Allen-Bradley

PowerFlex® Communications

RS-485 HVAC Adapter

Modbus RTU
Metasys N2
Siemens Building Technologies P1 FLN

20-COMM-H
FRN 2.xxx

User Manual

Rockwell Automation

Important User Information

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

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

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

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

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

Attentions help you:

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

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

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

The information below summarizes the changes made to this manual since its last release (January 2003):

Description of Changes	Page(s)
Added network protocol/PowerFlex drive compatibility chart.	1-2
Reversed “TxRxD” polarity at Terminals A and B in Figure 2.3 table, and corrected recommended Belden cable from “3105A” to “3106A.”	2-3
Added “Setting Stop Bits (Modbus RTU only)” section.	3-4
Added “Direct Access” method to read/write drive parameter values at start of “Using Modbus Configurable Objects to Access Parameters” section.	4-8
Added “Using Broadcast Messages” section.	4-11
Changed name of Parameter 09 from “Net Stop Bits” to “Stop Bits Act.”	B-2
Added Parameter 30 - [Stop Bits Cfg] and Parameter 31 - [RTU Ref. Adjust].	B-5
Added definitions for PowerFlex 700S drive Logic Command/Status Words	C-3, C-4

v2.xxx firmware adds the following features to Modbus RTU:

- Direct parameter access (Direct Access Method, page 4-8)
- Broadcast messaging support (Using Broadcast Messages, page 4-11)
- Stop bits can now be independently adjusted (Parameter 30, page B-5)

No changes were made to the N2 or P1 FLN features.

About This Manual

Related Documentation

For:	Refer to:	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer DriveExplorer Online help (installed with the software)	—
DriveExecutive™	http://www.ab.com/drives/drivetools DriveExecutive Online help (installed with the software)	—
HIM	*HIM Quick Reference*	20HIM-QR001…
PowerFlex® 70 Drive	*PowerFlex 70 User Manual* *PowerFlex 70/700 Reference Manual*	20A-UM001… PFLEX-RM001…
PowerFlex® 700 Drive	*PowerFlex 700 User Manual* *PowerFlex 70/700 Reference Manual*	20B-UM001… PFLEX-RM001…
PowerFlex® 700VC Drive	*PowerFlex 700 User Manual* *PowerFlex 70/700 Reference Manual*	20B-UM001… PFLEX-RM001…
PowerFlex® 700H Drive	*PowerFlex 700 User Manual* *PowerFlex 70/700 Reference Manual*	20B-UM001… PFLEX-RM001…
PowerFlex® 700S Drive	PowerFlex 700S User Manual *PowerFlex 700S Reference Manual*	20D-UM001… PFLEX-RM002…
Modbus RTU Protocol Specification	www.modicon.com/techpubs/TechPubNew	PI_MBUS_300.pdf

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

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the following format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name. For example **Parameter 01 - [DPI Port]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.

- The firmware release is displayed as FRN X.xxx. The “FRN” signifies Firmware Release Number. The “X” is the major release number. The “xxx” is the minor update number.
- This manual provides information about the HVAC adapter and using it with PowerFlex 7-Class drives. The adapter can be used with other products that support DPI. Refer to the documentation for your product for specific information about how it works with the adapter.

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

Technical Product Assistance

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

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

UK Customer Support Center:
E-mail: esupport2@ra.rockwell.com
Tel: +44 (0) 870 2411802
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E-mail: ragermany-csc@ra.rockwell.com
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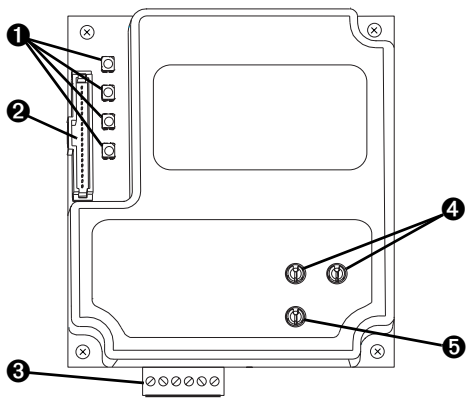
Fax: +49 (0) 2104 960-501

Getting Started

The 20-COMM-H RS-485 HVAC adapter is a communication option intended for installation into a PowerFlex 7-Class drive. It can also be used with other Allen-Bradley products that support an internal DPI™ (Drive Peripheral Interface) adapter.

Components

Figure 1.1 Components of the Adapter



Item	Part	Description
1	Status Indicators	Four LEDs indicate the status of the connected drive, adapter, and network. Refer to Chapter 8, 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.
4	Node Address Switches	Two switches set the node address.
5	Network Selector Switch	One switch selects the network protocol.

Features

The RS-485 HVAC adapter features the following:

- The adapter is mounted in the PowerFlex 7-Class drive. It receives the required power from the drive.
- Switches let you set a node address before applying power to the drive. Alternatively, you can disable the switches and use a parameter to configure the node address.
- A switch lets you select from the following three network protocols:
  - Modbus™ RTU
  - Metasys™ N2
  - Siemens Building Technologies P1 FLN™
- Status indicators report the status of the drive communications, adapter, and network. They are visible when the cover is opened or closed.
- I/O, including Logic Command/Reference and up to four pairs of Datalinks, may be configured for your application using a parameter in the adapter.
- Read/write access to parameters is available. You can configure and monitor parameter values over the networks.
- User-defined fault actions let you determine how the adapter and drive respond to communication disruptions on the network.

Compatible Products

DPI is a second generation peripheral communication interface. The RS-485 HVAC adapter is compatible with Allen-Bradley PowerFlex 7-Class drives and other products that support DPI. DPI is a functional enhancement to SCANport. At the time of publication, compatible products for each network protocol are indicated below and include:

Network Protocol	Compatible PowerFlex Drives					
	70	700 (std)	700VC	700H	700S	7000
Modbus RTU	✔	✔	✔	✔	✔	✔
Metasys N2	✔	✔		✔		✔
Siemens P1 FLN	✔	✔		✔		✔

The PowerFlex 70/700 are used for examples in this manual. Refer to a DPI Host product's user manual for additional information.

Required Equipment

Equipment Shipped with the Adapter

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

- ❑ One RS-485 HVAC adapter
- ❑ A 2.54 cm (1 in.) and a 15.24 cm (6 in.) Internal Interface cable (only one cable is needed to connect the adapter to the drive)
- ❑ This manual

User-Supplied Equipment

To install and configure the RS-485 HVAC 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.
- ❑ Configuration tool, such as:
  - PowerFlex HIM
  - DriveExplorer (version 2.01 or higher)
  - DriveExecutive (version 1.01 or higher)
  - Third-party network 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 drive, and then verify power has been removed before installing or removing an RS-485 HVAC 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 an RS-485 HVAC adapter. Read and understand this manual in its entirety before proceeding. Failure to comply may result in injury and/ or equipment damage.

ATTENTION: Risk of injury or equipment damage exists. If the RS-485 HVAC 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 15 - [Comm Flt Action]** lets you determine the action of the adapter and connected PowerFlex drive if communications are disrupted. By default, this parameter faults the PowerFlex drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this 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).

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected via 1202 cables. Unpredictable behavior due to timing and other internal procedures can result if two or more hosts are connected in this manner.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 11 - [Network Timeout]** lets you determine how long it will take your adapter to detect network communication losses. By default, this parameter sets the timeout to ten 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.

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.

Quick Start

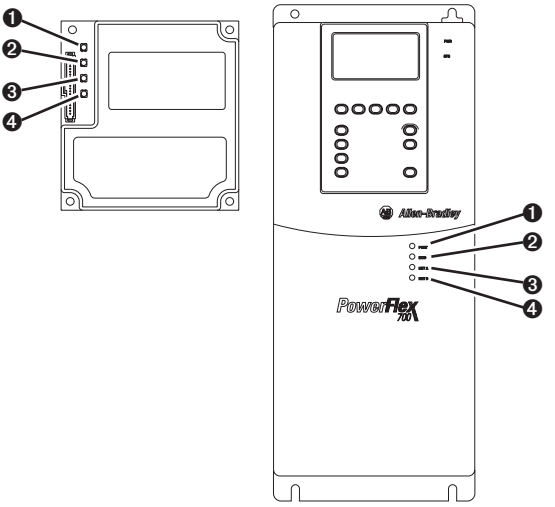
This section is provided to help experienced users quickly start using the RS-485 HVAC adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	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	**Commission the adapter.** Select the network protocol using the Network Selector switch on the adapter. Set a unique node address using the Node Address switches on the adapter or set both switches to "0" and configure the node address later using a parameter in the adapter.	Chapter 2, Installing the Adapter
4	**Install the adapter.** Verify that the drive and the network are not powered. Then, connect the adapter to the network and to the drive. Use the captive screws to secure and ground the adapter to the drive.	Chapter 2, Installing the Adapter
5	**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 8, Troubleshooting, for a description of the other LEDs.	Chapter 2, Installing the Adapter
6	**Configure the adapter for your application.** Set the parameters for the following features as required by your application: • Node address, data rate, and parity • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
7	**Set up the master device to communicate with the adapter.** Use a network tool to configure the master device on the network.	Instruction manual for your network tool.

Modes of Operation

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

Figure 1.2 Status Indicators (location on drive may vary)



Item	Status Indicator	Normal Status	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	Green	Normal Operation. The adapter is properly connected and communicating on the network.
❹	NET B	Off	Normal Operation. The adapter is properly connected but is idle.
		Green	Normal Operation. The adapter is transmitting data.

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

Installing the Adapter

Chapter 2 provides instructions for installing the RS-485 HVAC adapter in a PowerFlex 7-Class drive.

Preparing for the Installation

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

Commissioning the Adapter

To commission the adapter, you must set a unique node address and select a network protocol.

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

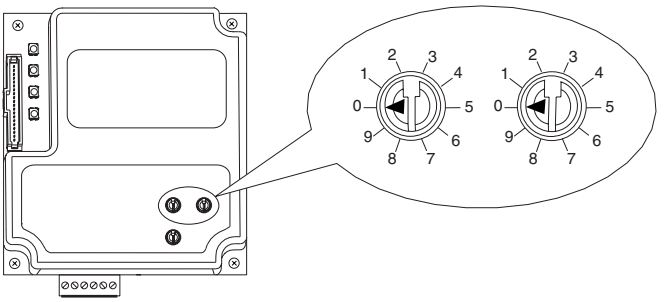
ATTENTION: Risk of equipment damage exists. The adapter contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, refer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

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

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

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

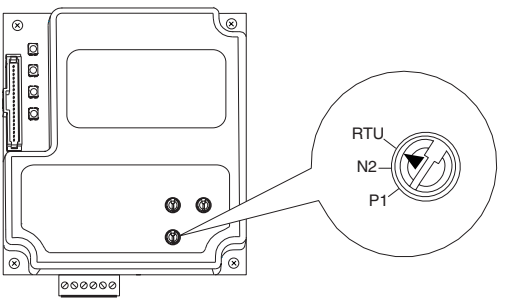
Figure 2.1 Setting the Node Address



Setting	Description
01 – 99	Node address used by the adapter.
00 (Default)	If network protocols are capable of handling a node address of 0 or node addresses higher than 99, these addresses can be configured by setting the switches to 00 and then setting **Parameter 03 - [Net Addr Cfg]** to the desired network node address.

2. Set the network protocol switch.

Figure 2.2 Setting the Network Protocol



Setting	Description
RTU (Default)	Modbus RTU
N2	Metasys N2
P1	Siemens Building Technologies P1 FLN

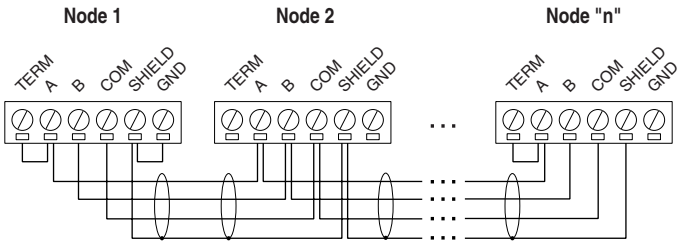
The switch settings can be verified using a PowerFlex HIM, DriveExplorer software, or DriveExecutive software, and viewing Diagnostic Device Item numbers 40-42 (page 8-7).

Connecting the Adapter to the Network

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

1. Remove power from the network and drive.
2. Use static control precautions, and open the drive cover.
3. Connect an RS-485 cable to the network, and route it through the bottom of the drive. (See Figure 2.5.)
4. Connect a six-pin linear plug to the RS-485 cable. (See Figure 2.3 for the terminal definitions.)

Figure 2.3 Typical Network Connections



Terminal	Signal	Function
TERM	Termination (1)	Signal RC Termination
A	Signal A	TxRxD-
B	Signal B	TxRxD+
COM	Common	Signal Common
SHIELD	Shield	Shield RC Termination
GND	Ground (2)	Shield GND Termination

(1) Jumper terminals TERM and A on the adapters at end of the RS-485 network. This enables a built-in RC termination network on the adapter.

(2) The shield must be grounded at a single point on the network (jumper terminals SHIELD and GND).

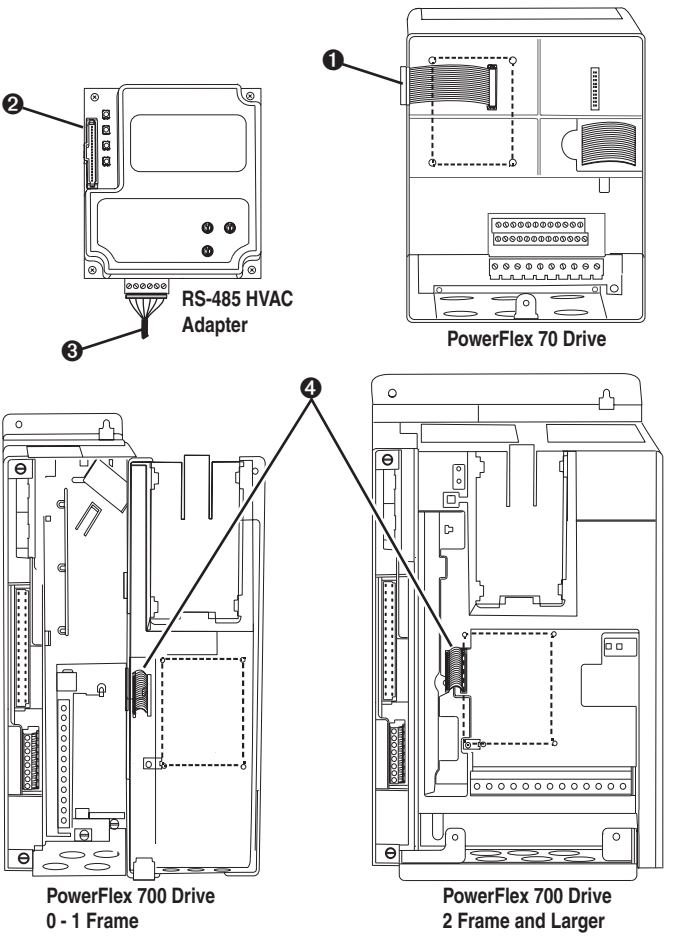
A 3-wire network using Belden 3106A cable or equivalent is recommended for Modbus RTU applications and shown in Figure 2.3 above. A 2-wire network using Belden 3105A cable or equivalent (COM terminal is not connected) can also be used for most applications. However, a 3-wire network is more robust in noisy environments.

