Allen-Bradley

PowerFlex® Communications

LonWorks Adapter

22-COMM-L
FRN 1.xxx

User Manual

Rockwell Automation

Important User Information

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

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

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

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

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

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

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

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

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

Summary of Changes

This is the first release of the LonWorks adapter FRN 1.xxx.

Table of Contents

About This Manual

Related Documentation

For:	Refer to:	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer, and DriveExplorer online help (installed with the software)	—
DriveTools™ SP (includes DriveExecutive™)	http://www.ab.com/drives/drivetools, and DriveExecutive online help (installed with the software)	—
HIM	*HIM Quick Reference*	22HIM-QR001…
PowerFlex® 4 Drive	*PowerFlex 4 User Manual* *PowerFlex 4 Quick Start*	22A-UM001… 22A-QS001…
PowerFlex® 40 Drive	*PowerFlex 40 User Manual* *PowerFlex 40 Quick Start*	22B-UM001… 22B-QS001…
PowerFlex® 400 Drive	*PowerFlex 400 User Manual*	22C-UM001…
Network Cabling	LonMark Layers 1-6 Interoperability Guidelines, Appendix A “Cable Requirements for the TP/FT-10 Channel.”	www.lonmark.org

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

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number, and the * represents the parameter name — for example **Parameter 01 - [DPI Port]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.
- The firmware release is displayed as FRN X.xxx. The "FRN" signifies Firmware Release Number. The "X" is the major release number. The "xxx" is the minor update number.
- This manual provides information about the 22-COMM-L LonWorks adapter and using it with PowerFlex 4-Class drives. The adapter can be used with other products that support a DSI adapter, such as the DSI External Comms Kit (22-XCOMM-DC-BASE). Refer to the documentation for your product for specific information about how it works with the adapter.

Rockwell Automation Support

Rockwell Automation, Inc. offers support services worldwide, with over 75 sales/support offices, over 500 authorized distributors, and over 250 authorized systems integrators located throughout the United States alone. In addition, Rockwell Automation, Inc. 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

If you need to contact Rockwell Automation, Inc. for technical assistance, please review the information in Chapter 5, Troubleshooting, first. If you still have problems, then call your local Rockwell Automation, Inc. representative.

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

UK Customer Support Center:
E-mail: esupport2@ra.rockwell.com
Tel: +44 (0) 870 2411802
Fax: +44 (0) 1908 838804

Germany Customer Service Center:
E-mail: ragermany-csc@ra.rockwell.com
Tel: +49 (0) 2104 960-630
Fax: +49 (0) 2104 960-501

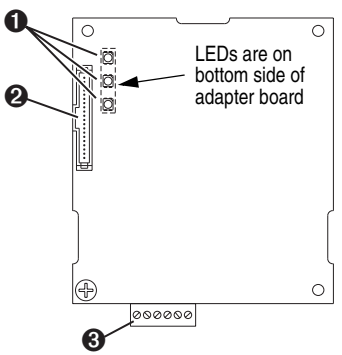
Notes:

Getting Started

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

Components

Figure 1.1 Components of the Adapter



Item	Part	Description
1	Status Indicators	Three LEDs indicate the status of the connected drive, adapter, and network. Refer to Chapter 5, Troubleshooting, for details.
2	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable connects to this connector and one on the drive.
3	Terminal Block	A 6-screw terminal block connects the adapter to the network.

Features

The LonWorks adapter features the following:

- The adapter is normally installed in a PowerFlex 40 or PowerFlex 400 drive. It can also be used in a DSI External Comms Kit (22-XCOMM-DC-BASE).
- A number of configuration tools can be used to configure the adapter and connected drive. The tools include an external PowerFlex 4-Class HIM (22-HIM-*) or drive-configuration software such as DriveExplorer (version 3.01 or higher) or DriveExecutive (version 3.01 or higher).
- Status indicators report the status of drive communications, the adapter, and network.
- Based on the LonMark Functional Profile: “Variable Speed Motor Drive: 6010.”
- Read/write access to parameters is available. You can configure and monitor parameter values over the networks.
- User-defined fault actions determine how the adapter and drive respond to communication disruptions on the network.
- LonMark conformance tested.
- Flash-upgradable.

Compatible Products

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

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

Required Equipment

Equipment Shipped with the Adapter

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

- ❑ One LonWorks adapter
- ❑ One 15.24 cm (6 in.) Internal Interface Cable
- ❑ This manual
- ❑ A diskette containing resource files

User-Supplied Equipment

To install and configure the adapter, you must supply:

- ❑ A small flathead screwdriver
- ❑ Network-specific cable to connect the adapter to the network. Refer to the network-specific documentation for the cable recommendations and requirements.
- ❑ A configuration tool, such as:
  - PowerFlex 4-Class HIM (22-HIM-*)
  - DriveExplorer (version 3.01 or higher)
  - DriveExecutive stand-alone software (version 3.01 or higher) or bundled with the DriveTools SP suite (version 1.01 or higher)
  - LonMaker configuration software
- ❑ A PC connection to the LonWorks network

Safety Precautions

Please read the following safety precautions carefully.

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

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

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

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

ATTENTION: Risk of injury or equipment damage exists. **Parameter 6 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

ATTENTION: Risk of injury or equipment damage exists. **Parameter 7 - [RcvHrtBeat Time]** lets you determine how long it will take your adapter to detect network communication losses. By default, this parameter is set to 120 seconds. You can set it so that the duration is shorter, longer, or disabled. Take precautions to ensure that the setting 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).

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

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

Quick Start

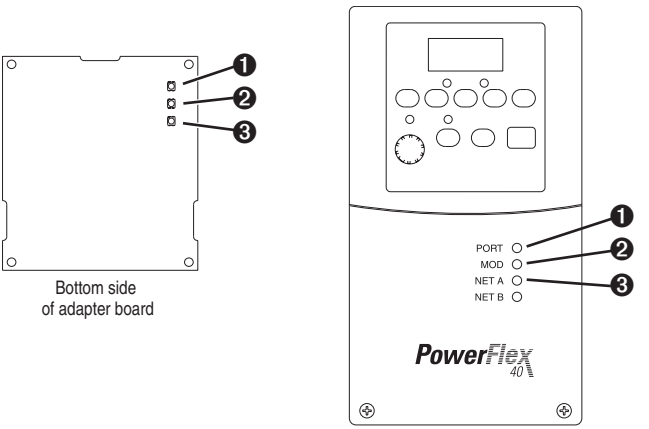
This section is provided to help experienced users quickly start using the adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step		Refer to…
1	**Review the safety precautions for the adapter.**	Throughout This Manual
2	**Verify that the drive is properly installed.**	Drive User Manual
3	**Install the adapter.** Verify that the drive and the network are not powered. Then, connect the adapter to the network using a network-specific cable and to the drive using the Internal Interface cable. Use the captive screw to secure and ground the adapter to the drive. When installing the adapter in a DSI External Comms Kit, refer to the *22-XCOMM-DC-BASE Installation Instructions* (Publication No. 22COMM-IN001…) supplied with the kit.	Chapter 2, Installing the Adapter
4	**Apply power to the adapter.** Verify that the adapter and network are installed correctly and then apply power to them. The adapter receives power from the drive. The topmost status indicator should be solid green. Refer to Chapter 5, Troubleshooting, for a description of the other LEDs.	Chapter 2, Installing the Adapter
5	**Configure the adapter for your application.** Install and bind network variables. Set the parameters for the following features as required by your application: • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
6	**Set up the network to communicate with the adapter.** Use a network tool (such as LonMaker) to configure the adapter on the network.	Chapter 4, Configuring the Network

Modes of Operation

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

Figure 1.2 Status Indicators (location on drive may vary)



Item	Status Indicator	Normal Status (1)	Description
❶	PORT	Flashing Green	Normal Operation. The adapter is establishing an I/O connection to the drive. It will turn solid green or red.
		Green	Normal Operation. The adapter is properly connected and communicating with the drive
❷	MOD	Flashing Green	Normal Operation. The adapter is operating but is not transferring I/O data.
		Green	Normal Operation. The adapter is operating and transmitting I/O data.
❸	NET A	Off	Normal Operation. The adapter is configured.

