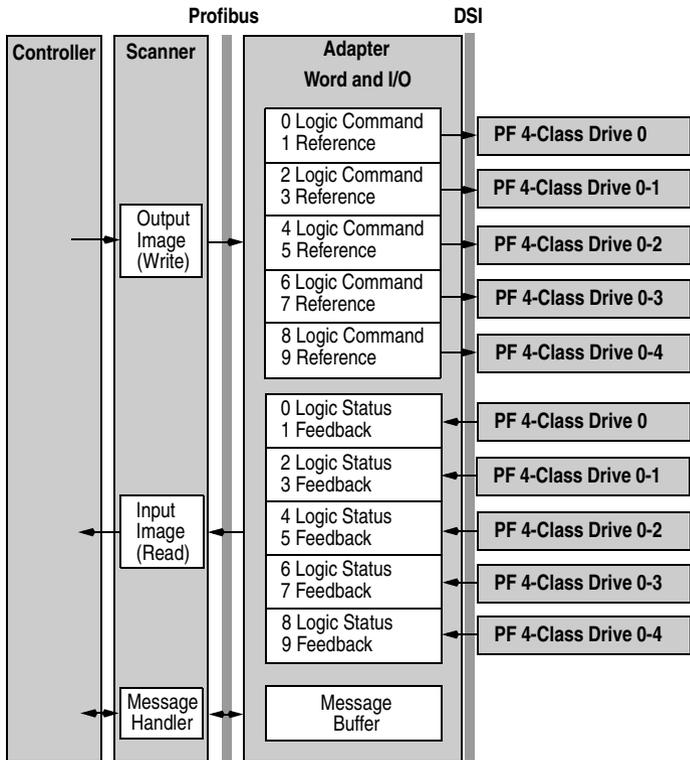
Configuring the RS-485 (DSI) Network

Properly configure the adapter (Single mode operation) and only the 1st drive (as shown in Figure 7.4 or Figure 7.5) on the node so that they are communicating with each other. Communication has been established when the adapter PORT indicator is solid green. When the PORT indicator is red, communication between the adapter and the drive is not established.

After establishing communication with the 1st drive, the remaining drives on the node can be configured. Carefully follow these step-by-step instructions to successfully configure the adapter and RS-485 network of daisy-chained drives on the node.

1. Verify that all drives on the node are correctly daisy-chained together, and that the 120 ohm, 1/4 watt terminating resistors are connected at the appropriate locations shown in Figure 7.7 or Figure 7.8.

2. Temporarily disconnect Drives 1…4 from the RS-485 daisy-chain network, so that only Drive 0 remains connected.

3. Set the following parameters in the 1st drive to these values:

PowerFlex 4-Class Drive Parameter				
Number			**Name**	**Value**
4/40/40P	**4M**	**400**		
P36	P106	P36	[Start Source]	5 (Comm Port)
P38	P108	P38	[Speed Reference]	5 (Comm Port)
A103	C302	C103	[Comm Data Rate]	4 (19.2K)
A104	C303	C104	[Comm Node Addr]	1…247 (must be unique)
A107	C306	C102	[Comm Format]	0 (RTU 8-N-1)

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

4. Set the adapter Mode Jumper J2 to the "1x" (Single mode) position.

5. Power cycle Drive 0 to apply the new settings. **NOTE:** When the adapter is installed in a DSI External Comms Kit, you must also power cycle the Comms Kit, which will reset the adapter.

   At this time, the adapter PORT indicator should be steady green, indicating that the adapter is properly commuincating with Drive 0.

6. Set the following adapter Multi-Drive parameters:

Adapter Parameter	Value
11 - [DSI I/O Cfg]	0 = Drive 0 connected 1 = Drives 0…1 connected 2 = Drives 0…2 connected 3 = Drives 0…3 connected 4 = Drives 0…4 connected
17 - [Drv 0 Addr] [1]	Equal to Drive 0 [Comm Node Address] Parameter
18 - [Drv 1 Addr] [1]	Equal to Drive 1 [Comm Node Address] Parameter
19 - [Drv 2 Addr] [1]	Equal to Drive 2 [Comm Node Address] Parameter
20 - [Drv 3 Addr] [1]	Equal to Drive 3 [Comm Node Address] Parameter
21 - [Drv 4 Addr] [1]	Equal to Drive 4 [Comm Node Address] Parameter

[1] The settings for these parameters must match the [Comm Node Addr] parameter values for the respective drives. The [Comm Node Addr] parameter is A104 for PowerFlex 4, PowerFlex 40, and PowerFlex 40P drives, parameter C303 for PowerFlex 4M drives, and parameter C104 for PowerFlex 400 drives.

> **Important:** To set adapter parameters, you must use DriveExplorer software, DriveExecutive software or an optional, external PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S).

7. Set the following parameters in daisy-chained Drives 1…4 to these values:

PowerFlex 4-Class Drive Parameter				
Number			Name	Value
4/40/40P	4M	400		
P36	P106	P36	[Start Source]	5 (Comm Port)
P38	P108	P38	[Speed Reference]	5 (Comm Port)
A103	C302	C103	[Comm Data Rate]	4 (19.2K)
A104	C303	C104	[Comm Node Addr]	1…247 (must be unique)
A107	C306	C102	[Comm Format]	0 (RTU 8-N-1)

8. Set the adapter Mode Jumper J2 to the "5x" (Multi-Drive) position.

9. Reconnect daisy-chained Drives 1…4 to the RS-485 network.

10. Power cycle ALL drives on the node to apply new settings. **NOTE:** When the adapter is installed in a DSI External Comms Kit, you must also power cycle the Comms Kit, which will reset the adapter.

The adapter PORT indicator should now be steady green, indicating successfull configuration of the daisy-chained Multi-Drive node.

The following table shows example settings for all five drives on the node:

PowerFlex 4-Class Drive Parameter				Parameter Value				
Number			**Name**	Drive 0	Drive 1	Drive 2	Drive 3	Drive 4
4/40/40P	**4M**	**400**						
P36	P106	P36	[Start Source]	5	5	5	5	5
P38	P108	P38	[Speed Reference]	5	5	5	5	5
A103	C302	C103	[Comm Data Rate] [1]	4	4	4	4	4
A104	C303	C104	[Comm Node Addr] [1][2]	1	2	3	4	5
A105	C304	C105	[Comm Loss Action]	0	0	0	0	0
A106	C305	C106	[Comm Loss Time]	5	5	5	5	5
A107	C306	C102	[Comm Format] [1]	0	0	0	0	0

[1]   The drive must be power cycled for a change to this parameter to take effect.

[2]   The settings for these parameters must match the respective parameter settings in the adapter (**Parameter 17 - [Drv 0 Addr** through **Parameter 21 - [Drv 4 Addr]**).

Important: Parameter A105 - [Comm Loss Action] in the drives that are daisy chained is also used in Multi-Drive mode. If the RS-485 daisy-chain cable is disconnected or broken, the disconnected drives will immediately take the corresponding Comm Loss Actions. Drive parameter A106 - [Comm Loss Time] is not used in Multi-Drive mode. For a network disruption, adapter **Parameters 09 - [Comm Flt Action]** and **10 - [Idle Flt Action]** determine the action taken for ALL of the drives on the Multi-Drive node.

Multi-Drive Mode Parameter Data

Parameter addressing for Parameter Data in Multi-Drive mode is similar to that in Single mode.

The parameter numbers (PNU) range from 1 to 2047. The parameter numbers 1…1023 are used to access the drive or adapter parameters, while parameter numbers 1024…2047 are used for accessing the adapter fault codes, events and diagnostic items.

For details to access the drive parameters when the adapter is operated in of Multi-Drive mode, see .

Example: The parameter messaging accesses the drive **Parameter 39 - [Accel Time]** for Drive 0 to Drive 4 in Multi-Drive mode.

