User Manual

Allen-Bradley

Dual-Port EtherNet/IP Communication Adapter

Catalog Number 20-COMM-ER

Allen-Bradley · Rockwell Software

Rockwell Automation

Important User Information

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

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

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

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

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

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

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

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Preface

About This Manual

This manual provides information about the adapter and using it with PowerFlex 7-Class (Architecture-Class) drives or Bulletin 150 SMC Soft Starters. The adapter can be used with other products that support a DPI™ adapter, such as the DPI External Comms Kit (20-XCOMM-DC-BASE). See the documentation for your product for specific information about how it works with the adapter.

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name—for example **Parameter 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 revision number (FRN) is displayed as FRN *X.xxx*, where '*X*' is the major revision number and '*xxx*' is the minor revision number.

- The screen images in this manual resulted from using the following software:
  – RSLinx® Classic software, version 2.51
  – RSLogix 5000 software, version 16

  Different versions of the software may have screens that vary in appearance, and differences in procedures.

Rockwell Automation Support

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

Local Product Support

Contact your local Rockwell Automation representative for the following:

- Sales and order support
- Product technical training

- Warranty support
- Support service agreements

Technical Product Assistance

For technical assistance, please review the information in Chapter 7, Troubleshooting, first. If you still have problems, then access the Allen-Bradley Technical Support website at www.ab.com/support/abdrives or contact Rockwell Automation.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation wiring and grounding guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.
Industrial Security Best Practices, publication SECUR-AT001	Provides further information and guidelines on product and system security.
PowerFlex 7-Class DPI (Drive Peripheral Interface) Network Communication Adapter Installation Instructions, publication 20COMM-IN004	Information on the installation of PowerFlex® 20-COMM-x Network Communication Adapters.
EtherNet/IP Media Planning and Installation Manual, ODVA publication 148 [1]	Information on the planning, installation, and techniques used to implement an EtherNet/IP network.
EtherNet/IP Network Infrastructure Guidelines, ODVA publication 35 [1]	
Ethernet Design Considerations Reference Manual, publication ENET-RM002	
Connected Components Workbench website http://www.ab.com/support/abdrives/webupdate/software.html, and online help	Information on the Connected Components Workbench™ software tool—and includes a link for **free** software download.
PowerFlex 20-HIM-A3/-A5/-C3S/-C5S HIM Quick Reference, publication 20HIM-QR001	Information on the use of the PowerFlex 20-HIM-A3, 20-HIM-A5, 20-HIM-C3S, and 20-HIM-C5S HIMs.
PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication 20HIM-UM001	Information on the installation and use of the PowerFlex 20-HIM-A6 and 20-HIM-C6S HIMs.
PowerFlex 70 User Manual, publication 20A-UM001 PowerFlex 70/700 Reference Manual, publication PFLEX-RM001 PowerFlex 70EC/700VC Reference Manual, publication PFLEX-RM004	Information on installing, programming, and technical data of PowerFlex 70 and PowerFlex 70EC drives.
PowerFlex 700 Series A User Manual, publication 20B-UM001 PowerFlex 700 Series B User Manual, publication 20B-UM002 PowerFlex 70/700 Reference Manual, publication PFLEX-RM001 PowerFlex 70EC/700VC Reference Manual, publication PFLEX-RM004	Information on installing, programming, and technical data of PowerFlex 700/700VC Series A and PowerFlex 700VC Series B drives.
PowerFlex 700H Installation Instructions, publication PFLEX-IN006 PowerFlex 700H Programming Manual, publication 20C-PM001	Information on installing, programming, and technical data of PowerFlex 700H drives.

Resource	Description
PowerFlex 700S w/Phase I Control Installation Manual (Frames 1…6), publication 20D-IN024 PowerFlex 700S w/Phase I Control Installation Manual (Frames 9 and 10), publication PFLEX-IN006 PowerFlex 700S w/Phase I Control User Manual (All Frame Sizes), publication 20D-UM001 PowerFlex 700S w/Phase I Control Reference Manual, publication PFLEX-RM002 PowerFlex 700S w/Phase II Control Installation Manual (Frames 1…6), publication 20D-IN024 PowerFlex 700S w/Phase II Control Installation Manual (Frames 9…14), publication PFLEX-IN006 PowerFlex 700S w/Phase II Control Programming Manual (All Frame Sizes), publication 20D-PM001 PowerFlex 700S w/Phase II Control Reference Manual, publication PFLEX-RM003	Information on installing, programming, and technical data of PowerFlex 700S drives.
PowerFlex 700L User Manual, publication 20L-UM001	Information on installing, programming, and technical data of PowerFlex 700L Liquid-Cooled AC drives.
SMC Flex Smart Motor Controller User Manual, publication 150-UM008	Information on installing, programming, and technical data of SMC Flex State Smart Motor Controller.
SMC-50 Solid-State Smart Motor Controller User Manual, publication 150-UM011	Information on installing, programming, and technical data of SMC-50 Solid-State Smart Motor Controller.
PowerFlex Digital DC Drive User Manual, publication 20P-UM001	Information on installing, programming, and technical data of PowerFlex Digital DC drives.
Getting Results with RSLinx Guide, publication LINX-GR001and online help [1]	Information on using RSLinx Classic software.
RSLogix Emulate 5/500 Getting Results Guide, publication EMULAT-GR002 and online help	Information on how to install and navigate the RSLogix Emulate software for ladder logic programming with Allen-Bradley® PLC-5® and SLC™ 500 processors.
RSLogix 500 Getting Results Guide, publication LG500-GR002 and online help [1]	Information on using RSLogix 500 software tool.
RSLogix 5000 PIDE Autotuner Getting Results Guide, publication PIDE-GR001 and online help [1]	Information on using RSLogix 5000 software tool.
EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001	Information on using the ControlLogix® 1756-ENBT or 1756-EN2T EtherNet/IP communication modules with your Logix5000 controller and communicating with various devices on the EtherNet/IP network.
Enhanced and Ethernet PLC-5 Programmable Controllers User Manual, publication 1785-UM012	Information to help design, operate and maintain an Enhanced and Ethernet PLC-5 programmable controller system.
MicroLogix 1100 Programmable Controllers User Manual, publication 1763-UM001 MicroLogix 1400 Programmable Controllers User Manual, publication 1766-UM001	Information to install, wire, and troubleshoot the MicroLogix™ 1100 and MicroLogix 1400 controllers respectively.
Web Updates http://www.ab.com/support/abdrives/webupdate/	Flash Update Files, Product Help Files, Control Bar Files, GSD Files, EDS File links, DriveTools SP / Drive AOP Database Files, and other downloads to keep your Allen-Bradley brand drive products up to date

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

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 http://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 http://www.ab.com/support/abdrives and click on the Downloads or Knowledgebase link.

Notes:

Getting Started

The adapter is intended for installation in a PowerFlex 7-Class drive or Bulletin 150 SMC soft starter and is used for network communication.

Components
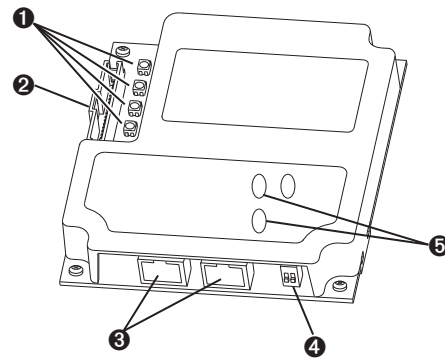
Item	Part	Description
❶	Status Indicators	Four status indicators that indicate the status of the DPI, the adapter, and network connection. See Chapter 7, Troubleshooting.
❷	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
❸	Ethernet Connector	RJ-45 connector for the Ethernet network cable. The connector is CAT-5 compliant to ensure reliable data transfer on 100Base-TX Ethernet connections.
❹	Web Pages Switch (SW4)	Enables or disables the adapter web pages. See Setting the Web Pages Switch on page 19.
❺	Address/mode switches	Set IP address or DHCP/BootP mode.

Features

The features of the adapter include the following:

- Typical mounting in a PowerFlex 7-Class drive or SMC soft starter.

- Captive screws to secure and ground the adapter to the drive.

- Compatibility with various configuration tools to configure the adapter and connected host drive, including the following tools:
  - PowerFlex HIM (Human Interface Module) on the drive or SMC, if available
  - Connected Components Workbench software, version 1.02 or later
  - DriveExplorer software, version 2.01 or later
  - DriveExecutive software, version 3.01 or later
  - RSLogix5000 version16 and later with Drives Add-on Profile version 4.05 and later

  Additionally, you can use a BOOTP/DHCP 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-configured I/O (Logic Command/Reference and up to four pairs of Datalinks) to accommodate application requirements.

- Explicit Messaging support.

- Master-Slave or Peer-to-Peer hierarchy that can be configured to transmit data to and from either a controller or another PowerFlex drive or SMC on the network.

- User-defined fault actions to determine how the adapter and connected PowerFlex drive respond to the following:
- I/O messaging communication disruptions (Comm Flt Action)
- Controllers in idle mode (Idle Flt Action)

- Web pages, viewed by using a web browser, that show information about the adapter, its connected host drive, and 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 or idle fault action.

- Access to any PowerFlex drive or SMC and its connected peripherals on the network to which the adapter is connected.

- Device Level Ring (DLR) or Star Topology support with Quality of Service (QoS) support.

Compatible Products

At the time of publication, the adapter is compatible with the following products:

- PowerFlex 70/70EC drives
- PowerFlex 700/700VC drives
- PowerFlex 700H drives
- PowerFlex 700S drives
- PowerFlex 7000/7000-2 drives

- PowerFlex 700L drives
- PowerFlex Digital DC drives
- DPI External Comms Kit
- SMC™-50
- SMC™ Flex

Note: The adapter is not compatible with PowerFlex 750 series drives.

Required Equipment

Some of the equipment that is required for use with the adapter is shipped with the adapter, but some you must supply yourself.

Equipment Shipped with the Adapter

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

❑ One 20-COMM-ER EtherNet/IP adapter

❑ One 2.54 cm (1 in.) long and one 15.24 cm (6 in.) long Internal Interface cable (only one cable is needed to connect the adapter to the drive; for which cable to use, see <u>Figure 3 - on page 2-21</u>)

❑ One PowerFlex 7-Class DPI (Drive Peripheral Interface) Network Communication Adapter Installation Instructions, publication 20COMM-IN004

❑ One LED Identification Label for use with Bulletin 150 SMC Flex and Bulletin 700 PowerFlex drives

User-Supplied Equipment

To install and configure the adapter, you must supply the following:

❑ A small flathead screwdriver

❑ Ethernet cable (for details, see the EtherNet/IP Media Planning and Installation Manual, ODVA publication 148 available on the ODVA website at <u>http://odva.org/Home/ODVATECHNOLOGIES/ EtherNetIP/EtherNetIPLibrary/tabid/76/Default.aspx</u>)

❑ Ethernet switch (for details, see the Ethernet Design Considerations Reference Manual, publication ENET-RM002)

❑ Configuration tool, such as the following:

– PowerFlex 20-HIM-xx HIM

– Connected Components Workbench software, version 1.02 or later

Connected Components Workbench is the recommended stand-alone software tool for use with PowerFlex drives. You can obtain a **free copy** by:

- Internet download at
http://www.ab.com/support/abdrives/webupdate/software.html

- Requesting a DVD at
http://www.ab.com/onecontact/controllers/micro800/

Your local distributor may also have copies of the DVD available.

Connected Components Workbench software cannot be used to configure SCANport-based drives or Bulletin 160 drives.

– DriveExplorer software, version 2.01 or later

This software tool has been discontinued and is now available as **freeware** at http://www.ab.com/support/abdrives/webupdate/software.html. There are no plans to provide future updates to this tool and the download is being provided 'as-is' for users that lost their DriveExplorer CD, or need to configure legacy products not supported by Connected Components Workbench software.

– DriveExecutive software, version 3.01 or later

A Lite version of DriveExecutive software ships with RSLogix 5000, RSNetWorx MD, FactoryTalk AssetCentre, and ItelliCENTER software. All other versions are purchasable items:

- 9303-4DTE01ENE Drive Executive software

- 9303-4DTS01ENE DriveTools SP Suite (includes DriveExecutive and DriveObserver software)

- 9303-4DTE2S01ENE DriveExecutive software upgrade to DriveTools SP Suite (adds DriveObserver software)

DriveExecutive software updates (patches, and so forth) can be obtained at http://www.ab.com/support/abdrives/webupdate/software.html. It is highly recommended that you periodically check for and install the latest update.

– BOOTP server, version 2.1 or higher, for network setup only

❑ Controller configuration software, such as RSLogix 5/500/5000

❑ A computer connection to the EtherNet/IP 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 or SMC, 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 electrostatic discharge (ESD) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, see Guarding Against Electrostatic Damage, publication 8000-4.5.2.

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

ATTENTION: Risk of injury or equipment damage exists. **Parameters 21 - [Comm Flt Action]**, **24 - [Idle Flt Action]**, and **43 - [Peer Flt Action]** let you determine the action of the adapter and connected drive if communication is disrupted or the controller is idle. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable or a controller in idle state).

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

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

Quick Start

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

Step	Action	See
1	Review the safety precautions for the drive or SMC	Drive or SMC User Manual
2	Review the safety precautions for the adapter	Throughout this manual
3	Verify that the power control device is properly installed.	Drive or SMC User Manual
4	Install the adapter. a. Verify that the power control device is not powered. b. Connect the adapter to the device with the Internal Interface cable. c. Use the captive screws to secure and ground the adapter to the device. d. Connect the adapter to the network with an Ethernet cable. **NOTE:** When installing the adapter in the DPI External Comms Kit—see 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
5	Apply power to the adapter. a. Verify that the adapter is installed correctly. b. The adapter receives power from the drive or SMC. Apply power to the device. The status indicators should be green. If they flash red, there is a problem. See Chapter 7, Troubleshooting. c. Configure and verify key drive or SMC parameters.	Chapter 2, Installing the Adapter
6	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 • Master-Slave or Peer-to-Peer hierarchy • Fault actions	Chapter 3, Configuring the Adapter
7	Configure the controller to communicate with the adapter. Use a controller configuration tool, such as RSLogix software, to configure the master on the network to recognize the adapter and drive or SMC.	Chapter 4, Configuring the I/O
8	Create a ladder logic program. Use a controller configuration tool, such as RSLogix software, to create a ladder logic program that enables you to do the following: • Control the connected device, via the adapter, by using I/O. • Monitor or configure the device or SMC by using explicit messages.	Chapter 5, Using the I/O Chapter 6, Using Explicit Messaging

Installing the Adapter

This chapter provides instructions for installing the adapter in a PowerFlex 7-Class drive.

EMC Conformance

For all PowerFlex 70 and 700 drive installations that require CE conformance per EN61800-3, a ferrite core must be installed on each EtherNet/IP cable connected to the drive.

These ferrites are not required for installation on SMC products.

A ferrite core such as FAIR-RITE part number 2643803802 needs to be installed according to the following diagram.

Note: the cable is wrapped 4 times around each core.

Figure 1 - Ferrite Core Installation
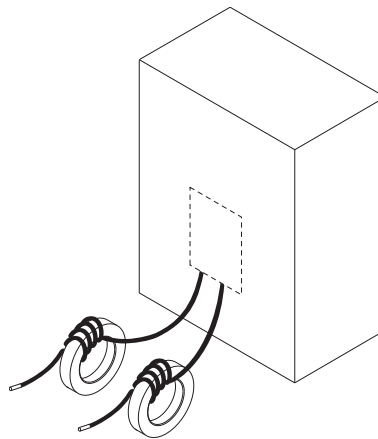
Preparing for an Installation

Before installing the adapter, do the following:

- Make sure the Ethernet switch is the correct type. A 'managed' switch that supports IGMP snooping is usually recommended. An 'unmanaged' switch can be used instead if RSLogix 5000 software, version 18.00 or later, is used and all devices on the network are configured for 'unicast' I/O. For more details, see the following documents:

    - EtherNet/IP Media Planning and Installation Manual, ODVA publication 148
    - EtherNet/IP Network Infrastructure Guidelines, ODVA publication 35
    - Ethernet Design Considerations Reference Manual, publication ENET-RM002

- Understand IGMP Snooping/Ethernet Switches

    The 20-COMM-ER adapter is a multicast device. In most situations, an IGMP snooping (managed) switch is required. If more than one or two 20-COMM-ER adapters are connected to the switch, a managed switch is required—otherwise the drive may fault on a DPI Port x network loss. The 20-COMM-ER, RSLogix 5000 software, version 18.00 or later, and a ControlLogix or CompactLogix controller will support unicast. Unicast setup is required when adding the drive to the I/O. When all adapters are set up as unicast devices, then an IGMP snooping (managed) switch is not needed.

    Much of EtherNet/IP implicit (I/O) messaging uses IP multicast to distribute I/O control data, which is consistent with the CIP producer/consumer model. Historically, most switches have treated multicast packets the same as broadcast packets. That is, all multicast packets are re-transmitted to all ports.

    IGMP snooping constrains the flooding of multicast traffic by dynamically configuring switch ports so that multicast traffic is forwarded only to ports associated with a particular IP multicast group.

    Switches that support IGMP snooping (managed switches) 'learn' which ports have devices that are part of a particular multicast group and only forward the multicast packets to the ports that are part of the multicast group.

    Be careful as to what level of support a switch has of IGMP snooping. Some layer 2 switches that support IGMP snooping require a router (which could be a layer 3 switch) to send out IGMP polls to learn what devices are part of the multicast group. Some layer 2 switches can use IGMP snooping without a router sending polls. If your control system is a standalone network or is required to continue performing if the router is out of service, make sure the switch you are using supports IGMP snooping without a router being present.

- See <u>Appendix A</u> for the number of CIP connections supported by the 20-COMM-ER adapter.

- Verify that you have all required equipment. See <u>Required Equipment on page 13</u>.

Setting the Web Pages Switch

To use the adapter web pages, the Web Pages Switch must be set to its 'Enable Web' position. For information to enable or disable web pages for an adapter, see <u>Setting Web Access Control on page 42</u>.

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

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 (SW4 in <u>Figure 2</u>) to enable or disable the adapter web pages. By default, the adapter web pages are disabled. For complete details on adapter web pages, see <u>Viewing the Adapter Web Pages on page 153</u>.

Figure 2 - Setting Web Pages Switch (only Series B Adapter)
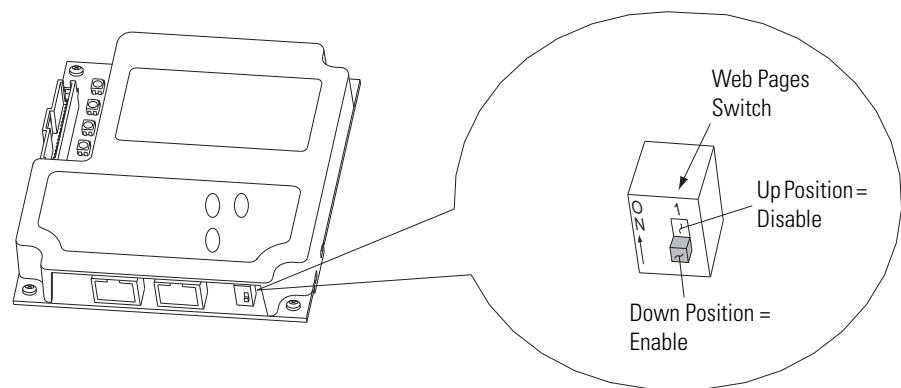
Setting	Description
Down (OFF) position	Web server enabled
Up (ON) position	Web server disabled (as shipped)

Connecting the Adapter to the Drive or SMC

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

1. Remove **ALL** power from the drive or SMC.

2. Use static control precautions.

3. Remove the drive or SMC 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 3).

5. Secure and ground the adapter to the drive or SMC (see Figure 4) 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 an SMC Flex, put the wire lug between the mounting screw and 20-COMM-ER board

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

Figure 3 - DPI Ports and Internal Interface Cables

20-COMM-ER Adapter

❶

❷

❸

PowerFlex 70 - All Frames

7

8

SMC-50

❹

PowerFlex 700 Frames 0 and 1
PowerFlex 700S Frames 0 and 1

PowerFlex 700 Frames 2 and Larger
PowerFlex 700S Frames 2 through 6

SMC Flex

HIM panel opens to allow access to DPI interface. To open panel, remove screws on left side of HIM panel and swing open.

X2

X1

❹

PowerFlex 700H Frames 9 and Larger

Place ground wire tab between mounting screw and circuit board

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 4 - Mounting and Grounding the Adapter

0.9 N•m (8.0 lb•in) 4 Places

Drive

Adapter

Internal Interface Cable folded behind the adapter and in front of the drive.

PowerFlex 70 - All Frame Sizes
(Adapter mounts in drive.)

Ground Tab Detail

0.9 N•m
(8.0 lb•in)

Verify metal ground tab is bent 90° and is under the adapter before tightening screw. After tightening the screw, verify continuity exists between the head of the screw and drive ground.

PowerFlex 700 Frames 0 and 1
PowerFlex 700S Frames 0 and 1
(Adapter mounts on door.)

PowerFlex 700 Frames 2 and Larger
PowerFlex 700S Frames 2 through 6
(Adapter mounts in drive.)

Ground Tab Detail

X2

X1

0.9 N•m
(8.0 lb•in)
4 Places

Verify metal ground tab is bent 90° and is under the adapter before tightening screw. After tightening the screw, verify continuity exists between the head of the screw and drive ground.

PowerFlex 700H Frames 9 and Larger
PowerFlex 700S Frames 9 and Larger
(Adapter mounts behind HIM panel.)

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 5 for an example of wiring to an EtherNet/IP network.

Figure 5 - Connecting the Ethernet Cable in a Linear Topology Network

(1) The option module's ENET1 and ENET2 network ports are used.
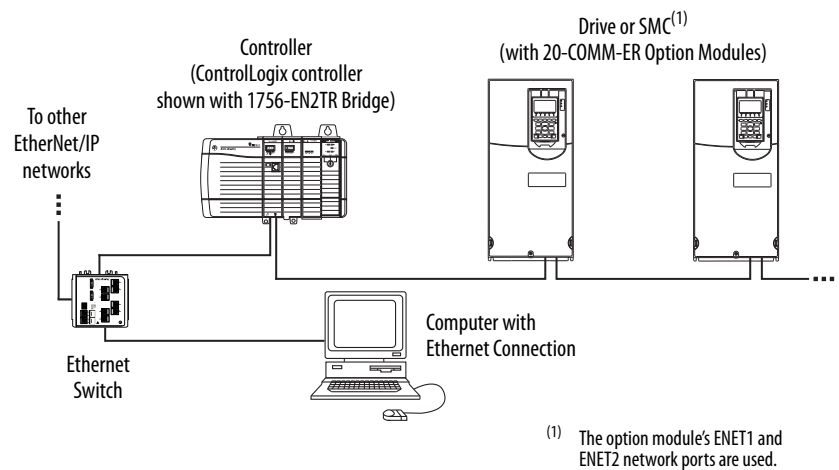
Figure 6 - Connecting the Ethernet Cable in a DLR Topology Network

(1) The option module's ENET1 and ENET2 network ports are used.
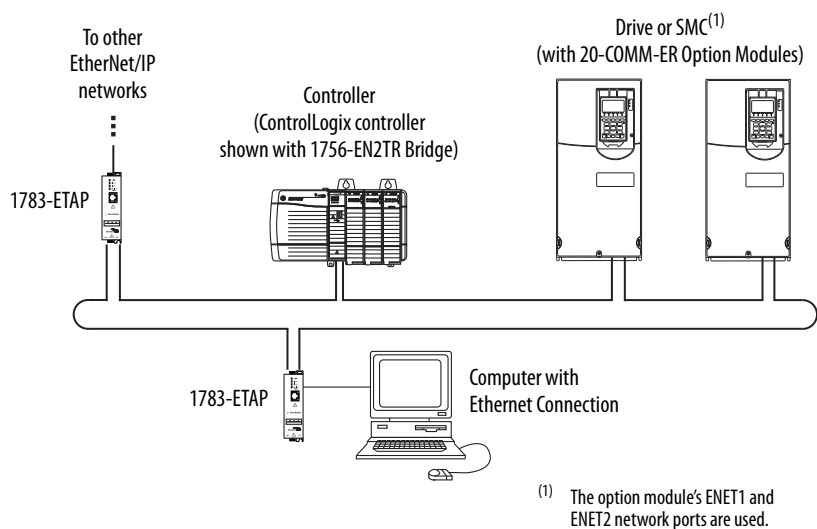
4. For Linear or DLR Network Topology, route the other end of the Ethernet cable from the network through the bottom of the first drive, and insert its cable plug into the option module ENET1 network port.

To connect to the second drive, attach another Ethernet cable between the first drive's option module ENET2 network port and the second drive's option module ENET1 network port.

To connect additional drives, repeat these daisy-chain connections in the same way.

5. Route the other end of the Ethernet cable through the bottom of the PowerFlex drive (Figure 4) 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 device cover or close the drive door, and apply power to the device. The adapter receives its power from the connected device. 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. See Chapter 7, Troubleshooting.

Start-Up Status Indications

After power has been applied, the status indicators for the device and communications adapter can be viewed on the front of the device (Figure 7). Possible start-up status indications are shown in Table 1.

Figure 7 - Drive and Adapter Status Indicators (location will vary by device)
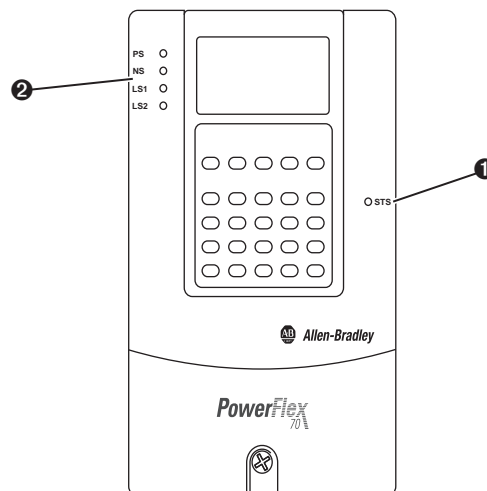
Table 1 - Drive and Adapter Start-Up Status Indications

Item	Name	Color	State	Description
			Drive STS Indicator	
❶	STS (Status) refer to drive or SMC manual for status indication information)	Green	Flashing	Device ready but not running, and no faults are present.
			Steady	Device running, no faults are present.
		Yellow	Flashing, device stopped	An inhibit condition exists – the drive cannot be started. Check device Parameter 214 - [Start Inhibits].
			Flashing, device running	An intermittent type 1 alarm condition is occurring. Check device Parameter 211 - [Drive Alarm 1].
			Steady, device running	A continuous type 1 alarm condition exists. Check device Parameter 211 - [Drive Alarm 1].
		Red	Flashing	A fault has occurred.
			Steady	A non-resettable fault has occurred.
			Adapter Status Indicators	
❷	PS	Off	Steady	No power
		Orange	Flashing	Requesting DPI I/O Connections
			Steady	Peripheral is Connected to an incompatible product or no DPI ping events are detected.
		Green	Flashing	Normal Operation (DPI connected) - No I/O, or PLC in Program
			Steady	Normal Operation (DPI connected) - I/O Operational
		Red	Flashing	DPI Problem, Bad CRC of Adapter Parameters or Flash Program
			Steady	DPI Failure or Failed power-on diagnostic test (hardware failure)
		Green/ Red	Flashing	Flash update in progress
	NS	Off	Steady	No power OR no IP Address
		Green	Flashing	An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out
			Steady	At least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out
		Red	Flashing	Connection has timed out see the "The EtherNet Adaptation of CIP" Specification sections 9-4.4 for detailed behavior description
			Steady	Duplicate IP Address detected
		Orange	Steady	Adapter Failure (used in conjunction with PS orange)
		Green/ Red	Flashing	Self-test on power up
	LS1	Off	Steady	No Network Activity
		Green	Flashing	Network activity at 100 Mbps
		Yellow	Flashing	Network activity at 10 Mbps
	LS2	Off	Steady	No Network Activity
		Green	Flashing	Network activity at 100 Mbps
		Yellow	Flashing	Network activity at 10 Mbps

After verifying correct operation, close or install the drive cover. For more details on status indicator operation, see .

Configuring and 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. After installing the adapter and applying power, you can set the IP address by using a BOOTP/DHCP server or adapter parameters. See for details.

By default, the adapter is configured so that you must set the IP address using a BOOTP/DHCP server or by setting the adapter to a valid address, 1-254, via the rotary switches on the adapter. An invalid address 0 or >254 will cause the module to defer to the addressing mode selected by parameter 3 [BOOTP/ DHCP]. If disabled, the adapter will use the address information stored in the adapters database. If that address is invalid, the adapter will try to contact a DHCP server on the network. To use adapter parameters, you must disable the BOOTP feature. For details, see .

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 in the adapter.

Topic	Page
Configuration Tools	27
Using the PowerFlex 7-Class HIM	28
Using BOOTP	29
Setting the IP Address, Subnet Mask, and Gateway Address	32
Setting the Data Rate	34
Setting the I/O Configuration	35
Selecting Master-Slave or Peer-to-Peer	36
Setting the Reference Adjustment	41
Setting a Fault Action	41
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For a list of parameters, see Appendix B, Adapter Parameters. For definitions of terms in this chapter, see the .

Configuration Tools
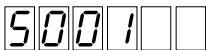
The adapter stores parameters and other information in its own nonvolatile storage (NVS) memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters.

Tool	See
PowerFlex 7-Class HIM	page 28
BOOTP/DHCP server	page 29
Connected Components Workbench software, version 1.02 or later	http://www.ab.com/support/abdrives/webupdate/software.html, or online help (installed with the software)
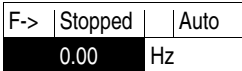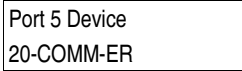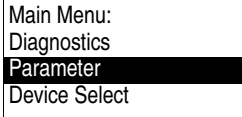
Using the PowerFlex 7-Class HIM

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, see the drive documentation 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.	$5\ 0\ 0\ 1$
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**.	F-> | Stopped | Auto
2. Press the ⏎ (Enter) key to enter your selection.	0.00 Hz
3. Press the ▲ or ▼ key to scroll to the adapter (20-COMM-ER).	Main Menu: Diagnostics Parameter Device Select
4. Press the ⏎ (Enter) key to select the adapter.	Port 5 Device 20-COMM-ER
A parameter database is constructed, and then the main menu for the adapter is displayed.	Main Menu: Diagnostics Parameter Device Select
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.

TIP   When using a PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, see its User Manual, publication 20-HIM-UM001.

SMC Flex controllers require an external HIM (A3 or A6) to program the adapter. The internal Human Interface of the SMC Flex does not allow programming of the Adapter.

Using BOOTP

The IP address, subnet mask and gateway address can be configured multiple ways depending on the setting of the three rotary switches on the adapter. The switches are read on power up or reset.

1. If the switches are set to an address from 1...254, that value will be used as the LSB of the IP address 192.168.1.xxx

2. If the switches are set to an invalid number (000 or a value greater than 254), the unit will check if DHCP is enabled. If DHCP is enabled, the unit requests an address from a DHCP server.
   If DHCP is not enabled and switches are set to an illegal value, the adapter will use the IP address (along with other TCP configurable parameters) stored in nonvolatile memory. If the unit finds that the stored IP configuration is not usable (set to 0), then the unit will revert to the out-of-box behavior of DHCP being enabled.

3. Any other switch setting will cause the adapter to use the IP address data set in the adapter's database parameters.

By default, the adapter is configured so that you can set its IP address, subnet mask, and gateway address by using a BOOTP or a DHCP server. There is a variety of BOOTP servers available. The following instructions use Rockwell Automation's BOOTP Server, version 2.3 or later, a **free** standalone 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. See the Readme file and online Help for directions and more information.

> **TIP** If desired, you can disable BOOTP and configure the IP address, subnet mask, and gateway address with adapter parameters. For details, see .

Configure the Adapter Using a 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 EtherNet/IP network, start the BOOTP software.

The BOOTP Server window appears.
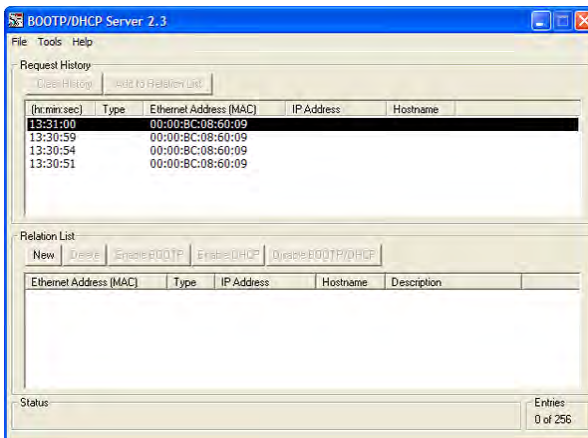
3. Select **Tools > Network Settings** to display the Network Settings window.
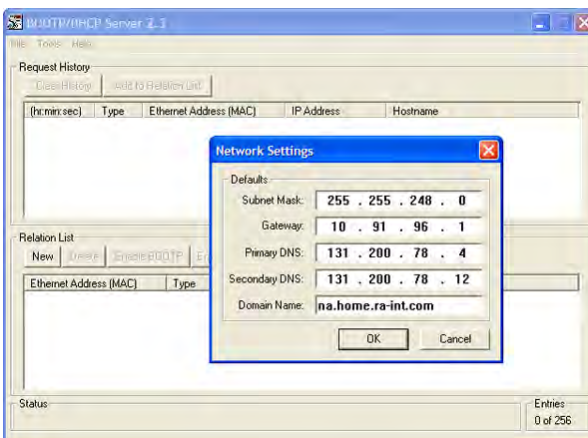
To properly configure devices on your EtherNet/IP network, you must configure settings in the BOOTP software to match the network.

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 .

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 appears.

In the first case, the Ethernet Address (MAC) is automatically entered. In the latter case, you must manually enter it.

7. Edit the following:

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

8. Click **OK** to apply the settings.

The adapter appears in the Relation List with the new settings.
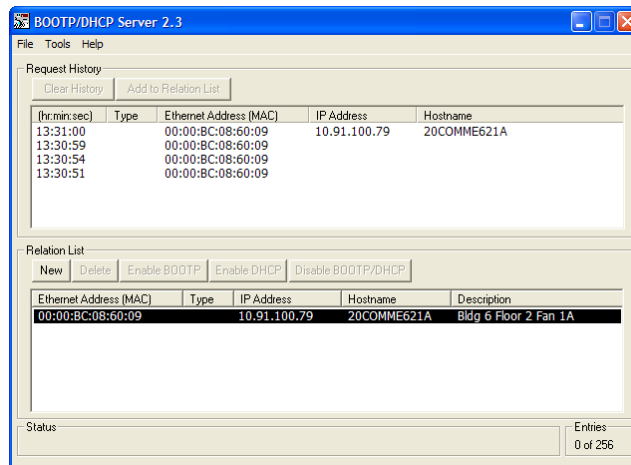
9. To assign this configuration to the adapter permanently, select the device in the Relation List and click **Disable BOOTP/DHCP**.

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 lastly reset the adapter or power cycle the drive.

10. Select **File > Save** to save the Relation List.

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/DHCP server. To use adapter parameters instead, you must disable BOOTP/DHCP and then set the associated adapter parameters.

The IP address can be set using the rotary switches on the adapter to an address from 1...254 that will be used as the lower byte of the IP address 192.168.1.xxx. The Subnet mask will be set to 255.255.255.0.

If the rotary switches are set to any invalid address (0 or >254), the address programmed in the adapter's internal data base will be used.

Disable the BOOTP Feature

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

Port 5 Device
20-COMM-ER
Parameter #: 03 BOOTP
0
Disabled

Value	Setting
0	Disabled
1	Enabled (Default)

   Note: The internal port used by the adapter is different for different products. The examples here show port 5, used by the SMC Flex and drive products. The SMC-50 uses port 4.

2. Reset the adapter; see .

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

Set an IP Address Using Parameters

1. Verify that **Parameter 03 - [BOOTP/DHCP]** is set to '0' (Disabled).

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

```
Port 5 Device
20-COMM-ER
Parameter #: 04
IP Addr Cfg 1
        0
            0 <> 255
```

Default = 0.0.0.0   255.255.255.255

[IP Addr Cfg 1]
[IP Addr Cfg 2]
[IP Addr Cfg 3]
[IP Addr Cfg 4]
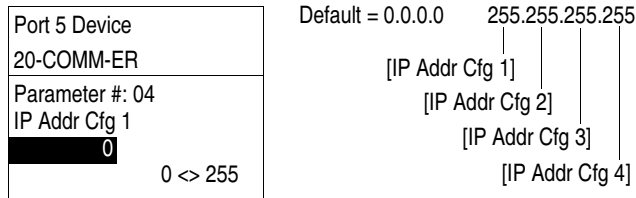
3. Reset the adapter; see .

The Network status indicator will be steady green or flashing green if the IP address is correctly configured, and is connected to an operating ethernet network.

Set a Subnet Mask Using Parameters

1. Verify that **Parameter 03 - [BOOTP/DHCP]** is set to '0' (Disabled).

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

```
Port 5 Device
20-COMM-ER
Parameter #: 08
Subnet Cfg 1
        0
            0 <> 255
```

Default = 0.0.0.0   255.255.255.255

[Subnet Cfg 1]
[Subnet Cfg 2]
[Subnet Cfg 3]
[Subnet Cfg 4]
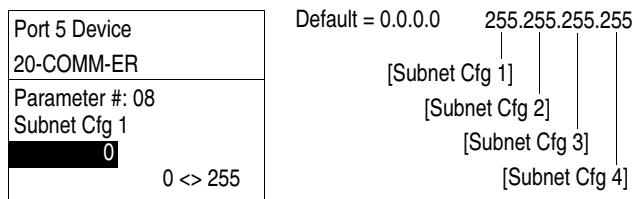
3. Reset the adapter; see .

Set a Gateway Address Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to '0' (Disabled).

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

```
Port 5 Device
20-COMM-ER
Parameter #: 12
Gateway Cfg 1
        0
            0 <> 255
```

Default = 0.0.0.0   255.255.255.255

[Gateway Cfg
[Gateway Cfg 2]
[Gateway Cfg 3]
[Gateway Cfg 4]
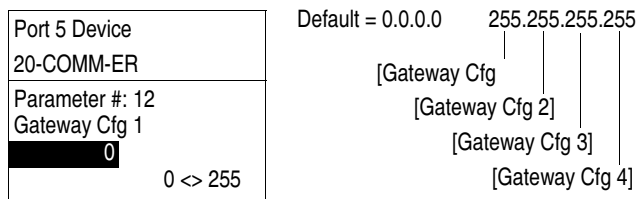
3. Reset the adapter; see .

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 P1 Rate Config]** determines the Ethernet data rate and duplex setting that the adapter will use to communicate. For definitions of data rate and duplex, see Glossary on .

1. Set the value of **Parameter 16 - [EN P1 Rate Config]** to the data rate at which your network is operating.

Port 5 Device
20-COMM-ER
Parameter #: 16 EN P1 Rate Config
0
Autodetect

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 automatically 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 43.

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 18 - [EN P2 Rate Config]** determines the Ethernet data rate and duplex setting that the adapter will use to communicate. For definitions of data rate and duplex, see Glossary on .

1. Set the value of **Parameter 18 - [ENEN P2 Rate Config]** to the data rate at which your network is operating.

Port 5 Device
20-COMM-ER
Parameter #: 18 EN P2 Rate Config
0
Autodetect

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 automatically 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 43.

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. (Datalinks allow you to read/write directly to parameters in the drive using implicit I/O.) A '1' enables the I/O and a '0' disables the I/O.

1. Set the bits in **Parameter 25 - [DPI I/O Cfg]**.

```
Port 5 Device
20-COMM-ER
Parameter #: 25
DPI I/O Cfg
x x x x x x x x x x x 0 0 0 0 1
Cmd/Ref          b00
```

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. It is highlighted above and equals '1'.

2. If a controller is used to control the drive, set adapter **Parameters 37 - [M-S Input]** and **38 - [M-S Output]** for Master-Slave Hierarchy.

   For details, see .

3. 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. See the documentation for your drive for details.

   The the SMC devices do not currently use the reference data sent in the IO frame. No reference configuration is required. Refer to the applicable SMC user manual for the latest reference configuration information.

4. If you enabled one or more Datalinks, configure parameters in the drive to determine the source and destination of data in the Datalink(s).

   When using Datalinks, up to 8 [Data In xx] parameters and/or up to 8 [Data Out xx] parameters must be assigned to point to the appropriate parameters for your application. See Chapter 4 for an example.

5. Reset the adapter; see .

The adapter is ready to receive I/O. You must now configure the adapter to receive I/O from a master or peer device. See Selecting Master-Slave or Peer-to-Peer. If you select a Master-Slave hierarchy, you must also configure the master to communicate with the adapter. See Chapter 4, Configuring the I/O.

Selecting Master-Slave or Peer-to-Peer

A hierarchy determines the type of device with which the adapter exchanges data. In a Master-Slave hierarchy, the adapter exchanges data with a master, such as a scanner or bridge (1756-ENBT, 1756-EN2T, 1747-L5-xxx, and so forth). In a Peer-to-Peer hierarchy, the adapter exchanges data with one or more EtherNet/IP adapters in other devices. (The devices must have compatible Logic Command/ Status words.)

For both Master-Slave and Peer-to-Peer hierarchies, the devices exchanging data must be on the same IP subnet. See 'IP Addresses' in the for information about IP subnets.

Setting a Master-Slave Hierarchy (Scanner-to-Drive Communication)

1. Enable the desired I/O in **Parameter 25 - [DPI I/O Cfg]**.

   See .

2. Set the bits in **Parameter 37 - [M-S Input]**.

   This parameter determines the data received from the master by the device. A '1' enables the I/O and a '0' disables the I/O.

   Port 5 Device
   20-COMM-ER
   Parameter #: 37
   M-S Input
   x x x x x x x x x x x 0 0 0 0 **1**
   Cmd/Ref   b00

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

   Bit 0 is the right-most bit. It is highlighted above and equals '1'.

3. Set the bits in **Parameter 38 - [M-S Output]**.

   This parameter determines the data transmitted from the device to the scanner. A '1' enables the I/O and a '0' disables the I/O.

   Port 5 Device
   20-COMM-ER
   Parameter #: 38
   M-S Output
   x x x x x x x x x x x 0 0 0 0 **1**
   Status/Fdbk   b00

Bit	Description
0	Status/Feedback (Default)
1	Datalink A Output
2	Datalink B Output
3	Datalink C Output
4	Datalink D Output
5…15	Not Used

   Bit 0 is the right-most bit. It is highlighted above and equals '1'.

4. Reset the adapter; see .

The adapter is ready to receive I/O from the master (that is, scanner). You must now configure the scanner to recognize and transmit I/O to the adapter. See Chapter 4, Configuring the I/O.

Setting the Adapter to Transmit Peer-to-Peer Data (Drive-to-Drive Communication)

1. Verify that **Parameter 53 - [Peer Out Enable]** is set to '0' (Off).

   This parameter must be Off while you configure peer output parameters.

Port 5 Device
20-COMM-ER
Parameter #: 53 Peer Out Enable 0 Off

Value	Setting
0	Off (Default)
1	On

2. Set **Parameter 51 - [Peer A Output]** to select the source of the data to output to the network.

Port 5 Device
20-COMM-ER
Parameter #: 51 Peer A Output 1 Cmd/Ref

Value	Description
0	Off (Default)
1	Logic Command/Reference
2…5	Datalink A, B, C, or D Input
6…9	Datalink A, B, C, or D Output

3. If desired, set **Parameter 52 - [Peer B Output]** to select an additional source of the data to output to the network.

Port 5 Device
20-COMM-ER
Parameter #: 52 Peer B Output 2 DL A Input

Value	Description
0	Off (Default)
1	Logic Command/Reference
2…5	Datalink A, B, C, or D Input
6…9	Datalink A, B, C, or D Output

4. Set **Parameters 54 - [Peer Out Time]** and **55 - [Peer Out Skip]** to establish the minimum and maximum intervals between peer messages.

Because the adapter transmits peer messages when a change-of-state condition occurs, minimum and maximum intervals are required.

– The minimum interval ensures that the adapter does not transmit messages on the network too often, thus minimizing network traffic. Set it with **Parameter 54 - [Peer Out Time]**.

– The maximum interval ensures that the adapter transmits messages often enough so that the receiving adapter(s) can receive recent data and verify that communications are working or, if communications are not working, can timeout. The maximum interval is the value of **Parameter 54 - [Peer Out Time]** multiplied by the value of **Parameter 55 - [Peer Out Skip]**.