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

If any other conditions occur, refer to Chapter 5, Troubleshooting.

Installing the Adapter

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

Preparing for the Installation

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

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

Connecting the Adapter to the Network

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

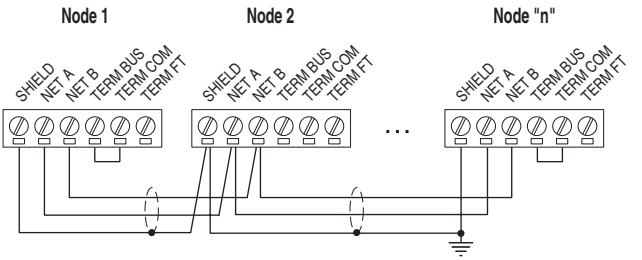
1. Remove power from the drive.
2. Use static control precautions.

3. Open the drive cover.

4. Connect a cable to the network, and route it through the bottom of the PowerFlex drive. (Refer to the LonMark Layers 1-6 Interoperability Guidelines, Appendix A “Cable Requirements for the TP/FT-10 Channel.”)

5. Connect a six-pin linear plug to the network cable. (See Figure 2.1 for the terminal definitions.)

Figure 2.1 Bus Topology with Shield Example



Terminal	Name	Function
1	SHIELD (1)	Noise mitigation (2)
2	NET A	Network connection, polarity insensitive
3	NET B	Network connection, polarity insensitive
4	TERM BUS	Connect to TERM COM for termination of Bus (3) topology networks.
5	TERM COM	Termination common
6	TERM FT	Connect to TERM COM for termination of Free (4) topology networks.

(1) It is recommended to use shielded network cable. This shield must be grounded at one point on the network via a 470K ohm, 1/4 watt, ≤10% metal film resistor.

(2) For noise mitigation, LON trunk lines should not be run in close proximity to drive or equipment power distribution feeds.

(3) To terminate a Bus Topology network (one termination at each end of the network), connect TERM COM to TERM BUS.

(4) To terminate a Free Topology network (one termination per segment), connect TERM COM to TERM FT.

6. Insert the six-pin linear plug into the mating adapter socket.

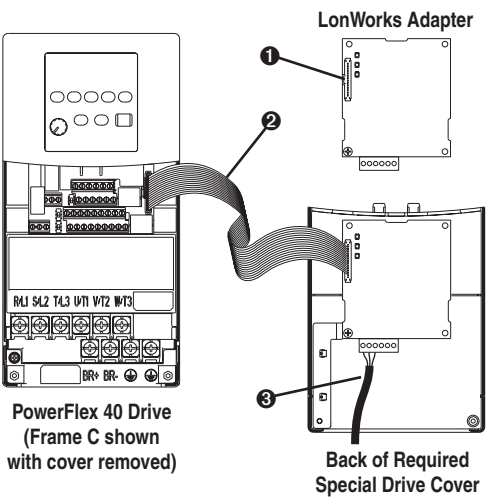
Connecting the Adapter to the Drive

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

1. Remove power from the drive.
2. Use static control precautions.
3. Mount the adapter on the *required special* drive cover (ordered separately — see Figure 2.3 for part numbers).
   - Frame C: Use the adapter screw to secure the adapter to the cover.
   - Frame B: Disregard the screw and snap the adapter in place.

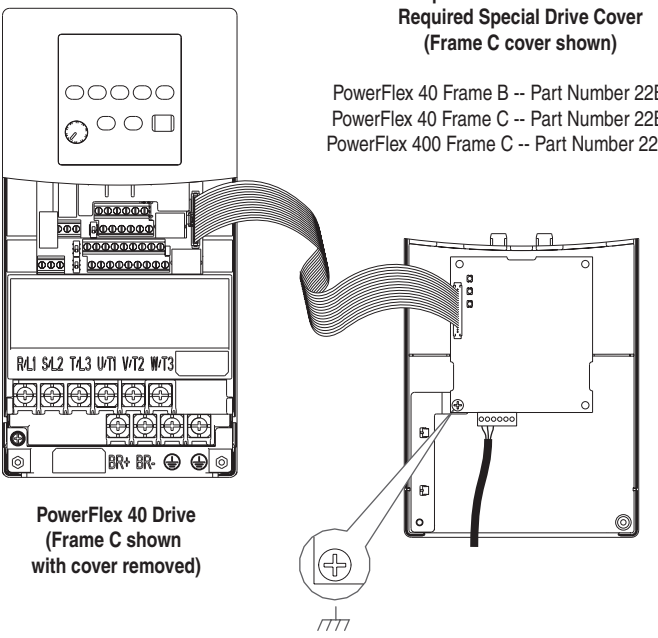
   Important: For Frame C drives, tighten the adapter's lower left screw to ground the adapter (see Figure 2.3). For Frame B drives, install the special drive cover onto the drive using both cover fasteners to ground the adapter.
4. Connect the Internal Interface cable to the DSI port on the drive and then to the mating DSI connector on the adapter.

Figure 2.2 Connecting DSI Ports with Internal Interface Cable



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

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



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

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

PowerFlex 40 Drive (Frame C shown with cover removed)

Ground for Frame C Drives

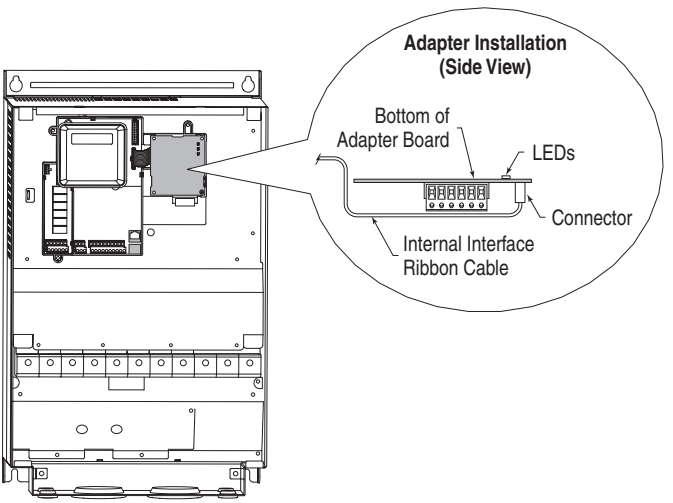
NOTE: For Frame B drives, the lower left adapter screw does not ground the adapter. To ground the adapter, install the special drive cover onto the drive using both cover fasteners.

PowerFlex 400 Frames D, E, and F

1. Remove power from the drive.
2. Use static control precautions.
3. Remove the drive cover.
4. With the adapter board right side up, remove its mounting screw from the lower left hole. Save the screw for mounting in Step 7.
5. Connect the Internal Interface cable to the DSI port on the drive (see Figure 2.4).
6. With the adapter board oriented bottom side up, route the Internal Interface cable under the adapter, and then to the mating DSI connector on the adapter.
7. Install the adapter, bottom side up, to the right side of the display board by snapping it into place. Then insert the adapter mounting screw into the lower left hole on the board.

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

Figure 2.4 Mounting and Connecting the Adapter – PowerFlex 400 Frame D, E, and F Drives



Applying Power

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

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

2. Apply power to the PowerFlex drive. The adapter receives its power from the connected drive. When you apply power to the adapter for the first time, the topmost status indicator on the adapter should be solid green. If it is not green, refer to Chapter 5, Troubleshooting.