Accessing Parameter 39 - [Accel Time]

Module	**IND** (0 - 2 bits)	**PNU**
Drive 0 Single Drive	0 0 0	39
Drive 0-1 Multi Drive	0 0 1	39
Drive 0-2 Multi Drive	0 1 0	39
Drive 0-3 Multi Drive	0 1 1	39
Drive 0-4 Multi Drive	1 0 0	39

Notes:

Troubleshooting

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

Locating the Status Indicators

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

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

(Series A adapter shown)
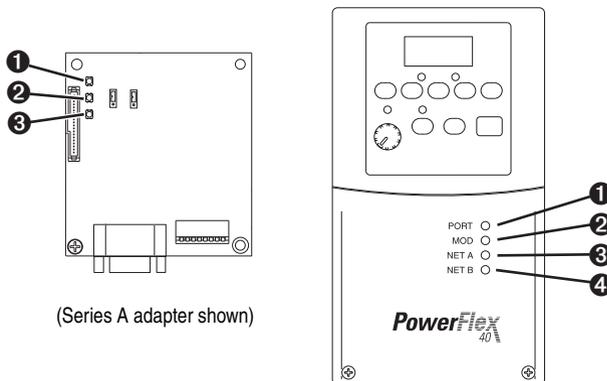
Number	Status Indicator	Description	Page
❶	PORT	DSI Connection Status	8-2
❷	MOD	Adapter Status	8-3
❸	NET A	Profibus Status	8-4
❹	NET B	Not Used for Profibus	—

PORT Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the ribbon cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	In Single mode, the adapter is not receiving a ping message from the drive. In Multi-Drive mode, the adapter is not receiving a ping message from the drive—or the adapter is connected to a drive that is not compatible.	• Verify that the Mode Jumper J2 (Figure 2.1) is in the position corresponding to the mode in which the adater is being used. • Verify the setting for **Parameter 11 - [DSI I/O Cfg]**. • Verify that cables are securely connected and not damaged. Replace cables if necessary. • Cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • Connect the adapter to compatible PowerFlex 4-Class 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 (or adapter if mounted in a DSI External Comms Kit) after making the following corrections: • Verify that all DSI cables are securely connected and not damaged. Replace cables if necessary. • Check the Events, replace the adapter with a compatible Allen-Bradley branded product (22-COMM-P).
Flashing Green	Not used.	—
Solid Green	The adapter is properly connected and is communicating with the drive.	No action required.
Solid Orange	The adapter is booting.	Wait until boot program has been finished.
Flashing Orange	The adapter is in flash mode (SW8 down). Application failure.	• Wait until Firmware Update has been finished, then switch SW8 to 1. • Download Application code.

MOD Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the ribbon cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	The adapter has faults or a drive is missing in Multi Drive mode.	• Clear faults in the drive. • Disconnect additional DSI peripheral and cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • If cycling power does not correct the problem, the adapter parameter settings may have been corrupted. Reset defaults and reconfigure the adapter. • If resetting defaults does not correct the problem, flash the adapter with the latest firmware release. • For Multi-Drive mode, determine which drive is missing or faulted. Check cabling and configuration settings (see Configuring the RS-485 (DSI) Network on page 7-8).
Solid Red	The adapter has failed the hardware test.	• Cycle power to the drive (or adapter if mounted in a DSI External Comms Kit). • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Place the scanner in RUN mode. • Program the controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller.
Solid Green	The adapter is operational and transferring I/O data.	No action required.

NET A Status Indicator

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not connected properly to the network or the Node Address is incorrect.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable and to the network using a Profibus cable. (Screw D-shell to the adapter). • Check the SW8 of DIP-Switches and set it to one - Normal operating state. • Check the DIP-Switches (SW1…SW7) node address and the Scanner setting. • Apply power to the drive cable (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	Error in Profibus configuration.	Re-configure the Profibus module.
Solid Red	Not used.	—
Flashing Green	Not used.	—
Solid Green	The adapter is properly connected and communicating on the network.	No action required.

NOTE: For the Multi Drive mode, disconnecting a DSI cable from a daisy-chained drive does not lead to an error! There is no indication in the adapter that a drive is missing, except that commands to the missing drive have no effect.

Adapter Diagnostic Items in Single Mode

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

No.	Name	Description
1	Field Flash Cnt	The number of Firmware Updates.
2	Adapter Events	The number of events in the event queue.
3	Reference	Reference from Profibus returned to DSI drive.
4	Logic Cmd	Command from Profibus returned to DSI drive.
5	Logic Sts	Status of the drive returned to Profibus.
6	Feedback	Feedback from drive returned to Profibus.
7	Profibus Rx Errors	Current value of the Profibus Receive Error Counter register.
8	Profibus Tx Errors	Current value of the Profibus Transmit Error Counter register.
9	Data Rate	Current setting of the Profibus baud rate.
10	Node Address	Current setting of the adapter Node address switch.

Adapter Diagnostic Items in Multi-Drive Mode

In Multi-Drive mode, it is not possible to connect a peripheral device such as a HIM or 22-SCM-232 (DriveExplorer). Therefore, the following adapter diagnostic items can only be accessed via the Profibus network.

No.	Name	Description
1	Field Flash Cnt	The number of Firmware Updates.
2	Adapter Events	The number of events in the event queue.
3	Drv 0 Reference	Reference from Profibus returned to DSI Drive 0.
4	Drv 0 Logic Cmd	Command from Profibus returned to DSI Drive 0.
5	Drv 0 Logic Sts	Status of the Drive 0 returned to Profibus.
6	Drv 0 Feedback	Feedback from Drive 0 returned to Profibus.
7	Drv 1 Reference	Reference from Profibus returned to DSI Drive 0-1.
8	Drv 1 Logic Cmd	Command from Profibus returned to DSI Drive 0-1.
9	Drv 1 Logic Sts	Status of the Drive 0-1 returned to Profibus.
10	Drv 1 Feedback	Feedback from Drive 0-1 returned to Profibus.
11	Drv 2 Reference	Reference from Profibus returned to DSI Drive 0-2.
12	Drv 2 Logic Cmd	Command from Profibus returned to DSI Drive 0-2.
13	Drv 2 Logic Sts	Status of the Drive 0-2 returned to Profibus.
14	Drv 2 Feedback	Feedback from Drive 0-2 returned to Profibus.
15	Drv 3 Reference	Reference from Profibus returned to DSI Drive 0-3.
16	Drv 3 Logic Cmd	Command from Profibus returned to DSI Drive 0-3.
17	Drv 3 Logic Sts	Status of the Drive 0-3 returned to Profibus.
18	Drv 3 Feedback	Feedback from Drive 0-3 returned to Profibus.
19	Drv 4 Reference	Reference from Profibus returned to DSI Drive 0-4.
20	Drv 4 Logic Cmd	Command from Profibus returned to DSI Drive 0-4.
21	Drv 4 Logic Sts	Status of the Drive 0-4 returned to Profibus.
22	Drv 4 Feedback	Feedback from Drive 0-4 returned to Profibus.
23	Profibus Rx Errors	Present value of the Profibus Receive Error Counter register.
24	Profibus Tx Errors	Present value of the Profibus Transmit Error Counter register.
25	Active drives number	The number of active slave drives.

Viewing and Clearing Events

The adapter maintains an event queue that reports the history of its actions. You can view the event queue using DriveExplorer (3.01).

Figure 8.2   DriveExplorer Event View/Clear Screen
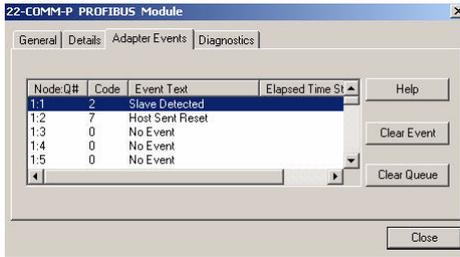
Events

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

Code	Event	Description
0	No Event	Text displayed in an empty event queue entry.
1	EEPROM Sum Flt	Startup sequence detected corrupt EEPROM storage in the adapter.
2	Slave Detected	A DSI slave was detected on the slave I/O line.
3	Slave Removed	A DSI slave was removed on the slave I/O line.
7	Bad I/O Config	The actual connected drives are different from I/O configuration (Adapter Parameter 11).
8	Host Timeout	An Parameter Data to a Drive Host timed out waiting for a response.
9	Slave Timeout	An Param. Data to a Slave timed out waiting for a response.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	DSI Bus Off Flt	A bus-off condition was detected on DSI. This event may be caused by loose or broken cables or by noise.
13	P-DP Idle	The Profibus Adapter received a Network Clear from the Profibus Master.
14	P-DP Online	The Profibus adapter has gone on-line the Profibus Network.
15	P-DP Offline	The Profibus adapter has gone off-line the Profibus Network.
17	DSI Fault Msg	The Host drive faulted.
18	DSI Fault Clear	The user cleared a fault in the adapter.
19	Not COMM Flt	The adapter detected a fault condition on the network.
21	Program damage	The Checksum of the Program is wrong.

Specifications

Appendix A presents the specifications for the adapter.

Communications

Network	
Protocol	Profibus
Data Rates	9.6 Kbps, 19.2 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps, 12 Mbps. The adapter has an auto baud rate detection.
Drive	
Protocol	DSI

Electrical

Consumption	
Drive	370 mA at 5V supplied through the drive.
Network	

Mechanical

Dimensions	
Height	19 mm (0.75 inches)
Length	86 mm (3.39 inches)
Width	78.5 mm (3.09 inches)
Weight	57 g (2 oz.)