In the example below, the minimum interval is set to 2.00 seconds (**Parameter 54 - [Peer Out Time]**), and the maximum interval is set to 4.00 seconds (2.00 x '2' setting of **Parameter 55 - [Peer Out Skip]**).

```
Port 5 Device
20-COMM-ER
Parameter #: 54
Peer Out Time
         2.00      s
                  0 <> 10.00
```
Default = 10.00 s

```
Port 5 Device
20-COMM-ER
Parameter #: 55
Peer Out Skip
         2
                  1 <>16
```
Default = 1

5. Set **Parameter 53 - [Peer Out Enable]** to '1' (On).

The adapter will transmit the data selected in **Parameters 51 - [Peer A Output]** and **52 - [Peer B Output]** to the network. Another adapter must be configured to receive the peer I/O data.

Setting the Adapter to Receive Peer-to-Peer Data

1. Verify that **Parameter 49 - [Peer Inp Enable]** is set to '0' (Off).

This parameter must be Off while you configure the peer input parameters.

```
Port 5 Device
20-COMM-ER
Parameter #: 49
Peer Inp Enable
         0
Off
```

Value	Setting
0	Off (Default)
1	On

2. Set **Parameters 44 - [Peer Inp Addr 1]** through **47 - [Peer Inp Addr 4]** to the IP address of the node from which you want to receive data.

Valid nodes must have 20-COMM-ER adapters connected to drives with compatible Logic Command/Status words.

```
Port 5 Device
20-COMM-ER
Parameter #: 44
Peer Inp Addr 1
        0
              0 <> 255
```

IP Address of Node Transmitting Peer I/O   255.255.255.255

[Peer Inp Addr 1]
[Peer Inp Addr 2]
[Peer Inp Addr 3]
Default = 0.0.0.0   [Peer Inp Addr 4]
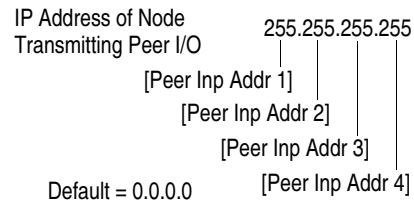
3. Set **Parameter 40 - [Peer A Input]** to select the destination of the data that is input to the drive as Peer A.

```
Port 5 Device
20-COMM-ER
Parameter #: 40
Peer A Input
        1
Cmd/Ref
```

Value	Description
0	Off (Default)
1	Logic Command/Reference
2…5	Datalink A, B, C, or D Input

Data is used from the least significant word in the event of a mismatch in Reference or Datalink sizes.

4. If desired, set **Parameter 41 - [Peer B Input]** to select the destination of the data to input to the device as Peer B.

```
Port 5 Device
20-COMM-ER
Parameter #: 41
Peer B Input
        2
DL A Input
```

Value	Description
0	Off (Default)
1	Logic Command/Reference
2…5	Datalink A, B, C, or D Input

5. If the adapter receives a Logic Command, set the bits in **Parameter 42 - [Peer Cmd Mask]** that the device should use.

The bit definitions for the Logic Command word will depend on the drive to which the adapter is connected. See <u>Appendix D</u> or the device documentation.

```
Port 5 Device
20-COMM-ER
Parameter #: 42
Peer Cmd Mask
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Bit 0              B00
```

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

If the adapter receives a Logic Command from both a master device and a peer device, each command bit must have only one source. The source of command bits set to '0' will be the master device. The source of command bits set to '1' will be the peer device.

6. Reset the adapter (see Resetting the Adapter on page 43) so that changes to **Parameter 42 - [Peer Cmd Mask]** take effect.

7. Set **Parameter 48 - [Peer Inp Timeout]** to the maximum amount of time the adapter will wait for a message before timing out.

Important: This value must be greater than the product of **Parameter 54 - [Peer Out Time]** multiplied by **Parameter 55 - [Peer Out Skip]** in the adapter from which you are receiving I/O.

For example, if the value of **Parameter 54 - [Peer Out Time]** is 2.00 seconds and the value of **Parameter 55 - [Peer Out Skip]** is 2 (see example screen in step 4 on page 37), then **Parameter 48 - [Peer Inp Timeout]** needs to have a value greater than 4.00, such as 5.00 in the example screen below.

```
Port 5 Device
20-COMM-ER
Parameter #: 48
Peer Inp Timeout
        5.00       s
     0.01 <> 10.00
```

Default = 10.00 s

8. Set **Parameter 43 - [Peer Flt Action]** to the action that the adapter will take if it times out.

⚠️ **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 43 - [Peer Flt Action]** lets you determine the action of the adapter and connected device if peer communication is disrupted. By default, this parameter faults the device. You can set this parameter so that the device continues to run, however, precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage. When commissioning the device, verify that your system responds correctly to various situations (for example, a disconnected cable).

```
Port 5 Device
20-COMM-ER
Parameter #: 43
Peer Flt Action
         0
Fault
```

Value	Description
0	Fault (Default)
1	Stop
2	Zero Data
3	Hold Last
4	Send Flt Cfg

For more details, see Setting a Fault Action on page 41.

9. Set **Parameter 49 - [Peer Inp Enable]** to '1' (On).

The adapter is now configured to receive peer I/O from the specified node. Ensure that the specified node is configured to transmit peer I/O.

Setting the Reference Adjustment

A Reference Adjustment is a percent scaling factor for the Reference from the network. It can be set from 0.00...200.00% to allow the drive's Reference to either match the network Reference (= 100.00%), scale below the network Reference (< 100.00%), or scale above the network Reference (> 100.00%).

The SMC controllers do not currently use the reference data sent in the IO frame. No Reference configuration is required. Refer to the applicable SMC user manual for the latest reference configuration information.

> ⚠ **ATTENTION:** To guard against equipment damage and/or personal injury, note that changes to adapter **Parameter 39 - [Ref Adjust]** take effect immediately. A drive receiving its Reference from the adapter will receive the newly scaled Reference, resulting in a change of speed.

If the adapter is receiving a Reference, set **Parameter 39 - [Ref Adjust]** to the desired scaling factor.

| Port 5 Device |
| 20-COMM-ER |
| Parameter #: 39 |
| Ref Adjust |
| 100.00   % |
| 0.00 <> 200.00 |

Default = 100.00%

The adjustment takes effect as soon as it is entered.

Setting a Fault Action

By default, when I/O communication is disrupted (for example, a cable is disconnected) or the controller is idle (in program mode or faulted), the drive responds by faulting if it is using I/O from the network. You can configure a different response to these events:

- Disrupted I/O communication by using **Parameter 23 - [Comm Flt Action]**

- An idle controller by using **Parameter 24 - [Idle Flt Action]**

> ⚠ **ATTENTION:** Risk of injury or equipment damage exists. **Parameters 23 - [Comm Flt Action]** and **24 - [Idle Flt Action]** let you determine the action of the adapter and connected device if I/O communication is disrupted or the controller is idle. By default, these parameters fault the device. You can set these parameters so that the device continues to run, however, precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the device, verify that your system responds correctly to various situations (for example, a disconnected cable or faulted controller).

Changing the Fault Action

Set the values of **Parameters 23 - [Comm Flt Action]** and **24 - [Idle Flt Action]** to any of these desired responses.

Value	Action	Description
0	Fault	The device is faulted and stopped. (Default)
1	Stop	The device is stopped, but not faulted.
2	Zero Data	The device is sent 0 for output data. This does not command a stop.
3	Hold Last	The device continues in its present state.
4	Send Flt Cfg	The device is sent the data that you set in the fault configuration parameters (**Parameters 27 - [Flt Cfg Logic]** through **36 - [Flt Cfg D2 In]**).

```
Port 5 Device
20-COMM-ER
Parameter #: 23
Comm Flt Action
          0
Fault
```

```
Port 5 Device
20-COMM-ER
Parameter #: 24
Idle Flt Action
          0
Fault
```

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

If communication is disrupted and then is re-established, the drive will automatically take commands from the network again.

Setting the Fault Configuration Parameters

If you set **Parameter 23 - [Comm Flt Action]** or **24 - [Idle 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
27 - [Flt Cfg Logic]	A 16-bit value sent to the device for Logic Command.
28 - [Flt Cfg Ref]	A 32-bit value (0…4294967295) sent to the device as a Reference or Datalink.
29 - [Flt Cfg x1 In] through **36 - [Flt Cfg x2 In]**	**Important:** If the device 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 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 device, and other DPI devices connected to the device, such as HIMs or converters. Additionally, the adapter can be configured to automatically send e-mail messages

to desired addresses when selected device 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 8, Viewing the Adapter Web Pages.

By default, the adapter web pages are disabled. See Figure 2 and set the Web Pages Switch (SW4) to the 'Enable Web' (up) position. **Parameter 56 [Web Enabled]** reflects the position of the web enable DIP switch on the adapter.

Important: For a change to the switch setting to take effect, the adapter must be reset (see Resetting the Adapter on page 43).

Bit 0 of **Parameter 57 - [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, see Email Configuration Link on page 162.

Port 5 Device
20-COMM-ER
Parameter #: 57 Web Features x x x x x x x x x x x x x x x **1** E-mail Cfg   b00

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

Bit 0 is the right-most bit. It is highlighted above 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).

Port 5 Device
20-COMM-ER
Parameter #: 22 Reset Module   1 Reset Module

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

When you enter '1' (Reset Module), the adapter will be immediately reset. 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 P1 Rate Act]	The data rate used on port 1 of the adapter
19 - [EN P2 Rate Act]	The data rate used on port 2 of the adapter
20 - [Ref/Fdbk Size]	The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set in the device 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 device and the adapter automatically uses the correct size.
26 - [DPI I/O Act]	The Reference/Feedback and Datalinks used by the adapter. This value is the same as **Parameter 25 - [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	0 = I/O disabled
Bit	7	6	5	4	3	2	1	0	1 = I/O enabled

Parameter	Description
50 - [Peer Inp Status]	The status of the consumed peer input connection. <u>Values</u> 0 = Off 1 = Waiting 2 = Running 3 = Faulted

Updating the Adapter Firmware

The adapter firmware can be 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 updating firmware over the network, you can use the Allen-Bradley ControlFLASH software tool, the built-in update capability of DriveExplorer Full software, or the built-in update capability of DriveExecutive software.

When updating firmware 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 terminal emulation software set to the X-modem protocol.

If using a direct serial connection, you can use DriveExplorer Lite software.

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

- Firmware update enhancements and anomalies
- How to determine the existing firmware revision
- How to update firmware using DriveExplorer, DriveExecutive, ControlFLASH, or HyperTerminal software

Configuring the I/O

This chapter provides instructions on how to configure a Rockwell Automation ControlLogix or MicroLogix 1100/1400 controller to communicate with the adapter and connected PowerFlex drive.

Using RSLinx Classic Software

RSLinx Classic software, in all its variations (Lite, Gateway, OEM, and so forth), is used to provide a communication link between the computer, network, and controller. RSLinx Classic software requires its network-specific driver to be configured before communication is established with network devices. To configure the RSLinx driver, follow this procedure.

1. Start RSLinx Classic software and select **Communications > Configure Drivers** to display the Configure Drivers screen.

2. From the Available Driver Types pull-down menu, choose EtherNet/IP Driver.

3. Click **Add New…** to display the Add New RSLinx Driver screen.

4. Use the default name or type a new name and click **OK**. The 'Configure driver:' screen appears.

5. Depending on your application, select either the browse local or remote subnet option.

6. Click **OK**.

The Configure Drivers screen reappears with the new driver in the Configured Drivers list.
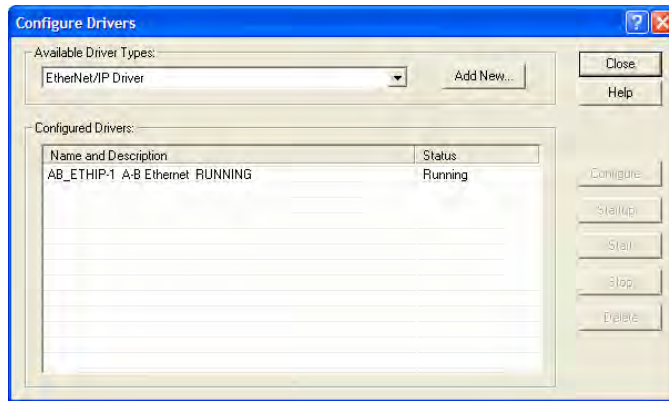
7. Click **Close** to close the Configure Drivers screen.

8. Keep RSLinx running and verify that the computer recognizes the drive.

   a. Select **Communications > RSWho**.

   b. In the menu tree, click '+' next to the Ethernet driver.

   If the 'EtherNet/IP driver' cannot see your drive, as an alternative, use either the 'Ethernet devices' or 'Remote Devices via Linx Gateway' RSLinx driver.

ControlLogix Controller Example

After the adapter is configured, the connected drive and adapter will be a single node on the network. This section provides the steps needed to configure a simple EtherNet/IP network (see Figure 8). In our example, we will configure a ControlLogix controller with 1756-ENBT (Series A) bridge to communicate with a drive using Logic Command/Status, Reference/Feedback, and 16 Datalinks (8 to read and 8 to write) over the network.

Figure 8 - Example ControlLogix EtherNet/IP Network

IP Address 10.91.100.80
ControlLogix Controller
with 1756-ENBT Bridge

IP Address 10.91.100.79
PowerFlex 70 Drive with
20-COMM-ER Adapter

Ethernet
Switch

Computer with
Ethernet Connection
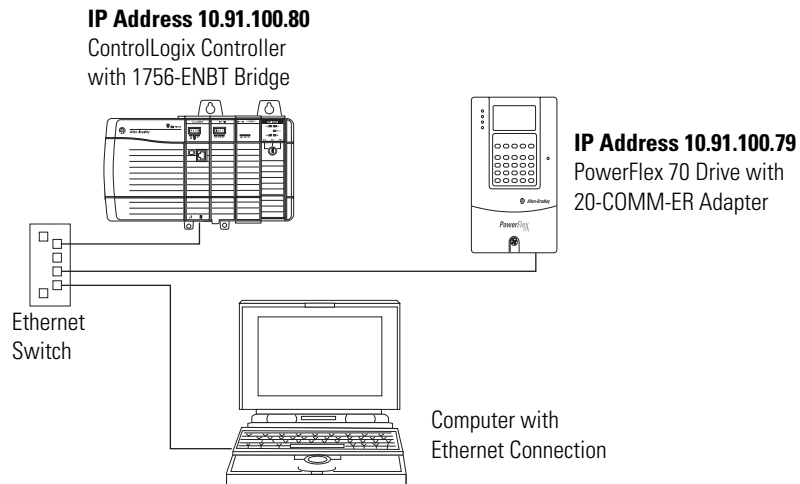
Adding the Bridge to the I/O Configuration

To establish communications between the controller and adapter over the network, you must first add the ControlLogix controller and its bridge to the I/O configuration. This procedure is similar for all RSLogix 5000 versions.

1. Start RSLogix 5000 software.

2. Select **File > New** to display the New Controller screen.
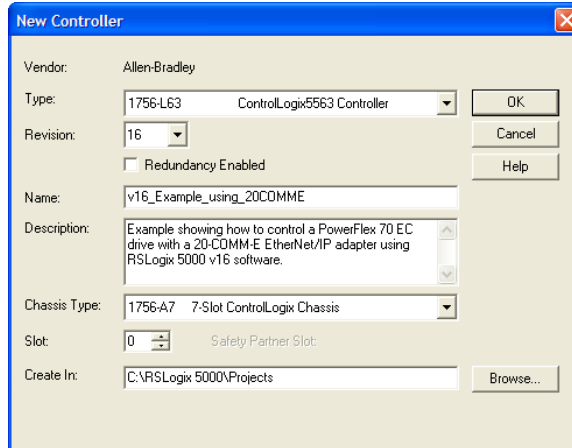
   a. Choose the appropriate choices for the fields in the screen to match your application.

   b. Click **OK**.

   The RSLogix 5000 window reappears with the treeview in the left pane.

3. In the treeview, right-click the I/O Configuration folder and choose **New Module…**

   The Select Module screen appears.

4. Expand the Communications group to display all of the available communication modules.
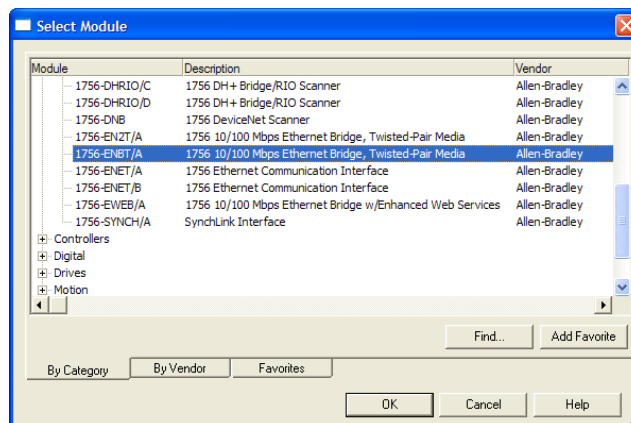
5. In the list, select the EtherNet/IP bridge used by your controller.

In this example, we use a 1756-ENBT EtherNet/IP Bridge (Series A), so the 1756-ENBT/A option is selected.

6. Click **OK**.

7. In the Select Major Revision pop-up dialog box, select the major revision of its firmware.

8. Click **OK**.

The bridge's New Module screen appears.
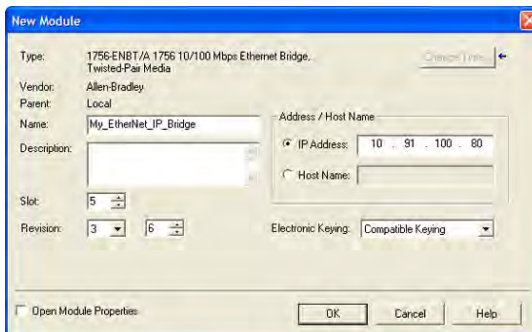
9. Edit the following:

Box	Setting
Name	A name to identify the EtherNet/IP bridge.
Description	Optional – description of the EtherNet/IP bridge.
IP Address	The IP address of the EtherNet/IP bridge.
Host Name	Not used.
Slot	The slot of the EtherNet/IP bridge in the rack.
Revision	The minor revision of the firmware in the bridge. (You already set the major revision by selecting the bridge series in step 5.)
Electronic Keying	**Compatible Keying**. The 'Compatible Keying' setting for Electronic Keying ensures the physical module is consistent with the software configuration before the controller and bridge make a connection. Therefore, be sure that you have set the correct revision in this screen. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select 'Disable Keying'. Disable keying is recommended.
Open Module Properties	When this box is checked, clicking **OK** opens additional module properties screens to further configure the bridge. When unchecked, clicking **OK** closes the bridge's New Module screen. For this example, uncheck this box.

10. Click **OK**.

The bridge is now configured for the EtherNet/IP network, added to the RSLogix 5000 project, and appears in the I/O Configuration folder. In our example, a 1756-ENBT bridge appears under the I/O Configuration folder with its assigned name.
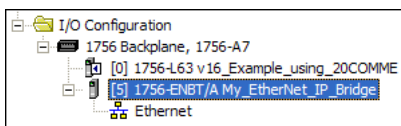
For convenience, keep the project open. Later in this chapter the project will need to be downloaded to the controller.

There are three ways to add the adapter into the I/O configuration:

- Device Add-on Profiles (RSLogix 5000 software, version 16.00 or later)
- Classic Profile (RSLogix 5000 software, versions 13.00…15.00)
- Generic Profile (RSLogix 5000 software, all versions)

These are described in separate sections below. If your version of RSLogix 5000 software supports device Add-on Profiles, we recommend that you use this method.

Using RSLogix 5000 Device Add-on Profiles, Version 16.00 or Later

When compared to using the RSLogix 5000 Classic Profile (versions 13.00…15.00) or Generic Profile (all versions), the RSLogix 5000 device Add-on Profiles provide the following advantages:

- Profiles for specific drives that provide descriptive controller tags for basic control I/O words (Logic Command/Status and Reference/Feedback) **and** Datalinks. Additionally, Datalinks automatically take the name of the drive parameter to which they are assigned. These profiles virtually eliminate I/O mismatch errors and substantially reduce drive configuration time.

- New Drive tab eliminates the need for a separate drive software configuration tool.

- Drive configuration settings are saved as part of the RSLogix 5000 software, version 16.00 or later, project file (.ACD) and also downloaded to the controller.

- Unicast connection (RSLogix 5000 software, version 18.00 or later)

- Device Add-on Profiles can be updated anytime. When a new drive is used or to benefit from new updates for Add-on Profiles, you will need the newest Add-on Profile update. Go to www.ab.com/support/abdrives/webupdate to download the latest RSLogix 5000 device Add-on Profile. To determine your device Add-on Profile version, see Allen-Bradley Knowledgebase document #65882.

Add the Drive/Adapter to the I/O Configuration

To transmit data between the bridge and the drive, you must add the drive as a child device to the parent bridge. In this example, RSLogix 5000 software, version 16.00 is used with device Add-on Profile version 4.05 or later.

1. In the treeview, right-click on the bridge and choose **New Module…** to display the Select Module screen.

   In our example, we right-click on the 1756-ENBT/A bridge. Expand the Drives group to display all of the available drives with their communication adapters.

   TIP   If the PowerFlex drive is not shown, go to www.ab.com/support/abdrives/webupdate and download the latest RSLogix 5000 device Add-on Profile.

2. From the list, select the drive and its connected adapter.

   For this example, we selected 'PowerFlex 70 EC-E'.

3. Click **OK**.

   The drive's New Module screen appears.

4. On the General tab, edit the following data about the drive/adapter.

Box	Setting
Name	A name to identify the drive.
Description	Optional – description of the drive/adapter.
IP Address	The IP address of the adapter.

5. On the New Module screen in the Module Definition section, click **Change…** to launch the Module Definition screen and begin the drive/adapter configuration process.

   In this example, Datalinks are used to do the following.

Read…	Write to…
Output Current (Parameter 3)	Accel Time 1 (Parameter 140)
DC Bus Voltage (Parameter 12)	Decel Time 1 (Parameter 142)
Fault 1 Code (Parameter 243)	High Resolution Reference (Parameter 308)

   TIP   To get the latest RSLogix 5000 device Add-on Profile, go to www.ab.com/support/abdrives/webupdate.

6. In the Module Definition screen, edit the following information.

Box	Setting
Revision	The major and minor revision of the firmware (database) in the drive. If the drive's major and minor revision is not available, the drive database is not installed on your computer. To get the correct database revision, use one of the following buttons at the bottom left of the Module Definition screen:
	• **Create Database:** Creates a database from an online network drive. Clicking this button displays an RSLinx software RSWho window. Browse to the online drive (for this example, PowerFlex 70 EC), select it, and click **OK**. The database will be uploaded and stored on the computer. Thereafter, close the Module Definition screen and then re-open it to display the new revision.
	• **Web Update:** When a drive is not available online, opens the Allen-Bradley Drives Web Updates website to download a specific database file. After downloading the file, close the Module Definition screen and then re-open it to display the new revision.
	• **Match Drive:** Use this button when the drive being added to the network matches the drive profile (revision, rating, configuration settings, and so forth) of an existing online network drive. Click this button to conveniently create a duplicate drive profile from the online drive, and automatically load this identical information into the Module Definition screen. This eliminates the need to manually enter the information each time a new drive with a matching profile is added to the network.
Electronic Keying	**Compatible Module**. The 'Compatible Module' setting for Electronic Keying ensures that the physical module is consistent with the software configuration before the controller and bridge make a connection. Therefore, be sure that you have set the correct revision in this screen. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select 'Disable Keying'. Drives do not require keying, and so 'Disable Keying' is recommended.
Drive Rating	The voltage and current rating of the drive. If the drive rating is not listed, the drive database is not installed on your computer. To get the correct drive rating, use the **Create Database**, **Web Update**, or **Match Drive** button described above.
Connection	**Parameters via Datalinks.** When selecting 'Parameters via Datalinks' (default), the controller tags for the Datalinks use the drive parameter names to which they are assigned. When selecting 'Datalinks', the controller tags for the Datalinks have non-descriptive UserDefinedData[n] names like those used in RSLogix 5000 software, version 15.00.
Data Format	**Parameters.** When the Connection field is set to 'Parameters via Datalinks', 'Parameters' is automatically selected. When the Connection field is set to 'Datalinks', you must select the number of Datalinks required for your application in the 'Data Format' field.
Datalink A, B, C, D	In the Input Data column, assigns selected drive parameters to be READ by the controller. In the Output Data column, assigns selected drive parameters to be WRITTEN by the controller.
Sort Input/ Output selection…	When this box is checked, sorts the Input Data and Output Data assigned parameters by name and then by number, and enables parameter search by name. When unchecked, sorts the assigned parameters by parameter number and then by name, and enables parameter search by number.
Use Network Reference	Conveniently selects the speed reference for the drive to come from the network. This box is checked by default.

When a 32-bit parameter is selected for Input Data or Output Data for a drive with 16-bit Datalinks, two contiguous Datalinks (for example, x1 and x2, where x = A, B, C or D) are automatically assigned as a pair to

represent that parameter. See Datalink examples in the screen shown on the previous page. For more information on Datalinks, see .

On the Module Definition screen, notice that the automatically-assigned controller tags DriveStatus, OutputFreq, DriveLogicRslt, and CommandedFreq are always used.

When a Datalink is enabled, the following 20-COMM-ER adapter I/O parameters are automatically set:

– **Parameter 25 - [DPI I/O Cfg]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will communicate that Datalink's information with the drive.

– **Parameter 37 - [M-S Input]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will input that Datalink's information from the controller.

– **Parameter 38 - [M-S Output]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will output that Datalink's information to the controller.

7. Click **OK** on the Module Definition screen to save the drive and adapter configuration and close the screen.

The drive's New Module screen reappears.

8. On the New Module screen, click the Connection tab.
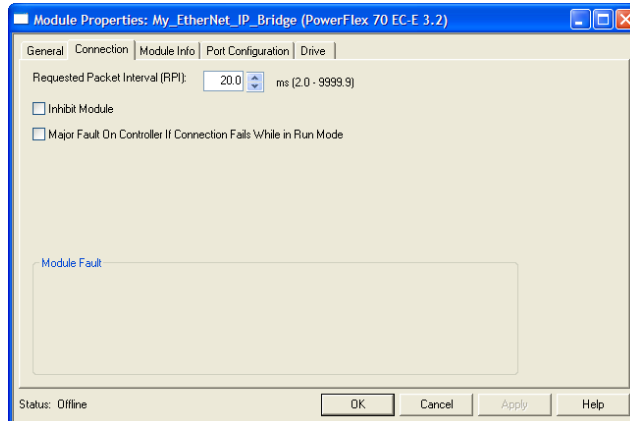
Screen for
RSLogix 5000
software, version
16.00 or 17.00
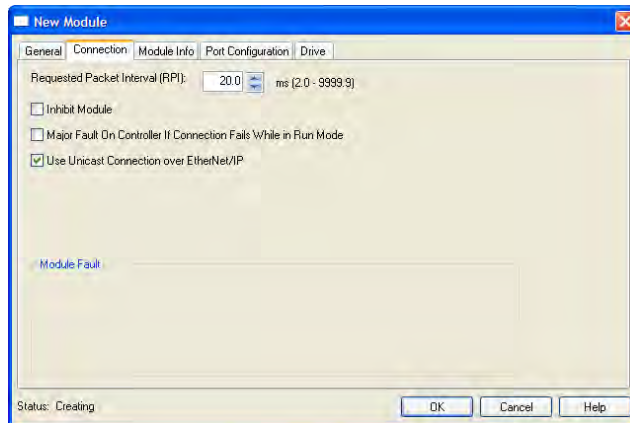
Screen for
RSLogix 5000
software, version
18.00 or later

9. In the 'Requested Packet Interval (RPI)' box, set the value to 5.0 milliseconds or greater.

This value determines the maximum interval that a controller should use to move data to and from the adapter. To conserve bandwidth, use higher values for communicating with low priority devices.

The 'Inhibit Module' box, when checked, inhibits the module from communicating with the RSLogix 5000 project. When the 'Major Fault on ...' box is checked, a major controller fault will occur when the module's connection fails while the controller is in the Run Mode. For this example, leave the 'Inhibit Module' and 'Major Fault On ...' boxes unchecked.

Important: Unicast support has been added to RSLogix 5000 software, version 18.00 or later. However, to also support unicast, the controller firmware must be version 18.00 or later. Unicast is recommended whenever possible. For the benefits of unicast operation, see Preparing for an Installation on page 18.

10. On the New Module screen, click the Port Configuration tab.
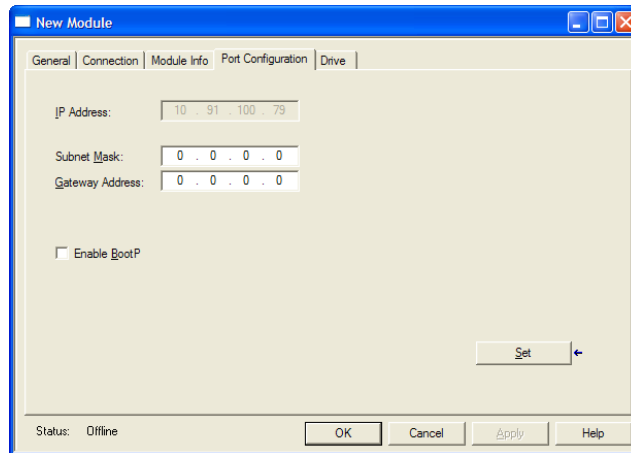
11. In the Port Configuration tab screen, edit the following information.

Box	Setting
IP Address	The IP address of the adapter that was already set in the General tab. This field is not configurable (grayed out).
Subnet Mask	The Subnet Mask configuration setting of the network. This setting must match the setting of other devices on the network (for example, 255.255.255.0).
Gateway Address	The Gateway Address configuration setting of the network. This setting must match the setting of other devices on the network (for example, 10.91.100.1).
Enable BootP	When this box is checked, BOOTP is enabled in the adapter and will ignore the IP address set in the General tab. When unchecked, the controller uses the set IP address. This is another method to enable/disable BOOTP in the adapter. For this example, leave this box unchecked.

12. Click **Set** to save the Port Configuration information which sets the corresponding offline Subnet Cfg x and Gateway Cfg x parameters in the adapter.

13. Click **OK** on the New Module screen.

The new node ('My_PowerFlex_70_EC_Drive' in this example) now appears under the bridge ('My_EtherNet_IP_Bridge' in this example) in the I/O Configuration folder. If you double-click the Controller Tags, you will see that module-defined data types and tags have been automatically created (Figure 9). Note that all tag names are defined and Datalinks include the assigned drive parameter name. After you save and download the configuration, these tags allow you to access the Input and Output data of the drive via the controller's ladder logic.

Figure 9 - Controller Tags

Save the I/O Configuration to the Controller

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

1. In the RSLogix 5000 window, select **Communications > Download**.

The Download dialog box appears.

TIP   If a message box reports that RSLogix 5000 software is unable to go online, select **Communications > Who Active** to find your controller in the Who Active screen. After finding and selecting the controller, click **Set Project Path** to establish the path. If your controller does not appear, you need to add or configure the EtherNet/IP driver with RSLinx software. See <u>Using RSLinx Classic Software on page 47</u> and RSLinx online help for details.

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

When the download is successfully completed, RSLogix 5000 software goes into the Online mode and the I/O Not Responding box in the upper-left of the window should be flashing green. Also, a yellow warning symbol ⚠ should be displayed on the I/O Configuration folder in the treeview and on the drive profile.

If the controller was in Run Mode before clicking **Download**, RSLogix 5000 software prompts you to change the controller mode back to Remote Run. In this case, choose the appropriate mode for your application. If the controller was in Program Mode before clicking **Download**, this prompt will not appear.

3. Select **File > Save**.

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

a. Navigate to a folder.

b. Type a file name.

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

To be sure that the present project configuration values are saved, RSLogix 5000 software prompts you to upload them. Click **Yes** to upload and save the values.

Correlate the Drive with the Controller

You must now correlate the drive settings to the RSLogix 5000 project I/O settings so that they match. This requires loading the project I/O settings into the drive.

1. In the treeview under I/O Configuration, right-click on the drive profile (for this example, My_PowerFlex_70_EC_Drive) and choose **Properties**.

2. Click the Drive tab.
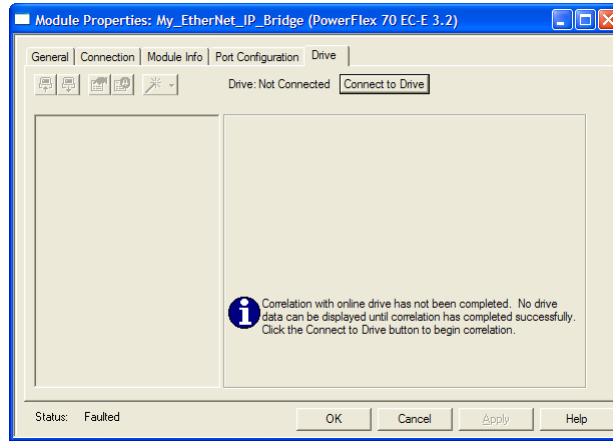
3. Click **Connect to Drive** to begin the correlation process.

After the drive configuration data has been verified, a pop-up dialog box appears, which synchronizes ports from the online drive to the project to be sure that correct Datalinks are assigned.

4. Click OK.

If the Differences Found screen appears—which is typical, click **Download**. This will download the project settings from the controller to the drive and its connected adapter. If **Upload** is clicked, the drive and adapter settings are uploaded to the controller.
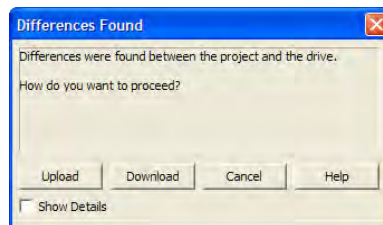
TIP On subsequent connections to the drive (after initial download), click **Upload**.

5. When the Reset Comm Module screen appears, click **Yes** to reset the communication adapter so that the new I/O settings take effect.
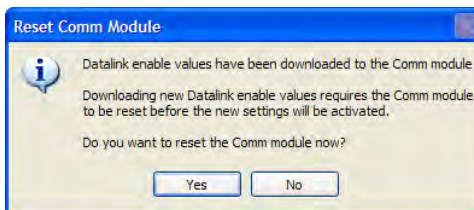
After resetting the communication module, which may take up to a minute to complete, the I/O OK box in the upper-left of the RSLogix 5000 window should now be steady green and the yellow warning symbols ⚠ in

the treeview under the I/O Configuration folder and drive profile should be gone.

> **TIP** If the yellow warning symbol ⚠ for your drive remains displayed, first try power cycling the drive. Otherwise, double-click the drive under the I/O tree and click the Connection tab to find the cause of the problem.

6. The Module Properties Drive Tab screen re-appears.
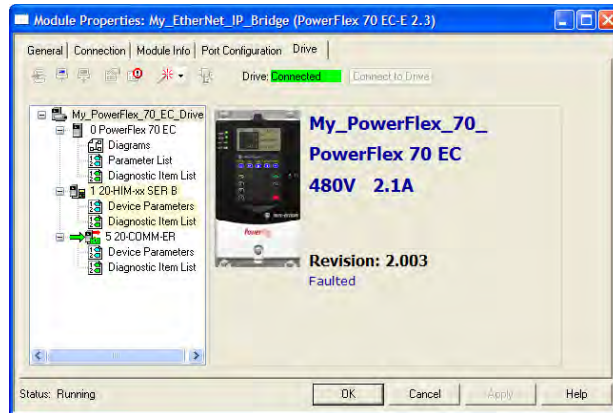
You can view the drive's Parameter List, Diagnostic Items List, and lists for any connected peripheral, including the 20-COMM-ER. While connected to the drive, you can dynamically change values of parameters. Diagnostic items and diagram views can be used for troubleshooting. provides diagnostic items for troubleshooting the adapter.

7. Click **OK** when finished to close the Module Properties screen for the drive.

Using the RSLogix 5000 Classic Profile, Versions 13.00…15.00

When compared to using the RSLogix 5000 Generic Profile (all versions), the RSLogix 5000 Classic Profile provides these advantages:

- Profiles for specific drives (Figure 10) that provide descriptive controller tags for basic control I/O words (Logic Command/Status and Reference/ Feedback). The controller tags for Datalinks, however, have non-descriptive UserDefinedData[n] names.

- Improved I/O configuration—no I/O assembly configuration required. Basic control I/O is defined, but Datalinks still need to be configured/ mapped.

- The Setup tab includes a DriveExecutive icon link to conveniently launch DriveExecutive software (when installed on computer) to match the adapter I/O configuration with the controller, and to assign the Datalink parameters in the drive. This reduces I/O mismatches.

TIP Since the RSLogix 5000 Classic Profile has been significantly improved upon by RSLogix 5000 Device Add-on Profiles, version 16.00 or later, we recommend using RSLogix 5000 Device Add-on Profiles to take advantage of its benefits (more intuitive, time saving, and less likely to make I/O configuration errors).

Figure 10 - Classic Profile Screens for Drives
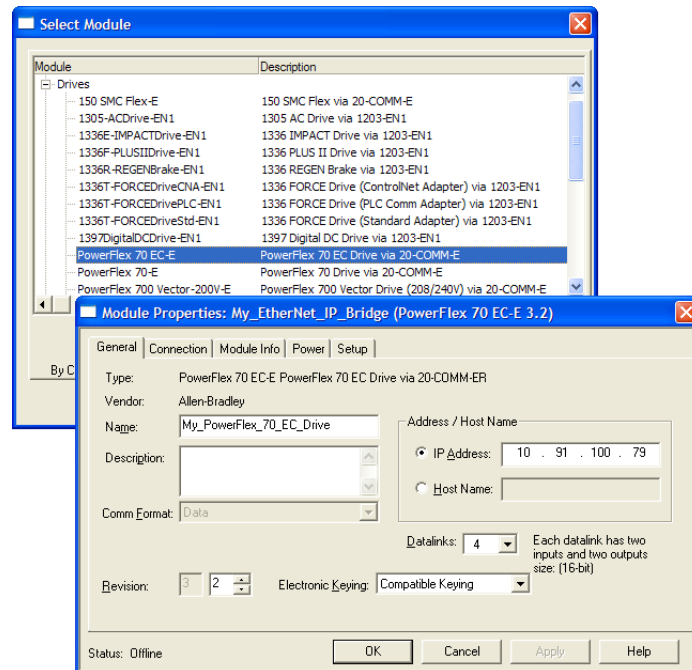
When Datalinks are used, you must enable the desired Datalinks and assign names to their non-descriptive controller tags. When a Datalink is enabled, you must set the following adapter I/O parameters:

- **Parameter 25 - [DPI I/O Cfg]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will communicate that Datalink's information with the drive.

- **Parameter 37 - [M-S Input]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will input that Datalink's information from the controller.

- **Parameter 38 - [M-S Output]** turns on the enabled Datalink bit so the 20-COMM-ER adapter will output that Datalink's information to the controller.

When using Datalinks, up to 8 [Data In xx] parameters and/or up to 8 [Data Out xx] parameters must be assigned to point to the appropriate drive parameters for your application.

Using the RSLogix 5000 Generic Profile, All Versions

We recommend that you use the basic RSLogix 5000 Generic Profile for only the following reasons:

- A specific drive profile in other versions of RSLogix 5000 software is unavailable.

- Users are already familiar with a drive Generic Profile and do not want to convert an existing project to a Classic Profile, versions 13.00…15.00, or to a device Add-on Profile (RSLogix 5000 software, version 16.00 or later).

- A project must maintain specific revision level control.

- The controller cannot be taken offline. RSlogix 5000 software, version 16.00 or later, enables the drive Generic Profile to be added while the controller is online and in the Run mode.

Add the Drive/Adapter to the I/O Configuration

To transmit data between the bridge and the drive, you must add the drive as a child device to the parent bridge.

1. In the treeview, right-click the bridge and select **New Module…** to display the Select Module screen.
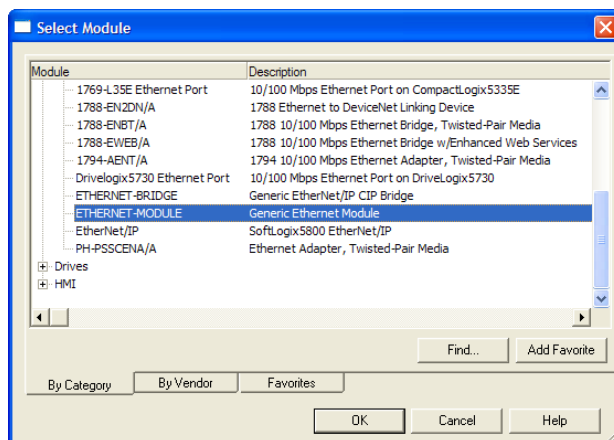
In our example, we right-click on the 1756-ENBT/A bridge.

2. Expand the Communications group to display all of the available communication modules.

3. Select "ETHERNET-MODULE" from the list to configure the drive and its connected 20-COMM-ER adapter.

4. Click **OK**.

The drive's New Module screen appears.
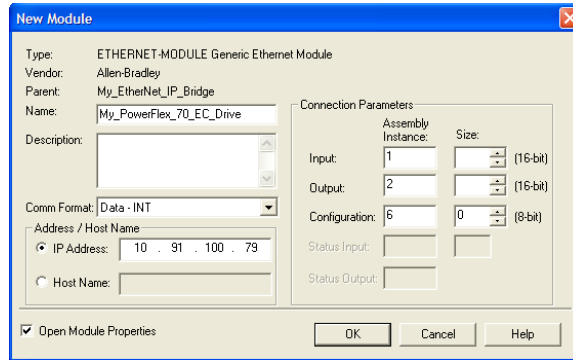
5. Edit the following information about the drive and adapter.

Box	Setting
Name	A name to identify the drive and adapter.
Description	Optional – description of the drive/adapter.
Comm Format	**Data - INT** (This setting formats the data in 16-bit words.)
IP Address	The IP address of the adapter.
Open Module Properties	When this box is checked, clicking **OK** opens additional module properties screens to further configure the drive/adapter. When unchecked, clicking **OK** closes the drive's New Module screen. For this example, check this box.

6. Under Connection Parameters, edit the following information.

Box	Assembly Instance	Size
Input	1 (This value is required.)	The value will vary based on your application (setting of **Parameters 25 - [DPI I/O Cfg]** and **38 - [M-S Output]**) and the size (16-bit or 32-bit) of the Reference/Feedback and Datalinks in the drive. See Table 2, Table 3, or Table 4 on page 64.
Output	2 (This value is required.)	The value will vary based on your application (setting of **Parameters 25 - [DPI I/O Cfg]** and **37 - [M-S Input]**) and the size (16-bit or 32-bit) of the Reference/Feedback and Datalinks in the drive. See Table 2, Table 3, or Table 4 on page 64.
Configuration	6 (This value is required.)	**0** (This value is required.)

The following tables define the number of 16-bit words that you need to enter for the Input Size and Output Size boxes depending on your configuration.

Table 2 - Devices with 16-bit Reference/Feedback and 16-bit Datalinks

These products include the following:

- PowerFlex 70 drives with standard or enhanced control
- PowerFlex 700 drives with standard control
- PowerFlex 700H drives
- SMC Flex smart motor controllers
- SMC-50 smart motor controllers

Logic Command/ Status	Ref/Fdbk (16-bit)	Datalinks (16-bit)				User Configured Settings			
		A	B	C	D	Size in Words		Par. 23 - [DPI I/O Cfg]	Par. 35 - [M-S Input]	Par. 36 - [M-S Output]
						Input	Output			
✔	✔					4	2	…0 0001	…0 0001	…0 0001
✔	✔	✔				6	4	…0 0011	…0 0011	…0 0011
✔	✔	✔	✔			8	6	…0 0111	…0 0111	…0 0111
✔	✔	✔	✔	✔		10	8	…0 1111	…0 1111	…0 1111
✔	✔	✔	✔	✔	✔	12	10	…1 1111	…1 1111	…1 1111

Table 3 - Devices with 16-bit Reference/Feedback and 32-bit Datalinks

These products include the following:

- PowerFlex 700 drives with vector control
- PowerFlex 700L drives with 700 control
- PowerFlex Digital DC drives
- SMC Controllers

Logic Command/ Status	Ref/Fdbk (16-bit)	Datalinks (32-bit)				User Configured Settings			
		A	B	C	D	Size in Words		Par. 23 - [DPI I/O Cfg]	Par. 35 - [M-S Input]	Par. 36 - [M-S Output]
						Input	Output			
✔	✔					4	2	…0 0001	…0 0001	…0 0001
✔	✔	✔				8	6	…0 0011	…0 0011	…0 0011
✔	✔	✔	✔			12	10	…0 0111	…0 0111	…0 0111
✔	✔	✔	✔	✔		16	14	…0 1111	…0 1111	…0 1111
✔	✔	✔	✔	✔	✔	20	18	…1 1111	…1 1111	…1 1111

Table 4 - Drives with 32-bit Reference/Feedback and 32-bit Datalinks

These products include the following:

- PowerFlex 700S drives with Phase I or Phase II control
- PowerFlex 700L drives with 700S control
- PowerFlex 753 drives
- PowerFlex 755 drives

Logic Command/ Status	Ref/Fdbk (32-bit)	Datalinks (32-bit)				User Configured Settings			
		A	B	C	D	Size in Words		Par. 23 - [DPI I/O Cfg]	Par. 35 - [M-S Input]	Par. 36 - [M-S Output]
						Input	Output			
✔	✔					6	4	…0 0001	…0 0001	…0 0001
✔	✔	✔				10	8	…0 0011	…0 0011	…0 0011
✔	✔	✔	✔			14	12	…0 0111	…0 0111	…0 0111
✔	✔	✔	✔	✔		18	16	…0 1111	…0 1111	…0 1111
✔	✔	✔	✔	✔	✔	22	20	…1 1111	…1 1111	…1 1111

> **TIP** For instructions on configuring the I/O for the adapter using **Parameter 25 - [DPI I/O Cfg]** and its Master-Slave Hierarchy using **Parameters 37 - [M-S Input]** and **38 - [M-S Output]**, see .