Configuring the Adapter

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

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

Configuration Tools

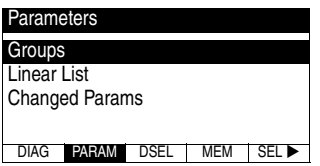
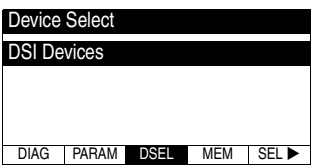
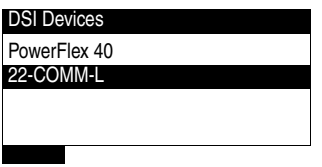
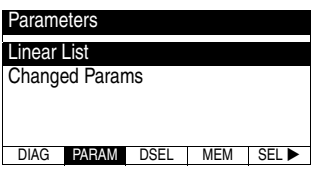
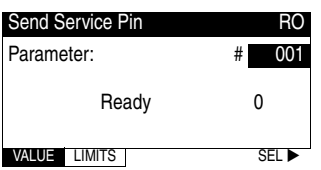
The LonWorks adapter stores parameters and other information in its own non-volatile memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters:

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

Using the PowerFlex 4-Class HIM

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

Using the HIM

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

Setting the Comm Fault Action

By default, when communications are disrupted (for example, a cable is disconnected), the drive will remain in its current state (for example, a running drive will continue to run) until **Parameter 12 - [RcvHrtBeat Time]** has elapsed.

You can configure different responses to communications disruptions using **Parameter 06 - [Comm Flt Action]** and **Parameter 12 - [RcvHrtBeat Time]**.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 06 - [Comm Flt Action]** and **Parameter 12 - [RcvHrtBeat Time]** let you determine the action of the adapter and connected drive if communications are disrupted. Take precautions to ensure that the setting of these parameters 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).

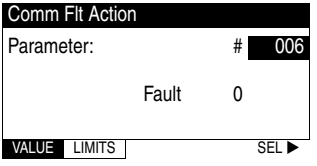
To change the Comm fault action

- Set the value of **Parameter 06 - [Comm Flt Action]** to the desired response action.

Value	Action (1)	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent 0 for output data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameter 07 - [Flt Cfg Logic]** and **Parameter 08 - [Flt Cfg Ref]**).

(1) Actual action taken requires **Parameter 12 - [RcvHrtBeat Time]** to have a value greater than "0."

Figure 3.1 Comm Fault Action Screen on PowerFlex 4-Class HIM (22-HIM-*)



- Setting **Parameter 12 - [RcvHrtBeat Time]** to “0” disables the fault action, and a value greater than “0” enables the fault action. If nviDrvSpeedStpt is not received by the adapter within the **Parameter 12 - [RcvHrtBeat Time]** value, the fault action in **Parameter 06 - [Comm Flt Action]** will be taken.

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

Setting the Idle Fault Action

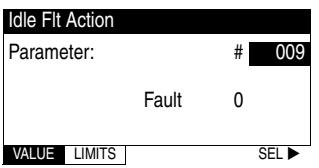
Parameter 09 - [Idle Flt Action] lets you determine the action of the adapter and connected drive when the node is taken offline.

To change the idle fault action

- Set the value of **Parameter 09 - [Idle Flt Action]** to the desired response action:

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

Figure 3.2 Idle Fault Action Screen on PowerFlex 4-Class HIM (22-HIM-*)



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

To set the fault configuration parameters

If you set **Parameter 06 - [Comm Flt Action]** or **09 - [Idle Flt Action]** to the "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault and/or idle fault occurs. You must set these parameters to values required by your application.

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

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

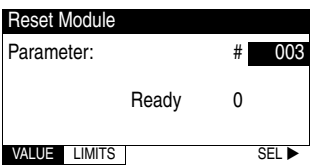
Resetting the Adapter

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

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

- Set **Parameter 03 - [Reset Module]** to **Reset Module**.

Figure 3.3 Reset Screen on PowerFlex 4-Class HIM (22-HIM-*)



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

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

Viewing the Adapter Configuration

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

Number	Name	Description
01	Send Service Pin	Broadcasts a LON Service Pin Message from the Neuron Chip. This provides the Neuron ID.
02	Neuron State	Displays the state of the Neuron Chip.
04	Neuron ID	Displays the Neuron Chip ID.

Configuring the Network

Chapter 4 provides information about configuring network variables to access a PowerFlex 40 or 400 drive when using a LonWorks adapter.

Overview of LonWorks Functionality

A network variable is a data item that a particular device application program expects to get from other devices on a network (*Network Variable Inputs*) or expects to make available to other devices on a network (*Network Variable Outputs*). Data exchange on a LonWorks network is handled with Standard Network Variable Types (SNVTs), which represent different types of standard data (for example, temperature, pressure, voltage, etc.).

When a program writes into one of its Network Variable Outputs, the new value of the network variable is propagated across the network to all nodes with Network Variable Inputs connected to that Network Variable Output. A network variable can only be bound to another network variable of the same type.

Specific network variables are described in Network Variable Inputs (NVIs) on page 4-5, Network Variable Outputs (NVOs) on page 4-7, and Network Configuration Inputs (NCIs) on page 4-13.

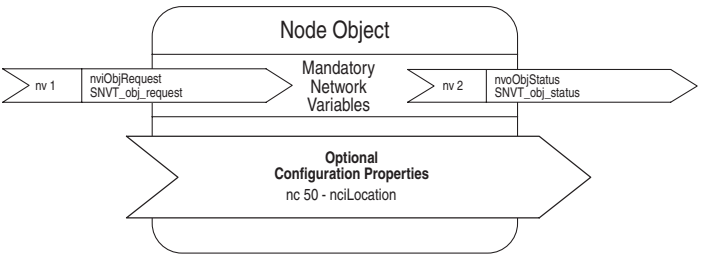
Important: Any changes made using a PowerFlex 4-Class HIM to a parameter that is also updated by the network will be overwritten when the next network update occurs.

Operating the Drive Using a LonMark Profile

A LonMark profile defines the functional profile for a node communicating with other nodes. The profile specifies which SNVTs (Standard Network Variable Types) and SCPTs (Standard Configuration Property Types) are used, and provides a semantic meaning about the information being communicated.

