20-COMM-M Modbus/TCP Adapter
Firmware 1.xxx

Allen-Bradley

User Manual

Important User Information

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

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

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

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

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

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

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

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

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

The information below summarizes the changes made to this manual since its last release (March 2010):

Description of Changes	Page
In the subsection “Direct Access Method,” added a TIP to determine the starting register for a 0-based Modbus/TCP master device, and the registers to read for the example provided.	4-9

Table of Contents

About This Manual

Related Documentation

For:	Refer to:	Publication
EtherNet/IP	EtherNet/IP Media Planning and Installation Manual (1) EtherNet/IP Network Infrastructure Guidelines (1) EtherNet/IP Performance and Application Guide	ODVA Pub. 148 ODVA Pub. 35 ENET-AP001
DriveExplorer™	http://www.ab.com/drives/driveexplorer, and DriveExplorer online help (2)	—
DriveTools™ SP (includes DriveExecutive™)	http://www.ab.com/drives/drivetools, and DriveExecutive online help (2)	—
PowerFlex 7-Class HIM	HIM Quick Reference	20HIM-QR001
PowerFlex® 70/70EC Drive	PowerFlex 70 User Manual PowerFlex 70/700 Reference Manual PowerFlex 70EC/700VC Reference Manual	20A-UM001 PFLEX-RM001 PFLEX-RM004
PowerFlex® 700/700VC Series A Drive PowerFlex® 700VC Series B Drive	PowerFlex 700 Series A User Manual PowerFlex 700 Series B User Manual PowerFlex 70/700 Reference Manual PowerFlex 70EC/700VC Reference Manual	20B-UM001 20B-UM002 PFLEX-RM001 PFLEX-RM004
PowerFlex® 700H Drive	PowerFlex 700H Installation Instructions PowerFlex 700H Programming Manual	PFLEX-IN006 20C-PM001
PowerFlex® 700S Drive (Frames 1 through 6)	PowerFlex 700S with Phase I Control User Manual PowerFlex 700S with Phase I Control Reference Manual PowerFlex 700S with Phase II Control Installation Instructions PowerFlex 700S with Phase II Control User Manual PowerFlex 700S with Phase II Control Reference Manual	20D-UM001 PFLEX-RM002 20D-IN024 20D-UM006 PFLEX-RM003
PowerFlex® 700S Drive (Frames 9 and higher)	PowerFlex 700S with Phase I Control User Manual PowerFlex 700S with Phase I Control Reference Manual PowerFlex 700S with Phase II Control Installation Instructions PowerFlex 700S with Phase II Control User Manual PowerFlex 700S with Phase II Control Reference Manual	20D-UM001 PFLEX-RM002 PFLEX-IN006 20D-UM006 PFLEX-RM003
PowerFlex® 700L Drive	PowerFlex 700L User Manual	20L-UM001
PowerFlex® Digital DC Drive	PowerFlex Digital DC Drive User Manual	20P-UM001
Modbus RTU Protocol Specification	www.modicon.com/techpubs/TechPubNew	PI_MBUS_300.pdf

(1) Use this link to the ODVA EtherNet/IP library for these publications: http://odva.org/Home/ODVATECHNOLOGIES/EtherNetIP/EtherNetIPLibrary/tabid/76/Default.aspx

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

Documentation can be obtained online at http://literature.rockwellautomation.com. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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

For information such as firmware updates or answers to drive-related questions, go to the Drives Service & Support web site at www.ab.com/support/abdrives and click on the “Downloads” or “Knowledgebase” link.

Rockwell Automation Support

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Local Product Support

Contact your local Rockwell Automation, Inc. representative for:

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

Technical Product Assistance

For technical assistance, please review the information in Chapter 5, Troubleshooting, first. If you still have problems, then access the Allen-Bradley Technical Support web site at www.ab.com/support/abdrives or contact Rockwell Automation, Inc.

Conventions Used in This Manual

This manual provides information about the adapter and using it with PowerFlex 7-Class (Architecture-Class) drives. The adapter can be used with other products that support a DPI™ adapter, such as the DPI External Comms Kit (20-XCOMM-DC-BASE). Refer to the documentation for your product for specific information about how it works with the adapter.

The following conventions are used throughout this manual:

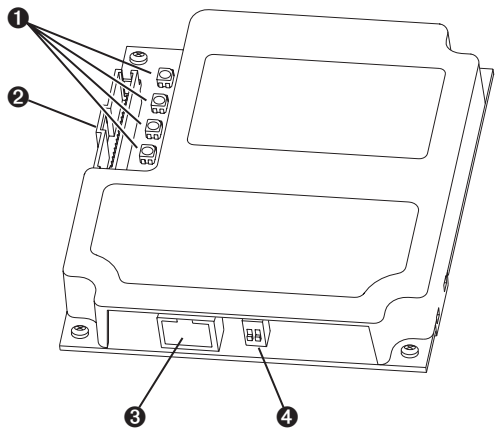
- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name—for example **Parameter 01 - [DPI Port]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read “Select **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.

Getting Started

The adapter is intended for installation into a PowerFlex 7-Class drive and is used for network communication. The adapter can also be installed in an External DPI Comms Kit (20-XCOMM-DC-BASE).

Components

Figure 1.1 Components of the Adapter



Item	Part	Description
1	Status Indicators	Four LEDs that indicate the status of the DPI, the adapter, and network connection. Refer to Chapter 5, Troubleshooting.
2	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
3	Ethernet Connector	An RJ-45 connector for the Ethernet cable. The connector is CAT-5 compliant to ensure reliable data transfer on 100Base-TX Ethernet connections.
4	Web Pages Switch (SW2)	Enables or disables the adapter web pages. Refer to Setting the Web Pages Switch on page 2-2. SW1 is unused.

Features

The features of the adapter include:

- Typical mounting in a PowerFlex 7-Class drive. The adapter can also be installed in a DPI External Comms Kit. See Chapter 7, Installing the Adapter in a DPI External Comms Kit (20-XCOMM-DC-BASE) for more information.

  Important: Due to inherent operating limitations, the adapter cannot be used with the kit's optional I/O board.

- Captive screws to secure and ground the adapter to the drive or, when mounted in a DPI External Comms Kit, to the kit's metal enclosure.
- Compatibility with various configuration tools to configure the adapter and connected drive. The tools include the PowerFlex 7-Class HIM on the drive, and drive-configuration software such as DriveExplorer (version 2.01 or higher) or DriveExecutive (version 3.01 or higher). In addition, you can use a BOOTP server to configure the network address for the adapter.
- Status indicators that report the status of the drive communications, the adapter, and network. They are visible when the drive cover is open or closed.
- Parameter-configurable I/O (Logic Command/Reference and up to four pairs of Datalinks) to meet application requirements.
- Uses Ethernet II framing for Modbus/TCP protocol.
- Support for a variety of Modbus/TCP function codes.
- User-defined fault actions to determine how the adapter and connected drive respond to I/O messaging communication disruptions.
- Web pages, viewed using a web browser, that show information about the adapter, connected drive, and other DPI devices connected to the drive.
- Configurable e-mail messaging to desired addresses when selected drive faults occur and/or are cleared, and/or when the adapter takes a communication fault action.
- Access to any PowerFlex drive and its connected peripherals on the network to which the adapter is connected.

Compatible Products

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

- PowerFlex 70/70EC drives
- PowerFlex 700/700VC drives
- PowerFlex 700H drives
- PowerFlex 700S drives
- PowerFlex 700L drives
- PowerFlex Digital DC drives
- DPI External Comms Kit
- SMC™ Flex

Required Equipment

Equipment Shipped with the Adapter

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

- ❑ One 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; for which cable to use, see Figure 2.2 on page 2-4)
- ❑ One *PowerFlex 7-Class DPI (Drive Peripheral Interface) Network Communication Adapter Installation Instructions* (publication 20COMM-IN004)

User-Supplied Equipment

To install and configure the adapter, you must supply:

- ❑ A small flathead screwdriver
- ❑ Ethernet cable – refer to the *EtherNet/IP Media Planning and Installation Manual* (publication ENET-IN001)
- ❑ Configuration tool, such as:
  - PowerFlex 7-Class HIM (20-HIM-xx)
  - DriveExplorer (version 2.01 or higher)
  - DriveExecutive stand-alone software (version 3.01 or higher) or bundled with the DriveTools SP suite (version 1.01 or higher)
  - BOOTP Server (version 2.1 or higher; for network setup only)
- ❑ Third-party network configuration software tool
- ❑ A PC connection to the Modbus/TCP network

Safety Precautions

Please read the following safety precautions carefully.

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

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

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

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

ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [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 or a faulted controller).

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

ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the adapter to detect network communication losses. By default, this parameter sets the timeout to five seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables **Parameter 23 - [Comm Flt Action]**. Therefore, a communications fault action will be ignored. 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. 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: For security reasons, it is recommended to isolate the Modbus/TCP control network from the enterprise-wide Ethernet network. This can be accomplished by:

- Making the Modbus/TCP control network a stand-alone network.
- Placing a firewall between the Modbus/TCP control network and the enterprise-wide Ethernet network.

Quick Start

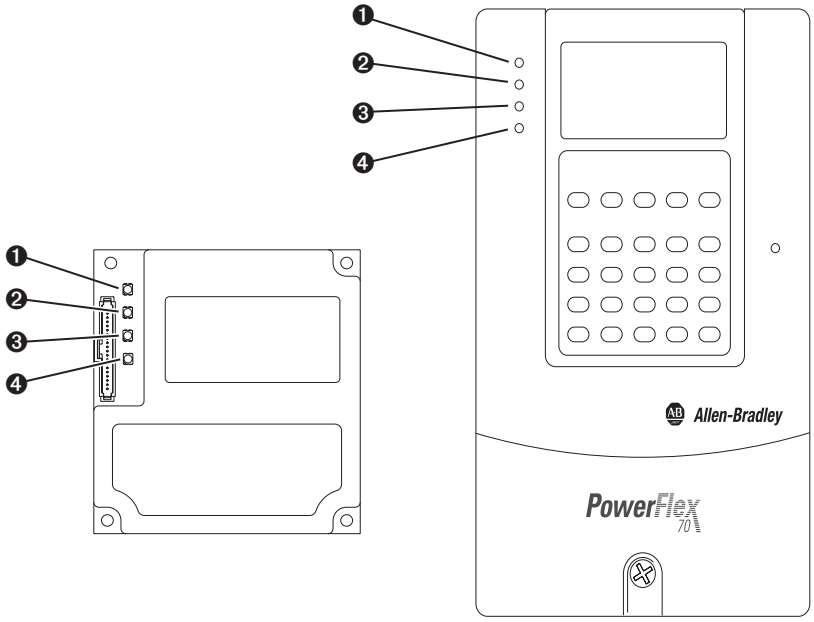
This section is provided to help experienced users quickly start using the adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	Refer to…
1	**Review the safety precautions for the adapter.**	Throughout This Manual
2	**Verify that the PowerFlex drive is properly installed.**	Drive User Manual
3	**Install the adapter.** Verify that the PowerFlex drive is not powered. Then, connect the adapter to the network using an Ethernet cable and to the drive using the Internal Interface cable. Use the captive screws to secure and ground the adapter to the drive. **Note:** When installing the adapter in a DPI External Comms Kit, refer to the *20-XCOMM-DC-BASE Installation Instructions* (publication 20COMM-IN001) supplied with the kit.	*PowerFlex 7-Class DPI Network Communication Adapter Installation Instructions* (publication 20COMM-IN004) and Chapter 2, Installing the Adapter
4	**Apply power to the adapter.** A. The adapter receives power from the drive. Verify that the adapter is installed correctly and then apply power to the drive. The status indicators should be green. If they flash red, there is a problem. Refer to Chapter 5, Troubleshooting. B. Configure/verify key drive parameters.	Chapter 2, Installing the Adapter
5	**Configure the adapter for your application.** Set adapter parameters for the following functions as required by your application: • IP address, subnet mask, and gateway address • Data rate • I/O configuration • Fault action	Chapter 3, Configuring the Adapter
6	**Set up the master device to communicate with the adapter.** Use a network tool to configure the master device on the Modbus/TCP network.	Instructions for your network tool

Status Indicators

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

Figure 1.2 Status Indicators (location on drive may vary)



Item	Name
❶	PORT
❷	MOD
❸	NET A
❹	NET B

After installing the adapter and applying power to the drive, refer to Start-Up Status Indications on page 2-6 for possible start-up status indications and their descriptions.

Installing the Adapter

This chapter provides instructions for installing the adapter in a PowerFlex 7-Class drive. This adapter can also be installed in a DPI External Comms Kit. In this case, refer to the *20-XCOMM-DC-BASE Installation Instructions* (publication 20COMM-IN001) supplied with the kit.

Preparing for an Installation

Before installing the adapter:

- Read the *EtherNet/IP Performance and Application Guide* (publication ENET-AP001) and *EtherNet/IP Media Planning and Installation Manual* (publication ENET-IN001).
- Verify that you have all required equipment. Refer to Required Equipment on page 1-3.

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).

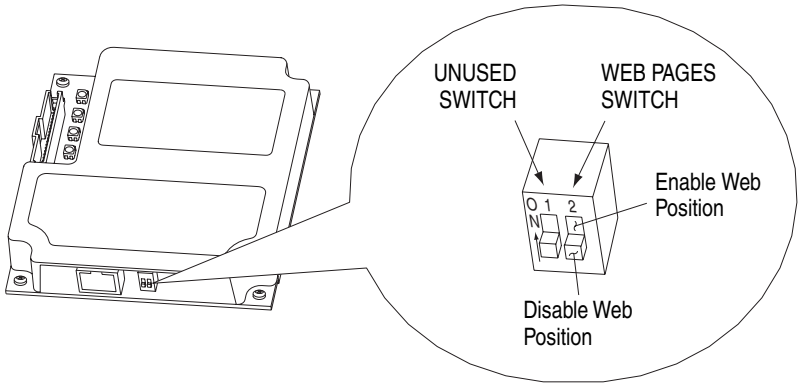
Setting the Web Pages Switch

To use the adapter web pages, the Web Pages Switch must be set to its "Enable Web" position.

Important: A new switch setting is recognized only when power is applied to the adapter, or the adapter is reset. If you change a switch setting, cycle power or reset the adapter to apply the change.

Set the Web Pages Switch SW2 (Figure 2.1) to enable or disable the adapter web pages. By default, the adapter web pages are disabled. For complete details on adapter web pages, see Viewing the Adapter's Web Pages on page 6-1.

Figure 2.1 Setting Web Pages Switch



SW2 Setting	Description
Down (OFF) position	Disables the adapter web pages (default setting)
Up (ON) position	Enables the adapter web pages

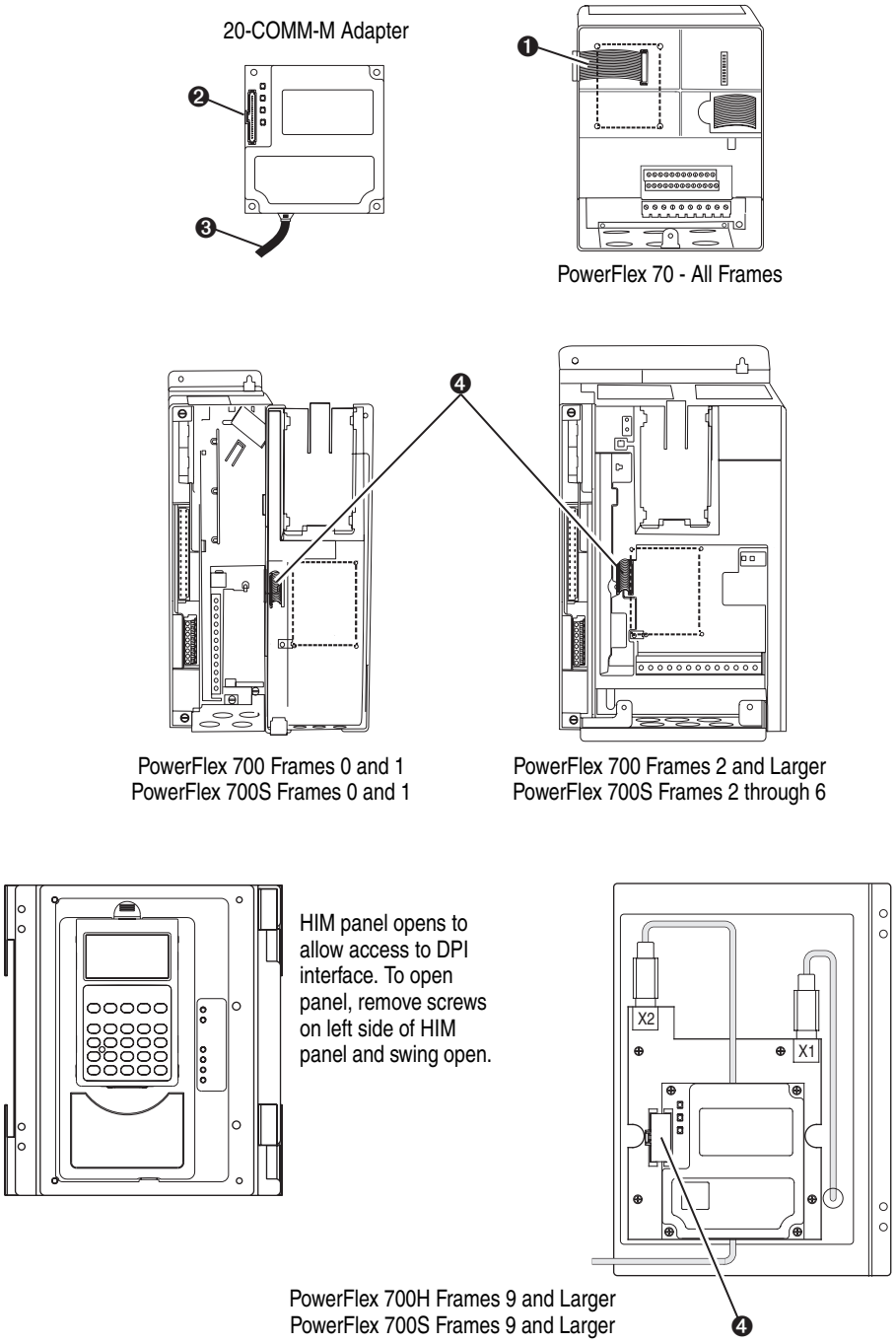
Connecting the Adapter to the Drive

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

1. Remove power from the drive.
2. Use static control precautions.
3. Remove the drive cover or open the drive door.
4. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the adapter (see Figure 2.2).
5. Secure and ground the adapter to the drive (see Figure 2.3) by doing the following:
   - On a PowerFlex 70 drive, fold the Internal Interface cable behind the adapter and mount the adapter on the drive using the four captive screws.
   - On a PowerFlex 700, PowerFlex 700H or PowerFlex 700S drive, mount the adapter on the drive using the four captive screws.