When using Datalinks, up to 8 [Data In xx] parameters and/or up to 8 [Data Out xx] parameters must be assigned to point to the appropriate device parameters for your application.

7. After setting the information in the device's New Module screen, click **OK**.

The Module Properties screen appears.

8. Click the Connection tab.
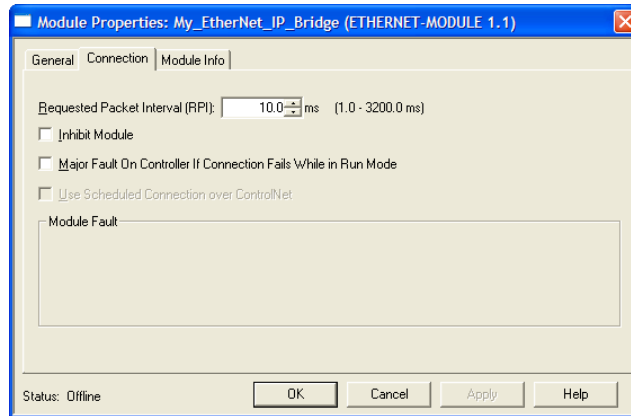
9. In the 'Requested Packet Interval (RPI)' box, set the value to 5.0 ms or greater.

This value determines the maximum interval that a controller should use to move data to and from the adapter. To conserve bandwidth, use higher values for communicating with low priority devices. For this example, leave the 'Inhibit Module' and 'Major Fault …' boxes unchecked.

10. Click **OK**.

The new node ('My_PowerFlex_70_EC_Drive' in this example) now appears under the bridge ('My_EtherNet_IP_Bridge' in this example) in the I/O Configuration folder. If you double-click the Controller Tags, you will see that module-defined data types and tags have been automatically created (Figure 11). After you save and download the configuration, these tags allow you to access the Input and Output data of the drive via the controller's ladder logic.

For this example, all Datalinks (A, B, C, and D) are enabled. The Input Size is set to 12 words and the Output Size is set to 10 words. Also, the following adapter I/O parameters are set to the following values.

Adapter Parameter No.	Setting
25 - [DPI I/O Cfg]	xxxx xxxx xxx1 1111
37 - [M-S Input]	xxxx xxxx xxx1 1111
38 - [M-S Output]	xxxx xxxx xxx1 1111

11. Reset the adapter (see <u>Resetting the Adapter on page 43</u>) or power cycle the device.

For the device speed reference and Datalink parameter values and the adapter setup parameter values, see <u>Drive and Adapter Parameter Settings on page 90</u>.

Figure 11 - Controller Tags

Name	△	Value	←	Force Mask	←	Style	Data Type
+ My_PowerFlex_70_EC_Drive:C		{...}		{...}			AB:ETHERNET_...
− My_PowerFlex_70_EC_Drive:I		{...}		{...}			AB:ETHERNET_...
− My_PowerFlex_70_EC_Drive:I.Data		{...}		{...}		Decimal	INT[12]
+ My_PowerFlex_70_EC_Drive:I.Data[0]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[1]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[2]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[3]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[4]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[5]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[6]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[7]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[8]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[9]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[10]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:I.Data[11]		0				Decimal	INT
− My_PowerFlex_70_EC_Drive:O		{...}		{...}			AB:ETHERNET_...
− My_PowerFlex_70_EC_Drive:O.Data		{...}		{...}		Decimal	INT[10]
+ My_PowerFlex_70_EC_Drive:O.Data[0]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[1]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[2]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[3]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[4]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[5]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[6]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[7]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[8]		0				Decimal	INT
+ My_PowerFlex_70_EC_Drive:O.Data[9]		0				Decimal	INT

Save the I/O Configuration to the Controller

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

TIP   When using RSLogix 5000 software, version 16.00 or later, you can add the I/O configuration of a Generic Profile while the controller is online and in the Run mode.

1. In the RSLogix 5000 window, select **Communications > Download**.

The Download dialog box appears.

TIP If a message box reports that RSLogix 5000 software is unable to go online, select **Communications > Who Active** to find your controller in the Who Active screen. After finding and selecting the controller, click **Set Project Path** to establish the path. If your controller does not appear, you need to add or configure the EtherNet/IP driver with RSLinx software. See Using RSLinx Classic Software on page 47 and RSLinx online help for details.

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

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

3. Select **File > Save**.

   If this is the first time you saved the project, the Save As dialog box appears. Navigate to a folder, type a file name, and click **Save** to save the configuration to a file on your computer.

   To be sure that the present project configuration values are saved, RSLogix 5000 software prompts you to upload them. Click **Yes** to upload and save the values.

4. Configure any Datalinks in the drive (for example, Datalink parameters 300...317 in PowerFlex 70 drives) that were enabled in the controller and adapter during I/O configuration (Table 2, Table 3, or Table 4).

   Each Datalink being used must be assigned to a specific parameter in the drive or connected peripheral. If this is not done, the controller will receive or send placeholder data instead of actual drive or peripheral parameter values.

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

Limitations Using a MicroLogix 1100/1400 Controller

Controlling I/O with explicit messages is relatively complex compared to normal implicit I/O control.

ControlLogix and CompactLogix controllers with EtherNet/IP provide the easiest and most integrated form of implicit I/O control for a device. RSLogix 5000 software, version 16.00 or later, for ControlLogix and CompactLogix controllers contains integrated profiles for PowerFlex drives that, with a few clicks of the mouse, automatically create all controller tags and an implicit connection at the specified Requested Packet Interval to control the drive. This connection is monitored at both ends to verify that the controller and drive are communicating. A watchdog will cause a drive fault if the drive does not respond within approximately 100 milliseconds. Therefore, using a ControlLogix or CompactLogix controller is by far the much preferred method of controlling drives on EtherNet/IP.

If you are not using either of these type of controllers, then devices on EtherNet/IP can be controlled with explicit messages using MicroLogix 1100/1400 controllers with the following limitations:

- An explicit message is a much slower form of control and is non-deterministic. This means that you cannot guarantee how long the device will take to start up or stop when the command is given. Therefore, all equipment used in this manner should be subject to a risk assessment, taking into account the mechanical and electrical implementation.

- A timeout value (in seconds) in the EtherNet/IP adapter will issue a device fault if a message is not received from the controller within the specified time. However, the controller has no way of detecting a loss of communication to the device until the next cycle of explicit messages. This is another factor in the risk assessment.

- Any additional devices to be controlled will require additional explicit messages for their control, and they need to be carefully sequenced. Most controllers have small communication queues (see the User Manual), which need to be carefully managed if messages are not to be lost.

- Each controller has a limited number of communication connections (see its User Manual for maximum connections), which will limit the number of drives that can be connected.

In summary, unlike a ControlLogix or CompactLogix controller, programming a MicroLogix 1100/1400 controller by using RSLogix 500 software with explicit messages is more difficult, and produces a more complex program.

MicroLogix 1100/1400 Controller Example

After the adapter is configured, the connected drive and adapter will be a single node on the network. This section provides the steps needed to configure a simple EtherNet/IP network (see). In our example, we will configure a MicroLogix 1100 controller to communicate with a drive using Logic Command/Status, Reference/Feedback, and Datalinks over the network.

Figure 12 - Example MicroLogix 1100/1400 Controller EtherNet/IP Network

IP Address 10.91.100.81
MicroLogix 1100/1400 Controller

IP Address 10.91.100.79
PowerFlex 70 Drive with
20-COMM-ER Adapter

Ethernet
Switch

Computer with
Ethernet Connection
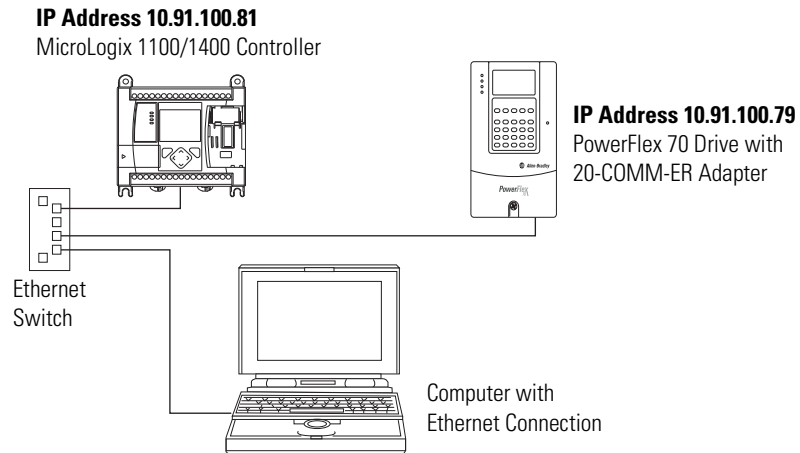
> **TIP**   Information for PowerFlex 750-Series drives has been added where applicable.

Configuring Parameters for Network I/O

Because the I/O for the drive is message-based, there is no need to configure any I/O inside the RSLogix 500 project, version 7.00 or later, until using the I/O as described in Chapter 5.

However, to get the adapter to operate with the I/O created in Chapter 5, we need to configure the adapter to accept the I/O and drive to point to the appropriate Datalinks.

1. For this example, the following adapter I/O parameters are set to the following values.

Adapter Parameter No.	Setting
25 - [DPI I/O Cfg]	xxxx xxxx xxx1 1111
37 - [M-S Input]	xxxx xxxx xxx1 1111
38 - [M-S Output]	xxxx xxxx xxx1 1111

2. Reset the adapter (see Resetting the Adapter on page 43) or power cycle the drive.

   For the drive speed reference and Datalink parameter values and the adapter setup parameter values, refer to Drive and Adapter Parameter Settings on page 96.

Creating RSLogix 500 Project, Version 7.00 or Later

To transmit (read and write) data between the controller and drive, you must create message instructions that allocate data table addresses in the controller for Logic Command/Status, Reference/Feedback, and Datalinks.

Select the Controller

1. Start RSLogix 500 software.

   The RSLogix 500 window appears.

2. Select **File > New** to display the Select Processor Type screen.
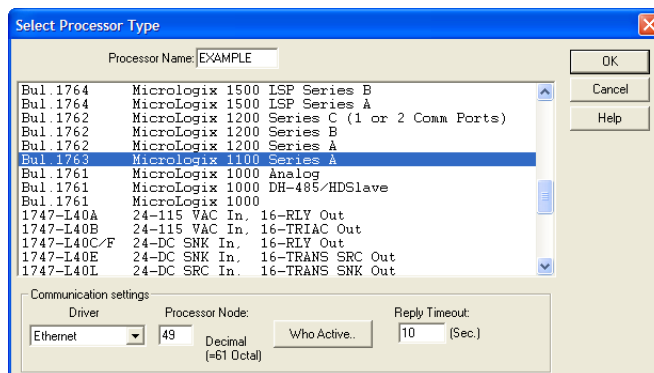
3. Assign a name for the processor.

4. In the list, select the MicroLogix 1100.

5. Choose the appropriate choices for the fields in the screen to match your application.

6. Click **OK**.

   The RSLogix 500 project window appears.

Create MicroLogix 1100/1400 Ladder Logic for the Control Timeout

1. In the RSLogix 500 project window treeview under Program Files double-click on LAD 2.

2. Insert a ladder rung.

3. Double-click on the rung to display the rung editor.

4. Enter **MSG MGxx:n**, where:

   xx is an unused data file number (for example, MG10:n), and
   n is an unused element of the data file chosen for xx (for example, MG10:0)

5. Press **Enter**.

6. Insert another separate rung.

7. Double-click on the rung to display the rung editor.

8. Enter **BST XIC MGxx:n/DN NXB XIC MGxx:n/ER BND OTU MGxx:n/EN**, where:

   xx and n must correspond to the assigned data file number and element
   (for example, MG10:0) for the message created in steps 2…5.

   Important: The information must be entered with appropriate numbers for 'xx' and 'n' for your application, and with spaces and forward slashes exactly as shown.

9. Press **Enter**.

10. In the MSG instruction (Figure 13), double-click Setup Screen to launch the message configuration screen (Figure 14).

Figure 13 - MicroLogix 1100/1400 Ladder Logic for the Control Timeout
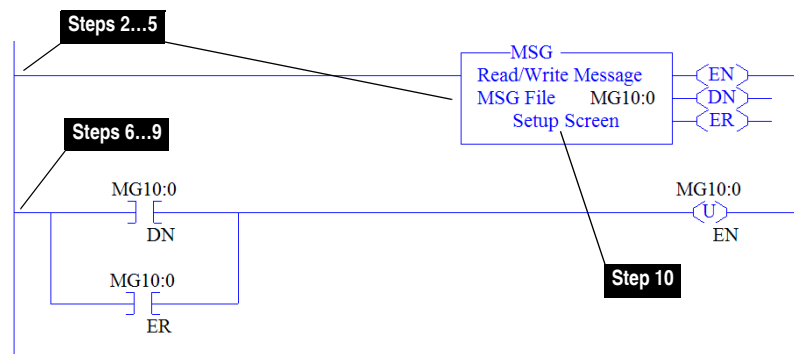
11. Configure the General tab fields by entering or verifying the information shown in the message configuration screen.

Figure 14 - MicroLogix 1100/1400 Message Configuration Screens for the Control Timeout

General Tab Box	Setting
This Controller (data for MicroLogix 1100)	
Channel	**1 (integral)**. Controller port to which the network is connected.
Communication Command	**500CPU Write**. The controller type and command type for the controller to read or write data. Because the MicroLogix 1100 is part of the SLC-500 controller family, the '500CPU' controller type was selected. The 'Write' command type was selected to write the control timeout value to the drive.
Data Table Address [1]	**N20:0**. An unused controller data table address containing the control timeout value to be written.
Size in Elements [2]	**1**. Number of elements (words) to be transferred. Each element size is a 16-bit integer.
Target Device (data for adapter/drive)	
Message Timeout	**5**. Message timeout duration in seconds.
Data Table Address [3]	**N42:3**. Specific starting address of the destination file in the drive.
Routing Information File	**RI9:0**. An unused routing information file for the controller.
MultiHop Tab Box	**Setting**
To Address	**10.91.100.79.** The IP address of the adapter connected to the drive.

(1)   For details on data table addresses for this example project, see Table 11…Table 14 starting on page 98.

(2)   For details to determine element size for a specific drive, see Understanding Controller Data Table Addresses on page 97.

(3)   For details on setting the control timeout value and its function, see N-Files on page 192. The Control Timeout (N42:3) is stored in RAM. If the 20-COMM-ER adapter is power cycled, the Control Timeout Message must be re-sent. If the Control Timeout is not changed from a non-zero value, the control message (page 75) will error out.

TIP   The Control Timeout (N42:3) must be changed to a non-zero value (5…20 seconds recommended). If the Control Timeout is not changed from a non-zero value, the control message (page 75) will error out. The Control Timeout is stored in RAM. If the adapter is power cycled, the Control Timeout Message must be re-sent.

Create MicroLogix 1100/1400 Ladder Logic for the Logic Status, Feedback, and Datalink Out

1. Insert another separate rung.

2. Double-click on the rung to display the rung editor.

3. Enter **MSG MGxx:n**, where:

   xx is an unused data file number (for example, MG11:n), and
   n is an unused element of the data file chosen for xx (for example, MG11:0)

4. Press **Enter**.

5. Insert another separate rung.

6. Double-click on the rung to display the rung editor.

7. Enter **BST XIC MGxx:n/DN NXB XIC MGxx:n/ER BND OTU MGxx:n/EN**, where:

   xx and n must correspond to the assigned data file number and element
   (for example, MG11:0) for the message created in steps 1…4.

   Important: The information must be entered with appropriate numbers for 'xx' and 'n' for your application, and with spaces and forward slashes exactly as shown.

8. Press **Enter**.

9. In the MSG instruction (Figure 15), double-click Setup Screen to launch the message configuration screen (Figure 16).

Figure 15 - MicroLogix 1100/1400 Ladder Logic for the Logic Status, Feedback, and Datalink Out
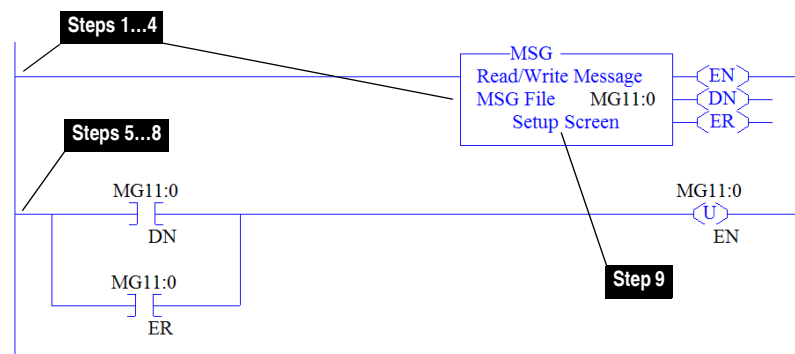
10. Configure the General tab fields by entering or verifying the information shown in the message configuration screen.

Figure 16 - MicroLogix 1100/1400 Message Configuration Screens for the Logic Status, Feedback, and Datalink Out

General Tab Box	Setting
This Controller (data for MicroLogix 1100)	
Channel	**1 (integral)**. Controller port to which the network is connected.
Communication Command	**500CPU Read**. The controller type and command type for the controller to read or write data. Because the MicroLogix 1100 is part of the SLC-500 controller family, the '500CPU' controller type was selected. The 'Read' command type was selected to read data from the drive.
Data Table Address [1]	**N20:1**. An unused controller data table address containing the data to be read from the drive.
Size in Elements [2]	**19**. Number of elements (words) to be transferred. Each element size is a 16-bit integer.
Target Device (data for adapter/drive)	
Message Timeout	**5**. Message timeout duration in seconds.
Data Table Address [3]	**N41:0**. Specific starting address of the source file in the drive.
Routing Information File	**RI9:1**. An unused routing information file for the controller.
MultiHop Tab Box	**Setting**
To Address	**10.91.100.79.** The IP address of the adapter connected to the drive.

(1)   For details on data table addresses for this example project, see Table 11…Table 14 starting on page 98.

(2)   For details to determine element size for a specific drive, see Understanding Controller Data Table Addresses on page 97.

(3)   For N-File details, see N-Files on page 192.

Create MicroLogix 1100/1400 Ladder Logic for the Logic Command, Reference, and Datalink In

1. Insert another separate rung.

2. Double-click on the rung to display the rung editor.

3. Enter **MSG MGxx:n**, where:

   xx is an unused data file number (for example, MG12:n), and
   n is an unused element of the data file chosen for xx (for example, MG12:0)

4. Press **Enter**.

5. Insert another separate rung.

6. Double-click on the rung to display the rung editor.

7. Enter **BST XIC MGxx:n/DN NXB XIC MGxx:n/ER BND OTU MGxx:n/EN**, where:

   xx and n must correspond to the assigned data file number and element
   (for example, MG12:0) for the message created in steps 1…4.

   Important: The information must be entered with appropriate numbers for 'xx' and 'n' for your application, and with spaces and forward slashes exactly as shown.

8. Press **Enter**.

9. In the MSG instruction (Figure 17), double-click Setup Screen to launch the message configuration screen (Figure 18).

Figure 17 - MicroLogix 1100/1400 Ladder Logic for the Logic Command, Reference, and Datalink In
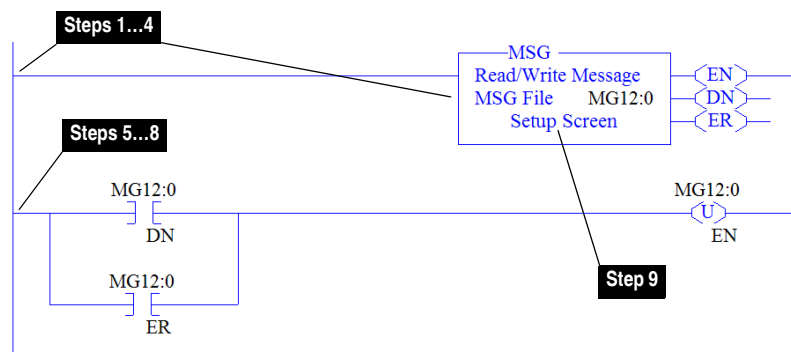
10. Configure the General tab fields by entering or verifying the information shown in the message configuration screen.

Figure 18 - MicroLogix 1100/1400 Message Configuration Screens for the Logic Command, Reference, and Datalink In

General Tab Box	Setting
This Controller (data for MicroLogix 1100)	
Channel	**1 (integral)**. Controller port to which the network is connected.
Communication Command	**500CPU Write**. The controller type and command type for the controller to read or write data. Because the MicroLogix 1100 is part of the SLC-500 controller family, the '500CPU' controller type was selected. The 'Write' command type was selected to write data to the drive.
Data Table Address [1]	**N20:20**. An unused controller data table address containing the data to be written to the drive.
Size in Elements [2]	**19**. Number of elements (words) to be transferred. Each element size is a 16-bit integer.
Target Device (data for adapter/drive)	
Message Timeout	**5**. Message timeout duration in seconds.
Data Table Address [3]	**N41:0**. Specific starting address of the destination file in the drive.
Routing Information File	**RI9:2**. An unused routing information file for the controller.
MultiHop Tab Box	**Setting**
To Address	**10.91.100.79.** The IP address of the adapter connected to the drive.

(1) For details on data table addresses for this example project, see Table 11…Table 14 starting on page 98.

(2) For details to determine element size for a specific drive, see Understanding Controller Data Table Addresses on page 97.

(3) For N-File details, see N-Files on page 192.

> **TIP** This message will error out if the Control Timeout value is not changed from a non-zero value. Refer to page 71 for writing a value to the Control Timeout.

> **TIP** If the controller is controlling more than one drive, it is recommended to intersperse the control I/O messaging for each drive to conserve network bandwidth and decrease response time. That is, sequence the message instructions for each drive so that its group of messages will occur at a different time than those for another drive.

Notes:

Using the I/O

This chapter provides information and examples that explain how to control, configure, and monitor a PowerFlex 7-Class drive or SMC using the configured I/O.

> **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.

About I/O Messaging

On CIP-based networks, including EtherNet/IP, I/O connections are used to transfer the data which controls the PowerFlex drive or SMC and sets its Reference. I/O can also be used to transfer data to and from Datalinks.

The adapter provides many options for configuring and using I/O, including the following:

- Configuring the size of I/O by enabling or disabling the Logic Command/ Reference and Datalinks.

- Setting a Master-Slave or Peer-to-Peer hierarchy.

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

Understanding the I/O Image

The terms 'input' and 'output' are defined from the controller's point of view. Therefore, output I/O is data that is produced by the controller and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the controller. The I/O image will vary based on the following:

- Size (either 16-bit or 32-bit) of the Reference/Feedback words and Datalink words used by the device. To determine the size of the Reference/Feedback and Datalinks, view adapter **Parameters 20 - [Ref/Fdbk Size]** and **21- [Datalink Size]**. For information to access parameters, see .

- Configuration of I/O (**Parameter 25 - [DPI I/O Cfg]**). If all I/O is not enabled, the image is truncated. The image always uses consecutive words starting at word 0.

- **ControlLogix/CompactLogix Controllers only**—The drive profile used in RSLogix 5000 software (device Add-on Profile in version 16.00 or later, Classic Profile in versions 13.00...15.00, or Generic Profile in all versions).

ControlLogix Controller Image

Since the device Add-on Profile in RSLogix 5000 software, version 16.00 or later, and the Classic Profile, versions 13.00...15.00, provide descriptive controller tags, the I/O image (tag size and location) is automatically configured based on the device being used. When using the Generic Profile () in RSLogix 5000 software, however, controller tags are not descriptive or defined.

The ControlLogix controller I/O image changes depending on the size of the device's Reference/Feedback and Datalinks. Table , Table , and Table show the I/O image when using various PowerFlex 7-Class drives, and all Datalinks enabled.

Table 5 - ControlLogix Controller I/O Image for Devices with 16-bit Reference/ Feedback and 16-bit Datalinks – Using Generic Profile

These products include the following:

- PowerFlex 70 drives with standard or enhanced control
- PowerFlex 700 drives with standard control
- PowerFlex 700H drives
- SMC Flex smart motor controllers
- SMC-50 smart motor controllers

Word	Output I/O
0	Logic Command
1	Reference
2	Datalink In A1
3	Datalink In A2
4	Datalink In B1
5	Datalink In B2
6	Datalink In C1
7	Datalink In C2
8	Datalink In D1
9	Datalink In D2

Word	Input I/O
0	Pad Word
1	Pad Word
2	Logic Status
3	Feedback
4	Datalink Out A1
5	Datalink Out A2
6	Datalink Out B1
7	Datalink Out B2
8	Datalink Out C1
9	Datalink Out C2
10	Datalink Out D1
11	Datalink Out D2

Table 6 - ControlLogix Controller I/O Image for Devices with 16-bit Reference/ Feedback and 32-bit Datalinks – Using Generic Profile

These products include the following:

- PowerFlex 700 drives with vector control
- PowerFlex 700L drives with 700 control
- PowerFlex Digital DC drives
- SMC-50 smart motor controllers

Word	Output I/O
0	Logic Command
1	Reference
2	Datalink In A1 (LSW)
3	Datalink In A1 (MSW)
4	Datalink In A2 (LSW)
5	Datalink In A2 (MSW)
6	Datalink In B1 (LSW)
7	Datalink In B1 (MSW)
8	Datalink In B2 (LSW)
9	Datalink In B2 (MSW)
10	Datalink In C1 (LSW)
11	Datalink In C1 (MSW)
12	Datalink In C2 (LSW)
13	Datalink In C2 (MSW)
14	Datalink In D1 (LSW)
15	Datalink In D1 (MSW)
16	Datalink In D2 (LSW)
17	Datalink In D2 (MSW)

Word	Input I/O
0	Pad Word
1	Pad Word
2	Logic Status
3	Feedback
4	Datalink Out A1 (LSW)
5	Datalink Out A1 (MSW)
6	Datalink Out A2 (LSW)
7	Datalink Out A2 (MSW)
8	Datalink Out B1 (LSW)
9	Datalink Out B1 (MSW)
10	Datalink Out B2 (LSW)
11	Datalink Out B2 (MSW)
12	Datalink Out C1 (LSW)
13	Datalink Out C1 (MSW)
14	Datalink Out C2 (LSW)
15	Datalink Out C2 (MSW)
16	Datalink Out D1 (LSW)
17	Datalink Out D1 (MSW)
18	Datalink Out D2 (LSW)
19	Datalink Out D2 (MSW)

Table 7 - ControlLogix Controller I/O Image for Drives with 32-bit Reference/ Feedback and 32-bit Datalinks – Using Generic Profile

These products include the following:

- PowerFlex 700S drives with Phase I or Phase II control
- PowerFlex 700L drives with 700S control
- PowerFlex 753 drives
- PowerFlex 755 drives

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Pad Word
1	Not Used	1	Pad Word
2	Reference (LSW)	2	Logic Status
3	Reference (MSW)	3	Not Used
4	Datalink In A1 (LSW)	4	Feedback (LSW)
5	Datalink In A1 (MSW)	5	Feedback (MSW)
6	Datalink In A2 (LSW)	6	Datalink Out A1 (LSW)
7	Datalink In A2 (MSW)	7	Datalink Out A1 (MSW)
8	Datalink In B1 (LSW)	8	Datalink Out A2 (LSW)
9	Datalink In B1 (MSW)	9	Datalink Out A2 (MSW)
10	Datalink In B2 (LSW)	10	Datalink Out B1 (LSW)
11	Datalink In B2 (MSW)	11	Datalink Out B1 (MSW)
12	Datalink In C1 (LSW)	12	Datalink Out B2 (LSW)
13	Datalink In C1 (MSW)	13	Datalink Out B2 (MSW)
14	Datalink In C2 (LSW)	14	Datalink Out C1 (LSW)
15	Datalink In C2 (MSW)	15	Datalink Out C1 (MSW)
16	Datalink In D1 (LSW)	16	Datalink Out C2 (LSW)
17	Datalink In D1 (MSW)	17	Datalink Out C2 (MSW)
18	Datalink In D2 (LSW)	18	Datalink Out D1 (LSW)
19	Datalink In D2 (MSW)	19	Datalink Out D1 (MSW)
		20	Datalink Out D2 (LSW)
		21	Datalink Out D2 (MSW)

MicroLogix 1100/1400 Controller Image

The I/O image for these controllers always has 19 words of output and 19 words of input. However, depending on the size of the device's Reference/Feedback and Datalinks, specific words in the I/O image may not be used. Table 8, Table 9, and Table 10 show the I/O image when using various PowerFlex 7-Class drives, and all Datalinks enabled.

Table 8 - MicroLogix 1100/1400 I/O Image for PowerFlex 70/ 700/700H Drives and SMC Flex (16-bit Reference/Feedback and 16-bit Datalinks)

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Logic Status
1	Not used	1	Not used
2	Reference (MSW)	2	Feedback (MSW)
3	Not used	3	Not used
4	Datalink In A1 (MSW)	4	Datalink Out A1 (MSW)
5	Not used	5	Not used
6	Datalink In A2 (MSW)	6	Datalink Out A2 (MSW)
7	Not used	7	Not used
8	Datalink In B1 (MSW)	8	Datalink Out B1 (MSW)
9	Not used	9	Not used
10	Datalink In B2 (MSW)	10	Datalink Out B2 (MSW)
11	Not used	11	Not used
12	Datalink In C1 (MSW)	12	Datalink Out C1 (MSW)
13	Not used	13	Not used
14	Datalink In C2 (MSW)	14	Datalink Out C2 (MSW)
15	Not used	15	Not used
16	Datalink In D1 (MSW)	16	Datalink Out D1 (MSW)
17	Not used	17	Not used
18	Datalink In D2 (MSW)	18	Datalink Out D2 (MSW)

Table 9 - MicroLogix 1100/1400 I/O Image for PowerFlex 700 VC Drives and SMC-50 Controllers (16-bit Reference/Feedback and 32-bit Datalinks)

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Logic Status
1	Not used	1	Not used
2	Reference (MSW)	2	Feedback (MSW)
3	Datalink In A1 (LSW)	3	Datalink Out A1 (LSW)
4	Datalink In A1 (MSW)	4	Datalink Out A1 (MSW)
5	Datalink In A2 (LSW)	5	Datalink Out A2 (LSW)
6	Datalink In A2 (MSW)	6	Datalink Out A2 (MSW)
7	Datalink In B1 (LSW)	7	Datalink Out B1 (LSW)
8	Datalink In B1 (MSW)	8	Datalink Out B1 (MSW)
9	Datalink In B2 (LSW)	9	Datalink Out B2 (LSW)
10	Datalink In B2 (MSW)	10	Datalink Out B2 (MSW)
11	Datalink In C1 (LSW)	11	Datalink Out C1 (LSW)
12	Datalink In C1 (MSW)	12	Datalink Out C1 (MSW)
13	Datalink In C2 (LSW)	13	Datalink Out C2 (LSW)
14	Datalink In C2 (MSW)	14	Datalink Out C2 (MSW)
15	Datalink In D1 (LSW)	15	Datalink Out D1 (LSW)
16	Datalink In D1 (MSW)	16	Datalink Out D1 (MSW)
17	Datalink In D2 (LSW)	17	Datalink Out D2 (LSW)
18	Datalink In D2 (MSW)	18	Datalink Out D2 (MSW)

Table 10 - MicroLogix 1100/1400 I/O Image for PowerFlex 700S Series Drives (32-bit Reference/Feedback and 32-bit Datalinks)

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Logic Status
1	Reference (LSW)	1	Feedback (LSW)
2	Reference (MSW)	2	Feedback (MSW)
3	Datalink In A1 (LSW)	3	Datalink Out A1 (LSW)
4	Datalink In A1 (MSW)	4	Datalink Out A1 (MSW)
5	Datalink In A2 (LSW)	5	Datalink Out A2 (LSW)
6	Datalink In A2 (MSW)	6	Datalink Out A2 (MSW)
7	Datalink In B1 (LSW)	7	Datalink Out B1 (LSW)
8	Datalink In B1 (MSW)	8	Datalink Out B1 (MSW)
9	Datalink In B2 (LSW)	9	Datalink Out B2 (LSW)
10	Datalink In B2 (MSW)	10	Datalink Out B2 (MSW)
11	Datalink In C1 (LSW)	11	Datalink Out C1 (LSW)
12	Datalink In C1 (MSW)	12	Datalink Out C1 (MSW)
13	Datalink In C2 (LSW)	13	Datalink Out C2 (LSW)
14	Datalink In C2 (MSW)	14	Datalink Out C2 (MSW)
15	Datalink In D1 (LSW)	15	Datalink Out D1 (LSW)
16	Datalink In D1 (MSW)	16	Datalink Out D1 (MSW)
17	Datalink In D2 (LSW)	17	Datalink Out D2 (LSW)
18	Datalink In D2 (MSW)	18	Datalink Out D2 (MSW)

Using Logic Command/Status

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

This manual contains the bit definitions for most compatible products available at the time of publication in Appendix D, Logic Command/Status Words. For other products, see their documentation.

Using Reference/Feedback

The Reference is produced by the controller and consumed by the adapter. The Feedback is produced by the adapter and consumed by the controller. The size of the Reference/Feedback is determined by the drive and displayed using adapter **Parameter 20 - [Ref/Fdbk Size]**.

Size	Valid Values
16-bit	-32768 to 32767
32-bit	-2147483648 to 2147483647

When the Reference and Feedback are enabled and a ControlLogix controller with a device Add-on Profile or Classic Profile is used, specific controller tags are automatically created, sized (16-bit or 32-bit), and placed in the I/O image.

PowerFlex 7-Class Drives

The Reference value is an unscaled 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 drive 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 the following formula:

$$\textbf{(Parameter 82} \div \textbf{Parameter 55) * 32767 = Scaling}$$

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

$$(60 \text{ Hz} \div 130 \text{ Hz}) * 32767 = 15123$$

Therefore, 0...15123 = 0...60.0 Hz.

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

$$(90 \text{ Hz} \div 130 \text{ Hz}) * 32767 = 22685$$

Therefore, 0...22685 = 0...90.0 Hz.

A graphic representation of this Reference scaling is shown below.
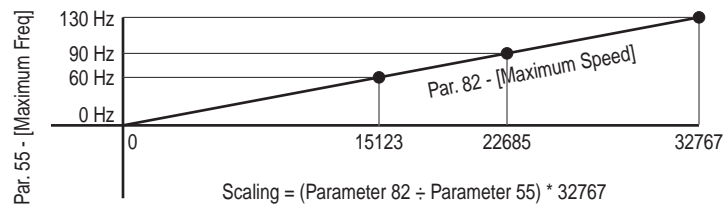
For PowerFlex 70 EC drives, firmware 2.xxx or later, or PowerFlex 700 VC drives, firmware 3.xxx or later, drive parameter 298 - [DPI Ref Select] was added to simplify scaling for the speed Reference. When drive parameter 298 - [DPI Ref Select] is set to its default '0' (Max Freq), the speed Reference 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]:

$$\textbf{Parameter 82 = Scaling}$$

Using the parameter 82 default value, speed Reference scaling is:

$$0...32767 = 0...60.0 \text{ Hz.}$$

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

$$90 \text{ Hz} = 32767$$

Speed Feedback uses the same scaling as the speed Reference.

TIP   For PowerFlex 700 VC drives, firmware 3.xxx or later, 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 software screens in the drive status area of the screen.

The controller in the system sends a reference to the SMC, but it is not used for control purposes in the current release.

The SMC products use the feedback to send motor current information.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives and SMCs to transfer data to and from the controller. Datalinks allow a device parameter value to be read or written without using an Explicit Message. When enabled, each Datalink occupies two 16-bit or 32-bit words in both the input and output image. Use adapter **Parameter 21 - [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 device can be used by only one adapter. If more than one adapter is connected to a single device, multiple adapters cannot use the same Datalink.

- Parameter settings in the device determine the data passed through the Datalink mechanism. See the documentation for your device.

- When you use a Datalink to change a value, the value is NOT written to the Nonvolatile Storage (NVS). The value is stored in volatile memory and lost when the device loses power. Therefore, use Datalinks when you need to change a value of a parameter frequently.

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

This subsection only pertains to the SMC Flex and 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 (Parameter 310) and Datalink A2 Out (Parameter 311) 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 (Parameter 310) and Datalink A2 Out (Parameter 311).

Datalink	Word	Parameter	Data (Hex)
A1 Out	LSW	10	0003
A2 Out	MSW	10	0001

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 hours.

Datalink	Word	Parameter	Data (Hex)
A2 Out	MSW	242	000D
B1 Out	LSW	242	7F3D

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

Example Ladder Logic Program Information

The example ladder logic programs in the sections of this chapter are intended for and operate PowerFlex 7-Class drives and SMC Flex controllers.

Functions of the Example Programs

The example programs enable you to do the following:

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

Logic Command/Status Words

These examples use the Logic Command word and Logic Status word for PowerFlex 70/700 drives. See Appendix D to view details. The definition of the bits in these words may vary if you are using a different DPI device. See the documentation for your device.

ControlLogix Controller Example

Creating Ladder Logic Using the RSLogix 5000 Device Add-on Profiles, Version 16.00 or Later

Because the device Add-on Profile automatically created descriptive controller tags (Figure 9) for the entire I/O image in Chapter 4, you can use these tags to directly control and monitor the device without creating any ladder logic program. However, if you intend to use Human Machine Interface devices (PanelView, and so forth) to operate the device and view its status, you will need to create descriptive user-defined Program tags (Figure 19) and a ladder logic program that will pass the Controller tag data to the Program tags.

Figure 19 - ControlLogix Program Tags for Device Add-on Profile Ladder Logic Program Example

Name	△	Style	Data Type
Command_Clear_Faults		Decimal	BOOL
Command_Forward_Reverse		Decimal	BOOL
Command_Jog		Decimal	BOOL
Command_Start		Decimal	BOOL
Command_Stop		Decimal	BOOL
+ Speed_Feedback		Decimal	DINT
+ Speed_Reference		Decimal	DINT
Status_Active		Decimal	BOOL
Status_At_Speed		Decimal	BOOL
Status_Faulted		Decimal	BOOL
Status_Forward		Decimal	BOOL
Status_Ready		Decimal	BOOL
Status_Reverse		Decimal	BOOL

An example ladder logic program that uses the automatically created descriptive Controller tags and passes their data to the user-defined Program tags is shown in Figure 20 and Figure 21. Note that the prefix for the device Controller tags is determined by the name assigned when configuring the I/O (Chapter 4).

Figure 20 - ControlLogix Example Ladder Logic Program Using a Device Add-on Profile for Logic Status/Feedback
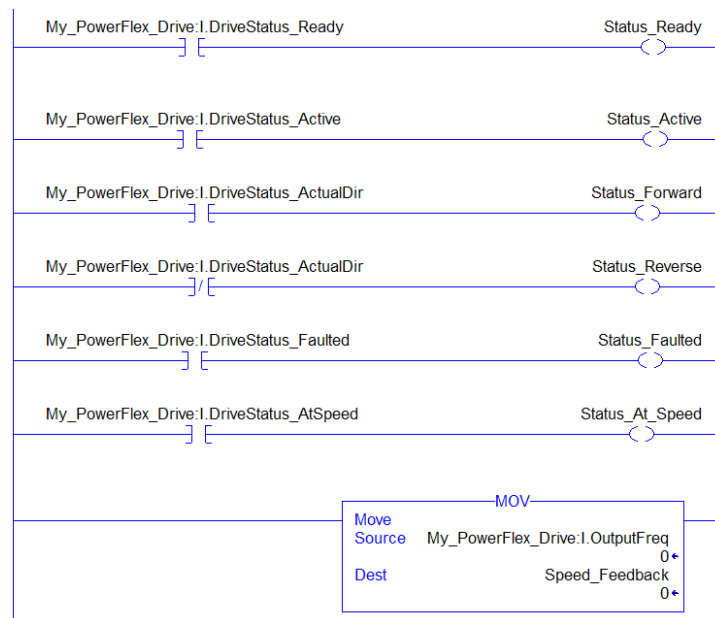
Figure 21 - ControlLogix Example Ladder Logic Program Using a Device Add-on Profile for Logic Command/Reference
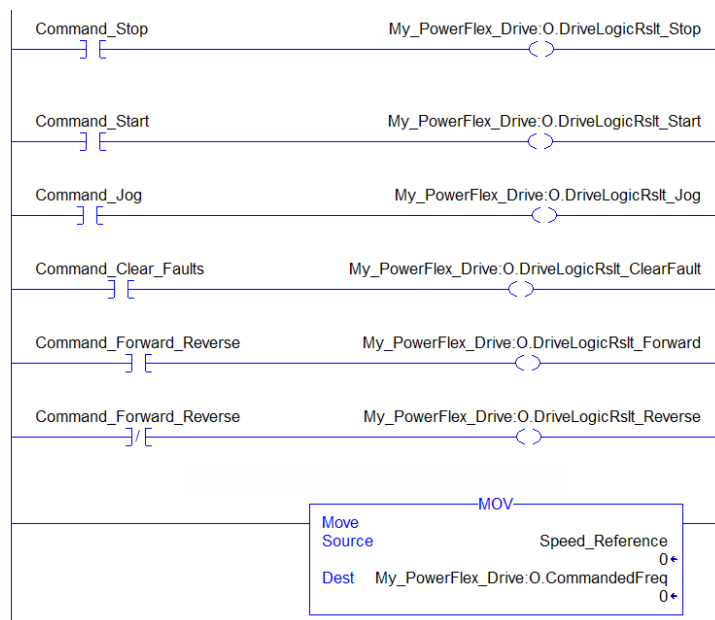
Creating Ladder Logic Using the RSLogix 5000 Classic Profile, Versions 1300…15.00

Since the RSLogix 5000 Classic Profile has been significantly improved upon by RSLogix 5000 device Add-on Profiles, version 16.00 or later, we highly

recommended using the RSLogix 5000 device Add-on Profiles to take advantage of their benefits (more intuitive, time saving, and less likely to make ladder logic program errors).

Creating Ladder Logic Using the RSLogix 5000 Generic Profile, All Versions

Drive and Adapter Parameter Settings

The following drive and adapter settings were used for the example ladder logic program in this section.

Device	Parameter	Value	Description
PowerFlex 70 EC Drive	90 - [Speed Ref A Sel]	22 (DPI Port 5)	Assigns 20-COMM-ER to be used for the Reference.
	300 - [Data In A1]	140	Points to Par. 140 - [Accel Time 1]
	301 - [Data In A2]	142	Points to Par. 142 - [Decel Time 1]
	302 - [Data In B1]	100	Points to Par. 100 - [Jog Speed]
	303 - [Data In B2]	155	Points to Par. 155 - [Stop Mode A]
	304 - [Data In C1]	101	Points to Par. 101 - [Preset Speed 1]
	305 - [Data In C2]	102	Points to Par. 102 - [Preset Speed 2]
	306 - [Data In D1]	103	Points to Par. 103 - [Preset Speed 3]
	307 - [Data In D2]	104	Points to Par. 104 - [Preset Speed 4]
	310 - [Data Out A1]	140	Points to Par. 140 - [Accel Time 1]
	311 - [Data Out A2]	142	Points to Par. 142 - [Decel Time 1]
	312 - [Data Out B1]	100	Points to Par. 100 - [Jog Speed]
	313 - [Data Out B2]	155	Points to Par. 155 - [Stop Mode A]
	314 - [Data Out C1]	101	Points to Par. 101 - [Preset Speed 1]
	315 - [Data Out C2]	102	Points to Par. 102 - [Preset Speed 2]
	316 - [Data Out D1]	103	Points to Par. 103 - [Preset Speed 3]
	317 - [Data Out D2]	104	Points to Par. 104 - [Preset Speed 4]
20-COMM-ER Adapter	04 - [IP Addr Cfg 1] ⋮ 07 - [IP Addr Cfg 4]	10.91.100.79	IP address for the adapter.
	08 - [Subnet Cfg 1] ⋮ 11 - [Subnet Cfg 4]	255.255.248.0	Subnet mask for the adapter.
	23 - [DPI I/O Cfg]	xxx1 1111	Enables Cmd/Ref and Datalinks A…D.
	35 - [M-S Input]	xxx1 1111	Configures the I/O Data to be transferred from the controller on the network to the drive.
	36 - [M-S Output]	xxx1 1111	Configures the I/O Data to be transferred from the drive to the controller on the network.