Environmental

Temperature	
Operating	-10…50 °C (14…149 °F)
Storage	-40…85 °C (-40…185 °F)
Relative Humidity	-5…95% non-condensing
Vibration	
Operational	1.0 g
Non-operational	2.5 g
Shock	
Operational	15.0 g
Non-operational	30.0 g
Altitude	1000 m (3300 ft.) without derating
Atmosphere	**Important:** The adapter **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the adapter is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

Certification	Specification
UL	UL508C
CE	EN50178 and EN61800-3

Adapter Parameters

Appendix B provides information about the adapter parameters.

Topic	Page

About Parameter Numbers

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

Configuration Tool	Numbering Scheme
• HIM • DriveExplorer • DriveTools SP	The adapter parameters begin with parameter 1. For example, **Parameter 04 - [P-DP Addr Actual]** is parameter 04 as indicated by this manual.

Parameter List

Parameter		
No.	**Name and Description**	**Details**
01	**[Mode]** Displays the Single or Multi-Drive operating mode selected with the jumper J2 on the adapter.	Default: N/A Values: 0 = Single Drv 1 = Multiple Drv Type: Read Only
02	**Reserved**	—
03	**Reserved**	—
04	**[P-DP Addr Actual]** Profibus Node Address actually used by the adapter.	Default: N/A Minimum: 0 Maximum: 127 Type: Read Only

Parameter		
No.	**Name and Description**	**Details**

05	**[P-DP Rate Actual]**
	
	PROFIBUS actual operating data rate.
	
	NOTE: The value of this parameter will show 9 (12 Mbps) when not yet communicating to the scanner. This parameter will update when communication is established.
		Default: N/A
		Values: 0 = 9.6 Kbps
		               1 = 19.2 Kbps
		               2 = 45.45 Kbps
		               3 = 93.75 Kbps
		               4 = 187.5 Kbps
		               5 = 500 Kbps
		               6 = 1.5 Mbps
		               7 = 3 Mbps
		               8 = 6 Mbps
		               9 = 12 Mbps
		               10 = Off-line
		Type: Read Only

06	**Reserved**	—
07	**Reserved**	—

08	**[Reset Module]**
	
	No action if set to "Ready." Resets the adapter if set to "Reset Module." Restores the adapter to its factory default settings if set to "Set Defaults." This parameter is a command. It will be reset to "0 = Ready" after the command has been performed.
		Default: 0 = Ready
		Values 0 = Ready
		                  1 = Reset Module
		                  2 = Set Defaults
		Type: Read/Write
		Reset Required: No

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

| 09 | **[Comm Flt Action]**

Sets the action that the adapter and drive take if the adapter detects that Profibus communications have 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
                  5 = Fault&ClrCmd [1]
Type: Read/Write
Reset Required: No

[1] This setting is available only with adapter firmware revision 3.xxx or later. |

> **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 09- [Comm Flt Action]** lets you determine the action of the adapter and connected drive if the I/O communications are disrupted. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, 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 cable).

Parameter		
No.	**Name and Description**	**Details**

10	**[Idle Flt Action]**
	
	Sets the action that the adapter and drive 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
		  5 = Fault&ClrCmd [1]
		Type: Read/Write
		Reset Required: No
		
		[1] This setting is available only with adapter firmware revision 3.xxx or later.

	⚠️ **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 10- [Idle Flt Action]** lets you determine the action of the adapter and connected drive when the controller is idle. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, 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 controller in idle state).	

11	**[DSI I/O Cfg]**
	
	Sets the configuration of the Drives that are active in the Multi-Drive mode. Identifies the connections that would be attempted on a reset or power cycle.
		Default: 0
		Values: 0 = Drive 0
		  1 = Drives 0-1
		  2 = Drives 0-2
		  3 = Drives 0-3
		  4 = Drives 0-4
		Type: Read/Write
		Reset Required: Yes

12	**[DSI I/O Act]**
	
	Displays the Drives that are active in the Multi-Drive mode.
		Default: N/A
		Bit Values: 0 = Drive 0
		  1 = Drives 0-1
		  2 = Drives 0-2
		  3 = Drives 0-3
		  4 = Drives 0-4
		Type: Read Only

13	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • **Parameter 09 - [Comm Flt Action]** is set to Send Flt Cfg and communications are disrupted. • **Parameter 10 - [Idle Fault Action]** is set to Send Flt Cfg and the scanner is put into Program mode. The bit definitions will depend on the product to which the adapter is connected.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No

Parameter		
No.	**Name and Description**	**Details**
14	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • **Parameter 09- [Comm Flt Action]** is set to Send Flt Cfg and communications are disrupted. • **Parameter 10 - [Idle Flt Action]** is set to Send Flt Cfg and the scanner is put into Program mode.	Default: 0 Minimum: 0 Maximum: 4000 Type: Read/Write Reset Required: No **Important:** If the drive uses a 16-bit Reference, the most significant word of this value must be set to zero (0) or a fault will occur.
15	**Reserved**	—
16	**Reserved**	—
17 18 19 20 21	**[Drv 0 Addr]** **[Drv 1 Addr]** **[Drv 2 Addr]** **[Drv 3 Addr]** **[Drv 4 Addr]** Sets the corresponding node addresses of the daisy-chained drives when the adapter Mode Jumper (J2) is set for Multi-Drive operation. **Important:** The settings for these parameters must match the drive Parameter A104 - [Comm Node Addr] settings in the respective drives. Each setting must also be unique (no duplicate node address).	Default: 1 Default: 2 Default: 3 Default: 4 Default: 5 Minimum: 1 Maximum: 127 Type: Read/Write Reset Required: Yes
24	**[P-DP State]** Displays the state of the Profibus controller. 0 = Not connected to the network. 1 = On network and not scanning or not connected to the network 2 = Online/running 3 = Error in configuration	Default: N/A Values: 0 = WAIT_PRM 　　　　1 = WAIT_CFG 　　　　2 = DATA_EX 　　　　3 = ERROR Type: Read Only

Parameter		
No.	**Name and Description**	**Details**
25	**[DSI Loss Action]** [(2)] Sets the action that the adapter will take for the Logic Status and Feedback words when the adapter detects that DSI communication with the drive has been lost. [(2)] This parameter is available only with adapter firmware revision 4.001 or later, and only applies when the adapter is operated in Single mode. When operated in Multi-Drive mode, the Logic Status and Feedback words are zeroed for any drive that loses DSI communication.	Default: 0 = Hold Sts/Fbk Values: 0 = Hold Sts/Fbk 1 = Zero Sts/Fbk Type: Read/Write Reset Required: No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 25 - [DSI Loss Action]** lets you determine the action of the adapter when DSI communication with the drive has been lost. By default, this parameter maintains the Logic Status and Feedback word values sent to the controller at the timeDSI communication was lost (that is, hold last state). Alternatively, you can set this parameter so that the Logic Status and Feedback word values are zeroed after a DSI communication loss. Whether the drive faults or takes a different action is determined by the setting of the following drive parameter:

Drive	**Parameter Number/Name**
PowerFlex 4, 40, and 40P	A105 - [Comm Loss Action]
PowerFlex 4M	C304 - [Comm Loss Action]
PowerFlex 400	C105 - [Comm Loss Action]

Precautions should be taken to ensure that the setting of adapter **Parameter 25** and drive parameter A105, C304 or C105 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 faulty drive DSI cable or excessive electrical noise interference).

Notes:

PowerFlex 4-Class Drives Logic Command/Status Words

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

Logic Command Word

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

[1] A "0 = Not Stop" condition (logic 0) must first be present before a "1 = Start" condition will start the drive. The Start command acts as a momentary Start command. A "1" will start the drive, but returning to "0" will not stop the drive.

[2] Depending on the PowerFlex 4-Class drive, the functions for bits 6, 7, and 15 change. Refer to Appendix C in the PowerFlex 4, PowerFlex 4M, PowerFlex 40 or PowerFlex 40P drive User Manual, or Appendix E for the PowerFlex 400 drive bit functions.

[3] The functions for these bits are the same for all PowerFlex 4-Class drives—including the PowerFlex 40P when it is used in the "Velocity" mode. When using the PowerFlex 40P in the "Position" mode, the bit functions are different. For details, see Appendix C in the PowerFlex 40P User Manual.