For Metasys N2 or Siemens P1 FLN applications, refer to published guidelines from Johnson Controls or Siemens Building Technologies respectively.

Connecting the Adapter to the Drive

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

Figure 2.4 DPI Ports and Internal Interface Cables



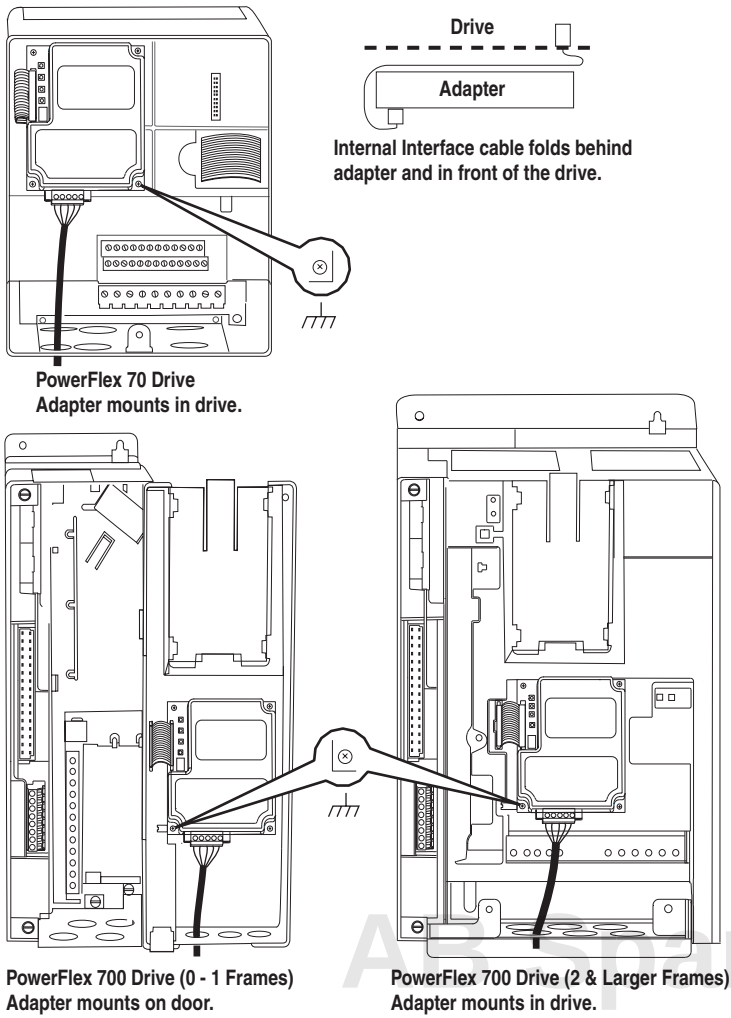
Item	Description
❶	15.24 cm (6 in.) Internal Interface cable
❷	DPI Connector

Item	Description
❸	RS-485 serial cable
❹	2.54 cm (1 in.) Internal Interface cable

4. Secure and ground the adapter to the drive by doing the following:
   - On a PowerFlex 70, fold the Internal Interface cable behind the adapter and mount the adapter on the drive using the four captive screws.
   - On a PowerFlex 700 or PowerFlex 700S, just mount the adapter on the drive using the four captive screws.

   Important: All screws must be tightened since the adapter is grounded through a screw. Recommended torque is 0.9 N-m (8.0 lb.-in.).

Figure 2.5 Mounting and Grounding the Adapter



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. Close the door or reinstall the cover on the drive. The status indicators can be viewed on the front of the drive after power has been applied.

2. Apply power to the PowerFlex drive. The adapter receives its power from the connected drive. When you apply power to the drive for the first time, the topmost status indicator on the adapter should be solid green. If it is not green, there is a problem. Refer to Chapter 8, 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

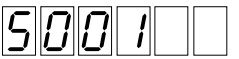
The RS-485 HVAC adapter stores parameters and other information in its own non-volatile memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters:

Tool	Refer to . . .
PowerFlex HIM	page 3-2
DriveExplorer Software (version 3.xx or higher)	http://www.ab.com/drives/driveexplorer, or DriveExplorer Online help (installed with the software)
DriveExecutive Software (version 1.xx or higher)	DriveExecutive Product Profile, Publication 9303-PP002… or DriveExecutive Online help (installed with the software)

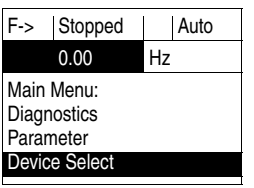
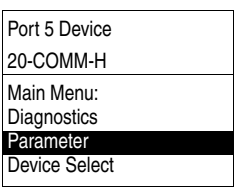
Using the PowerFlex HIM

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

Using an LED HIM

Step	Key(s)	Example Screens
1. Press ALT and then Sel (Device) to display the Device Screen.	Device ALT AND Sel	
2. Press the Up Arrow or Down Arrow to scroll to the 20-COMM-H adapter. Letters represent files in the drive, and numbers represent ports. The adapter is usually connected to port 5.	OR	
3. Press the Enter key to enter your selection. A parameter database is constructed, and then the first parameter is displayed.		
4. Edit the parameters using the same techniques that you use to edit drive parameters.		

Using an LCD HIM

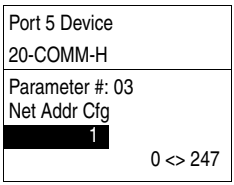
Step	Key(s)	Example Screens
1. In the main menu, press the Up Arrow or Down Arrow to scroll to **Device Select**.	OR	
2. Press Enter to enter your selection.		
3. Press the Up Arrow or Down Arrow to scroll to the RS-485 HVAC adapter (20-COMM-H).	OR	
4. Press Enter to select the RS-485 HVAC adapter. A parameter database is constructed, and then the main menu for the adapter is displayed.		
5. Edit the parameters using the same techniques that you use to edit drive parameters.		

Setting the Node Address

If the Node Address switches on the adapter are set to "00," the value of **Parameter 03 - [Net Addr Cfg]** determines the node address.

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

Figure 3.1 Node Address Screen on an LCD HIM



Default = 1

2. Reset the adapter. See Resetting the Adapter section in this chapter. The actual node address is then displayed in **Parameter 04 - [Net Addr Act]**.

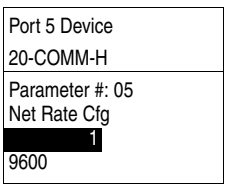
Setting the Network Data Rate

The data rate at which the adapter operates varies based on the type of network and your network configuration. Refer to the following table.

Network	Possible Data Rates
Modbus RTU	4800, 9600, 19200, 38400
Metasys N2	9600
Siemens Building Technologies P1 FLN	4800, 9600

1. Set the value of **Parameter 05 - [Net Rate Cfg]** to the data rate at which your network is operating.

Figure 3.2 Data Rate Screen on an LCD HIM



Value	Baud
0	4800
1	9600 (Default)
2	19200
3	38400

2. Reset the adapter. See Resetting the Adapter section in this chapter. The actual data rate is then displayed in **Parameter 06 - [Net Rate Act]**.

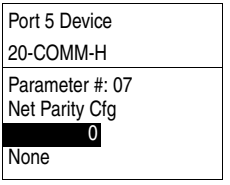
Setting the Network Parity

The parity that the adapter uses to verify data integrity varies based on the type of network and your network configuration. Refer to the following table.

Network	Possible Types of Parity
Modbus RTU	None, Even, or Odd
Metasys N2	None
Siemens Building Technologies P1 FLN	None

1. Set the value of **Parameter 07 - [Net Parity Cfg]** to the type of parity that is used on the network.

Figure 3.3 Network Parity Screen on an LCD HIM



Value	Type of Parity
0	None (Default)
1	Odd
2	Even

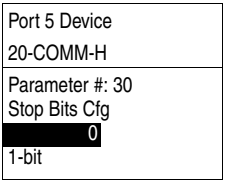
2. Reset the adapter. See Resetting the Adapter section in this chapter. The actual network parity is then displayed in **Parameter 08 - [Net Parity Act]**.

Setting Stop Bits (Modbus RTU only)

Parameter 30 - [Stop Bits Cfg] enables you to set 1 or 2 stop bits for the Modbus RTU network protocol. When the adapter rotary switch is set to "N2" or "P1," the Stop Bits Cfg value is ignored and does not transfer to read-only **Parameter 09 - [Stop Bits Act]** on power-up or reset (N2 and P1 are fixed at 1 stop bit).

1. Set the value of **Parameter 30 - [Stop Bits Cfg]**.

Figure 3.4 Stop Bits Screen on an LCD HIM



Value	Type of Stop Bit
0	1-bit (Default)
1	2-bits

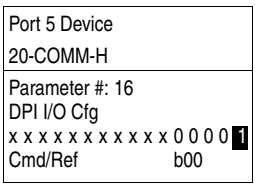
2. Reset the adapter. See Resetting the Adapter section in this chapter. The actual stop bits is then displayed in **Parameter 09 - [Stop Bits Act]**.

Setting the I/O Configuration

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

1. Set the bits in **Parameter 16 - [DPI I/O Cfg]**.

Figure 3.5 DPI I/O Configuration Screen on an LCD HIM



Bit	Description
0	Logic Command/Reference (Default)
1	Datalink A
2	Datalink B
3	Datalink C (not used with Metasys N2)
4	Datalink D (not used with Metasys N2)
5 - 15	Not Used

Bit 0 is the right-most bit. In Figure 3.5, it is highlighted and equals “1.”

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

3. If you enabled one or more Datalinks, configure the drive to determine the source and destination of data in the Datalink(s). For example, configure the Datalinks in a PowerFlex 70 or 700 drive by setting **Parameters 300 - [Data In A1]** to **317 - [Data Out D2]**. Also, ensure that the RS-485 HVAC adapter is the only adapter using the enabled Datalink(s).

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

The adapter is ready to send and receive I/O. The following chapters provide information about basic data transfer for each type of protocol.

Network	Refer to …
Modbus RTU	Chapter 4, Using Modbus RTU
Metasys N2	Chapter 5, Using Metasys N2
Siemens Building Technologies P1 FLN	Chapter 6, Using Siemens Building Technologies P1 FLN

For details about using Datalinks for all types of networks, refer to Chapter 7, Using Datalinks with All Protocols.

Setting a Network Time-out

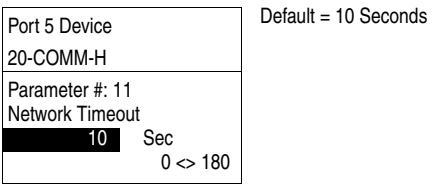
The network timeout sets an interval within which the adapter must communicate with its master. If this time is exceeded, the adapter determines a loss of network communications has occurred and responds with the action specified in **Parameter 15 - [Comm Flt Action]**.

By default, the timeout is set to ten (10) seconds. You can increase or decrease this value. Alternatively, you can set the value to zero (0) so that the adapter does not detect communication losses.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 11 - [Network Timeout]** lets you determine how long it will take your adapter to detect network communication losses. By default, this parameter sets the timeout to ten (10) 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).

- Set the network timeout in **Parameter 11 - [Network Timeout]**.

Figure 3.6 Network Timeout Screen on an LCD HIM



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

Setting a Fault Action

By default, when communications are disrupted (for example, a cable is disconnected), the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruptions using **Parameter 15 - [Comm Flt Action]**.

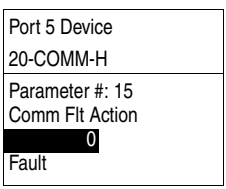
ATTENTION: Risk of injury or equipment damage exists. **Parameter 15 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

To change the fault action

- Set the value of **Parameter 15 - [Comm Flt Action]** to the desired response:

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 (Parameters 18 - [Flt Cfg Logic] through 27 - [Flt Cfg D2 In]).

Figure 3.7 Fault Action Screen on an LCD HIM



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

To set the fault configuration parameters

If you set **Parameter 15 - [Comm Flt Action]** to "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault occurs. You must set these parameters to values required by your application.

Parameter	Name	Description
18	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command.
19	Flt Cfg Ref	A 32-bit value (0 – 4294967295) sent to the drive as a Reference or Datalink. **Important:** If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.
20 – 27	Flt Cfg x1 In or Flt Cfg x2 In	

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

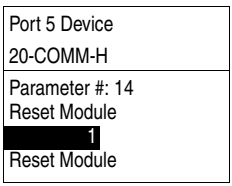
Resetting the Adapter

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

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

- Set **Parameter 14 - [Reset Module]** to **Reset Module**.

Figure 3.8 Reset Screen on an LCD HIM

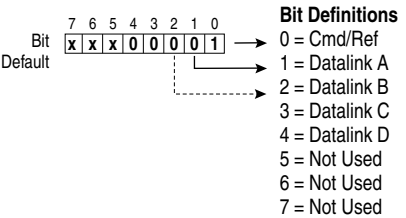


Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

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

Viewing the Adapter Configuration

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

Number	Name	Description
04	Net Addr Act	Displays the actual network address of the adapter.
06	Net Rate Act	Displays the network data rate actually used by the adapter. Only valid values for the specified network are displayed.
08	Net Parity Act	Displays the actual network parity used by the adapter. Only valid values for the specified network are displayed.
09	Stop Bits Act	Displays the actual number of stop bits used by the selected protocol. This value is network-dependent: • ModBus RTU Protocol – The number of stop bits used depends on the value set by Parameter 30 - [Stop Bits Cfg]). If the value is "0," the adapter uses 1 stop bit; otherwise, it uses 2 stop bits. • Metasys N2 Protocol – Uses only 1 bit, so the adapter shows only this value. • Siemens Building Technologies P1 FLN Protocol – Uses only 1 bit, so the adapter shows only this value.
10	Net Chksum Type	Displays the type of checksum used by the selected protocol. The values are as follows: • CRC16 (0) is Cyclic Redundancy Check with 0 as a seed value. The Siemens Building Technologies P1 FLN protocol uses this checksum. • RLC is Run Length Checksum. The Metasys N2 protocol uses this checksum. • CRC16 (-1) is Cyclic Redundancy Check with -1 as a seed value. The Modbus RTU protocol uses this checksum.
17	DPI I/O Act	Displays I/O that the adapter is set to transmit. The value of this parameter will usually be equal to the value of Parameter 23 - [DPI I/O Cfg]. 

Using Modbus RTU

Chapter 4 provides information about controlling a PowerFlex 7-Class drive, setting its Reference, and accessing its parameters through configurable objects when the Modbus RTU network protocol is selected.

TIP: Datalinks can also be used for accessing parameters. For information about using Datalinks, refer to Chapter 7, Using Datalinks with All Protocols.

Understanding Modbus RTU

The Modbus RTU protocol is a messaging structure used to establish master-slave communication between intelligent devices. The protocol defines the format of the messages.

Messages from a master to a slave contain the address of the slave, a function code defining the requested action, any data to be sent, and an error-checking field. Messages from a slave to a master contain fields confirming the action taken, any data to be returned, and an error-checking field. If an error occurred in the receipt of the message or if the slave is unable to perform the requested action, the slave will construct an error message and send it as its response.