> **TIP** Data In parameters are inputs into the device that come from controller outputs (for example, data to write to a device parameter). Data Out parameters are outputs from the device that go to controller inputs (for example, data to read a device parameter).

Controller Tags

When you add the adapter and drive to the I/O configuration (Chapter 4), RSLogix 5000 software automatically creates generic (non-descriptive) controller tags for them. In this example program, the following controller tags are used.

Figure 22 - ControlLogix Controller Tags for Drive Generic Profile Example Ladder Logic Program

Name	△	Data Type	Description
+ My_PowerFlex_Drive:C		AB:ETHER...	
+ My_PowerFlex_Drive:I		AB:ETHER...	
+ My_PowerFlex_Drive:O		AB:ETHER...	

You can expand the Input and Output tags to reveal the input and output configuration.

Figure 23 - ControlLogix Input Image for Drive Generic Profile Example Ladder Logic Program

Name	△	Data Type	Description
– My_PowerFlex_Drive:I		AB:ETHER...	
– My_PowerFlex_Drive:I.Data		INT[12]	Input Image
+ My_PowerFlex_Drive:I.Data[0]		INT	Pad Word
+ My_PowerFlex_Drive:I.Data[1]		INT	Pad Word
+ My_PowerFlex_Drive:I.Data[2]		INT	Logic Status
+ My_PowerFlex_Drive:I.Data[3]		INT	Speed Feedback
+ My_PowerFlex_Drive:I.Data[4]		INT	Datalink Out A1
+ My_PowerFlex_Drive:I.Data[5]		INT	Datalink Out A2
+ My_PowerFlex_Drive:I.Data[6]		INT	Datalink Out B1
+ My_PowerFlex_Drive:I.Data[7]		INT	Datalink Out B2
+ My_PowerFlex_Drive:I.Data[8]		INT	Datalink Out C1
+ My_PowerFlex_Drive:I.Data[9]		INT	Datalink Out C2
+ My_PowerFlex_Drive:I.Data[10]		INT	Datalink Out D1
+ My_PowerFlex_Drive:I.Data[11]		INT	Datalink Out D2

PowerFlex 70 Drive
16-bit Speed Feedback and Datalinks

Name	△	Data Type	Description
– My_PowerFlex_Drive:I		AB:ETHER...	
– My_PowerFlex_Drive:I.Data		INT[22]	Input Image
+ My_PowerFlex_Drive:I.Data[0]		INT	Pad Word
+ My_PowerFlex_Drive:I.Data[1]		INT	Pad Word
+ My_PowerFlex_Drive:I.Data[2]		INT	Logic Status
+ My_PowerFlex_Drive:I.Data[3]		INT	Not Used
+ My_PowerFlex_Drive:I.Data[4]		INT	FeedBack (LSW)
+ My_PowerFlex_Drive:I.Data[5]		INT	Feedback (MSW)
+ My_PowerFlex_Drive:I.Data[6]		INT	Datalink Out A1 (LSW)
+ My_PowerFlex_Drive:I.Data[7]		INT	Datalink Out A1 (MSW)
+ My_PowerFlex_Drive:I.Data[8]		INT	Datalink Out A2 (LSW)
+ My_PowerFlex_Drive:I.Data[9]		INT	Datalink Out A2 (MSW)
+ My_PowerFlex_Drive:I.Data[10]		INT	Datalink Out B1 (LSW)
+ My_PowerFlex_Drive:I.Data[11]		INT	Datalink Out B1 (MSW)
+ My_PowerFlex_Drive:I.Data[12]		INT	Datalink Out B2 (LSW)
+ My_PowerFlex_Drive:I.Data[13]		INT	Datalink Out B2 (MSW)
+ My_PowerFlex_Drive:I.Data[14]		INT	Datalink Out C1 (LSW)
+ My_PowerFlex_Drive:I.Data[15]		INT	Datalink Out C1 (MSW)
+ My_PowerFlex_Drive:I.Data[16]		INT	Datalink Out C2 (LSW)
+ My_PowerFlex_Drive:I.Data[17]		INT	Datalink Out C2 (MSW)
+ My_PowerFlex_Drive:I.Data[18]		INT	Datalink Out D1 (LSW)
+ My_PowerFlex_Drive:I.Data[19]		INT	Datalink Out D1 (MSW)
+ My_PowerFlex_Drive:I.Data[20]		INT	Datalink Out D2 (LSW)
+ My_PowerFlex_Drive:I.Data[21]		INT	Datalink Out D2 (MSW)

PowerFlex 700S-Series Drive
32-bit Speed Feedback and Datalinks

Figure 24 - ControlLogix Output Image for Drive Generic Profile Example Ladder Logic Program

Name	△	Data Type	Description
─ My_PowerFlex_Drive:O		AB:ETHER...	
─ My_PowerFlex_Drive:O.Data		INT[10]	Output Image
+ My_PowerFlex_Drive:O.Data[0]		INT	Logic Command
+ My_PowerFlex_Drive:O.Data[1]		INT	Speed Reference
+ My_PowerFlex_Drive:O.Data[2]		INT	Datalink In A1
+ My_PowerFlex_Drive:O.Data[3]		INT	Datalink In A2
+ My_PowerFlex_Drive:O.Data[4]		INT	Datalink In B1
+ My_PowerFlex_Drive:O.Data[5]		INT	Datalink In B2
+ My_PowerFlex_Drive:O.Data[6]		INT	Datalink In C1
+ My_PowerFlex_Drive:O.Data[7]		INT	Datalink In C2
+ My_PowerFlex_Drive:O.Data[8]		INT	Datalink In D1
+ My_PowerFlex_Drive:O.Data[9]		INT	Datalink In D2

PowerFlex 70 Drive
16-bit Speed Reference and Datalinks

Name	△	Data Type	Description
─ My_PowerFlex_Drive:O		AB:ETHER...	
─ My_PowerFlex_Drive:O.Data		INT[20]	Output Image
+ My_PowerFlex_Drive:O.Data[0]		INT	Logic Command
+ My_PowerFlex_Drive:O.Data[1]		INT	Not Used
+ My_PowerFlex_Drive:O.Data[2]		INT	Reference (LSW)
+ My_PowerFlex_Drive:O.Data[3]		INT	Reference (MSW)
+ My_PowerFlex_Drive:O.Data[4]		INT	Datalink In A1 (LSW)
+ My_PowerFlex_Drive:O.Data[5]		INT	Datalink In A1 (MSW)
+ My_PowerFlex_Drive:O.Data[6]		INT	Datalink In A2 (LSW)
+ My_PowerFlex_Drive:O.Data[7]		INT	Datalink In A2 (MSW)
+ My_PowerFlex_Drive:O.Data[8]		INT	Datalink In B1 (LSW)
+ My_PowerFlex_Drive:O.Data[9]		INT	Datalink In B1 (MSW)
+ My_PowerFlex_Drive:O.Data[10]		INT	Datalink In B2 (LSW)
+ My_PowerFlex_Drive:O.Data[11]		INT	Datalink In B2 (MSW)
+ My_PowerFlex_Drive:O.Data[12]		INT	Datalink In C1 (LSW)
+ My_PowerFlex_Drive:O.Data[13]		INT	Datalink In C1 (MSW)
+ My_PowerFlex_Drive:O.Data[14]		INT	Datalink In C2 (LSW)
+ My_PowerFlex_Drive:O.Data[15]		INT	Datalink In C2 (MSW)
+ My_PowerFlex_Drive:O.Data[16]		INT	Datalink In D1 (LSW)
+ My_PowerFlex_Drive:O.Data[17]		INT	Datalink In D1 (MSW)
+ My_PowerFlex_Drive:O.Data[18]		INT	Datalink In D2 (LSW)
+ My_PowerFlex_Drive:O.Data[19]		INT	Datalink In D2 (MSW)

PowerFlex 700S-Series Drive
32-bit Speed Reference and Datalinks

Program Tags

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

Figure 25 - ControlLogix Program Tags for Drive Generic Profile Example Ladder Logic Program

Name	△	Style	Data Type
Command_Clear_Faults		Decimal	BOOL
Command_Forward_Reverse		Decimal	BOOL
Command_Jog		Decimal	BOOL
Command_Start		Decimal	BOOL
Command_Stop		Decimal	BOOL
+ Speed_Feedback		Decimal	DINT
+ Speed_Reference		Decimal	DINT
Status_Active		Decimal	BOOL
Status_At_Speed		Decimal	BOOL
Status_Faulted		Decimal	BOOL
Status_Forward		Decimal	BOOL
Status_Ready		Decimal	BOOL
Status_Reverse		Decimal	BOOL

For information on speed Reference and Feedback scaling, see .

Figure 26 - ControlLogix Example Ladder Logic Program Using a Drive Generic Profile for Logic Status/Feedback

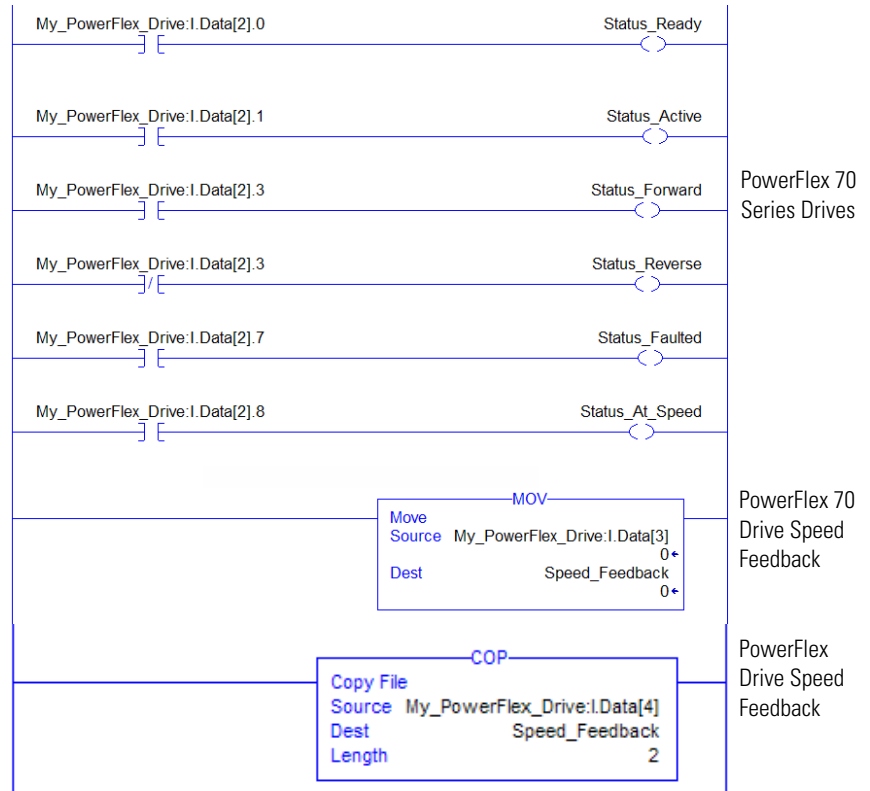**Figure 27 - ControlLogix Example Ladder Logic Program Using a Drive Generic Profile for Logic Command/Reference**
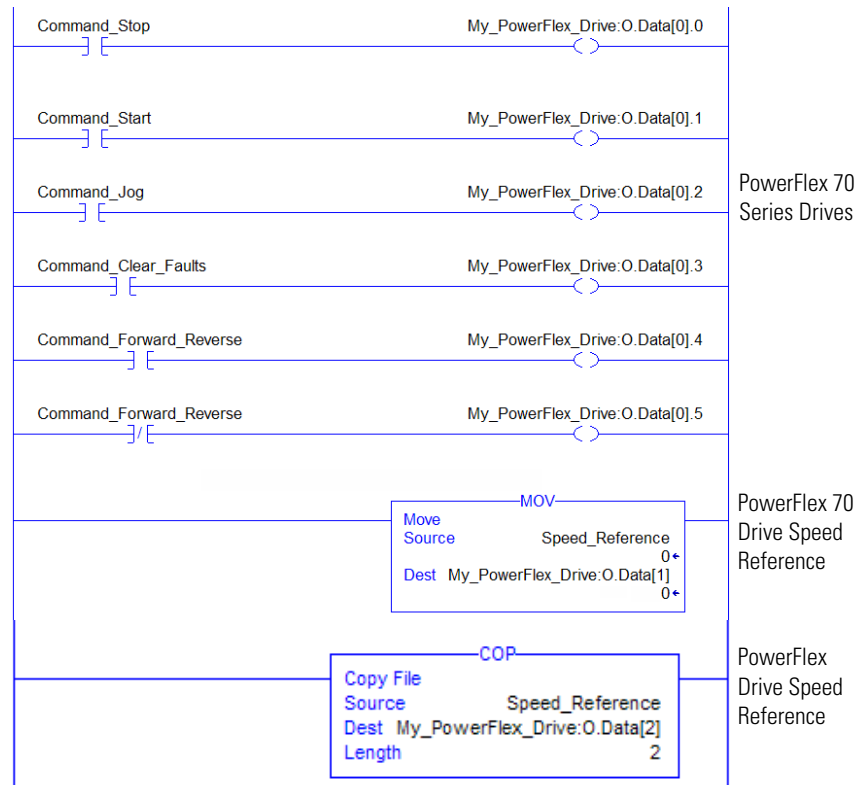
Example Datalink Data

The Datalink data used in the example program is shown in Figure 28. Note that to describe the parameters to which the Datalinks are assigned, you may want to add descriptions to the automatically-created generic controller tags or create a User Defined Data Types (UDDT).

Figure 28 - ControlLogix Example Datalinks for Ladder Logic Program Using a Drive Generic Profile

Name	△	Value	←	Data Type	Description
⊟ My_PowerFlex_Drive:I		{...}		AB:ETHER...	
⊟ My_PowerFlex_Drive:I.Data		{...}		INT[12]	Input Image
⊞ My_PowerFlex_Drive:I.Data[0]		0		INT	Pad Word
⊞ My_PowerFlex_Drive:I.Data[1]		0		INT	Pad Word
⊞ My_PowerFlex_Drive:I.Data[2]		0		INT	Logic Status
⊞ My_PowerFlex_Drive:I.Data[3]		0		INT	Speed Feedback
⊞ My_PowerFlex_Drive:I.Data[4]		50		INT	Datalink Out A1
⊞ My_PowerFlex_Drive:I.Data[5]		50		INT	Datalink Out A2
⊞ My_PowerFlex_Drive:I.Data[6]		100		INT	Datalink Out B1
⊞ My_PowerFlex_Drive:I.Data[7]		1		INT	Datalink Out B2
⊞ My_PowerFlex_Drive:I.Data[8]		200		INT	Datalink Out C1
⊞ My_PowerFlex_Drive:I.Data[9]		300		INT	Datalink Out C2
⊞ My_PowerFlex_Drive:I.Data[10]		400		INT	Datalink Out D1
⊞ My_PowerFlex_Drive:I.Data[11]		500		INT	Datalink Out D2
⊟ My_PowerFlex_Drive:O		{...}		AB:ETHER...	
⊟ My_PowerFlex_Drive:O.Data		{...}		INT[10]	Output Image
⊞ My_PowerFlex_Drive:O.Data[0]		0		INT	Logic Command
⊞ My_PowerFlex_Drive:O.Data[1]		0		INT	Speed Reference
⊞ My_PowerFlex_Drive:O.Data[2]		50		INT	Datalink In A1
⊞ My_PowerFlex_Drive:O.Data[3]		50		INT	Datalink In A2
⊞ My_PowerFlex_Drive:O.Data[4]		100		INT	Datalink In B1
⊞ My_PowerFlex_Drive:O.Data[5]		1		INT	Datalink In B2
⊞ My_PowerFlex_Drive:O.Data[6]		200		INT	Datalink In C1
⊞ My_PowerFlex_Drive:O.Data[7]		300		INT	Datalink In C2
⊞ My_PowerFlex_Drive:O.Data[8]		400		INT	Datalink In D1
⊞ My_PowerFlex_Drive:O.Data[9]		500		INT	Datalink In D2

PowerFlex 70 Drive

Name	△	Value	←	Data Type	Description
⊟ My_PowerFlex_Drive:I		{...}		AB:ETHER...	
⊟ My_PowerFlex_Drive:I.Data		{...}		INT[22]	Input Image
⊞ My_PowerFlex_Drive:I.Data[0]		0		INT	Pad Word
⊞ My_PowerFlex_Drive:I.Data[1]		0		INT	Pad Word
⊞ My_PowerFlex_Drive:I.Data[2]		1295		INT	Logic Status
⊞ My_PowerFlex_Drive:I.Data[3]		0		INT	Not Used
⊞ My_PowerFlex_Drive:I.Data[4]		25000		INT	Feedback (LSW)
⊞ My_PowerFlex_Drive:I.Data[5]		0		INT	Feedback (MSW)
⊞ My_PowerFlex_Drive:I.Data[6]		−26970		INT	Datalink Out A1 (LSW)
⊞ My_PowerFlex_Drive:I.Data[7]		17432		INT	Datalink Out A1 (MSW)
⊞ My_PowerFlex_Drive:I.Data[8]		15562		INT	Datalink Out A2 (LSW)
⊞ My_PowerFlex_Drive:I.Data[9]		5457		INT	Datalink Out A2 (MSW)
⊞ My_PowerFlex_Drive:I.Data[10]		0		INT	Datalink Out B1 (LSW)
⊞ My_PowerFlex_Drive:I.Data[11]		16840		INT	Datalink Out B1 (MSW)
⊞ My_PowerFlex_Drive:I.Data[12]		0		INT	Datalink Out B2 (LSW)
⊞ My_PowerFlex_Drive:I.Data[13]		0		INT	Datalink Out B2 (MSW)
⊞ My_PowerFlex_Drive:I.Data[14]		0		INT	Datalink Out C1 (LSW)
⊞ My_PowerFlex_Drive:I.Data[15]		0		INT	Datalink Out C1 (MSW)
⊞ My_PowerFlex_Drive:I.Data[16]		0		INT	Datalink Out C2 (LSW)
⊞ My_PowerFlex_Drive:I.Data[17]		0		INT	Datalink Out C2 (MSW)
⊞ My_PowerFlex_Drive:I.Data[18]		0		INT	Datalink Out D1 (LSW)
⊞ My_PowerFlex_Drive:I.Data[19]		0		INT	Datalink Out D1 (MSW)
⊞ My_PowerFlex_Drive:I.Data[20]		0		INT	Datalink Out D2 (LSW)
⊞ My_PowerFlex_Drive:I.Data[21]		0		INT	Datalink Out D2 (MSW)
⊟ My_PowerFlex_Drive:O		{...}		AB:ETHER...	
⊟ My_PowerFlex_Drive:O.Data		{...}		INT[20]	Output Image
⊞ My_PowerFlex_Drive:O.Data[0]		0		INT	Logic Command
⊞ My_PowerFlex_Drive:O.Data[1]		0		INT	Not Used
⊞ My_PowerFlex_Drive:O.Data[2]		25000		INT	Reference (LSW)
⊞ My_PowerFlex_Drive:O.Data[3]		0		INT	Reference (MSW)
⊞ My_PowerFlex_Drive:O.Data[4]		0		INT	Datalink In A1 (LSW)
⊞ My_PowerFlex_Drive:O.Data[5]		16680		INT	Datalink In A1 (MSW)
⊞ My_PowerFlex_Drive:O.Data[6]		4430		INT	Datalink In A2 (LSW)
⊞ My_PowerFlex_Drive:O.Data[7]		1909		INT	Datalink In A2 (MSW)
⊞ My_PowerFlex_Drive:O.Data[8]		−2621		INT	Datalink In B1 (LSW)
⊞ My_PowerFlex_Drive:O.Data[9]		16664		INT	Datalink In B1 (MSW)
⊞ My_PowerFlex_Drive:O.Data[10]		0		INT	Datalink In B2 (LSW)
⊞ My_PowerFlex_Drive:O.Data[11]		0		INT	Datalink In B2 (MSW)

PowerFlex 700S-Series Drive

For PowerFlex 7-Class drives, the scaling may need to be multiplied by 10 or 100, depending on the parameter. For more information, see .

MicroLogix 1100/1400 Controller Example

Drive and Adapter Parameter Settings

The following drive and adapter settings were used for the example ladder logic program in this section.

Device	Parameter	Value	Description
PowerFlex 70 EC Drive	90 - [Speed Ref A Sel]	22 (DPI Port 5)	Assigns 20-COMM-ER to be used for the Reference.
	300 - [Data In A1]	140	Points to Par. 140 - [Accel Time 1]
	301 - [Data In A2]	142	Points to Par. 142 - [Decel Time 1]
	302 - [Data In B1]	100	Points to Par. 100 - [Jog Speed]
	303 - [Data In B2]	155	Points to Par. 155 - [Stop Mode A]
	304 - [Data In C1]	101	Points to Par. 101 - [Preset Speed 1]
	305 - [Data In C2]	102	Points to Par. 102 - [Preset Speed 2]
	306 - [Data In D1]	103	Points to Par. 103 - [Preset Speed 3]
	307 - [Data In D2]	104	Points to Par. 104 - [Preset Speed 4]
	310 - [Data Out A1]	140	Points to Par. 140 - [Accel Time 1]
	311 - [Data Out A2]	142	Points to Par. 142 - [Decel Time 1]
	312 - [Data Out B1]	100	Points to Par. 100 - [Jog Speed]
	313 - [Data Out B2]	155	Points to Par. 155 - [Stop Mode A]
	314 - [Data Out C1]	101	Points to Par. 101 - [Preset Speed 1]
	315 - [Data Out C2]	102	Points to Par. 102 - [Preset Speed 2]
	316 - [Data Out D1]	103	Points to Par. 103 - [Preset Speed 3]
	317 - [Data Out D2]	104	Points to Par. 104 - [Preset Speed 4]
20-COMM-ER Adapter	04 - [IP Addr Cfg 1] ⋮ 07 - [IP Addr Cfg 4]	10.91.100.79	IP address for the adapter.
	08 - [Subnet Cfg 1] ⋮ 11 - [Subnet Cfg 4]	255.255.248.0	Subnet mask for the adapter.
	23 - [DPI I/O Cfg]	xxx1 1111	Enables Cmd/Ref and Datalinks A…D.
	35 - [M-S Input]	xxx1 1111	Configures the I/O Data to be transferred from the controller on the network to the drive.
	36 - [M-S Output]	xxx1 1111	Configures the I/O Data to be transferred from the drive to the controller on the network.

TIP   Data In parameters are inputs into the drive that come from controller outputs (for example, data to write to a drive parameter). Data Out parameters are outputs from the drive that go to controller inputs (for example, data to read a drive parameter).

TIP   When using a drive that has 16-bit Datalinks (PowerFlex 70, PowerFlex 700, and PowerFlex 700H drives) to transfer a 32-bit parameter, two contiguous drive Datalink parameters (for example, Data Out A1/A2, B1/B2, etc.) are required. To determine if a parameter is a 32-bit parameter, see the Parameter section in the drive documentation and look for a $\overset{32}{\triangledown}$ symbol in the 'No.' column. (All parameters in PowerFlex 700 Series B drives are 32-bit parameters.) For example, parameter 3 - [Output Current] in a PowerFlex 70 EC drive is a 32-bit parameter. When using a drive that has 32-bit Datalinks (PowerFlex 700 VC and PowerFlex 700S), only one drive Datalink parameter is required to transfer any parameter.

Understanding Controller Data Table Addresses

Because MicroLogix 1100/1400 controllers are 16-bit platforms and are used with the 32-bit 20-COMM-ER adapter, the data will be transposed from the least-significant word (LSW) to the most-significant word (MSW) in the controller.

When the I/O was configured (Chapter 4), an available data table address (N20) was used. Figure 29 shows the entire data file address structure for this example.

Figure 29 - Data File Table for Example Ladder Logic Program

Important: The N20:0 data table address in this example is used to set a control timeout value (in seconds) which determines how long it will take the adapter to detect a communication loss. Enter a valid value (1…32767) for N20:0. A value of zero (0) is not valid, because it disables the timeout and all I/O connections (Logic Command/Status, Reference/Feedback, and Datalinks) intended for the drive will not execute. A timeout value of 5…20 seconds is recommended.

Depending on the drive you are using, Table 11, Table 12, Table 13, or Table 14 show the I/O definitions as they relate to the N20 data table (Figure 29) being used in this example.

When using PowerFlex 70 or 70 EC, PowerFlex 700, PowerFlex 700VC drives, or SMC Flex controllers—which all contain INT (16-bit format) data types, you will read from and write to the MSW data table address in the controller.

When using PowerFlex 700 VC drives or SMC-50 controllers, which contain DINT (32-bit format) data types, you will read from and write to the LSW data table address in the controller.

When using PowerFlex 700S drives, which contain both DINT (32-bit format) and REAL (floating point format) data types, you will always read from and write to the LSW data table address in the controller first. Then if the data value exceeds 16 bits, the remaining value will be in the MSW data table address.

Table 11 - Controller Data Table Addresses for PowerFlex 70/70 EC, PowerFlex 700 Drives, and SMC Flex Controllers

Data Table Address	Description
N20:1	Logic Status (see Appendix D)
N20:2	Reserved
N20:3	Speed Feedback
N20:4	Value of parameter assigned to Parameter 310 [Data Out A1] LSW
N20:5	Value of parameter assigned to Parameter 310 [Data Out A1] MSW
N20:6	Value of parameter assigned to Parameter 311 [Data Out A2] LSW
N20:7	Value of parameter assigned to Parameter 311 [Data Out A2] MSW
N20:8	Value of parameter assigned to Parameter 312 [Data Out B1] LSW
N20:9	Value of parameter assigned to Parameter 312 [Data Out B1] MSW
N20:10	Value of parameter assigned to Parameter 313 [Data Out B2] LSW
N20:11	Value of parameter assigned to Parameter 313 [Data Out B2] MSW
N20:12	Value of parameter assigned to Parameter 314 [Data Out C1] LSW
N20:13	Value of parameter assigned to Parameter 314 [Data Out C1] MSW
N20:14	Value of parameter assigned to Parameter 315 [Data Out C2] LSW
N20:15	Value of parameter assigned to Parameter 315 [Data Out C2] MSW
N20:16	Value of parameter assigned to Parameter 316 [Data Out D1] LSW
N20:17	Value of parameter assigned to Parameter 316 [Data Out D1] MSW
N20:18	Value of parameter assigned to Parameter 317 [Data Out D2] LSW
N20:19	Value of parameter assigned to Parameter 317 [Data Out D2] MSW
N20:20	Logic Command (see Appendix D)
N20:21	Reserved
N20:22	Speed Reference
N20:23	Value of parameter assigned to Parameter 300 [Data In A1] LSW
N20:24	Value of parameter assigned to Parameter 300 [Data In A1] MSW
N20:25	Value of parameter assigned to Parameter 301 [Data In A2] LSW
N20:26	Value of parameter assigned to Parameter 301 [Data In A2] MSW
N20:27	Value of parameter assigned to Parameter 302 [Data In B1] LSW
N20:28	Value of parameter assigned to Parameter 302 [Data In B1] MSW
N20:29	Value of parameter assigned to Parameter 303 [Data In B2] LSW
N20:30	Value of parameter assigned to Parameter 303 [Data In B2] MSW
N20:31	Value of parameter assigned to Parameter 304 [Data In C1] LSW
N20:32	Value of parameter assigned to Parameter 304 [Data In C1] MSW
N20:33	Value of parameter assigned to Parameter 305 [Data In C2] LSW
N20:34	Value of parameter assigned to Parameter 305 [Data In C2] MSW
N20:35	Value of parameter assigned to Parameter 306 [Data In D1] LSW
N20:36	Value of parameter assigned to Parameter 306 [Data In D1] MSW
N20:37	Value of parameter assigned to Parameter 307 [Data In D2] LSW
N20:38	Value of parameter assigned to Parameter 307 [Data In D2] MSW

Table 12 - Controller Data Table Addresses for PowerFlex 700 VC Drives and SMC-50 Controllers

Data Table Address	Description
N20:1	Logic Status (see Appendix D)
N20:2	Reserved
N20:3	Speed Feedback
N20:4	Value of parameter assigned to Parameter 310 [Data Out A1] LSW
N20:5	Value of parameter assigned to Parameter 310 [Data Out A1] MSW
N20:6	Value of parameter assigned to Parameter 311 [Data Out A2] LSW
N20:7	Value of parameter assigned to Parameter 311 [Data Out A2] MSW
N20:8	Value of parameter assigned to Parameter 312 [Data Out B1] LSW
N20:9	Value of parameter assigned to Parameter 312 [Data Out B1] MSW
N20:10	Value of parameter assigned to Parameter 313 [Data Out B2] LSW
N20:11	Value of parameter assigned to Parameter 313 [Data Out B2] MSW
N20:12	Value of parameter assigned to Parameter 314 [Data Out C1] LSW
N20:13	Value of parameter assigned to Parameter 314 [Data Out C1] MSW
N20:14	Value of parameter assigned to Parameter 315 [Data Out C2] LSW
N20:15	Value of parameter assigned to Parameter 315 [Data Out C2] MSW
N20:16	Value of parameter assigned to Parameter 316 [Data Out D1] LSW
N20:17	Value of parameter assigned to Parameter 316 [Data Out D1] MSW
N20:18	Value of parameter assigned to Parameter 317 [Data Out D2] LSW
N20:19	Value of parameter assigned to Parameter 317 [Data Out D2] MSW
N20:20	Logic Command (see Appendix D)
N20:21	Reserved
N20:22	Speed Reference
N20:23	Value of parameter assigned to Parameter 300 [Data In A1] LSW
N20:24	Value of parameter assigned to Parameter 300 [Data In A1] MSW
N20:25	Value of parameter assigned to Parameter 301 [Data In A2] LSW
N20:26	Value of parameter assigned to Parameter 301 [Data In A2] MSW
N20:27	Value of parameter assigned to Parameter 302 [Data In B1] LSW
N20:28	Value of parameter assigned to Parameter 302 [Data In B1] MSW
N20:29	Value of parameter assigned to Parameter 303 [Data In B2] LSW
N20:30	Value of parameter assigned to Parameter 303 [Data In B2] MSW
N20:31	Value of parameter assigned to Parameter 304 [Data In C1] LSW
N20:32	Value of parameter assigned to Parameter 304 [Data In C1] MSW
N20:33	Value of parameter assigned to Parameter 305 [Data In C2] LSW
N20:34	Value of parameter assigned to Parameter 305 [Data In C2] MSW
N20:35	Value of parameter assigned to Parameter 306 [Data In D1] LSW
N20:36	Value of parameter assigned to Parameter 306 [Data In D1] MSW
N20:37	Value of parameter assigned to Parameter 307 [Data In D2] LSW
N20:38	Value of parameter assigned to Parameter 307 [Data In D2] MSW

Table 13 - Controller Data Table Addresses for PowerFlex 700S Drives with Phase I Control

Data Table Address	Description
N20:1	Logic Status (see Appendix D)
N20:2	Speed Feedback LSW
N20:3	Speed Feedback MSW
N20:4	Value of parameter assigned to Parameter 724/725 [Data Out A1] LSW
N20:5	Value of parameter assigned to Parameter 724/725 [Data Out A1] MSW
N20:6	Value of parameter assigned to Parameter 726/727 [Data Out A2] LSW
N20:7	Value of parameter assigned to Parameter 726/727 [Data Out A2] MSW
N20:8	Value of parameter assigned to Parameter 728/729 [Data Out B1] LSW
N20:9	Value of parameter assigned to Parameter 728/729 [Data Out B1] MSW
N20:10	Value of parameter assigned to Parameter 730/731 [Data Out B2] LSW
N20:11	Value of parameter assigned to Parameter 730/731 [Data Out B2] MSW
N20:12	Value of parameter assigned to Parameter 732/733 [Data Out C1] LSW
N20:13	Value of parameter assigned to Parameter 732/733 [Data Out C1] MSW
N20:14	Value of parameter assigned to Parameter 734/735 [Data Out C2] LSW
N20:15	Value of parameter assigned to Parameter 734/735 [Data Out C2] MSW
N20:16	Value of parameter assigned to Parameter 736/737 [Data Out D1] LSW
N20:17	Value of parameter assigned to Parameter 736/737 [Data Out D1] MSW
N20:18	Value of parameter assigned to Parameter 738/739 [Data Out D2] LSW
N20:19	Value of parameter assigned to Parameter 738/739 [Data Out D2] MSW
N20:20	Logic Command (see Appendix D)
N20:21	Speed Reference LSW
N20:22	Speed Reference MSW
N20:23	Value of parameter assigned to Parameter 707/708 [Data In A1] LSW
N20:24	Value of parameter assigned to Parameter 707/708 [Data In A1] MSW
N20:25	Value of parameter assigned to Parameter 709/710 [Data In A2] LSW
N20:26	Value of parameter assigned to Parameter 709/710 [Data In A2] MSW
N20:27	Value of parameter assigned to Parameter 711/712 [Data In B1] LSW
N20:28	Value of parameter assigned to Parameter 711/712 [Data In B1] MSW
N20:29	Value of parameter assigned to Parameter 713/714 [Data In B2] LSW
N20:30	Value of parameter assigned to Parameter 713/714 [Data In B2] MSW
N20:31	Value of parameter assigned to Parameter 715/716 [Data In C1] LSW
N20:32	Value of parameter assigned to Parameter 715/716 [Data In C1] MSW
N20:33	Value of parameter assigned to Parameter 717/718 [Data In C2] LSW
N20:34	Value of parameter assigned to Parameter 717/718 [Data In C2] MSW
N20:35	Value of parameter assigned to Parameter 719/720 [Data In D1] LSW
N20:36	Value of parameter assigned to Parameter 719/720 [Data In D1] MSW
N20:37	Value of parameter assigned to Parameter 721/722 [Data In D2] LSW
N20:38	Value of parameter assigned to Parameter 721/722 [Data In D2] MSW

Table 14 - Controller Data Table Addresses for PowerFlex 700S Drives with Phase II Control

Data Table Address	Description
N20:1	Logic Status (see Appendix D)
N20:2	Speed Feedback LSW
N20:3	Speed Feedback MSW
N20:4	Value of parameter assigned to Parameter 660 [DPI Data Out A1] LSW
N20:5	Value of parameter assigned to Parameter 660 [DPI Data Out A1] MSW
N20:6	Value of parameter assigned to Parameter 661 [DPI Data Out A2] LSW
N20:7	Value of parameter assigned to Parameter 661 [DPI Data Out A2] MSW
N20:8	Value of parameter assigned to Parameter 662 [DPI Data Out B1] LSW
N20:9	Value of parameter assigned to Parameter 662 [DPI Data Out B1] MSW
N20:10	Value of parameter assigned to Parameter 663 [DPI Data Out B2] LSW
N20:11	Value of parameter assigned to Parameter 663 [DPI Data Out B2] MSW
N20:12	Value of parameter assigned to Parameter 664 [DPI Data Out C1] LSW
N20:13	Value of parameter assigned to Parameter 664 [DPI Data Out C1] MSW
N20:14	Value of parameter assigned to Parameter 665 [DPI Data Out C2] LSW
N20:15	Value of parameter assigned to Parameter 665 [DPI Data Out C2] MSW
N20:16	Value of parameter assigned to Parameter 666 [DPI Data Out D1] LSW
N20:17	Value of parameter assigned to Parameter 666 [DPI Data Out D1] MSW
N20:18	Value of parameter assigned to Parameter 667 [DPI Data Out D2] LSW
N20:19	Value of parameter assigned to Parameter 667 [DPI Data Out D2] MSW
N20:20	Logic Command (see Appendix D)
N20:21	Speed Reference LSW
N20:22	Speed Reference MSW
N20:23	Value of parameter assigned to Parameter 651 [DPI Data In A1] LSW
N20:24	Value of parameter assigned to Parameter 651 [DPI Data In A1] MSW
N20:25	Value of parameter assigned to Parameter 652 [DPI Data In A2] LSW
N20:26	Value of parameter assigned to Parameter 652 [DPI Data In A2] MSW
N20:27	Value of parameter assigned to Parameter 653 [DPI Data In B1] LSW
N20:28	Value of parameter assigned to Parameter 653 [DPI Data In B1] MSW
N20:29	Value of parameter assigned to Parameter 654 [DPI Data In B2] LSW
N20:30	Value of parameter assigned to Parameter 654 [DPI Data In B2] MSW
N20:31	Value of parameter assigned to Parameter 655 [DPI Data In C1] LSW
N20:32	Value of parameter assigned to Parameter 655 [DPI Data In C1] MSW
N20:33	Value of parameter assigned to Parameter 656 [DPI Data In C2] LSW
N20:34	Value of parameter assigned to Parameter 656 [DPI Data In C2] MSW
N20:35	Value of parameter assigned to Parameter 657 [DPI Data In D1] LSW
N20:36	Value of parameter assigned to Parameter 657 [DPI Data In D1] MSW
N20:37	Value of parameter assigned to Parameter 658 [DPI Data In D2] LSW
N20:38	Value of parameter assigned to Parameter 658 [DPI Data In D2] MSW

You can use the controller data table addresses to directly control and monitor the drive without creating any ladder logic program. However, if you intend to use Human Machine Interface devices (PanelView, and so forth) to operate the drive and view its status, you will need to create descriptive controller data table addresses (Table 15 and Table 16) and a ladder logic program that will pass that data to the data table addresses used for messaging.

Table 15 - Controller and Program Data Table Address Descriptions for Example Logic Status/Feedback Ladder Logic Program

Description	Controller Data Table Address	Description	Program Data Table Address
Drive Ready	N20:1/0	Status Ready	B3:1/0
Drive Active	N20:1/1	Status Active	B3:1/1
Actual Direction (XIO)	N20:1/3	Status Forward	B3:1/3
Actual Direction (XIC)	N20:1/3	Status Reverse	B3:1/4
Drive Faulted	N20:1/7	Status Faulted	B3:1/7
Drive At Speed	N20:1/8	Status At Speed	B3:1/8
Speed Feedback	N20:3	Speed Feedback	B30:3

Table 16 - Program and Controller Data Table Address Descriptions for Example Logic Command/Reference Ladder Logic Program

Description	Program Data Table Address	Description	Controller Data Table Address
Command Stop	B3:20/0	Drive Stop	N20:20/0
Command Start	B3:20/1	Drive Start	N20:20/1
Command Jog	B3:20/2	Drive Jog	N20:20/2
Command Clear Faults	B3:20/3	Drive Clear Faults	N20:20/3
Command Forward Reverse (XIO)	B3:20/4	Drive Forward	N20:20/4
Command Forward Reverse (XIC)	B3:20/4	Drive Reverse	N20:20/5
Speed Reference	N30:22	Speed Reference	N20:22

An example ladder logic program that uses these descriptive controller data table addresses and passes their data to the descriptive program data table addresses is shown in .

Figure 30 - MicroLogix 1100/1400 Example Ladder Logic Program for Logic Status
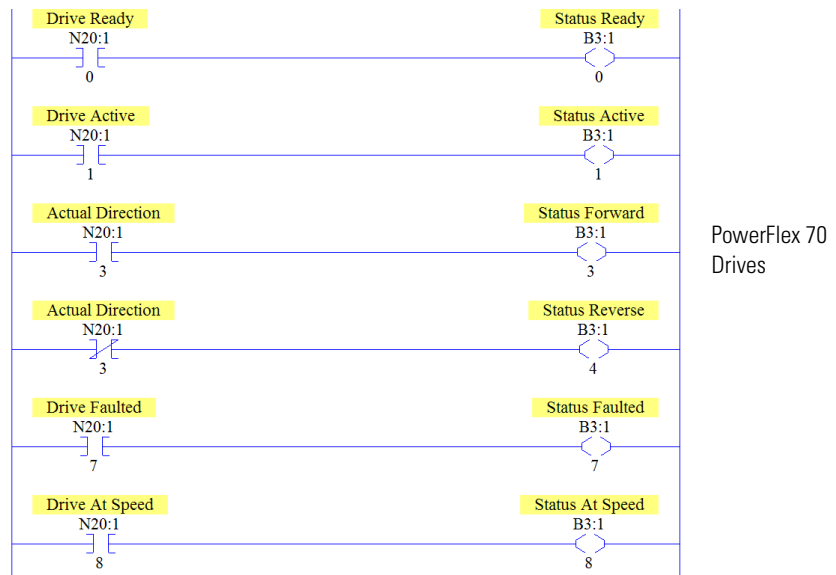
Figure 31 - MicroLogix 1100/1400 Example Ladder Logic Program for Speed Feedback

PowerFlex 70
Drive Speed
Feedback
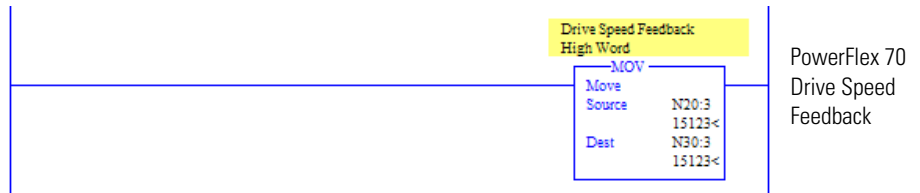
Figure 32 - MicroLogix 1100/1400 Example Ladder Logic Program for Logic Command

PowerFlex 70
Drives
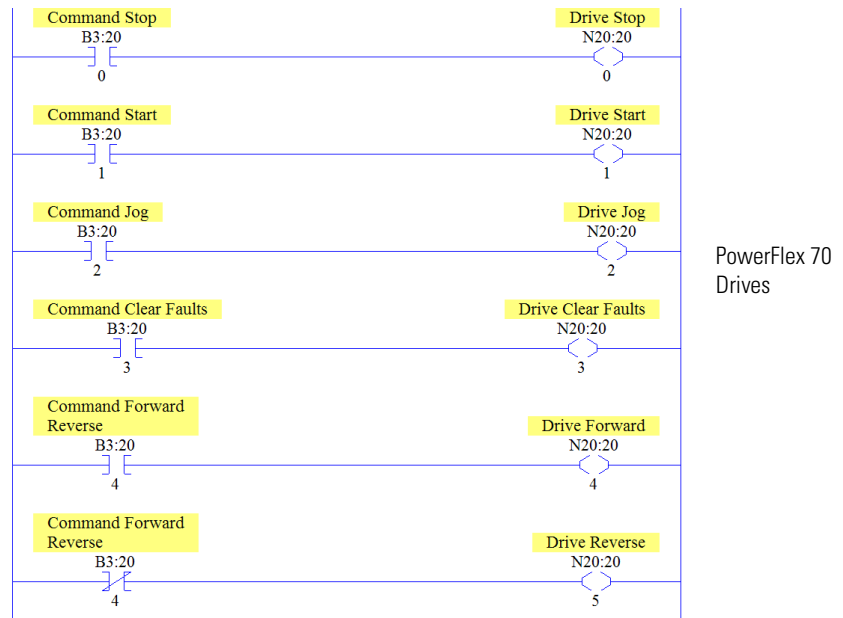
Figure 33 - MicroLogix 1100/1400 Example Ladder Logic Program for Speed Reference

PowerFlex 70
Drive Speed
Reference
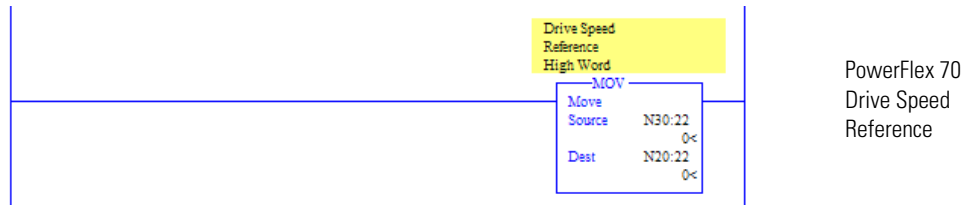
Using Explicit Messaging

This chapter provides information and examples that explain how to use Explicit Messaging to configure and monitor the adapter and connected PowerFlex 7-Class drive or SMC.