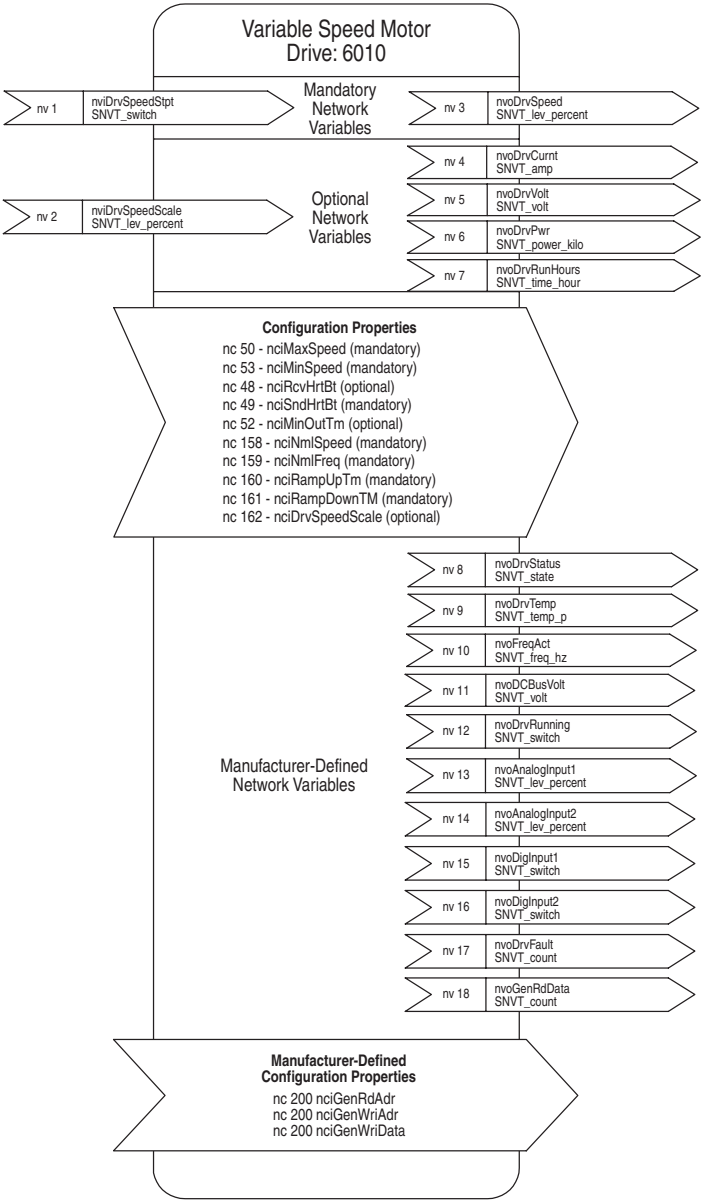
When a profile is implemented in a node, it's called a LonMark object. One node can have several objects implemented. The LonWorks adapter has two objects: a node object and a drive object. The node object (Figure 4.1) is used to control the other objects in a node.

Figure 4.1 Node Object



The drive object is based on a specific LonMark functional profile ("Variable Speed Motor Drive: 6010") and is shown in Figure 4.2.

Figure 4.2 Drive Object



Node Operations

This section describes the basics of node operation.

WINK (What is a WINK?)

WINK is a network command that verifies communication with a node. The NET A indicator will flash to indicate that a WINK was received. The LED will flash red according to the following sequence:

- 3 fast flashes
- OFF for 1 second

This sequence is repeated 10 times.

If the Node is Offline

If node is brought offline it will not accept any NVI (Network Variable Inputs) settings or update NVOs (Network Variable Outputs). The adapter uses the setting in **Parameter 09 - [Idle Flt Action]** and issues a command to the drive. NCI (Network Configuration Input) variable updates will be accepted but not forwarded to the drive until the node goes online and/or is reset.

If the Node is Online

The node accepts NCI and NVI settings and updates NVOs.

Drive Settings to Enable Operation on the Network

Two parameters in PowerFlex 40/400 drives must be set to enable the drive to operate on a LonWorks network:

- Set drive parameter P036 - [Start Source] to “5” (Comm Port)
- Set drive parameter P038 - [Speed Reference] to “5” (Comm Port)

Network Variable Inputs (NVIs)

This section describes the Network Variable Inputs.

Node Object Request

Variable: nviObjRequest

Format: SNVT_obj_request

Explanation: This Network Variable Input enables control commands and updates from the network to specific objects in the node. The identification number for the node is 0 and for the drive object is 1. The request functionality is the same for both objects. The setting of nviObjRequest does not affect the ability of setting drive speed. The status of the node is reported in nvoObjStatus (page 4-7).

Valid Range for Object ID: 0 and 1

Valid Range for Request:

- RQ_UPDATE_STATUS updates nvoObjStatus.
- RQ_CLEAR_STATUS clears nvoObjStatus.
- RQ_CLEAR_ALARM clears a fault in the drive.
- RQ_REPORT_MASK reports supported requests in nvoObjStatus.
- RQ_NORMAL is the normal request where the node functions as normal.
- RQ_DISABLE puts the node in a disabled state. It sets a Comm Loss Action to the drive (at address 0x2002 bit 5). It does not respond to any updates received on Network Variable Inputs, but it supports writing of configuration properties (Network Configuration Inputs). A value written to a Network Variable Input in this state is not written to the drive. It will NOT be valid when the node is enabled again. In the disabled state, Network Variable Outputs (NVOs) are not propagated to the network. If the node was already in the disabled state, a request to disable the node is not an error.
- RQ_ENABLE enables the node again after a disable request.

All other requests are not supported, and any attempt to use them sets the invalid_request bit in nvoObjStatus.

Drive Speed Setpoint

Variable: nviDrvSpeedStpt

Format: SNVT_switch

Explanation: This Network Variable Input provides a low-resolution speed setpoint. The setpoint value consists of two elements: the requested speed and the drive state. When the drive state element of the nviDrvSpeedStpt variable is set to zero, the drive will stop.

Valid Range: 0.0 - 100.0 (in 0.5% increments) followed by a space and either a “0” (STOP), “1” (RUN), or “-1” (AUTO) drive state.

nviDrvSpeedStpt Value		nviSpeedScale Value (%)	Resulting Speed
Requested Speed (%)	Drive State		
n/a	0 (STOP)	n/a	STOPPED
0.0	1 (RUN)	n/a	RUNNING at 0%
0.5-99.5	1 (RUN)	Effect speed and running direction	Equals nviDrvSpeedStpt Value times nviDrvSpeedScale Value
n/a	-1 (AUTO)	n/a	AUTO (Invalid)

Scaling: See table above and Adjusting the Frequency Setting on page 4-19.

Default Value: -1 (state = AUTO). This value is adapted at power up. This Network Variable Input may use **Parameter 12 - [RcvHrtBeat Time]** if this function is set up for use.

Speed Setpoint Scaling

Variable: nviDrvSpeedScale

Format: SNVT_lev_percent

Explanation: This Network Variable Input provides scaling for nviDrvSpdStpt. For example, if nviDrvSpeedStpt value is 100.0% and nviDrvSpeedScale value is -150.000%, then actual speed setpoint value is -150.000% (reverse direction at 1.5 times nominal speed).

Valid Range: -163.840 to +163.830%

Scaling: See Drive Speed Setpoint on page 4-6 and Adjusting the Frequency Setting on page 4-19.

Default Value: Defined by nciDrvSpeedScale.

Network Variable Outputs (NVOs)

This section describes the Network Variable Outputs, which are read-only values. No output values are sent over the network, unless they have changed (except nvoDrvSpeed, which is sent for the heartbeat functionality, and nvoObjStatus, if update status is requested).

Node Object Status

Variable: nvoObjStatus

Format: SNVT_obj_status

Explanation: This Network Variable Output reports node object status (bit field) and is updated every time its status changes (see Node Object Request on page 4-5).

Valid Range:

Bit	Name	Description
1	Invalid_ID	The node has been asked for an invalid object ID.
2	Invalid_request	The node has been asked for an unsupported request.
3	Disabled	Object disabled.
6	Out_of_service	The drive is not supported. The Lon adapter has detected an unknown drive. It will not attempt to communicate on the DSI bus.
13	Comm_failure	No contact with DSI.
16	Locked_out	The initial Neuron processor state after a reset.
17	Manual_control	The drive is not fully controlled from the LonWorks peripheral.
18	In_alarm	The drive is faulted.
20	Report_mask	Report supported fields.

Drive Status

Variable: nvoDrvStatus

Format: SNVT_state

Explanation: This Network Variable Output provides the status of the drive via the Logic Status word (see Logic Status Word on page C-2).

Scaling: Bit 0 in the drive is bit 0 (Most Significant Bit) in this variable when it is viewed using the SNVT_state format (default). SNVT_state bits, shown in the LonMaker Browser window, are numbered from left to right.