Modbus RTU can access a single address or multiple addresses simultaneously, either reading or writing single-bit values or 16-bit values.

Modbus RTU Data Formats

Modbus data types are 1-bit and 16-bit values. Refer to Table 4.A.

Table 4.A Modbus RTU Data Formats

Modbus Type	Description	Reference
Coil Status	1-bit Discrete Output	0x
Input Status	1-bit Discrete Input	1x
Holding Register	16-bit Output Register	4x
Input Register	16-bit Input Register	3x

Supported Modbus RTU Commands

The adapter supports the Modbus RTU commands listed in Table 4.B.

Table 4.B Modbus RTU Commands Supported by RS-485 Adapter

Function Code	Description
01	Read Coil Status
02	Read Input Status
03	Read Holding Registers
04	Read Input Registers
05	Force Single Coil
06	Write Single Register
08	Diagnostics Subfunction 00 Only - Return Query Data (loop back)
16	Write Multiple Registers
23	Read/Write 4x Registers

Data Addresses in Modbus Messages

All data addresses in Modbus messages are referenced to zero. That is, the first occurrence of a data item is addressed as item number zero. Therefore, when you create a message, you must address it to one less than the Modbus address in the manual. The following are examples:

- Logic Command is Holding Register address 4x0001 in Table 4.E, so you address it as register “0000” in the data address field of the message.
- Feedback Hi is Input Register address 3x0003 in Table 4.G, so you address it as register “0002” in the data address field of the message.
- Start is Coil address 0x0002 in Table 4.D, so you address it as coil “0001” in the data address field of the message.
- At Speed is Input address 1x0009 in Table 4.F, so you address it as input “0008” in the data address field of the message.

Using the Modbus RTU Point Map for I/O

On Modbus, data transfers are used to transfer the I/O data that controls the drive and sets its Reference. Note that *output I/O* is data that the master device sends and the adapter receives. *Input I/O* is status data that the adapter sends and the master device receives.

Important: In order for the drive to use the I/O and Reference from the Modbus RTU network, you must set parameters in it and the adapter to receive the I/O and Reference. For details, refer to Setting the I/O Configuration in Chapter 3.

Setting the Logic Command and Reference

ATTENTION: Select and use **either** the "Product Logic Command Discrete Outputs (0x000x)" or the "Product Logic Command Register Output (4x0001)" as a control method, but **not both**. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause bodily injury and/or damage to equipment.

On Modbus RTU, there are two ways to set the logic command: discrete outputs (Table 4.D) and register outputs (Table 4.E).

- When you need to set only one bit in the logic command word, you can use a discrete output. For example, to stop a PowerFlex 70/700 drive (bit 0), you can use a discrete output (Modbus Address 0x0001).
- When you need to set multi-bit fields in the logic status word or to set the entire logic status word, you must use the register output to maintain data integrity. For example, to set the direction of a PowerFlex 70/700 drive (bits 4 - 5), you must use a register output (Modbus Address 4x0001).

A 16-bit product logic word is buffered in the adapter, holding the last logic command sent to the drive regardless of whether it was sent through the discrete outputs or through the product logic command register output. When a bit is updated through the discrete outputs or the register output, a new logic command is generated and sent to the drive.

To set the Reference, you must use a register output (Modbus Address 4x0002 and/or 4x0003 in Table 4.E). Remember that the Reference value is a scaled value; it is not an engineering value. For example, in PowerFlex 70/700 drives, the reference is scaled based on the value of **Parameter 55 - [Maximum Freq]**, but the commanded maximum speed

can never exceed the value of **Parameter 82 - [Maximum Speed]**. Table 4.C shows example References and their results on a PowerFlex 70/700 drive that has its **Parameters 55 - [Maximum Freq]** set to 130 Hz and **82 - [Maximum Speed]** set to 60 Hz.

Table 4.C Example Speed Reference and Feedback for a PowerFlex 70/700

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

(1) A value of 32767 is equivalent to 100%. The effects of values greater than 32767 depend on whether the DPI product uses a bipolar or unipolar direction mode. Refer to the documentation for your DPI product.

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

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

Table 4.D shows that there are 16 discrete points to represent the command word bit by bit. These points can be used only for writing single-bit commands.

Table 4.D Logic Command: Discrete Outputs (to Drive from Controller)

Modbus Address	Logic Command Bit	PowerFlex 70/700 Example	
		Description	Values
0x0001	0	Stop	0 = Not Stop 1 = Stop
0x0002	1	Start (1) (2)	0 = Not Start 1 = Start
0x0003	2	Jog	0 = Not Jog 1 = Jog
0x0004	3	Clear Faults (2)	0 = Not Clear Faults 1 = Clear Faults
0x0005 0x0006	4 5	Direction	Modbus Address 06 05 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
0x0007	6	Local Control	0 = No Local Control 1 = Local Control
0x0008	7	MOP Increment	0 = Not Increment 1 = Increment

Table 4.D Logic Command: Discrete Outputs (to Drive from Controller) (Continued)

Modbus Address	Logic Command Bit	PowerFlex 70/700 Example	
		Description	**Values**
0x0009 0x0010	8 9	Accel Rate	Modbus Address 10 09 0 0 = No Command 0 1 = Accel Rate 1 Command 1 0 = Accel Rate 2 Command 1 1 = Hold Accel Rate
0x0011 0x0012	10 11	Decel Rate	Modbus Address 12 11 0 0 = No Command 0 1 = Decel Rate 1 Command 1 0 = Decel Rate 2 Command 1 1 = Hold Decel Rate
0x0013 0x0014 0x0015	12 13 14	Reference Select	Modbus Address 15 14 13 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Ref 2 (Ref B Select) 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Preset 7)
0x0016	15	MOP Decrement	0 = Not Decrement 1 = Decrement

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

(2) To perform this command, the value must change from “0” to “1.”

Table 4.E shows the register outputs. These outputs must be used for writing multi-bit commands and the Reference.

Table 4.E Logic Command and Reference: Register Outputs

Modbus Address	Output Description	Values
4x0001	Product Logic Command	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 4.G. For other products, refer to their documentation.
4x0002	Reference Lo	Bit 0-15 of 32-bit reference.
4x0003 (1)	Reference Hi	Bit 16-31 of 32-bit reference or the whole 16-bit reference.

(1) The reference value is sent only when accessing address 4x0003. If a 32-bit reference is used, the 32-bit value will be merged together by register 4x0002 and 4x0003 when accessing address 4x0003.

Viewing the Logic Status and Feedback

On Modbus RTU, there are two ways to view the logic status: discrete inputs (Table 4.F) and register inputs (Table 4.G). You can use discrete inputs when you need to view only one bit in the logic status word. For example, to view whether a PowerFlex 70/700 drive is Ready (bit 0), you can use a discrete input (Modbus Address 1x0001).

When you need to view multi-bit fields in the logic status word or to view the entire logic status word, you must use a register input to maintain data integrity. For example, to view the local control of a PowerFlex 70/700 drive (bits 9 – 11), you must use a register input (Modbus Address 3x0001).

To view the Feedback, you must also use a register input (Modbus Address 3x0002 and/or 3x0003). For details about how the feedback is scaled, refer to the Setting the Logic Command and Reference section in this chapter.

Table 4.F shows that there are 16 discrete points to represent the status word bit by bit. These points can be used only for reading single-bit status.

Table 4.F Logic Status: Discrete Inputs (to Controller from Drive)

Modbus Address	Logic Status Bit	PowerFlex 70/700 Example	
		Description	Values
1x0001	0	Ready	0 = Not Ready 1 = Ready
1x0002	1	Active	0 = Not Running 1 = Running
1x0003	2	Command Direction	0 = Reverse 1 = Forward
1x0004	3	Actual Direction	0 = Reverse 1 = Forward
1x0005	4	Accel	0 = Not Accelerating 1 = Accelerating
1x0006	5	Decel	0 = Not Decelerating 1 = Decelerating
1x0007	6	Alarm	0 = No Alarm 1 = Alarm
1x0008	7	Fault	0 = No Fault 1 = Fault
1x0009	8	At Speed	0 = Not At Reference 1 = At Reference

Table 4.F Logic Status: Discrete Inputs (to Controller from Drive) (Continued)

Modbus Address	Logic Status Bit	PowerFlex 70/700 Example	
		Description	Values
1x0010	9	Local Control	Modbus Address
1x0011	10		12 11 10
1x0012	11		0 0 0 = Port 0 (TB)
			0 0 1 = Port 1
			0 1 0 = Port 2
			0 1 1 = Port 3
			1 0 0 = Port 4
			1 0 1 = Port 5
			1 1 0 = Port 6
			1 1 1 = No Local
1x0013	12	Reference	Modbus Address
1x0014	13		16 15 14 13
1x0015	14		0 0 0 0 = Ref A Auto
1x0016	15		0 0 0 1 = Ref B Auto
			0 0 1 0 = Preset 2 Auto
			0 0 1 1 = Preset 3 Auto
			0 1 0 0 = Preset 4 Auto
			0 1 0 1 = Preset 5 Auto
			0 1 1 0 = Preset 6 Auto
			0 1 1 1 = Preset 7 Auto
			1 0 0 0 = Term Blk Manual
			1 0 0 1 = DPI 1 Manual
			1 0 1 0 = DPI 2 Manual
			1 0 1 1 = DPI 3 Manual
			1 1 0 0 = DPI 4 Manual
			1 1 0 1 = DPI 5 Manual
			1 1 1 0 = DPI 6 manual
			1 1 1 1 = Jog Ref

Table 4.G shows the register inputs. These inputs must be used for reading multi-bit status fields and the Feedback.

Table 4.G Logic Status and Feedback: Register Inputs

Modbus Address	Input Description	Values
3x0001	Product Status Word	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 4.F. For other products, refer to their documentation.
3x0002	Feedback Lo	Bit 0-15 of 32-bit feedback
3x0003 (1)	Feedback Hi	Bit 16-31 of 32-bit feedback or the whole 16-bit feedback.

(1) The Feedback value is refreshed only when accessing address 3x0003. This is to maintain data integrity.

Accessing Drive Parameters

There are two methods for accessing drive parameters: the direct access method and the pointer access method.

Direct Access Method

You can use Function Code 03 to read and Function Codes 06 (single) and 16 (multiple) to write, to directly access the drive parameters (see Table 4.B). This allows direct access of parameters in a single read or write as opposed to first having to write the “Param# for INx” or “Param# for OUTx” using the Pointer Access Method.

When a 41000 or higher Modbus address is used, the adapter assumes the controller is accessing the drive’s parameters directly. The address is determined by:

Modbus Address = 41000 + (Drive Parameter # - 1)

For example, Parameter 1 is accessed by Modbus Address 41000. Any attempts to access a parameter number that does not exist will return an error.

Pointer Access Method

Reading Parameter Values

With a configurable input point, you can read any 16-bit parameter in the drive. The sequence for reading parameter values is as follows:

1. Set one or more Param# for INx points in the controller to the parameter number(s) that you want to read. You can set up to eight Param# for INx points. Refer to Table 4.H.

2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for INx point(s) to the adapter only one time per power cycle because, when the adapter receives the Param# for INx point(s), it stores them in its RAM. The adapter then continuously reads the values for the drive parameters specified in the Param# for INx points.

3. Send a message with a Read Input Registers (code 04) function. The adapter reads the drive parameter(s) that have been configured in the Param# for IN point(s) and returns their values in the User INx

point(s). It can return up to eight User INx points. Refer to Table 4.H. You can perform Read Input Registers continuously, if desired.

Figure 4.1 Configurable Input Point Operations

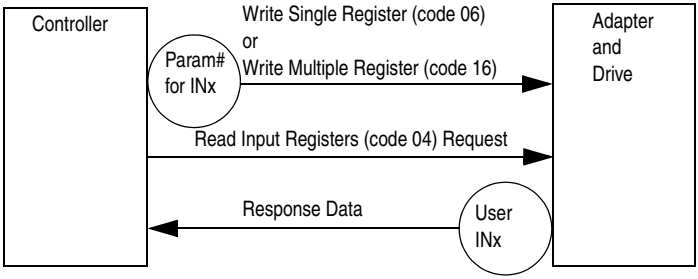


Table 4.H Configurable Objects Inputs

Modbus Address	Data Direction	Description	Values	User Default
3x0004	Register Input	User IN1	depends on parameter selected	0
3x0005	Register Input	User IN2	depends on parameter selected	0
3x0006	Register Input	User IN3	depends on parameter selected	0
3x0007	Register Input	User IN4	depends on parameter selected	0
3x0008	Register Input	User IN5	depends on parameter selected	0
3x0009	Register Input	User IN6	depends on parameter selected	0
3x0010	Register Input	User IN7	depends on parameter selected	0
3x0011	Register Input	User IN8	depends on parameter selected	0
4x0004	Register Output	Param# for IN1	0 = Not in use, 1 to max. parameter #	0
4x0005	Register Output	Param# for IN2	0 = Not in use, 1 to max. parameter #	0
4x0006	Register Output	Param# for IN3	0 = Not in use, 1 to max. parameter #	0
4x0007	Register Output	Param# for IN4	0 = Not in use, 1 to max. parameter #	0
4x0008	Register Output	Param# for IN5	0 = Not in use, 1 to max. parameter #	0
4x0009	Register Output	Param# for IN6	0 = Not in use, 1 to max. parameter #	0
4x0010	Register Output	Param# for IN7	0 = Not in use, 1 to max. parameter #	0
4x0011	Register Output	Param# for IN8	0 = Not in use, 1 to max. parameter #	0

Writing Parameter Values

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

With a configurable output point, you can write a new value for any 16-bit parameter in the drive. The sequence for writing parameter values is as follows:

1. Set one or more Param# for OUTx points in the controller to the parameter number(s) to which you want to write. A value of zero in the Param# field disables the writing of data for that specific point. Refer to the drive user manual for the desired parameter number(s). You can set up to three Param# for OUTx points at a time. Refer to Table 4.I.

2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for OUTx point(s) to the adapter only one time per power cycle because, when the adapter receives the Param# for OUTx point(s), it stores them in its RAM.

3. Set the values that you want to write to the parameters in the User OUTx points. You can set up to three User OUTx points at a time. Refer to Table 4.I.

4. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. Each time that the adapter receives the values in the User OUTx points, it writes them to the drive parameters.