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MicroLogix 1100/1400 Controller Examples	124

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

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

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

About Explicit Messaging

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

Important: When an explicit message is performed, by default no connection is made since it is an 'unconnected' message. When timing of the message transaction is important, you can create a dedicated message connection between the controller and drive by checking the 'Connected' box on the Communications tab message configuration screen during message setup. These message connections are in addition to the I/O connection. However, the trade off for more message connections is decreased network performance. If your application cannot tolerate this, do not check the 'Connected' box, which is recommended.

Important: PowerFlex 7-Class drives have explicit messaging limitations. Table 17 shows the EtherNet/IP Object Class code compatibilities for these drives.

Table 17 - Explicit Messaging Class Code Compatibility with Drives

EtherNet/IP Object Class Code	PowerFlex 7-Class Drives	Explicit Messaging Function
Parameter Object 0x0F	Yes	Single parameter reads/writes
DPI Parameter Object 0x93	Yes	Single and scattered parameter reads/writes

Performing Explicit Messages

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

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

Figure 34 - Explicit Message Process
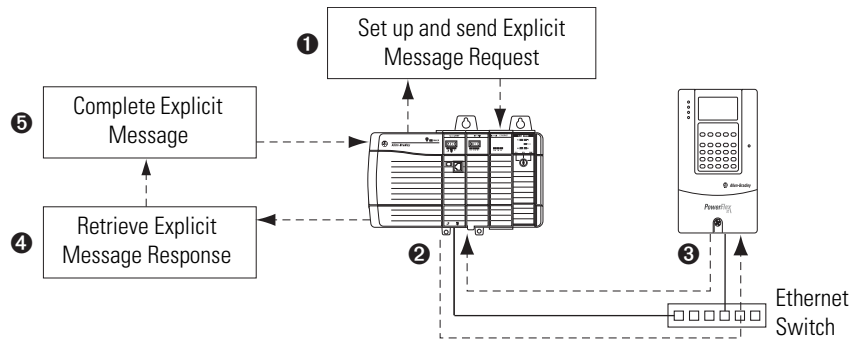
Event	Description
❶	You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner or bridge module (download).
❷	The scanner or bridge module transmits the Explicit Message Request to the slave device over the network.
❸	The slave device transmits the Explicit Message Response back to the scanner. The data is stored in the scanner buffer.
❹	The controller retrieves the Explicit Message Response from the scanner's buffer (upload).
❺	The Explicit Message is complete.

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

ControlLogix Controller Examples

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

For supported classes, instances, and attributes, see Appendix C, EtherNet/IP Objects.

Explicit Messaging Using RSLogix 5000 Software, Version 15.00 or Later

ControlLogix Controller Example Ladder Logic Program to Read a Single Parameter

A Parameter Read message is used to read a single parameter. This read message example reads the value of parameter 003 - [Output Current] in a PowerFlex 7-Class drive.

Table 18 - Example Controller Tags to Read a Single Parameter

Operand	Controller Tags for Single Read Message	Data Type
XIC	Execute_Single_Read_Message	BOOL
MSG	Single_Read_Message	MESSAGE

Figure 35 - Example Ladder Logic to Read a Single Parameter

ControlLogix Controller – Formatting a Message to Read a Single Parameter, RSLogix 5000 Software, Version 15.00 or Later

Figure 36 - Parameter Read Single Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type Service Type [1] Service Code [1] Class Instance [2] Attribute Destination	CIP Generic Parameter Read e (Hex.) f (Hex.) 3 (Dec.) 1 (Hex.) Output_Current [4]	Used to access the Parameter Object in the adapter. This service is used to read a parameter value. Code for the requested service. Class ID for the DPI Parameter Object. Instance number is the same as parameter number. Attribute number for the Parameter Value attribute. The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path [3]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Read_Message	The name for the message.

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

(2) Only drive parameters (Port 0) can be read using Parameter Object Class code 0x0F. To read a parameter of a peripheral in another port, use DPI Parameter Object Class code 0x93 (see).

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(4) In this example, Output Current is a 32-bit parameter requiring the Data Type field to be set to 'DINT' when creating the controller tag. If the parameter being read is a 16-bit parameter, the tag Data Type field must be set to 'INT'. When using a PowerFlex 700S drive, Output Current is a floating point parameter requiring the Data Type field to be set to 'REAL' when creating the controller tag. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

ControlLogix Controller Example Ladder Logic Program to Write a Single Parameter, RSLogix 5000 Software, Version 15.00 or Later

A Parameter Write message is used to write to a single parameter. This write message example writes a value to parameter 140 - [Accel Time 1] in a PowerFlex 7-Class drive.

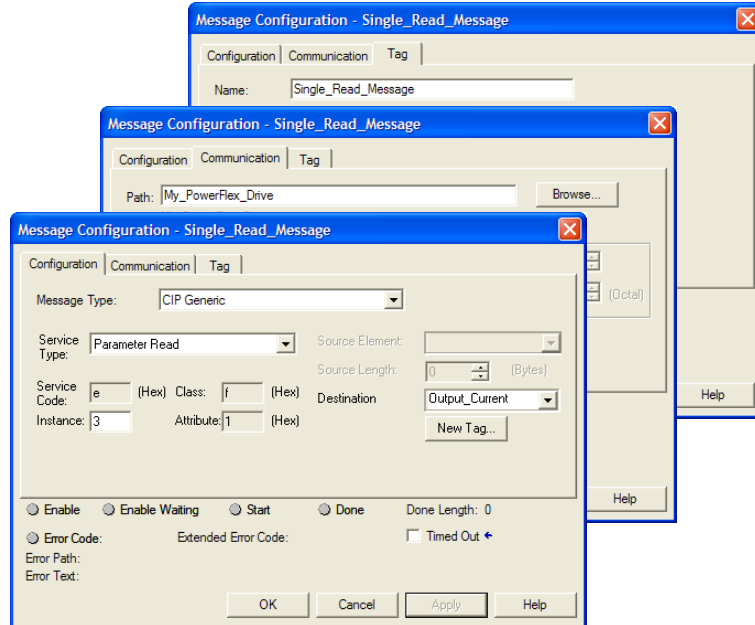**Table 19 - Example Controller Tags to Write a Single Parameter**

Operand	Controller Tags for Single Write Message	Data Type
XIC	Execute_Single_Write_Message	BOOL
MSG	Single_Write_Message	MESSAGE

Figure 37 - Example Ladder Logic to Write a Single Parameter

Important: If the explicit message single write must be written continuously, use DPI Parameter Object Class code 0x93. This writes to RAM—not NVS (EEPROM) memory. This example single write message using Class code F writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

ControlLogix Controller – Formatting a Message to Write a Single Parameter, RSLogix 5000 Software, Version 15.00 or Later

Figure 38 - Parameter Write Single Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type Service Type [1] Service Code [1] Class Instance [2] Attribute Source Element Source Length	CIP Generic Parameter Write 10 (Hex.) f (Hex.) 140 (Dec.) 1 (Hex.) Accel_Time_1 [4] 2 [4]	Used to access the Parameter Object in the adapter. This service is used to write a parameter value. Code for the requested service. Class ID for the DPI Parameter Object. Instance number is the same as parameter number. Attribute number for the Parameter Value attribute. Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive. Number of bytes of service data to be sent in the message.
Communication Tab	**Example Value**	**Description**
Path [3]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Write_Message	The name for the message.

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

(2) Only drive parameters (Port 0) can be written to using Parameter Object Class code 0x0F. To write to a parameter of a peripheral in another port, use DPI Parameter Object Class code 0x93 (see page 123).

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(4) In this example, Accel Time 1 is a 16-bit parameter requiring the tag Data Type field to be set to 'INT' when creating the controller tag. If the parameter being written to is a 32-bit parameter, the tag Data Type field must be set to 'DINT'. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for example, 4 bytes for a DINT or a REAL). When using a PowerFlex 700S drive, Accel Time 1 is a floating point number requiring the Data Type field to be set to 'REAL' when creating the controller tag. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

ControlLogix Controller Example Ladder Logic Program to Read Multiple Parameters, RSLogix 5000 Software, All Versions

A Scattered Read message is used to read the values of multiple parameters. Up to 22 parameters can be read. This read message example reads the values of these five parameters.

PowerFlex 7-Class Drive

- Parameter 001 - [Output Freq]
- Parameter 003 - [Output Current]
- Parameter 006 - [Output Voltage]
- Parameter 012 - [DC Bus Voltage]
- Parameter 017 - [Analog In1 Value]

See (Class code 0x93) for parameter numbering.

Important: See for limitations of PowerFlex 7-Class drives when using Class code 0x93.

Table 20 - Example Controller Tags to Read Multiple Parameters

Operand	Controller Tags for Read Multiple Message	Data Type
XIC	Execute_Scattered_Read_Message	BOOL
MSG	Scattered_Read_Message	MESSAGE

Figure 39 - Example Ladder Logic to Read Multiple Parameters

ControlLogix Controller – Formatting a Message to Read Multiple Parameters, RSLogix 5000 Software, All Versions

Figure 40 - Scattered Read Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access Parameter Object in the adapter.
Service Type [1]	Custom	Required for scattered messages.
Service Code [1]	4b (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) [3]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Read_Request [4]	Name of the tag for any service data to be sent from scanner or bridge to the adapter/drive.
Source Length	30 [4]	Number of bytes of service data to be sent in the message.
Destination	Scattered_Read_Response	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path [2]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Read_Message	The name for the message.

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

(2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(3) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(4) In this example, we are reading five parameters. Each parameter being read requires an array of three INT registers. Therefore, a controller tag was created with its Data Type field set to 'INT[15]'. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for this example, 30 bytes for an INT[15] array). Scattered read messages always assume that every parameter being read is a 32-bit parameter, regardless of its actual size. Maximum length is 132 bytes or 66 words which equates to 22 parameters. For parameter numbering, see DPI Parameter Object on page 198 (Class code 0x93).

ControlLogix Controller Example Scattered Read Request Data

In this message example, we use the data structure in Figure 41 or Figure in the source tag named Scattered_Read_Request to read these five parameters.

PowerFlex 7-Class Drive
• Parameter 001 - [Output Freq] • Parameter 003 - [Output Current] • Parameter 006 - [Output Voltage] • Parameter 012 - [DC Bus Voltage] • Parameter 017 - [Analog In1 Value]

See DPI Parameter Object on page 198 (Class code 0x93) for parameter numbering.

Figure 41 - Example Scattered Read Request Data for PowerFlex 7-Class Drive

Name	Value	Data Type	Description
─ Scattered_Read_Request	{...}	INT[15]	
⊞ Scattered_Read_Request[0]	1	INT	Parameter Number (decimal)
⊞ Scattered_Read_Request[1]	0	INT	Pad Word
⊞ Scattered_Read_Request[2]	0	INT	Pad Word
⊞ Scattered_Read_Request[3]	3	INT	Parameter Number (decimal)
⊞ Scattered_Read_Request[4]	0	INT	Pad Word
⊞ Scattered_Read_Request[5]	0	INT	Pad Word
⊞ Scattered_Read_Request[6]	6	INT	Parameter Number (decimal)
⊞ Scattered_Read_Request[7]	0	INT	Pad Word
⊞ Scattered_Read_Request[8]	0	INT	Pad Word
⊞ Scattered_Read_Request[9]	12	INT	Parameter Number (decimal)
⊞ Scattered_Read_Request[10]	0	INT	Pad Word
⊞ Scattered_Read_Request[11]	0	INT	Pad Word
⊞ Scattered_Read_Request[12]	17	INT	Parameter Number (decimal)
⊞ Scattered_Read_Request[13]	0	INT	Pad Word
⊞ Scattered_Read_Request[14]	0	INT	Pad Word

ControlLogix Controller Example Scattered Read Response Data

The Scattered Read Request message reads the multiple parameters and returns their values to the destination tag (Scattered_Read_Response). or shows the parameter values.

Figure 42 - Example Scattered Read Response Data for PowerFlex 7-Class Drive

Name	Value	Data Type	Description
⊟ Scattered_Read_Response	{...}	INT[15]	
⊞ Scattered_Read_Response[0]	1	INT	Parameter Number (decimal)
⊞ Scattered_Read_Response[1]	325	INT	Parameter Value LSW
⊞ Scattered_Read_Response[2]	0	INT	Parameter Value MSW
⊞ Scattered_Read_Response[3]	3	INT	Parameter Number (decimal)
⊞ Scattered_Read_Response[4]	1	INT	Parameter Value LSW
⊞ Scattered_Read_Response[5]	0	INT	Parameter Value MSW
⊞ Scattered_Read_Response[6]	6	INT	Parameter Number (decimal)
⊞ Scattered_Read_Response[7]	1187	INT	Parameter Value LSW
⊞ Scattered_Read_Response[8]	0	INT	Parameter Value MSW
⊞ Scattered_Read_Response[9]	12	INT	Parameter Number (decimal)
⊞ Scattered_Read_Response[10]	3292	INT	Parameter Value LSW
⊞ Scattered_Read_Response[11]	0	INT	Parameter Value MSW
⊞ Scattered_Read_Response[12]	17	INT	Parameter Number (decimal)
⊞ Scattered_Read_Response[13]	8318	INT	Parameter Value LSW
⊞ Scattered_Read_Response[14]	0	INT	Parameter Value MSW

In this message example, the parameters have the following values.

PowerFlex 7-Class Drive Parameter	Read Value
1 - [Output Freq]	32.5 Hz
3 - [Output Current]	0.01 Amp
6 - [Output Voltage]	118.7 VAC
12 - [DC Bus Voltage]	329.2 VDC
17 - [Analog In2 Value]	8.318 mA

ControlLogix Controller Example Ladder Logic Program to Write Multiple Parameters, RSLogix 5000 Software, All Versions

A Scattered Write message is used to write to multiple parameters. This write message example writes the following values to these five parameters.

PowerFlex 7-Class Drive Parameter	Write Value
141 - [Accel Time 2]	11.1 Sec.
143 - [Decel Time 2]	22.2 Sec.
105 - [Preset Speed 5]	33.3 Hz.
106 - [Preset Speed 6]	44.4 Hz.
107 - [Preset Speed 7]	55.5 Hz.

See <u>DPI Parameter Object on page 198</u> (Class code 0x93) for parameter numbering.

Important: See <u>Table 17 on page 106</u> for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Table 21 - Example Controller Tags to Write Multiple Parameters

Operand	Controller Tags for Write Multiple Message	Data Type
XIC	Execute_Scattered_Write_Message	BOOL
MSG	Scattered_Write_Message	MESSAGE

Figure 43 - Example Ladder Logic to Write Multiple Parameters

Important: If the explicit message scattered write must be written continuously, then use a separate explicit message single write for each parameter using DPI Parameter Object Class code 0x93 and attribute A (10 decimal; see <u>page 123</u>). Attribute A writes to RAM—not NVS (EEPROM) memory. This example scattered write message using attribute 0 writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

ControlLogix Controller – Formatting a Message to Write Multiple Parameters, RSLogix 5000 Software, All Versions

Figure 44 - Scattered Write Multiple Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access Parameter Object in the adapter.
Service Type [1]	Custom	Required for scattered messages.
Service Code [1]	4c (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) [3]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Write_Request [4]	Name of the tag for any service data to be sent from scanner or bridge to the adapter/drive.
Source Length	30 [4]	Number of bytes of service data to be sent in the message.
Destination	Scattered_Write_Response	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path [2]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Write_Message	The name for the message.

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

(2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(3) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(4) In this example, we are writing to five parameters. Each parameter being written to requires an array of three INT registers. Therefore, a controller tag was created with its Data Type field set to 'INT[15]'. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for this example, 30 bytes for an INT[15] array). Scattered write messages always assume that every parameter being written to is a 32-bit parameter, regardless of its actual size. Maximum length is 132 bytes or 66 words which equates to 22 parameters. For parameter numbering, see DPI Parameter Object on page 198 (Class code 0x93).

ControlLogix Controller Example Scattered Write Request Data

In this message example, we use the data structure in Figure 45 or
Figure in the source tag (Scattered_Write_Request) to write new values to these
parameters.

PowerFlex 7-Class Drive Parameter	Write Value
141 - [Accel Time 2]	11.1 Sec.
143 - [Decel Time 2]	22.2 Sec.
105 - [Preset Speed 5]	33.3 Hz.
106 - [Preset Speed 6]	44.4 Hz.
107 - [Preset Speed 7]	55.5 Hz.

See DPI Parameter Object on page 198 (Class code 0x93) for parameter
numbering.

Figure 45 shows the parameter values.

Figure 45 - Example Scattered Write Request Data for PowerFlex 7-Class Drive

Name	△	Value	←	Data Type	Description
⊟ Scattered_Write_Request		{...}		INT[15]	
⊞ Scattered_Write_Request[0]		141		INT	Parameter Number (decimal)
⊞ Scattered_Write_Request[1]		111		INT	Parameter Value LSW
⊞ Scattered_Write_Request[2]		0		INT	Parameter Value MSW
⊞ Scattered_Write_Request[3]		143		INT	Parameter Number (decimal)
⊞ Scattered_Write_Request[4]		222		INT	Parameter Value LSW
⊞ Scattered_Write_Request[5]		0		INT	Parameter Value MSW
⊞ Scattered_Write_Request[6]		105		INT	Parameter Number (decimal)
⊞ Scattered_Write_Request[7]		333		INT	Parameter Value LSW
⊞ Scattered_Write_Request[8]		0		INT	Parameter Value MSW
⊞ Scattered_Write_Request[9]		106		INT	Parameter Number (decimal)
⊞ Scattered_Write_Request[10]		444		INT	Parameter Value LSW
⊞ Scattered_Write_Request[11]		0		INT	Parameter Value MSW
⊞ Scattered_Write_Request[12]		107		INT	Parameter Number (decimal)
⊞ Scattered_Write_Request[13]		555		INT	Parameter Value LSW
⊞ Scattered_Write_Request[14]		0		INT	Parameter Value MSW

ControlLogix Controller Example Scattered Write Response Data

The results of the message appear in the destination tag named
Scattered_Write_Response ([Figure 46](#)). Values of '0' indicate no errors occurred.

Figure 46 - Example Scattered Write Response Data for PowerFlex 7-Class Drive

Name	△	Value	←	Data Type	Description
− Scattered_Write_Response		{...}		INT[15]	
+ Scattered_Write_Response[0]		141		INT	Parameter Number (decimal)
+ Scattered_Write_Response[1]		0		INT	Pad Word or Error Code
+ Scattered_Write_Response[2]		0		INT	Pad Word
+ Scattered_Write_Response[3]		143		INT	Parameter Number (decimal)
+ Scattered_Write_Response[4]		0		INT	Pad Word or Error Code
+ Scattered_Write_Response[5]		0		INT	Pad Word
+ Scattered_Write_Response[6]		105		INT	Parameter Number (decimal)
+ Scattered_Write_Response[7]		0		INT	Pad Word or Error Code
+ Scattered_Write_Response[8]		0		INT	Pad Word
+ Scattered_Write_Response[9]		106		INT	Parameter Number (decimal)
+ Scattered_Write_Response[10]		0		INT	Pad Word or Error Code
+ Scattered_Write_Response[11]		0		INT	Pad Word
+ Scattered_Write_Response[12]		107		INT	Parameter Number (decimal)
+ Scattered_Write_Response[13]		0		INT	Pad Word or Error Code
+ Scattered_Write_Response[14]		0		INT	Pad Word

*ControlLogix Controller – Explanation of Request and Response Data for
Read/Write Multiple Messaging, RSLogix 5000 Software, All Versions*

The data structures in [Figure 47](#) and [Figure 48](#) use 16-bit words and can
accommodate up to 22 parameters in a single message. In the Response Message, a
parameter number with the high bit set indicates that the associated parameter
value field contains an error code (parameter number in response data will be
negative).

Important: See [Table 17 on page 106](#) for limitations of PowerFlex 7-Class
drives when using Class code 0x93 for explicit messaging.

Figure 47 - Data Structures for Scattered Read Messages

	Request (Source Data)		**Response (Destination Data)**
Word 0	Parameter Number	Word 0	Parameter Number
1	Pad Word	1	Parameter Value LSW
2	Pad Word	2	Parameter Value MSW
3	Parameter Number	3	Parameter Number
4	Pad Word	4	Parameter Value LSW
5	Pad Word	5	Parameter Value MSW
6	Parameter Number	6	Parameter Number
7	Pad Word	7	Parameter Value LSW
8	Pad Word	8	Parameter Value MSW
9	Parameter Number	9	Parameter Number
10	Pad Word	10	Parameter Value LSW
11	Pad Word	11	Parameter Value MSW
12	Parameter Number	12	Parameter Number
13	Pad Word	13	Parameter Value LSW
14	Pad Word	14	Parameter Value MSW
⋮		⋮	
63	Parameter Number	63	Parameter Number
64	Pad Word	64	Parameter Value LSW
65	Pad Word	65	Parameter Value MSW

Figure 48 - Data Structures for Scattered Write Messages

	Request (Source Data)		**Response (Destination Data)**
Word 0	Parameter Number	Word 0	Parameter Number
1	Parameter Value LSW	1	Pad Word
2	Parameter Value MSW	2	Pad Word
3	Parameter Number	3	Parameter Number
4	Parameter Value LSW	4	Pad Word
5	Parameter Value MSW	5	Pad Word
6	Parameter Number	6	Parameter Number
7	Parameter Value LSW	7	Pad Word
8	Parameter Value MSW	8	Pad Word
9	Parameter Number	9	Parameter Number
10	Parameter Value LSW	10	Pad Word
11	Parameter Value MSW	11	Pad Word
12	Parameter Number	12	Parameter Number
13	Parameter Value LSW	13	Pad Word
14	Parameter Value MSW	14	Pad Word
⋮		⋮	
63	Parameter Number	63	Parameter Number
64	Parameter Value LSW	64	Pad Word
65	Parameter Value MSW	65	Pad Word

Explicit Messaging Using RSLogix 5000 Software, All Versions

ControlLogix Controller Example Ladder Logic Program to Read a Single Parameter

A Get Attribute Single message is used to read a single parameter. This read message example reads the value of parameter 003 - [Output Current] in a PowerFlex 7-Class drive.

Important: See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

Table 22 - Example Controller Tags to Read a Single Parameter

Operand	Controller Tags for Single Read Message	Data Type
XIC	Execute_Single_Read_Message	BOOL
MSG	Single_Read_Message	MESSAGE

Figure 49 - Example Ladder Logic to Read a Single Parameter

ControlLogix Controller – Formatting a Message to Read a Single Parameter, RSLogix 5000 Software, All Versions

Figure 50 - Get Attribute Single Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type Service Type [1] Service Code [1] Class [2] Instance [2] Attribute Destination	CIP Generic Get Attribute Single e (Hex.) 93 or 9F (Hex.) [4] 3 (Dec.) 9 (Hex.) Output_Current [5]	Used to access the Parameter Object in the adapter. This service is used to read a parameter value. Code for the requested service. Class ID for the DPI Parameter Object. Instance number is the same as parameter number. Attribute number for the Parameter Value attribute. The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path [3]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Read_Message	The name for the message.

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

(2) The instance is the parameter number in the drive (Port 0). For example, to read parameter 4 of a peripheral in Port 5 of an SMC-50 controller, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 198 (Class code 0x93) to determine the instance number.

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(4) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(5) In this example, Output Current is a 32-bit parameter requiring the Data Type field to be set to 'DINT' when creating the controller tag. If the parameter being read is a 16-bit parameter, the tag Data Type field must be set to 'INT'. When using a PowerFlex 700S drive, Output Current is a floating point number requiring the Data Type field to be set to 'REAL' when the creating controller tag. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

ControlLogix Controller Example Ladder Logic Program to Write a Single Parameter, RSLogix 5000 Software, All Versions

A Set Attribute Single message is used to write to a single parameter. This write message example writes a value to parameter 140 - [Accel Time 1] in a PowerFlex 7-Class drive.

Table 23 - Example Controller Tags to Write a Single Parameter

Operand	Controller Tags for Single Write Message	Data Type
XIC	Execute_Single_Write_Message	BOOL
MSG	Single_Write_Message	MESSAGE

Figure 51 - Example Ladder Logic to Write a Single Parameter

ControlLogix Controller – Formatting a Message to Write a Single Parameter, RSLogix 5000 Software, All Versions

Figure 52 - Set Attribute Single Message Configuration Screens

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

Configuration Tab	Example Value	Description
Message Type Service Type [1] Service Code [1] Class Instance [2] Attribute [3] Source Element Source Length	CIP Generic Set Attribute Single 10 (Hex.) 93 or 9F (Hex.) [5] 140 (Dec.) 9 or A (Hex.) Accel_Time_1 [6] 2 [6]	Used to access the Parameter Object in the adapter. This service is used to write a parameter value. Code for the requested service. Class ID for the DPI Parameter Object. Instance number is the same as parameter number. Attribute number for the Parameter Value attribute. Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive. Number of bytes of service data to be sent in the message.
Communication Tab	**Example Value**	**Description**
Path [4]	My_PowerFlex_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Write_Message	The name for the message.

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

(2) The instance is the parameter number in the drive (Port 0). For example, to write to parameter 4 of a peripheral in Port 7 of an SMC-50 controller, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 198 (Class code 0x93) to determine the instance number.

(3) Setting the Attribute value to '9' will write the parameter value to the drive's Nonvolatile Storage (EEPROM) memory, which retains the parameter value even after the drive is power cycled. **Important:** When set to '9', the EEPROM may quickly exceed its life cycle and cause the drive to malfunction. Setting the Attribute value to 'A' (10 decimal) will write the parameter value to temporary memory, which deletes the parameter value after the drive is power cycled. When frequent write messages are required, we recommend using the 'A' (10 decimal) setting.

(4) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder.

(5) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

(6) In this example, Accel Time 1 is a 16-bit parameter requiring the tag Data Type field to be set to 'INT' when creating the controller tag. If the parameter being written to is a 32-bit parameter, the tag Data Type field must be set to 'DINT'. Also, the Source Length field on the Message Configuration screen must correspond to the selected Data Type in bytes (for example, 4 bytes for a DINT or a REAL). When using a PowerFlex 700S drive, Accel Time 1 is a floating point number requiring the Data Type field to be set to 'REAL' when creating the controller tag. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

ControlLogix Controller Example Ladder Logic Program to Read or Write Multiple Parameters, RSLogix 5000 Software, All Versions

Because the example ladder logic rungs, configuration screens, and request/response data to read or write multiple parameters using RSLogix 5000 software, all versions, are identical to those for RSLogix 5000 software, version 15.00 or later, see the information contained on page 112 through page 119 for complete details.

MicroLogix 1100/1400 Controller Examples

When using RSLogix 500 software, version 7.10 and earlier, explicit messaging must be performed using the PCCC N-File method. For RSLogix 500 software, version 7.20 and later, the CIP messaging method has been added along with the PCCC N-File method. However, it is recommended to use the CIP method because it is easier to use and understand. For this reason, only instructions for the CIP method are provided.

The CIP messaging method provides two ways to perform explicit messaging:

- Read/Write Parameter Service simplifies setup by requiring less data to be entered in message configuration screens. However, the Read/Write Parameter Service can only be used to perform single parameter read or single parameter write explicit messages. (Multiple parameter reads or writes must be performed using the Generic Get/Set Attribute Service described below.)

Important: When performing a Write Parameter message, the data will always be written to the drive's Nonvolatile Storage (NVS). Continuous NVS writes may damage the drive's EEPROM. If continuous writes are necessary, use the Generic Set Attribute Single Service and attribute A (10 decimal; see page 133).

- Generic Get/Set Attribute Service requires more setup data to be entered in message configuration screens, but can be used to perform single parameter read or write and multiple parameter read or write explicit messages. Also, the Generic Set Attribute Service offers the choice of writing the data to the drive's Nonvolatile Storage (NVS) or the drive's Random Access Memory (RAM; for Generic Set Attribute Single service only, see page 133). Note that when selecting the data to be written to RAM, the data will be lost if the drive loses power.

For supported classes, instances, and attributes, see Appendix C, EtherNet/IP Objects.

MicroLogix 1100/1400 Controller Explicit Messaging Using the Read/Write Parameter Service

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Read a Single Parameter

A Read Parameter message is used to read a single parameter. This read message example reads the value of parameter 003 - [Output Current] in a PowerFlex 7-Class drive.

Figure 53 - Example Ladder Logic to Read a Single Parameter
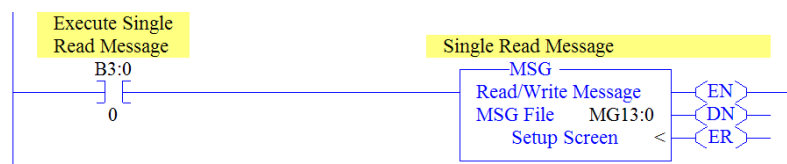
MicroLogix 1100/1400 Controller – Formatting a Message to Read a Single Parameter Using Read/Write Parameter Service

Figure 54 - Read Parameter Message Configuration Screens

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

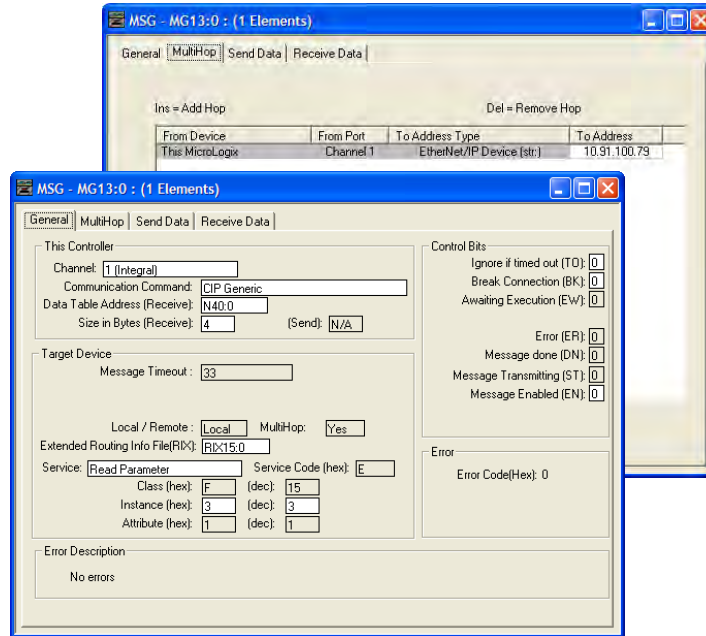| General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N40:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	4 [3]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX15:0	An unused routing information file for the controller.
Service [1]	Read Parameter	Code for the requested service.
Instance [2]	3 (Dec.)	Instance number is the same as the parameter number.

MultiHop Tab	Example Value	Description
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2) Only drive parameters (Port 0) can be read using Parameter Object Class code 0x0F. To read a parameter of a peripheral in another port, use DPI Parameter Object Class code 0x93 (see).

(3) In this example, Output Current is a 32-bit parameter. If the parameter being read is a 16-bit parameter, the Size in Bytes would be set to 2. When the parameter being read is a 32-bit REAL (floating point) data type, the size in bytes would be set to 4. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

MicroLogix 1100/1400 Controller Example Read Single Response Data

In this message example, we use the data table address in Figure 55 to store the response value (0.13 amps) that was read from drive parameter 003 - [Output Current]. To determine the data type for the parameter and its required scaling, see the specific drive documentation.

Figure 55 - Example Read Single Response Data File
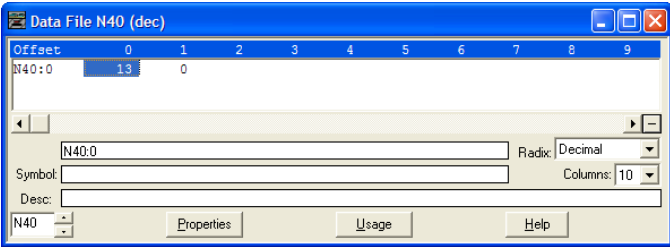
Figure 56 shows example ladder logic to correctly format the three possible data types for read messages in the MicroLogix 1100/1400 controller.

Figure 56 - Example Ladder Logic to Format Parameter Data Types for Reads

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Write a Single Parameter Using Read/Write Parameter Service

A Write Parameter message is used to write to a single parameter. This write message example writes a value to parameter 140 - [Accel Time 1] in a PowerFlex 7-Class drive.

Figure 57 - Example Ladder Logic to Write a Single Parameter
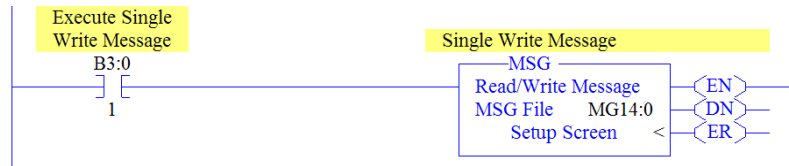
Important: If the explicit message single write must be written continuously, use DPI Parameter Object Class code 0x93 and attribute A (10 decimal; see). This writes to RAM—not NVS (EEPROM) memory. This example single write message using Class code F writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

MicroLogix 1100/1400 Controller – Formatting a Message to Write a Single Parameter Using Read/Write Parameter Service

Figure 58 - Write Parameter Message Configuration Screens

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

General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N50:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	2 [3]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX16:0	An unused routing information file for the controller.
Service [1]	Write Parameter	Code for the requested service.
Instance [2]	140 (Dec.)	Instance number is the same as the parameter number.

MultiHop Tab	Example Value	Description
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2) Only drive parameters (Port 0) can be written to using Parameter Object Class code 0x0F. To write to a parameter of a peripheral in another port, use DPI Parameter Object Class code 0x93 (see page 133).

(3) In this example, Accel Time 1 is a 16-bit parameter. If the parameter being written to is a 32-bit parameter, the Size in Bytes would be set to 4. When the parameter being written to is a 32-bit REAL (floating point) data type, the size in bytes would be set to 4. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

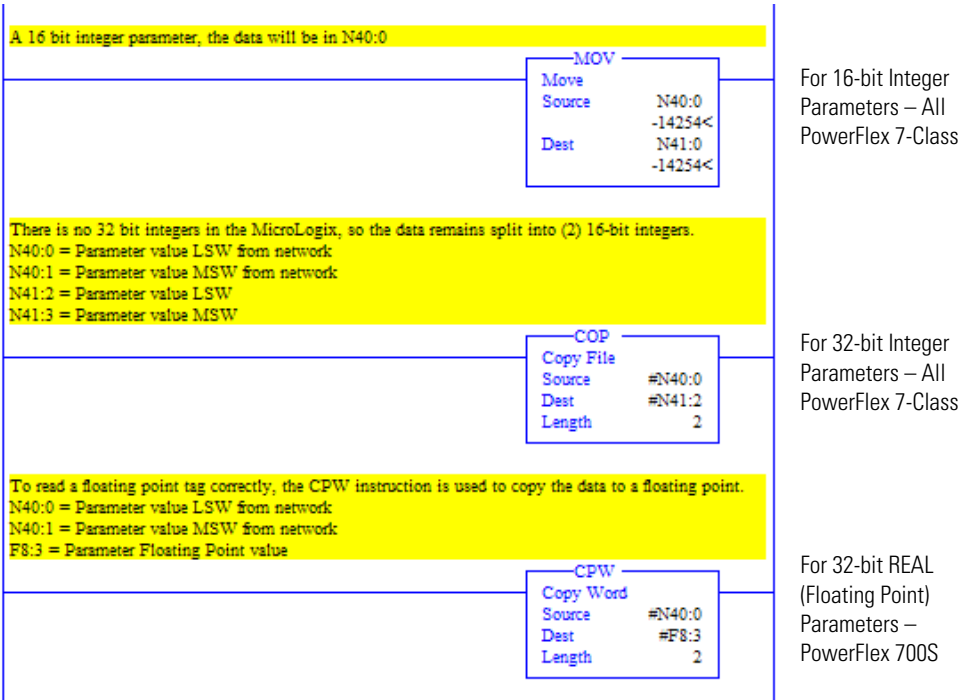### MicroLogix 1100/1400 Controller Example Write Single Request Data

In this message example, we use the data table address in Figure 59 to store the request value (10.0 sec.) that was written to drive parameter 140 - [Accel Time 1]. To determine the data type for the parameter and its required scaling, see the specific drive documentation.

Figure 59 - Example Write Single Request Data File

Figure 60 shows example ladder logic to correctly format the three possible data types for write messages in the MicroLogix 1100/1400 controller.
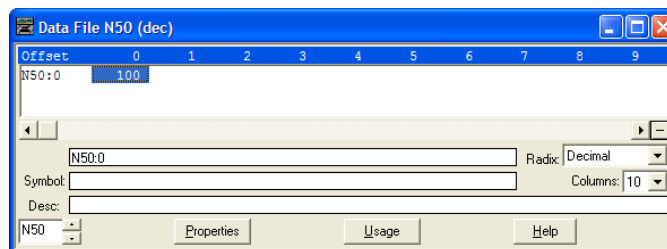
Figure 60 - Example Ladder Logic to Format Parameter Data Types for Writes

For 16-bit Integer Parameters – All PowerFlex 7-Class Drives

For 32-bit Integer Parameters – All PowerFlex 7-Class Drives

For 32-bit REAL (Floating Point) Parameters – PowerFlex 700S Drives

MicroLogix 1100/1400 Controller Explicit Messaging Using the Generic Get/Set Attribute Service

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Read a Single Parameter

A Generic Get Attribute Single message is used to read a single parameter. This read message example reads the value of parameter 003 - [Output Current] in a PowerFlex 7-Class drive.

Important: See for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Figure 61 - Example Ladder Logic to Read a Single Parameter
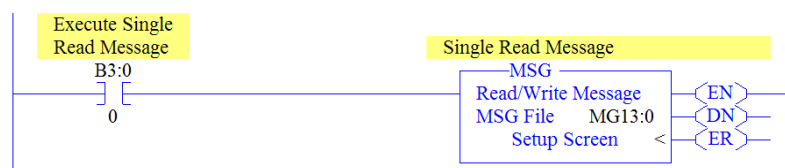
MicroLogix 1100/1400 Controller – Formatting a Message to Read a Single Parameter Using Generic Get/Set Attribute Service

Figure 62 - Generic Get Attribute Single Message Configuration Screens

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

General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N40:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	4 [3]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX15:0	An unused routing information file for the controller.
Service [1]	Generic Get Attribute Single	Code for the requested service.
Class	93 or 9F (Hex.) [4]	Class ID for the DPI Parameter Object.
Instance [2]	3 (Dec.)	Instance number is the same as the parameter number.
Attribute	9 (Dec.)	Attribute number for the Parameter Value attribute.

MultiHop Tab	Example Value	Description
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2) The instance is the parameter number in the drive (Port 0). For example, to read parameter 4 of a peripheral in Port 7 of an SMC-50 controller, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 198 (Class code 0x93) to determine the instance number.

(3) In this example, Output Current is a 32-bit parameter. If the parameter being read is a 16-bit parameter, the Size in Bytes would be set to 2. When the parameter being read is a 32-bit REAL (floating point) data type, the size in bytes would be set to 4. See the drive documentation to determine the size of the parameter and its data type (16-bit or 32-bit integer or REAL).

(4) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

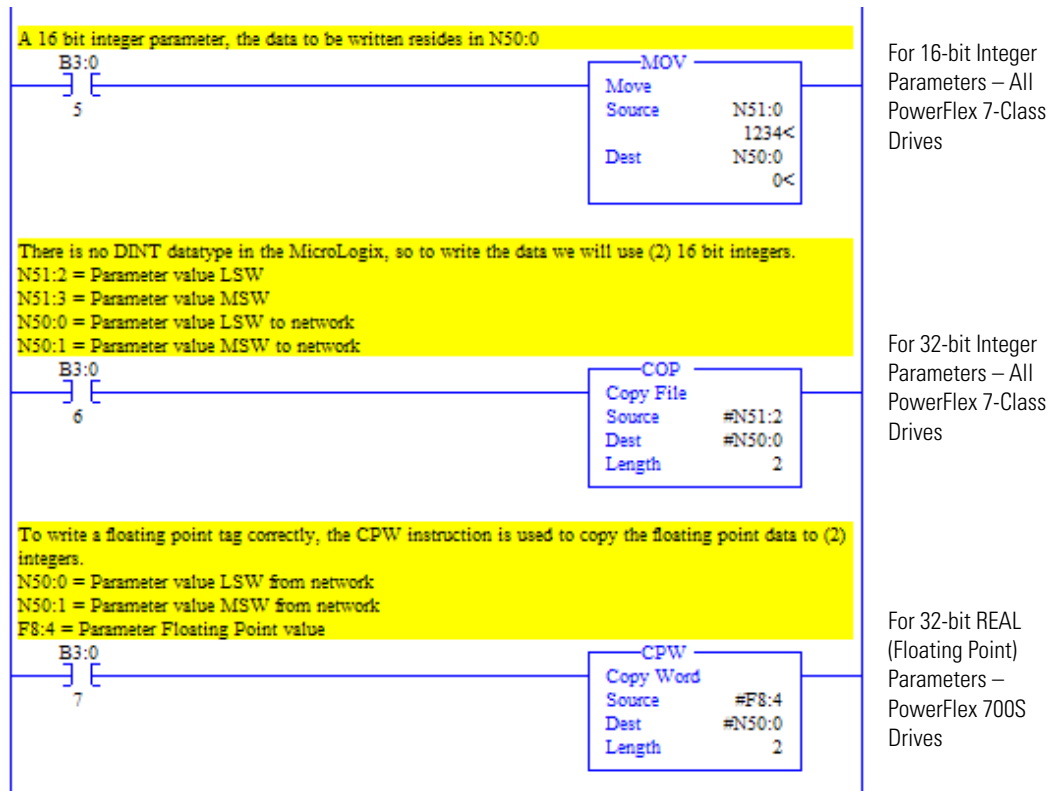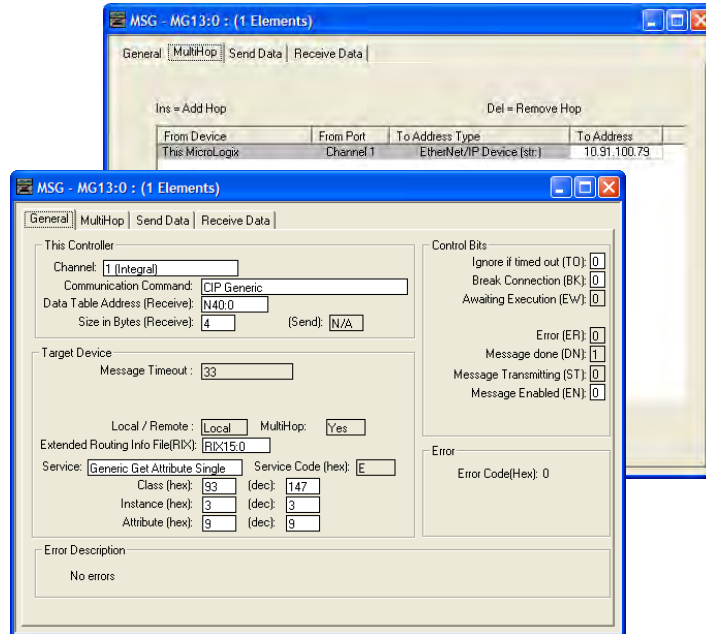*MicroLogix 1100/1400 Controller Example Get Attribute Single Response Data*

In this message example, we use the data table address in Figure 63 to store the response value (0.13 amps) that was read from drive parameter 003 - [Output Current]. To determine the data type for the parameter and its required scaling, see the specific drive documentation.

Figure 63 - Example Get Attribute Single Response Data File
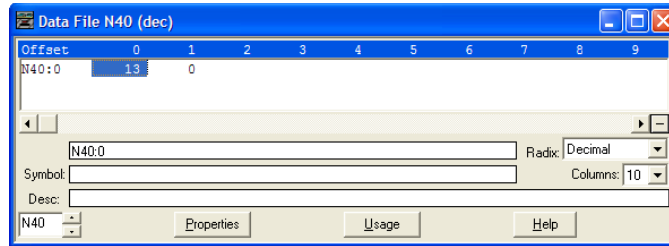
Figure 64 shows example ladder logic to correctly format the three possible data types for read messages in the MicroLogix 1100/1400 controller.

Figure 64 - Example Ladder Logic to Format Parameter Data Types for Gets

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Write a Single Parameter Using Generic Get/Set Attribute Service

A Generic Set Attribute Single message is used to write to a single parameter. This write message example writes a value to parameter 140 - [Accel Time 1] in a PowerFlex 7-Class drive.

