User Manual

Allen-Bradley

PowerFlex 20-COMM-R Remote I/O Adapter

FRN 1.xxx

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.
	**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 consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The information below summarizes the changes made to this manual since its last release (March 2002).

Description of Changes	Page
Reformatted document from half size (5.5 x 8.5 in.) to full size (8.5 x 11 in.)	Throughout manual
Added information about Connected Components Workbench software configuration tool for drives and connected peripherals.	
Revised the 'DPI Ports and Internal Interface Cables' figure, and the 'Mounting and Grounding the Adapter' figure to show PowerFlex 700H/S Frames 9 and larger.	2-5 and 2-6
In the 'Applying Power' section in Chapter 2, added new subsections 'Start-Up Status Indications' and 'Configuring and Verifying Key Drive Parameters'.	2-8 and 2-10
In Chapter 3, added new section 'Updating the Adapter Firmware'.	3-10
In the subsection 'Reference/Feedback in Discrete I/O Image' in Chapter 4, added the following new sub-subsections: • 'PowerFlex 70/700/700H, and PowerFlex 700L Drives with 700 Control' • 'PowerFlex 700S and PowerFlex 700L Drives with 700S Control' • 'PowerFlex 753/755 Drives' • 'PowerFlex Digital DC Drives'	 4-5 4-6 4-6 4-6
In the section 'Block Transfer I/O Image' in Chapter 4, added the new subsection 'Datalink Scaling'.	4-9
Revised Appendix D to include the following new sections: • 'PowerFlex 70/700/700H, and 700L (with 700 Control) Drives'. • 'PowerFlex 700S (Phase II Control) and 700L (with 700S Control) Drives'. • 'PowerFlex 750-Series Drives'. • 'PowerFlex Digital DC Drives'.	 D-1 D-3 D-5 D-7

Table of Contents

About This Manual

This manual provides information about the adapter and using it with PowerFlex 7-Class (Architecture-Class) drives. The adapter can be used with other products that support a DPI™ adapter. 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.

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 throughout 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:

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

Technical Product Assistance

For technical assistance, please review the information in Chapter 6, 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
PowerFlex 7-Class DPI (Drive Peripheral Interface) Network Communication Adapter Installation Instructions, publication 20COMM-IN004	Information on installing PowerFlex® 20-COMM-x Network Communication Adapters.
Connected Components Workbench website http://www.ab.com/support/abdrives/webupdate/software.html, and online help (1)	Information on the Connected Components Workbench software tool—and includes a link for **free** software download.
DriveExplorer website http://www.ab.com/drives/driveexplorer, and online help (1)	Information on using the DriveExplorer™ software tool.
DriveExecutive website http://www.ab.com/drives/drivetools, and online help (1)	Information on using the DriveExecutive™ software tool.
PowerFlex 20-HIM-A3/-A5/-C3S/-C5S HIM Quick Reference, publication 20HIM-QR001	Information on using 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 installing and using 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 70 Enhanced Control and 700 Vector Control Reference Manual, publication PFLEX-RM004	Information on installing and programming PowerFlex 70 standard control and enhanced control 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 70 Enhanced Control and 700 Vector Control Reference Manual, publication PFLEX-RM004	Information on installing and programming PowerFlex 700 standard control and vector control Series A drives, and PowerFlex 700 vector control Series B drives.
PowerFlex 700H Installation Instructions, publication PFLEX-IN006 PowerFlex 700H Programming Manual, publication 20C-PM001	Information on installing and programming 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 and programming PowerFlex 700S drives.
PowerFlex 700L User Manual, publication 20L-UM001	Information on installing and programming PowerFlex 700L Liquid-Cooled AC drives.
PowerFlex 750-Series Drive Installation Instructions, publication 750-IN001 PowerFlex 750-Series Drive Programming Manual, publication 750-PM001 20-750-20COMM and 20-750COMM-F1 Communication Carrier Cards Installation Instructions, publication 750COM-IN001	Information on installing and programming PowerFlex 750-Series AC drives.
PowerFlex Digital DC Drive User Manual, publication 20P-UM001	Information on installing and programming PowerFlex Digital DC drives.
Getting Results with RSLinx Guide, publication LINX-GR001, and online help (1)	Information on using RSLinx® Classic software.
RSLogix Emulate 5/500 Getting Results Guide, publication EMULAT-GR002, and online help (1)	Information on installing and navigating 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 the RSLogix™ 500 software tool.
RSLogix 5000 PIDE Autotuner Getting Results Guide, publication PIDE-GR001, and online help (1)	Information on using the RSLogix™ 5000 software tool.