Figure 4.2 Configurable Output Point Operations

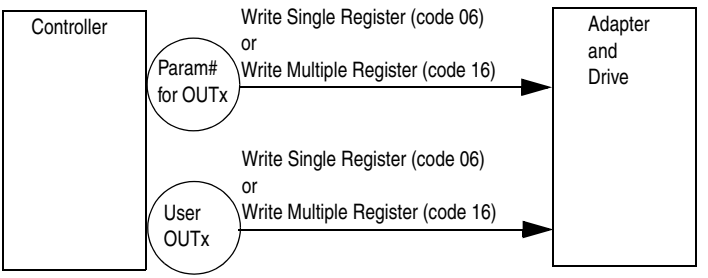


Table 4.I Configurable Objects: Outputs

Modbus Address	Data Direction	Description	Values	User Default
4x0012	Register Output	User OUT1	depends on parameter selected	0
4x0013	Register Output	User OUT2	depends on parameter selected	0
4x0014	Register Output	User OUT3	depends on parameter selected	0
4x0015	Register Output	Param# for OUT1	0 = Not in use, 1 to max. parameter #	0
4x0016	Register Output	Param# for OUT2	0 = Not in use, 1 to max. parameter #	0
4x0017	Register Output	Param# for OUT3	0 = Not in use, 1 to max. parameter #	0

Using Broadcast Messages

A Modbus RTU global broadcast feature enables you to send a command (start, stop, etc.) to all drives on the network at the same time by using Modbus Address "0." This feature can also be used to write the same message to each network drive via a single message, for example setting Accel Time to 5 seconds in every drive.

Important: Every node capable of receiving a broadcast message will act upon the message, so it is required that broadcast messages are used only on networks of similar devices. For example, PowerFlex 70 and 700's use the same Logic Command structure, Reference format and the same Modbus addressing, so these could be controlled together using a broadcast message. Always check the Modbus addressing, Logic Command structure, Reference format, etc. for every node device type before designing a system with broadcast messages.

The adapter also enables you to independently scale the broadcast message Reference of its connected drive by using **Parameter 31 - [RTU Ref. Adjust]**. The scaling factor can be set from 0-200.0%. This lets the drive's Reference either match the broadcast message Reference (= 100%), scale below the broadcast message Reference (<100%), or scale above the broadcast message Reference (>100%).

Notes:

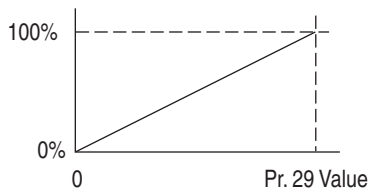
Using Metasys N2

Chapter 5 provides information about controlling a PowerFlex 7-Class drive, setting its Reference, and accessing its parameters through configurable objects when the Metasys N2 network protocol is selected.

TIP: Datalinks can also be used for accessing parameters. For information about using Datalinks, refer to Chapter 7, Using Datalinks with All Protocols.

Additional Configuration Specific for Metasys N2

The Reference (AO#2) for Metasys N2 is set as a percentage from -100% to +100%. However, the actual value transmitted over DPI is in an engineering unit that equals the entered percentage. **Parameter 29 - [N2 Ref Scale]** determines the engineering unit value sent when AO#2 is set to 100%. The relationship is linear, where:



By default, **Parameter 29 - [N2 Ref Scale]** equals 32,767, which is the maximum Reference value for PowerFlex 70/700 drives. Note that additional scaling is performed in the PowerFlex 70/700 drive, where 32,767 equals the frequency selected in drive **Parameter 55 - [Maximum Freq]**. For other DPI hosts, refer to the documentation of the specific DPI host product.

Understanding Metasys N2

Metasys nodes are built up by the use of several virtual objects. The Metasys N2 master performs read and write commands to these virtual objects, and the adapter transfers/translates the data between these virtual objects and the drive.

When a read or write command occurs to a certain dedicated virtual object, data in the virtual objects is refreshed from or transferred to the drive.

The Metasys N2 master performs read and write commands to the virtual objects one at a time. The data types that are used in the virtual objects are binary input (BI), binary output (BO), analog input (AI), analog output (AO), and internal integer (ADI), which is a 16-bit data value.

The Metasys master also performs cyclic polling of all the virtual objects.

Metasys N2 Virtual Objects

A Metasys N2 node may contain up to 256 virtual objects in each of its seven different data types, called regions (Table 5.A).

Table 5.A Description of the Regions of a Virtual Object

Region	Type	Short	Description
Region 1	Analog Input	AI	32-bit, IEEE-standard floats
Region 2	Binary Input	BI	1-bit
Region 3	Analog Output	AO	32-bit, IEEE-standard floats
Region 4	Binary Output	BO	1-bit
Region 5	Internal Float	ADF	32-bit, IEEE-standard floats (Analog Data Float)
Region 6	Internal Integer	ADI	16-bit (Analog Data Integer)
Region 7	Internal Byte	DB	8-bit (Analog Data Byte)

Metasys N2 Data Types

Table 5.B Internal Structure of Metasys N2 Analog Input (AI)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Float	Analog Input Value
8	Float	Low Alarm Limit
9	Float	Low Warning Limit
10	Float	High Warning Limit
11	Float	High Alarm Limit
12	Float	Differential

Table 5.C Internal Structure of Metasys N2 Binary Input (BI)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status

Table 5.D Internal Structure of Metasys N2 Analog Output (AO)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Float	Current Value

Table 5.E Internal Structure of Metasys N2 Binary Output (BO)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Integer	Minimum On-Time
4	Integer	Minimum Off-Time
5	Integer	Maximum Cycle/Hour

Table 5.F Internal Structure of Metasys N2 Internal Integer (ADI)

Attribute	Type	Description
1	Byte	Object Status
2	Integer	Current Value. Signed 16-bit.

Using the Metasys N2 Point Map for I/O

On Metasys N2, data transfers are used to transfer the I/O data that controls the drive and sets its Reference. Note that *Output I/O* is data that the master device sends and the adapter receives. *Input I/O* is status data that the adapter sends and the master device receives.

Important: In order for the drive to use the I/O and Reference from the Metasys N2 network, you must set parameters in it and the adapter to receive the I/O and Reference. For details, refer to Setting the I/O Configuration in Chapter 3.

Setting the Logic Command and Reference

ATTENTION: Select and use **either** the point type Digital (BO) or the word type Analog (AO) as a control method, but **not both**. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause bodily injury and/or damage to equipment.

On Metasys N2, there are two ways to set the logic command: binary outputs (Table 5.H) and an analog output (Table 5.I).

- When you need to set only one bit in the Logic Command word, you can use binary outputs. For example, to stop a PowerFlex 70/700 drive (bit 0), you can use a binary output (BO#1).
- When you need to set multi-bit fields in the Logic Command word or to set the entire Logic Command word, you must use the analog output to maintain data integrity. For example, to set the Reference Selection of a PowerFlex 70/700 drive (bits 12 – 14), you must use an analog output (AO#1).

A 16-bit product logic word is buffered in the adapter, holding the last Logic Command sent to the drive regardless of whether it was sent through the binary outputs or through product logic command outputs (AO#1). When a bit is updated through either of these outputs, a new Logic Command will be generated and sent to the drive.

To set the Reference, you must use an analog output (AO#2). Table 5.G shows example References and their results on a PowerFlex 70/700 drive that has its **Parameters 55 - [Maximum Freq]** set to 70 Hz and **82 - [Maximum Speed]** set to 60 Hz, and adapter **Parameter 29 - [N2 Ref Scale]** is set to 32,767.

Table 5.G Example Speed Reference and Feedback for a PowerFlex 70/700

Reference (1)		Feedback (2)	
Percent	**Speed**	**Speed**	**Percent**
100%	70 Hz	60 Hz (3)	85.7%
50%	35 Hz	35 Hz	50%
25%	17.5 Hz	17.5 Hz	25%
0%	0 Hz	0 Hz	0%

(1) The actual value transmitted over the network is an engineering unit where 100% equals sending the value in the adapter Parameter 29 - [N2 Ref Scale], and 0% equals sending a zero.

(2) The Feedback percent value is also scaled based on the value of adapter Parameter 29 - [N2 Ref Scale].

(3) The drive runs at 60 Hz instead of 70 Hz because Parameter 82 - [Maximum Speed] sets 60 Hz as the maximum speed.

Table 5.H shows that there are 16 binary outputs to represent the command word bit by bit. These outputs can be used only for writing single-bit commands.

Table 5.H Logic Command: Binary Outputs (Inputs to a Drive)

Network Point Type (NPT)	Network Point Address (NPA)	Product Logic Command Bit	PowerFlex 70/700 Example	
			Description	Values
BO	1	0	Stop	0 = Stop 1 = Not Stop
BO	2	1	Start (1) (2)	0 = Not Start 1 = Start
BO	3	2	Jog	0 = Not Jog 1 = Jog
BO	4	3	Clear Faults (2)	0 = Not Clear Faults 1 = Clear Faults
BO BO	5 6	4 5	Direction	Network Point Addresses 06 05 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
BO	7	6	Local Control	0 = No Local Control 1 = Local Control
BO	8	7	MOP Increment	0 = Not Increment 1 = Increment
BO BO	9 10	8 9	Accel Rate	Network Point Addresses 10 09 0 0 = No Command 0 1 = Accel Rate 1 1 0 = Accel Rate 2 1 1 = Hold Accel Rate
BO BO	11 12	10 11	Decel Rate	Network Point Addresses 12 11 0 0 = No Command 0 1 = Decel Rate 1 1 0 = Decel Rate 2 1 1 = Hold Decel Rate
BO BO BO	13 14 15	12 13 14	Reference Select	Network Point Addresses 15 14 13 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Ref 2 (Ref B Select) 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Preset 7)
BO	16	15	MOP Decrement	0 = Not Decrement 1 = Decrement

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

(2) To perform this command, the value must change from “0” to “1.”

Table 5.I shows the analog outputs. These outputs must be used for writing multi-bit commands and the Reference.

Table 5.I Logic Command and Reference: Analog Outputs

Network Point Type (NPT)	Network Point Address (NPA)	Parameter Description	Range
AO	1	Product Logic Command	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 5.H. For other products, refer to their documentation.
AO	2	Reference	-100.0% to +100.0%

Viewing the Logic Status and Feedback

On Metasys N2, there are two ways to view the Logic Status: binary inputs (Table 5.J) and an analog input (Table 5.K). You can use binary inputs when you need to view only one bit in the Logic Status word. For example, to view whether a PowerFlex 70/700 drive is ready (bit 0), you can use a binary input (BI 1).

When you need to view multi-bit fields in the Logic Status word, to view the entire Logic Status word, or to view the Feedback word, you must use an analog input. For example, to view the local control of a PowerFlex 70/700 drive (bits 9 – 11), you must use an analog input (AI #1). To view the Feedback, you must use an analog input (AI #2 or AI #3).

Table 5.J shows that there are 16 binary inputs to represent the status word bit by bit. These inputs can be used only for reading single-bit status.

Table 5.J Logic Status: Binary Inputs (Output from a Drive)

Network Point Type (NPT)	Network Point Address (NPA)	Logic Status Bit	PowerFlex 70/700 Example	
			Description	Values
BI	1	0	Ready	0 = Not Ready 1 = Ready
BI	2	1	Active	0 = Not Running 1 = Running
BI	3	2	Command Direction	0 = Reverse 1 = Forward
BI	4	3	Actual Direction	0 = Reverse 1 = Forward

Table 5.J Logic Status: Binary Inputs (Output from a Drive) (Continued)

Network Point Type (NPT)	Network Point Address (NPA)	Logic Status Bit	PowerFlex 70/700 Example	
			Description	Values
BI	5	4	Accel	0 = Not Accelerating 1 = Accelerating
BI	6	5	Decel	0 = Not Decelerating 1 = Decelerating
BI	7	6	Alarm	0 = No Alarm 1 = Alarm
BI	8	7	Fault	0 = No Fault 1 = Fault
BI	9	8	At Speed	0 = Not At Reference 1 = At Reference
BI BI BI	10 11 12	9 10 11	Local Control	Network Point Addresses 12 11 10 0 0 0 = Port 0 (TB) 0 0 1 = Port 1 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 1 1 0 = Port 6 1 1 1 = No Local
BI BI BI BI	13 14 15 16	12 13 14 15	Reference (typically used when commanding drive speed from source other than Metasys)	Network Point Addresses 16 15 14 13 0 0 0 0 = Ref A Auto 0 0 0 1 = Ref B Auto 0 0 1 0 = Preset 2 Auto 0 0 1 1 = Preset 3 Auto 0 1 0 0 = Preset 4 Auto 0 1 0 1 = Preset 5 Auto 0 1 1 0 = Preset 6 Auto 0 1 1 1 = Preset 7 Auto 1 0 0 0 = Term Blk Manual 1 0 0 1 = DPI 1 Manual 1 0 1 0 = DPI 2 Manual 1 0 1 1 = DPI 3 Manual 1 1 0 0 = DPI 4 Manual 1 1 0 1 = DPI 5 Manual 1 1 1 0 = DPI 6 Manual 1 1 1 1 = Jog Ref

Table 5.K shows the analog inputs. These inputs must be used for reading multi-bit status fields and the Feedback.

Table 5.K Logic Status and Feedback: Analog Inputs

Network Point Type (NPT)	Network Point Address (NPA)	Parameter Description	Range
AI	1	Product Status Word	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 5.J. For other products, refer to their documentation.
AI	2	Feedback Lo	-100.0% to +100.0%

Using Metasys Configurable Objects to Access Parameters

Configurable objects are inputs and outputs that let you read and write parameter values. These objects handle only 16-bit parameter values.

Reading Parameter Values

The configurable points may show any 16-bit parameter in the drive by configuring the Param# point. The Param# for INx points are stored in the RAM in the adapter and need to be written to only one time per power cycle.

The adapter reads the value of the drive parameter configured in the Param# point and shows the result in the User INx point. The adapter reads the parameter values from the drive continuously one at a time when Param# is set to a non-zero value. See Figure 5.1 and Table 5.L.

Figure 5.1 Configurable Input Point Operation Objects Inputs

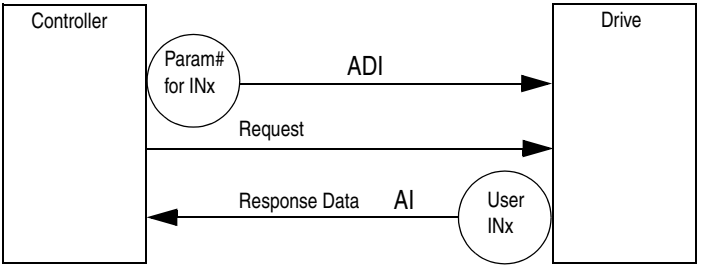


Table 5.L Configurable Objects: Inputs

Network Point Type (NPT)	Network Point Address (NPA)	Name	Description	Default
AI	3	User IN1	User-defined Input 1	0
AI	4	User IN2	User-defined Input 2	0
AI	5	User IN3	User-defined Input 3	0
AI	6	User IN4	User-defined Input 4	0
ADI	1	Param# for IN1	0 (not in use), 1 to maximum # of drive parameters	0
ADI	2	Param# for IN2	0 (not in use), 1 to maximum # of drive parameters	0
ADI	3	Param# for IN3	0 (not in use), 1 to maximum # of drive parameters	0
ADI	4	Param# for IN4	0 (not in use), 1 to maximum # of drive parameters	0

Table 5.M Example of Configurable Objects: Inputs

Network Point Type (NPT)	Network Point Address (NPA)	Name	Description	Default
AI	3	Output Frequency	+/-400 Hz [0.1 Hz]	60.0
AI	4	Output Current	0.0 to Drive Related Amps [0.1 A]	14.0
AI	5	Output Voltage	0.0 to Drive Related Volts [0.1 VAC]	460.0
AI	6	Output Power	0.0 to Drive Related kW [0.1 kW]	7.5
ADI	1	Param# for IN1	Integer# of drive parameter	1
ADI	2	Param# for IN2	Integer# of drive parameter	3
ADI	3	Param# for IN3	Integer# of drive parameter	6
ADI	4	Param# for IN4	Integer# of drive parameter	7

Writing Parameter Values

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

These outputs are written from the adapter each time the User OUT point is written from the network.