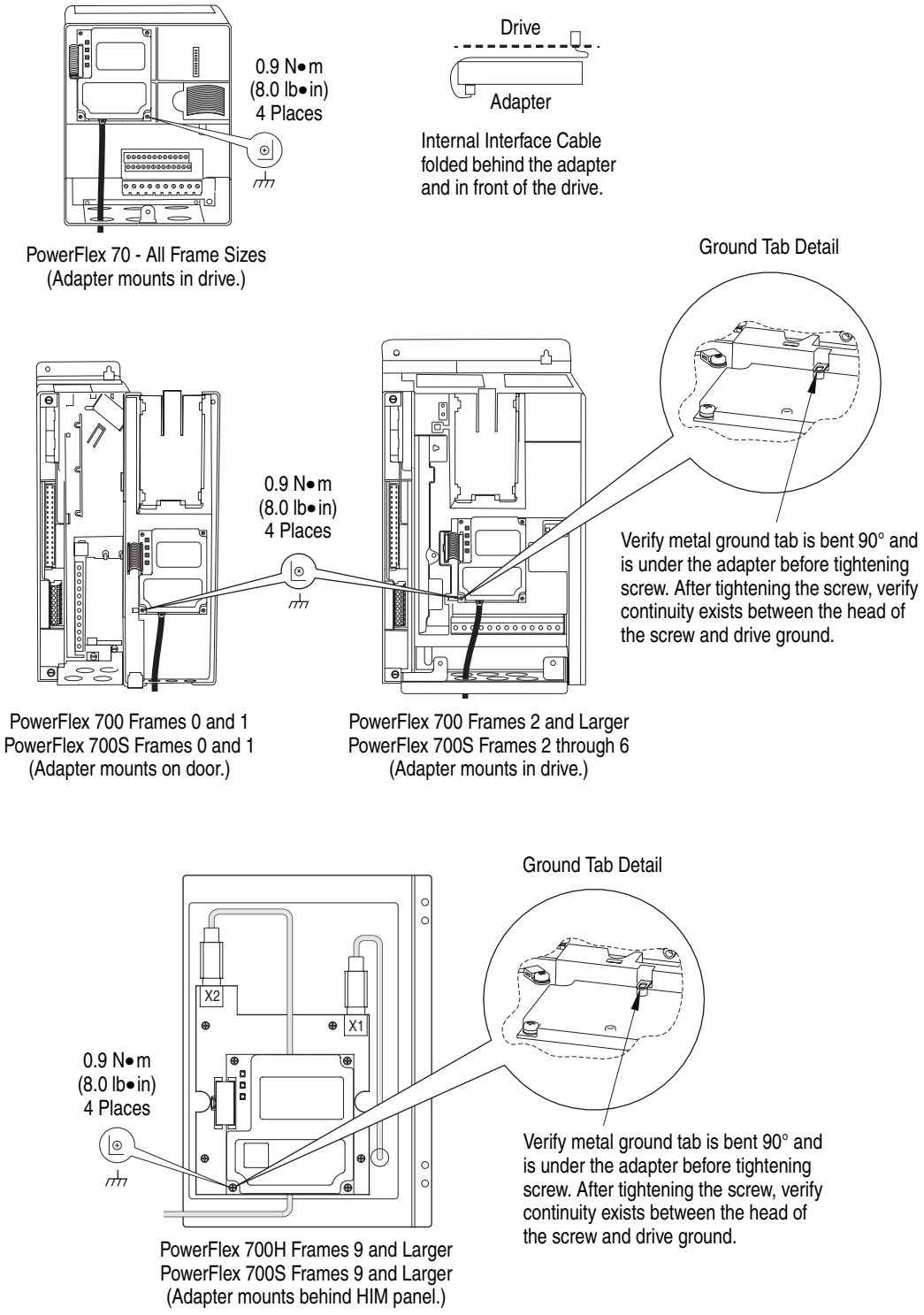
   Important: Tighten all screws to properly ground the adapter. Recommended torque is 0.9 N•m (8.0 lb•in).

Figure 2.2 DPI Ports and Internal Interface Cables



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

Figure 2.3 Mounting and Grounding the Adapter

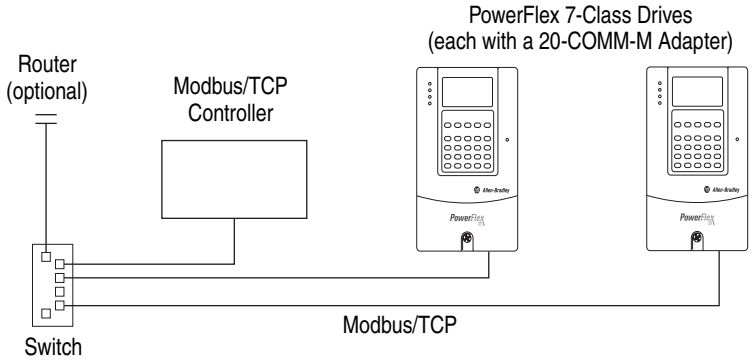


Connecting the Adapter to the Network

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

1. Remove power from the drive.
2. Use static control precautions.
3. Connect one end of an Ethernet cable to the network. See Figure 2.4 for an example of wiring to a Modbus/TCP network.

Figure 2.4 Connecting the Ethernet Cable to the Network



4. Route the other end of the Ethernet cable through the bottom of the PowerFlex drive (Figure 2.3) and insert its Ethernet cable plug into the mating adapter receptacle.

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.

Install the drive cover or close the drive door, and apply power to the drive. The adapter receives its power from the connected drive. When you apply power to the adapter for the first time, its topmost "PORT" status indicator should be steady green or flashing green after an initialization. If it is red, there is a problem. Refer to Chapter 5, Troubleshooting.

Start-Up Status Indications

After power has been applied, the status indicators for the drive and communications adapter can be viewed on the front of the drive (Figure 2.5). Possible start-up status indications are shown in Table 2.A.

Figure 2.5 Drive and Adapter Status Indicators (location on drive may vary)

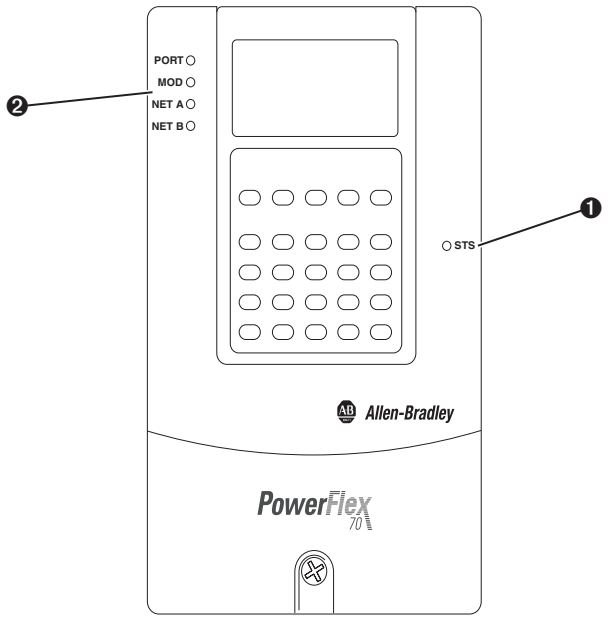


Table 2.A Drive and Adapter Start-Up Status Indications

Item	Name	Color	State	Description
Drive STS Indicator				
❶	STS (Status)	Green	Flashing	Drive ready but not running, and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow	Flashing, Drive Stopped	An inhibit condition exists – the drive cannot be started. Check drive Parameter 214 - [Start Inhibits].
			Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check drive Parameter 211 - [Drive Alarm 1].
			Steady, Drive Running	A continuous type 1 alarm condition exists. Check drive Parameter 211 - [Drive Alarm 1].
		Red	Flashing	A fault has occurred.
			Steady	A non-resettable fault has occurred.
Adapter Status Indicators				
❷	PORT	Green	Flashing	Normal Operation. The adapter is establishing an I/O connection to the drive. It will turn steady green or red.
			Steady	Normal Operation. The adapter is properly connected and communicating with the drive.
	MOD	Green	Flashing	Normal Operation. The adapter is operating but is not transferring I/O data to a controller.
			Steady	Normal Operation. The adapter is operating and transferring I/O data to a controller.
	NET A	Green	Off	BOOTP is enabled or a valid IP address is not set.
			Flashing	Normal Operation. The adapter is properly connected, has an IP address, and is connected to a Modbus/TCP network but does not have an I/O connection.
			Steady	Normal Operation. The adapter is properly connected and communicating on the network to a controller.
	NET B	Green	Off	Normal Operation. The adapter is properly connected but is idle.
			Flashing	Normal Operation. The adapter is properly connected, BOOTP is enabled, and the adapter is transmitting data packets on the network.

Configuring/Verifying Key Drive Parameters

The PowerFlex 7-Class drive can be separately configured for the control and Reference functions in various combinations. For example, you could set the drive to have its control come from a peripheral or terminal block with the Reference coming from the network. Or you could set the drive to have its control come from the network with the Reference coming from another peripheral or terminal block. Or you could set the drive to have both its control and Reference come from the network.

The following steps in this section assume that the drive will receive the Logic Command and Reference from the network.

1. Use drive Parameter 090 - [Speed Ref A Sel] to set the drive speed Reference to “22” (DPI Port 5).
2. If hard-wired discrete digital inputs are not used to control the drive, verify that unused digital input drive Parameters 361 - [Dig In1 Sel] and 362 - [Dig In2 Sel] are set to “0” (Not Used).
3. Verify that drive Parameter 213 - [Speed Ref Source] is reporting that the source of the Reference to the drive is “22” (DPI Port 5). This ensures that any Reference commanded from the network can be monitored by using drive Parameter 002 - [Commanded Speed]. If a problem occurs, this verification step provides the diagnostic capability to determine whether the drive/adapter or the network is the cause.

Commissioning the Adapter

To commission the adapter, you must set a unique IP address on the network. (Refer to the Glossary for details about IP addresses.) After installing the adapter and applying power, you can set the IP address by using a BOOTP server or by setting adapter parameters. (See Setting the IP Address, Subnet Mask, and Gateway Address on page 3-6 for details).

By default, the adapter is configured so that you must set the IP address using a BOOTP server. To set the IP address using adapter parameters, you must disable the BOOTP feature. See Disabling the BOOTP Feature on page 3-6 for details.

Important: New settings for some adapter parameters (for example, **Parameters 04 - [IP Addr Cfg 1]** through **07 - [IP Addr Cfg 4]**) are recognized only when power is applied to the adapter or it is reset. After you change parameter settings, cycle power or reset the adapter.

Configuring the Adapter

This chapter provides instructions and information for setting the parameters to configure 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 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
BOOTP Server	page 3-3
DriveExplorer Software (version 2.01 or higher)	http://www.ab.com/drives/driveexplorer, or DriveExplorer online help (installed with the software)
DriveExecutive Software (version 3.01 or higher)	http://www.ab.com/drives/drivetools, or DriveExecutive online help (installed with the software)

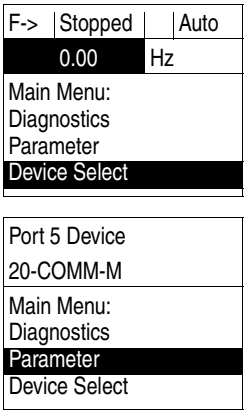
Using the PowerFlex 7-Class HIM

If your drive has either an LED or LCD HIM (Human Interface Module), it can be used 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 information, refer to your PowerFlex Drive User Manual or the *PowerFlex 7-Class HIM Quick Reference* (publication 20HIM-QR001).

Using an LED HIM

Step	Example Screens
1. Press the ALT key and then the Device Sel (Sel) key to display the Device Screen. 2. Press the ▲ or ▼ key to scroll to the adapter. Letters represent files in the drive, and numbers represent ports. The adapter is usually connected to port 5. 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	Example Screens
1. In the main menu, press the ▲ or ▼ key to scroll to **Device Select**. 2. Press the ↵ (Enter) key to enter your selection. 3. Press the ▲ or ▼ key to scroll to the adapter (20-COMM-M). 4. Press the ↵ (Enter) key to select the 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.	

NOTE: All configuration procedures throughout this chapter use the PowerFlex 7-Class LCD HIM to access parameters in the adapter and show example LCD HIM screens.

Using BOOTP

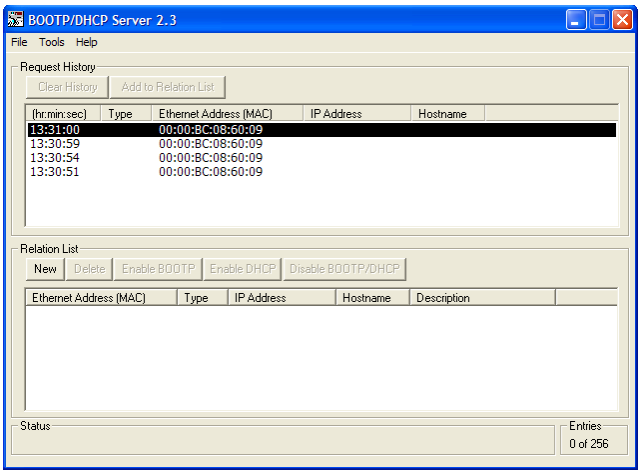
By default, the adapter is configured so that you can set its IP address, subnet mask, and gateway address by using a BOOTP utility. You can select from a variety of BOOTP utilities. These instructions use Rockwell's BOOTP Server (version 2.3 or higher), a stand-alone program that incorporates the functionality of standard BOOTP utilities with a graphical interface. It is available from http://www.software.rockwell.com/support/download/detail.cfm?ID=3390. Refer to the Readme file and online Help for detailed directions and information.

TIP: If desired, you can disable BOOTP and configure the IP address, subnet mask, and gateway address by setting parameters. For details, see Setting the IP Address, Subnet Mask, and Gateway Address on page 3-6.

Configuring the Adapter Using BOOTP Server

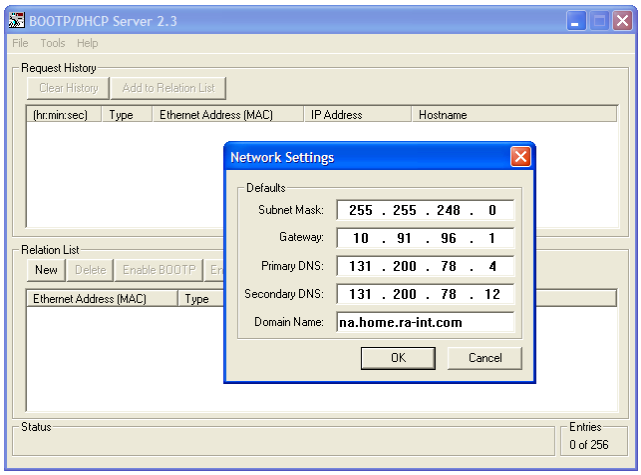
1. On the adapter label, note the adapter's hardware Ethernet Address (MAC), which will be used in Step 6.
2. On a computer connected to the Modbus/TCP network, start the BOOTP software. The BOOTP Server window (Figure 3.1) appears.

Figure 3.1 BOOTP Server Window



3. To properly configure devices on your Modbus/TCP network, you must configure settings in the BOOTP software to match the network. Select **Tools > Network Settings** to display the Network Settings window (Figure 3.2).

Figure 3.2 Network Settings Window



4. Edit the following:

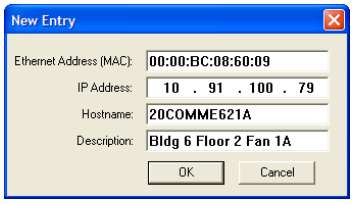
Box	Type
Subnet Mask (1)	The subnet mask for the adapter's network.
Gateway (1)	The IP address of the gateway device on the adapter's network.
Primary DNS	The address of the primary DNS server to be used on the local end of the link for negotiating with remote devices.
Secondary DNS	Optional — the address of the secondary DNS server to be used on the local end of the link for negotiating with remote devices when the primary DNS server is unavailable.
Domain Name	The text name corresponding to the numeric IP address that was assigned to the server that controls the network.