Drive Current

Variable: nvoDrvCurnt

Format: SNVT_amp

Explanation: This Network Variable Output provides the drive output current in Amps.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d003 - [Output Current]

Drive Speed

Variable: nvoDrvSpeed

Format: SNVT_level_percent

Explanation: This Network Variable Output provides the speed of the drive as a percentage of the nominal speed. This Network Variable Output is also used as a heartbeat to monitor the health of the LonWorks communication interface.

Scaling: nciNmlFreq ÷ (nvoFreqAct * run_dir) = nvoDrvSpeed

The run_dir value is bit 3 of the drive Logic Status word. If rotation direction is forward, then run_dir will be a positive value. If reverse, then run_dir will be a negative value.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d001 - [Output Freq], but scaled in percent.

Drive Power

Variable: nvoDrvPwr

Format: SNVT_power_kilo

Explanation: This Network Variable Output provides the drive output power in kilowatts.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d022 - [Output Power]

Drive Voltage

Variable: nvoDrvVolt

Format: SNVT_volt

Explanation: This Network Variable Output provides the drive output voltage in volts.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d004 - [Output Voltage]

Drive Temperature

Variable: nvoDrvTemp

Format: SNVT_temp_p#US

Explanation: This Network Variable Output provides the drive temperature in °F.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d024 - [Drive Temp]

Output Frequency

Variable: nvoFreqAct

Format: SNVT_freq_hz

Explanation: This Network Variable Output provides the drive output frequency in Hz. This value is always positive (does not indicate the forward/reverse direction of revolution).

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d001 - [Output Freq]

Operation Hour Counter

Variable: nvoDrvRunHours

Format: SNVT_time_hour

Explanation: This Network Variable Output provides the drive total running time in whole hours.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d018 - [Elapsed Run Time]

DC Bus Output

Variable: nvoDCBusVolt

Format: SNVT_volt

Explanation: This Network Variable Output provides the DC Bus voltage in volts.

PowerFlex 40/400 Drive Parameter Equivalent: Parameter d005 - [DC Bus Voltage]

Drive Running

Variable: nvoDrvRunning

Format: SNVT_switch

Explanation: This Network Variable Output indicates if the drive is running (active). It is the same status as read from bit 1 in nvoDrvStatus.

nvoDrvRunning Variable		
Value (%)	State	Status
0.0	0	Not Active
100.0	1	Active

Analog Input 1 Status

Variable: nvoAnalogInput1

Format: SNVT_lev_percent

Explanation: This Network Variable Output provides the status of drive analog input 1.

PowerFlex 40 Drive Parameter Equivalent: Parameter d020 - [Analog In 0-10V]
PowerFlex 400 Drive Parameter Equivalent: Parameter d305 - [Analog In 1]

Analog Input 2 Status

Variable: nvoAnalogInput2

Format: SNVT_lev_percent

Explanation: This Network Variable Output provides the status of drive analog input 2.

PowerFlex 40 Drive Parameter Equivalent: Parameter d021 - [Analog In 4-20mA]
PowerFlex 400 Drive Parameter Equivalent: Parameter d306 - [Analog In 2]

Digital Input 1 Status

Variable: nvoDigInput1

Format: SNVT_switch

Explanation: This Network Variable Output provides the status of drive digital input 1 via Logic Status word bit 12 (see Logic Status Word on page C-2).

nvoDigInput 1 Variable		
Value (%)	State	Status
0.0	0	Input 1 Disabled
100.0	1	Input 1 Enabled

Digital Input 2 Status

Variable: nvoDigInput2

Format: SNVT_switch

Explanation: This Network Variable Output provides the status of drive digital input 2 via Logic Status word bit 13 (see Logic Status Word on page C-2).

nvoDigInput 2 Variable		
Value (%)	State	Status
0.0	0	Input 2 Disabled
100.0	1	Input 2 Enabled

Drive Error

Variable: nvoDrvFault

Format: SNVT_count

Explanation: This Network Variable Output provides the drive fault code.

PowerFlex 40 Drive Parameter Equivalent: Parameter d007 - [Fault 1 Code]
PowerFlex 400 Drive Parameter Equivalent: Parameter b007 - [Fault 1 Code]

Generic Parameter Data

Variable: nvoGenRdData

Format: SNVT_count

Explanation: This Network Variable Output provides data from the parameter number defined by nciGenRdAdr. Data size is 2 bytes.

Scaling: No scaling is performed and all data is presented in raw format.

Parameter Mapping: nciGenRdAdr

Network Configuration Inputs (NCIs)

The values of the NCIs change when written to and keep their values after a power cycle.

All NCIs, with a corresponding parameter in the drive, are read from the drive after reset and when going from offline to online. When the parameter is updated from the network, it is written to the drive.

Send Heartbeat

NCI: nciSndHrtBt

Format: SNVT_time_sec

Explanation: This Network Configuration Input sets the maximum send time for the variable nvoDrvSpeed.

Valid Range: 0.0 - 6553.4 seconds

Default Value: 0.0 seconds (disabled)

Receive Heartbeat

NCI: nciRcvHrtBt

Format: SNVT_time_sec

Explanation: This Network Configuration Input sets the maximum time that is allowed to elapse between updates of the Network Variable Input nviDrvSpeedStpt. Setting nciRcvHrtBt to 0.0 seconds disables the Receive Heartbeat function. If a timeout occurs, the adapter will issue the fault action set in **Parameter 06 - [Comm Flt Action]**. A timeout cannot occur before the reception of the first nviDrvSpeedStpt update.

Valid Range: 0.0 - 6553.4 seconds

Default Value: 120.0 seconds

Minimum Send Time

NCI: nciMinOutTm

Format: SNVT_time_sec

Explanation: This Network Configuration Input sets the minimum period of time that expires before the Network Variable Outputs can be re-sent. All variables are updated if they changed at each period end. This is good for limiting use of bandwidth on the LonWorks network. Setting nciMinOutTm to 0.0 seconds disables transmission limiting.

Valid Range: 0.0 - 6553.4 seconds
Default Value: 0.0 seconds (disabled)

Motor Nominal Speed (only for PowerFlex 400 Drives)

NCI: nciNmlSpeed

Format: SNVT_rpm

Explanation: This Network Configuration Input sets the nominal speed of the drive in RPMs. Nominal speed uses the drive's motor pole parameter A199 - [Motor NP Poles] value and sets the nominal frequency of the drive output.

Scaling: Nominal Frequency = (nciNmlSpeed * No. of Poles) ÷ 120.0
Default Value: —

Nominal Frequency

NCI: nciNmlFreq

Format: SNVT_freq_hz

Explanation: This Network Configuration Input sets the nominal frequency of the drive output in Hz. This also affects commanded drive speed. For more information, see Drive Speed Setpoint on page 4-6 and Speed Setpoint Scaling on page 4-6.

Valid Range: 10.0 - 400.0 Hz
Default Value: 60.0 Hz

PowerFlex 40/400 Drive Parameter Equivalent: Parameter P032 - [Motor NP Hertz]

Minimum Speed

NCI: nciMinSpeed

Format: SNVT_lev_percent

Explanation: This Network Configuration Input limits the minimum speed that can be set from the network to the drive. The value is entered as a percentage of nominal frequency as defined by the Nominal Frequency (nciNmlFreq) configuration value. For example, if nciNmlFreq = 50 Hz and nciMinSpeed = 10.000%, the minimum speed is 5 Hz.

Valid Range: The minimum speed value is validated as follows:

-163.840% ≤ minimum speed ≤ maximum speed ≤ 163.830%

Default Value: 0.000%

Maximum Speed

NCI: nciMaxSpeed

Format: SNVT_lev_percent

Explanation: This Network Configuration Input limits the maximum speed that can be set from the network to the drive. The value is entered as a percentage of nominal frequency as defined by the Nominal Frequency (nciNmlFreq) configuration value. For example, if nciNmlFreq = 50 Hz. and nciMaxSpeed = 125.000%, the maximum speed is 62.5 Hz.