A value of zero in the Param# field disables the writing of data for that specific point. Refer to the drive user manual for the desired parameter number.

Figure 5.2 Configurable Objects: Outputs

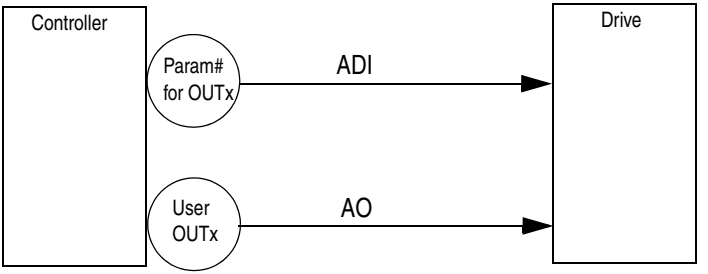


Table 5.N Configurable Objects: Outputs

Network Point Type (NPT)	Network Point Address (NPA)	Description	Range	Default
AO	3	User OUT1	User-defined Output 1	0
AO	4	User OUT2	User-defined Output 2	0
ADI	5	Param# for OUT1	0 (not in use), 1 to maximum # of drive parameters	0
ADI	6	Param# for OUT2	0 (not in use), 1 to maximum # of drive parameters	0

Using Siemens Building Technologies P1 FLN

Chapter 6 provides information about controlling a PowerFlex 7-Class drive, setting its Reference, and accessing its parameters through points when the Siemens Building Technologies P1 FLN network protocol is selected.

TIP: Datalinks can also be used for accessing parameters. For information about using Datalinks, refer to Chapter 7, Using Datalinks with All Protocols.

ATTENTION: Risk of injury or equipment damage exists. On P1 FLN networks, 16-bit values are truncated to 15-bit values. Unpredictable operation may result from using **non-**15-bit drive parameters with the configurable points. Recognize the data range limitation of P1 FLN and understand the data value ranges of each parameter to be accessed over the network. Refer to the drive user manual for information about drive parameter sizes.

Understanding Siemens Building Technologies P1 FLN

P1 FLN nodes are built by the use of several points. The P1 FLN master controller performs read and write commands to these points, and the adapter transfers/translates the data between these points and the drive.

All values (byte-sized, Boolean, and true integers) are represented in a 16-bit word over the network, where the sign bit is always positive. The actual range allowed by P1 FLN, however, is always 15 bits: 0 – 32767 for integers, 0 – 255 for bytes, and 0 – 1 for Boolean. The limit of 15 bits prevents the use of the adapter's P1 FLN mode with 32-bit DPI hosts, where either Reference/Feedback or Datalink values are represented in 32-bit format. 16-bit real values will be truncated to show only 15-bit values.

P1 FLN Point Types

Logic analog and digital I/O points are used for controlling the drive, monitoring status, and reading/writing parameters. Table 6.A shows the four point types.

Table 6.A Point Types

Abbreviation	Name	Used for
LDI	Logical Digital Inputs	Reading bit level points (0 or 1) such as drive status. For example, FWD.REV MON (point 21) provides the status of the rotation direction of the drive.
LDO	Logical Digital Outputs	Writing bit-level points (0 or 1) such as drive commands. For example, CMD RUN.STOP (Point 24) commands the drive to run.
LAI	Logical Analog Inputs	Reading word-level points such as FREQ OUTPUT (Point 03) and CURRENT (Point 06).
LAO	Logical Analog Outputs	Writing word-level points such as REFERENCE (Point 92) and acceleration (Point 31).

Some points can be unbundled. Unbundle means that you can characterize the subpoint so that three additional items can be enabled for that specific subpoint:

- The subpoint can be monitored for COV (Change of Value). All unbundled points are reported for any change of value when a “Scan for COV” command is issued. (Analog points may have COV limits defined to reduce network traffic.)
- The subpoint can be overridden by the operator.
- Unbundling a point allows the operator to set up a virtual point in the controller's database, which when commanded, can also affect the subpoints in the device.

Table 6.B Siemens Building Technologies P1 FLN Point List

Point Number(1)	Point Type(2)	Descriptor	English Units	Slope	Intercept	ON Text	OFF Text	Default	Range	COV(3)	Description
01	LAO	CTRL ADDRESS		1	0			99	0 – 255	No	Node address of this device.
02	LAO	APPLICATION		1	0			2718	0 – 32767	No	Firmware application number.
{03}	LAI	FREQ OUTPUT	HZ	0.01	-163.83			0	0 – 32767	Yes	Drive speed in frequency (Hertz).
{04}	LAI	PCT OUTPUT	PCT	0.1	0			0	0 – 32767	Yes	Drive speed in percentage of max.
{05}	LAI	SPEED	RPM	1	0			0	0 – 32767	Yes	Drive speed in RPM.
{06}	LAI	CURRENT	AMPS	0.1	0			0	0 – 32767	Yes	Drive current consumption in amps.
{07}	LAI	TORQUE	PCT	0.1	-1638.3			0	0 – 32767	Yes	Drive torque in percentage of max.
{08}	LAI	POWER	KW	0.1	0			0	0 – 32767	Yes	Drive power in kW.
{09}	LAI	DRIVE TEMP	DEG C	0.1	-1638.3			0	0 – 32767	Yes	Drive temperature in degree C.
{11}	LAI	DRIVE MWH	MWH	0.1	0			0	0 – 32767	Yes	Drive total power consumption in MWH.
{12}	LAI	RUN TIME	HRS	0.1	0			0	0 – 32767	Yes	Drive total run time in hours.
{13}	LAI	DC BUS VOLT	VOLTS	0.1	0			0	0 – 32767	Yes	Drive DC bus voltage.
{20}	LAO	OVRD TIME		1	0			0	0 – 255	Yes	Not used by this application.
{21}	LDI	FWD.REV MON		1	0	REV	FWD	0 (FWD)	0 – 1	Yes	Monitor the rotation direction of the drive.
{22}	LDO	CMD FWD.REV		1	0	REV	FWD	0 (FWD)	0 – 1	Yes	Command the rotation direction of the drive.

(1) Points not listed are not used in this application. Point numbers that appear in braces { } may be unbundled.

(2) For a description of point types, refer to Table 6.A. Note that the outputs and inputs are from the network perspective, not the drive perspective. For example, an LAO is an output from the controller on the network, but it is an input to the drive.

(3) COV indicates whether the points is able to support COVs and overrides.

Table 6.B Siemens Building Technologies P1 FLN Point List (Continued)

Point Number[1]	Point Type[2]	Descriptor	English Units	Slope	Intercept	ON Text	OFF Text	Default	Range	COV[4]	Description
{23}	LDI	RUN.STOP MON		1	0	RUN	STOP	0 (STOP)	0 – 1	Yes	Monitor the Run/Stop status of the drive.
{24}	LDO	CMD RUN.STOP		1	0	RUN	STOP	0 (NO)	0 – 1	Yes	Command Run to the drive. A STOP issues a momentary Stop command to the drive.
{25}	LDI	READY		1	0	READY	NOTRDY	0 (NOTRDY)	0 – 1	Yes	Monitor the Ready status of the drive.
{26}	LDO	RUN ENABLE		1	0	ENABLE	STOP	0 (NO)	0 – 1	Yes	Must be set to ENABLE to allow controlling the drive.
{29}	LDO	DAY.NGT		1	0	NIGHT	DAY	0 (DAY)	0 – 1	Yes	Not used by this application.
{30}	LAO	CURRNT LIMIT		0.1	0			[3]	0 – 255	No	Current limit of the drive. Min value 0.9; max value 6.0
{31}	LAO	ACCEL TIME		0.1	0			[3]	0 – 32767	No	Acceleration time of the drive. Min value 0.1; max value 3276.7
{32}	LAO	DECEL TIME		0.1	0			[3]	0 – 32767	No	Deceleration time of the drive. Min value 0.1; max value 3276.7
36	LAO	PARAM IN		1	0			0	0 – 32767	No	Parameter number to User In point.
{37}	LAI	USER IN		1	0			0	0 – 32767	Yes	User-defined input.

(1) Points not listed are not used in this application. Point numbers that appear in braces { } may be unbundled.

(2) For a description of point types, refer to Table 6.A. Note that the outputs and inputs are from the network perspective, not the drive perspective. For example, an LAO is an output from the controller on the network, but it is an input to the drive.

(3) Depends on DPI Host product connected to (PowerFlex 70, etc.) and HP size.

(4) COV indicates whether the points is able to support COVs and overrides.

Table 6.B Siemens Building Technologies P1 FLN Point List (Continued)

Point Number(1)	Point Type(2)	Descriptor	English Units	Slope	Intercept	ON Text	OFF Text	Default	Range	COV(3)	Description
38	LAO	PARAM OUT		1	0			0	0 – 32767	No	Parameter number to USER IN point.
39	LAO	USER OUT		1	0			0	0 – 32767	No	User-defined output.
{44}	LAI	DLNK A1 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out A1.
{46}	LAI	DLNK A2 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out A2.
{48}	LAI	DLNK B1 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out B1.
{50}	LAI	DLNK B2 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out B2.
{52}	LAI	DLNK C1 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out C1.
{54}	LAI	DLNK C2 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out C2.
{56}	LAI	DLNK D1 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out D1.
{58}	LAI	DLNK D2 OUT		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink Out D2.
{60}	LAI	INPUT REF 1		0.001	-16.383			0	0 – 32767	Yes	Shows the Input Reference 1 parameter.
{61}	LAI	INPUT REF 2		0.001	-16.383			0	0 – 32767	Yes	Shows the Input Reference 2 parameter.
{62}	LAO	DLNK A1 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In A1.
{64}	LAO	DLNK A2 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In A2
{66}	LAO	DLNK B1 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In B1.
{68}	LAO	DLNK B2 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In B2.

(1) Points not listed are not used in this application. Point numbers that appear in braces { } may be unbundled.

(2) For a description of point types, refer to Table 6.A. Note that the outputs and inputs are from the network perspective, not the drive perspective. For example, an LAO is an output from the controller on the network, but it is an input to the drive.

(3) COV indicates whether the points is able to support COVs and overrides.

Table 6.B Siemens Building Technologies P1 FLN Point List (Continued)

Point Number[1]	Point Type[2]	Descriptor	English Units	Slope	Intercept	ON Text	OFF Text	Default	Range	COV[3]	Description
{70}	LAO	DLNK C1 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In C1.
{72}	LAO	DLNK C2 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In C2.
{74}	LAO	DLNK D1 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In D1.
{76}	LAO	DLNK D2 IN		1	0			0	0 – 32767	Yes	Bits 0-14 of Datalink In D2.
{89}	LAO	LOGIC CMD LO		1	0			0	0 – 255	Yes	Lower 8 bits of Product Logic Command Word.
{90}	LAO	LOGIC CMD HI		1	0			0	0 – 255	Yes	Higher 8 bits of Product Logic Command Word.
{91}	LAI	FEEDBACK		1	0			0	0 – 32767	Yes	Feedback value bits 0-14 (absolute value).
{92}	LAO	REFERENCE		1	0			0	0 – 32767	Yes	Reference value bits 0-14.
{93}	LDI	OK.FAULT		1	0	FAULT	OK	0 (OK)	0 – 1	Yes	Shows if the drive is faulted or not.
{94}	LDO	RESET FAULT		1	0	RESET	NORMAL	0 (NORMAL)	0 – 1	Yes	Resets the fault condition in the drive. Special point. Will return to NORMAL (0) automatically.
{95}	LAI	LOGIC STS LO		1	0			0	0 – 255	Yes	Lower 8 bits of Product Logic Status Word.
{96}	LAI	LOGIC STS HI		1	0			0	0 – 255	Yes	Higher 8 bits of Product Logic Status Word.
{99}	LAO	ERROR STATUS		1	0			0	0 – 255	Yes	Not used by this application.

(1) Points not listed are not used in this application. Point numbers that appear in braces { } may be unbundled.

(2) For a description of point types, refer to Table 6.A. Note that the outputs and inputs are from the network perspective, not the drive perspective. For example, an LAO is an output from the controller on the network, but it is an input to the drive.

(3) COV indicates whether the points is able to support COVs and overrides.

Using the P1 FLN Point Map for I/O

On Siemens Building Technologies P1 FLN, data transfers are used to transfer the I/O data that controls the drive and sets its Reference. Note that *Output I/O* is data that the master device sends and the adapter receives. *Input I/O* is status data that the adapter sends and the master device receives.

Important: In order for the drive to use the I/O and Reference from the P1 FLN network, you must set parameters in it and the adapter to receive the I/O and Reference. For details, refer to Setting the I/O Configuration in Chapter 3.

Setting the Logic Command and Reference

ATTENTION: Select and use **either** the point type Digital (LDO) or the word type Analog (LAO) as a control method, but **not both**. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause bodily injury and/or damage to equipment.

On Siemens Building Technologies P1 FLN, there are two ways to control a drive and set its Reference.

- The more common way uses points such as CMD RUN.STOP (point 24) and RUN ENABLE (point 26). Refer to Table 6.B for a list of points. For example, to start a PowerFlex 70/700 drive, you can set CMD RUN.STOP (point 24) to “RUN.” To stop it, you can set CMD RUN.STOP (point 24) to “STOP” or RUN ENABLE (point 26) to “STOP.”

ATTENTION: LOGIC CMD LO (point 89) must be written prior to LOGIC CMD HI (point 90) to maintain data integrity of the Logic Command word. Failure to observe this precaution could result in bodily injury and/or damage to equipment.

- The second way uses LOGIC CMD HI (point 90) and LOGIC CMD LO (point 89). The LOGIC CMD LO and LOGIC CMD HI points are both 8-bit points. The adapter joins these two words together to make a 16-bit command word. Refer to Appendix C, Logic Command/ Status Words, for definitions of the bits in the command word. The command word in the adapter’s buffer is updated with the content of LOGIC CMD LO and LOGIC CMD HI points. It is transferred to the drive when LOGIC CMD HI is written. Therefore, to maintain data

integrity of the command word, LOGIC CMD LO must be written prior to writing LOGIC CMD HI. For example, to start a PowerFlex 70/700 drive, you can write a value of “2” to LOGIC CMD LO and a value of “0” to LOGIC CMD HI. To stop it, you can write a value of “1” to LOGIC CMD LO and a value of “0” to LOGIC CMD HI.

The Reference value is a 16-bit value in the drive but will only use 15 bits due to the P1 FLN protocol limitation. You can send the reference using REFERENCE (point 92). Remember that the Reference value is a scaled engineering value. For example, in PowerFlex 70/700 drives, the Reference is scaled based on the value of **Parameter 55 - [Maximum Freq]**, but the commanded maximum speed can never exceed the value of **Parameter 82 - [Maximum Speed]**. Table 6.C shows example References and their results on a PowerFlex 70/700 drive that has its **Parameters 55 - [Maximum Freq]** set to 130 Hz and **82 - [Maximum Speed]** set to 60 Hz.