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

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

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

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

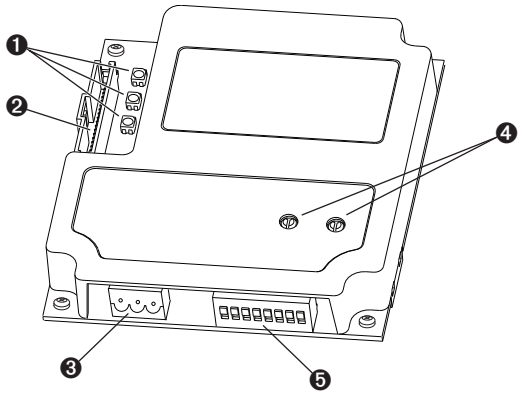
Notes:

Getting Started

The adapter is intended for installation into a PowerFlex 7-Class drive and is used for network communication.

When used with PowerFlex 750-Series drives, the 20-COMM-R adapter must have firmware revision 1.010 or later, and must be installed using the 20-750-20COMM or 20-750-20COMM-F1 Communication Carrier Card. This manual does include some information on using the 20-COMM-R adapter with PowerFlex 750-Series drives—but there are operating limitations. For details, see Compatible Products on page 1-3.

Components



Item	Part	Description
1	Status Indicators	Three status indicators that indicate the status of the DPI, adapter, and network connection. See Chapter 6, Troubleshooting.
2	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
3	Remote I/O Connector	A standard 3-pin connector to connect to the network.
4	Rack Address Rotary Switches	Switches to set the rack address. See Setting the Rack Address Rotary Switches on page 2-2.
5	Configuration DIP Switches	Switches to set the starting module group, last rack, rack size, and baud rate. See Setting the Configuration DIP Switches on page 2-3.

Features

The features of the adapter include the following:

- Typical mounting in a PowerFlex 7-Class drive.
- 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, 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
- Rotary switches to set a rack address before applying power to the PowerFlex drive. Or, you can disable the switches and use an adapter parameter to set the rack address.
- DIP switches to configure the adapter for starting module group, last/not last RIO group within the rack, 1/4 or 1/2 rack, and baud rate. Or, you can disable the switches and use adapter parameters to configure 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. The adapter can be configured to use a 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words) of discrete I/O. Additionally, up to eighteen 16-bit words of I/O can be transferred using the Block Transfer I/O image without increasing the size of the discrete I/O rack. See Chapter 4, Using Discrete and Block Transfer I/O for more information.
- Block Transfer Messaging support.
- 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)
- Access to any PowerFlex drive and its connected peripherals on the network to which the adapter is connected.

Compatible Products

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

• PowerFlex 70 drives with standard or enhanced control	• PowerFlex 750-Series drives [1]
• PowerFlex 700 drives with standard or vector control	• PowerFlex Digital DC drives
• PowerFlex 700H drives	• SMC™ Flex smart motor controllers
• PowerFlex 700S drives with Phase I or Phase II control	• SMC-50 smart motor controllers
• PowerFlex 700L drives with 700 vector control or 700S control	

[1] The 20-COMM-R adapter can be used with PowerFlex 750-Series drives, but the adapter must have firmware revision 1.01 or later. Also, the adapter has the following limitations and differences:

- Only the first 16 bits of the Logic Command and Logic Status words are used.
- Only drive Ports 0…6 are supported.
- Controller must be capable of reading/writing 32-bit floating point (REAL) values.
- Speed Reference/Feedback scaling are Hz (or RPM) x 1000 (depending on the setting of drive parameter 300 - [Speed Units].