Valid Range: The maximum speed value is validated against the value of the minimum speed as follows:

-163.840% ≤ minimum speed ≤ maximum speed ≤ 163.830%

Default Value: 100.000%

Ramp Up Time

NCI: nciRampUpTm

Format: SNVT_time_sec

Explanation: This Network Configuration Input sets the acceleration time. The value specifies the length of time it will take to bring the inverter from stop to maximum frequency.

Valid Range: 0.0 - 600.0 seconds

Default Value: 10.0 seconds

PowerFlex 40/400 Drive Parameter Equivalent: Parameter P039 - [Accel Time 1]

Ramp Down Time

NCI: nciRampDownTm

Format: SNVT_time_sec

Explanation: This Network Configuration Input sets the deceleration time. The value specifies the length of time it will take to bring the inverter to a stop when running at maximum frequency.

Valid Range: 0.1 - 600.0 seconds

Default Value: 10.0 seconds

PowerFlex 40/400 Drive Parameter Equivalent: Parameter P040 - [Decel Time 1]

Location

NCI: nciLocation

Format: SNVT_str_asc

Explanation: This Network Configuration Input can be used to set the physical location of the object in text. That is, it can hold the building, level, and room descriptor. A maximum of 31 characters can be entered.

Default Value: Empty spaces

Speed Setpoint Scaling Default Value

NCI: nciDrvSpeedScale

Format: SNVT_lev_percent

Explanation: This Network Configuration Input sets a default value to nviDrvSpeedScale on every drive power cycle.

Valid Range: -163.000 to + 163.000%

Default Value: 0.000%

Generic Parameter Read Address

NCI: nciGenRdAdr

Format: SNVT_count

Explanation: This Network Configuration Input is used to read any parameter in the drive. The data is read via the nvoGenRdData output.

Valid Range: Any 2-byte valid drive parameter that can be read with Modbus command 03 (read holding register).

Default Value: 0 (not used)

Generic Parameter Write Address

NCI: nciGenWriAdr

Format: SNVT_count

Explanation: This Network Configuration Input is used to set the drive parameter number to which a write operation should be performed. The drive parameter must be a writable parameter. The actual data value is collected from nciGenWriData. The write operation is triggered only when nciGenWriData is updated. The write operation is not triggered if nciGenWriAdr is updated.

ATTENTION: Risk of equipment damage exists. Writing to a parameter using this method causes a Non-Volatile Storage (NVS) update (EEPROM write cycle). By using this method to frequently write parameter data, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not frequently write parameter data via this method.

Valid Range: Any 2-byte valid drive parameter that can be written using Modbus command 06 (preset single register).

Default Value: 0 (not used)

Generic Parameter Write Data

NCI: nciGenWriData

Format: UNVT_count

Explanation: This Network Configuration Input is the raw data value that will be written to the drive parameter set in nciGenWriAdr. The adapter will not scale the value.

Valid Range: Dependent on drive parameter

Default Value: 0

Conditions Required for Operation

This section describes what conditions are required for performing some common actions and how the combination of SNVTs and SCPTs affects the operation of the drive.

Starting the Drive

The drive will RUN if the drive state element in the Network Variable Input nviDrvSpeedStpt is set to "1."

Stopping the Drive

The drive will stop and use the default stop mode if the drive state element in the Network Variable Input nviSpeedStpt is set to "0." When the node is brought offline or disabled, the drive will take the idle fault response action set in adapter **Parameter 09 - [Idle Flt Action]**.

Adjusting the Frequency Setting

The actual value written to the drive equals:

nciNmlFreq * (nviDrvSpeedStpt ÷ 100) * (nviDrvSpeedScale ÷ 100)

Explanation: Nominal frequency is the basis for speed setpoint and speed scale percent values. For more information, see Drive Speed Setpoint on page 4-6 and Speed Setpoint Scaling on page 4-6.

nviDrvSpeedStpt Value		nviSpeedScale	
Requested Speed (%)	Drive State	Value (%)	Resulting Speed
0.0	1 (RUN)	0.000	0 Hz (RUN)
0.0	1 (RUN)	100.000	0 Hz (RUN)
100.0	1 (RUN)	0.000	0 Hz (RUN)
100.0	0 (STOP)	150.000	(Normal) STOP
100.0	1 (RUN)	150.000	1.0 * 1.5 * NomFreq (RUN)
100.0	1 (RUN)	-75.000	1.0 * -0.75 * NomFreq (RUN)
50.0	1 (RUN)	150.000	0.5 * 1.5 * NomFreq (RUN)

Resetting Faults

If an error occurs, the drive faults. After removing the cause of the fault and setting nviObjRequest to RQ_CLEAR_ALARM, the drive can be reset.

nciMinOutTm versus nciSendHrtBt

The nciMinOutTm has priority over nciSendHrtBt. This means that heartbeats will not be sent as often as specified in nciSendHrtBt if nciMinOutTm has a longer time set.

Error Handling

If nciRcvHrtBt is larger than zero, and heartbeats are not received within the nciRcvHrtBt time, then communication with the LonWorks network is considered disrupted. The adapter response to loss of communication depends on the setting of adapter **Parameter 06 - [Comm Flt Action]**.

Refer to Chapter 5, Troubleshooting for more information on potential problems with the adapter and network.

Resource Files

LonMark resource files define the components of the external interface for a LonWorks device. These files allow installation tools and operator interface applications to interpret data produced by a device and to correctly format data sent to a device. They also help a system integrator or system operator to understand how to use a device and to control the LonMark objects on a device.

The LonWorks module uses three types of resource files:

- **Type File (.TYP) -** Defines network variable, configuration property, and enumerated types. LonMark standard network variable and configuration property types are defined in the STANDARD.TYP file. Type files have a .TYP extension.

- **Functional Profile Template (.FPT) -** Defines functional profiles that are used for describing LonMark objects. A functional profile specifies the mandatory and optional network variable and configuration property components of a LonMark object. LonMark standard functional profiles are defined in the STANDARD.FPT file. Functional profile templates have a .FPT extension.

- **Format File (.FMT) -** Defines display and input formats for network variable and configuration property types defined in a type file. Formats for the LonMark standard network variable and configuration property types are defined in the STANDARD.FMT file. Format files have a .FMT extension.

In addition to the resource files, these other file types are also used:

- **Language File -** Defines language-dependent strings. There is a separate language file for each supported language. The supported language file determines the extension of a language file. Two language files are currently available for the LonMark standard type files; these are STANDARD.ENU for American English and STANDARD.ENG for British English.

- **XIF File -** Defines the external interface for a LonWorks device. This file contains self-documentation information, number of address table entries, number of message tags, and the number, types, and directions of network variables.

The resource files and XIF file are shipped with the LonWorks module on a disk.

Notes:

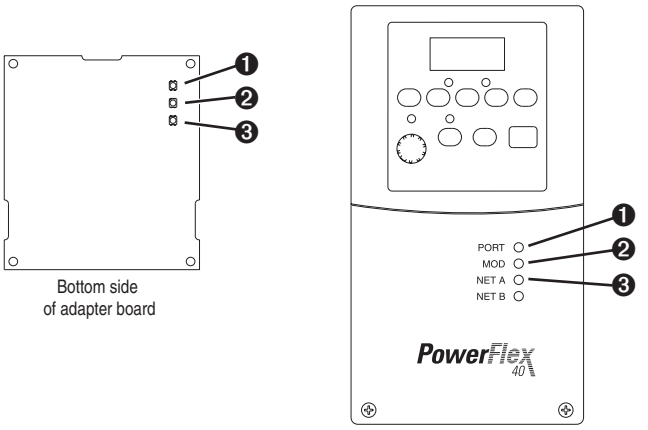
Troubleshooting

Chapter 5 provides information for troubleshooting potential problems with the adapter.