Table 6.C Example Speed Reference and Feedback for a PowerFlex 70/700

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

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

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

Table 6.D shows the commands that you can execute on a PowerFlex 70/700 drive and the point(s) that you can use to execute them.

Table 6.D Logic Commands

Point Number(s)	Point	Logic Command Bit	PowerFlex 70/700 Example	
			Description	Values
24	CMD RUN.STOP	0	Stop (1)	0 = Not Stop 1 = Stop (3)
26	RUN ENABLE			
89	LOGIC CMD LO bit 0			
24	CMD RUN.STOP	1	Start (1) (2)	0 = Not Start 1 = Start
89	LOGIC CMD LO bit 0			
89	LOGIC CMD LO bit 2	2	Jog	0 = Not Jog 1 = Jog
94	RESET FAULTS	3	Clear Faults(2)	0 = Not Clear Faults 1 = Clear Faults
89	LOGIC CMD LO bit 3			

Table 6.D Logic Commands (Continued)

Point Number(s)	Point	Logic Command Bit	PowerFlex 70/700 Example	
			Description	Values
22	CMD FWD.REV	4 and 5	Direction	Bits 05 04 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
89	LOGIC CMD LO bits 4, 5			
89	LOGIC CMD LO bit 6	6	Local Control	0 = No Local Control 1 = Local Control
89	LOGIC CMD LO bit 7	7	MOP Increment	0 = Not Increment 1 = Increment
90	LOGIC CMD HI bits 0, 1	8 and 9	Accel Rate	LOGIC CMD HI Bits 01 00 0 0 = No Command 0 1 = Accel Rate 1 1 0 = Accel Rate 2 1 1 = Hold Accel Rate
90	LOGIC CMD HI bits 3, 2	10 and 11	Decel Rate	LOGIC CMD HI Bits 03 02 0 0 = No Command 0 1 = Decel Rate 1 1 0 = Decel Rate 2 1 1 = Hold Decel Rate
90	LOGIC CMD HI bits 6, 5, 4	12, 13, and 14	Reference Select	Bits 06 05 04 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Ref 2 (Ref B Select) 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Preset 7)
90	LOGIC CMD HI bit 7	15	MOP Decrement	0 = Not Decrement 1 = Decrement

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

(2) To perform this command, the value must change from “0” to “1.”

(3) Setting CMD RUN.STOP to STOP issues a momentary Stop command to the drive. Logic Command Bit 0 is momentarily set to 1 (STOP) to initiate a Stop and then set to 0 (Not Stop).

The P1 FLN point map provides points to execute other commands on an adapter or drive. These points include CTRL ADDRESS (point 01), CURRENT LIMIT (point 30), ACCEL TIME (point 31), and DECEL TIME (point 32). Refer to Table 6.E on page 6-10 for a description of the various points.

Viewing the Logic Status and Feedback

There are two ways to determine drive status.

- The more common way uses points such as RUN.STOP MON (point 23) and FWD.REV MON (point 21) that represent individual bits in the Logic Status word. Refer to Table 6.B for a list of points. For example, to view if a PowerFlex 70/700 drive is running, you can read RUN.STOP MON (point 23) to see if it is "RUN" or "STOP." To view its direction, you can read FWD.REV MON (point 21) to see if it is "FWD" or "REV."
- The second way uses LOGIC STS LO (point 95) and LOGIC STS HI (point 96). The LOGIC STS LO and LOGIC STS HI are both 8-bit points that the adapter can use to report its 16-bit status word. Refer to Appendix C, Logic Command/Status Words, for definitions of the bits in the status word. Since LOGIC STS LO gets updated only when LOGIC STS HI is read, you must read LOGIC STS HI prior to reading LOGIC STS LO to maintain the data integrity of the status word. For example, to view if a PowerFlex 70/700 drive is running, you can read LOGIC STS HI and LOGIC STS LO and determine if bit 1 is "0" (Not Running) or "1" (Running). To view its direction, you can read LOGIC STS LO and LOGIC STS HI and determine if bit 3 is "0" (Reverse) or "1" (Forward).

The Feedback can also be viewed in two ways.

- FREQ OUTPUT (point 03), PCT OUTPUT (point 04), and SPEED (point 05) report the feedback in values such as Hz, percent of maximum speed, and RPM, respectively.
- FEEDBACK (point 91) reports the feedback as a scaled value. For an explanation of how the Reference/Feedback is scaled, refer to the Setting the Logic Command and Reference section in this chapter.

Table 6.E shows the status that you can view on a PowerFlex 70/700 drive and the points that you can use to view them.

Table 6.E Logic Status

Point Number(s)	Point Name	Logic Status Bit	PowerFlex 70/700 Example	
			Description	Values [1]
25	READY	0	Ready	0 = Not Ready 1 = Ready
95	LOGIC STS LO bit 0			
23	RUN.STOP MON	1	Active	0 = Not Running 1 = Running
95	LOGIC STS LO bit 1			
95	LOGIC STS LO bit 2	2	Command Direction	0 = Reverse 1 = Forward

Table 6.E Logic Status (Continued)

Point Number(s)	Point Name	Logic Status Bit	PowerFlex 70/700 Example	
			Description	Values [1]
21	FWD.REV MON	3	Actual Direction	0 = Reverse 1 = Forward
95	LOGIC STS LO bit 3			
95	LOGIC STS LO bit 4	4	Accel	0 = Not Accelerating 1 = Accelerating
95	LOGIC STS LO bit 5	5	Decel	0 = Not Decelerating 1 = Decelerating
95	LOGIC STS LO bit 6	6	Alarm	0 = No Alarm 1 = Alarm
93	OK.FAULT	7	Fault	0 = No Fault 1 = Fault
95	LOGIC STS LO bit 7			
96	LOGIC STS HI bit 0	8	At Speed	0 = Not At Reference 1 = At Reference
96	LOGIC STS HI bits 3, 2, 1	9, 10, and 11	Local Control	LOGIC STS HI Bits 03 02 01 0 0 0 = Port 0 (TB) 0 0 1 = Port 1 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 1 1 0 = Port 6 1 1 1 = No Local
96	LOGIC STS HI bits 7, 6, 5, 4	12, 13, 14, and 15	Reference	LOGIC STS HI Bits 07 06 05 04 0 0 0 0 = Ref A Auto 0 0 0 1 = Ref B Auto 0 0 1 0 = Preset 2 Auto 0 0 1 1 = Preset 3 Auto 0 1 0 0 = Preset 4 Auto 0 1 0 1 = Preset 5 Auto 0 1 1 0 = Preset 6 Auto 0 1 1 1 = Preset 7 Auto 1 0 0 0 = Term Blk Manual 1 0 0 1 = DPI 1 Manual 1 0 1 0 = DPI 2 Manual 1 0 1 1 = DPI 3 Manual 1 1 0 0 = DPI 4 Manual 1 1 0 1 = DPI 5 Manual 1 1 1 0 = DPI 6 Manual 1 1 1 1 = Jog Ref

[1] The values in this column are for LOGIC STS LO (point 95) and LOGIC STS HI (point 96). For details about other point values, refer to Table 6.B on page 6-3.

The P1 FLN point map provides points to monitor a number of other features in the drive. These points include CURRENT (point 06), TORQUE (point 07), and POWER (point 08). Refer to Table 6.E on page 6-10 for a description of the various points.

Using the P1 FLN Point Map to Access Parameters

Drive parameters can be accessed using Configurable Points or Datalinks (Chapter 7, Using Datalinks with All Protocols).

Reading Parameter Values

Configurable points USER IN (point 37) and PARAM IN (point 36) are points that enable any parameter in the drive to be monitored. The USER IN shows only 15-bit values; therefore, only 16-bit drive parameters can be used (however, only values between 0 - 32767 would be used).

The PARAM IN is used to configure which parameter is to be monitored, and the value ends up in the USER IN. For example, for a PowerFlex 70 or 700 drive, writing the value of “1” into PARAM IN point (reading drive parameter 1) would provide the Output Frequency in USER IN point.

Writing Parameter Values

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

Configurable Points USER OUT (point 39) and PARAM OUT (point 38) are points that enable write access to any parameter in the drive. However, due to the 15-bit limitation, only 16-bit drive parameters should be accessed.

For example, for a PowerFlex 70/700 drive, writing a value of “140” in PARAM OUT (writing drive parameter 140) and the value of “200” in USER OUT would set drive **Parameter 140 - [Accel Time 1]** to 20.0 seconds.

Using Datalinks with All Protocols

Chapter 7 provides information and examples showing how to use Datalinks.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks “point” to specific parameters to be accessed. When enabled, each Datalink consumes either two 16-bit or 32-bit words in both the input and output image depending on its size. The size of Datalinks (16-bit words or 32-bit words) is determined by the drive and displayed in **Parameter 19 - [Datalink Size]** in the adapter.

Rules for Using Datalinks

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

32-Bit Parameters using 16-Bit Datalinks

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

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

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

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

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

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

32-bit data is stored in binary as follows:

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

Example:

Parameter 242 - [Power Up Marker] = 88.4541 hours

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

LSW = 32573

851968 + 32573 = 884541

Configuring Datalinks

Configuring Datalinks from the drive side is a two-step process:

1. Configure the datalink parameters in the drive. For example, in a PowerFlex 70 or 700 drive, set **Parameters 300 - [Data In A1]** to **317 - [Data Out D2]** to "point" to the parameters to be accessed. For instance, to read drive **Parameter 1 - [Output Freq]**, set **Parameter 310 - [Data Out A1]** to "1."

2. Enable the desired Datalinks in **Parameter 16 - [DPI I/O Cfg]** in the adapter. This tells the adapter to transfer Datalink data to and from the drive. For example, to enable Datalink A1, set bit 1 to "1." For details, refer to Setting the I/O Configuration in Chapter 3.

Using Datalinks with Modbus

This section presents information about using Datalinks with Modbus networks. For information about using Datalinks for Metasys N2 networks or Siemens P1 FLN networks, refer to the Using Datalinks with Metasys N2 or Using Datalinks with Siemens P1 FLN sections in this chapter.

Modbus Datalinks Out: A-D

Table 7.A Modbus Datalinks Out - A1, A2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0012	Register Input	Datalink A1 Out	Not used	LSW of 32-bit
3x0013 (1)	Register Input	Datalink A1 Out	16-bit value	MSW of 32-bit
3x0014	Register Input	Datalink A2 Out	Not used	LSW of 32-bit
3x0015 (2)	Register Input	Datalink A2 Out	16-bit value	MSW of 32-bit

(1) A read access to address 3x0013 initiates a refresh of Datalink A1 value before reading.
(2) A read access to address 3x0015 initiates a refresh of Datalink A2 value before reading.

Table 7.B Modbus Datalinks Out - B1, B2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0016	Register Input	Datalink B1 Out	Not used	LSW of 32-bit
3x0017 (1)	Register Input	Datalink B1 Out	16-bit value	MSW of 32-bit
3x0018	Register Input	Datalink B2 Out	Not used	LSW of 32-bit
3x0019 (2)	Register Input	Datalink B2 Out	16-bit value	MSW of 32-bit

(1) A read access to address 3x0017 initiates a refresh of Datalink B1 value before reading.
(2) A read access to address 3x0019 initiates a refresh of Datalink B2 value before reading.

Table 7.C Modbus Datalinks Out - C1, C2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0020	Register Input	Datalink C1 Out	Not used	LSW of 32-bit
3x0021 (1)	Register Input	Datalink C1 Out	16-bit value	MSW of 32-bit
3x0022	Register Input	Datalink C2 Out	Not used	LSW of 32-bit
3x0023 (2)	Register Input	Datalink C2 Out	16-bit value	MSW of 32-bit

(1) A read access to address 3x0021 initiates a refresh of Datalink C1 value before reading.

(2) A read access to address 3x0023 initiates a refresh of Datalink C2 value before reading.

Table 7.D Modbus Datalinks Out - D1, D2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0024	Register Input	Datalink D1 Out	Not used	LSW of 32-bit
3x0025 (1)	Register Input	Datalink D1 Out	16-bit value	MSW of 32-bit
3x0026	Register Input	Datalink D2 Out	Not used	LSW of 32-bit
3x0027 (2)	Register Input	Datalink D2 Out	16-bit value	MSW of 32-bit

(1) A read access to address 3x0025 initiates a refresh of Datalink D1 value before reading.

(2) A read access to address 3x0027 initiates a refresh of Datalink D2 value before reading.

Modbus Datalinks In: A-D

Table 7.E Modbus Datalinks In - A1, A2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0018	Register Output	Datalink A1 In	Not used	LSW of 32-bit
4x0019 (1)	Register Output	Datalink A1 In	16-bit value	MSW of 32-bit
4x0020	Register Output	Datalink A2 In	Not used	LSW of 32-bit
4x0021 (2)	Register Output	Datalink A2 In	16-bit value	MSW of 32-bit

(1) A write access to address 4x0019 initiates an update of the Datalink A1 field in the DPI I/O image.

(2) A write access to address 4x0021 initiates an update of the Datalink A2 field in the DPI I/O image.

Table 7.F Modbus Datalinks In - B1, B2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0022	Register Output	Datalink B1 In	Not used	LSW of 32-bit
4x0023 (1)	Register Output	Datalink B1 In	16-bit value	MSW of 32-bit
4x0024	Register Output	Datalink B2 In	Not used	LSW of 32-bit
4x0025 (2)	Register Output	Datalink B2 In	16-bit value	MSW of 32-bit

(1) A write access to address 4x0023 initiates an update of the Datalink B1 field in the DPI I/O image.

(2) A write access to address 4x0025 initiates an update of the Datalink B2 field in the DPI I/O image.

Table 7.G Modbus Datalinks In - C1, C2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0026	Register Output	Datalink C1 In	Not used	LSW of 32-bit
4x0027 (1)	Register Output	Datalink C1 In	16-bit value	MSW of 32-bit
4x0028	Register Output	Datalink C2 In	Not used	LSW of 32-bit
4x0029 (2)	Register Output	Datalink C2 In	16-bit value	MSW of 32-bit

(1) A write access to address 4x0027 initiates an update of the Datalink C1 field in the DPI I/O image.

(2) A write access to address 4x0029 initiates an update of the Datalink C2 field in the DPI I/O image.

Table 7.H Modbus Datalinks In - D1, D2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0030	Register Output	Datalink D1 In	Not used	LSW of 32-bit
4x0031 (1)	Register Output	Datalink D1 In	16-bit value	MSW of 32-bit
4x0032	Register Output	Datalink D2 In	Not used	LSW of 32-bit
4x0033 (2)	Register Output	Datalink D2 In	16-bit value	MSW of 32-bit

(1) A write access to address 4x0031 initiates an update of the Datalink D1 field in the DPI I/O image.

(2) A write access to address 4x0033 initiates an update of the Datalink D2 field in the DPI I/O image.

Using Datalinks with Metasys N2

This section presents information about using Datalinks with Metasys N2 networks. For information about using Datalinks for Modbus networks or Siemens P1 FLN networks, refer to the Using Datalinks with Modbus and Using Datalinks with Siemens P1 FLN sections in this chapter.