See the PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001, for drive parameter information.

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-R 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 Figure 2.3 on page 2-5)
- ❑ One 3-pin Remote I/O plug (connected to the Remote I/O connector on the adapter)
- ❑ Two termination resistors (one 82 ohm and one 150 ohm resistor)
- ❑ One PowerFlex 7-Class DPI (Drive Peripheral Interface) Network Communication Adapter Installation Instructions, publication 20COMM-IN004

TIP: When mounting the 20-COMM-R adapter in a PowerFlex 750-Series drive, you must use a 20-750-20COMM or 20-750-20COMM-F1 Communication Carrier Card, publication 750COM-IN001—and the 20-COMM-R adapter must have firmware revision 1.010 or later.

User-Supplied Equipment

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

- ❑ A small flathead screwdriver
- ❑ Remote I/O cable
- ❑ Drive and adapter 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.
- ❑ Controller configuration tool, such as RSLogix 5, RSLogix 500, or RSLogix 5000 software
- ❑ A computer connection to the Remote I/O network by way of a 1203-USB serial converter

Safety Precautions

Please read the following safety precautions carefully.

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

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

ATTENTION: Risk of equipment damage exists. The adapter contains 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. DPI or SCANport host products must not be directly connected together using 1202 cables. Unpredictable behavior due to timing and other internal procedures can result if two or more devices are connected this way.

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 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if I/O communication is disrupted or the controller is idle. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run, however, precautions should be taken to verify 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 faulted controller).

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

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

Quick Start

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

Step	Action	See
1	Review the safety precautions for the adapter.	Throughout this manual
2	Verify that the PowerFlex drive is properly installed.	Drive User Manual
3	Commission the adapter. a. With power removed, use the adapter Rack Address Rotary Switches to set a unique rack address on the network. b. Use the Configuration DIP Switches to set the following: • Starting remote I/O module group (SW1 and SW2) • Last rack (SW3) • Rack size (SW4) • Remote I/O baud rate (SW7 and SW8) **NOTE:** If desired, the Rack Address Rotary Switches and Configuration DIP Switches can be disabled so that adapter parameters can be used instead to set these items. To disable all hardware switch settings, set Configuration DIP Switches SW7 and SW8 both to the 'On' position. Then configure the appropriate adapter parameters after applying power to the adapter.	Chapter 2, Installing the Adapter
4	Install the adapter. a. Verify that the PowerFlex drive is not powered. b. Connect the adapter to the drive with the Internal Interface cable. c. Use the captive screws to secure and ground the adapter to the drive. d. Connect the adapter to the network with a Remote I/O cable. **NOTE:** When installing the adapter in a PowerFlex 750-Series drive, see the 20-750-20COMM and 20-750-20COMM-F1 Communication Carrier Cards Installation Instructions, publication 750COM-IN001, supplied with the card.	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. The adapter receives power from the drive. b. Apply power to the drive. The status indicators should be green. If they flash red, there is a problem. See Chapter 6, Troubleshooting. c. Configure and verify key drive 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: • Rack address, starting module group, last rack, rack size, and baud rate (only when Configuration DIP Switches SW7 and SW8 are both disabled—set to 'On') • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
7	Create a ladder logic program. Use a controller configuration tool such as RSLogix software to create a ladder logic program that lets you to do the following: • Control the connected drive, by way of the adapter, by using Discrete I/O and Block Transfer I/O. • Monitor or configure the drive using Block Transfer Explicit messages.	Chapter 4, Using Discrete and Block Transfer I/O Chapter 5, Using Block Transfer Messaging Chapter 6, Troubleshooting

Installing the Adapter

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

Preparing for an Installation

Before installing the adapter, verify that you have all required equipment. See Required Equipment on page 1-3.