Locating the Status Indicators

The adapter has three status indicators. They can be viewed on the adapter or through the drive cover. See Figure 5.1.

Figure 5.1 Status Indicators (location on drive may vary)



Item	Status Indicator	Description	Page
❶	PORT	DSI Connection Status	5-2
❷	MOD	Adapter Status	5-2
❸	NET A	LonWorks Communication Status	5-3
❹	NET B	Not used for LonWorks	—

PORT Status Indicator

The Port status LED indicates the status of the DSI interface between the adapter and the drive.

State	Cause	Corrective Actions
Off	The adapter is not powered or is not connected properly to the drive.	• Securely connect the adapter to the drive using the Internal Interface ribbon cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Red	The adapter is not receiving a communication from the drive or the drive is faulted.	• 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).
Solid Red	The drive is not an Allen-Bradley drive.	• Verify that cables are securely connected and not damaged. Replace cables if necessary. • Use Allen-Bradley PowerFlex 4/40/400 drives.
Flashing Green	The adapter is establishing communication with the drive.	No action required. This status indicator will turn solid green or flashing red.
Solid Green	The adapter is properly connected and communicating with the drive.	No action required.

MOD Status Indicator

The MOD status LED reports the status of the communication adapter.

State	Cause	Corrective Actions
Off	The adapter is not powered or properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interconnect ribbon cable. • Apply power to the drive (or adapter if mounted in a DSI External Comms Kit).
Flashing Green	The adapter is operational, but is not transferring I/O data.	Set adapter to Enabled and Online mode.
Solid Green	The adapter is operational and transferring I/O data.	No action required.
Flashing Red	The adapter has detected a communication error on the Lon network.	• Verify that cables are securely connected and not damaged. Replace cables if necessary. • Adjust the values of MinSendTime and SendHeartBeatTime to match each other.

NET A Status Indicator (Service Indicator)

The NET A status LED indicates the status of the LonWorks interface.

State	Cause	Corrective Actions
Off	The node is configured.	No action required.
Solid Green	The node has no application program.	The Neuron Chip must be loaded with a new application program.
Flashing Red	WINK command received.	No action required.
Flashing Green	The node is not configured.	Configure the node.

Adapter Diagnostic Items

If you encounter unexpected communications problems, diagnostic items can help you or Allen-Bradley personnel troubleshoot the problem. The following diagnostic items can be accessed using DriveExplorer software (version 3.01 or higher), DriveExecutive software (version 3.01 or higher), or a PowerFlex 4-Class HIM (22-HIM-*).

No.	Name	Description
1	Last Reset Cause	0 = Power Up 1 = External 2 = Watchdog 3 = Software 4 = Cleared
2	LON Recv Err	Lon CRC errors detected during packet reception.
3	LON Lost Msg	Number of incoming packets that have been discarded due to no available application buffers.
4	DSI CRC Errors	Current value of faulty DSI messages.
5	DSI Messages	Current value of valid DSI messages.
6	Neuron Error	Most recent error logged by the system in the Neuron Chip. See System Events on page 5-5 for code numbers and descriptions.
7	Reference	Current value of the product-specific Reference being transmitted to the host by this adapter.
8	Feedback	Current value of the product-specific Feedback being received from the host by this adapter.
9	Logic Cmd	Current value of the product-specific Logic Command being transmitted to the host by this adapter.
10	Logic Sts	Current value of the Common Logic Status being received from the host by this adapter.
11	Number of Events	Number of events in the event list.

Viewing and Clearing Events

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

Device Events

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

Code	Event	Description
0	No Event	Empty event queue entry.
1	DSI Issued Reset	The DSI secondary master issued a reset event to the adapter.
2	LON Issued Reset	The LonWorks network issued a reset event to the adapter, or the adapter issued a reset.
3	Normal Startup	The adapter detected a normal start up and a valid drive.
4	Drive Not Sup	During start up the adapter detected a non-valid drive.
5	Slave Detected	A DSI secondary slave is detected.
6	Slave Removed	A DSI secondary slave is no longer present.
7	No Response	The drive did not respond within 50 messages.
8	Response	The drive is responding again after communication had been disrupted.
9	Disabled	The adapter is in the disabled state (for example, during network management).
10	Enabled	The adapter is enabled (for example, after network management).
11	Offline	The node is brought offline.
12	Online	The node is brought online.
13	Drive Fault	The drive is faulted.
14	Drive Fault Cleared	The fault is no longer present.
15	RcvHrtBt Timeout	The node did not get a receive heartbeat message (network timeout).

System Events

This is the most recent error logged by the Neuron firmware or application.

Code	Description
0	NO_ERROR
129	BAD_EVENT = (signed short)129
130	NV_LENGTH_MISMATCH
131	NV_MSG_TOO_SHORT
132	EEPROM_WRITE_FAIL
133	BAD_ADDRESS_TYPE
134	PREEMPTION_MODE_TIMEOUT
135	ALREADY_PREEMPTED
136	SYNC_NV_UPDATE_LOST
137	INVALID_RESP_ALLOC
138	INVALID_DOMAIN
139	READ_PAST_END_OF_MSG
140	WRITE_PAST_END_OF_MSG
141	INVALID_ADDR_TABLE_INDEX
142	INCOMPLETE_MSG
143	NV_UPDATE_ON_OUTPUT_NV
144	NO_MSG_AVAIL
145	ILLEGAL_SEND
146	UNKNOWN_PDU
147	INVALID_NV_INDEX
148	DIVIDE_BY_ZERO
149	INVALID_APPL_ERROR
150	MEMORY_ALLOC_FAILURE
151	WRITE_PAST_END_OF_NET_BUFFER
152	APPL_CS_ERROR
153	CNFG_CS_ERROR
154	INVALID_XCVR_REG_ADDR
155	XCVR_REG_TIMEOUT
156	WRITE_PAST_END_OF_APPL_BUFFER
157	IO_READY
158	SELF_TEST_FAILED
159	SUBNET_ROUTER
160	AUTHENTICATION_MISMATCH
161	SELF_INST_SEMAPHORE_SET
162	READ_WRITE_SEMAPHORE_SET
163	APPL_SIGNATURE_BAD
164	ROUTER_FIRMWARE_VERSION_MISMATCH

Notes:

Specifications

Appendix A presents the specifications for the adapter.

Communications

Network	
Protocol	LonWorks
Data Rate	78 kbps
Drive	
Protocol	DSI
Data Rate	19.2 kbps

Electrical

Consumption	
Drive	50 mA at 5 VDC supplied through the drive
Network	None

Mechanical

Dimensions	
Height	20 mm (0.79 in.)
Length	86 mm (3.33 in.)
Width	78.5 mm (3.09 in.)
Weight	85g (3 oz.)

Environmental

Temperature Operating Storage	 -15 to 70°C (5 to 158°F) -40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% non-condensing
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
cUL	CAN / CSA C22.2 No. 14-M91
CE	EN61800-6-4: 2001, EN61000-6-2: 2001

NOTE: In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

Adapter Parameters

Appendix B presents information about the adapter parameters.