Logic Status Word

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

[1] The functions for these bits are the same for all PowerFlex 4-Class drives—including the PowerFlex 40P when it is used in the "Velocity" mode. When using the PowerFlex 40P in the "Position" mode, the bit functions are different. For details, see Appendix C in the PowerFlex 40P User Manual.

[2] This status is available for only PowerFlex 40 drives with firmware revision 2.xx (or later). For PowerFlex 4 and PowerFlex 4M drives, these bits are not used.

SLC Ladder Logic Examples

Appendix D provides examples that explain how to use a SLC controller to send I/O Messaging to control, configure and monitor a PowerFlex 40 drive in Single Drive and Multi Drive mode.

Single Drive Example

Figure D.1 Main Routine

This example program is for a PROFIBUS demonstration using a SLC 5/ 04 processor with an SST Profibus scanner (SST-PFB-SLC) in the first slot of the rack. The program is written for 2 drives on the network:

Station 1   PowerFlex 40 with 22-COMM-P
Station 2   PowerFlex 40 with 22-COMM-P

The expample program demonstrates using Logic Command / Reference, Logic Status / Feedback and Parameter Access using the Parameter Protocol.

On power-up, zero out the transmit buffer to the Scanner.

First Pass
S:1

```
0  ┤ ├                                                 ┌─FLL ─────────────────┐
    15                                                 │ Fill File            │
                                                       │ Source          0    │
                                                       │ Dest         #N20:0  │
                                                       │ Length          12   │
                                                       └──────────────────────┘
```

Automatically have the SST-PFB-SCL scanner's watchdog period track that of the SCL processor (recommended per SST user manual)

```
1                                                      ┌─MOV ─────────────────┐
                                                       │ Move                 │
                                                       │ Source         S:3   │
                                                       │              2561<   │
                                                       │ Dest     M0:1.4011   │
                                                       │               ?<     │
                                                       └──────────────────────┘
```
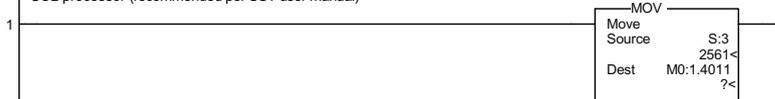
The Scanner is configured to 12 bytes (6 words) of inputs for each drive. Two drives require 24 bytes (12 words).

Read the drives data from the Profibus scanner.

File N10: contains the acutal read data that can be used elsewhere in the ladder program.

Station 1		Station 2		Description
M1:1.0	(N10:0)	M1:1.6	(N10:6)	Logic Status
M1:1.1	(N10:1)	M1:1.7	(N10:7)	Speed Feedback
M1:1.2	(N10:2)	M1:1.8	(N10:8)	Parameter Protocol Word 1 (PCA)
M1:1.3	(N10:3)	M1:1.9	(N10:9)	Parameter Protocol Word 2 (IND)
M1:1.4	(N10:4)	M1:1.10	(N10:10)	Parameter Protocol Word 3 (PVA 1)
M1:1.5	(N10:5)	M1:1.11	(N10:11)	Parameter Protocol Word 4 (PVA 2)

```
2                                                      ┌─COP ─────────────────┐
                                                       │ Copy File            │
                                                       │ Source       #M1:1.0 │
                                                       │ Dest         #N10:0  │
                                                       │ Length          12   │
                                                       └──────────────────────┘
```

Execute LAD 3 - Station 1 Drive Logic

```
3                                              ┌─JSR ─────────────────┐
                                               │ Jump To Subroutine   │
                                               │ SBR File Number  U:3 │
                                               └──────────────────────┘
```
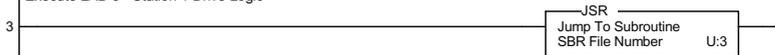
Execute LAD 4 - Station 2 Drive Logic

```
4                                              ┌─JSR ─────────────────┐
                                               │ Jump To Subroutine   │
                                               │ SBR File Number  U:4 │
                                               └──────────────────────┘
```

Write the drives' data to the profibus scanner.

File N20: contains the actual write data generated elsewhere in the ladder program.

Station 1		Station		Description
M0:1.0	(N20:0)	M0:1.6	(N20:6)	Logic Command
M0:1.1	(N20:1)	M0:1.7	(N20:7)	Speed Reference
M0:1.2	(N20:2)	M0:1.8	(N20:8)	Parameter Protocol Word 1 (PCA)
M0:1.3	(N20:3)	M0:1.9	(N20:9)	Parameter Protocol Word 2 (IND)
M0:1.4	(N20:4)	M0:1.10	(N20:10)	Parameter Protocol Word 3 (PVA1)
M0:1.5	(N20:5)	M0:1.11	(N20:11)	Parameter Protocol Word 4 (PVA2)

```
5                                                      ┌─COP ─────────────────┐
                                                       │ Copy File            │
                                                       │ Source       #N20:0  │
                                                       │ Dest         #M0:1.0 │
                                                       │ Length          12   │
                                                       └──────────────────────┘
```

```
6                                                              ⟨ END ⟩
```

Figure D.2   Drive 0 Control/Reference/Parameter Access Routine

Controlling the Logic Command word in the drive. B3:20/* bits are controlled elsewhere in the user program.

	Station 1 Stop Command B3:20	Station 1 Logic Command STOP N20:0
0	┤ ├ 0	◇ 0

	Station 1 Start Command B3:20	Station 1 Logic Command START N20:0
1	┤ ├ 1	◇ 1

	Station 1 Jog Command B3:20	Station 1 Logic Command JOG N20:0
2	┤ ├ 2	◇ 2

	Station 1 Clear Faults Command B3:20	Station 1 Logic Command CLEAR FAULTS N20:0
3	┤ ├ 3	◇ 3

	Station 1 Reverse Command B3:20	Station 1 Logic Command FORWARD N20:0
4	┤/├ 4	◇ 4

	Station 1 Reverse Command B3:20	Station 1 Logic Command REVERSE N20:0
5	┤ ├ 4	◇ 5

To control the speed reference over the Profibus, the three Reference Select bits (bits 14-12) need to have the values 011.

		Station 1 Logic Command REFERENCE SELECT 0 N20:0
6		◇ 12

		Station 1 Logic Command REFERENCE SELECT 1 N20:0
7		◇ 13

	"Never Closed" B3:20	Station 1 Logic Command REFERENCE SELECT 2 N20:0
8	┤ ├ 5	◇ 14

Figure D.2 Drive 0 Control/Reference/Parameter Access Routine (continued)

Station 1 Speed Reference
The PowerFlex 40 parameter 38 - [Speed Reference] needs to be set to 5 ("RS485 [DSI] Port").
N19:1 is controlled elsewhere in the user program.

```
                                                    Station 1
                                                    Speed Reference
                                                    Write
                                                   ┌─MOV ──────────┐
  9                                                │ Move          │
                                                   │ Source   N19:1│
                                                   │           273<│
                                                   │ Dest     N20:1│
                                                   │           273<│
                                                   └───────────────┘
```

This section of the routine is only needed if the application needs to perform Parameter Protocol Reads or Writes to Station 1.

On power-up, initialize the Parameter Protocol routine.

```
                                                             Station 1
                                                             Par Prot
                                                             Messaging
          First Pass                                         Request
          S:1                                                B3:19
  10      ─┤ ├─────────────────────────────────────────────────(U)─
           15                                                    15
```

This circuit utilizes the Parameter Protocol. A REQUEST to Station 1 is processed only once at a time, and after each
RESPONSE from Station 1 a zero must be sent and received to 'handshake' before the next REQUEST/RESPONSE
transaction can take place. For example:
Send a param. read request --> Receive a parameter read response --> Send a "0" --> Receive a "0" --> [Transaction compl.]

If the RESPONSE PCA Word 1 (N10:2) is "0", then a REQUEST can be initiated.