Selecting Remote I/O Cables

Remote I/O adapters are connected to the Remote I/O network or link with twinaxial cable used for Remote I/O and Data Highway Plus (DH+) communications. When selecting a cable, remember these points:

- Only 1770-CD Belden #9463 is tested and approved for Remote I/O and DH+ installations. Use other cables at your own risk.
- The maximum cable length depends on the baud rate.

Baud Rate	Maximum Cable Length
57.6 Kbps	3,048 m (10,000 ft)
115.2 Kbps	1,524 m (5,000 ft)
230.4 Kbps	762 m (2,500 ft)

- All three connectors (blue, shield, and clear) must be connected at each node.
- Do not use a star topology. Only two cables may be connected at any wiring point. You can use a series topology and daisy-chain two wires at a point.

Commissioning the Adapter

To commission the adapter, set the Rack Address Rotary Switches and the Configuration DIP Switches. Either set these switches to the desired settings or disable them by sliding Configuration DIP Switches SW7 and SW8 to the 'On' position so that adapter parameters can be used instead.

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

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.

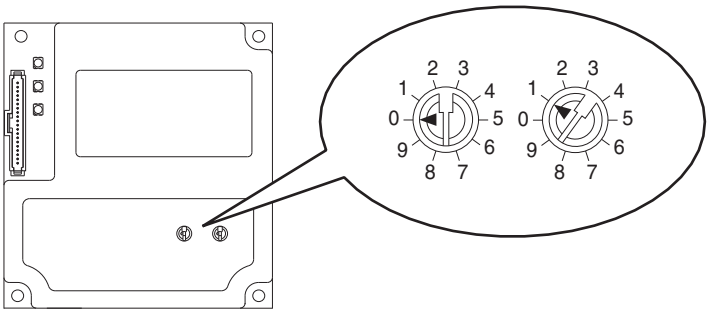
ATTENTION: Risk of equipment damage exists. Pen ink or pencil lead may damage the adapter switches. Do not use a pen or pencil to set the switches.

Setting the Rack Address Rotary Switches

The adapter accepts a rack address between 00 and 77 octal. The default setting is 01. See Table 3.A on page 3-3 to determine the decimal equivalent of the octal address to be used. Set the Rack Address Rotary Switches (Figure 2.1) to the octal address. The address is entered and displayed as an octal value, but is internally converted to a decimal address. Each Remote I/O device must have a unique rack address that the controller can recognize. Note the following points:

- Although the adapter supports rack addresses up to 77 octal, not all controllers recognize all of the addresses, and a Remote I/O channel can support only 32 devices.
- If Configuration DIP Switches SW7 and SW8 are both set to 'On', the adapter uses the decimal rack address set in **Parameter 3 - [RIO Addr Cfg]**. See Setting the Rack Address on page 3-3.
- PLC-2 controllers identify rack addresses differently than other controllers. PLC-2 controllers identify the adapter rack address as one plus the value of the switch settings.

Figure 2.1 Setting the Rack Address Rotary Switches (Octal)

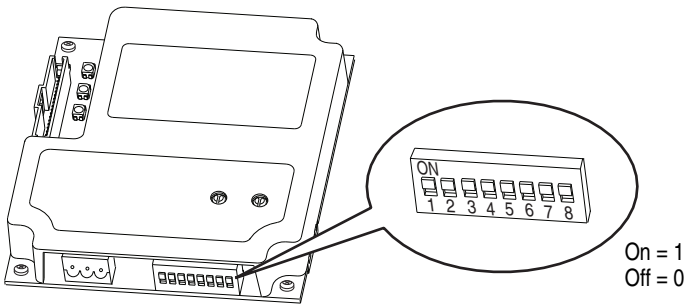


The Rack Address Rotary Switch settings can be verified (as a decimal value) by viewing Diagnostic Device Item number 29 (page 6-4).