(1) For definitions of these terms, refer to the Glossary.

5. Click **OK** to apply the settings. Devices on the network issuing BOOTP requests appear in the BOOTP Request History list.

6. In the BOOTP Request History list, either double-click the adapter's Ethernet Address (MAC) noted in Step 1, or click **New** in the Relation List. The New Entry dialog box (Figure 3.3) appears. In the first case, the Ethernet Address (MAC) is automatically entered. In the latter case, you must manually enter it.

Figure 3.3 New Entry Dialog Box



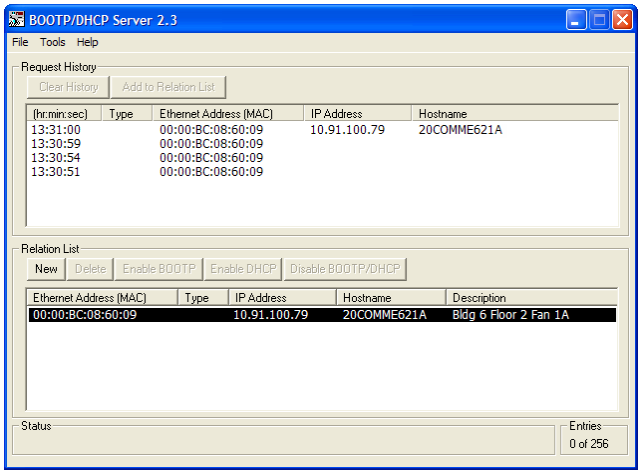
7. Edit the following:

Box	Type
IP Address (1)	A unique IP address for the adapter
Host Name	Optional
Description	Optional

(1) For definitions of these terms, refer to the Glossary.

8. Click **OK** to apply the settings. The adapter appears in the Relation List (Figure 3.4) with the new settings.

Figure 3.4 BOOTP Server Window with Adapter in the Relation List



9. To assign this configuration to the adapter permanently, select the device in the Relation List and click **Disable BOOTP/DHCP**. When power is cycled on the adapter, it will use the configuration you assigned it and not issue new BOOTP requests.

TIP: To enable BOOTP for an adapter that has had BOOTP disabled, first select the adapter in the Relation List, then click **Enable BOOTP**, and finally reset the adapter or power cycle the drive.

10. To save the Relation List, select **File > Save**.

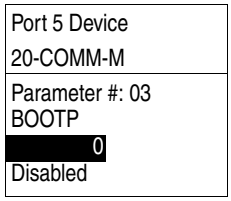
Setting the IP Address, Subnet Mask, and Gateway Address

By default, the adapter is configured so that you set its IP address, subnet mask, and gateway address using a BOOTP server. If you want to set these attributes using the adapter parameters instead, you must disable BOOTP and then set the appropriate parameters in the adapter.

Disabling the BOOTP Feature

1. Set the value of **Parameter 03 - [BOOTP]** to "0" (Disabled).

Figure 3.5 Example BOOTP LCD HIM Screen



Value	Setting
0	Disabled
1	Enabled (Default)

2. Reset the adapter (see Resetting the Adapter on page 3-12).

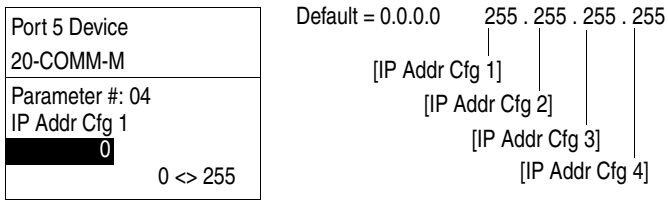
   After disabling the BOOTP feature, you can then configure the IP address, subnet mask, and gateway address using adapter parameters.

Setting an IP Address Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to "0" (Disabled). This parameter must be set to Disabled to configure the IP address using the adapter parameters.

2. Set the value of **Parameters 04 - [IP Addr Cfg 1]** through **07 - [IP Addr Cfg 4]** to a unique IP address.

Figure 3.6 Example IP Addr Cfg 1 LCD HIM Screen



3. Reset the adapter (see Resetting the Adapter on page 3-12).

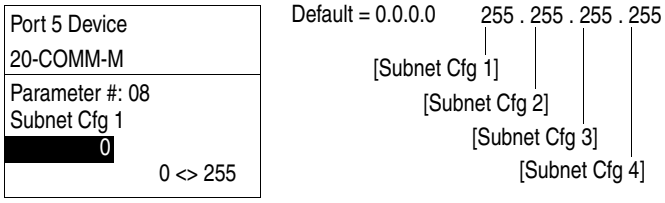
   The NET A status indicator will be steady green or flashing green if the IP address is correctly configured.

Setting a Subnet Mask Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to “0” (Disabled). This parameter must be set to Disabled to configure the subnet mask using the adapter parameters.

2. Set the value of **Parameters 08 - [Subnet Cfg 1]** through **11 - [Subnet Cfg 4]** to the desired value for the subnet mask.

Figure 3.7 Example Subnet Cfg 1 LCD HIM Screen



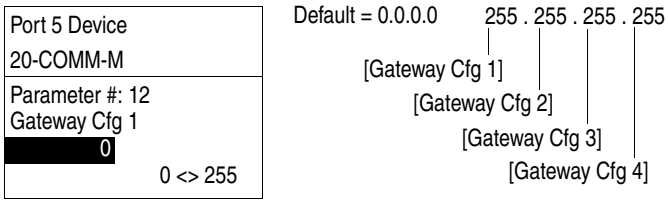
3. Reset the adapter (see Resetting the Adapter on page 3-12).

Setting a Gateway Address for the Adapter Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to “0” (Disabled). This parameter must be set to Disabled to configure the gateway address using the adapter parameters.

2. Set the value of **Parameters 12 - [Gateway Cfg 1]** through **15 - [Gateway Cfg 4]** to the IP address of the gateway device.

Figure 3.8 Example Gateway Cfg 1 LCD HIM Screen



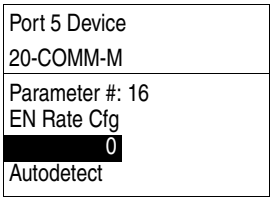
3. Reset the adapter (see Resetting the Adapter on page 3-12).

Setting the Data Rate

By default, the adapter is set to autodetect, so it automatically detects the data rate and duplex setting used on the network. If you need to set a specific data rate and duplex setting, the value of **Parameter 16 - [EN Rate Cfg]** determines the Ethernet data rate and duplex setting that the adapter will use to communicate. For definitions of data rate and duplex, refer to the Glossary.

1. Set the value of **Parameter 16 - [EN Rate Cfg]** to the data rate at which your network is operating.

Figure 3.9 Example Ethernet Rate Cfg LCD HIM Screen



Value	Data Rate
0	Autodetect (default)
1	10 Mbps Full
2	10 Mbps Half
3	100 Mbps Full
4	100 Mbps Half

TIP: Auto detection of baud rate and duplex works properly only if the device (usually a switch) on the other end of the cable is also set to auto detect the baud rate/duplex. If one device has the baud rate/duplex hard coded, the other device must be hard-coded to the same settings.

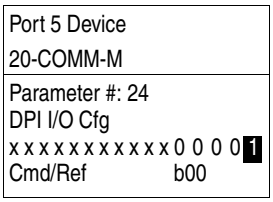
2. Reset the adapter (see Resetting the Adapter on page 3-12).

Setting the I/O Configuration

The I/O configuration determines the 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 the I/O.

1. Set the bits in **Parameter 24 - [DPI I/O Cfg]**.

Figure 3.10 Example DPI I/O Cfg LCD HIM Screen



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

Bit 0 is the right-most bit. In Figure 3.10, it is highlighted and equals “1.”

2. If Logic Command/Reference is enabled, configure the parameters in 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 “22” (DPI Port 5) so that the drive uses the Reference from the adapter. Also, verify that the mask parameters (for example, Parameter 276 - [Logic Mask]) in the drive are configured to receive the desired logic from the adapter. Refer to the documentation for your drive for details.

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

4. Reset the adapter (see Resetting the Adapter on page 3-12).

The adapter is ready to receive I/O.

Setting a Communication Fault Action

By default, when I/O 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 disrupted I/O communication using **Parameter 23 - [Comm Flt Action]**.

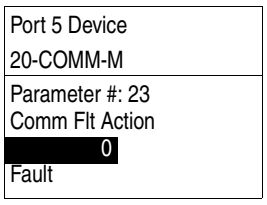
ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if I/O communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. 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).

Changing the Fault Action

Set the value of **Parameter 23 - [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 26 - [Flt Cfg Logic]** through **35 - [Flt Cfg D2 In]**).

Figure 3.11 Example Fault Action LCD HIM Screens



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

Setting the Fault Configuration Parameters

If you set **Parameter 23 - [Comm Flt Action]** to "Send Flt Cfg," the values in the following parameters are sent to the drive after an I/O communications fault and/or idle fault occurs. You must set these parameters to values required by your application.

Parameter	Description
26 - [Flt Cfg Logic]	A 16-bit value sent to the drive for Logic Command.
27 - [Flt Cfg Ref]	A 32-bit value (0…4294967295) sent to the drive as a Reference or Datalink.
28 - [Flt Cfg x1 In] through **35 - [Flt Cfg x2 In]**	**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.

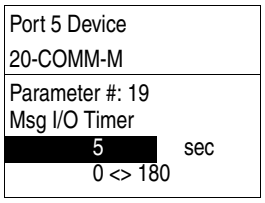
Changes to these parameters take effect immediately. A reset is not required.

Setting the Message I/O Timer

Set **Parameter 19 - [Msg I/O Timer]** to a communication loss timeout period suitable for your application. By default, the timeout is set to five (5) seconds. You can increase or decrease this value. Alternatively, you can set the value to zero (0) to disable this timeout feature so that the adapter does not detect communication losses.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the adapter to detect network communication losses. By default, this parameter sets the timeout to five (5) seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables adapter **Parameter 23 - [Comm Flt Action]**. Therefore, a communications fault action will be ignored. 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).

Figure 3.12 Example Ref Adjust LCD HIM Screen



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

Setting Web Access Control

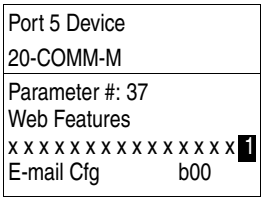
By using a web browser to access the IP address set for the adapter, you can view the adapter's web pages for information about the adapter, its connected drive, and other DPI devices connected to the drive, such as HIMs or converters. Additionally, the adapter can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the adapter takes a communication or idle fault action. For more details on the adapter's web pages, refer to Chapter 6, Viewing the Adapter's Web Pages.

By default, the adapter web pages are disabled. Refer to Figure 2.1 and set the Web Pages Switch (SW2) to the "Enable Web" (up) position.

Important: For a change to the switch setting to take effect, the adapter must be reset (see Resetting the Adapter on page 3-12).

Bit 0 of **Parameter 37 - [Web Features]** is used to protect the configured settings for e-mail messaging. By default, settings are not protected and the user can make changes. To protect the configured settings, set the value of E-mail Cfg Bit 0 to "0" (Disabled). You can unprotect the configuration by changing Bit 0 back to "1" (Enabled). E-mail messaging will always remain active regardless of whether or not its settings are protected — unless e-mail messaging was *never* configured. For more information about configuring adapter e-mail messaging or to stop e-mail messages, refer to Configure E-mail Notification Web Page on page 6-6.

Figure 3.13 Example Web Features LCD HIM Screen



Bit	Description
0	E-mail Cfg (Default = 1 = Enabled)
1…7	Not Used

Bit 0 is the right-most bit. In Figure 3.13 it is highlighted and equals "1."

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

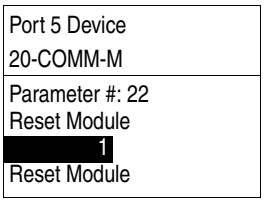
Resetting the Adapter

Changes to switch settings and some adapter parameters require that you reset the adapter before the new settings take effect. You can reset the adapter by power cycling the drive or by using **Parameter 22 - [Reset Module]**.

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

Set **Parameter 22 - [Reset Module]** to "1" (Reset Module).

Figure 3.14 Example Reset Module LCD HIM Screen



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 values. 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 Status Using Parameters

The following parameters provide information about the status of the adapter. You can view these parameters at any time.

Parameter	Description
17 - [EN Rate Act]	The data rate used by the adapter.
18 - [Modbus/TCP Port]	The port used to transport Modbus/TCP messages.
20 - [Ref/Fdbk Size]	The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
21 - [Datalink Size]	The size of the Datalinks. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
25 - [DPI I/O Act]	The Reference/Feedback and Datalinks used by the adapter. This value is the same as **Parameter 24 - [DPI I/O Cfg]** unless the parameter was changed and the adapter was not reset.

Bit Definition	Not Used	Not Used	Not Used	Datalink D	Datalink C	Datalink B	Datalink A	Cmd/Ref
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

0 = I/O disabled
1 = I/O enabled

Flash Updating the Adapter

The adapter can be flash updated over the network or serially through a direct connection from a computer to the drive using a 1203-USB or 1203-SSS serial converter.

When flashing over the network, you can use the Allen-Bradley software tool ControlFLASH, the built-in flash capability of DriveExplorer Lite or Full, or the built-in flash capability of DriveExecutive.

When flashing through a direct serial connection from a computer to a drive, you can use the same Allen-Bradley software tools described above, or you can use HyperTerminal set to the X-modem protocol.

To obtain a flash update for this adapter, go to http://www.ab.com/support/abdrives/webupdate. This site contains all firmware update files and associated Release Notes that describe firmware update enhancements/anomalies, how to determine the existing firmware version, and how to flash update using DriveExplorer, DriveExecutive, ControlFLASH or HyperTerminal.

Notes:

Using Modbus/TCP Function Codes

This chapter provides information about controlling a PowerFlex 7-Class drive, setting its Reference, and accessing its parameters and the parameters of its connected peripherals using Modbus/TCP Function Codes over the Modbus/TCP network.

Understanding Modbus/TCP

The Modbus/TCP 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, and any data to be sent. Messages from a slave to a master contain fields confirming the action taken and any data to be returned. 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/TCP can access a single address or multiple addresses simultaneously, either reading or writing single-bit values, 16-bit values, or 32-bit values.

Important: Modbus/TCP devices can be 0-based (register addresses numbered starting at 0) or 1-based (register addresses numbered starting at 1). The convention in this manual is 1-based. Depending on the Modbus/TCP master used, the register addresses listed in this chapter may need to be offset by "-1." For example, Logic Command is register address 10001 for some master devices and register address 10000 for others.

TIP: When using a Modbus/TCP controller that provides a selection for Internet Protocol (IP), select Ethernet II framing since it is used by the adapter. Do not select IEEE 802.3 LLC/SNAP framing.

Supported Modbus/TCP Function Codes

On Modbus/TCP, a register is defined as an addressable container that holds 16-bit data. All parameters (16-bit or 32-bit) for the drive and its connected peripherals always occupy two consecutive 16-bit registers—one for the Lo Word and one for the Hi Word—even if the parameter is only a 16-bit word. In this case, the parameter value is the Lo Word.

The adapter supports the Modbus/TCP function codes listed in Table 4.A.

Table 4.A Supported Modbus/TCP Function Codes

Function Code	Name	Description
01	Read Coils (also known as Read Discrete Outputs)	Reads groups of up to 16 output bits simultaneously in the Logic Command word.
02	Read Discrete Inputs	Reads groups of up to 16 input bits simultaneously in the Logic Status word.
03	Read Holding Registers (one or many)	Reads any single or multiple parameters of the drive or its connected peripherals. It also reads the Logic Command, Logic Status, Reference, Feedback, or Datalink words.
05	Write Single Coil (also known as Write Discrete Output)	Writes to individual output bits or groups of output bits in the Logic Command word.
06	Write Single Register	Writes to the Logic Command word or Keep-Alive register.
15	Write Multiple Coils (also known as Write Multiple Discrete Outputs)	Writes to groups of up to 16 output bits simultaneously in the Logic Command word.
16	Write Multiple Registers (one or many)	Writes to any group of parameters of the drive or its connected peripherals. It also writes to the Logic Command, Reference, or Datalink (Data In xx) words.
23	Read/Write Multiple Registers (also known as Read/Write Parameters)	Reads and/or writes to any group of parameters of the drive or its connected peripherals. It also reads the Logic Command, Logic Status, Reference, Feedback, or Datalink words—and writes to the Logic Command, Reference, and Datalinks.
43	Read Device Identification	Reads the vendor name, product code, and major/minor firmware version of the connected drive.

Unit Identifier (Port Number)

The Modbus/TCP Application Data Unit includes a Unit Identifier which is used by a Modbus/TCP gateway to route to remote serial Modbus slave devices. The 20-COMM-M adapter acts similarly as a gateway to DPI devices and uses the Unit Identifier as the DPI Port Number (0…6) to access parameters in those connected peripherals. Since the adapter can be connected to different ports, a Unit Identifier of “255” can be used to always access parameters in the adapter. When the specific DPI port to which a device is connected is known, you can use this port number as the Unit Identifier.