Elsewhere in the user program these words must be loaded with message data prior to initiating the REQUEST.
N7:10 = RC = the operation to be performed ("1" = Read, "2" = 16-bit Write)
N7:11 = PNU = the parameter number to read or write
N7:12 = Subindex = the DPI port # ("0" = Host or PowerFlex drive, "5" = 22-COMM-P, etc.)
N7:13 = PVA #1 (the parameter value (high word)) - only used when writing parameters
N7:14 = PVA #2 (the parameter value (low word)) - only used when writing parameters

The four Parameter Protocol Words set up in the scanner are used to perform the Parameter Protocol:
N20:2 = contains RC (the operation to be performed) and PNU (the parameter number to read or write) combined
N20:3 = Subindex (the DPI port #)
N20:4 = PVA #1 (the parameter value (high word))
N20:5 = PVA #2 (the parameter value (low word))

B3:19/15 is turned ON elsewhere in the program after a REQUEST message (N7:10-14) is loaded. This causes one Param.
Protocol read or write to occur and B3:19/15 is turned OFF when the transaction is complete.

```
          Station 1
          Par Prot      Station 1
          Messaging     RESPONSE
          Request       PCA Word                              Station 2
          B3:19                                               PCA Word
  11      ─┤ ├────────┬──EQU─────────┐                       ┌─MOV ──────────┐
           15         │  Equal       │                       │ Move          │
                      │  Source A N10:2│                      │ Source   N7:11│
                      │            0< │                       │           77< │
                      │  Source B    0│                       │ Dest     N20:2│
                      │            0< │                       │            0< │
                      └──────────────┘                        └───────────────┘

                                                    RC bit 0        PCA Word
                                                                    RC bit 0
                                                    N7:10           N20:2
                                                    ─┤ ├──────────────(L)─
                                                      0              12

                                                    RC bit 1        PCA Word
                                                                    RC bit 1
                                                    N7:10           N20:2
                                                    ─┤ ├──────────────(L)─
                                                      1              13

                                                    RC bit 2        PCA Word
                                                                    RC bit 2
                                                    N7:10           N20:2
                                                    ─┤ ├──────────────(L)─
                                                      2              14

                                                    IND Word
                                                    (Subindex)
                                                   ┌─COP ──────────┐
                                                   │ Copy File     │
                                                   │ Source  #N7:12│
                                                   │ Dest    #N20:3│
                                                   │ Length       3│
                                                   └───────────────┘
```

Figure D.2   Drive 0 Control/Reference/Parameter Access Routine (continued)

N10:2 is the Station 1 Response Parameter Access Word 1. It is <> 0 when a message has been received in response to a
message request. If the response is >= 7000 hex (28672 decimal), then the adapter is responding that an error has occurred.
In this case, the returned data in the response will contain a fault code and not the parameter value data.

The response message can be found at:
N7:20 = PCA Word = contains RC and PNU
N7:21 = Subindex = the DPI port # ("0" = Host or PowerFlex drive, "5" = 22-COMM-P, etc.)
N7:22 = PVA #1 = the parameter value (high word)
N7:23 = PVA #2 = the parameter value (low word)
The PVA's will either contain parameter read data, echo the parameter write data or contain an error code if unsuccessful.

```
       Station 1
       Par Prot    Station 1
       Messaging   RESPONSE                                RESPONSE Message
       Request     PCA Word                                PCA Word
       B3:19       ┌──────NEQ──────┐                       ┌──────COP──────────────┐
 12    ──┤ ├──────┤ Not Equal      │                       │ Copy File             │
        15         │ Source A   N10:2 │                     │ Source         #N10:2 │
                   │            0<  │                       │ Dest           #N7:20 │
                   │ Source B     0 │                       │ Length            4   │
                   │            0<  │                       └───────────────────────┘
                   └───────────────┘
                                                           Station 2
                                                           PCA Word
                                                           ┌──────MOV──────┐
                                                           │ Move          │
                                                           │ Source      0 │
                                                           │           0<  │
                                                           │ Dest    N20:2 │
                                                           │           0<  │
                                                           └───────────────┘

                                                           Station 1
                                                           Par Prot
                                                           Messaging
                                                           Request
                                                           B3:19
                                                           ─(U)─
                                                            15

 13    ──────────────────────────────────────────────────────────────────⟨END⟩──
```

Figure D.3   Drive 1 Control/Reference/Parameter Access Routine

Controlling the Logic Command word in the drive. B3:21/* bits are controlled elsewhere in the user program.

```
       Station 2                                              Station 2
       Stop                                                   Logic Command
       Command                                                STOP
       B3:21                                                  N20:6
0 ─────┤ ├────────────────────────────────────────────────────( )─────
         0                                                      0

       Station 2                                              Station 2
       Start                                                  Logic Command
       Command                                                START
       B3:21                                                  N20:6
1 ─────┤ ├────────────────────────────────────────────────────( )─────
         1                                                      1

       Station 2                                              Station 2
       Jog                                                    Logic Command
       Command                                                JOG
       B3:21                                                  N20:6
2 ─────┤ ├────────────────────────────────────────────────────( )─────
         2                                                      2

       Station 2                                              Station 2
       Clear Faults                                           Logic Command
       Command                                                CLEAR FAULTS
       B3:21                                                  N20:6
3 ─────┤ ├────────────────────────────────────────────────────( )─────
         3                                                      3

       Station 2                                              Station 2
       Reverse                                                Logic Command
       Command                                                FORWARD
       B3:21                                                  N20:6
4 ─────┤/├────────────────────────────────────────────────────( )─────
         4                                                      4

       Station 2                                              Station 2
       Reverse                                                Logic Command
       Command                                                REVERSE
       B3:21                                                  N20:6
5 ─────┤ ├────────────────────────────────────────────────────( )─────
         4                                                      5
```

To control the speed reference over the Profibus, the three Reference Select bits (bits 14-12) need to have the values 011.

```
                                                             Station 2
                                                             Logic Command
                                                             REFERENCE SELECT 0
                                                             N20:6
6 ─────────────────────────────────────────────────────────────( )─────
                                                               12

                                                             Station 2
                                                             Logic Command
                                                             REFERENCE SELECT 1
                                                             N20:6
7 ─────────────────────────────────────────────────────────────( )─────
                                                               13

                                                             Station 2
                                                             Logic Command
       "Never Closed"                                        REFERENCE SELECT 2
       B3:21                                                  N20:6
8 ─────┤ ├────────────────────────────────────────────────────( )─────
         5                                                     14
```

Figure D.3   Drive 1 Control/Reference/Parameter Access Routine (continued)

Station 2 Speed Reference
The PowerFlex 40 parameter 38 - [Speed Reference] needs to be set to 5 ("RS485 [DSI] Port").
N19:7 is controlled elsewhere in the user program.

```
                                                        Station 2
                                                        Speed Reference
                                                        Write
                                                       ┌─MOV─────────────┐
                                                       │ Move            │
  9                                                    │ Source    N19:7 │
                                                       │            314< │
                                                       │ Dest      N20:7 │
                                                       │            314< │
                                                       └─────────────────┘
```

This section of the routine is only needed if the application needs to perform Parameter Protocol Reads or Writes to Station 2.

On power-up, initialize the Parameter Protocol routine.

```
                                                        Station 2
                                                        Par Prot
                                                        Messaging
      First Pass                                        Request
      S:1                                               B3:19
 10  ─┤ ├──────────────────────────────────────────────(U)──
       15                                                0
```

This circuit utilizes the Parameter Protocol. A REQUEST to Station 2 is processed only once at a time, and after each RESPONSE from Station 2 a zero must be sent and received to 'handshake' before the next REQUEST/RESPONSE transaction can take place. For example:
Send a parameter read request --> Receive a param. read response --> Send a "0" --> Receive a "0" --> [Transaction compl.]

If the RESPONSE PCA Word 1 (N10:8) is "0", then a REQUEST can be initiated.

Elsewhere in the user program these words must be loaded with message data prior to initiating the REQUEST.
N7:30 = RC = the operation to be performed ("1" = Read, "2" = 16-bit Write)
N7:31 = PNU = the parameter number to read or write
N7:32 = Subindex = the DPI port # ("0" = Host or PowerFlex drive, "5" = 22-COMM-P, etc.)
N7:33 = PVA #1 (the parameter value (high word)) - only used when writing parameters
N7:34 = PVA #2 (the parameter value (low word)) - only used when writing parameters

The four Parameter Protocol Words set up in the scanner are used to perform the Parameter Protocol:
N20:8 = contains RC (the operation to be performed) and PNU (the parameter number to read or write) combined
N20:9 = Subindex (the DPI port #)
N20:10 = PVA #1 (the parameter value (high word))
N20:11 = PVA #2 (the parameter value (low word))

B3:19/0 is turned ON elsewhere in the program after a REQUEST message (N7:30-34) is loaded. This causes one Parameter Protocol read or write to occur and B3:19/0 is turned OFF when the transaction is complete.

```
      Station 2
      Par Prot     Station 2                           Station 2
      Messaging    RESPONSE                            PCA Word
      Request      PCA Word
      B3:19        ┌─EQU──────────────┐               ┌─MOV─────────────┐
 11  ─┤ ├─────────┤ Equal            ├────────────────┤ Move            │
       0          │ Source A   N10:8 │               │ Source    N7:31 │
                  │             0<   │               │            77<  │
                  │ Source B     0   │               │ Dest      N20:8 │
                  │             0<   │               │            0<   │
                  └──────────────────┘               └─────────────────┘

                                                       RC bit 0    PCA Word
                                                                   RC bit 0
                                                       N7:30       N20:8
                                                      ─┤ ├─────────(L)──
                                                        0           12

                                                       RC bit 1    PCA Word
                                                                   RC bit 1
                                                       N7:30       N20:8
                                                      ─┤ ├─────────(L)──
                                                        1           13

                                                       RC bit 2    PCA Word
                                                                   RC bit 2
                                                       N7:30       N20:8
                                                      ─┤ ├─────────(L)──
                                                        2           14

                                                       IND Word
                                                       (Subindex)
                                                      ┌─COP─────────────┐
                                                      │ Copy File       │
                                                      │ Source   #N7:32 │
                                                      │ Dest     #N20:9 │
                                                      │ Length       3  │
                                                      └─────────────────┘
```

Figure D.3   Drive 1 Control/Reference/Parameter Access Routine (continued)

N10:8 is the Station 2 Response Parameter Access Word 1. It is <> 0 when a message has been received in response to a message request. If the response is >= 7000 hex (28672 decimal), then the adapter is responding that an error has occured. In this case, the returned data in the response will contain a fault code and not the parameter value data.