Setting the Configuration DIP Switches

Set the Configuration DIP Switches (Figure 2.2) to match your application specifics for the controller and network.

Figure 2.2 Setting the Configuration DIP Switches



Switches	Setting		Description
SW1 and SW2	1	2	SW1 and SW2 are used together to set the starting module group:
	0	0	Group 0 (Default)
	1	0	Group 2
	0	1	Group 4
	1	1	Group 6 – Only used if SW4 is set to “0” (1/4 rack).
SW3	0		Not the last RIO rack (Default)
	1		Last RIO group within the rack
SW4	0		1/4 rack (Default)
	1		1/2 rack
SW5	0		Not Used
SW6	0		Not Used
SW7 and SW8	7	8	SW7 and SW8 are used together to set the Remote I/O baud rate:
	0	0	57.6 kbps (Default)
	1	0	115.2 kbps
	0	1	230.4 kbps
	1	1	Disables all hardware switches. Instead, the adapter uses the values of the following parameters: • **Parameter 3 - [RIO Addr Cfg]** for the rack address • **Parameter 5 - [RIO Rate Cfg]** for the baud rate • **Parameter 25 - [Start RIO Group]** for the starting module group • **Parameter 26 - [Last RIO Rack]** for the last physical rack • **Parameter 27 - [Rack Size]** for the rack size

The Configuration DIP Switches SW7 and SW8 settings can be verified by viewing **Parameter 24 - [Switches]** with any of the following drive configuration tools:

- PowerFlex HIM
- Connected Components Workbench software, version 1.02 or later
- Drive Explorer software, version 2.01 or later
- DriveExecutive software, version 3.01 or later

The settings for all of the Configuration DIP Switches can be verified by viewing Diagnostic Item number 28 (page 6-4).