Important: See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Figure 65 - Example Ladder Logic to Write a Single Parameter
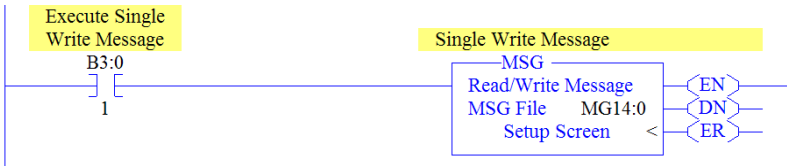
MicroLogix 1100/1400 Controller – Formatting a Message to Write a Single Parameter Using Generic Get/Set Attribute Service

Figure 66 - Generic Set Attribute Single Message Configuration Screens

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

General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N50:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	2 [4]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX16:0	An unused routing information file for the controller.
Service [1]	Generic Set Attribute Single	Code for the requested service.
Class	93 or 9F (Hex.) [5]	Class ID for the DPI Parameter Object.
Instance [2]	140 (Dec.)	Instance number is the same as the parameter number.
Attribute [3]	9 or 10 (Dec.)	Attribute number for the Parameter Value attribute.

MultiHop Tab	Example Value	Description
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2)   The instance is the parameter number in the drive (Port 0). For example, to write to parameter 4 of a peripheral in Port 5 of an SMC-50 controller, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 198 (Class code 0x93) to determine the instance number.

(3)   Setting the Attribute value to '9' will write the parameter value to the drive's Nonvolatile Storage (EEPROM) memory, which retains the parameter value even after the drive is power cycled. **Important:** When set to '9', the EEPROM may quickly exceed its life cycle and cause the drive to malfunction. Setting the Attribute value to '10' will write the parameter value to temporary memory, which deletes the parameter value after the drive is power cycled. When frequent write messages are required, we recommend using the '10' setting.

(4)   In this example, Accel Time 1 is a 16-bit parameter. If the parameter being written to is a 32-bit parameter, the Size in Bytes would be set to 4.

(5)   See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

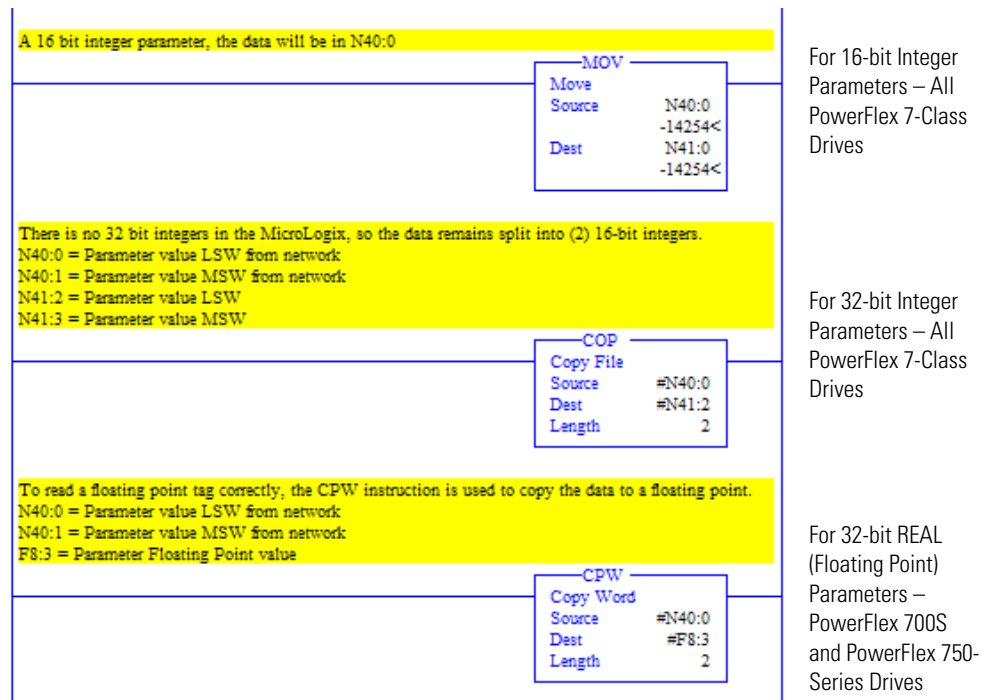### MicroLogix 1100/1400 Controller Example Set Attribute Single Request Data

In this message example, we use the data table address in Figure 67 to store the request value (10.0 sec.) that was written to drive parameter 140 - [Accel Time 1]. To determine the data type for the parameter and its required scaling, see the specific drive documentation.

Figure 67 - Example Set Attribute Single Request Data File

Figure 68 shows example ladder logic to correctly format the three possible data types for write messages in the MicroLogix 1100/1400 controller.

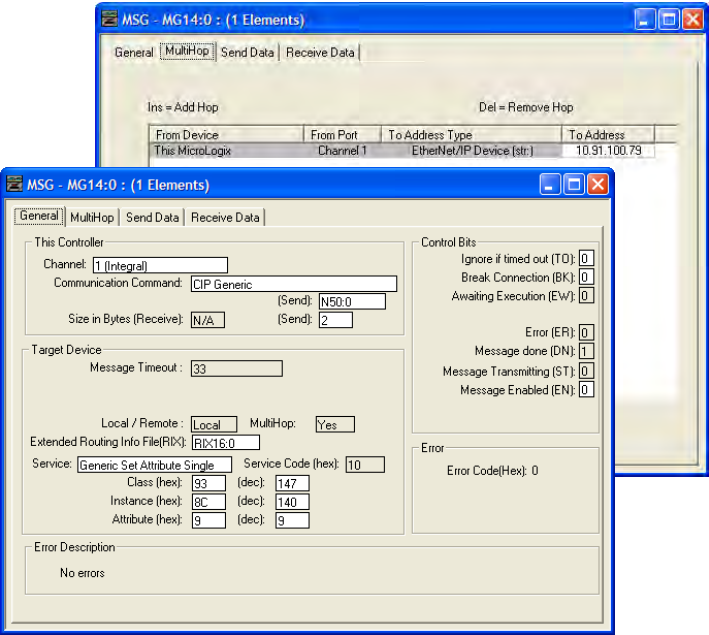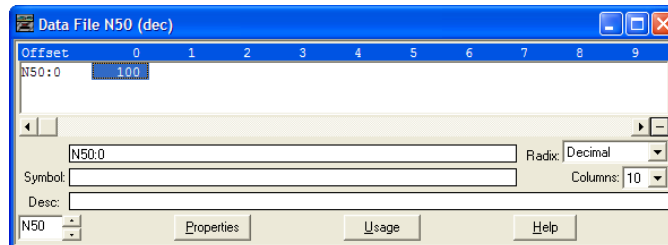**Figure 68 - Example Ladder Logic to Format Parameter Data Types for Sets**

For 16-bit Integer Parameters – All PowerFlex 7-Class Drives

For 32-bit Integer Parameters – All PowerFlex 7-Class Drives

For 32-bit REAL (Floating Point) Parameters – PowerFlex 700S Drives

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Read Multiple Parameters Using Generic Get/Set Attribute Service

A Custom scattered read message is used to read the values of multiple parameters. This read message example reads the values of these five parameters.

PowerFlex 7-Class Drive

- Parameter 001 - [Output Freq]
- Parameter 003 - [Output Current]
- Parameter 006 - [Output Voltage]
- Parameter 012 - [DC Bus Voltage]
- Parameter 017 - [Analog In1 Value]

See (Class code 0x93) for parameter numbering.

Important: See for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Figure 69 - Example Ladder Logic to Read Multiple Parameters
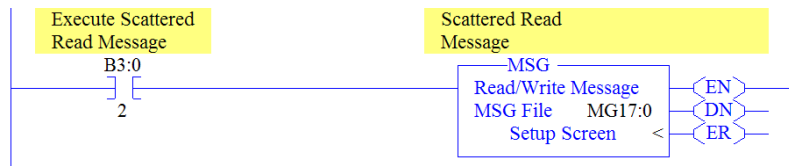
MicroLogix 1100/1400 Controller – Formatting a Message to Read Multiple Parameters Using Generic Get/Set Attribute Service

Figure 70 - Custom Scattered Read Message Configuration Screens

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

General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N60:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	30 [2]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX19:0	An unused routing information file for the controller.
Service [1]	Custom	Required for scattered messages.
Service Code	4B (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) [3]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Dec.)	Required for scattered messages.
MultiHop Tab	**Example Value**	**Description**
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2) In this example, we are reading five parameters. Each parameter being read requires three contiguous 16-bit words. Scattered read messages always assume that every parameter being read is a 32-bit parameter, regardless of its actual size. Therefore, the Size in Bytes must be set to 30. The data structure format is the same as shown on page 141. Maximum length is 66 words (132 bytes), which equates to 22 parameters. For parameter numbering, see DPI Parameter Object on page 198 (Class code 0x93).

(3) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

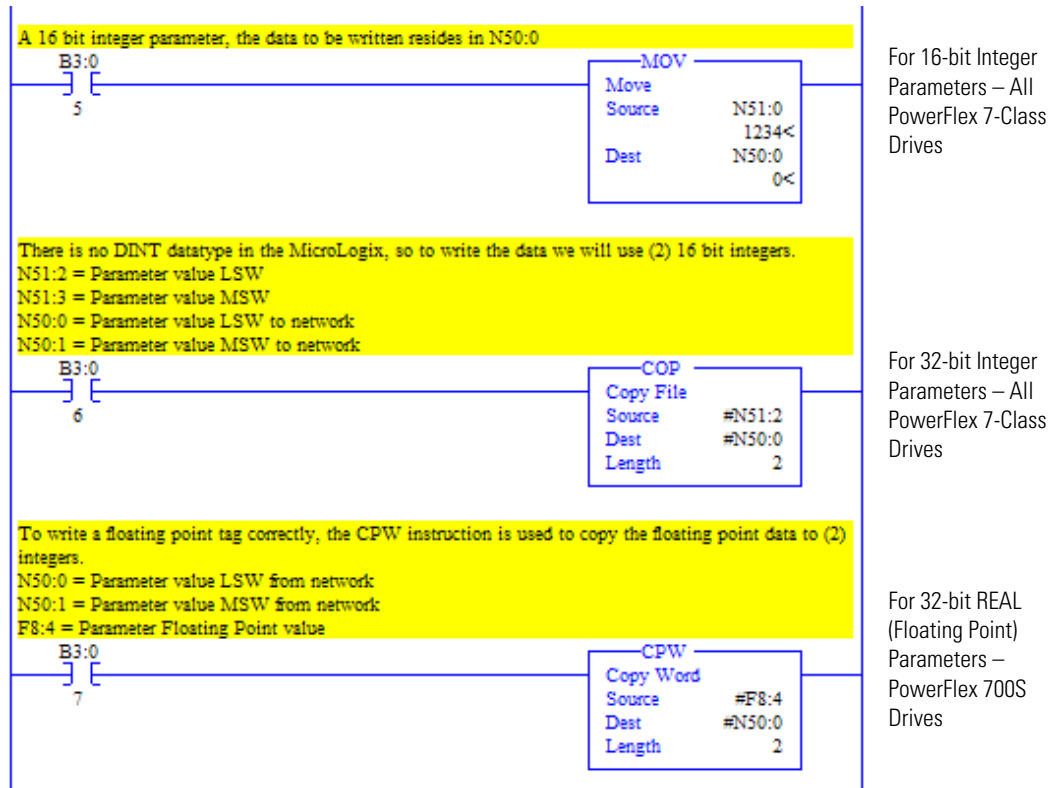### MicroLogix 1100/1400 Controller Example Scattered Read Request Data

In this message example, we use the data table addresses in to store the request values to be read from these drive parameters.

PowerFlex 7-Class Drive

- Parameter 001 - [Output Freq]
- Parameter 003 - [Output Current]
- Parameter 006 - [Output Voltage]
- Parameter 012 - [DC Bus Voltage]
- Parameter 017 - [Analog In1 Value]

See DPI Parameter Object on page 198 (Class code 0x93) for parameter numbering.

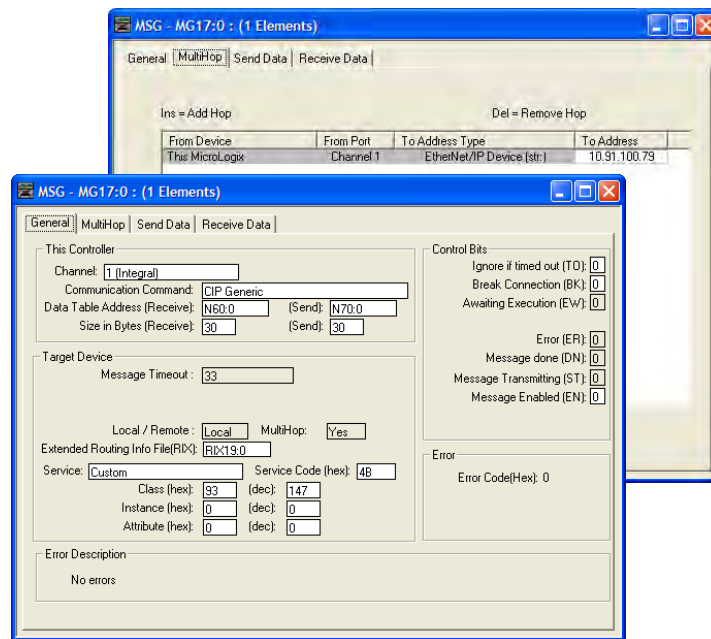**Figure 71 - Example Scattered Read Request Data File for PowerFlex 7-Class Drive**

MicroLogix 1100/1400 Controller Example Scattered Read Response Data

In this message example, we use the data table addresses in Figure 72 to store the response values that were read from the requested drive parameters.

Figure 72 - Example Scattered Read Response Data File for PowerFlex 7-Class Drive
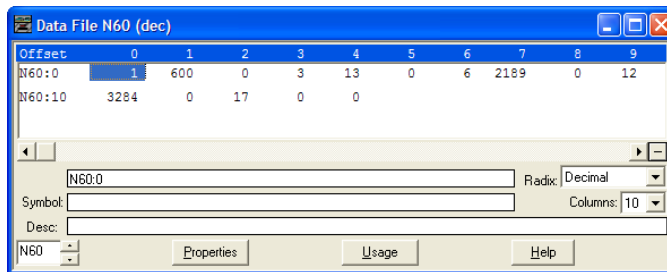
In this example, the parameters have the following values.

PowerFlex 7-Class Drive Parameter	Address	Read Value
1 - [Output Freq]	N60:1	32.5 Hz
3 - [Output Current]	N60:4	0.01 Amp
6 - [Output Voltage]	N60:7	118.7 VAC
12 - [DC Bus Voltage]	N60:10	329.2 VDC
17 - [Analog In2 Value]	N60:13	8.318 mA

MicroLogix 1100/1400 Controller Example Ladder Logic Program to Write Multiple Parameters Using Generic Get/Set Attribute Service

A Custom scattered write message is used to write to multiple parameters. This write message example writes the following values to these five parameters.

PowerFlex 7-Class Drive Parameter	Write Value
141 - [Accel Time 2]	11.1 Sec.
143 - [Decel Time 2]	22.2 Sec.
105 - [Preset Speed 5]	33.3 Hz.
106 - [Preset Speed 6]	44.4 Hz.
107 - [Preset Speed 7]	55.5 Hz.

See DPI Parameter Object on page 198 (Class code 0x93) for parameter numbering.

Important: See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Figure 73 - Example Ladder Logic to Write Multiple Parameters
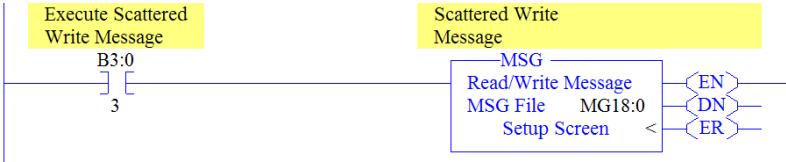
Execute Scattered
Write Message
B3:0
3

Scattered Write
Message
MSG
Read/Write Message — EN
MSG File   MG18:0 — DN
Setup Screen   < — ER

Important: If the explicit message scattered write must be written continuously, then use a separate Generic Set service explicit message single write for each parameter using DPI Parameter Object Class code 0x93 and attribute A (10 decimal; see). Attribute A writes to RAM—not NVS (EEPROM) memory. This example scattered write message using attribute 0 writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

MicroLogix 1100/1400 Controller – Formatting a Message to Write Multiple Parameters Using Generic Get/Set Attribute Service

Figure 74 - Custom Scattered Write Multiple Message Configuration Screens

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

General Tab	Example Value	Description
Channel	1	Controller port to which the network is connected.
Comm… Command	CIP Generic	Used to access the Parameter Object in the adapter.
Data Table Address	N80:0	An unused controller data table address containing the message instruction. This address is the starting word of the destination file.
Size in Bytes	30 [2]	Number of bytes to be transferred. Each byte size is an 8-bit integer.
Extended Routing…	RIX21:0	An unused routing information file for the controller.
Service [1]	Custom	Required for scattered messages.
Service Code	4C (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) [3]	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Dec.)	Required for scattered messages.
MultiHop Tab	**Example Value**	**Description**
To Address	10.91.100.79	IP address of the adapter connected to the drive.

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

(2) In this example, we are writing to five parameters. Each parameter being written to requires three contiguous 16-bit words. Scattered write messages always assume that every parameter being written to is a 32-bit parameter, regardless of its actual size. Therefore, the Size in Bytes must be set to 30. The data structure format is the same as shown on page 120. Maximum length is 66 words (132 bytes), which equates to 22 parameters. For parameter numbering, see DPI Parameter Object on page 198 (Class code 0x93).

(3) See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using DPI Parameter Object Class code 0x93 for explicit messaging.

MicroLogix 1100/1400 Controller Example Scattered Write Request Data

In this message example, we use the data table addresses in Figure 75 to store the request values to be written to these drive parameters.

See DPI Parameter Object on page 198 (Class code 0x93) for parameter numbering.

Figure 75 or Figure 76 shows the parameter values.

Figure 75 - Example Scattered Write Request Data File for PowerFlex 7-Class Drive
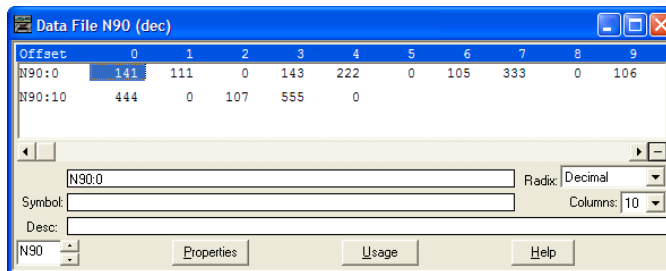
MicroLogix 1100/1400 Controller Example Scattered Write Response Data

In this message example, we use the data table addresses in Figure 76 to store the response values that were written to the requested drive parameters. Values of '0' indicate no errors occurred.

Figure 76 - Example Scattered Write Response Data File for PowerFlex 7-Class Drive

The results of the explicit message appear in the destination tag array N80 (Figure 76). Values of '0' indicate no errors occurred.

MicroLogix 1100/1400 Controller – Explanation of Request and Response Data for Read/Write Multiple Messaging

The data structures in Figure 77 and Figure 78 use 16-bit words and can accommodate up to 22 parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated parameter value field contains an error code (parameter number in response data will be negative).

Important: See Table 17 on page 106 for limitations of PowerFlex 7-Class drives when using Class code 0x93 for explicit messaging.

Figure 77 - Data Structures for Scattered Read Messages

	Request (Source Data)		Response (Destination Data)
Word 0	Parameter Number	Word 0	Parameter Number
1	Pad Word	1	Parameter Value LSW
2	Pad Word	2	Parameter Value MSW
3	Parameter Number	3	Parameter Number
4	Pad Word	4	Parameter Value LSW
5	Pad Word	5	Parameter Value MSW
6	Parameter Number	6	Parameter Number
7	Pad Word	7	Parameter Value LSW
8	Pad Word	8	Parameter Value MSW
9	Parameter Number	9	Parameter Number
10	Pad Word	10	Parameter Value LSW
11	Pad Word	11	Parameter Value MSW
12	Parameter Number	12	Parameter Number
13	Pad Word	13	Parameter Value LSW
14	Pad Word	14	Parameter Value MSW
⋮		⋮	

63	Parameter Number
64	Pad Word
65	Pad Word

63	Parameter Number
64	Parameter Value LSW
65	Parameter Value MSW

Figure 78 - Data Structures for Scattered Write Messages

	Request (Source Data)		Response (Destination Data)
Word 0	Parameter Number	Word 0	Parameter Number
1	Parameter Value LSW	1	Pad Word
2	Parameter Value MSW	2	Pad Word
3	Parameter Number	3	Parameter Number
4	Parameter Value LSW	4	Pad Word
5	Parameter Value MSW	5	Pad Word
6	Parameter Number	6	Parameter Number
7	Parameter Value LSW	7	Pad Word
8	Parameter Value MSW	8	Pad Word
9	Parameter Number	9	Parameter Number
10	Parameter Value LSW	10	Pad Word
11	Parameter Value MSW	11	Pad Word
12	Parameter Number	12	Parameter Number
13	Parameter Value LSW	13	Pad Word
14	Parameter Value MSW	14	Pad Word
⋮		⋮	
63	Parameter Number	63	Parameter Number
64	Parameter Value LSW	64	Pad Word
65	Parameter Value MSW	65	Pad Word

Troubleshooting

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

Topic	Page
Understanding the Status Indicators	143
Port Status Indicator	144
Network Status Indicator	145
Link (LS1, LS2) Status Indicator	145
NET A Status Indicator	145
Hardware Reset via Node Switches	146
Viewing Adapter Diagnostic Items	146
Viewing and Clearing Events	149

Understanding the Status Indicators

The adapter has four status indicators. They can be viewed on the adapter or through the device cover.

Location on device may vary.
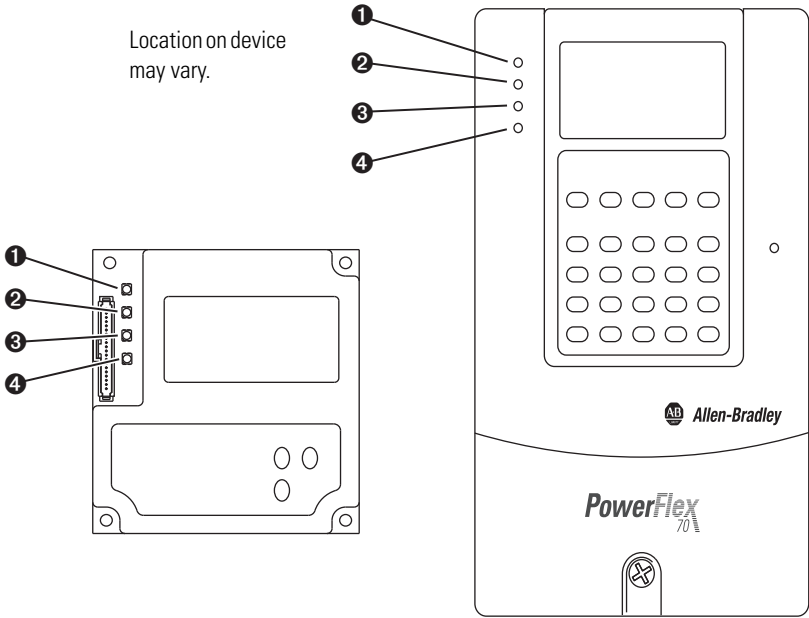
Item	Indicator Name	Description	See
❶	PS	DPI Connection Status	page 144
❷	NS	Network Status	page 145
❸	LS1	Link Status 1	page 145
❹	LS2	Link Status 2	page 145

Port Status Indicator

The LED indicates the status of the adapter's connection to the device as shown in the table below.

Status	Cause	Corrective Action
Off	No power	Securely connect the adapter to the drive using the internal interface (ribbon) cable.
Orange	Peripheral is Connected to an incompatible product, or no DPI ping events are detected.	Verify that cables are securely connected and not damaged. Replace cables if necessary. Cycle power to the device. Verify that Host is an Allen-Bradley compatible product.
Flashing Orange	Requesting DPI I/O Connections	No action required this is normal operation if No DPI IO is enabled
Flashing Green	Normal Operation (DPI connected) - No I/O, or PLC in Program	Place the scanner in RUN mode. Program the controller to recognize and transmit I/O to the adapter. Configure the adapter for the program in the controller. Normal behavior if no DPI I/O is enabled.
Green	Normal Operation (DPI connected) - I/O Operational	No action required.
Red	DPI Problem, Bad CRC of Adapter Parameters or Flash Program	Replace adapter
Flashing Red	DPI Failure or Failed power-on diagnostic test (hardware failure)	Clear faults in the adapter. 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. Check mode switch settings. Cycle power to the device 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.
Flashing Green and Red	Flash update in progress	Normal during flash update process of application firmware

Network Status Indicator

The LED indicates the status of the adapter's connection to the device as shown in the table below.

Status	Cause	Corrective Action
Steady Off	No power OR No 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 and disable BOOTP using a BOOTP server, or set a unique IP address by using adapter parameters. Apply power to the drive (or adapter if mounted in a DPI External Comms Kit).
Flashing Green	An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out	Place the controller in RUN mode, or apply power to the peer device that will send I/O. Program the controller or peer device to recognize and transmit I/O or make a messaging connection to the adapter. Configure the adapter for the program in the controller or the I/O from the peer device.
Steady Green	At least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out	No Action Required
Flashing Red	Connection has timed out see the "The EtherNet Adaptation of CIP" Specification sections 9-4.4 for detailed behavior description	Place the scanner in RUN mode, or apply power to the peer device that will send I/O. Check the IGMP Snooping/Ethernet Switches for correct operation. Check the amount of traffic on the network.
Steady Red	Duplicate IP Address detected	Configure the adapter to use a unique IP address and cycle power.
Orange	Adapter Failure (used in conjunction with PS orange)	Verify that cables are securely connected and not damaged. Replace cables if necessary. Cycle power to the drive. Verify that Host is a Scanport or Allen-Bradley compatible product. Replace Adapter
Flashing Green/Red	Self-test on power up	No action required

Link (LS1, LS2) Status Indicator

The LED indicates the status of the adapter's connection to the device as shown in the table below.

Status	Cause	Corrective Action
Blinking Yellow	Network at 10M Baud	Normal Operation
Blinking Green	Network at 100M Baudr	Normal Operation

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, the adapter needs an IP address, or BOOTP is enabled.	• 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 and disable BOOTP using a BOOTP server, or set a unique IP address by 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	An EtherNet/IP connection has timed out.	• Place the scanner in RUN mode, or apply power to the peer device that will send I/O. • Check the IGMP Snooping/Ethernet Switches for correct operation. • Check the amount of traffic on the network.

Status	Cause	Corrective Actions
Flashing Red/ Green	The adapter is performing a self-test.	No action required.
Flashing Green	The adapter is properly connected, has an IP address, and is connected to an EtherNet/IP network but does not have an I/O connection.	• Place the controller in RUN mode, or apply power to the peer device that will send I/O. • Program the controller or peer device to recognize and transmit I/O or make a messaging connection to the adapter. • Configure the adapter for the program in the controller or the I/O from the peer device.
Steady Green	The adapter is properly connected and communicating on the network to a controller.	No action required.

Hardware Reset via Node Switches

The special switch value of 888 allows the user to return the module to its factory default configuration.   The setting of 888 shall reset all local configuration parameters on the adapter,

The setting of 888 is useful in situations where the user wishes to decommission an adapter (but may use it again later, e.g., as a spare module), or when the user wishes to commission a previously-used module that has unknown configuration parameters.

When the switches are set to 888, upon the next power up, a module shall behave as follows:

- Return to factory default settings local to the adapter.
- Cease communications on all communication ports.
- The Port Status LED shall transition to blinking red.
- The Network Status LED shall transition to off.

The purpose of the above behavior is to prevent the user from resetting the module and then never changing the switch setting from 888. Upon the next power up, the module would simply reset itself again.

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 with any of these drive configuration tools:

- LCD PowerFlex 7-Class HIM (Diagnostics/Device Items)
- Connected Components Workbench software, version 1.02 or later
- DriveExplorer software, version 2.01 or later
- DriveExecutive software, version 3.01 or later

Using the HIM to View Adapter Diagnostic Items
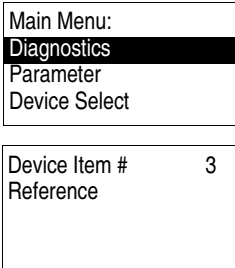
Step	Example Screen
1. Access parameters in the adapter. See Using the PowerFlex 7-Class HIM on page 28. 2. Press the ▲ or ▼ key to scroll to **Diagnostics**. 3. Press the ↵ (Enter) key to display the Diagnostics menu in the adapter. 4. Repeat steps 2 and 3 to enter the **Device Items** option. 5. Press the ▲ or ▼ key to scroll through the items.	Main Menu: **Diagnostics** Parameter Device Select Device Item # 3 Reference

Table 24 - Adapter Diagnostic Items

No.	Name	Description
1	Common Logic Cmd	The present value of the Common Logic Command being transmitted to the drive by this adapter.
2	Prod Logic Cmd	The present value of the Product Logic Command being transmitted to the drive by this adapter from the controller.
3	Reference	The present value of the Reference being transmitted to the drive by this adapter. Note that a 16-bit value will be sent as the Most Significant Word of the 32-bit field.
4	Common Logic Sts	The present value of the Common Logic Status being received from the drive by this adapter.
5	Prod Logic Sts	The present value of the Product Logic Status being received from the drive by this adapter to the controller.
6	Feedback	The present value of the Feedback being received from the drive by this adapter. Note that a 16-bit value will be sent as the Most Significant Word of the 32-bit field.
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.)
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.)
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.
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	M-S Input Size	Size of data transferred from the network to the drive.
30	M-S Output Size	Size of data transferred from the drive to the network.

No.	Name	Description
31 32 33 34 35 36	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. 255:255:255:255:255:255 [HW Addr 1] [HW Addr 2] [HW Addr 3] [HW Addr 4] HW Addr 5] [HW Addr 6]
37 38 39 40	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]
41 42 43 44	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]
45 46 47 48	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]
49	EN Rx Overruns	Number of receive buffer overruns reported by the Ethernet hardware.
50	EN Rx Packets	Number of Ethernet packets that the adapter has received.
51	EN Rx Errors	Number of receive errors reported by the Ethernet hardware.
52	EN Tx Packets	Number of Ethernet packets that the adapter has sent.
53	EN Tx Errors	Number of transmit errors reported by the Ethernet hardware.
54	Last TCP Reset	Last reason that the adapter reset or rejected a TCP/IP connection.
55	Missed IO Pkts	Number of incoming I/O connection packets that the adapter did not receive.
56	OPT Status	Operating status of optional I/O board in DPI External Comms Kit. For the meanings of the individual bits, see Viewing Adapter Diagnostic Items on page 146.
57	OPT RX Errors	Number of optional I/O board receive errors.
58	OPT FW Version	Firmware version of optional I/O board (in DPI External Comms Kit).

Viewing and Clearing Events
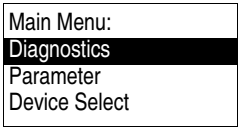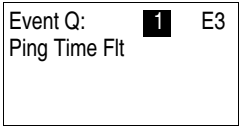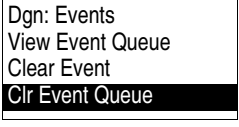
The adapter has an event queue to record significant events that occur in the operation of the adapter. When such an event occurs, an entry is put into the event queue. You can view the event queue with any of these drive configuration tools:

- LCD PowerFlex 7-Class HIM
- Connected Components Workbench software, version 1.02 or later
- DriveExplorer software, version 2.01 or later
- DriveExecutive software, version 1.01 or later
- 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. See Using the PowerFlex 7-Class HIM on page 28. 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.	Main Menu: Diagnostics Parameter Device Select
Clearing Events 1. Access parameters in the adapter. See Using the PowerFlex 7-Class HIM on page 28. 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'.	Event Q: 1 E3 Ping Time Flt Dgn: Events View Event Queue Clear Event Clr Event Queue

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 25 - Adapter Events

Code	Event	Description
1	No Event	Empty event queue entry.
2	Device Power Up	Cold/hard boot.
3	Device Reset	Warm/soft boot.
4	Config CRC Error	Startup sequence detected corrupt NV storage.
5	App Updated	Startup sequence detected new application firmware in candidate area.
6	Boot Updated	Startup sequence detected new boot firmware in candidate area.
7	FATAL Error	A FATAL error was reported by the operating system.
8	DPI Bus Off	A bus-off condition is detected on DPI.
9	DPI Ping Timeout	No Ping message was received on DPI for longer than the maximum time allowed
10	DPI Port Invalid	The debounced DPI Pin ID is read as zero or seven after the peripheral has completed startup.
11	DPI Port Changed	The debounced DPI Pin ID has changed after the peripheral has completed startup.
12	DPI Host Reset	The drive issued a reset event.
13	DPI Baud 125K	The peripheral detects that the host is at 125 kbps.
14	DPI Baud 500K	The peripheral detects that the host is at 500 kbps.
15	DPI Host Invalid	Connected to a SCANport product and peripheral does not support a SCANport mode.
16	DPI Dup Port	Another peripheral with the same port number is already present.
17	DPI Type 0 Logon	The peripheral successfully logs in for Type 0 control.
18	DPI Type 0 Time	The peripheral has not received a Type 0 status message for longer than the maximum Type 0 time.
19	DPI DL Logon	The peripheral successfully logs into a data link.
20	DPI DL Error	The host rejects a login to a data link (e.g., data link not supported or already in use)
21	DPI DL Time	No Datalink status message is received on DPI for longer than the maximum time allowed
22	DPI Ctrl Disable	The peripheral has sent a "Soft Control Disable" command to the host.
23	DPI Ctrl Enable	The peripheral has sent a "Soft Control Enable" command to the host.
24	DPI Msg Timeout	A Client-Server message sent by the peripheral has not completed within one second.
25	DPI Manual Reset	Manual reset via DPI triggered.
31	Net Dup Address	IP address conflict.
32	Net Comm Fault	The peripheral detected a communications fault on the network.
33	Net Sent Reset	The peripheral received a reset from the network.
34	Net IO Close	An I/O connection from the network to the peripheral was closed.
35	Net Idle Fault	The peripheral is receiving "Idle" packets from the network.
36	Net IO Open	An I/O connection to the peripheral from the network has been opened.
37	Net IO Timeout	An I/O connection from the network to the Peripheral has timed out.
38	Net IO Size Err	EtherNet I/P I/O connection size mismatch error.
39	PCCC IO Close	The device sending PCCC Control messages to the Peripheral has set the PCCC Control Timeout to a value of zero.

Table 25 - Adapter Events (Continued)

Code	Event	Description
40	PCCC IO Open	The Peripheral has begun receiving PCCC Control messages (the PCCC Control Timeout was previously set to a non-zero value).
41	PCCC IO Timeout	The Peripheral has not received a PCCC control message for longer than the PCCC Control Timeout.
42	Msg Ctrl Open	The peripheral has sent a "Soft Control Enable" command to the host.
43	Msg Ctrl Close	The peripheral has sent a "Soft Control Disable" command to the host.
44	Msg Ctrl Timeout	A Client-Server message sent by the peripheral has not completed within one second.
45	Peer IO Open	The peripheral has received the first peer I/O message.
46	Peer IO Timeout	The Peripheral has not received a Peer I/O message for longer than the Peer I/O Timeout.
56	Email Failed	E-mail send failure.
58	Adapter Defaulted	Adapter parameters has been reset to default.
61	Net Link 1 Up	Link has been established on Eth Port 1
62	Net Link 1 Down	Link was lost on Eth Port 1.
63	Net Link 2 Up	Link has been established on Eth Port 2
64	Net Link 2 Down	Link was lost on Eth Port 2.
67	Net Ring Up	The Device Level Ring (DLR) status is Normal.
68	Net Ring Down	The Device Level Ring (DLR) status is Faulted.
69	Invalid Net Cfg	The adapter's network address configuration parameters are invalid, or the network address provided by the BOOTP or DHCP server is invalid.
70	DHCP Response	The adapter received a response to its DHCP request.

Notes:

Viewing the Adapter 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 Web Home Page

After configuring the adapter, you can view its web pages. These pages present information about the adapter, the device to which it is connected, and other DPI devices connected to or installed in the device such as a HIM or I/O card.

The adapter can be configured to automatically send email messages to desired addresses when selected device faults occur and/or are cleared when the adapter rakes a communication or idle fault action. Bit 0 of **Parameter 57-[Web Features]** can be used to protect the configured settings. For more details, see page 162.

Viewing the Web Pages

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 57 - [Web Features]** can be used to protect the configured settings. For more details, see page 162.

1. On a computer with access to the EtherNet/IP network on which the adapter/device is installed, launch a web browser such as Microsoft™ Internet Explorer, version 5.0 or later.

The computer can access the adapter web pages if it is connected to:

– The same network as the adapter.

– 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.

3. Press ENTER.

The adapter web Home Page ([Figure 79](#)) appears.

Important: Using the browser's View >Refresh function will always re-display the adapter home page while viewing any of the adapter's web pages.

Figure 79 - Adapter Web Home Page Example
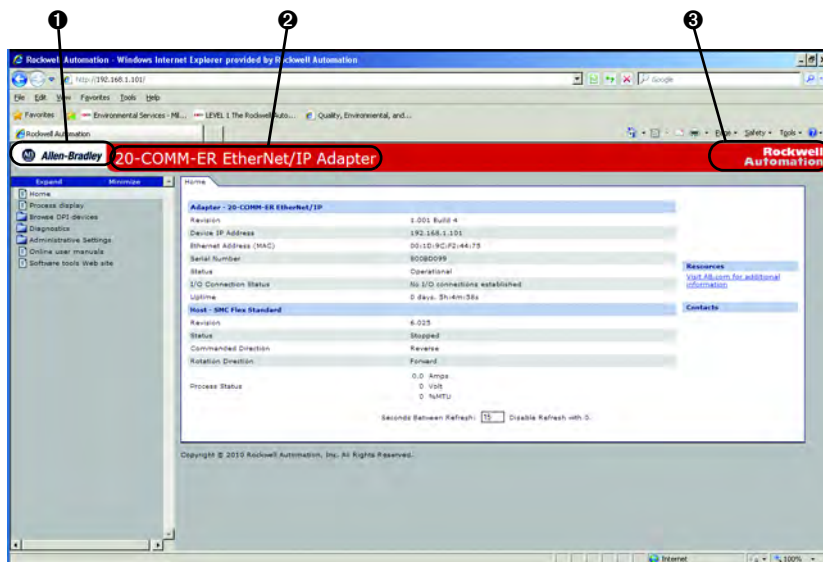
Title Bar on Adapter Web Pages

The title bar appears on the adapter Home Page and all of the adapter's other web pages. The title bar consists of three elements as shown in [Figure 79](#).

Title Bar Element	Description
❶ Allen-Bradley logo	This logo is a hyperlink. Click it to view the ab.com web Home Page.
❷ Adapter Title	Shows the adapter type or user-configurable title.
❸ Rockwell Automation logo	This logo is a hyperlink. Click it to view the Rockwell Automation web Home Page.

Navigation Pane on Adapter Web Pages

The navigation pane appears on the left side of the adapter Home Page and all of the adapter's other web pages. The navigation pane consists of links and link folders which can be expanded or minimized. The following table shows all navigation pane links and link folders.

Navigation Pane Link/ Folder	Description
Home link	Click this link to view the adapter's Home Page (Figure 79).
Process display link	Click this link to view the host drive's Process Display pop-up window (Figure 81).
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 devices connected to the drive such as a HIM.
Diagnostics	Displays Ethernet/IP diagnostic information to aid in monitoring and troubleshooting the Ethernet/IP network.
Administrative Settings	Manage adapter settings such as password, IP address, and network configuration. Password Authorization is required to access subfolders.
Online user manuals link	Click this link to view Rockwell Automation's web page with documentation for drives, SMCs, 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.

Figure 80 - Adapter Web Home Page Example
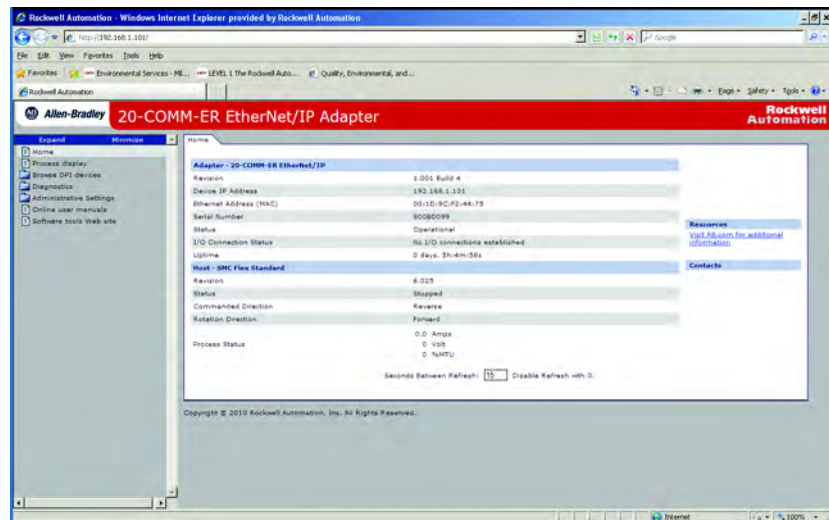
Process Display Home Page

The Process Display pop-up window dynamically shows the host drive's information. To view this window, click the 'Process display' link in the navigation pane.

Figure 81 - Example of Process Display Pop-up Window
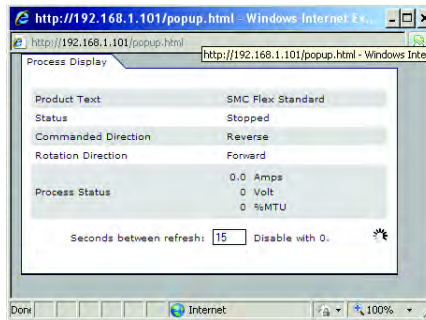
Browse DPI Device Folder

This folder gives access to the databases, fault and alarm queues and diagnostic data (if applicable) to all the devices connected to the DPI network.

Each Device on the DPI network has its own folder that has links to module information, parameters, diagnostic information, fault queues and alarm queue. The Parameters are further organized into the DPI groups defined for the specific device.

Figure 82 shows an example of an SMC-50 device acting as the DPI host on port 0 of the DPI network.

Figure 82 - Example of an SMC-50 Controller Acting as DPI Host

Parameters for the SMC-50 can be changed via the parameters web page by clicking on the Edit button near the bottom of the web page and entering the correct username and password when the authorization pop up window appears.

Note: PowerFlex drives on the network will not allow parameters to be changed via the Parameter Web page.

Figure 83 - Example of Parameter Web Page
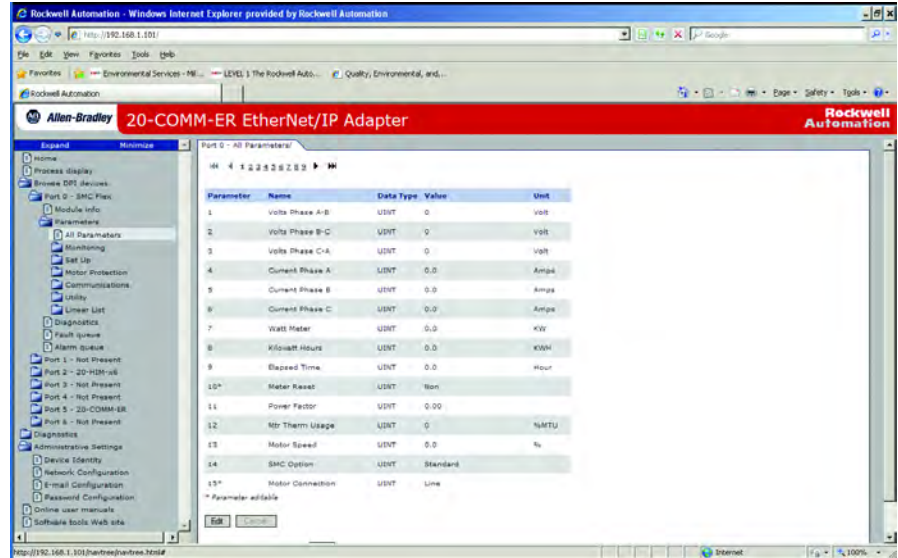
Diagnostics Web Page

The diagnostics web page provides the user with Adapter performance on the network detailing the configuration, status and traffic information about the EtherNet/IP network communications.

Diagnostic Overview link

This link provides a general overview of the Adapter's activity on the EtherNet/IP network.