Metasys N2 Datalinks Out: A & B (No Datalinks C & D)

Table 7.I Metasys N2 Datalinks Out - A1, A2

Network Point Type (NPT)	Network Point Address (NPA)	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AI	7	Input	Datalink A1 Out	16-bit value	Limited to -16,777,215 to +16,777,215
AI	8	Input	Datalink A2 Out	16-bit value	Limited to -16,777,215 to +16,777,215

Table 7.J Metasys N2 Datalinks Out - B1, B2

Network Point Type (NPT)	Network Point Address (NPA)	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AI	9	Input	Datalink B1 Out	16-bit value	Limited to -16,777,215 to +16,777,215
AI	10	Input	Datalink B2 Out	16-bit value	Limited to -16,777,215 to +16,777,215

Metasys N2 Datalinks In: A & B (No Datalinks C & D)

Table 7.K Metasys N2 Datalinks In - A1, A2

Network Point Type (NPT)	Network Point Address (NPA)	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AO	5	Output	Datalink A1 In	16-bit value	Limited to -16,777,215 to +16,777,215
AO	6	Output	Datalink A2 In	16-bit value	Limited to -16,777,215 to +16,777,215

Table 7.L Metasys N2 Datalinks In - B1, B2

Network Point Type (NPT)	Network Point Address (NPA)	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AO	7	Output	Datalink B1 In	16-bit value	Limited to -16,777,215 to +16,777,215
AO	8	Output	Datalink B2 In	16-bit value	Limited to -16,777,215 to +16,777,215

Using Datalinks with Siemens P1 FLN

This section presents information about using Datalinks with Siemens P1 FLN networks. For information about using Datalinks for Modbus networks or Metasys N2 networks, refer to the Using Datalinks with Modbus or Using Datalinks with Metasys N2 sections in this chapter.

DLNK A1 OUT to DLNK D2 OUT contain the Datalink Out A1 to D2 parameters *from* the drive. DLNK A1 IN to DLNK D2 IN contain the Datalink In A1 to D2 parameter values *to* the drive.

For example, a PowerFlex 70 or 700 drive enabling Datalink A for the adapter and configuring drive **Parameter 310 - [Data Out A1]** to "1" will provide drive **Parameter 1 - [Output Frequency]** at the DLNK A1 OUT point. Configuring **Parameter 300 - [Data In A1]** to "140" in the drive will transfer the value of the DLNK A1 IN point value to drive **Parameter 140 - [Accel Time 1]** when accessed.

Note that certain drives may utilize 32-bit datalinks. In this case, Datalinks are not supported by the adapter. The adapter will support only 15-bit Datalink values.

ATTENTION: Risk of injury or equipment damage exists. On P1 FLN networks, 16-bit values are truncated to 15-bit values. Unpredictable operation may result from using **non-**16-bit drive parameters with the configurable points. Recognize the data range limitation of P1 FLN and understand the data value ranges of each parameter to be accessed over the network. Refer to the drive user manual for information about drive parameter sizes.

Siemens P1 FLN Datalinks Out: A-D

P1 FLN devices work only with 15-bit integer values; therefore, these points only show 15-bit values. If an adapter is connected to a host using 32-bit Datalinks, the adapter will be prevented from using Datalinks. The DPI host determines if 16- or 32-bit Datalink values are used.

Table 7.M Siemens P1 FLN Datalinks Out: A – D

Point Number (1)	Point Type	Descriptor	Factory Default	Description
{44}	LAI	DLINK A1 OUT	0	Bit 0-14 of Datalink Out A1.
{46}	LAI	DLINK A2 OUT	0	Bit 0-14 of Datalink Out A2.
{48}	LAI	DLINK B1 OUT	0	Bit 0-14 of Datalink Out B1.
{50}	LAI	DLNK B2 OUT	0	Bit 0-14 of Datalink Out B2.
{52}	LAI	DLNK C1 OUT	0	Bit 0-14 of Datalink Out C1.
{54}	LAI	DLNK C2 OUT	0	Bit 0-14 of Datalink Out C2.
{56}	LAI	DLNK D1 OUT	0	Bit 0-14 of Datalink Out D1.
{58}	LAI	DLNK D2 OUT	0	Bit 0-14 of Datalink Out D2.

(1) Point numbers that appear in braces { } may be unbundled at the field panel.

Siemens P1 FLN Datalinks In: A-D

P1 FLN devices work only with 15-bit integer values; therefore, these points only show 15-bit values. If an adapter is connected to a host using 32-bit Datalinks, the adapter will be prevented from using Datalinks. The DPI host determines if 16- or 32-bit Datalink values are used.

Table 7.N Siemens P1 FLN Datalinks In: A – D

Point Number (1)	Point Type	Descriptor	Factory Default	Description
{62}	LAO	DLNK A1 IN	0	Bits 0-14 of Datalink In A1.
{64}	LAO	DLNK A2 IN	0	Bits 0-14 of Datalink In A2.
{66}	LAO	DLNK B1 IN	0	Bits 0-14 of Datalink In B1.
{68}	LAO	DLNK B2 IN	0	Bits 0-14 of Datalink In B2.
{70}	LAO	DLNK C1 IN	0	Bits 0-14 of Datalink In C1.
{72}	LAO	DLNK C2 IN	0	Bits 0-14 of Datalink In C2.
{74}	LAO	DLNK D1 IN	0	Bits 0-14 of Datalink In D1.
{76}	LAO	DLNK D2 IN	0	Bits 0-14 of Datalink In D2.

(1) Point numbers that appear in braces { } may be unbundled at the field panel.

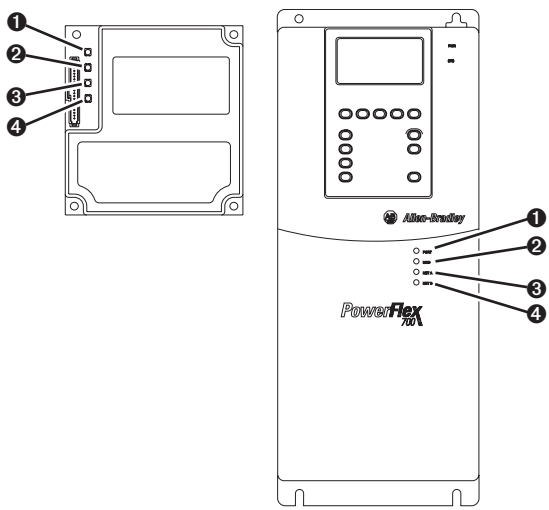
Troubleshooting

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

Locating the Status Indicators

The RS-485 HVAC adapter has four status indicators. They can be viewed on the adapter or through the drive cover. See Figure 8.1.

Figure 8.1 Status Indicators (location on drive may vary)



Item	Status Indicator	Description	Page
1	PORT	DPI Connection Status	8-2
2	MOD	Adapter Status	8-3
3	NET A	Serial Communication Status	8-4
4	NET B	Serial Communication Traffic Status	8-4

PORT Status Indicator

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.
Flashing Red	The adapter is not receiving a ping message from the drive.	• Verify that cables are securely connected. • Cycle power to the drive.
Solid Red	The drive has refused an I/O connection from the adapter. Another DPI peripheral is using the same DPI port as the adapter.	**Important:** Cycle power to the drive after making any of the following corrections: • Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary. • Verify that the drive supports Datalinks. • Configure the adapter and drive to use a Datalink that is not already being used by another peripheral.
Orange	The adapter is connected to a product that does not support Rockwell Automation DPI communications. A connection to a host with a 32-bit reference or 32-bit Datalinks is detected when the peripheral has been configured to use the P1 FLN protocol. The peripheral doesn't support 32-bit devices when using the P1 FLN network protocol.	• Connect the adapter to a product that supports Allen-Bradley DPI communications (for example, PowerFlex 7-Class drives). • Connect the adapter to a product that uses a 16-bit reference and 16-bit Datalinks.
Flashing Green	The adapter is establishing an I/O connection to the drive or I/O has been disabled.	• Verify the settings of Parameter 16 - [DPI I/O Cfg]. • Normal behavior if all I/O is disabled in Parameter 16 - [DPI I/O Cfg].
Solid Green	The adapter is properly connected and is communicating with the drive.	No action required.

MOD Status Indicator

State	Cause	Corrective Actions
Off	The adapter is not powered.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive.
Flashing Red	Bad CRC of adapter parameters or Flash program; other recoverable fault condition.	• Clear any faults in the adapter. • Cycle power to the drive. • If cycling power does not correct the problem, the parameter settings may have been corrupted. Reset faults and reconfigure the adapter. • If resetting defaults does not correct the problem, flash the adapter with the latest firmware release.
Solid Red	The adapter has failed the hardware test.	• Cycle power to the drive. • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Place the scanner in RUN mode. • Program the controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller. • Normal behavior if all I/O has been disabled in Parameter 16 - [DPI I/O Cfg].
Solid Green	The adapter is operational and transferring I/O data.	No action required.

NET A Status Indicator

State	Cause	Corrective Actions
Off	The adapter is not powered or is not connected to the network properly. The first incoming network command not yet recognized.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Correctly connect the RS-485 cable to the connector. • Apply power to the drive. • Set the baud rate and/or parity to match the controller. • Set the correct network protocol.
Flashing Red	A network connection has timed out.	• Set the timeout in Parameter 11 - [Network Timeout]. • Place the scanner in RUN mode. • Verify that there is not too much traffic on the network.
Solid Red	The device has detected an error that has made it incapable of communication on the network.	• Select the correct network protocol. • Select correct data rate. • Verify node address is correct. • Cycle power to apply changes.
Flashing Green	Online to network, but not producing or consuming I/O. If Parameter 11 - [Network Timeout] has not been set to zero (0), this indicates that the adapter has not received any messages within the interval, but it has not yet timed out. The LED will turn solid green when communication resumes.	• Place the scanner in RUN mode. • Program the scanner to send messages to this specific adapter within the specified timeout. • Configure the adapter for the program in the controller or the I/O from the peer device.
Solid Green	The adapter is properly connected and communicating on the network.	No action required.

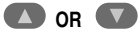
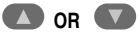
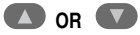
NET B Status Indicator

State	Cause	Corrective Actions
Off	Adapter is not receiving data over the network.	• Program a controller to recognize and transmit I/O to the adapter. • Place the controller in RUN mode or apply power. • Configure the adapter for the program in the controller.
Solid Green	Adapter is transmitting data.	No action required.

Viewing and Clearing Adapter Diagnostic Items

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

To view and clear adapter diagnostic items

Step	Keys	Example Screen
Viewing Diagnostic Items		
1. Access parameters in the adapter. Refer to Using the PowerFlex HIM in Chapter 3.		
2. Press the Up Arrow or Down Arrow to scroll to **Diagnostics**.		Main Menu: **Diagnostics** Parameter Device Select
3. Press Enter to display the Diagnostics menu in the adapter.		
4. Repeat steps 2 and 3 to enter the **Device Items** option.		
5. Press the Up Arrow or Down Arrow to scroll through the items.		Device Item # 27 Net Packet Rcvd 1022
Clearing Diagnostic Items		
1. Access parameters in the Adapter. Refer to Using the PowerFlex HIM in Chapter 3.		
2. Press the Up Arrow or Down Arrow to scroll to **Parameter**.		Main Menu: Diagnostics **Parameter** Device Select
3. Press Enter to display the list of parameters in the adapter.		
4. Repeat steps 2 and 3 to select **Parameter 28 - [Clear Counters]**.		
5. Set the value to 1 = Clear and then press Enter to clear the following diagnostic items: 24, 25, 26, 27, and 28.		Parameter #: 28 Clear Counters 1 Clear

List of Diagnostic Device Items

If you encounter unexpected communications problems, diagnostic items can help you or Rockwell Automation personnel troubleshoot the problem.

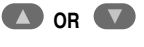
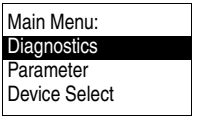
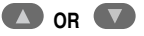
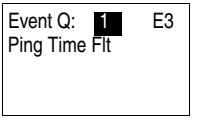
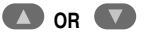
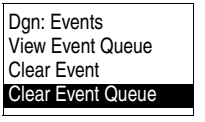
No.	Name	Description
1	Common Logic Cmd	Current value of the common Logic Command being transmitted to the drive by this adapter.
2	Prod Logic Cmd	Current value of the product-specific Logic Command being transmitted to the drive by this adapter.
3	Reference	Current value of the product-specific Reference being transmitted to the drive by this adapter. Note that a 16-bit value will be sent as the MSW of the 32-bit field.
4	Common Logic Sts	Current value of the common Logic Status being received from the drive by this adapter.
5	Prod Logic Sts	Current value of the product-specific Logic Status being received from the drive by this adapter.
6	Feedback	Current value of the product-specific Feedback being received from the drive by this adapter. Note that a 16-bit value will be sent as the MSW of the 32-bit field.
7	Datalink A1 In	Current value of respective Datalink In being transmitted to the drive by this adapter. (If not using a Datalink, this parameter should have a value of zero. Refer to Chapter 7, Using Datalinks with All Protocols for information about Datalinks.)
8	Datalink A2 In	
9	Datalink B1 In	
10	Datalink B2 In	
11	Datalink C1 In	
12	Datalink C2 In	
13	Datalink D1 In	
14	Datalink D2 In	
15	Datalink A1 Out	Current value of respective Datalink Out being received from the drive by this adapter. (Refer to Chapter 7, Using Datalinks with All Protocols for information about Datalinks.)
16	Datalink A2 Out	
17	Datalink B1 Out	
18	Datalink B2 Out	
19	Datalink C1 Out	
20	Datalink C2 Out	
21	Datalink D1 Out	
22	Datalink D2 Out	
23	Field Flash Cntr	Number of times this device has been flash updated.
24	DPI Rx Errors	Current value of the DPI CAN Receive error counter.
25	DPI Tx Errors	Maximum value of the DPI CAN Transmit error counter.
26	Net Packet Sent	Number of packets sent by the adapter.
27	Net Packet Rcvd	Number of OK packets received by the adapter.
28	Net Bad Packet	Number of BAD packets received by the adapter.
29	User IN 1	Current value of configurable point User IN 1 (RTU / N2 / P1 FLN).
30	User IN 2	Current value of configurable point User IN 2 (RTU / N2).
31	User IN 3	Current value of configurable point User IN 3 (RTU / N2).
32	User IN 4	Current value of configurable point User IN 4 (RTU / N2).

No.	Name	Description
33	User IN 5	Current value of configurable point User IN 5 (RTU).
34	User IN 6	Current value of configurable point User IN 6 (RTU).
35	User IN 7	Current value of configurable point User IN 7 (RTU).
36	User IN 8	Current value of configurable point User IN 8 (RTU).
37	User OUT 1	Current value of configurable point User OUT 1 (RTU / N2 / P1 FLN).
38	User OUT 2	Current value of configurable point User OUT 2 (RTU / N2).
39	User OUT 3	Current value of configurable point User OUT 3 (RTU).
40	Switch 1	Current value of Rotary Switch 1 (Protocol Select) which can be “1” = RTU, “0” = N2, or “9” = P1.
41	Switch 2	Current value of Rotary Switch 2 (Node Address ones digit).
42	Switch 3	Current value of Rotary Switch 3 (Node Address tens digit).