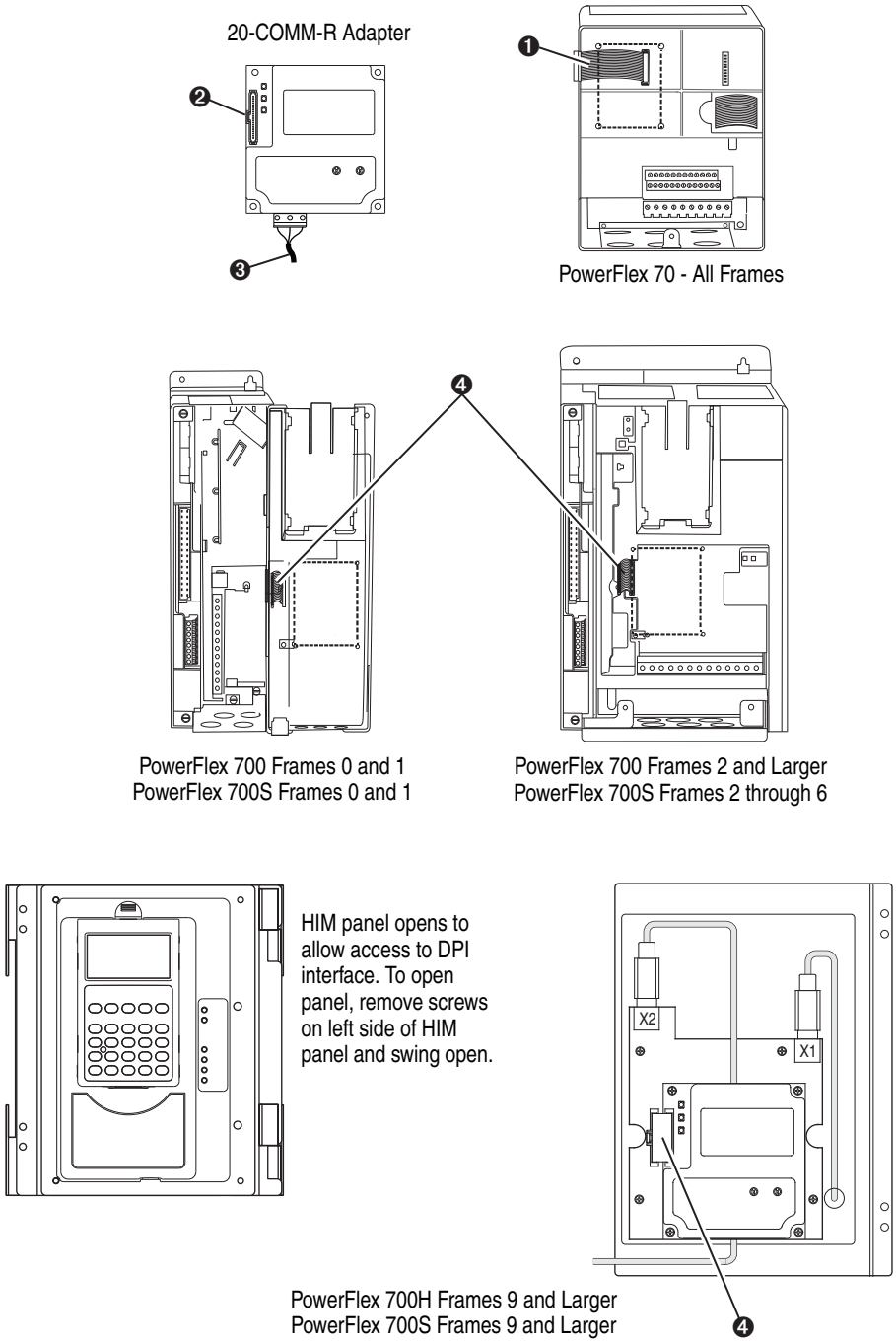
Connecting the Adapter to the Drive

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

1. Remove power from the drive.
2. Use static control precautions.
3. Remove or open the drive cover.
4. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the adapter (see Figure 2.3).
5. Secure and ground the adapter to the drive (see Figure 2.4) 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 a PowerFlex 700, PowerFlex 700H, or PowerFlex 700S drive, mount the adapter on the drive using the four captive screws.