Figure 84 - Diagnostic Overview Page
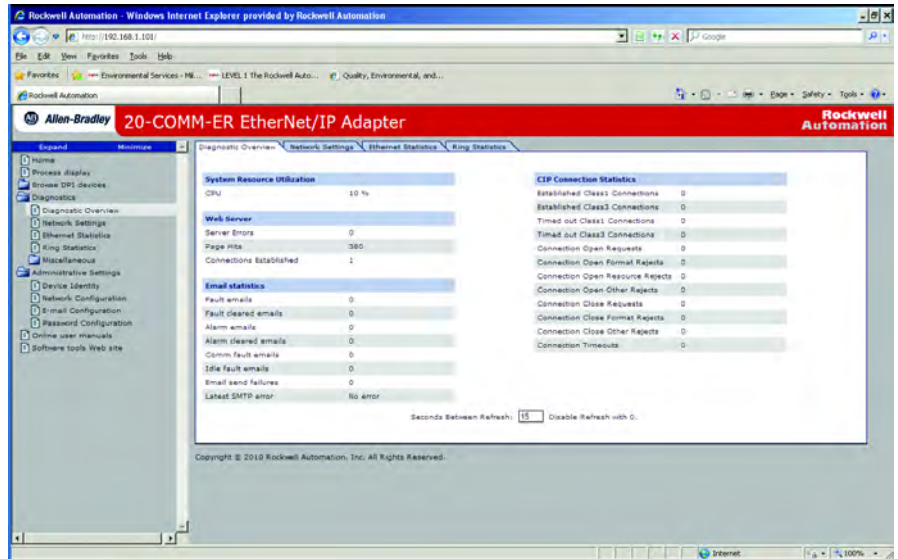
Network Setting Link

This link provides information about the adapter's Ethernet settings and network activities.

Figure 85 - Network Setting Page
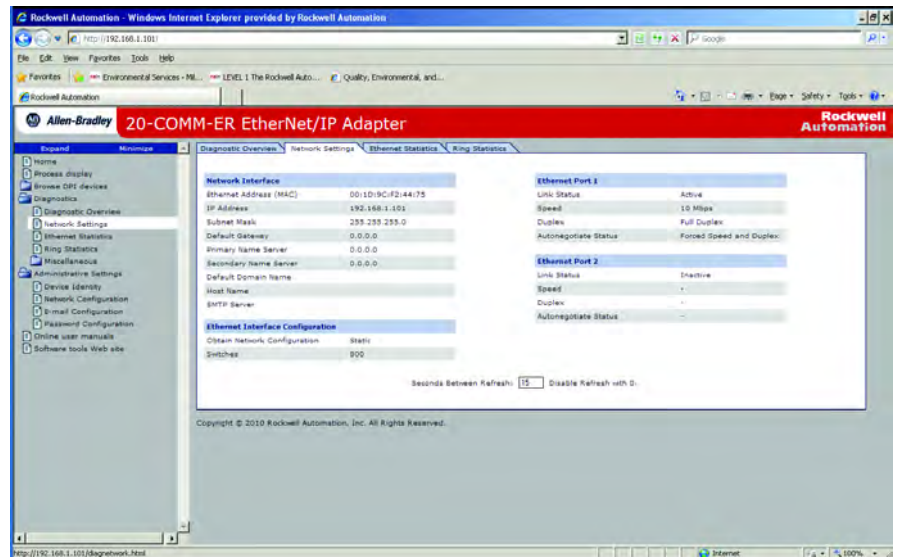
EtherNet/IP Statistics Link

This links displays information about the traffic activity on the EtherNet/IP network.

Figure 86 - EtherNet/IP Statistics Page
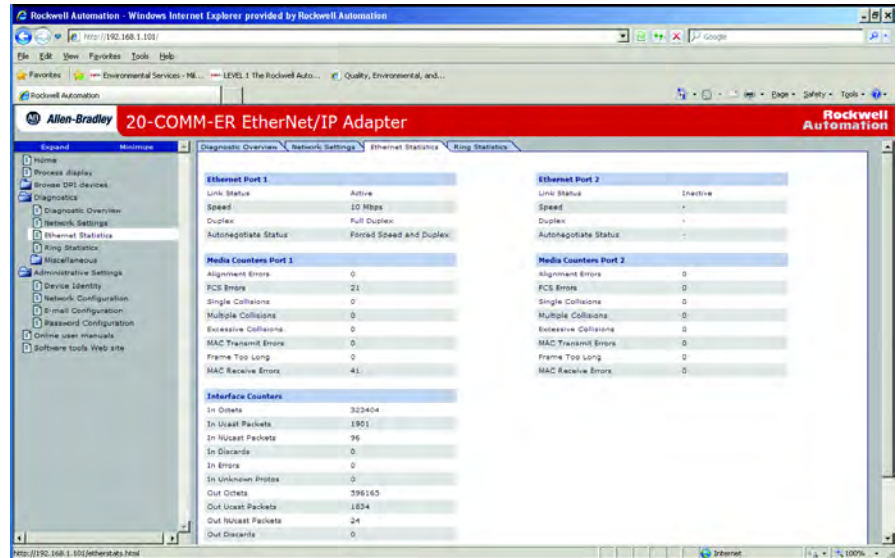
Ring Statistics link

This page displays configuration and status of the network and identifies the ring supervisor if the Ethernet network is configured as a ring.

Figure 87 - Ring Statistics Page
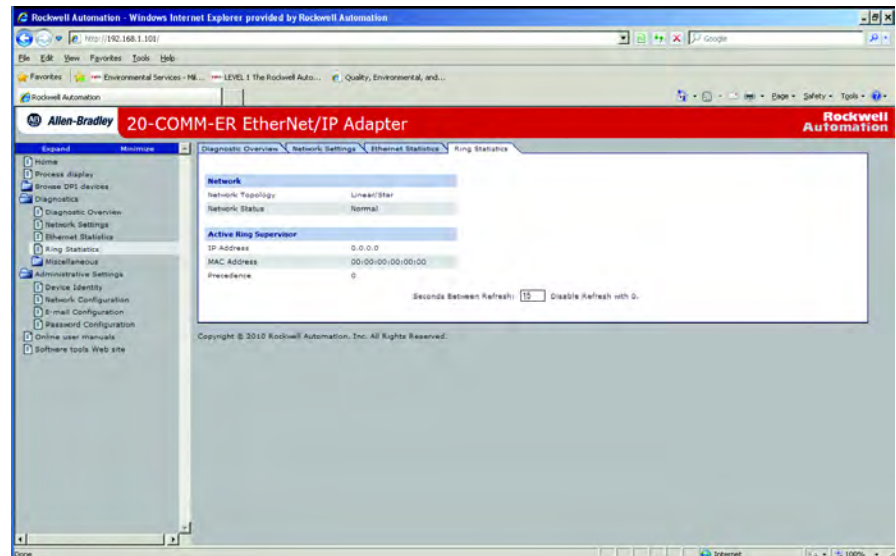
Crash Display Link

Figure 88 - Crash Display Page
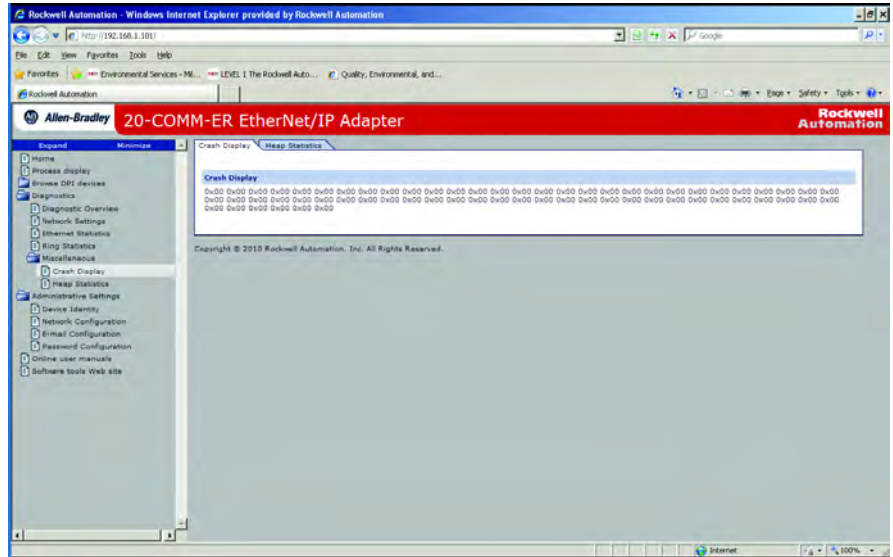
Heap Statistics Display link

Figure 89 - Heap Statistics Page
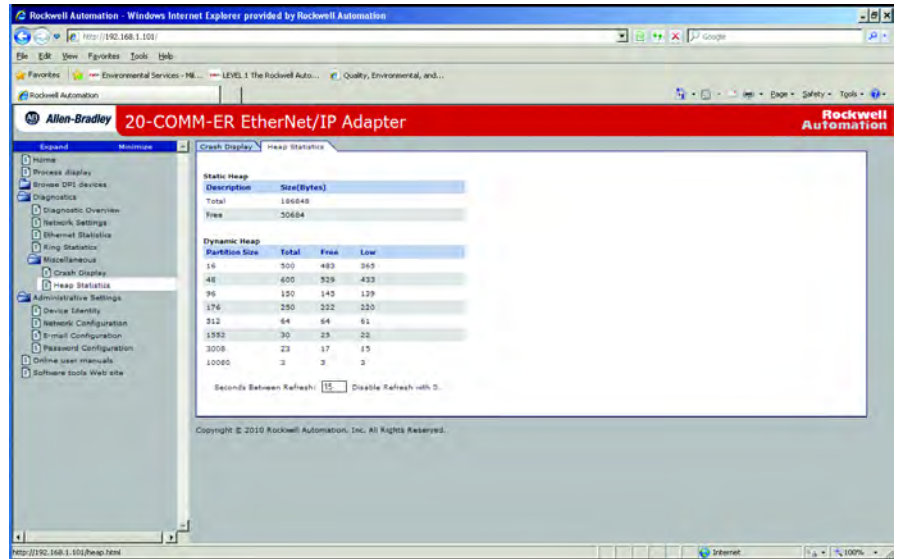
Administrative Web Pages   Administrative Web pages give the user access to the 20-COMM-ER module for the purpose of configuring the device for network operation and messaging.

Device Identity Link

The Device Identity link is used to give the Adapter an identity on the EtherNet/IP network that will be recognized by the user, software tools, and other devices on the network.

Figure 90 - Device Identity Page
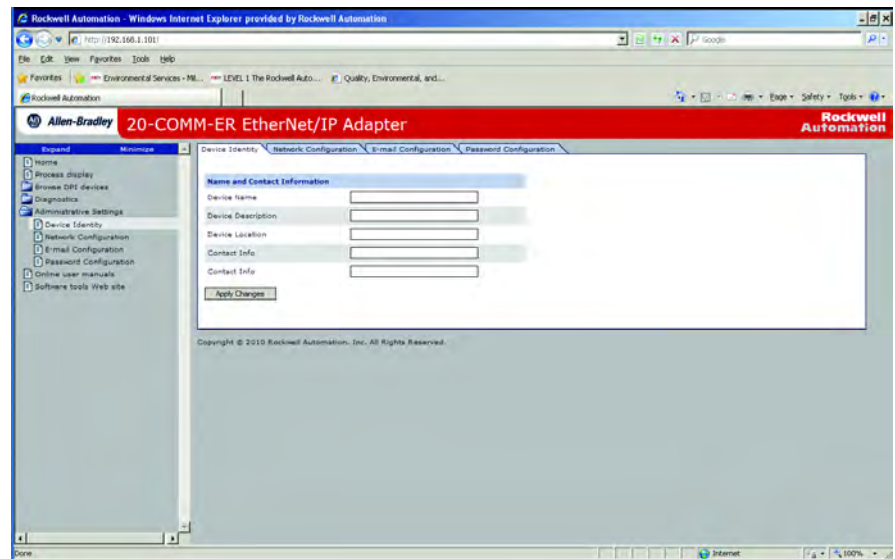
Network Configuration Link

The network configuration link allows setting of the TCP/IP layer of the Adapter, including IP address, Subnet mask, and gateway address.

Figure 91 - Network Configuration Page
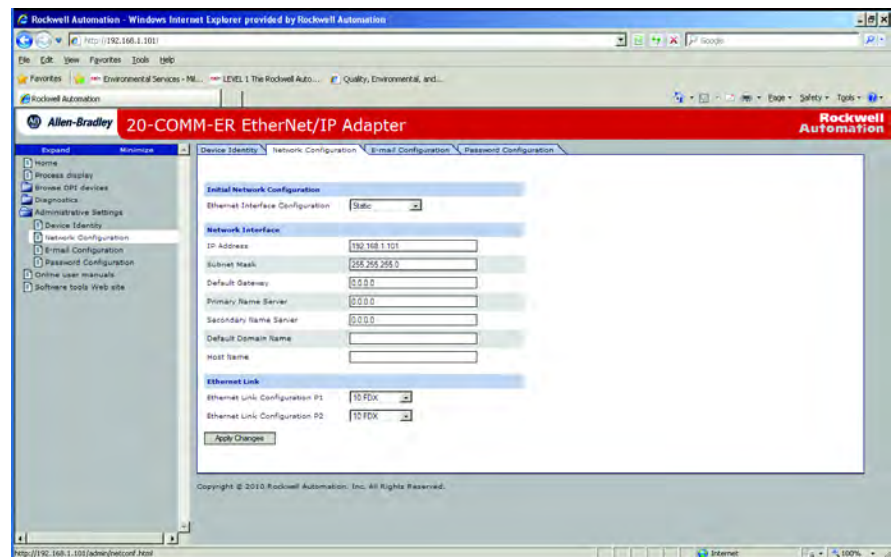
Email Configuration Link

The Configure E-mail Notification web page contains selections and data fields for configuring the adapter to automatically send email messages to desired addresses when selected types of events occur. To view this web page, click the 'Configure e-mail...' link (highlighted in Figure 92) in the navigation pane.

Figure 92 - E-mail Configuration Page
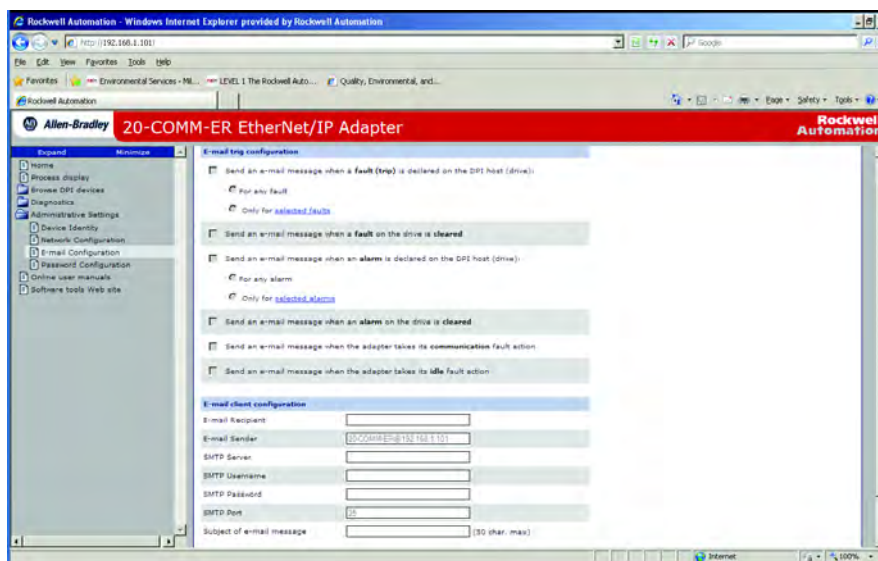
To configure email notification, perform the following steps.

1. Click the desired 'Send an e-mail message when...' check boxes you want to occur that will send email notification. If you only want email 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 93 shows an example faults configuration page.

Figure 93 - Example of Selected Faults Configuration Page
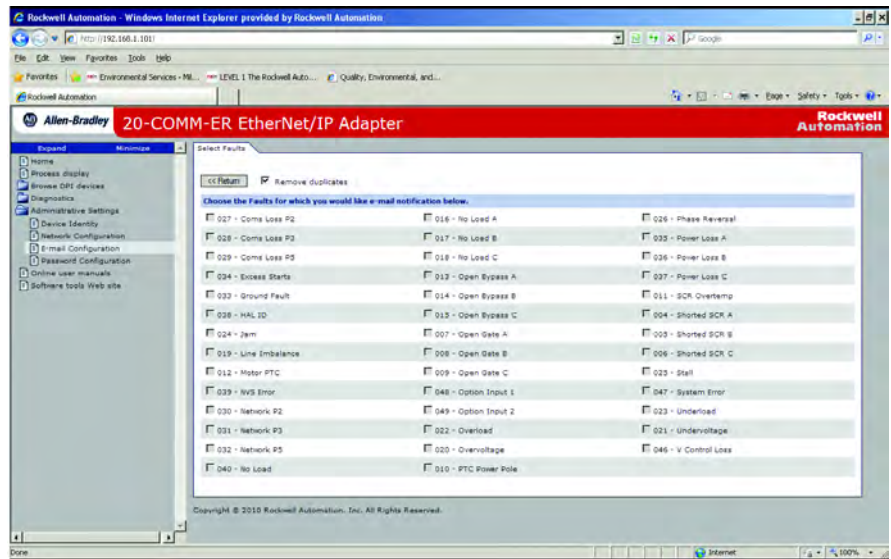
c. Click the desired fault/alarm check boxes.

d. Click **Apply Changes**.

e. Click the 'Back to E-mail Configuration Page' link.

2. Type the following information in their respective boxes.

Information	Description
'SMTP Server'	Type in the address of the mail server that will be used to deliver the email messages. (When the IP address is unknown, read the TIP shown below this table to determine the mail server address.)
'TO email recipient'	Type in addresses to where you want email 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 email message.

Figure 94 shows an example email message automatically sent by the adapter in response to selected events.

Figure 94 - Example of E-mail Message Sent by the Adapter
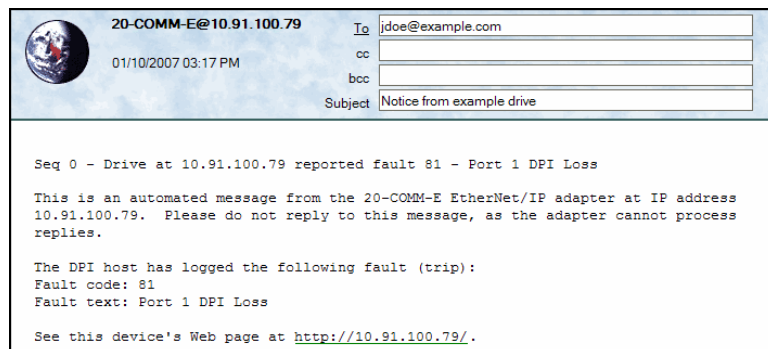
TIP   To stop email messages, uncheck all of the 'Send an e-mail message when…' boxes.

Disabling the adapter web pages by setting the Web Pages Switch (SW2 in Figure 2) to the 'Disable Web' position will **not stop** the adapter from sending email messages.

Password Configuration

The Password Configuration Link allows the user to set or change a password. The factory default configuration is:

Username: Administrator

Password: <none>   no password is set

Figure 95 - Password Configuration Page
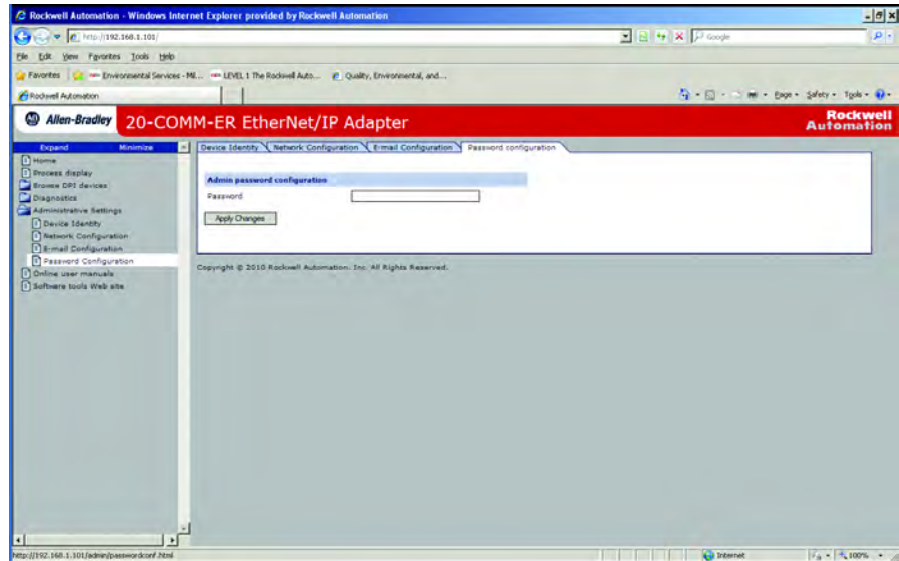
Notes:

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

This chapter provides information and examples that explain how to use 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 a DriveExplorer or DriveExecutive software tool, data collection, and so forth.

- 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.

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Installing the Adapter	167

Installing the Adapter

The adapter can be installed in a DPI External Comms Kit.

Figure 96 - Mounting and Connecting the Adapter

Comms Kit Enclosure Base

Comms Kit Enclosure Cover (with adapter mounted inside)

15.24 cm (6 in.) Internal Interface Cable (connects power supply board
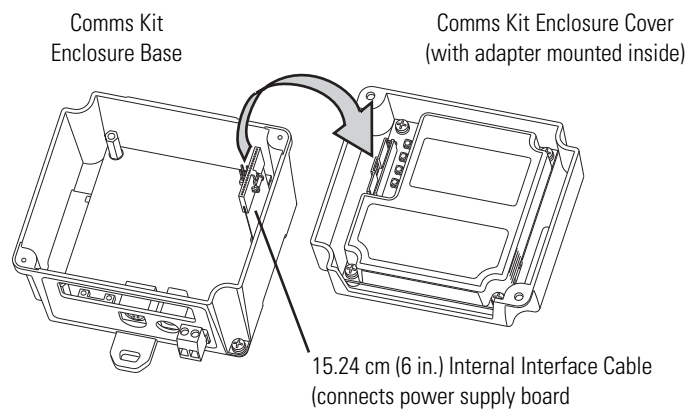
For more information, see the DPI External Communications Kit Installation Instructions, publication 20COMM-IN001.

Specifications

This appendix presents the specifications for the adapter.

Communications

Network Protocol	EtherNet/IP
Data Rates	10 Mbps Full Duplex 10 Mbps Half Duplex 100 Mbps Full Duplex 100 Mbps Half Duplex
Connection Limits	30 TCP connections Two 'class 1' connections and 14 'class 3' connections are supported. The following activities use a CIP connection: • Explicit messaging where 'connected' is chosen (for example, in a checkbox in RSLogix 5000) The following activities **do not** use a CIP connection: • Explicit messaging-based control using PCCC or the Register or Assembly objects, including the PLC-5, SLC 500, and MicroLogix 1100 examples in Chapter 4 • Explicit messaging where 'connected' is **not** chosen, which is typically the default
Requested Packet Interval (RPI)	2 ms minimum

Drive
   Protocol
   Data Rates
	DPI
	125 kbps or 500 kbps

Electrical

Consumption
   Drive
   Network
	482 mA at 5V DC supplied by the host (drive or DPI External Comms Kit)
	N/A

Mechanical

Dimensions	
Height	19 mm (0.75 inches)
Length	86 mm (3.39 inches)
Width	78.5 mm (3.09 inches)
Shipping Weight	150 g (5.2 oz.)

Environmental

Temperature	
Operating	-10…50 °C (14…122 °F)
Storage	-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	Drive Specification	SMC Specification
UL	UL508C	UL508
cUL	CSA C22.2 No. 14-2010	CSA C22.2 No. 14-10
CE	EN61800-3	EN60947-4-2
CTick	EN61800-3	EN60947-4-2

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.

Appendix B

Adapter Parameters

This appendix provides information about the adapter parameters.

Topic	Page

About Parameter Numbers

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

Configuration Tool	Numbering Scheme
• HIM • Connected Components Workbench software • 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	See Chapter 6, Using Explicit Messaging and Appendix C, EtherNet/IP Objects 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/DHCP]** 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

Parameter		Details
No.	**Name and Description**	

04
05
06
07
	[IP Addr Cfg 1]
	[IP Addr Cfg 2]
	[IP Addr Cfg 3]
	[IP Addr Cfg 4]
	
	Sets the IP address bytes for the adapter's network address when **Parameter 03 - [BOOTP]** is set to '0' (Disabled).
	
	255 . 255 . 255 . 255
	
	[IP Addr Cfg 1]
	    [IP Addr Cfg 2]
	        [IP Addr Cfg 3]
	            [IP Addr Cfg 4]
		Default: 0
		Default: 0
		Default: 0
		Default: 0
		Minimum: 0
		Maximum: 255
		Type: Read/Write
		Reset Required: Yes

08
09
10
11
	[Subnet Cfg 1]
	[Subnet Cfg 2]
	[Subnet Cfg 3]
	[Subnet Cfg 4]
	
	Sets the subnet mask bytes for the adapter's network address when **Parameter 03 - [BOOTP]** is set to '0' (Disabled).
	
	255 . 255 . 255 . 255
	
	[Subnet Cfg 1]
	    [Subnet Cfg 2]
	        [Subnet Cfg 3]
	            [Subnet Cfg 4]
		Default: 0
		Default: 0
		Default: 0
		Default: 0
		Minimum: 0
		Maximum: 255
		Type: Read/Write
		Reset Required: Yes

12
13
14
15
	[Gateway Cfg 1]
	[Gateway Cfg 2]
	[Gateway Cfg 3]
	[Gateway Cfg 4]
	
	Sets the gateway address bytes for the adapter's network address when **Parameter 03 - [BOOTP]** is set to '0' (Disabled).
	
	255 . 255 . 255 . 255
	
	[Gateway Cfg 1]
	    [Gateway Cfg 2]
	        [Gateway Cfg 3]
	            [Gateway Cfg 4]
		Default: 0
		Default: 0
		Default: 0
		Default: 0
		Minimum: 0
		Maximum: 255
		Type: Read/Write
		Reset Required: Yes

16	**[EN P1 Rate Cfg]**
	
	Sets the speed and duplex network data rate at which the adapter communicates. (Updates **Parameter 17 - [EN P1 Rate Act]** after a reset.)
		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

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

17	**[EN P1 Rate Act]**
	
	Displays the actual speed and duplex network data rate used by the adapter.
		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

18	**[EN P2 Rate Cfg]**
	
	Sets the speed and duplex network data rate at which the adapter communicates. (Updates **Parameter 19 - [EN PI Rate Act]** after a reset.)
		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

19	**[EN P2 Rate Act]**
	
	Displays the actual speed and duplex network data rate used by the adapter.
		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

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.	

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

23	**[Comm Flt Action]**
	
	Sets the action that the adapter and drive will take if the adapter detects that I/O communication has been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When communication is re-established, the drive will automatically receive commands over the network again.
		Default: 0 = Fault
		Values: 0 = Fault
		                   1 = Stop
		                   2 = Zero Data
		                   3 = Hold Last
		                   4 = Send Flt Cfg
		Type: Read/Write
		Reset Required: No

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

24	**[Idle Flt Action]**
	
	Sets the action that the adapter and drive will take if the adapter detects that the controller is in program mode or faulted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When the controller is put back in Run mode, the drive will automatically receive commands over the network again.
		Default: 0 = Fault
		Values: 0 = Fault
		                   1 = Stop
		                   2 = Zero Data
		                   3 = Hold Last
		                   4 = Send Flt Cfg
		Type: Read/Write
		Reset Required: No

	⚠ **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 24 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive when the controller is idle. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run, however, precautions should be taken to verify 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 faulted controller).	
25	**[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

Parameter		
No.	Name and Description	Details
26	**[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 25 - [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

No.	Name and Description	Details
27	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: · **Parameter 23 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. · **Parameter 24 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. · **Parameter 43 - [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is disrupted. The bit definitions will depend on the product to which the adapter is connected. See Appendix D 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
28	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: · **Parameter 23 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. · **Parameter 24 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. · **Parameter 43- [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is 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.

Parameter		
No.	**Name and Description**	**Details**
29 30 31 32 33 34 35 36	**[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 any of the following is true: · **Parameter 23 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. · **Parameter 24 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. · **Parameter 43 - [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is 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.
37	**[M-S Input]** Sets the Master-Slave input data. This data is produced by the scanner and consumed by the adapter.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes

Bit Definition (Parameter 37 - [M-S Input]):

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

38	**[M-S Output]** Sets the Master-Slave output data. This data is produced by the adapter and consumed by the Master device (for example, scanner).	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes

Bit Definition (Parameter 38 - [M-S Output]):

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

39	**[Ref Adjust]** Sets the percent scale factor for the Reference received from the network.	Default: 100.00% Minimum: 0.00% Maximum: 200.00% Type: Read/Write Reset Required: No

⚠ **ATTENTION:** To guard against equipment damage and/or personal injury, note that changes to **Parameter 39 - [Ref Adjust]** take effect immediately. A drive receiving its Reference from the adapter will receive the newly scaled Reference, resulting in a change of speed.

Parameter		
No.	**Name and Description**	**Details**
40 41	**[Peer A Input]** **[Peer B Input]** Sets the destination of the peer I/O input. The adapter receives this data from the network and sends it to the drive. **Important:** Changes to these parameters are ignored when **Parameter 49 - [Peer Inp Enable]** is set to '1' (On). **Important:** If the parameter is set to input a Logic Command, configure the mask in **Parameter 42 - [Peer Cmd Mask]** so that the desired bits from the peer device are used.	Default: 0 = Off Default: 0 = Off Values: 0 = Off 　　　　 1 = Cmd/Ref 　　　　 2 = Datalink A Input 　　　　 3 = Datalink B Input 　　　　 4 = Datalink C Input 　　　　 5 = Datalink D Input Type: Read/Write Reset Required: No
42	**[Peer Cmd Mask]** Sets the mask for the Logic Command word when it is received through peer input. If the mask bit is '0' (Off), the command bit is ignored and not used. If the mask bit is '1' (On), the command bit is checked and used. **Important:** If the adapter receives a Logic Command from both a Master device and a peer device, each command bit must have only one source. The source of command bits set to '0' will be the Master device. The source of command bits set to '1' will be the peer device.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Values: 0 = Ignore bit 　　　　 1 = Check bit Type: Read/Write Reset Required: Yes
43	**[Peer Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that peer I/O communication has been disrupted. This setting is effective only if I/O 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 43 - [Peer Flt Action]** lets you determine the action of the adapter and connected drive if the adapter is unable to communicate with the designated peer. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run, however, precautions should be taken to verify 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**

44
45
46
47
	[Peer Inp Addr 1]
	[Peer Inp Addr 2]
	[Peer Inp Addr 3]
	[Peer Inp Addr 4]
	
	Sets the IP address bytes that specifies the device from which the adapter receives (consumes) peer I/O data.
	
	255 . 255 . 255 . 255
	
	[Peer Inp Addr 1]
	    [Peer Inp Addr 2]
	        [Peer Inp Addr 3]
	            [Peer Inp Addr 4]
	
	Important: The Peer Inp Addr must be on the same subnet as the 20-COMM-ER. See <u>page 226</u> for more information.
	
	Changes to these parameters are ignored when **Parameter 49 - [Peer Inp Enable]** is set to '1' (On).
		Default: 0
		Default: 0
		Default: 0
		Default: 0
		Minimum: 0
		Maximum: 255
		Type: Read/Write
		Reset Required: No

48	**[Peer Inp Timeout]** Sets the timeout for a peer I/O connection. If the time is reached without the adapter receiving (consuming) a message, the adapter will respond with the action specified in **Parameter 43 - [Peer Flt Action]**. In an adapter receiving (consuming) peer I/O, the value of this parameter must be greater than the product of the value of **Parameter 54 - [Peer Out Time]** in the adapter transmitting (producing) peer I/O multiplied by the value of **Parameter 55 - [Peer Out Skip]** in the adapter transmitting (producing) peer I/O.	Default: 10.00 Seconds Minimum: 0.01 Seconds Maximum: 10.00 Seconds Type: Read/Write Reset Required: No
49	**[Peer Inp Enable]** Determines if peer I/O input is on or off.	Default: 0 = Off Values: 0 = Off 1 = On Type: Read/Write Reset Required: No

50	**[Peer Inp Status]**
	
	Displays the status of the consumed peer I/O input connection.
		Default: 0 = Off
		Values: 0 = Off
		                        1 = Waiting
		                        2 = Running
		                        3 = Faulted
		Type: Read Only

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

51
52
	[Peer A Output]
	[Peer B Output]
	
	Selects the source of the peer I/O output data. The adapter transmits this data to the network.
	
	Important: Changes to these parameters are ignored when **Parameter 53 - [Peer Out Enable]** is set to '1' (On).
		Default: 0 = Off
		Default: 0 = Off
		Values: 0 = Off
		                1 = Cmd/Ref
		                2 = Datalink A Input
		                3 = Datalink B Input
		                4 = Datalink C Input
		                5 = Datalink D Input
		                6 = Datalink A Output
		                7 = Datalink B Output
		                8 = Datalink C Output
		                9 = Datalink D Output
		Type: Read/Write
		Reset Required: No

53	**[Peer Out Enable]** Determines if peer I/O output is on or off.	Default: 0 = Off Values: 0 = Off 1 = On Type: Read/Write Reset Required: No
54	**[Peer Out Time]** Sets the minimum time that an adapter will wait when transmitting data to a peer. **Important:** Changes to these parameters are ignored when **Parameter 53 - [Peer Out Enable]** is set to '1' (On).	Default: 10.00 Seconds Minimum: 0.01 Seconds Maximum: 10.00 Seconds Type: Read/Write Reset Required: No
55	**[Peer Out Skip]** Sets the maximum time that an adapter will wait when transmitting data to a peer. The value of **Parameter 54 - [Peer Out Time]** is multiplied by the value of this parameter to set the time. **Important:** Changes to these parameters are ignored when **Parameter 53 - [Peer Out Enable]** is set to '1' (On).	Default: 1 Minimum: 1 Maximum: 16 Type: Read/Write Reset Required: No
56	**[Web Enable]** Displays the setting of the adapter Web Pages Switch (SW2) when the adapter was last reset.	Default: 0 = Disabled Values: 0 = Disabled 1 = Enabled Type: Read Only
57	**[Web Features]** Sets the access to the Web interface and Web configurable email notification feature.	Default: xxxx xxx0 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

Notes:

EtherNet/IP Objects

This appendix presents information about the EtherNet/IP objects that can be accessed using Explicit Messages. For information on the format of Explicit Messages and example ladder logic programs, refer to Chapter 6, Using Explicit Messaging.

Object	Class Code		Page	Object	Class Code		Page
	Hex.	Dec.			Hex.	Dec.	
Identity Object	0x01	1	182	DPI Device Object	0x92	146	196
Assembly Object	0x04	4	183	DPI Parameter Object	0x93	147	198
Register Object	0x07	7	184	DPI Fault Object	0x97	151	204
Parameter Object	0x0F	15	185	DPI Alarm Object	0x98	152	206
Parameter Group Object	0x10	16	188	DPI Diagnostic Object	0x99	153	207
Device Level Ring Object	0x47	71	189	DPI Time Object	0x9B	155	209
Quality of Service Object	0x48	72	190	TCP/IP Interface Object	0xF5	245	211
PCCC Object	0x67	103	190	Ethernet Link Object	0xF6	246	213

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

Supported Data Types

Data Type	Description
BOOL	8-bit value -- low bit is true or false
BOOL[n]	Array of n bits
BYTE	8-bit unsigned integer
CONTAINER	32-bit parameter value - sign extended if necessary
DINT	32-bit signed integer
DWORD	32-bit unsigned integer
INT	16-bit signed integer
LWORD	64-bit unsigned integer
REAL	32-bit floating point
SHORT_STRING	1-byte length indicator + that many characters
SINT	8-bit signed integer
STRING[n]	Array of n characters
STRUCT	Structure name only - no size in addition to elements
TCHAR	8 or 16-bit character
UDINT	32-bit unsigned integer
UINT	16-bit unsigned integer
USINT	8-bit unsigned integer
WORD	16-bit unsigned integer

Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Services

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

Instances

The number of instances depends on the number of components in the device connected to the adapter. This number of components can be read in Instance 0, Attribute 2.

Instance	Description
0	Class
1	Host
2…15	Peripherals on Ports 1…14

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
2	Get	Max Instance	WORD	Total number of instances

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	WORD	1 = Allen-Bradley
2	Get	Device Type	WORD	123
3	Get	Product Code	WORD	Number identifying product name and rating
4	Get	Revision: Major Minor	STRUCT of: BYTE BYTE	 Value varies Value varies
5	Get	Status	WORD	Bit 0 = Owned Bit 8 = Minor recoverable fault Bit 10 = Major recoverable fault
6	Get	Serial Number	DWORD	Unique 32-bit number
7	Get	Product Name	SHORT_STRING	Product name and rating
8	Get	State	USINT	Always returns 3 (Operational)
9	Get	Configuration Consistency Value	UINT	For the Host (Instance #1) the CCV is determined from the Host's NVS Checksum along with 20-COMM-ER's NVS Checksum. For DPI Peripherals (Instances 2-15) the CCV is from the peripheral's NVS Checksum only.

Assembly Object

Class Code

Hexadecimal	Decimal
0x04	4

Services

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

Instances

Instance	Description
1	All I/O data being read from the DPI device (read-only)
2	All I/O data written to the DPI device (read/write)
191	Input only
192	Listen only

Class Attributes

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

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Number of Members	WORD	1

2	Get	Member List	ARRAY of STRUCT:
			    WORD
			    WORD
			    Packed EPATH
				Size of member data
				Size of member path
				Member path

3	Conditional [1]	Data	Array of Bits	Data to be transferred
4	Get	Size	WORD	Size of assembly data in bits

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

Important: Setting an assembly object attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Register Object

Class Code

Hexadecimal	Decimal
0x07	7

Services

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

Instances

Instance	Description
1	All I/O data being read from the DPI device (read-only)
2	All I/O data written to the DPI device (read/write)
3	Logic Status and Feedback data (read-only)
4	Logic Command and Reference data (read/write)
5	Datalink A (input data from device to scanner) (read only)
6	Datalink A (output data from scanner to device) (read/write)
7	Datalink B (input data from device to scanner) (read only)
8	Datalink B (output data from scanner to device) (read/write)
9	Datalink C (input data from device to scanner) (read only)
10	Datalink C (output data from scanner to device) (read/write)
11	Datalink D (input data from device to scanner) (read only)
12	Datalink D (output data from scanner to device) (read/write)
13	Logic Status and Feedback Data (read-only)
14	Mask [1] (read/write)
15	Logic Status (read-only)
16	Logic Command (read/write)
17	Feedback (read-only)
18	Reference (read/write)

(1)   The mask command word is set to the value of the first word of the data where there are ones in the second word of the data.
       Command = (word 1 and not word 2) or (word 1 and word 2). This only controls specified bits in the Logic Command data to the DPI
       product and does not change the Reference value.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
100	Set	Control Timeout	WORD	Control timeout in seconds

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Bad Flag	BOOL	If set to 1, then attribute 4 may contain invalid data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Producer Register (drive to network) 1 = Consumer Register (network to drive)
3	Get	Size	WORD	Size of register data in bits
4	Conditional [1]	Data	ARRAY of BITS	Data to be transferred

(1) For this attribute, the Access Rule is Get if Direction = 0. The Access Rule is Set if Direction = 1.

> **Important:** Setting a Register object attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Parameter Object

Class Code

Hexadecimal	Decimal
0x0F	15

Services

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

Instances

The number of instances depends on the number of parameters in the DPI drive. The adapter parameters are appended to the list of drive parameters. The total number of parameters can be read in Instance 0, Attribute 2.

Instance	Description
0	Class Attributes
1	Drive Parameter 1 Attributes
⋮	⋮
n	Last Drive Parameter n Attributes [1]
n + 1	Adapter Parameter 1 Attributes
⋮	⋮
n + m	Last Adapter Parameter m Attributes [2]

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

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

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	WORD	1
2	Get	Max Instance	WORD	Number of parameters
8	Get	Parameter Class Descriptor	WORD	0 = False, 1 = True Bit 0 = Supports parameter instances Bit 1 = Supports full attributes Bit 2 = Must do NVS save command Bit 3 = Parameters are stored in NVS
9	Get	Configuration Assembly Instance	WORD	0
10	Set	Native Language	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	(1)	Parameter Value	(2)	(3)
2	Get	Link Path Size	BYTE	0 = No link specified n = The size of Attribute 3 in bytes
3	Get	Link Path		(4)
4	Get	Descriptor	WORD	0 = False, 1 = True Bit 1 = Supports ENUMs Bit 2 = Supports scaling Bit 3 = Supports scaling links Bit 4 = Read only Bit 5 = Monitor Bit 6 = Extended precision scaling
5	Get	Data Type	BYTE	1 = WORD (16-bit) 2 = UINT (16-bit) 3 = INT (16-bit) 5 = SINT 6 = DINT 8 = USINT 9 = UDINT 11 = REAL 22 = SHORT_STRING 24 = BYTE 25 = DWORD
6	Get	Data Size	BYTE	(3)
7	Get	Parameter Name String	SHORT_STRING	(3)
8	Get	Units String	SHORT_STRING	(3)
9	Get	Help String	SHORT_STRING	Null string
10	Get	Minimum Value	(2)	(3)
11	Get	Maximum Value	(2)	(3)
12	Get	Default Value	(2)	(3)
13	Get	Scaling Multiplier	WORD	(3)
14	Get	Scaling Divisor	WORD	(3)
15	Get	Scaling Base	WORD	(3)
16	Get	Scaling Offset	WORD	(3)
17	Get	Multiplier Link	WORD	(3)
18	Get	Divisor Link	WORD	(3)
19	Get	Base Link	WORD	(3)
20	Get	Offset Link	WORD	(3)
21	Get	Decimal Precision	BYTE	(3)

(1) Access rule is defined in Bit 4 of instance attribute 4 (0 = Get/Set, 1 = Get).

(2) Specified in descriptor, data type, and data size.

(3) Value varies based on parameter instance.

(4) See the EtherNet/IP specification for a description of the link path.

Parameter Group Object

Class Code

Hexadecimal	Decimal
0x10	16

Services

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

Instances

The number of instances depends on the number of groups in the device. A group of adapter parameters is appended to the list of groups in the device. The total number of groups can be read in Instance 0, Attribute 2.

Number	Description
0	Class Attributes
1	Drive Group 1 Attributes
⋮	⋮
n	Last Drive Group Attributes
n + 1	Adapter Group Attributes

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Parameter group version	WORD	1
2	Get	Max Instance	WORD	Total number of groups
8	Set	Native Language	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Group Name String	SHORT_STRING	Group name
2	Get	Number of Members in Group	WORD	Number of parameters in group
3	Get	1st Parameter Number in Group	WORD	(1)
4	Get	2nd Parameter Number in Group	WORD	(1)
n	Get	⋮	WORD	(1)

(1)   Value varies based on group instance.

Device Level Ring Object

Class Code

Hexadecimal	Decimal
0x0047	71

Services

The following common services will be implemented for the DLR Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	No	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single

Instances

Get_Attribute_ALL is implemented for instances and Get_Attribute_Single for both class and instance.

The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes

Class Attributes

The following class attributes will be supported for the DLR Object:

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UNIT	2

Instance Attributes

A single instance (instance 1) will be supported.

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Network Topology	USINT	0 = Linear 1 = Ring
2	Get	Network Status	USINT	0 = Normal 1 = Ring Fault 2 = Unexpected Loop Detect 3 = Partial Network Fault 4 = Rapid Fault/Restore Cycle

10	Get	Active Supervisor Address	STRUCT of:
			    UDINT
			Array of 6
			    USINT
				Ring supervisor

12	Get	Capability Flags	DWORD	0x00000002

Quality of Service Object

Class Code

Hexadecimal	Decimal
0x0048	72

Services

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

Instances

Get_Attribute_Single is implemented on both class and instance. Set_Attribute_Single is implemented on instances. Get_Attribute_All is not implemented

The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Set	802.1Q Tag Enable	USINT	0 = Disable (default) 1 = Enable
4	Set	DSCP Urgent	USINT	Default = 55
5	Set	DSCP Scheduled	USINT	Default = 47
6	Set	DSCP High	USINT	Default = 43
7	Set	DSCP Low	USINT	Default = 31
8	Set	DSCP Explici	USINT	Default = 27

PCCC Object

Class Code

Hexadecimal	Decimal
0x67	103

Services

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

Instances

Supports Instance 1.

Class Attributes

Not supported.

Instance Attributes

Not supported.