Parameter List

Parameter No.	Name and Description	Details	
01	**[Send Service Pin]** Broadcasts a LON Service Pin Message from the Neuron Chip. This provides the Neuron ID. An alternate method for providing the Neuron ID is enter the ID number manually. The Neuron ID can be viewed using **Parameter 04 - [Neuron ID]**.	Default: Values: Type: Reset Required	0 = Ready 0 = Ready 1 = Send Read/Write No
02	**[Neuron State]** Displays the state of the Neuron Chip.	Default: Values: Type:	— 0 = appl_uncnfg 1 = cnfg_online 2 = unknown 3 = cnfg_offline Read Only
03	**[Reset Module]** No action if set to “0 = Ready.” Resets the adapter if set to “1 = Reset Module.” Restores the adapter to its factory default settings if set to “2 = Set Defaults.” This parameter is a command. It will be reset to “0 = Ready” after the command has been performed.	Default: Values Type: Reset Required:	0 = Ready 0 = Ready 1 = Reset Module 2 = Set Defaults Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting I/O that controls the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.		
04	**[Neuron ID]** Displays the Neuron Chip ID (6 bytes).	Default: Values: Type:	— 0 = Neuron Chip ID Read Only

Parameter No.	Name and Description	Details	
05	**[Clear Counters]** Clears the network diagnostic counters (Diagnostic Items #8 and #9).	Default: Values Type: Reset Required:	0 = Ready 0 = Ready 1 = Clear Read/Write No
06	**[Comm Flt Action]** Sets the action that the adapter will take if it detects that network communications have been disrupted (if **Parameter 12 - [RcvHrtBeat Time]** times out before nviDrvSpeedStpt is updated from the network).	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 06 - [Comm Flt Action]** and **Parameter 12 - [RcvHrtBeat Time]** let you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Take precautions to ensure that the setting of these parameters does not create a hazard of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).		
07	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if **Parameter 06 - [Comm Flt Action]** is set to “4 = Send Flt Cfg” and communications are disrupted. Refer to Logic Command Word on page C-1 for the bit definitions.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 Read/Write No
08	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if **Parameter 06 - [Comm Flt Action]** is set to “4 = Send Flt Cfg” and communications are disrupted. This is a linear engineering unit value where “0” equals 0 Hz. and “32767” equals the Hz. value in the PowerFlex 40/400 parameter P035 - [Maximum Freq].	Default: Minimum: Maximum: Type: Reset Required:	0 0 65535 Read/Write No

Parameter No.	Name and Description	Details	
09	**[Idle Flt Action]** Sets the action that the adapter will take during offline/disable occurrences.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	 **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 09 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive when an offline/disable condition occurs. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Take precautions to ensure that the setting of this parameter does not create a hazard of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, an idle controller).		
10	**[Idle Cfg Logic]** Sets the Logic Command data that is sent to the drive if **Parameter 09 - [Idle Flt Action]** is set to "4 = Send Flt Cfg" and communications are disrupted. Refer to Logic Command Word on page C-1 for the bit definitions.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 Read/Write No
11	**[Idle Cfg Ref]** Sets the Reference data that is sent to the drive if **Parameter 09 - [Idle Flt Action]** is set to "4 = Send Flt Cfg" and communications are disrupted. This is a linear engineering unit value where "0" equals 0 Hz. and "32767" equals the Hz. value in the PowerFlex 40/400 Parameter P035 - [Maximum Freq].	Default: Minimum: Maximum: Type: Reset Required:	0 0 65535 Read/Write No
12	**[RcvHrtBeat Time]** Sets the time used as a Receive Heartbeat timer and triggers the fault action in **Parameter 06 - [Comm Flt Action]**.	Default: Minimum: Maximum: Type: Reset Required:	120.0 0.0 seconds 6553.0 seconds Read/Write No
	 **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 06 - [Comm Flt Action]** and **Parameter 12 - [RcvHrtBeat Time]** let you determine the action of the adapter and connected drive if communications are disrupted. Take precautions to ensure that the setting of these parameters does not create a hazard of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).		

Notes:

Logic Command/Status Words

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

PowerFlex 4/40/400 Drives

Logic Command Word

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

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

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

Logic Status Word

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

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

A

Adapter

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

B

Binding

A process whereby a Network Variable Input and a Network Variable Output are connected together. Binding a network variable tells the device which other devices it should talk to and what information it should share. Only network variables of the same SNVT type can be bound together. For example, a temperature type could not be bound to a pressure type.

Bus Off

A condition that occurs when an abnormal rate of errors is detected in a device. The bus off device cannot receive or transmit messages on the network. This condition is often caused by corruption of the network data signals due to noise or data rate mismatch.

C

Channel

The transmission media that connect devices on the network such as twisted pair 78 kbps or power line carrier. Also called segment.

Configuration Property

A data value used to configure the application program in a device.

D

Data Rate

The speed at which data is transferred on the network. Each device on a network must be set for the same data rate.

DSI (Drive Serial Interface)

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

DSI Peripheral

A device that provides an interface between DSI and a network or user. Peripheral devices are also referred to as “adapters” and “modules.” The

22-COMM-L, 22-SCM-232 serial converter, and PowerFlex 4-Class HIMs (22-HIM-xxx) are examples of DSI peripherals.

DSI Product

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

DriveExplorer Software

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

DriveTools SP Software

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

E

EDS (Electronic Data Sheet) Files

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

Explicit Messaging

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

F

Fault Action

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

Fault Configuration

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

Flash Update

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

H

HIM (Human Interface Module)

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

Hold Last

When communications are disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond by holding last. Hold last results in the drive receiving the last data received via the 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

Interoperability

The ability of systems from different manufacturers and of different types to share information with each other without losing any of their independent functional capabilities and without requiring complex programming by the integrator.

I/O Data

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

L

Logic Command/Status

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

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

LON™

An acronym for local operating network, which consists of intelligent devices, or nodes, that are connected by one or more communications media and that communicate with one another using a common protocol.

LonMaker™ Software

Windows™-based software package for designing, documenting, installing, and maintaining multi-vendor, open, interoperable LonWorks networks.

LonWorks™ Device

Hardware and software than runs an application and communicates with other devices using the LonWorks protocol. The LonWorks device may optionally interface with input/output hardware. It includes at least one processor and a LonWorks transceiver, and typically has a Neuron Chip.

LonWorks Network

Intelligent devices that communicate with each other using the LonWorks protocol over one or more communications channels.

LonWorks Protocol

The open control networking protocol designed for applications involving sense, monitor, control, and identification functions. It is also known as EIA 709.1 Control Networking Standard and as LonTalk™ protocol.

N

Network Variable

A data item that a particular device application program expects to get from other devices on a network (a Network Variable Input) or expects to make available to other devices on a network (a Network Variable Output). Examples are a temperature, switch value, and actuator position setting.

Neuron™ Chip

A microprocessor usually contained in each LonWorks node which processes all LonTalk protocol messages, senses inputs, manipulates outputs, implements application-specific functions, and stores installation-specific parameters.

Node

An intelligent device connected to the network. Nodes are programmed to send messages to one another in response to changes in various conditions, and to take action in response to messages they receive.

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

PowerFlex 4-Class (Component-Class) Drives

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

Protocols

Rules that order how information is transmitted and presented. An "open protocol" is one in which the manufacturer has made the language "translation" available to anyone who wishes to use it.

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 product. It consists of one 16-bit word of input from the adapter to the network.

S

SCPT (Standard Configuration Property Type)

SCPTs are standardized definitions of the units, scaling, encoding, and meaning of the contents of configuration properties.

SNVT (Standard Network Variable Type)

SNVTs are a set of predefined types of network variables with associated units, such as degrees, centigrade, etc. SNVTs promote interoperability of products from different manufacturers by standardizing the names given to Network Variable Inputs and Network Variable Outputs.

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.

T

Transceiver

A device that is both a transmitter and a receiver for a communications channel.

Type 0/Type 1/Type 2 Control

When transmitting I/O, the adapter can use different types of messages for control. The Type 0, Type 1, and Type 2 events help Rockwell Automation personnel identify the type of messages that is used.

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.

Numerics

A

B

C

D

M

N

O

P

Q

R

S

T

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