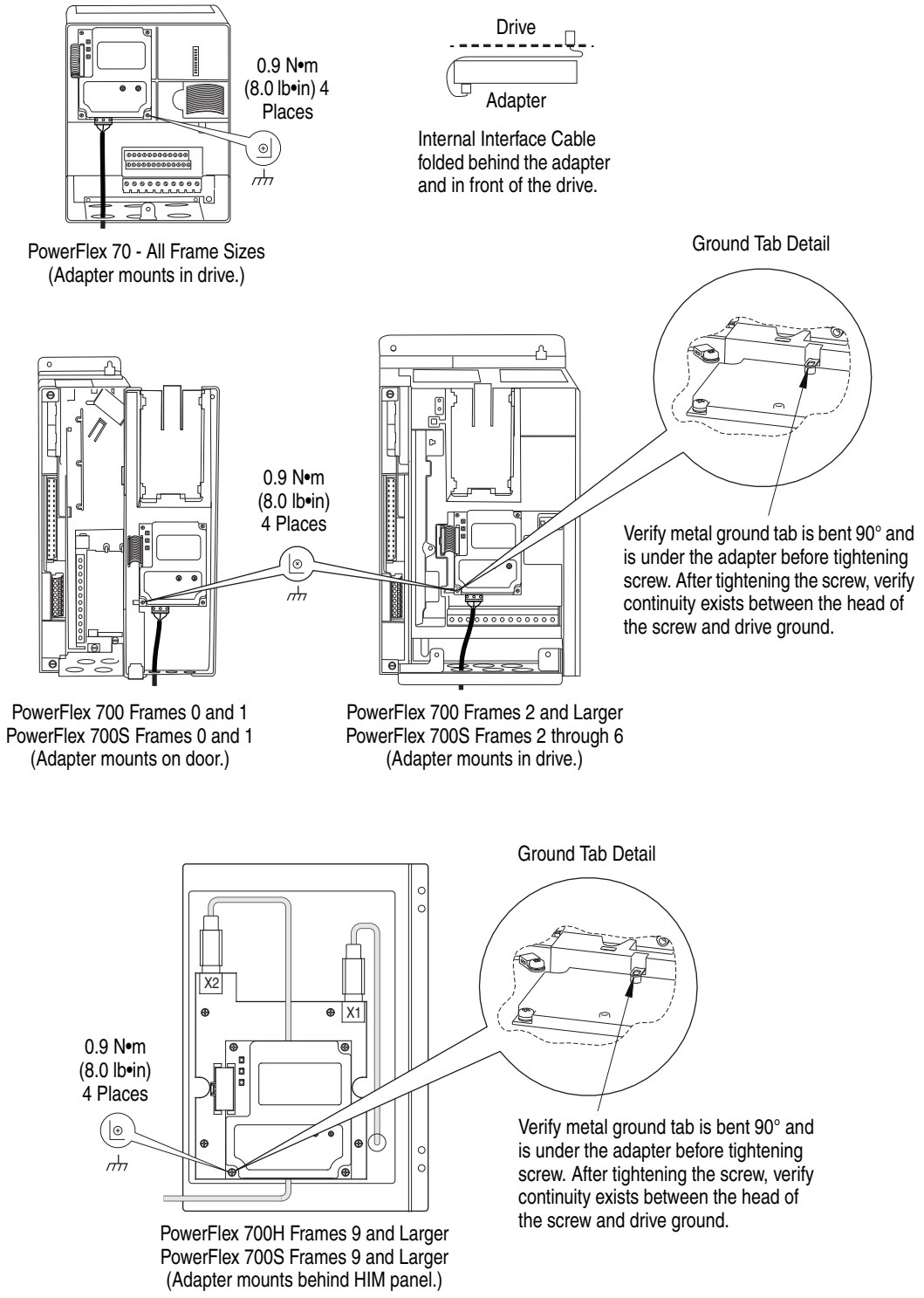
   Important: Tighten all screws to properly ground the adapter. Recommended torque is 0.9 N•m (8.0 lb•in).

Figure 2.3 DPI Ports and Internal Interface Cables



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

Figure 2.4 Mounting and Grounding the Adapter



NOTE: When installing the adapter in a PowerFlex 750-Series drive, see the 20-750-20COMM and 20-750-20COMM-F1 Communication Carrier Card Installation Instructions, publication 750COM-IN001, supplied with the card.

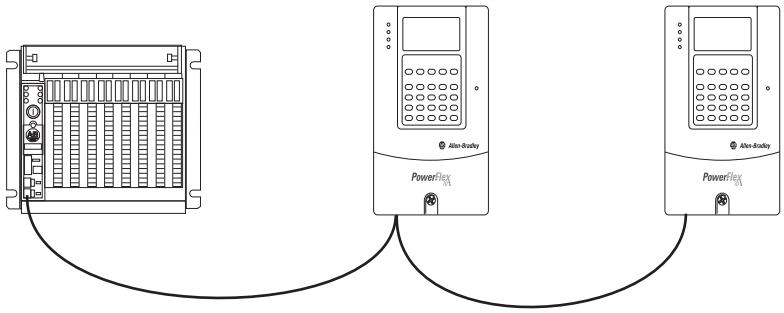
Connecting the Adapter to the Network

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 a Remote I/O cable to the controller or create a daisy-chain from another device on the Remote I/O network (see Figure 2.5).