Table 4.B Unit Identifiers

Unit Identifier	Device Connection (Example)
0	DPI Port 0 (Drive)
1	DPI Port 1 (HIM in drive cradle)
2	DPI Port 2 (remote-mount HIM or adapter in DPI External Comms Kit)
3	DPI Port 3 (peripheral connected to Port 3 of a two-way or four-way splitter cable)

Unit Identifier	Device Connection (Example)
4	DPI Port 4 (peripheral connected to Port 4 of a four-way splitter cable)
5	DPI Port 5 (peripheral connected to the drive's internal Port 5 or to Port 5 of a four-way splitter cable)
6	DPI Port 6 (reserved for future use)
7…15	Reserved for future use
16	DPI Port 0 (Drive) — an alternate to using Unit Identifier 0
17…254	Unused — defaults to Unit Identifier 0
255	Adapter

Using Function Code 43 to Read Drive Identification

Function Code 43 enables you to read the drive's vendor name, product code, and major/minor firmware version. To do this, always set the following Modbus/TCP transaction elements to these values:

Modbus/TCP Transaction Element	Required Value (Decimal)
Unit Identifier	0 (zero) or 16
MEI (Modbus Encapsulated Interface)	14
Read Device ID Code	1
Object Id	0 (zero)

Using the I/O

On Modbus/TCP, 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: To enable the drive to use the I/O and Reference from the Modbus/TCP network, you must set parameters in the drive to receive the I/O and Reference. For details, refer to Configuring/ Verifying Key Drive Parameters on page 2-8.

Keep-Alive Register (Address 10002)

The Keep-Alive register enables you to reset the adapter's internal communication loss timer to the value stored in adapter **Parameter 19 - [Msg I/O Timer]**. A decimal value between 0 and 65535 can be written to the Keep-Alive register address 10002 to reset the timer. This value is not stored and does not affect any data transaction. It is a convenient way to reset the timer without writing to the Logic Command, Reference, or Datalink (Data In xx) words.

Important: To establish communication between the controller and drive, you must write a positive non-zero value to the Keep-Alive register address 10002. Furthermore, that value must be written to register address 10002 more frequently than the timeout value stored in **Parameter 19 - [Msg I/O Timer]** to avoid a communication loss. For example, if parameter 19 is set to 5 seconds (default), write a value to register address 10002 every 4.9 seconds or less.

Peripheral Status Register (Address 10022)

The Peripheral Status register contains information on which DPI Ports presently have a peripheral connected and logged into the drive according to Table 4.C. By using Function Code 03 or 23, you can read register address 10022 to conveniently determine which DPI Ports and peripherals are in use.

Table 4.C Peripheral Status Register Data

Bit	Peripheral
0	This adapter
1	DPI Port 1
2	DPI Port 2
3	DPI Port 3
4	DPI Port 4
5	DPI Port 5
6	DPI Port 6 (reserved for future use)

Setting the Logic Command and Reference

ATTENTION: When using Function Codes to write to the Logic Command or Reference, avoid sending the drive control commands from multiple sources which can cause a conflict and result in dangerous operation. Failure to observe this precaution could cause bodily injury and/or damage to equipment.

On Modbus/TCP, you can set the Logic Command word using any of the following function codes:

- Function Code 05 — For example, to stop a PowerFlex 70/700 drive (bit 0), write a binary value of “1” to register address 1 (Table 4.D).
- Function Code 06 — For example, to stop a PowerFlex 70/700 drive (bit 0), write a decimal value of “1” to register address 10001 (Table 4.E).
- Function Code 15 — For example, to select Ref 1 (Ref A Sel) as the Reference for a PowerFlex 70/700 drive (bits 12, 13, and 14), write a binary value of “1” to register address 13 and values of “0” (zero) to register addresses 14 and 15 (Table 4.D).
- Function Code 16 or 23 — For example, to set the direction for a PowerFlex 70/700 drive (bits 4 - 5), write a decimal value of “16” to command a forward direction or a decimal value of “32” to command a reverse direction, and to start the drive (bit 1) write a decimal value of “2” to register address 10001 (Table 4.E).

Table 4.D shows that there are 16 discrete registers to represent the Logic Command word bit by bit. These registers are used only for writing single bits or multiple bits of commands.

Table 4.D Logic Command Registers (to Drive from Controller)

Register Address	Logic Command Bit	PowerFlex 70/700 Example	
		Description	Values
1	0	Stop	0 = Not Stop 1 = Stop
2	1	Start (1) (2)	0 = Not Start 1 = Start
3	2	Jog	0 = Not Jog (Par. 100) 1 = Jog
4	3	Clear Faults (2)	0 = Not Clear Faults 1 = Clear Faults
5 6	4 5	Direction	Register Address 6 5 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
7	6	Local Control	0 = No Local Control 1 = Local Control
8	7	MOP Increment	0 = Not Increment 1 = Increment
9 10	8 9	Accel Rate	Register Address 10 09 0 0 = No Command 0 1 = Accel Rate 1 Command (Par. 140) 1 0 = Accel Rate 2 Command (Par. 141) 1 1 = Hold Accel Rate
11 12	10 11	Decel Rate	Register Address 12 11 0 0 = No Command 0 1 = Decel Rate 1 Command (Par. 142) 1 0 = Decel Rate 2 Command (Par. 143) 1 1 = Hold Decel Rate
13 14 15	12 13 14	Reference Select	Register Address 15 14 13 0 0 0 = No Command 0 0 1 = Ref A Select (Par. 90) 0 1 0 = Ref B Select (Par. 93) 0 1 1 = Preset 3 (Par. 103) 1 0 0 = Preset 4 (Par. 104) 1 0 1 = Preset 5 (Par. 105) 1 1 0 = Preset 6 (Par. 106) 1 1 1 = Preset 7 (Par. 107)
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 4.E shows the Logic Command register used for writing 16-bit commands or multiple decimal values.

Table 4.E Logic Command Register

Register Address	Description	Values
10001	Logic Command	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 4.D. For other products, refer to their documentation.

To set the Reference, you must write the decimal values to register addresses 10003 and 10004 (Table 4.F) using Function Code 16 or 23.

Table 4.F Reference Registers

Register Address	Description	Values
10003 (1)	Reference Lo	Bit 0…15 of 32-bit Reference or the whole 16-bit Reference
10004	Reference Hi	Bit 16...31 of 32-bit Reference

(1) For a 16-bit Reference, you must write the complete 32-bit value.

The Reference value is a scaled engineering value; it is NOT in Hertz or RPM. The Reference uses a “32767” scale. The “32767” endpoint of the scale is equal to the value of parameter 55 - [Maximum Freq], which has a default value of 130 Hz. For all PowerFlex 70/700 drives, default scaling is 0…15123 which is equal to 0…60.0 Hz. This is based on the formula shown below. Reference scaling is limited by drive parameter 82 - [Maximum Speed]. If the default value of 60 Hz. for parameter 82 - [Maximum Speed] is changed, the speed Reference scaling also changes. To determine Reference scaling, use:

(Parameter 82 / Parameter 55) * 32767 = Scaling

Using parameter 82 and 55 default values, speed Reference scaling is:

(60 Hz / 130 Hz) * 32767 = 15123

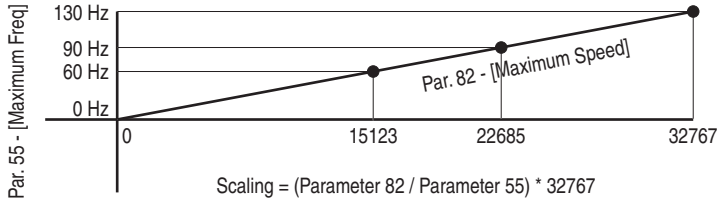
Therefore, 0…15123 = 0…60.0 Hz.

If parameter 82 - [Maximum Speed] is changed to 90 Hz, then:

(90 Hz / 130 Hz) * 32767 = 22685

Therefore, 0…22685 = 0…90.0 Hz.

A graphic representation of this Reference scaling is shown below:



For PowerFlex 70 EC drives (firmware v2.xxx or higher) or PowerFlex 700 VC drives (firmware v3.xxx or higher), parameter 298 - [DPI Ref Select] was added to simplify scaling for the speed Reference. When parameter 298 - [DPI Ref Select] is set to its default “0” (Max Freq), the speed Reference scaling is as shown above. However, when parameter 298 - [DPI Ref Select] is set to “1” (Max Speed), the speed Reference scaling is equal to parameter 82 - [Max Speed]:

Parameter 82 = Scaling

Therefore, 0…32767 = 0…60.0 Hz.

If parameter 82 - [Maximum Speed] is changed to 90 Hz, then:

90 Hz = 32767

Speed Feedback uses the same scaling as the speed Reference.

TIP: For PowerFlex 700 VC drives (firmware v3.xxx or higher), Parameter 299 - [DPI Fdbk Select] enables you to select the feedback data coming from the drive over DPI. The default is “Speed Fdbk” in Hz or RPM determined by Parameter 079 - [Speed Units]. The data selection for Parameter 299 is also displayed on the 1st line of the HIM and on DriveExplorer and DriveExecutive screens in the drive status area of the screen.

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

Reading the Logic Status and Feedback

On Modbus/TCP, you can read the Logic Status word using any of the following function codes:

- Function Code 02 — For example, to verify that a PowerFlex 70/700 drive is ready (bit 0), read register address 1 (Table 4.G).
- Function Code 03 or 23 — For example, to read the complete Logic Status word in a PowerFlex 70/700 drive, read register address 10001 (Table 4.H).

Table 4.G shows that there are 16 discrete registers to represent the Logic Status word bit by bit. These registers are used only for reading single bits or multiple bits of status.

Table 4.G Logic Status Registers (to Controller from Drive)

Register Address	Logic Status Bit	PowerFlex 70/700 Example	
		Description	Values
1	0	Ready	0 = Not Ready (Par. 214) 1 = Ready
2	1	Active	0 = Not Active (Running) 1 = Active
3	2	Command Direction	0 = Reverse 1 = Forward
4	3	Actual Direction	0 = Reverse 1 = Forward
5	4	Accel	0 = Not Accelerating 1 = Accelerating
6	5	Decel	0 = Not Decelerating 1 = Decelerating
7	6	Alarm	0 = No Alarm (Par. 211 & 212) 1 = Alarm
8	7	Fault	0 = No Fault (Par. 243) 1 = Fault
9	8	At Speed	0 = Not At Reference 1 = At Reference

Table 4.G Logic Status Registers (to Controller from Drive) (Continued)

Register Address	Logic Status Bit	PowerFlex 70/700 Example	
		Description	Values
10	9	Local Control	Register Address
11	10		12 11 10
12	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
13	12	Reference	Register Address
14	13		16 15 14 13
15	14		0 0 0 0 = Ref A Auto (Par. 90)
16	15		0 0 0 1 = Ref B Auto (Par. 93)
			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.H shows the Logic Status register used for reading 16-bit status fields or multiple decimal values.

Table 4.H Logic Status Register

Register Address	Description	Values
10021	Logic Status Word	16-bit word. Bit definitions for PowerFlex 70/700 drives are in Table 4.G. For other products, refer to their documentation.

To view the Feedback, you must read the decimal values of register addresses 10023 and 10024 (Table 4.I) using Function Code 03 or 23. For details about how the Feedback is scaled, refer to page 4-6.

Table 4.I Feedback Registers

Register Address	Description	Values
10023 (1)	Feedback Lo	Bit 0…15 of 32-bit Feedback or the whole 16-bit Feedback
10024	Feedback Hi	Bit 16…31 of 32-bit Feedback

(1) For a 16-bit Feedback, you must read the complete 32-bit value.

Accessing Device Parameters

There are two methods for accessing parameters in the drive or its connected peripherals: the direct access method (for individual or contiguous parameters) and the indirect access method (for contiguous or non-contiguous parameters).

Direct Access Method

ATTENTION: Risk of equipment damage exists. When data registers are used 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 writes parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters. See Using Datalinks on page 4-12 for more information.

You can use Function Code 03 or 23 to read single or multiple device (drive or its connected peripheral) parameters, and Function Code 16 or 23 to write single or multiple device parameters (see Table 4.A). However, Function Code 06 (Write Single Register) cannot be used because all device parameters being written to require two contiguous register addresses.

By using the appropriate Unit Identifier for a device (Table 4.B), you can directly access its parameters. Device parameter data is always contained in a Lo Word and a Hi Word which reside in contiguous Modbus/TCP register addresses. Therefore, the data in the starting register address and the next contiguous register address must be read together as a pair. The starting register address is determined by:

Starting Register Address = (Device Parameter No. x 2) - 1

For example, to access drive Parameter 003 - [Output Current] first set the Unit Identifier to 0 (zero) to access drive parameters. Then use the formaula above to determine the starting register address for drive Parameter 003 - [Output Current] data:

Starting Register Address = (3 x 2) - 1 = 5

In this example, read both the starting register address 5 (Lo Word) and register address 6 (Hi Word) to receive drive Parameter 003 - [Output Current] data.

TIP: For a 0-based Modbus/TCP master device, subtract 1 for the starting register address. Therefore, in the example above, read both the starting register address 4 (Lo Word) and register address 6 (Hi Word) to receive drive Parameter 003 - [Output Current] data.

Indirect Access Method

ATTENTION: Risk of equipment damage exists. When adapter **Parameters 38 - [Indirect Par #1]** through **53 - [Indirect Par #16]** and their corresponding data registers are used 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 Indirect Parameters to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters. See Using Datalinks on page 4-12 for more information.

Adapter **Parameters 38 - [Indirect Par #1]** through **53 [Indirect Par #16]** allow reading and writing to contiguous or non-contiguous sets of parameters for the drive or any of its connected peripherals using Function Code 03, 16 or 23. This can be done by writing the Indirect Par #x Value (formula shown below) to the corresponding Indirect Par #x parameter in the adapter. Adapter **Parameters 38 - [Indirect Par #1]** through **53 [Indirect Par #16]** enable you to set up a group of commonly read and written parameters and transfer that data in one transaction. Table 4.J shows the Indirect Par #x target address ranges and the peripherals to which they apply:

Table 4.J Indirect Par #x Target Address Ranges for Peripherals

Address Range	Peripheral
0...9999	Drive
10000...10999	Adapter
11000...11999	Peripheral connected to DPI Port 1
12000...12999	Peripheral connected to DPI Port 2
13000...13999	Peripheral connected to DPI Port 3
14000...14999	Peripheral connected to DPI Port 4
15000...15999	Peripheral connected to DPI Port 5
16000...16999	Reserved for future use

To determine the value of an adapter Indirect Par #x for a specific device, use the following formula:

Indirect Par #x Value = Device Starting Address + Parameter No.

For example, suppose the adapter is connected to the drive's internal Port 5 and you want to use adapter **Parameter 38 - [Indirect Par #1]** to access adapter **Parameter 22 - [Reset Module]** to reset the adapter. Using this formula:

Indirect Par #x Value = 15000 + 22 = 15022

In this case, set adapter **Parameter 38 - [Indirect Par #1]** to a value of "15022" to access adapter **Parameter 22 - [Reset Module]**.

TIP: If the port to which the adapter is connected is not known, always use "10000" for the Device Starting Address in the formula above. In this case, set adapter **Parameter 38 - [Indirect Par #1]** to a value of "10022" for this example to access adapter **Parameter 22 - [Reset Module]**.

Reading Device Parameters

1. Verify that the Unit Identifier is set to “0” (zero) or “16.”

2. Using Table 4.J and its associated formula, determine the value to use for an adapter Indirect Par #x that points to the specific device parameter you want to read. For example, suppose adapter **Parameter 38 - [Indirect Par #1]** is used and you want to read drive Parameter 003 - [Output Current] or drive Parameter 012 - [DC Bus Voltage]. In this case, set adapter **Parameter 38 - [Indirect Par #1]** to a value of “3” or “12” respectively.

3. Use Function Code 03 or 23 (Table 4.A) to read the value(s) of specific device parameter(s). For this example, read register addresses 10041 and 10042 for adapter Indirect Parameter #1 Data as shown in Table 4.K.

Table 4.K Register Addresses for Indirect Parameter Data

Register Address	Description	Detail
10041	Indirect Parameter #1 Data	Lo Word
10042		Hi Word
10043	Indirect Parameter #2 Data	Lo Word
10044		Hi Word
10045	Indirect Parameter #3 Data	Lo Word
10046		Hi Word
10047	Indirect Parameter #4 Data	Lo Word
10048		Hi Word
10049	Indirect Parameter #5 Data	Lo Word
10050		Hi Word
10051	Indirect Parameter #6 Data	Lo Word
10052		Hi Word
10053	Indirect Parameter #7 Data	Lo Word
10054		Hi Word
10055	Indirect Parameter #8 Data	Lo Word
10056		Hi Word
10057	Indirect Parameter #9 Data	Lo Word
10058		Hi Word
10059	Indirect Parameter #10 Data	Lo Word
10060		Hi Word
10061	Indirect Parameter #11 Data	Lo Word
10062		Hi Word
10063	Indirect Parameter #12 Data	Lo Word
10064		Hi Word
10065	Indirect Parameter #13 Data	Lo Word
10066		Hi Word
10067	Indirect Parameter #14 Data	Lo Word
10068		Hi Word
10069	Indirect Parameter #15 Data	Lo Word
10070		Hi Word
10071	Indirect Parameter #16 Data	Lo Word
10072		Hi Word

Writing Device Parameters

1. Verify that the Unit Identifier is set to “0” (zero).
2. Using Table 4.J and its associated formula, determine the value to use for an adapter Indirect Parameter that points to the specific device parameter you want to write. For example, suppose adapter **Parameter 38 - [Indirect Par #1]** is used and you want to write to drive Parameter 140 - [Accel Time 1]. In this case, set adapter **Parameter 38 - [Indirect Par #1]** to a value of “140.”
3. Use Function Code 16 or 23 (Table 4.A) to write a desired value to the specific device parameter(s). For this example, write a value of “20” (2.0 seconds) to register addresses 10041 and 10042 for adapter Indirect Parameter #1 Data as shown in Table 4.K.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be read or written without accessing the specific parameter. When enabled, each Datalink occupies two 16-bit or 32-bit words in both the input and output image. Use adapter **Parameter 22 - [Datalink Size]** to determine whether the drive uses 16-bit or 32-bit words for Datalinks.