Message Structure for Execute_PCCC

Request		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code; not used for all CMDs.
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended status; not used for all CMDs.
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

Message Structure for Execute_DH+

Request		
Name	**Data Type**	**Description**
DLink	UINT	Destination Link ID
DSta	USINT	Destination Station number
DUser	USINT	Destination "User" number
SLink	UINT	Source Link ID
SSta	USINT	Source Station number
SUser	USINT	Source User number
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code; not used for all CMDs
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
DLink	UINT	Destination Link ID
DSta	USINT	Destination Station number
DUser	USINT	Destination "User" number
SLink	UINT	Source Link ID
SSta	USINT	Source Station number
SUser	USINT	Source User number
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended status; not used for all CMDs
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

The adapter supports the following PCCC command types:

CMD	FNC	Description
0x06	0x03	Identify host and some status
0x0F	0x67	PLC-5 typed write
0x0F	0x68	PLC-5 typed read
0x0F	0x95	Encapsulate other protocol
0x0F	0xA2	SLC 500 protected typed read with 3 address fields
0x0F	0xAA	SLC 500 protected typed write with 3 address fields
0x0F	0xA1	SLC 500 protected typed read with 2 address fields
0x0F	0xA9	SLC 500 protected typed write with 2 address fields
0x0F	0x00	Word range read
0x0F	0x01	Word range write

For more information regarding PCCC commands, see DF1 Protocol and Command Set Manual, publication 1770-6.5.16.

N-Files

N-File	Description			
N40	This N-file lets you use Emulated Block Transfer messages to read and write many types of DPI messages. To use Emulated Block Transfer messages, you send a Write message to N40:0…N40:63, wait until the adapter responds with a reply message, and then read the response data in N40:0…N40:63 with a Read message.			
	For details about Block Transfer messages and the data required for each byte in the N-File, see the Remote I/O Adapter User Manual, publication 20COMM-UM004.			
	Bits 15…8 are the Most Significant Byte. Bits 7…0 are the Least Significant Byte.			
	Write		*Read*	
Bits	15	0	15	0
N40:0	0x00	Length (in Bytes)	0x00	Length (in Bytes)
N40:1	DPI Port	0x81	Status Size	Status Type
N40:2	0x00	CIP Service	Data (length varies based on message)	
N40:3	CIP Class			
N40:4	CIP Instance			
N40:5	CIP Attribute			
N40:6 ⋮ N40:63	Data (length varies based on message)			
N41	This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true: The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner. The adapter is not receiving peer I/O from another adapter. The value of N42:3 is set to a non-zero value.			
	Write		*Read*	

N-File	Description	
N41:0	Logic Command Word	Logic Status Word
N41:1	Reference (least significant word)	Feedback (least significant word)
N41:2	Reference (most significant word)	Feedback (most significant word)
N41:3	Datalink A1 (least significant word)	Datalink A1 (least significant word)
N41:4	Datalink A1 (most significant word)	Datalink A1 (most significant word)
N41:5	Datalink A2 (least significant word)	Datalink A2 (least significant word)
N41:6	Datalink A2 (most significant word)	Datalink A2 (most significant word)
N41:7	Datalink B1 (least significant word)	Datalink B1 (least significant word)
N41:8	Datalink B1 (most significant word)	Datalink B1 (most significant word)
N41:9	Datalink B2 (least significant word)	Datalink B2 (least significant word)
N41:10	Datalink B2 (most significant word)	Datalink B2 (most significant word)
N41:11	Datalink C1 (least significant word)	Datalink C1 (least significant word)
N41:12	Datalink C1 (most significant word)	Datalink C1 (most significant word)
N41:13	Datalink C2 (least significant word)	Datalink C2 (least significant word)
N41:14	Datalink C2 (most significant word)	Datalink C2 (most significant word)
N41:15	Datalink D1 (least significant word)	Datalink D1 (least significant word)
N41:16	Datalink D1 (most significant word)	Datalink D1 (most significant word)
N41:17	Datalink D2 (least significant word)	Datalink D2 (least significant word)
N41:18	Datalink D2 (most significant word)	Datalink D2 (most significant word)
N42	This N-file lets you read and write some values configuring the port.	
N42:3	Time-out (read/write): Time (in seconds) allowed between messages to the N41 file. If the adapter does not receive a message in the specified time, it performs the fault action configured in its [Comm Flt Action] parameter. A valid setting is between 1 and 32767 seconds (5…20 seconds is recommended).	
N42:7	Adapter Port Number (read only): DPI port on the drive to which the adapter is connected.	
N42:8	Peer Adapters (read only): Bit field of devices having DPI Peer capabilities.	

N45	This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true:
	The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner. The adapter is not receiving peer I/O from another adapter.
	The value of N42:3 is set to a non-zero value.

	Write	*Read*
N45:0	Logic Command (least significant)	Logic Status (least significant)
N45:1	Logic Command (most significant)	Logic Status (most significant)
N45:2	Reference (least significant)	Feedback (least significant)
N45:3	Reference (most significant)	Feedback (most significant)
N45:4	DL From Net 01 (least significant)	DL To Net 01 (least significant)
N45:5	DL From Net 01 (most significant)	DL To Net 01 (most significant)
N45:6	DL From Net 02 (least significant)	DL To Net 02 (least significant)
N45:7	DL From Net 02 (most significant)	DL To Net 02 (most significant)
N45:8	DL From Net 03 (least significant)	DL To Net 03 (least significant)
N45:9	DL From Net 03 (most significant)	DL To Net 03 (most significant)
N45:10	DL From Net 04 (least significant)	DL To Net 04 (least significant)
N45:11	DL From Net 04 (most significant)	DL To Net 04 (most significant)
N45:12	DL From Net 05 (least significant)	DL To Net 05 (least significant)
N45:13	DL From Net 05 (most significant)	DL To Net 05 (most significant)
N45:14	DL From Net 06 (least significant)	DL To Net 06 (least significant)
N45:15	DL From Net 06 (most significant)	DL To Net 06 (most significant)
N45:16	DL From Net 07 (least significant)	DL To Net 07 (least significant)
N45:17	DL From Net 07 (most significant)	DL To Net 07 (most significant)
N45:18	DL From Net 08 (least significant)	DL To Net 08 (least significant)
N45:19	DL From Net 08 (most significant)	DL To Net 08 (most significant)
N45:20	DL From Net 09 (least significant)	DL To Net 09 (least significant)
N45:21	DL From Net 09 (most significant)	DL To Net 09 (most significant)
N45:22	DL From Net 10 (least significant)	DL To Net 10 (least significant)
N45:23	DL From Net 10 (most significant)	DL To Net 10 (most significant)
N45:24	DL From Net 11 (least significant)	DL To Net 11 (least significant)
N45:25	DL From Net 11 (most significant)	DL To Net 11 (most significant)
N45:26	DL From Net 12 (least significant)	DL To Net 12 (least significant)
N45:27	DL From Net 12 (most significant)	DL To Net 12 (most significant)
N45:28	DL From Net 13 (least significant)	DL To Net 13 (least significant)
N45:29	DL From Net 13 (most significant)	DL To Net 13 (most significant)
N45:30	DL From Net 14 (least significant)	DL To Net 14 (least significant)
N45:31	DL From Net 14 (most significant)	DL To Net 14 (most significant)
N45:32	DL From Net 15 (least significant)	DL To Net 15 (least significant)
N45:33	DL From Net 15 (most significant)	DL To Net 15 (most significant)
N45:34	DL From Net 16 (least significant)	DL To Net 16 (least significant)
N45:35	DL From Net 16 (most significant)	DL To Net 16 (most significant)

Important: If your controller or HMI platform supports CIP messaging, use the CIP Parameter object to get and set parameters.

N-File	Description
N150…N199	These N-files let you read and write parameter values in DPI Port 0 (the host PowerFlex drive) as 32-bit double words. You can interpret the data in various ways (for example, 32-bit real, 32-bit integer) To read a parameter, you need to send a message with two elements. For example, to read parameter 1, read two elements beginning at N150:2. As another example, to read parameters 2…6, read ten elements beginning at N150:4.
N150:0…1	Number of parameters in the drive
N150:2…249	Drive parameters 1…124
N151:0…249	Drive parameters 125…249
N152:0…249	Drive parameters 250…374
N153:0…249	Drive parameters 375…499
⋮	⋮
N199:0…249	Drive parameters 6125…6249

N-File	Description
N201…N212	These N-files let you read and write values to DPI and Host parameters in Ports 1…14 (for example, a HIM or adapter) as 32-bit double words. You can interpret the data in various ways (for example, 32-bit real, 32-bit integer) To read a parameter, you need to send a message with two elements. For example, to read parameter 1 in the peripheral connected to DPI port 1, read two elements beginning at N201:2. As another example, to read parameters 2…6 in the peripheral connected to DPI port 5 (the adapter), read ten elements beginning at N209:4.
N201:0…1	Number of parameters in the DPI peripheral at DPI port 1
N201:2…249	Parameters 1…124 in the DPI peripheral at DPI port 1
N202:0…249	Parameters 125…249 in the DPI peripheral at DPI port 1
N203:0…1	Number of parameters in the DPI peripheral at DPI port 2
N203:2…249	Parameters 1…124 in the DPI peripheral at DPI port 2
N204:0…249	Parameters 125…249 in the DPI peripheral at DPI port 2
N205:0…1	Number of parameters in the DPI peripheral at DPI port 3
N205:2…249	Parameters 1…124 in the DPI peripheral at DPI port 3
N206:0…249	Parameters 125…249 in the DPI peripheral at DPI port 3
N207:0…1	Number of parameters in the DPI peripheral at DPI port 4
N207:2…249	Parameters 1…124 in the DPI peripheral at DPI port 4
N208:0…249	Parameters 125…249 in the DPI peripheral at DPI port 4
N209:0…1	Number of parameters in the DPI peripheral at DPI port 5
N209:2…249	Parameters 1…124 in the DPI peripheral at DPI port 5
N210:0…249	Parameters 125…249 in the DPI peripheral at DPI port 5
N211:0…1	Number of parameters in the DPI peripheral at DPI port 6
N211:2…249	Parameters 1…124 in the DPI peripheral at DPI port 6
N212:0…249	Parameters 125…249 in the DPI peripheral at DPI port 6

The following N-Files are supported only when the adapter is used with a PowerFlex 750-Series drive.

N213:0…1	Number of parameters in the DPI peripheral at DPI port 7
N213:2…249	Parameters 1…124 in the DPI peripheral at DPI port 7
N214:0…249	Parameters 125…249 in the DPI peripheral at DPI port 7
N215:0…1	Number of parameters in the DPI peripheral at DPI port 8
N215:2…249	Parameters 1…124 in the DPI peripheral at DPI port 8
N216:0…249	Parameters 125…249 in the DPI peripheral at DPI port 8
N217:0…1	Number of parameters in the DPI peripheral at DPI port 9
N217:2…249	Parameters 1…124 in the DPI peripheral at DPI port 9
N218:0…249	Parameters 125…249 in the DPI peripheral at DPI port 9
N219:0…1	Number of parameters in the DPI peripheral at DPI port 10
N219:2…249	Parameters 1…124 in the DPI peripheral at DPI port 10
N220:0…249	Parameters 125…249 in the DPI peripheral at DPI port 10
N221:0…1	Number of parameters in the DPI peripheral at DPI port 11
N221:2…249	Parameters 1…124 in the DPI peripheral at DPI port 11
N222:0…249	Parameters 125…249 in the DPI peripheral at DPI port 11
N223:0…1	Number of parameters in the DPI peripheral at DPI port 12
N223:2…249	Parameters 1…124 in the DPI peripheral at DPI port 12
N224:0…249	Parameters 125…249 in the DPI peripheral at DPI port 12
N225:0…1	Number of parameters in the DPI peripheral at DPI port 13
N225:2…249	Parameters 1…124 in the DPI peripheral at DPI port 13
N226:0…249	Parameters 125…249 in the DPI peripheral at DPI port 13
N227:0…1	Number of parameters in the DPI peripheral at DPI port 14
N227:2…249	Parameters 1…124 in the DPI peripheral at DPI port 14
N228:0…249	Parameters 125…249 in the DPI peripheral at DPI port 14

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

Services

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

Instances

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

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	DPI Port 1
0x4800…0x4BFF	18432…19455	DPI Port 2
0x4C00…0x4FFF	19456…20479	DPI Port 3
0x5000…0x53FF	20480…21503	DPI Port 4
0x5400…0x57FF	21504…22527	DPI Port 5
0x5800…0x5BFF	22528…23551	DPI Port 6
0x5C00…0x5FFF [(1)]	22552…24575	DPI Port 7
0x6000…0x63FF [(1)]	24576…25599	DPI Port 8
0x6400…0x67FF [(1)]	25600…26623	DPI Port 9
0x6800…0x6BFF [(1)]	26624…27647	DPI Port 10
0x6C00…0x6FFF [(1)]	27648…28671	DPI Port 11
0x7000…0x73FF [(1)]	28672…29695	DPI Port 12
0x7400…0x77FF [(1)]	29696…30719	DPI Port 13
0x7800…0x7BFF [(1)]	30720…31743	DPI Port 14

Example	Description
0	Class Attributes (Drive)
1	Drive Component 1
2	Drive Component 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Component 1
⋮	⋮

(1)   These instances are supported only when the adapter is used with a PowerFlex 750-Series drive.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	BYTE	0x00 = DPI Peripheral 0x30 = PowerFlex 70 0x34 = PowerFlex 700H 0x38, 0x39, or 0x3A= PowerFlex 700 0x40 = PowerFlex 7000 0x48, 0x49, or 0x4A = PowerFlex 700S 0x5A = SMC Flex 0x68, 0x69, or 0x6A = PowerFlex 700VC 0x90 = PowerFlex 753/755 0xA0 = 20-750-xxx Option Module 0xFF = HIM
1	Get	Family Text	STRING[16]	Text identifying the device.

Attribute ID	Access Rule	Name	Data Type	Description
2	Set	Language Code	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch
3	Get	Product Series	BYTE	1 = A 2 = B . . .
4	Get	Number of Components	BYTE	Number of components (for example, main control board, I/O boards, and so forth) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name.
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	BYTE	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	WORD	0x0001 = Allen-Bradley
11	Get	NVS Checksum	WORD	Checksum of the Non-Volatile Storage in a device.
12	Get	Class Revision	WORD	2 = DPI
13	Get	Character Set Code	BYTE	0 = SCANport HIM 1 = ISO 8859-1 (Latin 1) 2 = ISO 8859-2 (Latin 2) 3 = ISO 8859-3 (Latin 3) 4 = ISO 8859-4 (Latin 4) 5 = ISO 8859-5 (Cyrillic) 6 = ISO 8859-6 (Arabic) 7 = ISO 8859-7 (Greek) 8 = ISO 8859-8 (Hebrew) 9 = ISO 8859-9 (Turkish) 10 = ISO 8859-10 (Nordic) 255 = ISO 10646 (Unicode)
14	Get	Product Option Support	BOOL[64]	
15	Get	Languages Supported	STRUCT of: BYTE BYTE[n]	 Number of Languages Language Codes (see Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: WORD BYTE BYTE	 Year Month Day
17	Get	Product Revision	STRUCT of: BYTE BYTE	 Major Firmware Release Minor Firmware Release
18	Get	Serial Number	DWORD	Value between 0x00000000 and 0xFFFFFFFF
19	Set	Language Selected	BYTE	0 = Default (HIM will prompt at start up) 1 = Language was selected (no prompt)
20	Set	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware flashed into the device.
30	Get	International Status Text	STRINGN	Text describing the status of device with support for Unicode.
31	Get/Set	International User Definable Text	STRINGN	Text identifying the device with a user-supplied name with support for Unicode.

Attribute ID	Access Rule	Name	Data Type	Description
34	Get	Key Information	STRUCT of:	
			DWORD	Rating Code
			DWORD	Device Serial Number
			WORD	Customization Code
			WORD	Customization Revision
			WORD	Brand Code
			BYTE	Family Code
			BYTE	Config Code
			BYTE	Language Code
			BYTE	Major Revision
			BYTE	Minor Revision
			BYTE[16]	Customer-Generated Firmware UUID
35	Get	NVS CRC	DWORD	A 32-bit CRC of the Non-Volatile Storage in a device.
39	Get	SI Driver Code	WORD	Code identifying the protocol between the device and host.
128	Get	Customization Code	WORD	Code identifying the customized device.
129	Get	Customization Revision Number	WORD	Revision of the customized device.
130	Get	Customization Device Text	STRING[32]	Text identifying the customized device.

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Component Name	STRING[32]	Name of the component
4	Get	Component Firmware Revision	STRUCT of:	
			BYTE	Major Revision
			BYTE	Minor Revision
8	Get	Component Serial Number	DWORD	Value between 0x00000000 and 0xFFFFFFFF
9	Get	International Component Name	STRINGN	Name of the component with support for Unicode.

DPI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

To access 'Host Config' parameters, use the HOST DPI Parameter Object (Class code 0x9F).

Instances

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

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	DPI Port 1
0x4800…0x4BFF	18432…19455	DPI Port 2
0x4C00…0x4FFF	19456…20479	DPI Port 3
0x5000…0x53FF	20480…21503	DPI Port 4
0x5400…0x57FF	21504…22527	DPI Port 5
0x5800…0x5BFF	22528…23551	DPI Port 6
0x5C00…0x5FFF [(1)]	23552…24575	DPI Port 7
0x6000…0x63FF [(1)]	24576…25599	DPI Port 8
0x6400…0x67FF [(1)]	25600…26623	DPI Port 9

Example	Description
0	Class Attributes (Drive)
1	Drive Parameter 1 Attributes
2	Drive Parameter 2 Attributes
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Parameter 1 Attributes
⋮	⋮

Instances (Hex.)	(Dec.)	Device		Example	Description
0x6800…0x6BFF [1]	26624…27647	DPI Port 10			
0x6C00…0x6FFF [1]	27648…28671	DPI Port 11			
0x7000…0x73FF [1]	28672…29695	DPI Port 12			
0x7400…0x77FF [1]	29696…30719	DPI Port 13			
0x7800…0x7BFF [1]	30720…31743	DPI Port 14			

(1) These instances are supported only when the adapter is used with a PowerFlex 750-Series drive.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	WORD	Number of parameters in the device
1	Set	Write Protect Password	WORD	0 = Password disabled n = Password
2	Set	NVS Command Write	BYTE	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory
3	Get	NVS Parameter Value Checksum	WORD	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	WORD	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	WORD	First parameter available if parameters are protected by passwords. A '0' indicates all parameters are protected.
7	Get	Class Revision	WORD	2 = DPI
8	Get	First Parameter Processing Error	WORD	The first parameter that has been written with a value outside of its range. A '0' indicates no errors.
9	Set	Link Command	BYTE	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DPI Offline Read Full	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Offline minimum value
			CONTAINER	Offline maximum value
			CONTAINER	Offline default value
			STRING[16]	Parameter name
			STRING[4]	Offline parameter units
			WORD	Online minimum parameter instance
			WORD	Online maximum parameter instance
			WORD	Online default parameter instance
			WORD	Multiple parameter instance
			WORD	Divisor parameter instance
			WORD	Base parameter instance
			WORD	Offset parameter instance
			BYTE	Formula number
			BYTE	Pad byte (always zero)
			WORD	Help instance
			WORD	Pad word (always a value of zero)
			CONTAINER	Parameter value
			WORD	Multiplier
			WORD	Divisor
			WORD	Base
			INT	Offset
7	Get	DPI Online Read Full	STRUCT of:	
			BOOL[32]	Descriptor (see page 202)
			CONTAINER[1]	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			WORD	Next parameter
			WORD	Previous parameter
			STRING[4]	Units (for example, Amp, Hz)
			WORD	Multiplier [2]
			WORD	Divisor [2]
			WORD	Base [2]
			INT	Offset [2]
			BYTE[3]	Link (source of the value) (0 = no link)
			BYTE	Always zero (0)
			STRING[16]	Parameter name
8	Get	DPI Descriptor	BOOL[32]	Descriptor (see page 202)
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. [3]
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory. Valid only for DPI drives.
11	Get/Set	DPI Link	BYTE[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	WORD	ID for help text for this parameter
13	Get	DPI Read Basic	STRUCT of:	
			BOOL[32]	Descriptor (see page 202)
			CONTAINER	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			STRING[16]	Parameter name
			STRING[4]	Units (for example, Amp, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer supplied parameter name.
16	Get	Parameter Processing Error	BYTE	0 = No error
				1 = Value is less than the minimum
				2 = Value is greater than the maximum

Attribute ID	Access Rule	Name	Data Type	Description
18	Get	International DPI Offline Parameter Text	STRUCT of: STRINGN STRINGN	 International parameter name International offline units
19	Get	International DPI Online Parameter Text	STRUCT of: STRINGN STRINGN	 International parameter name International offline units
20	Get	International DPI Online Read Full	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER WORD WORD WORD WORD WORD INT BYTE[3] BYTE BOOL[32] STRINGN STRINGN	 Descriptor Parameter value Online minimum value Online maximum value Online default value Next Previous Multiplier Divisor Base Offset Link Pad word (always zero) Extended descriptor International parameter name International online parameter units
21	Get	DPI Extended Descriptor	DWORD	Extended descriptor (see page 203)
22	Get	International DPI Offline Read Full	STRUCT of: BOOL CONTAINER CONTAINER CONTAINER WORD WORD WORD WORD WORD WORD WORD BYTE BYTE WORD WORD CONTAINER WORD WORD WORD INT BOOL[32] STRINGN STRINGN	 Descriptor Offline minimum value Offline maximum value Offline default value Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiple parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad byte (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset Extended DPI descriptor International DPI parameter name International DPI offline parameter units

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

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. See Formulas for Converting on page 204.

(3) Do **not** continually write parameter data to NVS. See the attention on page 105.

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0).
1	Data Type (Bit 2)	000 = BYTE used as an array of Boolean
2	Data Type (Bit 3)	001 = WORD used as an array of Boolean 010 = BYTE (8-bit integer) 011 = WORD (16-bit integer) 100 = DWORD (32-bit integer) 101 = TCHAR (8-bit (not unicode) or 16-bits (unicode) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
3	Sign Type	0 = Unsigned 1 = Signed
4	Hidden	0 = Visible 1 = Hidden
5	Not a Link Sink	0 = Parameter can sink a link 1 = Parameter cannot sink a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point.
13	Decimal Place (Bit 1)	0000 = 0
14	Decimal Place (Bit 2)	1111 = 15
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 4)	Right bit is least significant bit (16).
17	Extended Data Type (Bit 5)	000 = Reserved
18	Extended Data Type (Bit 6)	001 = DWORD used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field used to control access to parameter data.
23	Access Level (Bit 2)	
24	Access Level (Bit 3)	
25	Writable ENUM	ENUM text: 0 = Read Only, 1 = Read/Write
26	Not a Link Source	0 = May be the source end of a link 1 = May not be the source end of a link
27	Enhanced Bit ENUM	Parameter supports enhanced bit ENUMs.
28	Enhanced ENUM	Parameter supports enhanced ENUMs.
29	Uses DPI Limits Object	Parameter uses the DPI LImits Object.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DPI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

Extended Descriptor Attributes

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

Bit	Name	Description
28	Current Value Is Default	This bit identifies a parameter that will not change if a 'Reset Defaults' is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the 'Disallow Zero' bit is set, this bit must be cleared. If the 'Disallow Zero' bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30-31	Reserved	Reserved

Formulas for Converting

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

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

Common Services

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

Object Specific Services

Service Code	Implemented for:		Service Name	Allocation Size (in bytes)	
	Class	Instance		Par. Number	Par. Value
0x4B	Yes	No	Get_Attributes_Scattered	2	2
0x4C	Yes	No	Set_Attributes_Scattered	2	2

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

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

DPI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

Products such as PowerFlex drives use this object for faults. Adapters use this object for events.

Services

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

Instances

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

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	DPI Port 1
0x4800…0x4BFF	18432…19455	DPI Port 2
0x4C00…0x4FFF	19456…20479	DPI Port 3
0x5000…0x53FF	20480…21503	DPI Port 4
0x5400…0x57FF	21504…22527	DPI Port 5
0x5800…0x5BFF	22528…23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Most Recent Drive Fault
2	Second Most Recent Drive Fault
⋮	⋮
16384	Class Attributes (Adapter)
16385	Most Recent Adapter Event
⋮	⋮

Class Attributes

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

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description

0	Get	Full/All Information	STRUCT of WORD
			STRUCT of:
			  BYTE
			  BYTE
			  STRING[16]
			STRUCT of:
			  LWORD
			  BOOL[16]
			
			WORD
			CONTAINER[n]
				Fault code
				Fault source
				DPI port
				DPI Device Object
				Fault text
				Fault time stamp
				Timer value (0 = timer not supported)
				BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15]: Not used
				Reserved
				Reserved

1	Get	Basic Information	STRUCT of WORD
			STRUCT of:
			  BYTE
			  BYTE
			STRUCT of:
			  LWORD
			  BOOL[16]
				Fault code
				Fault source
				DPI port
				DPI Device Object
				Fault time stamp
				Timer value (0 = timer not supported)
				BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15]: Not used

2	Get	International Fault Text	STRINGN	Text describing the fault with support for Unicode.

DPI Alarm Object

Class Code

Hexadecimal	Decimal
0x98	152

Products such as PowerFlex drives use this object for alarms or warnings. Adapters do not support this object.

Services

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

Instances

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

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host

Only host devices can have alarms.

Example	Description
0	Class Attributes (Drive)
1	Most Recent Alarm
2	Second Most Recent Alarm
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	Revision of object
2	Get	Number of Instances	WORD	Maximum number of alarms that the device can record in its queue
3	Set	Alarm Command Write	BYTE	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device

4	Get	Fault Data List	STRUCT of:
			    BYTE
			    BYTE
			    WORD[n]
				Reserved

5	Get	Number of Recorded Alarms	WORD	Number of alarms in the queue. A '0' indicates the alarm queue is empty.

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description

0	Get	Full/All Information	STRUCT of WORD
			STRUCT of:
			    BYTE
			    BYTE
			    STRING[16]
			STRUCT of:
			    LWORD
			    BOOL[16]
			
			WORD
			CONTAINER[n]
				Alarm code
				Alarm source
				DPI port
				DPI Device Object
				Alarm text
				Alarm time stamp
				Timer value (0 = timer not supported)
				BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15] Reserved
				Reserved
				Reserved

1	Get	Basic Information	STRUCT of WORD
			STRUCT of:
			    BYTE
			    BYTE
			STRUCT of:
			    LWORD
			    BOOL[16]
				Alarm code
				Alarm source
				DPI port
				DPI Device Object
				Alarm time stamp
				Timer value (0 = timer not supported)
				BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15] Reserved

2	Get	International Alarm Text	STRINGN	Text describing the alarm with support for Unicode.

DPI Diagnostic Object

Class Code

Hexadecimal	Decimal
0x99	153

Services

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

Instances

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

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	DPI Port 1
0x4800…0x4BFF	18432…19455	DPI Port 2
0x4C00…0x4FFF	19456…20479	DPI Port 3
0x5000…0x53FF	20480…21503	DPI Port 4
0x5400…0x57FF	21504…22527	DPI Port 5
0x5800…0x5BFF	22528…23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Drive Diagnostic Item 1
2	Drive Diagnostic Item 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Diagnostic Item1
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	1
2	Get	Number of Instances	WORD	Number of diagnostic items in the device.
3	Get	ENUM Offset	WORD	DPI ENUM object instance offset

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of:	
			BOOL[32]	Descriptor (see page 202)
			CONTAINER [1]	Value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			WORD	Pad Word
			WORD	Pad Word
			STRING[4]	Units (for example, Amp, Hz)
			WORD	Multiplier [2]
			WORD	Divisor [2]
			WORD	Base [2]
			INT	Offset [2]
			DWORD	Link (source of the value) (0 = no link)
			STRING[16]	Diagnostic name text

Attribute ID	Access Rule	Name	Data Type	Description
1	Get/Set	Value	Various	Diagnostic item value
2	Get	International Diagnostic Item Text	STRUCT of: STRINGN STRINGN	 Diagnostic name text Diagnostic units text
3	Get	International Full Read All	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER WORD WORD WORD WORD WORD INT DWORD BOOL[32] STRINGN STRINGN	 Descriptor Value Minimum Maximum Default Pad Word Pad Word Multiplier Divisor Base Offset Pad Extended descriptor Diagnostic name text Diagnostic units text

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

(2) This value is used in the formulas used to convert the value between display units and internal units. See Formulas for Converting on page 204.

DPI Time Object

Class Code

Hexadecimal	Decimal
0x9B	155

Services

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

Instances

The number of instances depends on the number of timers in the device. Instance 1 is always reserved for a real-time clock although a device may not support it. The total number of timers can be read in Instance 0, Attribute 2.

Instances (Hex.)	(Dec.)	Device
0x0000…0x3FFF	0…16383	Host
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	DPI Port 1
0x4800…0x4BFF	18432…19455	DPI Port 2
0x4C00…0x4FFF	19456…20479	DPI Port 3
0x5000…0x53FF	20480…21503	DPI Port 4
0x5400…0x57FF	21504…22527	DPI Port 5
0x5800…0x5BFF	22528…23551	DPI Port 6

Example	Description
0	Class Attributes (Drive)
1	Real Time Clock (Predefined) (not always supported)
2	Timer 1
3	Timer 2
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	Revision of object
2	Get	Number of Instances	WORD	Number of timers in the object, excluding the real-time clock that is predefined.
3	Get	First Device Specific Timer	WORD	Instance of the first timer that is not predefined.
4	Set	Time Command Write	BYTE	0 = No Operation 1 = Clear all timers (Does not clear the real-time clock or read only timers)
5	Get	Number of Supported Time Zones	WORD	Number of time zones described in the Time Zone List attribute.
6	Get	Time Zone List	STRUCT	Identifies a time zone.
7	Get/Set	Active Time Zone ID	WORD	The ID field of the Time Zone List structure for the desired time zone.
8	Get	Active Time Zone Data	STRUCT of: INT BYTE BYTE BYTE BYTE BYTE BYTE INT BYTE BYTE BYTE BYTE BYTE BYTE	 Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second
9	Get/Set	Custom Time Zone Data	STRUCT of: INT BYTE BYTE BYTE BYTE BYTE BYTE INT BYTE BYTE BYTE BYTE BYTE BYTE	 Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Read Full	STRUCT of:	
			STRING[16]	Name of the timer
			LWORD or STRUCT	Elapsed time in milliseconds unless timer is a real-time clock (see attribute 2)
			BOOL[16]	See attribute 3
1	Get	Timer Text	STRING[16]	Name of the timer
2	Get/Set	Timer Value	LWORD -or-	Elapsed time in milliseconds unless the timer is a real-time clock.
			STRUCT of:	Real-Time Clock Data:
			WORD	Milliseconds (0…999)
			BYTE	Seconds (0…59)
			BYTE	Minutes (0…59)
			BYTE	Hours (0…23)
			BYTE	Days (1…31)
			BYTE	Months (1 = January, 12 = December)
			BYTE	Years (since 1972)
3	Get	Timer Descriptor	BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15]: Not used
4	Get	International Read Full	STRUCT of:	
			STRINGN	International timer text
			STRUCT	Timer value
			BOOL[16]	Timer descriptor
5	Get	International Timer Text	STRINGN	Name of this timer
6	Get	Clock Status	BOOL[32]	Identifies clock status
8	Get/Set	Number of Leap Seconds	INT	Identifies the current number of Leap Seconds.
9	Get	Clock Options	BOOL[32]	Identifies the optional functionality available in the device's System Clock.
10	Get/Set	Clock Options Enable	BOOL[32]	Identifies which of the clock's options are enabled.

TCP/IP Interface Object

Class Code

Hexadecimal	Decimal
0xF5	245

Services

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

Instances

Get_Attribute_All is supported for instances. The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	WORD	The revision of this object

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Status of TCP/IP Network Interface	DWORD	
2	Get	Configuration Capability	DWORD	0x000000F4
3	Get/Set	Configuration Control	DWORD	0 = Configuration from NVS 2 = Configuration from DHCP

4	Get	Physical Link Object	STRUCT of:
			  UINT
			    Padded EPATH
				
				2 words
				20 F6 24 01 (Enet Link Object instance 1)

5	Get/Set	Interface Configuration	STRUCT of:
			  UDINT
			  UDINT
			  UDINT
			  UDINT
			  UDINT
			  STRING
				
				IP Address
				Network Mask
				Gateway Address
				Primary DNS
				Secondary DNS
				Default Domain Name for not fully qualified host names

6	Get/Set	Host Name	STRING	Host name when using DHCP
8	Get/Set	TTL Value	USINT	Time to Live value for EtherNet/IP multicast packets

9	Get/Set	Multicast Config	Struct of:
			  USINT
			  USINT
			  UINT
			  UDINT
				
				Allocation Control
				Reserved
				Number of multicast addresses to allocate (1-4)
				Multicast starting address.

10	Get/Set	SelectAcd	BOOL	Activates the use of ACD

11		LastConflictDetected	Struct of:
			  USINT
			  USINT[6]
			  USINT[28]
				
				AcdActivity
				RemoteMAC
				ArpPdu

Ethernet Link Object

Class Code

Hexadecimal	Decimal
0xF6	246

Services

The following common services will be implemented for the Ethernet Link Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4C	No	Yes	Get_and_Clear

Instances

The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes Ethernet Port 1
2	Object Attributes Ethernet Port 2

Class Attributes

The following class attributes will be supported.

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	3
2	Get	Max. Instance	UINT	2
3	Get	Number of Instances	UINT	2

Instance Attributes

Two instances of the Ethernet Link Object will be supported.

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Interface Speed	UDINT	10 or 100 megabits per second (Mbs)
2	Get	Interface Flags	DWORD	See EtherNet/IP specifications
3	Get	Physical Address	Array of 6 USINTs	MAC address
4	Get	Interface Counters	STRUCT of:	
			UDINT	In Octets
			UDINT	In Ucast packets
			UDINT	In NUcast packets
			UDINT	In Discards
			UDINT	In Errors
			UDINT	In Unknown Protos
			UDINT	Out Octets
			UDINT	Out Ucast packets
			UDINT	Out NUcast packets
			UDINT	Out Discards
			UDINT	Out Errors

Attribute ID	Access Rule	Name	Data Type	Description
5	Get	Media Counters	STRUCT of: DWORD DWORD DWORD DWORD DWORD DWORD DWORD DWORD DWORD DWORD DWORD DWORD	RX = Received, TX = Transmitted RX frames not having integral number of octets long RX frames not passing FCS check TX frames having one collision TX frames having multiple collisions Number of times of SQE test error message TX Frames delayed first attempt by busy medium Collisions detected later than 512 bit-times in trans. TX frames failing due to excessive collisions TX frames failing due to intern MAC sublayer TX error Times of carrier sense condition loss during trans. RX frames exceeding the maximum frame size RX frames failing due to intern MAC sublayer RX error
6	Get/Set	Interface Control	Struct of: WORD UINT	Struct of: Control Bits Forced Interface Speed
7	Get	Interface Type	USINT	2 = Twisted-pair (e.g., 10Base-T, 100Base-TX, 1000Base-T, etc.)
8	Get	Interface State	USINT	0 = Unknown interface state 1 = The interface is enabled and is ready to send and receive data 2 = The interface is disabled 3 = The interface is testing
9	Get/Set	Admin State	USINT	1 = Enable the interface (default) 2 = Disable the interface.
10	Get	Interface Label	SHORT_STRING	Instance 1: LS 1 Instance 2: LS 2

Logic Command/Status Words

This appendix 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 70/70EC, PowerFlex 700/700VC, and PowerFlex 700H Drives

Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	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																Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															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)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start [1]	0 = Not Start 1 = Start
													x			Jog 1	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	

Speed Reference Selection table:

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)

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.

SMC Flex Controllers
SMC-50 Controllers

Logic Status Word

| | | | | | | | | | Bit # | | | | | | | Status | Description |
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															X	Enabled	1 — Control Power Applied 0 — No Control Power
														X		Running	1 — Power Applied to Motor 0 — Power **not** Applied to Motor
													X			Phasing	1 — ABC Phasing 0 — CBA Phasing
												X				Phasing Active	1 — 3-phase is valid 0 — No valid 3-phase detected
											X					Starting (Accel)	1 — Performing a Start Maneuver 0 — Not Performing a Start Maneuver
										X						Stopping (Decel)	1 — Performing a Stop Maneuver 0 — Not Performing a Stop Maneuver
									X							Alarm	1 — Alarm Present 0 — No Alarm Present
								X								Fault	1 — Fault Condition Exists 0 — No Fault Condition
							X									At Speed	1 — Full Voltage Applied 0 — Not Full Voltage Applied
						X										Start/Isolation	1 — Start/Isolation Contactor Enabled 0 — Start/Isolation Contactor Disabled
					X											Bypass	1 — External Bypass Contactor Enabled 0 — External Bypass Contactor Disabled
				X												Ready	1 — Ready 0 — Not Ready
			X													Option 1 Input	1 — Input Active 0 — Input Inactive
		X														Option 2 Input	1 — Input Active 0 — Input Inactive
—																—	Bits 14 and 15 — Not Used

Logic Command Word (Control)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Status	Description
															X	Stop	1 — Stop/Inhibit 0 — No Action
														X		Start	1 — Start 0 — No Action
													X			Option #1 Input	1 — Stop Maneuver/Inhibit 0 — No Action
												X				Clear Faults	1 — Clear Faults 0 — No Action
											X					Option #2 Input	1 — Perform Option 2 function 0 — No Action
—																—	Bits 5…10 — Not Used
				X												Aux Enable	1 — Use Aux 1…Aux 4 0 — Ignore Aux 1…Aux 4
		X														Aux 1	1 — Aux 1 Active 0 — Aux 1 Inactive
	X															Aux 2	1 — Aux 2 Active 0 — Aux 2 Inactive
X																Aux 3	1 — Aux 3 Active 0 — Aux 3 Inactive
X																Aux 4	1 — Aux 4 Active 0 — Aux 4 Inactive

A   **Adapter**

Devices such as drives, controllers, and computers usually require a network communication adapter to provide a communication interface between them and a network such as EtherNet/IP. 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-ER EtherNet/IP adapter connects PowerFlex 7-Class drives and SMC controllers to an EtherNet/IP network. Adapters are sometimes also called 'cards', 'embedded communication options', 'gateways', 'modules', or 'peripherals'.

B   **BOOTP (Bootstrap Protocol)**

BOOTP lets the adapter configure itself dynamically at restart 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 with the parameters in the adapter. BOOTP can make it easier to administer an Ethernet network. A **free version** of the Rockwell Software® BOOTP Server can be obtained at http://www.software.rockwell.com/support/download/detail.cfm?ID=3390.

Bridge

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

C   **CIP (Common Industrial Protocol)**

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

Connected Components Workbench Software

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

ControlFLASH

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

updated is downloaded from the Allen-Bradley updates website to your computer.

Controller

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

D ### Data Rate

The speed at which data is transferred on the EtherNet/IP 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 and SMC controllers 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 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.

Device Level Ring (DLR)

A protocol that allows multiported EtherNet device to be connected in a ring topology, enabling broken ring connection detection and network reconfirmation to linear topology.

DLR Announce Frame

Data frame sent by the ring supervisor in a ring network to announce transition from linear to ring or ring to linear configuration.

DLR Beacon Frame

Data frame sent by the ring supervisor in a ring network used to lost connections that break the ring.

DLR Ring Supervisor

A node that sends beacon and announce frames on a ring network to monitor and maintain connectivity by re-configuring the ring while nodes are disconnected or reconnected.

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 and SMC controllers. 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-ER 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 network communication adapters. It can be used on computers running various Microsoft Windows operating systems. DriveExplorer software, version 3.xx or later, can be used to configure this adapter and PowerFlex drives. This software tool has been discontinued and is now available as **freeware** at http://www.ab.com/support/abdrives/webupdate/software.html. There are no plans to provide future updates to this tool and the download is being provided 'as-is' for users that lost their DriveExplorer CD, or need to configure legacy products not supported by Connected Components Workbench software.

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 software (version 3.01 or later), that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. DriveTools SP software can be used with PowerFlex 7-Class and PowerFlex 4-Class drives, and legacy drives that implement the SCANport communication interface. Information about DriveTools SP software can be accessed at http://www.ab.com/drives/drivetools.

Duplex

Duplex describes the mode of communication. 'Full-duplex' communication lets a device exchange data in both directions at the same time. 'Half-duplex' communication lets 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.

EtherNet/IP Network

EtherNet/IP (Industrial Protocol) is an open producer-consumer communication network based on the Ethernet standard (IEEE 802.3), TCP/IP, UDP/IP, and CIP. Designed for industrial communication, both I/O and explicit messages can be transmitted over the network. Each device is assigned a unique IP address and transmits data on the network. The number of devices that an EtherNet/IP network can support depends on the class of IP address. For example, a network with a Class C IP address can have 254 nodes.

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

Explicit Messaging

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

F   Fault Action

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

Fault Configuration

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

configuration data and a fault occurs, the data from these parameters is sent as the Logic Command, Reference, and/or Datalinks.

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 server.

HIM (Human Interface Module)

A device that can be used to configure and control a drive. PowerFlex 7-Class HIMs (catalog number 20-HIM-xx) 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 Idle Action

An idle action determines how the adapter and connected drive act when the controller is switched out of run mode.

I/O Data

I/O data, sometimes called 'implicit messages' or 'input/output', is time-critical data such as a Logic Command and Reference. The terms 'input' 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 EtherNet/IP 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.

```
          0 1             7           15          23          31
Class A   |0|Network ID    |Host ID                              |

          0 1             7           15          23          31
Class B   |1|0|Network ID               |Host ID                 |

          0 1 2           7           15          23          31
Class C   |1|1|0|Network ID                        |Host ID      |
```
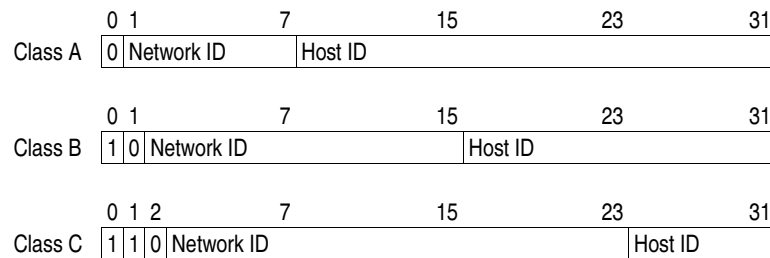
The number of devices on your EtherNet/IP network will vary depending on the number of bytes that are used for the network address. In many cases you are given a network with a Class C address, in which the first three bytes contain the network address (subnet mask = 255.255.255.0). This leaves 8 bits 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 powerup.

L   **Logic Command/Logic Status**

The Logic Command is used to control the PowerFlex 7-Class drive (for example, start, stop, and 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 <u>Appendix D</u>.

The Logic Status is used to monitor the PowerFlex 7-Class drive (for example, operating state and 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 <u>Appendix D</u>.

M **Master-Slave Hierarchy**

An adapter configured for a master-slave hierarchy exchanges data with the master device. Usually, a network has one scanner which is the master device, and all other devices (for example, drives connected to EtherNet/IP adapters) are slave devices.

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

N **NVS (Nonvolatile 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 software) also use PCCC to communicate.

Peer-to-Peer Hierarchy

An adapter that is configured for a peer-to-peer hierarchy can exchange data with a device on the network that is not a scanner. This type of hierarchy can be set up so that a scanner configures or transmits data to one PowerFlex 7-Class drive which then sends the same configuration or data to other PowerFlex 7-Class drives on the network. To use a peer-to-peer hierarchy, you configure one adapter to transmit data (2 or 4 words) and one or more adapters to receive the data.

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/IP, 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, at the time of publication, includes the PowerFlex 70, PowerFlex 700, PowerFlex 700H, PowerFlex 700S, PowerFlex 700L, and PowerFlex 7000 drives.

R **Reference/Feedback**

The Reference is used to send a setpoint (for example, speed, frequency, and 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.

RSLogix 5/500/5000 Software

RSLogix software is a tool for configuring and monitoring controllers to communicate with connected devices. It is a 32-bit application that runs on various Windows operating systems. Information about RSLogix software can be found at http://www.software.rockwell.com/rslogix.

S   Scanner

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

Status Indicators

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

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)**

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

U **UDP (User Datagram Protocol)**

EtherNet/IP uses this protocol to transfer I/O packets using IP. UDP provides a simple, but fast capability to send I/O messaging packets between devices. This protocol verifies that adapters transmit the most recent data because it does not use acknowledgements or retries.

UDDT (User-Defined Data Type)

A structure data type that you define during the development of an application (for example, to convert 32-bit REAL parameter data for written and read values to correctly display them in human readable format).

Update

The process of updating firmware in a device. The adapter and its connected PowerFlex 7-Class host drive and its peripherals can be updated using various Allen-Bradley software tools. See for more information.

Z **Zero Data**

When communication is 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.

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