The response message can be found at:
N7:40 = PCA Word = contains RC and PNU
N7:41 = Subindex = the DPI port # ("0" = Host or PowerFlex drive, "5" = 22-COMM-P, etc.)
N7:42 = PVA #1 = the parameter value (high word)
N7:43 = PVA #2 = the parameter value (low word)
The PVA's will either contain parameter read data, echo the parameter write data or contain an error code if unsuccessful.

```
       Station 2
       Par Prot      Station 2
       Messaging     RESPONSE                                    RESPONSE Message
       Request       PCA Word                                    PCA Word
       B3:19         ┌──────NEQ──────┐                           ┌──────COP──────────┐
 12  ──┤ ├──────────┤ Not Equal      │                          ┤ Copy File          ├──────┐
       0             │ Source A  N10:8│                          │ Source      #N10:8 │      │
                     │             0< │                          │ Dest        #N7:40 │      │
                     │ Source B     0 │                          │ Length          4  │      │
                     │             0< │                          └────────────────────┘      │
                     └────────────────┘                                                      │
                                                                  Station 2                   │
                                                                  PCA Word                    │
                                                                  ┌──────MOV──────────┐       │
                                                                 ┤ Move               ├───────┤
                                                                  │ Source          0  │       │
                                                                  │              0<    │       │
                                                                  │ Dest       N20:8  │       │
                                                                  │              0<    │       │
                                                                  └────────────────────┘       │
                                                                  Station 2                     │
                                                                  Par Prot                      │
                                                                  Messaging                     │
                                                                  Request                       │
                                                                  B3:19                          │
                                                                  ──(U)──────────────────────────┤
                                                                  0                               │
                                                                                                  │
 13  ─────────────────────────────────────────────────────────────────────────────( END )───────┘
```
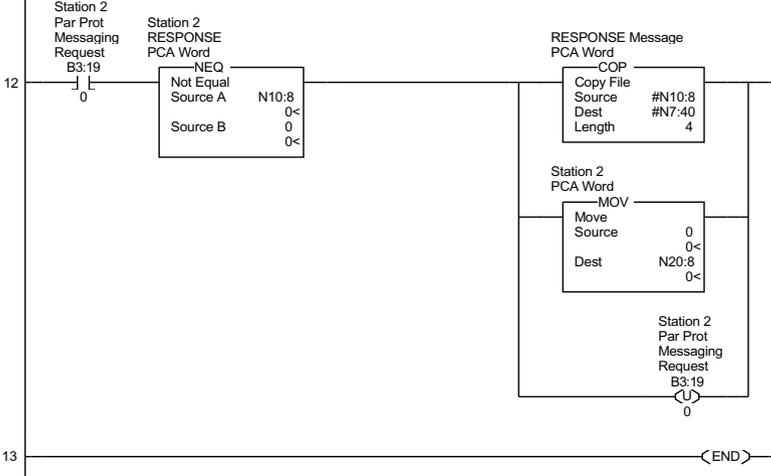
Multi Drive Example

Figure D.4 Main Routine

This example program is for a PROFIBUS demonstration using a SLC 5&05 processor with an SST Profibus scanner (SST-PFB-SLC) in the first slot of the rack. The program is written for 3 drives with one Profibus adapter on the network (MultiDrive Mode):

Station 0	PowerFlex 40 with 22-COMM-P
Station 1	PowerFlex 40
Station 2	PowerFlex 40

The expample program demonstrates using Logic Command / Reference, Logic Status / Feedback and Parameter Access using the Parameter Protocol.

On power-up, zero out the transmit buffer to the Scanner.

```
First Pass
     S:1
0   ┤ ├                                          ┌─FLL──────────────┐
     15                                          │ Fill File        │
                                                 │ Source          0│
                                                 │ Dest      #N20:0 │
                                                 │ Length         10│
                                                 └──────────────────┘
```

Automatically have the SST-PFB-SCL scanner's watchdog period track that of the SCL processor (recommended per SST user manual)

```
1                                                ┌─MOV──────────────┐
                                                 │ Move             │
                                                 │ Source       S:3 │
                                                 │            2561<  │
                                                 │ Dest   M0:1.4011 │
                                                 │              ?<   │
                                                 └──────────────────┘
```
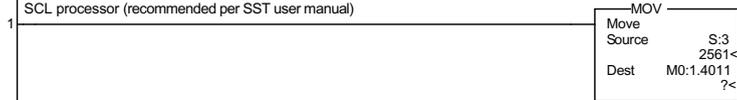
The Scanner is configured to 20 bytes (10 words) of inputs: 4 Bytes "Ctrl/Stat & Ref Fdbk" for each drive (= 12 Bytes)
8 Bytes "Parameter Access"

Read the drives data from the Profibus scanner.

File N10: contains the acutal read data that can be used elsewhere in the ladder program.

Address		Description
M1:1.0	(N10:0)	Logic Status Drive 0
M1:1.1	(N10:1)	Speed Feedback Drive 0
M1:1.2	(N10:2)	Logic Status Drive 1
M1:1.3	(N10:3)	Speed Feedback Drive 1
M1:1.4	(N10:4)	Logic Status Drive 2
M1:1.5	(N10:5)	Speed Feedback Drive 2
M1:1.6	(N10:6)	Parameter Access Word 1 (PCA)
M1:1.7	(N10:7)	Parameter Access Word 2 (IND)
M1:1.8	(N10:8)	Parameter Access Word 3 (PVA 1)
M1:1.9	(N10:9)	Parameter Access Word 4 (PVA 2)

```
2                                                ┌─COP──────────────┐
                                                 │ Copy File        │
                                                 │ Source    #M1:1.0│
                                                 │ Dest      #N10:0 │
                                                 │ Length         10│
                                                 └──────────────────┘
```

Execute LAD 3 - Station 0 Drive Logic

```
3                                                ┌─JSR──────────────┐
                                                 │ Jump To Subroutine│
                                                 │ SBR File Number U:3│
                                                 └──────────────────┘
```

Execute LAD 4 - Station 1 Drive Logic

```
4                                                ┌─JSR──────────────┐
                                                 │ Jump To Subroutine│
                                                 │ SBR File Number U:4│
                                                 └──────────────────┘
```

Figure D.4 Main Routine (continued)

Execute LAD 5 - Station 2 Drive Logic

```
5 ─────────────────────────────────────────────┌─ JSR ──────────────┐─
                                                │ Jump To Subroutine  │
                                                │ SBR File Number  U:5│
                                                └─────────────────────┘
```

Execute LAD 6 - Parameter Protocol

```
6 ─────────────────────────────────────────────┌─ JSR ──────────────┐─
                                                │ Jump To Subroutine  │
                                                │ SBR File Number  U:6│
                                                └─────────────────────┘
```

Write the drives' data to the profibus scanner.