Rules for Using Datalinks

- Each set of Datalink parameters in a PowerFlex drive can be used by only one adapter. If more than one adapter is connected to a single drive, multiple adapters cannot 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.

Reading Datalinks

Use the register addresses in Table 4.L to read Datalinks using Function Code 03 or 23.

Table 4.L Register Addresses to Read Datalinks

Register Address	Description	Detail
10025	Datalink A1 Out	Lo Word
10026		Hi Word
10027	Datalink A2 Out	Lo Word
10028		Hi Word
10029	Datalink B1 Out	Lo Word
10030		Hi Word
10031	Datalink B2 Out	Lo Word
10032		Hi Word
10033	Datalink C1 Out	Lo Word
10034		Hi Word
10035	Datalink C2 Out	Lo Word
10036		Hi Word
10037	Datalink D1 Out	Lo Word
10038		Hi Word
10039	Datalink D2 Out	Lo Word
10040		Hi Word

All 16-bit parameter values will appear in the Lo Word of an assigned Datalink Out.

Writing Datalinks

Use the register addresses in Table 4.M to write to Datalinks using Function Code 16 or 23.

Table 4.M Register Addresses to Write Datalinks

Register Address	Description	Detail
10005	Datalink A1 In	Lo Word
10006		Hi Word
10007	Datalink A2 In	Lo Word
10008		Hi Word
10009	Datalink B1 In	Lo Word
10010		Hi Word
10011	Datalink B2 In	Lo Word
10012		Hi Word
10013	Datalink C1 In	Lo Word
10014		Hi Word
10015	Datalink C2 In	Lo Word
10016		Hi Word
10017	Datalink D1 In	Lo Word
10018		Hi Word
10019	Datalink D2 In	Lo Word
10020		Hi Word

Any Datalink In can also be read using Function Code 03 or 23.

Using 16-Bit Datalinks to Read/Write 32-Bit Parameters

This subsection only pertains to PowerFlex 70 (SC or EC), PowerFlex 700 (SC), and PowerFlex 700H drives which use 16-bit Datalinks. To read or write a 32-bit parameter using 16-bit Datalinks, typically both Datalinks of a pair (A, B, C, D) are set to the same 32-bit parameter. For example, to read Parameter 10 - [Elapsed Run Time] in a PowerFlex 70 drive, both Datalink A1 Out and Datalink A2 Out are set to "10." Datalink A1 Out will contain the least significant word (LSW) and Datalink A2 Out will contain the most significant word (MSW).

32-bit data is stored in binary as follows:

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

In this example, the Parameter 10 - [Elapsed Run Time] value of 6553.9 Hrs is read as "6553.9" in Datalink A1 Out and Datalink A2 Out.

Register Address	Datalink	Word	Parameter	Data (Hex)
10025	A1 Out	LSW	10	0003
10026				0000
10027	A2 Out	MSW	10	0001
10028				0000

Conversion Example:

Parameter 010 - [Elapsed Run Time] = 6553.9 Hrs
MSW = 0001_{hex} = 0001_{binary} = 2^{16} = 65536
LSW = 0003_{hex} = 3
Engineering Value = 65536 + 3 = 65539
Parameter 10 Displayed Value = 6553.9 Hrs

Regardless of the Datalink combination, Datalink x1 Out will always contain the LSW and Datalink x2 Out will always contain the MSW. In the following example, the PowerFlex 70 drive Parameter 242 - [Power Up Marker] contains a value of 88.4541 Hrs.

Modbus Address	Datalink	Word	Parameter	Data (Hex)
10027	A2 Out	MSW	242	000D
10028				0000
10029	B1 Out	LSW	242	7F3D
10030				0000

Conversion Example:

Parameter 242 - [Power Up Marker] = 88.4541 hours
MSW = $000D_{hex}$ = 1101_{binary} = $2^{19} + 2^{18} + 2^{16}$ = 851968
LSW = $7F3D_{hex}$ = 32573
Engineering Value = 851968 + 32573 = 884541
Parameter 242 Displayed Value = 88.4541 Hrs

Supported Modbus Registers

The adapter supports the Modbus registers listed in Table 4.N.

Table 4.N Modbus Registers Supported by the Adapter

Modbus Register	Description
Write Product Command Word Bits	
0x00001	Stop
0x00002	Start
0x00003	Jog
0x00004	Clear Faults
0x00005	Direction 1
0x00006	Direction 2
0x00007	Local Control
0x00008	MOP Increment
0x00009	Accel Rate 1
0x00010	Accel Rate 2
0x00011	Decel Rate 1
0x00012	Decel Rate 2
0x00013	Reference Select 1
0x00014	Reference Select 2
0x00015	Reference Select 3
0x00016	MOP Decrement
Read Product Status Word Bits	
1x00001	Ready
1x00002	Active
1x00003	Command Direction
1x00004	Actual Direction
1x00005	Accel
1x00006	Decel
1x00007	Alarm
1x00008	Fault
1x00009	At Speed
1x00010	Local Control 1
1x00011	Local Control 2
1x00012	Local Control 3
1x00013	Reference Select 1
1x00014	Reference Select 2
1x00015	Reference Select 3
1x00016	Reference Select 4
Read/Write Various Holding Registers	
4x10001	Product Logic Command
4x10002	Keep Alive Register
4x10003	Reference Lo (Bit 0…15 of 32-bit Reference or the whole 16-bit Reference)
4x10004	Reference Hi (Bit 16…32 of 32-bit Reference)
4x10005	Datalink A1 In Lo Word
4x10006	Datalink A1 In Hi Word
4x10007	Datalink A2 In Lo Word
4x10008	Datalink A2 In Hi Word
4x10009	Datalink B1 In Lo Word
4x10010	Datalink B1 In Hi Word
4x10011	Datalink B2 In Lo Word
4x10012	Datalink B2 In Hi Word
4x10013	Datalink C1 In Lo Word
4x10014	Datalink C1 In Hi Word
4x10015	Datalink C2 In Lo Word
4x10016	Datalink C2 In Hi Word
4x10017	Datalink D1 In Lo Word
4x10018	Datalink D1 In Hi Word

Modbus Register	Description
4x10019	Datalink D2 In Lo Word
4x10020	Datalink D2 In Hi Word
4x10021	Product Status Word
4x10022	Peripheral Status Register
4x10023	Feedback Lo (Bit 0…15 of 32-bit Feedback or the whole 16-bit Feedback)
4x10024	Feedback Hi (Bit 16…32 of 32-bit Feedback)
4x10025	Datalink A1 Out Lo Word
4x10026	Datalink A1 Out Hi Word
4x10027	Datalink A2 Out Lo Word
4x10028	Datalink A2 Out Hi Word
4x10029	Datalink B1 Out Lo Word
4x10030	Datalink B1 Out Hi Word
4x10031	Datalink B2 Out Lo Word
4x10032	Datalink B2 Out Hi Word
4x10033	Datalink C1 Out Lo Word
4x10034	Datalink C1 Out Hi Word
4x10035	Datalink C2 Out Lo Word
4x10036	Datalink C2 Out Hi Word
4x10037	Datalink D1 Out Lo Word
4x10038	Datalink D1 Out Hi Word
4x10039	Datalink D2 Out Lo Word
4x10040	Datalink D2 Out Hi Word
4x10041	Indirect Parameter #1 Lo Word
4x10042	Indirect Parameter #1 Hi Word
4x10043	Indirect Parameter #2 Lo Word
4x10044	Indirect Parameter #2 Hi Word
4x10045	Indirect Parameter #3 Lo Word
4x10046	Indirect Parameter #3 Hi Word
4x10047	Indirect Parameter #4 Lo Word
4x10048	Indirect Parameter #4 Hi Word
4x10049	Indirect Parameter #5 Lo Word
4x10050	Indirect Parameter #5 Hi Word
4x10051	Indirect Parameter #6 Lo Word
4x10052	Indirect Parameter #6 Hi Word
4x10053	Indirect Parameter #7 Lo Word
4x10054	Indirect Parameter #7 Hi Word
4x10055	Indirect Parameter #8 Lo Word
4x10056	Indirect Parameter #8 Hi Word
4x10057	Indirect Parameter #9 Lo Word
4x10058	Indirect Parameter #9 Hi Word
4x10059	Indirect Parameter #10 Lo Word
4x10060	Indirect Parameter #10 Hi Word
4x10061	Indirect Parameter #11 Lo Word
4x10062	Indirect Parameter #11 Hi Word
4x10063	Indirect Parameter #12 Lo Word
4x10064	Indirect Parameter #12 Hi Word
4x10065	Indirect Parameter #13 Lo Word
4x10066	Indirect Parameter #13 Hi Word
4x10067	Indirect Parameter #14 Lo Word
4x10068	Indirect Parameter #14 Hi Word
4x10069	Indirect Parameter #15 Lo Word
4x10070	Indirect Parameter #15 Hi Word
4x10071	Indirect Parameter #16 Lo Word
4x10072	Indirect Parameter #16 Hi Word

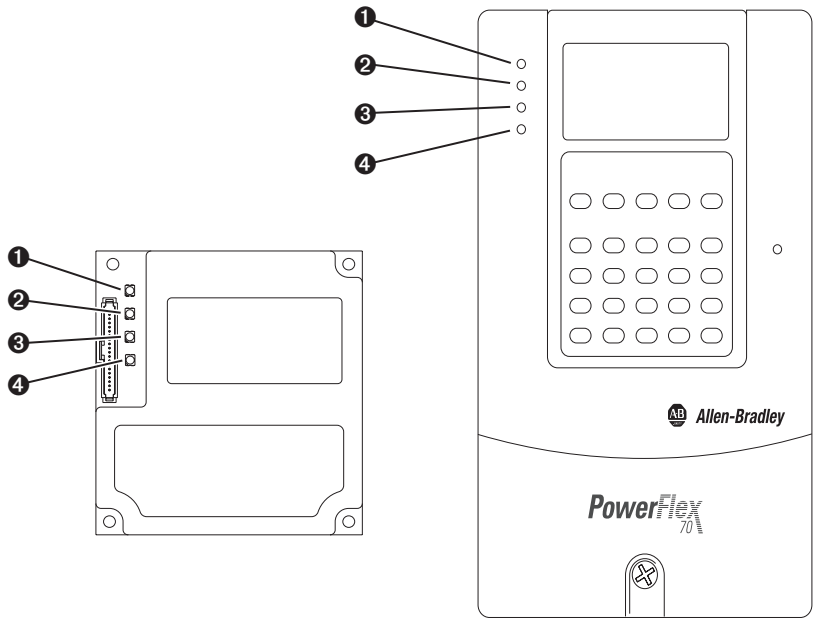
Troubleshooting

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

Understanding the Status Indicators

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

Figure 5.1 Status Indicators (location on drive may vary)



Item	Status Indicator	Description	Page
1	PORT	DPI Connection Status	5-2
2	MOD	Adapter Status	5-2
3	NET A	Modbus/TCP Connection Status	5-3
4	NET B	Modbus/TCP Transmit Status	5-3

PORT Status Indicator

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

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive (or adapter if mounted in a DPI External Comms Kit).
Flashing Red	The adapter is not receiving a ping message from the drive.	• Verify that cables are securely connected and not damaged. Replace cables if necessary. • Cycle power to the drive (or adapter if mounted in a DPI External Comms Kit).
Steady 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 (or adapter if mounted in a DPI External Comms Kit) 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 DPI drive supports Datalinks. • Configure the adapter to use a Datalink that is not already being used by another peripheral.
Steady Orange	The adapter is connected to a product that does not support Allen-Bradley DPI communications.	Connect the adapter to a product that supports Allen-Bradley DPI communications (for example, a PowerFlex 7-Class drive).
Flashing Green	The adapter is establishing an I/O connection to the drive.	No action required. Normal behavior if no DPI I/O is enabled.
Steady Green	The adapter is properly connected and is communicating with the drive.	No action required.

MOD Status Indicator

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

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive (or adapter if mounted in a DPI External Comms Kit).
Flashing Red	The adapter has failed the firmware test. The adapter is being flash upgraded.	• Clear faults in the adapter. • Cycle power to the drive (or adapter if mounted in a DPI External Comms Kit). • If cycling power does not correct the problem, the adapter parameter settings may have been corrupted. Reset defaults and reconfigure the adapter. • If resetting defaults does not correct the problem, flash the adapter with the latest firmware release.
Steady Red	The adapter has failed the hardware test.	• Cycle power to the drive (or adapter if mounted in a DPI External Comms Kit). • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Verify that the controller can send messages to the adapter. • Normal behavior if no DPI I/O is enabled.
Steady Green	The adapter is operational and transferring I/O data.	No action required.

NET A Status Indicator

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

Status	Cause	Corrective Actions
Off	The adapter is not powered, the adapter is not properly connected to the network, or the adapter needs an IP address.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable and to the network using an Ethernet cable. • Correctly connect the Ethernet cable to the Ethernet connector. • Set a unique IP address using a BOOTP server or by disabling BOOTP and using adapter parameters. • Apply power to the drive (or adapter if mounted in a DPI External Comms Kit).
Steady Red	The adapter failed the duplicate IP address detection test.	Configure the adapter to use a unique IP address and cycle power.
Flashing Red	The Modbus/TCP connection has timed out.	Clear the fault on the drive and change **Parameter 19 - [Msg I/O Timer]** to a higher value or to zero (0) to disable Modbus/TCP connection timeouts.
Flashing Red/Green	The adapter is performing a self-test.	No action required.
Flashing Green	The adapter is properly connected but is not communicating with any devices on the network.	• Verify that the controller can send messages to the adapter. • Create an I/O connection with the adapter by sending it Modbus/TCP messages.
Steady Green	The adapter is properly connected and communicating on the network.	No action required.

NET B Status Indicator

This green LED indicates the status of the adapter transmitting on the network as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not transmitting on the network.	If NET A indicator is off: • Securely connect the adapter to the drive using the Internal Interface (ribbon) cable and to the network using an Ethernet cable. • Correctly connect the Ethernet cable to the Ethernet connector. • Set a unique IP address using a BOOTP server or by disabling BOOTP and using adapter parameters. If NET A indicator is steady red: • Configure the adapter to use a unique IP address and cycle power. If NET A indicator is flashing red/green or red: • Check the IP address in the adapter and scanner, and verify that the controller can communicate with the adapter. • Ping the adapter. Normal condition if the adapter is idle.
Flashing Green	The adapter is transmitting on the network.	No action required.

Viewing Adapter Diagnostic Items

If you encounter unexpected communications problems, the adapter's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. Adapter diagnostic items can be viewed using an LCD PowerFlex 7-Class HIM (Diagnostics/Device Items), DriveExplorer software (version 2.01 or higher), or DriveExecutive software (version 3.01 or higher).

Using the HIM to View Adapter Diagnostic Items

Step	Example Screen
1. Access parameters in the adapter. Refer to Using the PowerFlex 7-Class HIM on page 3-2. 2. Press the ▲ or ▼ key to scroll to **Diagnostics**. 3. Press the Enter key to display the Diagnostics menu in the adapter. 4. Repeat steps 2 and 3 to enter the **Device Items** option. 5. Press the ▲ or ▼ key to scroll through the items.	Main Menu: Diagnostics Parameter Device Select Device Item # 3 Reference

Table 5.A Adapter Diagnostic Items

No.	Name	Description
1	DPI Common Cmd	The present value of the Common Logic Command being transmitted to the drive by this adapter.
2	DPI Product Cmd	The present value of the Product Logic Command being transmitted to the drive by this adapter.
3	Reference	The present value of the Reference being transmitted to the drive by this adapter. If the drive indicates a 16-bit Reference size, the Reference value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of this diagnostic item are zero (0).
4	DPI Common Sts	The present value of the Common Logic Status being received from the drive by this adapter.
5	DPI Product Sts	The present value of the Product Logic Status being received from the drive by this adapter.
6	Feedback	The present value of the Feedback being received from the drive by this adapter. If the drive indicates a 16-bit Feedback size, the Feedback value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of this diagnostic item are zero (0).
7	Datalink A1 In	The present 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. If the drive indicates a 16-bit Datalink size, the Datalink value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of this diagnostic item are zero (0).
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	The present value of respective Datalink Out being received from the drive by this adapter. If the drive indicates a 16-bit datalink size, the value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of this diagnostic item are zero (0).
16	Datalink A2 Out	
17	Datalink B1 Out	
18	Datalink B2 Out	
19	Datalink C1 Out	
20	Datalink C2 Out	
21	Datalink D1 Out	
22	Datalink D2 Out	
23	DPI Rx Errors	The present value of the DPI Receive error counter.
24	DPI Rx Error Max	The maximum value (since reset) of the DPI Receive error counter.
25	DPI Tx Errors	The present value of the DPI Transmit error counter.
26	DPI Tx Error Max	The maximum value (since reset) of the DPI Transmit error counter.