Viewing and Clearing Events

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

To view and clear events

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

Events

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

Code	Event	Description
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The adapter is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed after start up.
6	Host Sent Reset	The drive sent a reset event message.
7	EEPROM Sum Flt	The EEPROM in the adapter is corrupt.
8	Online @ 125 kbps	The adapter detected the drive communicating at 125 kbps.
9	Online @ 500 kbps	The adapter detected the drive communicating at 500 kbps.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	Dup Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The adapter has logged in for Type 0 control.
13	Type 0 Time Flt	The adapter has not received a Type 0 status message within the specified time.
14	DL Login	The adapter has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The adapter has not received a Datalink message within the specified time.
17	Control Disabled	The adapter has sent a “Soft Control Disable” command to the drive.
18	Control Enabled	The adapter has sent a “Soft Control Enable” command to the drive.
19	Message Timeout	A client-server message sent by the adapter was not completed within one second.
20	DPI Fault Msg	The drive has faulted.
21	DPI Fault Clear	The drive issued this because a fault was cleared.
22	Normal Startup	The adapter successfully started up.
23	Fault Cfg Error	The adapter detected a 32-bit fault configuration reference when the drive supports only a 16-bit reference, or detected a 32-bit fault configuration Datalink value when the drive supports only 16-bit Datalinks.
24	Net Comm Flt	The adapter detected a communications fault on the network.
25	Net Detected	The adapter has detected network communication.
26	Net TImeout Flt	The adapter has detected a network timeout. The timeout period is configured in Parameter 11- [Network Timeout].
27	Lang CRC Bad	The CRC of the language text file is incorrect.

Notes:

Specifications

Appendix A presents the specifications for the adapter.

Communications

Network	
Protocols	Modbus RTU Metasys N2 Siemens Building Technologies P1 FLN
Data Rates	
- Modbus RTU	4800, 9600, 19200, or 38400 baud
- Metasys N2	9600 baud
- Siemens Building Technologies P1 FLN	4800 or 9600 baud
Drive	
Protocol	DPI
Data Rates	125 kbps or 500 kbps

Electrical

Consumption	
Drive	150 mA at 5 VDC
Network	None

Mechanical

Dimensions	
Height	19 mm (0.75 in.)
Length	86 mm (3.33 in.)
Width	78.5 mm (3.09 in.)
Weight	85g (3 oz.)

Environmental

Temperature	
Operating	-10 to 50° C (14 to 149° F)
Storage	-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	EN50178 and EN61800-3
CTick	EN61800-3

NOTE: This is a product of category C2 according to IEC 61800-3. 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	**[DPI Port]** Displays the port to which the adapter is connected. This will usually be port 5.	Default: Minimum: Maximum: Type:	5 0 7 Read Only
02	**[DPI Data Rate]** Displays the data rate used by the drive. This data rate is set in the drive, and the adapter detects it.	Default: Values: Type:	0 = 125 kbps 0 = 125 kbps 1 = 500 kbps Read Only
03	**[Net Addr Cfg]** Configures the network node address if the network switches on the adapter are set to “00.”	Default: Minimum: Maximum: Type: Reset Required:	1 0 247 Read/Write Yes
04	**[Net Addr Act]** Displays the network address actually used by the adapter.	Default: Minimum: Maximum: Type:	1 0 247 Read Only
05	**[Net Rate Cfg]** Configures the network data rate at which the adapter communicates. The available values for this parameter depend on the network protocol selected. Only valid values for the specified network are displayed.	Default: Values: Type: Reset Required:	1 = 9600 0 = 4800 1 = 9600 2 = 19200 3 = 38400 Read/Write Yes
06	**[Net Rate Act]** Displays the network data rate actually used by the adapter.	Default: Values: Type:	1 = 9600 0 = 4800 1 = 9600 2 = 19200 3 = 38400 Read Only

Parameter No.	Name and Description	Details	
07	**[Net Parity Cfg]** Configures the network parity. The available values for this parameter depend on the network protocol selected. Only valid values for the specified network are displayed.	Default: Values: Type: Reset Required:	0 = None 0 = None 1 = Odd 2 = Even Read/Write Yes
08	**[Net Parity Act]** Displays the actual network parity used by the adapter.	Default: Values: Type:	0 = None 0 = None 1 = Odd 2 = Even Read Only
09	**[Stop Bits Act]** Displays the actual number of stop bits used by the selected protocol. This value is network-dependent: • ModBus RTU Protocol – The number of stop bits used depends on the value set by Parameter 30 - [Stop Bits Cfg]. • Metasys N2 Protocol – Uses only 1 bit, so the adapter shows only this value. • Siemens Building Technologies P1 FLN Protocol – Uses only 1 bit, so the adapter shows only this value.	Default: Values: Type:	0 = 1 bit 0 = 1 bit 1 = 2 bits Read Only
10	**[Net Chksum Type]** Displays the type of checksum used by the selected protocol. The value is network dependent: • Modbus RTU Protocol – Uses CRC16 (-1) which is Cyclic Redundancy Check with -1 as a seed value. • Metasys N2 Protocol – Uses RLC which is Run Length Checksum. • Siemens Building Technologies P1 FLN – Uses CRC16 (0) which is Cyclic Redundancy Check with 0 as a seed value.	Default: Values: Type:	0 = CRC16 (0) 0 = CRC16 (0) 1 = RLC 2 = CRC16 (-1) Read Only
11	**[Network Timeout]** Configures the time in seconds to be used to detect network communication loss.	Default: Minimum: Maximum: Type: Reset Required:	10 Seconds 0 Seconds (No Detection) 180 Seconds Read/Write No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 11 - [Network Timeout]** lets you determine how long it will take your adapter to detect network communication losses. By default, this parameter sets the timeout to ten 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).

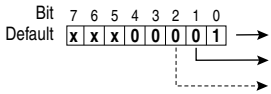
Parameter No.	Name and Description	Details	
12	**[Ref / Fdbk Size]** Displays the size of the Reference/Feedback. The drive determines the size of the Reference/ Feedback.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
13	**[Datalink Size]** Displays the size of each Datalink word. The drive determines the size of Datalinks.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
14	**[Reset Module]** No action if set to "Ready." Resets the adapter if set to "Reset Module." Restores the adapter to its factory default settings if set to "Set Defaults." This parameter is a command. It will be reset to "0 = Ready" after the command has been performed.	Default: Values Type: Reset Required:	0 = Ready 0 = Ready 1 = Reset Module 2 = Set Defaults Read/Write No

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

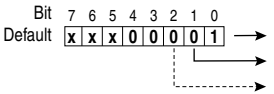
15	**[Comm Flt Action]** Sets the action that the adapter will take if it detects a network failure because it has not communicated with its master within the interval specified in Parameter 11 - [Network Timeout]. This action takes effective only if I/O that controls the drive is transmitted through the adapter.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 15 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

16	**[DPI I/O Cfg]** Sets the I/O that is transferred through the adapter.	Default: Bit Values: Type: Reset Required:	xxx0 0001 0 = I/O disabled 1 = I/O enabled Read/Write Yes



Bit Definitions
0 = Cmd/Ref
1 = Datalink A
2 = Datalink B
3 = Datalink C (Not used with Metasys N2)
4 = Datalink D (Not used with Metasys N2)
5 = Not Used
6 = Not Used
7 = Not Used

Parameter No.	Name and Description	Details
17	**[DPI I/O Active]** Displays the I/O that the adapter is actively transmitting. The value of this parameter will usually be equal to the value of Parameter 16 - [DPI I/O Cfg].  	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read Only **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C (Not used with Metasys N2) 4 = Datalink D (Not used with Metasys N2) 5 = Not Used 6 = Not Used 7 = Not Used
18	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if Parameter 15 - [Comm Flt Action] is set to "Send Flt Cfg" and the adapter times out. 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
19	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if Parameter 15 - [Comm Flt Action] is set to "Send Flt Cfg" and the adapter times out.	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses a 16-bit Reference, the most significant word of this value must be set to zero (0) or a fault will occur.
20 21 22 23 24 25 26 27	**[Flt Cfg A1 In]** **[Flt Cfg A2 In]** **[Flt Cfg B1 In]** **[Flt Cfg B2 In]** **[Flt Cfg C1 In]** **[Flt Cfg C2 In]** **[Flt Cfg D1 In]** **[Flt Cfg D2 In]** Sets the data that is sent to the Datalink in the drive if Parameter 15 - [Comm Flt Action] is set to "Send Flt Cfg" and the adapter times out.	Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses 16-bit Datalinks, the most significant word of this value must be set to zero (0) or a fault will occur.
28	**[Clear Counters]** Clears the network diagnostic counters.	Default: 0 = Ready Values 0 = Ready 1 = Clear Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details	
29	**[N2 Ref Scale]** Only used if Metasys N2 protocol is selected. Determines the engineering unit sent over DPI for the Reference when 100% is set for AO#2.	Default: Minimum: Maximum: Type: Reset Required:	32767 0 4294967295 Read/Write No
30	**[Stop Bits Cfg]** Sets the number of stop bits used by the adapter when the network protocol switch is set to "Modbus RTU." When any other protocol is selected, this parameter setting has no effect.	Default: Values: Type: Reset Required:	0 = 1 bit 0 = 1 bit 1 = 2 bits Read/Write Yes
31	**[RTU Ref. Adjust]** Sets the percent scale factor for the Reference from the network when the network protocol switch is set to "Modbus RTU," and broadcast messages (Modbus address "0") are sent. This lets the drive's Reference either match the broadcast message Reference (=100%), scale below it (<100%), or scale above it (>100%). When any other protocol is selected, this parameter setting has no effect.	Default: Minimum: Maximum: Type: Reset Required:	100.0% 0.0% 200.0% Read/Write No

ATTENTION: To guard against equipment damage and/or personal injury, note that changes to **Parameter 31 - [RTU Ref Adj]** take effect immediately. A drive receiving a broadcast message Reference from the adapter will receive the newly scaled Reference, resulting in a change of speed.

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 RS-485 HVAC adapter. If your product is not included here, refer to its documentation.

PowerFlex 70, PowerFlex 700, PowerFlex 700VC, and PowerFlex 700H 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) (2)	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults(2)	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

(1) A 0 = Not Stop condition (logic 0) must first be present before a 1 = Start condition will start the drive.
(2) To perform this command, the value must change from "0" to "1."

PowerFlex 70, PowerFlex 700, PowerFlex 700VC, and PowerFlex 700H Drives *(Continued)*

Logic Status Word

Logic Bits															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Status**	**Description**
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

PowerFlex 700S Drives

Logic Command Word

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

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

PowerFlex 700S Drives *(Continued)*

Logic Status Word

Logic Bits															Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Enabled	0 = Not Enabled 1 = Enabled
														x		Running	0 = Not Running 1 = Running
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Jogging	0 = Not Jogging 1 = Jogging
								x								Fault	0 = No Fault 1 = Fault
							x									Alarm	0 = No Alarm 1 = Alarm
						x										Flash Mode	0 = Not in Flash Mode 1 = In Flash Mode
					x											Run Ready	0 = Not Ready to Run 1 = Ready to Run
				x												At Limit (1)	0 = Not At Limit 1 = At Limit
			x													Tach Loss Sw	0 = Not Tach Loss Sw 1 = Tach Loss Sw
		x														At Zero Spd	0 = Not At Zero Speed 1 = At Zero Speed
	x															At Setpt Spd	0 = Not At Setpoint Speed 1= At Setpoint Speed
x																Reserved	

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

B

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

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 network. Each device on a network must be set for the same data rate.

Datalink

A type of pointer used by some drives to transfer data to and from the controller. Datalinks allow specified parameter value(s) to be accessed or changed without using Explicit Messages. When enabled, each Datalink consumes either four bytes or eight bytes in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI

A peripheral communication interface used by various Allen-Bradley drives and power products, such as PowerFlex 70 and 700 drives.

DPI Peripheral

A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as “modules” and “adapters.” The PowerFlex HIM is an example of a DPI peripheral.

DPI Product

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

DriveExplorer Software

DriveExplorer software is a tool for monitoring and configuring Allen-Bradley products and adapters. It can be run on computers running Microsoft Windows 95, Windows 98, Windows NT (version 4.0 or higher), Windows 2000, and Windows CE (version 2.01 or higher) operating systems. DriveExplorer (version 2.xx) can be used to configure this adapter and PowerFlex drives. Information about DriveExplorer software and a free lite version can be accessed at http://www.ab.com/drives/driveexplorer.

DriveTools SP Software

A software suite designed for Microsoft Windows 98, Windows ME, Windows NT (4.0 or higher), and Windows 2000 operating systems. This software suite provides a family of tools that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. DriveTools SP (version 1.xx) can be used with PowerFlex drives. Information about DriveTools SP can be accessed at http://www.ab.com/drives/drivetools.

E

Explicit Messaging

Explicit Messages are used to configure, monitor, and diagnose devices over the network.

F

Fault Action

Determines how the adapter and connected product act when a communications fault occurs (for example, a cable is disconnected).

Fault Configuration

When communications are disrupted (for example, a cable is disconnected), the adapter and drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive in the fault configuration parameters (**Parameters 18 - [Flt Cfg Logic]** through **27 - [Flt Cfg D2 In]**). When a fault action parameter is set to use the fault configuration and a fault occurs, the data from these parameters is sent as the Command Logic, Reference, and/or Datalink(s).

Flash Update

The process of updating firmware in the adapter. The adapter can be flash updated using the X-Modem protocol and a 1203-SSS Smart Self-powered Serial converter (version 3.xx or higher firmware), the Allen-Bradley software tool ControlFLASH, or the built-in flash capability of DriveExplorer (version 4.01 or higher).

H

HIM (Human Interface Module)

A device that can be used to configure and control a drive.

Hold Last

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

I

I/O Data

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

L

Logic Command/Status

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

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

N

Node Address

Each device on a network must have a unique node address to identify it. On Modbus RTU, Metasys N2, and Siemens Building Technologies P1 FLN networks, devices can have node addresses between 1 and 255 if the network is set up to accommodate that number of devices.

NVS (Non-Volatile Storage)

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

Parity Check

When the adapter uses a parity check, a non-data bit is added to each binary word that it sends and receives. Devices on the network verify the data integrity of the transmitted data by checking that the sum of the number of ones in a word is always even or odd.

Ping

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

PowerFlex Drives

The Allen-Bradley PowerFlex family of drives include the PowerFlex 70 and PowerFlex 700. These drives can be used for applications ranging from 0.37 kW (0.5 HP) to 3,000 kW (4,000 HP). All PowerFlex 7-Class drives support DPI, allowing them to use the 20-COMM-H RS-485 HVAC adapter. This manual focuses on using the adapter with PowerFlex 70 and PowerFlex 700 drives. Other products that support DPI can also use the adapter.

R

Reference/Feedback

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

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

S

Scanner

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

Status Indicators

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

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 Allen-Bradley personnel identify the type of messages that an adapter is using.

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 command data. If the drive was running and using the reference from the adapter, it will stay running but at zero reference.

Notes:

N

P

Q

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