File N20: contains the actual write data generated elsewhere in the ladder program.

```
Station  File No.  Description
M0:1.0   (N20:0)   Logic Command Drive 0
M0:1.1   (N20:1)   Speed Reference Drive 0
M0:1.2   (N20:2)   Logic Command Drive 1
M0:1.3   (N20:3)   Speed Reference Drive 1
M0:1.4   (N20:4)   Logic Command Drive 2
M0:1.5   (N20:5)   Speed Reference Drive 2
M0:1.6   (N20:6)   Parameter Access Word 1 (PCA)
M0:1.7   (N20:7)   Parameter Access Word 2 (IND)
M0:1.8   (N20:8)   Parameter Access Word 3 (PVA 1)
M0:1.9   (N20:9)   Parameter Access Word 4 (PVA 2)
```

```
7 ─────────────────────────────────────────────┌─ COP ──────────────┐─
                                                │ Copy File           │
                                                │ Source      #N20:0  │
                                                │ Dest        #M0:1.0 │
                                                │ Length          10  │
                                                └─────────────────────┘
```

```
8 ──────────────────────────────────────────────────────────<END>───
```

Figure D.5   Drive 0 Control/Reference Routine

Controlling the Logic Command word in the drive. B3:20/* bits are controlled elsewhere in the user program.

```
     Station 0                                          Station 0
     Stop                                               Logic Command
     Command                                            STOP
     B3:20                                              N20:0
0    ─┤ ├─                                              ◄● ►
       0                                                  0

     Station 0                                          Station 0
     Start                                              Logic Command
     Command                                            START
     B3:20                                              N20:0
1    ─┤ ├─                                              ◄● ►
       1                                                  1

     Station 0                                          Station 0
     Jog                                                Logic Command
     Command                                            JOG
     B3:20                                              N20:0
2    ─┤ ├─                                              ◄● ►
       2                                                  2

     Station 0                                          Station 0
     Clear Faults                                       Logic Command
     Command                                            CLEAR FAULTS
     B3:20                                              N20:0
3    ─┤ ├─                                              ◄● ►
       3                                                  3

     Station 0                                          Station 0
     Reverse                                            Logic Command
     Command                                            FORWARD
     B3:20                                              N20:0
4    ─┤/├─                                              ◄● ►
       4                                                  4

     Station 0                                          Station 0
     Reverse                                            Logic Command
     Command                                            REVERSE
     B3:20                                              N20:0
5    ─┤ ├─                                              ◄● ►
       4                                                  5
```

To control the speed reference over the Profibus, the three reference select bits (bits 14-12) need to have the values 11.

```
                                                        Station 0
                                                        Logic Command
                                                        REFERENCE SELECT 0
                                                        N20:0
6    ──────────────────────────────────────────────    ◄● ►
                                                          12

                                                        Station 0
                                                        Logic Command
                                                        REFERENCE SELECT 1
                                                        N20:0
7    ──────────────────────────────────────────────    ◄● ►
                                                          13

                                                        Station 0
     "Never Closed"                                     Logic Command
     B3:20                                              REFERENCE SELECT 2
                                                        N20:0
8    ─┤ ├───────────────────────────────────────────   ◄● ►
       5                                                  14
```

Station 0 Speed Reference
The PowerFlex 40 parameter 38 - [Speed Reference] needs to be set to 5 ("RS485 [DSI] Port").
N19:1 is controlled elsewhere in the user program.

```
                                          Station 0
                                          Speed Reference
                                          Write
                                        ┌─── MOV ──────────┐
9    ───────────────────────────────── │ Move             │
                                        │ Source    N19:1  │
                                        │            273<  │
                                        │ Dest      N20:1  │
                                        │            273<  │
                                        └──────────────────┘

10   ──────────────────────────────────────────────────── ⟨END⟩
```

Figure D.6   Drive 0-1 Control/Reference Routine

Controlling the Logic Command word in the drive. B3:21/* bits are controlled elsewhere in the user program.

```
                Station 1                                              Station 1
                Stop                                                   Logic Command
                Command                                                STOP
                B3:21                                                  N20:2
   0            ┤ ├                                                    ( )
                  0                                                      0

                Station 1                                              Station 1
                Start                                                  Logic Command
                Command                                                START
                B3:21                                                  N20:2
   1            ┤ ├                                                    ( )
                  1                                                      1

                Station 1                                              Station 1
                Jog                                                    Logic Command
                Command                                                JOG
                B3:21                                                  N20:2
   2            ┤ ├                                                    ( )
                  2                                                      2

                Station 1                                              Station 1
                Clear Faults                                           Logic Command
                Command                                                CLEAR FAULTS
                B3:21                                                  N20:2
   3            ┤ ├                                                    ( )
                  3                                                      3

                Station 1                                              Station 1
                Reverse                                                Logic Command
                Command                                                FORWARD
                B3:21                                                  N20:2
   4            ┤/├                                                    ( )
                  4                                                      4

                Station 1                                              Station 1
                Reverse                                                Logic Command
                Command                                                REVERSE
                B3:21                                                  N20:2
   5            ┤ ├                                                    ( )
                  4                                                      5
```

To control the speed reference over the Profibus, the three Reference Select bits (bits 14-12) need to have the values 011.

```
                                                                       Station 1
                                                                       Logic Command
                                                                       REFERENCE SELECT 0
                                                                       N20:2
   6                                                                   ( )
                                                                        12

                                                                       Station 1
                                                                       Logic Command
                                                                       REFERENCE SELECT 1
                                                                       N20:2
   7                                                                   ( )
                                                                        13

                                                                       Station 1
                "Never Closed"                                         Logic Command
                B3:21                                                  REFERENCE SELECT 2
                                                                       N20:2
   8            ┤ ├                                                    ( )
                  5                                                     14
```

Station 1 Speed Reference
The PowerFlex 40 parameter 38 - [Speed Reference] needs to be set to 5 ("RS485 [DSI] Port").
N19:3 is controlled elsewhere in the user program.

```
                                                               Station 1
                                                               Speed Reference
                                                               Write
                                                             ┌─── MOV ───────┐
                                                             │ Move          │
   9                                                         │ Source   N19:3│
                                                             │           314<│
                                                             │ Dest     N20:3│
                                                             │             0<│
                                                             └───────────────┘

  10                                                                   ( END )
```

Figure D.7   Drive 0-2 Control/Reference Routine

Controlling the Logic Command word in the drive. B3:22/* bits are controlled elsewhere in the user program.

```
       Station 2                                              Station 2
       Stop                                                   Logic Command
       Command                                                STOP
       B3:22                                                  N20:4
 0   ──┤ ├──────────────────────────────────────────────────────┤ ├──
        0                                                       0

       Station 2                                              Station 2
       Start                                                  Logic Command
       Command                                                START
       B3:22                                                  N20:4
 1   ──┤ ├──────────────────────────────────────────────────────┤ ├──
        1                                                       1

       Station 2                                              Station 2
       Jog                                                    Logic Command
       Command                                                JOG
       B3:22                                                  N20:4
 2   ──┤ ├──────────────────────────────────────────────────────┤ ├──
        2                                                       2

       Station 2                                              Station 2
       Clear Faults                                           Logic Command
       Command                                                CLEAR FAULTS
       B3:22                                                  N20:4
 3   ──┤ ├──────────────────────────────────────────────────────┤ ├──
        3                                                       3

       Station 2                                              Station 2
       Reverse                                                Logic Command
       Command                                                FORWARD
       B3:22                                                  N20:4
 4   ──┤/├──────────────────────────────────────────────────────┤ ├──
        4                                                       4

       Station 2                                              Station 2
       Reverse                                                Logic Command
       Command                                                REVERSE
       B3:22                                                  N20:4
 5   ──┤ ├──────────────────────────────────────────────────────┤ ├──
        4                                                       5
```

To control the speed reference over the Profibus, the three Reference Select bits (bits 14-12) need to have the values 011.

```
                                                              Station 2
                                                              Logic Command
                                                              REFERENCE SELECT 0
                                                              N20:4
 6   ──────────────────────────────────────────────────────────┤ ├──
                                                                12

                                                              Station 2
                                                              Logic Command
                                                              REFERENCE SELECT 1
                                                              N20:4
 7   ──────────────────────────────────────────────────────────┤ ├──
                                                                13

                                                              Station 2
                                                              Logic Command
       "Never Closed"                                         REFERENCE SELECT 2
       B3:22                                                  N20:4
 8   ──┤ ├──────────────────────────────────────────────────────┤ ├──
```

Station 2 Speed Reference
The PowerFlex 40 parameter 38 - [Speed Reference]
needs to be set to 5 ("RS485 [DSI] ¨Port").
N19.5 is controlled elsewhere in the user program.

```
                                                       Station 2
                                                       Speed Reference
                                                       Write
                                                     ┌──MOV──────────┐
                                                     │ Move          │
 9   ────────────────────────────────────────────────┤ Source  N19:5│
                                                     │           314<│
                                                     │ Dest    N20:5 │
                                                     │             0<│
                                                     └───────────────┘

10   ─────────────────────────────────────────────────────────────⟨END⟩──
```

Figure D.8   Parameter Accessing Routine

This section of the routine is only needed if the application needs to perform Parameter Protocol Reads or Writes to Station 2.