Table 5.A Adapter Diagnostic Items (Continued)

No.	Name	Description
27	Boot Flash Count	Number of times the boot firmware in the adapter has been flash updated.
28	App Flash Count	Number of times the application firmware in the adapter has been flash updated.
29 30 31 32 33 34	HW Addr 1 HW Addr 2 HW Addr 3 HW Addr 4 HW Addr 5 HW Addr 6	Decimal value of each byte in the adapter's Ethernet hardware address (MAC address). 255 : 255 : 255 : 255 : 255 : 255 [HW Addr 1] [HW Addr 2] [HW Addr 3] [HW Addr 4] HW Addr 5] [HW Addr 6]
35 36 37 38	IP Addr Act 1 IP Addr Act 2 IP Addr Act 3 IP Addr Act 4	Value of each byte in the adapter's present IP address. A value of "0" appears if the adapter does not currently have an IP address. 255 . 255 . 255 . 255 [IP Addr Act 1] [IP Addr Act 2] [IP Addr Act 3] [IP Addr Act 4]
39 40 41 42	Subnet Act 1 Subnet Act 2 Subnet Act 3 Subnet Act 4	Value of each byte in the adapter's present subnet mask. A value of "0" appears if the adapter does not currently have a subnet mask. 255 . 255 . 255 . 255 [Subnet Act 1] [Subnet Act 2] [Subnet Act 3] [Subnet Act 4]
43 44 45 46	Gateway Act 1 Gateway Act 2 Gateway Act 3 Gateway Act 4	Value of each byte in the adapter's present gateway address. A value of "0" appears if the adapter does not currently have a gateway address. 255 . 255 . 255 . 255 [Gateway Act 1] [Gateway Act 2] [Gateway Act 3] [Gateway Act 4]
47	EN Rx Overruns	Number of receive buffer overruns reported by the Ethernet hardware.
48	EN Rx Packets	Number of Ethernet packets that the adapter has received.
49	EN Rx Errors	Number of receive errors reported by the Ethernet hardware.
50	EN Tx Packets	Number of Ethernet packets that the adapter has sent.
51	EN Tx Errors	Number of transmit errors reported by the Ethernet hardware.

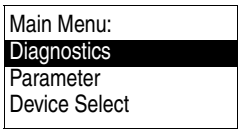
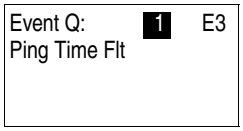
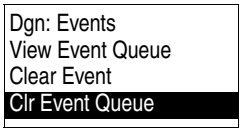
Viewing and Clearing Events

The adapter has an event queue to record significant events that occur in the operation of the adapter. When such an event occurs, an entry is put into the event queue. You can view the event queue using an LCD PowerFlex 7-Class HIM, DriveExplorer (2.01 or higher) software, DriveExecutive (1.01 or higher) software or other clients using the DPI Fault object.

The event queue can contain up to 32 entries. Eventually the event queue will become full, since its contents are retained through adapter resets. At that point, a new entry replaces the oldest entry. Only an event queue clear operation or adapter power cycle will clear the event queue contents.

Resetting the adapter to defaults has no effect on the event queue.

Using the HIM to View and Clear Events

Step	Example Screen
Viewing Events	
1. Access parameters in the adapter. Refer to Using the PowerFlex 7-Class HIM on page 3-2.	
2. Press the ▲ or ▼ key to scroll to **Diagnostics**.	
3. Press the ↵ (Enter) key 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 ▲ or ▼ key to scroll through events. The most recent event is Event 1.	
Clearing Events	
1. Access parameters in the adapter. Refer to Using the PowerFlex 7-Class HIM on page 3-2.	
2. Press the ▲ or ▼ key to scroll to **Diagnostics**.	
3. Press the ↵ (Enter) key 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 the ↵ (Enter) key to confirm your request. If **Clr Event Queue** was selected, 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:

Table 5.B Adapter Events

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 @ 125kbps	The adapter detected that the drive is communicating at 125 kbps.
9	Online @ 500kbps	The adapter detected that the drive is communicating at 500 kbps.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	Dup Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The adapter has logged in for Type 0 control.
13	Type 0 Time Flt	The adapter has not received a Type 0 status message within the specified time.
14	DL Login	The adapter has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The adapter has not received a Datalink message within the specified time.
17	Reserved	Not used.
18	Control Disabled	The adapter has sent a “Soft Control Disable” command to the drive.
19	Control Enabled	The adapter has sent a “Soft Control Enable” command to the drive.
20	Message Timeout	A Client-Server message sent by the adapter was not completed within 1 sec.
21	Flt Cfg Error	One of the Flt Cfg xx parameters is set to a value greater than 65535 and the drive requires a 16-bit value.
22	App Updated	Startup sequence detected new application firmware.
23	EN Comm Flt	The adapter detected a communications fault on the network.
24	EN Sent Reset	The adapter received a reset from the network.
25	EN Close Flt	An I/O connection from the network to the adapter was closed.
26	EN Idle Flt	The adapter is receiving “idle” packets from the network.
27	EN Open	An I/O connection from the network to the adapter has been opened.
28	EN Timeout Flt	An I/O connection from the network to the adapter has timed out.
29	PCCC IO Close	The device sending PCCC Control messages to the adapter has set the PCCC Control Timeout to zero.
30	PCCC IO Open	The adapter has begun receiving PCCC control messages (the PCCC Control Timeout was previously set to a non-zero value).
31	PCCC IO Time Flt	The adapter has not received a PCCC Control message for longer than the PCCC Control Timeout.
32	Watchdog T/O Flt	The software detects a failure.
33	EEPROM Init	Startup sequence detected a blank EEPROM map revision.
34	Normal Startup	The adapter successfully started up.
35	Manual Reset	The adapter was reset by changing its Reset Module parameter.
36	EN Link Down	The Ethernet link was removed from the adapter.
37	EN Link Up	An Ethernet link is available for the adapter.
38	BOOTP Response	The adapter received a response to its BOOTP request.
39	Dup IP Addr	The adapter uses the same IP address as another device on the network.
40-41	Reserved	Not used.
42	Email Failed	The adapter encountered an error attempting to send a requested e-mail message.
43-48	Reserved	Not used.

Notes:

Viewing the Adapter's Web Pages

This chapter provides instructions on how to monitor the adapter and connected PowerFlex drive by using the adapter's web interface.

Future enhancements may result in adapter web pages that look different than the examples shown in this chapter.

Accessing the Adapter's Web Home Page

After configuring the adapter, you can view its web pages. These pages present information about the adapter, the drive to which it is connected, and the other DPI devices connected to the drive such as a HIM.

By default the adapter web pages are disabled. To enable the web pages, set the Web Pages Switch (SW2 in Figure 2.1) to its "Enable Web" position and reset the adapter. **Parameter 36 - [Web Enable]** can be used to display the setting (Enabled or Disabled) of this switch.

The adapter can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the adapter takes a communication or idle fault action.

Bit 0 of **Parameter 37 - [Web Features]** can be used to protect the configured settings. For more details, see Configure E-mail Notification Web Page on page 6-6.

Viewing the Web Pages of the Adapter

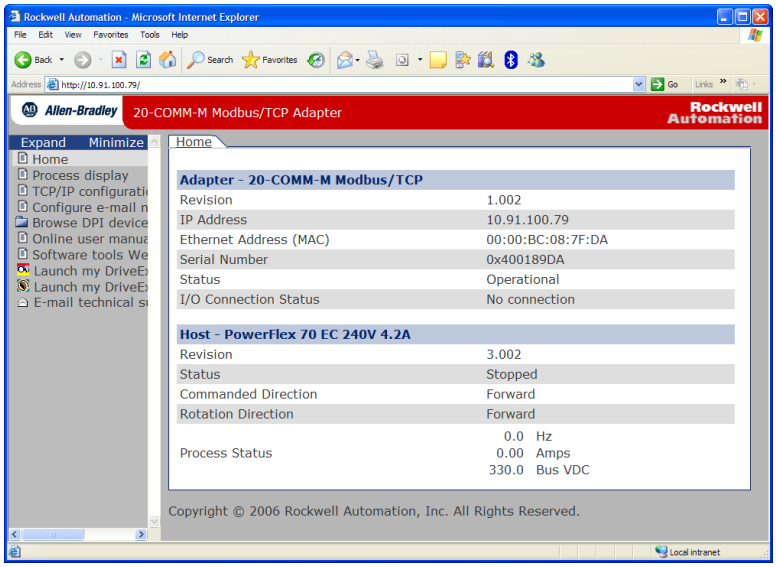
1. On a computer with access to the Modbus/TCP network on which the adapter is installed, launch a web browser such as Microsoft™ Internet Explorer (version 5.0 or greater).

   The computer can access the adapter web pages if it is connected to the same network as the adapter, or if it is connected to a network with access to the adapter's network via a gateway device (for example, a router).

2. In the Address box, type the IP address of the adapter, and then press ENTER. The adapter web Home Page (Figure 6.1) appears.

   Important: Clicking the browser's Refresh button always re-displays the Home Page even while viewing another adapter web page.

Figure 6.1 Adapter Web Home Page Example



Title Bar on Adapter Web Pages

The title bar appears on all adapter web pages, including its Home Page. It consists of three elements:

Title Bar Element	Description
Allen-Bradley logo (at far left)	This logo is a hyperlink. Click it to view the ab.com web Home Page.
Adapter Title (middle)	Shows the adapter type or user-configurable title.
Rockwell Automation logo (at far right)	This logo is a hyperlink. Click it to view the Rockwell Automation web Home Page.

Navigation Menu on Adapter Web Pages

The navigation menu appears on the left side of all adapter web pages, including its Home page. The navigation menu consists of links and link folders which can be expanded or minimized. The following table shows all navigation menu links and link folders:

Table 6.A Navigation Menu Links and Link Folders

Link/Folder	Description
Home link	Click this link to view the adapter's Home Page (Figure 6.1).
Process Display link	Click this link to view the Host's Process Display pop-up window (Figure 6.2).
TCP/IP configuration link	Click this link to view the adapter's TCP/IP Configuration web page showing information about the TCP/IP configuration, such as the adapter's IP address and the number of packets being sent. Figure 6.3 shows an example TCP/IP Configuration web page.
Configure e-mail notification link	Click this link to view the adapter's Configure E-mail Notification web page (Figure 6.4) to configure the adapter to send automatic e-mail messages. E-mail notification can accommodate specific needs such as when only selected faults occur (Figure 6.5). An example e-mail message is shown in Figure 6.7.
Browse DPI devices folder	Click this folder to expand and view the Port folders for all present DPI devices, including the drive, adapter, and other DPI devices connected to the drive such as a HIM.
Port x folders	Click a respective Port folder to expand and view its device's various links which take you to related information pages. For Port 0 (PowerFlex 70 Drive) example information pages, see Figure 6.8, Figure 6.9, and Figure 6.10.
Online user manuals link	Click this link to view Rockwell Automation's web page with documentation for drives and other devices.
Software tools Web site link	Click this link to view Allen-Bradley's web page with information about software tools such as DriveExplorer and DriveExecutive.
Launch my DriveExplorer software link	Click this link to launch the DriveExplorer software already installed on your PC.
Launch my DriveExecutive software link	Click this link to launch the DriveExecutive software already installed on your PC.
E-mail technical support link	Click this link to view a new e-mail message window to send a message to Allen-Bradley's Technical Support Team.

Information on Adapter Home Page

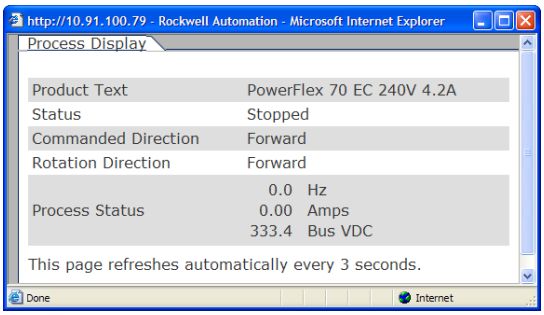
The adapter Home Page displays the following information for the adapter and host:

Information for	Description
Adapter	• Revision • IP Address • Ethernet Address (MAC) • Serial Number • Status • I/O Connection Status
Host "X"	• Revision • Status • Commanded Direction • Rotation Direction • Process Status

Process Display Pop-up Window

The Process Display pop-up window dynamically shows a host's information. To view this window, click the "Process Display" link in the navigation menu.

Figure 6.2 Example of Process Display Pop-up Window



Information	Description
Product Text	Description of host.
Status	Status of host.
Commanded Direction	Commanded direction of host.
Rotation Direction	Rotation direction of host.
Process Status	Line 1 – desired parameter of host and its dynamic value. (1) Line 2 – desired parameter of host and its dynamic value. (2) Line 3 – desired parameter of host and its dynamic value. (2)

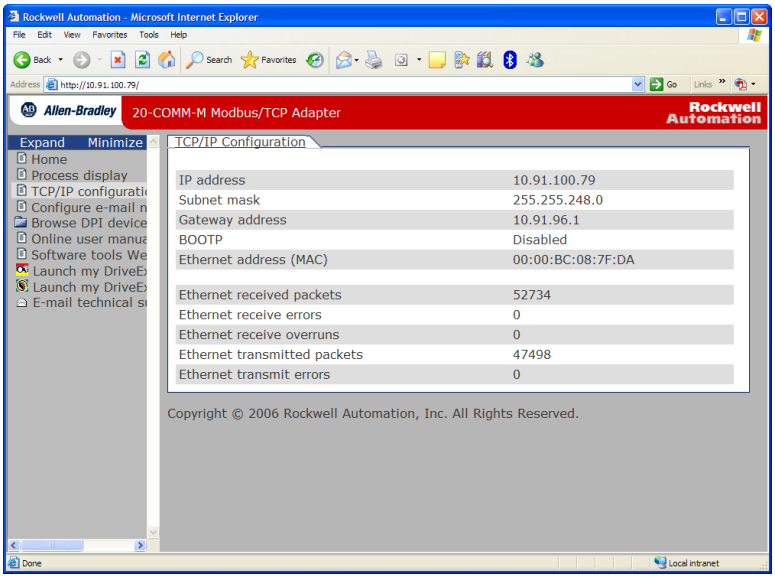
(1) The parameter whose value is shown on this line is the feedback value from the drive, and is not selectable.

(2) The parameter whose value is shown on this line can be set by using the HIM. For details, see the drive User Manual.

TCP/IP Configuration Web Page

The TCP/IP Configuration web page provides information about the adapter's Ethernet settings and network activities.

Figure 6.3 Example of TCP/IP Configuration Web Page



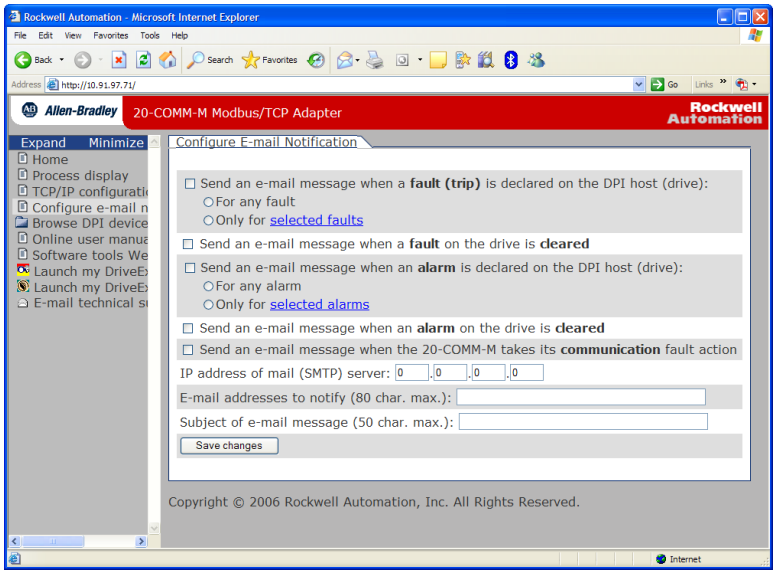
Information	Description
IP Address	IP address of the adapter.
Subnet Mask	Subnet mask for the adapter's network.
Gateway Address	Address for the gateway device on the adapter's network.
BOOTP	Whether BOOTP is being used to configure the adapter's network information.
Ethernet Address (MAC)	Hardware address for the adapter.
Ethernet Received Packets	Number of packets that the adapter has received.
Ethernet Receive Errors	Number of receive errors reported by the hardware.
Ethernet Receive Overruns	Number of receive buffer overruns reported by the hardware.
Ethernet Transmitted Packets	Number of packets that the adapter has sent.
Ethernet Transmit Errors	Number of transmit errors reported by the hardware.

Configure E-mail Notification Web Page

The Configure E-mail Notification web page contains selections and data fields for configuring the adapter to automatically send e-mail messages to desired addresses when selected types of events occur.

By default, settings are not protected. After configuration, settings can be protected by using **Parameter 37 - [Web Features]** to set E-mail Cfg Bit 0 value to "0" (Disabled). To change a protected configuration, it must first be unprotected by setting the E-mail Cfg Bit 0 value back to "1" (Enabled).

Figure 6.4 Example of Configure E-mail Notification Web Page



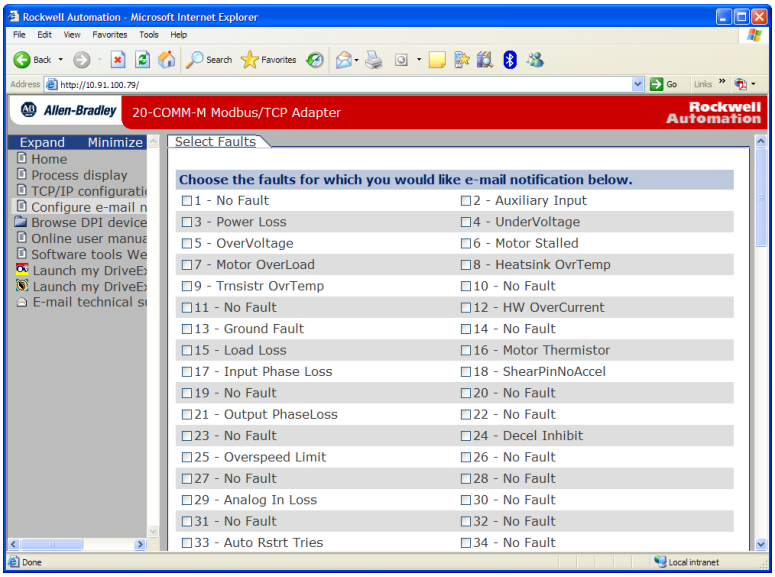
Configuring E-mail Notification

1. Click the desired "Send an e-mail message when…" check boxes you want to occur that will send e-mail notification. If you only want e-mail notification when selected faults/alarms occur:

   A. Click the respective fault and/or alarm radio buttons.

   B. Click the "selected faults" link and/or "selected alarms" link. Figure 6.5 shows an example faults configuration page.

Figure 6.5 Example of Selected Faults Configuration Page



C. Click the desired fault/alarm check boxes, and click **Save Changes**.

D. Click the "Back to E-mail Configuration Page" link.

2. Type the following information in their respective boxes:

Information	Description
"IP address of..."	Type in the address of the mail server that will be used to deliver the e-mail messages. (When the IP address is unknown, see the information following this table.)
"E-mail addresses to notify..."	Type in addresses to where you want e-mail messages to be sent. Multiple addresses can be used, but they must be separated by commas (comma delimited).
"Subject of e-mail message..."	Type in the desired subject text for the e-mail message.

If the IP address of the e-mail server is unknown, you can contact your IT department or use the DOS window to enter a command to find its IP address:

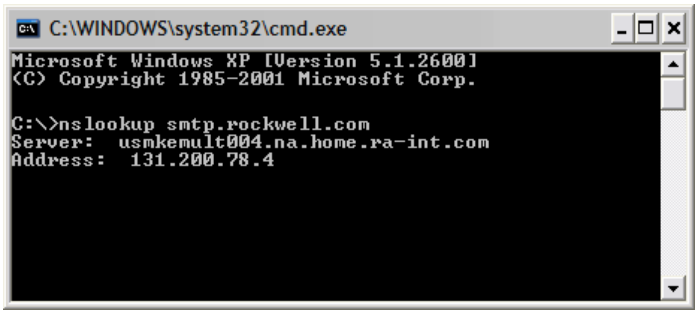
A. On the Windows task bar, click **Start > Run** to display the Run window.

B. In the Run window Open field, type "cmd" and click **OK** to display the DOS window.

C. On the c:\ > command line, type "nslookup [name of e-mail server]." The entry "c:\ > nslookup smtp.company.com" is an example.

D. Press **ENTER** to display the e-mail server IP address (see Figure 6.6).

Figure 6.6 DOS Window Showing E-mail Server IP Address



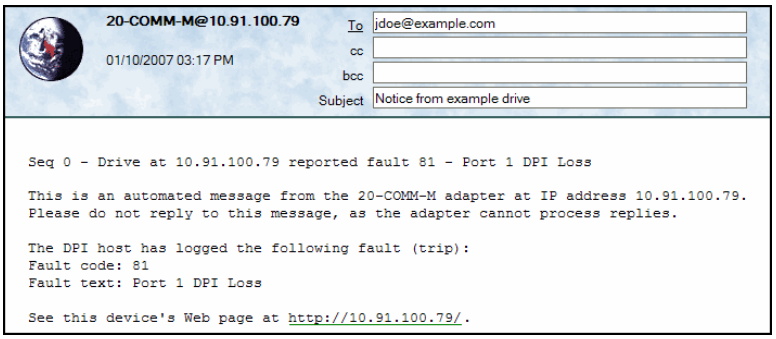
The IP address shown in the DOS window (for this example, 131.200.78.4) should be typed into the E-mail Notification Web Page shown in Figure 6.4.

3. Click **Save changes**.

Important: After configuring E-mail Notification, it is recommended to protect the settings. Otherwise the configuration can be changed anytime the web page is accessed with a browser. To protect the settings, use **Parameter 37 - [Web Features]** to set E-mail Cfg Bit 0 value to "0" (Disabled).

Figure 6.7 shows an example e-mail message automatically sent by the adapter in response to selected events.

Figure 6.7 Example of E-mail Message Sent by Adapter



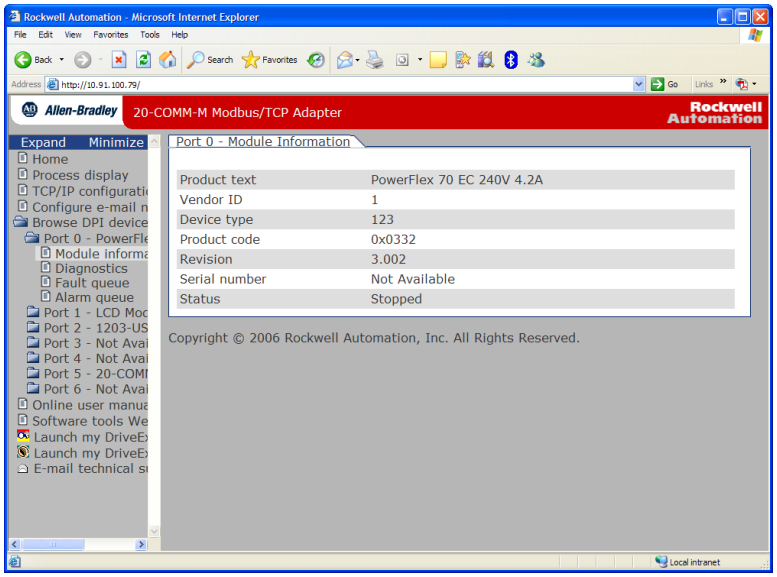
TIP: To stop e-mail messages, uncheck all of the "Send an e-mail message when…" boxes.

Disabling the adapter web pages by setting the Web Pages Switch (SW2 in Figure 2.1) to the "Disable Web" position will NOT stop the adapter from sending e-mail messages.

DPI Device Information Pages

DPI device information pages show a device's module information, diagnostic items, fault queue, event queue, and alarm queue. Figure 6.8 shows an example module information page for the Port 0 device (host). Figure 6.9, Figure 6.10, and Figure 6.11 respectively show example diagnostic items, fault queue, and alarm queue pages for this device.

Figure 6.8 Example of Port 0 (PowerFlex 70 Drive) Module Information Page



Information	Description
Product Text	Text identifying the device
Vendor ID	1 = Allen-Bradley
Device Type	123
Product Code	Code for the product name and its rating
Revision	Firmware revision used by the device
Serial Number	Serial number of the device
Status	Operating status of the device (for example, faulted)

Figure 6.9 Example of Port 0 (PowerFlex 70 Drive) Diagnostic Items Page

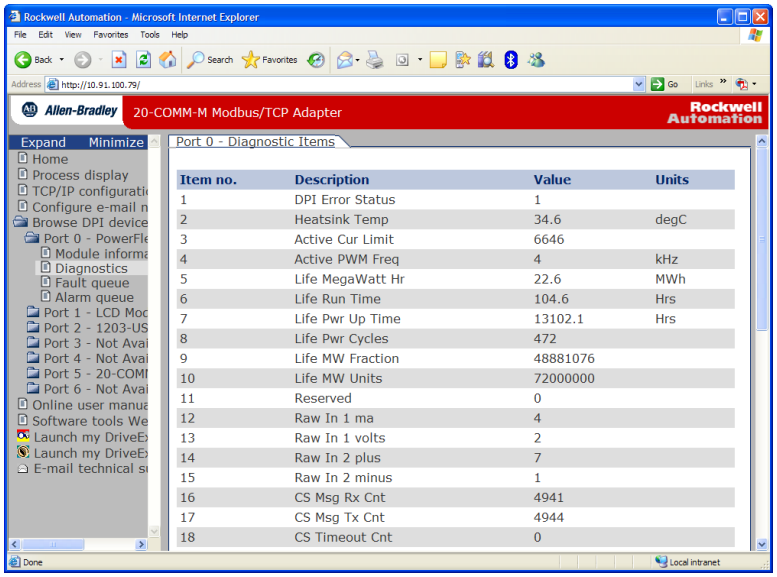
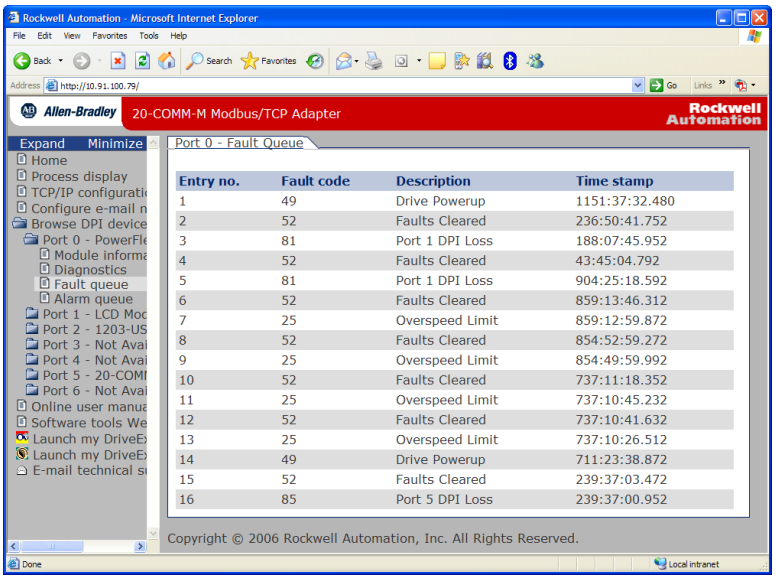


Figure 6.10 Example of Port 0 (PowerFlex 70 Drive) Fault Queue Page



For drives that do not support an alarm queue, the adapter will still display an alarm queue web page (Figure 6.11) showing that the alarm queue is not available.

Figure 6.11 Example of Port 0 (PowerFlex 70 Drive) Alarm Queue Page

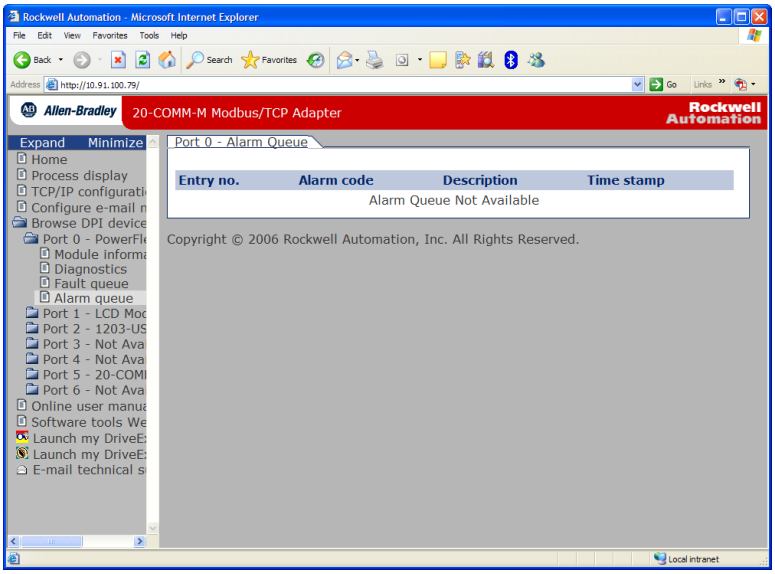
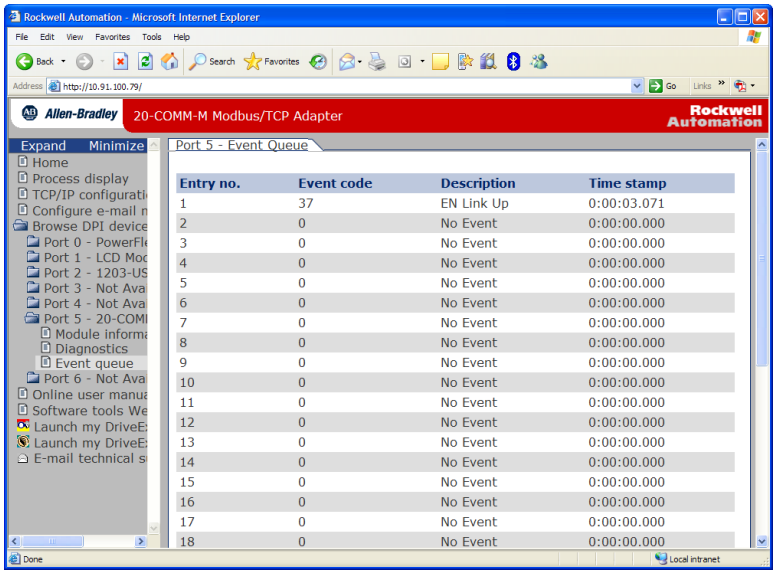


Figure 6.12 shows an example event queue page for the Port 5 device (20-COMM-M adapter).

Figure 6.12 Example of Port 5 (20-COMM-M Adapter) Event Queue Page



Notes:

Installing the Adapter in a DPI External Comms Kit (20-XCOMM-DC-BASE)

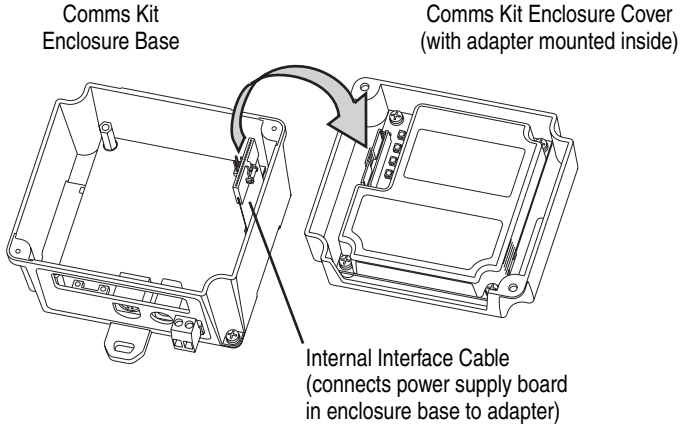
This chapter provides information on using the adapter in a DPI External Comms Kit (20-XCOMM-DC-BASE).

The adapter is typically installed in the internal communication slot on the PowerFlex 7-Class drive. However, an externally-mounted adapter may be desired when:

- The PowerFlex drive is already connected to an existing network, such as Remote I/O, and a second network is desired for software tools (DriveExplorer, DriveExecutive, etc.), data collection, etc.
- The PowerFlex drive is remotely located next to some I/O devices that also need to be networked. The DPI External Comms Kit has an option slot for general-purpose network I/O that a controller can use. Both the drive and I/O devices are handled as one node on the network to reduce the network node count.

Important: Due to inherent operating limitations, the adapter cannot be used with the kit's I/O board option (20-XCOMM-IO-OPT*).

Figure 7.1 Mounting and Connecting the Adapter



For more information, refer to the *DPI External Communications Kit Installation Instructions* (publication 20COMM-IN001).

Notes:

Specifications

Appendix A presents the specifications for the adapter.

Communications

Network	
Protocol	Modbus/TCP
Data Rates	10 Mbps Full Duplex 10 Mbps Half Duplex 100 Mbps Full Duplex 100 Mbps Half Duplex
Connection Limits	30 TCP connections 16 simultaneous CIP messaging connections and 1 Modbus/TCP I/O connection • Explicit messaging-based control using PCCC or the Register or Assembly objects • Explicit messaging where “connected” is NOT chosen, which is typically the default • DriveExplorer connections to the drive • DriveExecutive connections to the drive
Requested Packet Interval (RPI)	5 ms minimum
Packet Rate	Up to 400 total I/O packets per second (200 in and 200 out)
Drive	
Protocol	DPI
Data Rates	125 kbps or 500 kbps

Electrical

Consumption	
Drive	350 mA at 5 VDC supplied by the host (drive or DPI External Comms Kit)
Network	None

Mechanical

Dimensions	
Height	19 mm (0.75 inches)
Length	86 mm (3.39 inches)
Width	78.5 mm (3.09 inches)
Weight	85 g (3 oz.)

Environmental

Temperature Operating Storage	 -10…50°C (14…122°F) -40…85°C (-40…185°F)
Relative Humidity	5…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 provides information about the adapter parameters.

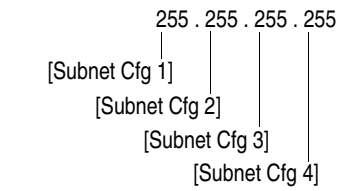
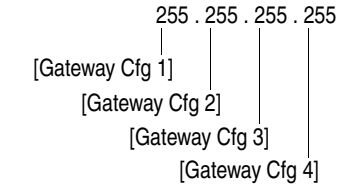
About Parameter Numbers

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

Configuration Tool	Numbering Scheme
• HIM • DriveExplorer • DriveExecutive	The adapter parameters begin with parameter 01. For example, **Parameter 01 - [DPI Port]** is parameter 01 as indicated by this manual.
• Explicit Messaging	Refer to Chapter 4, Using Modbus/TCP Function Codes for details.