On power-up, initialize the Parameter Protocol routine.

```
                                                                    Par Prot
                                                                    Messaging
                                                                    Request
       First Pass                                                   B3:19
        S:1                                                         (U)
0      ┤ ├                                                          
        15                                                          0
```

This circuit utilizes the Parameter Protocol. A REQUEST to the Profibus adapter is processed only once at a time, and after each RESPONSE from the adapter a zero must be sent and received to 'handshake' before the next REQUEST/RESPONSE transaction can take place. For example:
Send a param. read request --> Receive a param. read response --> Send a "0" --> Receive a "0" --> [Transaction complete]

If the RESPONSE PCA Word 1 (N10:6) is "0", then a REQUEST can be initiated

Elsewhere in the user program these words must be loaded with message data prior to initiating the REQUEST.
N7:10 = RC = the operation to be performed ("1" = Read, "2" = 16-bit Write)
N7:11 = PNU = the parameter number to read or write
N7:12 = Subindex = the DPI port # ("0" = Station 0, "1" = Station 1, "2" = Station 2, "5" = 22-COMM-P, etc.)
N7:13 = PVA #1 (the parameter value (high word)) - only used when writing parameters
N7:14 = PVA #2 (the parameter value (low word)) - only used when writing parameters

The four Parameter Protocol Words set up in the scanner are used to perform the Parameter Protocol:
N20:6 = contains RC (the operation to be performed) and PNU (the parameter number to read or write) combined
N20:7 = Subindex (the DPI port #)
N20:8 = PVA #1 (the parameter value (high word))
N20:9 = PVA #2 (the parameter value (low word))

B3:19/0 is turned ON elsewhere in the program after a REQUEST message (N7:10-14) is loaded. This causes one Parameter Protocol read or write to occur and B3:19/0 is turned OFF when the transaction is complete.

```
    Par Prot
    Messaging    RESPONSE
    Request      PCA Word                        PCA Word
    B3:19      ┌───EQU────┐                     ┌───MOV────┐
1   ┤ ├        │ Equa     │                     │ Move     │
    0          │ Source A    N10:6│             │ Source      N7:11│
               │               0< │             │               77<│
               │ Source B        0│             │ Dest        N20:6│
               │               0< │             │           12304< │
               └──────────┘                     └──────────┘

                                                     PCA Word
                                      RC bit 0       RC bit 0
                                      N7:10          N20:6
                                      ┤ ├            (L)
                                       0              12

                                                     PCA Word
                                      RC bit 1       RC bit 1
                                      N7:10          N20:6
                                      ┤ ├            (L)
                                       1              13

                                                     PCA Word
                                      RC bit 2       RC bit 2
                                      N7:10          N20:6
                                      ┤ ├            (L)
                                       2              14

                                      IND Word
                                      (Subindex)
                                    ┌───COP────┐
                                    │ Copy File │
                                    │ Source   #N7:12│
                                    │ Dest     #N20:7│
                                    │ Length       3 │
                                    └──────────┘
```

Figure D.8   Parameter Accessing Routine (continued)

N10:6 is the Response Parameter Access Word 1. It is <> 0 when a message has been received in response to a
message request. If the response is >= 7000 hex (28672 decimal), then the adapter is responding that an error has occurred.
In this case, the returned data in the response will contain a fault code and not the parameter value data.

The response message can be found at:
N7:20 = PCA Word = contains RC and PNU
N7:21 = Subindex = the DPI port # ("0" = Station 0, "1" = Station 1, "2" = Station 2, "5" = 22-COMM-P, etc.)
N7:22 = PVA #1 = the parameter value (high word)
N7:23 = PVA #2 = the parameter value (low word)
The PVA's will either contain parameter read data, echo the parameter write data or contain an error code if unsuccessful.

```
        Par Prot
        Messaging   RESPONSE                                      RESPONSE Message
        Request     PCA Word                                      PCA Word
        B3:19         ┌──NEQ──────────┐                             ┌──COP──────────┐
 2 ├─────┤ ├──────────┤ Not Equal     │                             │ Copy File     │
          0           │ Source A  N10:6│                            │ Source  #N10:6│
                      │           0<  │                             │ Dest    #N7:20│
                      │ Source B    0 │                             │ Length      4 │
                      │           0<  │                             └───────────────┘
                      └───────────────┘
                                                                    PCA Word
                                                                     ┌──MOV──────────┐
                                                                     │ Move          │
                                                                     │ Source      0 │
                                                                     │          0<   │
                                                                     │ Dest    N20:6 │
                                                                     │       12304<  │
                                                                     └───────────────┘

                                                                    Par Prot
                                                                    Messaging
                                                                    Request
                                                                    B3:19
                                                                     ─(U)─
                                                                       0

 3 ├────────────────────────────────────────────────────────────────────────────< END >
```

Notes:

A **Adapter**

Devices such as drives, controllers, and computers usually require an adapter to provide a communication interface between them and a network such as Profibus. 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 22-COMM-P Profibus adapter connects PowerFlex 4-Class drives to a Profibus Network. Adapters are sometimes also called "cards," "embedded communication options," "gateways," "modules," and "peripherals."

C **ControlFLASH**

An Allen-Bradley software tool that lets users electronically update firmware on printed circuit boards.

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.

D **Data Rate**

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

Baud Rate	Maximum Cable Length
9.6 Kbps	1000 m
19.2 Kbps	1000 m
93.75 Kbps	1000 m
187.5 Kbps	1000 m
500 Kbps	400 m
1.5 Mbps	200 m
3 Mbps	100 m
6 Mbps	100 m
12 Mbps	100 m

DSI (Device Serial Interface)

A modification of the ModBus RS-485 serial communication protocol used by various Allen-Bradley drives and power products.

DSI Peripheral

A device that provides an interface between DSI and a network or user. Peripheral devices are also referred to as "adapters" and "modules." The serial converter and PowerFlex 4-Class HIMs (22-HIM-xx) are examples of DSI peripherals.

DSI Product

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

DriveExplorer Software

A tool for monitoring and configuring Allen-Bradley drives and communication adapters. It can be run on computers running various Microsoft Windows operating systems. DriveExplorer (version 3.xx or higher) can be used to configure this communication adapter and PowerFlex 4-Class drives. Information about DriveExplorer software and a free lite version can be accessed at http://www.ab.com/drives/driveexplorer.

DriveTools SP Software

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

F **Fault Action**

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

Fault Configuration

When communications are disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive 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 Logic and/or Reference.

Feedback

See Reference/Feedback

Flash Update

The process of updating firmware in a device. The adapter can be flash updated using the controlFLASH tool or the X-Modem protocol and a 1203-SSS Smart Self-powered Serial converter (firmware 3.xxx or later).

G **GSD File**

A file used by network configuration tools to configure the adapter. The GSD file contains GSD modules for setting up the communication with the adapter.

H **HIM (Human Interface Module)**

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

Hold Last

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

I **I/O Data**

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

L **Logic Command/Logic Status**

The Logic Command is used to control the PowerFlex 4-Class drive (for example, start, stop, direction). It consists of one 16-bit word of output to the adapter from the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix C.

The Logic Status is used to monitor the PowerFlex 4-Class drive (for example, operating state, motor direction). It consists of one 16-bit word

of input from the adapter to the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix C.

M   **Master**

See Scanner

N   **Node Address**

A Profibus network can have as many as 126 devices connected to it. Each device on the network must have a unique node address between 0 and 126.

NVS (Non-Volatile Storage)

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

P   **Parameter Messaging**

Parameter Messages are used to configure, monitor, and diagnose devices over Profibus.

PowerFlex 4-Class (Component Class) Drives

The Allen-Bradley PowerFlex 4-Class family of drives supports DSI and, at the time of publication, includes the PowerFlex 4, PowerFlex 40, PowerFlex 40P, and PowerFlex 400. These drives can be used for applications ranging from 0.2…110 kW (0.25…150 HP).

Profibus Network

A Profibus network uses RS485 to connect devices (for example, controllers, drives, and motor starters). A Profibus network can support a maximum of 126 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 the bus signal. Devices can be connected to the network in a daisy chain connection.

General information about Profibus and the Profibus specification are maintained by the Profibus Trade Organization (PTO). PTO is online at http://www.profibus.com.

R   **Reference/Feedback**

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

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

S **Scanner**

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

A Scanner is often called Master.

Status Indicators

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

Z **Zero Data**

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

Notes:

U.S. Allen-Bradley Drives Technical Support
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