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: 5 Minimum: 0 Maximum: 7 Type: 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: 0 = 125 kbps Values: 0 = 125 kbps 1 = 500 kbps Type: Read Only
03	**[BOOTP]** Configures the adapter to use BOOTP so that you can set its IP address, subnet mask, and gateway address with a BOOTP server.	Default: 1 = Enabled Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: Yes
04 05 06 07	**[IP Addr Cfg 1]** **[IP Addr Cfg 2]** **[IP Addr Cfg 3]** **[IP Addr Cfg 4]** Sets the bytes in the IP address. 255 . 255 . 255 . 255 [IP Addr Cfg 1] [IP Addr Cfg 2] [IP Addr Cfg 3] [IP Addr Cfg 4] **Important:** To set the IP address using these parameters, **Parameter 03 - [BOOTP]** must be set to "0" (Disabled).	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details
08	**[Subnet Cfg 1]**	Default: 0
09	**[Subnet Cfg 2]**	Default: 0
10	**[Subnet Cfg 3]**	Default: 0
11	**[Subnet Cfg 4]**	Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
	Sets the bytes of the subnet mask.  **Important:** To set the subnet mask using these parameters, **Parameter 03 - [BOOTP]** must be set to "0" (Disabled).	
12	**[Gateway Cfg 1]**	Default: 0
13	**[Gateway Cfg 2]**	Default: 0
14	**[Gateway Cfg 3]**	Default: 0
15	**[Gateway Cfg 4]**	Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
	Sets the bytes of the gateway address.  **Important:** To set the gateway address using these parameters, **Parameter 03 - [BOOTP]** must be set to "0" (Disabled).	
16	**[EN Rate Cfg]**	Default: 0 = Autodetect Values: 0 = Autodetect 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half Type: Read/Write Reset Required: Yes
	Sets the network data rate at which the adapter communicates. (Updates **Parameter 17 - [EN Rate Act]** after a reset.)	
17	**[EN Rate Act]**	Default: 0 = No Link Values: 0 = No Link 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half Type: Read Only
	Displays the network data rate actually used by the adapter.	
18	**[Modbus/TCP Port]**	Default: 502 Minimum: 0 Maximum: 65535 Type: Read/Write Reset Required: Yes
	Sets the TCP port used to transport Modbus/TCP messages.	

Parameter No.	Name and Description	Details
19	**[Msg I/O Timer]** Sets the communication loss timeout period in seconds. The value zero (0) disables this parameter.	Default: 5 seconds Minimum: 0 seconds Maximum: 180 seconds Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the adapter to detect network communication losses. By default, this parameter sets the timeout to five (5) seconds. You can set this parameter so that the duration is shorter, longer, or disabled. When set to disabled, this also disables adapter **Parameter 23 - [Comm Flt Action]**. Therefore, a communication fault action will be ignored. 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).	
20	**[Ref/Fdbk Size]** Displays the size of the Reference/Feedback. The drive determines the size of the Reference/Feedback.	Default: 0 = 16-bit Values: 0 = 16-bit 1 = 32-bit Type: Read Only
21	**[Datalink Size]** Displays the size of each Datalink word. The drive determines the size of Datalinks.	Default: 0 = 16-bit Values: 0 = 16-bit 1 = 32-bit Type: Read Only
22	**[Reset Module]** No action if set to “0” (Ready). Resets the adapter if set to “1” (Reset Module). Restores the adapter to its factory default settings if set to “2” (Set Defaults). This parameter is a command. It will be reset to “0” (Ready) after the command has been performed.	Default: 0 = Ready Values: 0 = Ready 1 = Reset Module 2 = Set Defaults Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting I/O that controls the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.	
23	**[Comm Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that network communications have been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if I/O 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).	

Parameter No.	Name and Description	Details
24	**[DPI I/O Cfg]** Sets the I/O that is transferred through the adapter.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes Bit Definition: Not Used, Not Used, Not Used, Datalink D, Datalink C, Datalink B, Datalink A, Cmd/Ref Default: x x x 0 0 0 0 1 Bit: 7 6 5 4 3 2 1 0
25	**[DPI I/O Act]** Displays the I/O that the adapter is actively transmitting. The value of this parameter will usually be equal to the value of **Parameter 24 - [DPI I/O Cfg]**.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read Only Bit Definition: Not Used, Not Used, Not Used, Datalink D, Datalink C, Datalink B, Datalink A, Cmd/Ref Default: x x x 0 0 0 0 1 Bit: 7 6 5 4 3 2 1 0
26	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if **Parameter 23 - [Comm Flt Action]** is set to “4” (Send Flt Cfg) and communications are disrupted. The bit definitions will depend on the product to which the adapter is connected. See Appendix C or the documentation for the drive being used.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No
27	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if **Parameter 23 - [Comm Flt Action]** is set to “4” (Send Flt Cfg) and communications are disrupted.	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.
28 29 30 31 32 33 34 35	**[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 23 - [Comm Flt Action]** is set to “4” (Send Flt Cfg) and communications are disrupted.	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.
36	**[Web Enable]** Displays the setting of the adapter Web Pages Switch (SW2 in Figure 2.1) when the adapter was last reset.	Default: 0 = Disabled Values: 0 = Disabled 1 = Enabled Type: Read Only

Parameter No.	Name and Description	Details
37	**[Web Features]** Sets the access to the Web interface and Web-configurable e-mail notification feature.	Default: xxxx xxx1 Bit Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: No

Bit Definition	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	E-mail Cfg
Default	x	x	x	x	x	x	x	1
Bit	7	6	5	4	3	2	1	0

38	**[Indirect Par #1]**	Default: 0
39	**[Indirect Par #2**	Default: 0
40	**[Indirect Par #3]**	Default: 0
41	**[Indirect Par #4]**	Default: 0
42	**[Indirect Par #5]**	Default: 0
43	**[Indirect Par #6]**	Default: 0
44	**[Indirect Par #7]**	Default: 0
45	**[Indirect Par #8]**	Default: 0
46	**[Indirect Par #9]**	Default: 0
47	**[Indirect Par #10]**	Default: 0
48	**[Indirect Par #11]**	Default: 0
49	**[Indirect Par #12]**	Default: 0
50	**[Indirect Par #13]**	Default: 0
51	**[Indirect Par #14]**	Default: 0
52	**[Indirect Par #15]**	Default: 0
53	**[Indirect Par #16]** Sets the Indirect Parameter value used to point to a device parameter (drive or any of its connected peripherals) to read or write values with specific Modbus Function Codes. For details to use these adapter Indirect Par # parameters, see Indirect Access Method on page 4-10.	Default: 0 Minimum: 0 Maximum: 16999 Type: Read/Write Reset Required: No

Notes:

Logic Command/Status Words

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

PowerFlex 7-Class Drives (except PowerFlex 700S)

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 [1]	0 = Not Stop 1 = Stop
														x		Start [1][2]	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog (Par. 100) 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command (Par. 140) 10 = Accel Rate 2 Command (Par. 141) 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command (Par. 142) 10 = Decel Rate 2 Command (Par. 143) 11 = Hold Decel Rate
	x	x	x													Reference Select [3]	000 = No Command 001 = Ref A Select (Par. 90) 010 = Ref B Select (Par. 93) 011 = Preset 3 (Par. 103) 100 = Preset 4 (Par. 104) 101 = Preset 5 (Par. 105) 110 = Preset 6 (Par. 106) 111 = Preset 7 (Par. 107)
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. The Start command acts as a momentary Start command. A "1" will start the drive, but returning to "0" will not stop the drive.

[2] This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).

[3] This Reference Select will not function if a digital input (parameters 361-366) is programmed for "Speed Sel 1, 2 or 3" (option 15, 16 or 17). Note that Reference Select is "Exclusive Ownership" – see drive User Manual for more information.

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 (Par. 214) 1 = Ready
														x		Active	0 = Not Active (Running) 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 (Par. 211 & 212) 1 = Alarm
								x								Fault	0 = No Fault (Par. 243) 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control [1]	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 (Par. 90) 0001 = Ref B Auto (Par. 93) 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

[1] See “Owners” in drive User Manual for further information.

PowerFlex 700S Drives — Logic Command Word (Phase II Control)

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] (Par. 29) 1 = Jog using [Jog Speed 1] (Par. 29)
												x				Clear Fault (2)	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] (Par. 39) 1 = Jog using [Jog Speed 2] (Par. 39)
							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													Spd Ref Sel0	
		x														Spd Ref Sel1	
	x															Spd Ref Sel2	
x																Reserved	

Bits			
14	13	12	
0	0	0	= Spd Ref A (Par. 27)
0	0	1	= Spd Ref B (Par. 28)
0	1	0	= Preset 2 (Par. 15)
0	1	1	= Preset 3 (Par. 16)
1	0	0	= Preset 4 (Par. 17)
1	0	1	= Preset 5 (Par. 18)
1	1	0	= Preset 6 (Par. 19)
1	1	1	= Preset 7 (Par. 20)

(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.

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

Logic Status Word (Phase II Control)

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Status	Description
															x	Active	0 = Not Active 1 = Active
														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 (Par. 323, 324, 325) 1 = Fault
							x									Alarm	0 = No Alarm (Par. 326, 327, 328) 1 = Alarm
						x										Flash Mode	0 = Not in Flash Mode 1 = In Flash Mode
					x											Run Ready	0 = Not Ready to Run (Par. 156) 1 = Ready to Run
				x												At Limit (1)	0 = Not At Limit (Par. 304) 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																Enable	0 = Not Enabled 1 = Enabled

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

A

Adapter

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

The 20-COMM-M Modbus/TCP adapter connects PowerFlex 7-Class drives to a Modbus/TCP network. Adapters are sometimes also called “cards,” “embedded communication options,” “gateways,” “modules,” and “peripherals.”

B

BOOTP (Bootstrap Protocol)

BOOTP lets the adapter configure itself dynamically at boot time if the network has a BOOTP server. The BOOTP server assigns the adapter a preconfigured IP address, a subnet mask, and a gateway address; therefore, you do not have to configure these using the parameters in the adapter. BOOTP can make it easier to administer an Ethernet network. A free version of Rockwell Software’s BOOTP Server can be accessed at http://www.software.rockwell.com/support/download/detail.cfm?ID=3390.

C

CAN (Controller Area Network)

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

ControlFLASH

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

Controller

A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. See also Scanner.

D

Data Rate

The speed at which data is transferred on the Modbus/TCP network. You can set the adapter to a data rate of 10 Mbps Full-Duplex, 10 Mbps Half-Duplex, 100 Mbps Full-Duplex, or 100 Mbps Half-Duplex. If another device on the network sets or auto-negotiates the data rate, you can set the adapter to automatically detect the data rate.

Datalinks

A Datalink is a type of pointer used by PowerFlex 7-Class drives to transfer data to and from the controller. Datalinks allow specified parameters to be read or written to without using explicit messages. When enabled, each Datalink in a PowerFlex 7-Class drive consumes either four bytes or eight bytes in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI (Drive Peripheral Interface)

A second generation peripheral communication interface used by various Allen-Bradley drives and power products, such as PowerFlex 7-Class drives. It is a functional enhancement to SCANport.

DPI Peripheral

A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as “adapters” or “modules.” The 20-COMM-M adapter, 1203-USB or 1203-SSS converter, and PowerFlex 7-Class HIMs (20-HIM-xxx) are examples of DPI peripherals.

DPI Product

A device that uses the DPI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex 7-Class drive is a DPI product. In this manual, a DPI product is also referred to as “drive” or “host.”

DriveExplorer Software

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

DriveTools SP Software

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

Duplex

Duplex describes the mode of communication. *Full-duplex* communications let a device exchange data in both directions at the same time. *Half-duplex* communications let a device exchange data only in one direction at a time. The duplex used by the adapter depends on the type of duplex that other network devices, such as switches, support.

E

EDS (Electronic Data Sheet) Files

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

F

Fault Action

A fault action determines how the adapter and connected drive act when a communications fault (for example, a cable is disconnected) occurs.

Fault Configuration

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

Flash Update

The process of updating firmware in a device. The adapter can be flash updated using various Allen-Bradley software tools. Refer to Flash Updating the Adapter on page 3-13 for more information.

G

Gateway

A device on a network that connects an individual network to a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. You need to configure the address for the gateway device in the adapter if you want the adapter to communicate with devices that are not on its network.

H

Hardware Address

Each Ethernet device has a unique hardware address (sometimes called a MAC address) that is 48 bits. The address appears as six digits separated by colons (for example, xx:xx:xx:xx:xx:xx). Each digit has a value between 0 and 255 (0x00 and 0xFF). This address is assigned in the hardware and cannot be changed. It is required to identify the device if you are using a BOOTP utility.

HIM (Human Interface Module)

A device that can be used to configure and control a drive. PowerFlex 7-Class HIMs (20-HIM-xxx) can be used to configure PowerFlex 7-Class drives and their connected peripherals.

Hold Last

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

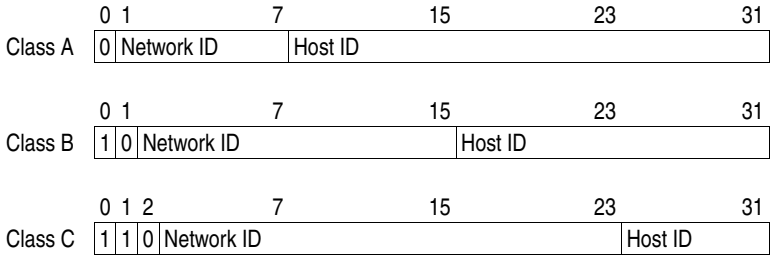
I/O Data

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

IP Addresses

A unique IP address identifies each node on an Modbus/TCP network. An IP address consists of 32 bits that are divided into four segments of one byte each. It appears as four decimal integers separated by periods (xxx.xxx.xxx.xxx). Each "xxx" can have a decimal value from 0 to 255. For example, an IP address could be 192.168.0.1.

An IP address has two parts: a network ID and a host ID. The class of network determines the format of the address.



The number of devices on your Modbus/TCP network will vary depending on the number of bytes that are used for the network address. In many cases you are given a network with a Class C address, in which the first three bytes contain the network address (subnet mask = 255.255.255.0). This leaves 8 bits or 256 addresses on your network. Because two addresses are reserved for special uses (0 is an address for the network usually used by the router, and 255 is an address for broadcast messages to all network devices), you have 254 addresses to use on a Class C address block.

To ensure that each device on the Internet has a unique address, contact your network administrator or Internet Service Provider for unique fixed IP addresses. You can then set the unique IP address for the adapter by using a BOOTP server or by manually configuring parameters in the adapter. The adapter reads the values of these parameters only at power-up.

L

Logic Command/Logic Status

The Logic Command is used to control the PowerFlex 7-Class drive (for example, start, stop, direction). It consists of one 16-bit word of output to the adapter from the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix C.

The Logic Status is used to monitor the PowerFlex 7-Class drive (for example, operating state, motor direction). It consists of one 16-bit word of input from the adapter to the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix C.

M

Modbus/TCP Network

Modbus/TCP is an open network designed for use in industrial environments. Modbus/TCP allows industrial devices to perform control, configuration, and monitoring tasks using standard Ethernet IEEE 802.3 equipment, the TCP/IP protocol (which uses Ethernet II framing), and the Modbus/TCP protocol. Modbus/TCP by itself, as with any Ethernet-based protocol, does not address control determinism issues, though they can be minimized by network design and the use of commercial network switches.

N

NVS (Non-Volatile Storage)

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

P

PCCC (Programmable Controller Communications Command)

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

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. On Ethernet, a ping can be used to determine if a node exists.

PowerFlex 7-Class (Architecture Class) Drives

The Allen-Bradley PowerFlex 7-Class family of drives supports DPI and includes the PowerFlex 70, PowerFlex 700, PowerFlex 700H, PowerFlex 700S, PowerFlex 700L, and PowerFlex 7000. These drives can be used for applications ranging from 0.37…3000 kW (0.5…4000 HP).

R

Reference/Feedback

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

Feedback is used to monitor the speed of the drive. It consists of one word of input 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

Status Indicators

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

Subnet Mask

An extension to the IP addressing scheme that lets you use a single network ID for multiple physical networks. A bit mask identifies the part of the address that specifies the network and the part of the address that specifies the unique node on the network. A “1” in the subnet mask indicates the bit is used to specify the network. A “0” in the subnet mask indicates that the bit is used to specify the node.

For example, a subnet mask on a network may appear as follows: 11111111 11111111 11111111 11000000 (255.255.255.192). This mask indicates that 26 bits are used to identify the network and 6 bits are used to identify devices on each network. Instead of a single physical Class C network with 254 devices, this subnet mask divides it into four networks with up to 62 devices each.

Switches

Network devices that provide virtual connections that help to control collisions and reduce traffic on the network. They are able to reduce network congestion by transmitting packets to an individual port only if they are destined for the connected device. In a control application, in which real time data access is critical, network switches may be required in place of hubs.

T

TCP (Transmission Control Protocol)

Modbus/TCP uses this protocol to transfer packets using IP. TCP guarantees delivery of data through the use of retries.

Z

Zero Data

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

L

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W

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

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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