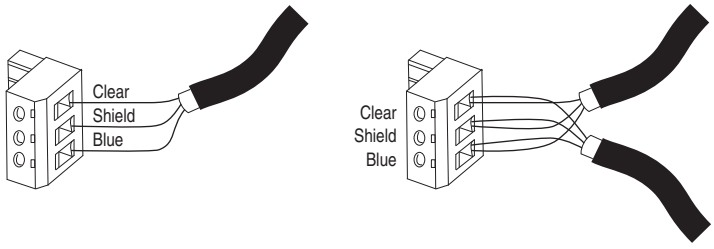
   Important: Maximum cable length depends on the Remote I/O baud rate. See Selecting Remote I/O Cables on page 2-1 for details.

Figure 2.5 Connecting a Remote I/O Cable to the Network



4. Route the other end of the Remote I/O cable through the bottom of the drive (Figure 2.4).
5. Connect a 3-pin Remote I/O plug to the cable.

Figure 2.6 Connecting a 3-Pin Remote I/O Plug to the Cable



6. If the adapter is at the end of the Remote I/O link, connect a termination resistor (see Figure 2.7).

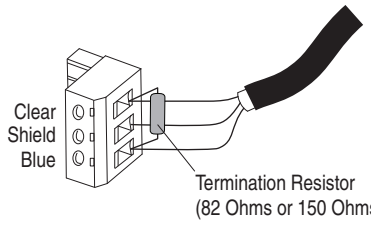
   The resistor should have a value of 82 or 150 ohms (82 ohms is preferred).

   Important: If the Remote I/O network is operating at 230.4 Kbps, an 82 ohm termination resistor must be used.

   Important: If any of the following products, which cannot operate at 230.4 Kbps, are on the Remote I/O network, a 150 ohm termination resistor must be used.

   - 1771-SN scanner
   - 1772-SD scanner
   - 1772-SD2 scanner
   - 1772-SR scanner
   - 1775-S4A scanner
   - 1775-S4B scanner
   - 6008-SQH1 scanner
   - 6008-SQH scanner
   - 1771-AS adapter
   - 1772-ASB (Ser. A) adapter
   - 1771-DCM adapter
   - 1771-AF device

Figure 2.7 Connecting a Termination Resistor (if required)



7. Connect the Remote I/O cable plug to the adapter's mating connector.

Applying Power

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

Install the drive cover or close the drive door, and apply power to the drive. The adapter receives its power from the connected drive. When you apply power to the adapter for the first time, its topmost 'PORT' status indicator should be steady green or flashing green after an initialization. If it is red, there is a problem. See Chapter 6, Troubleshooting.

Start-Up Status Indications

Status indicators for the drive and communication adapter can be viewed on the front of the drive (Figure 2.8) after power has been applied. Possible start-up status indications are shown in Table 2.A.

Figure 2.8 Drive and Adapter Status Indicators (location on drive may vary)

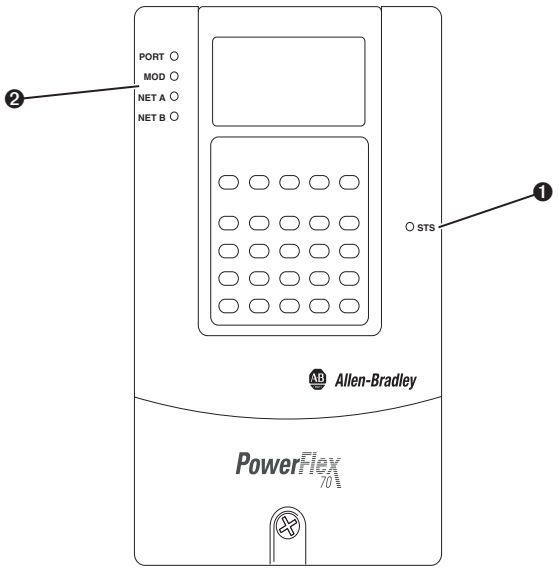


Table 2.A Drive and Adapter Start-Up Status Indications

Item	Name	Color	State	Description
Drive STS Indicator				
❶	STS (Status)	Green	Flashing	Drive ready but not running, and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow	Flashing, drive stopped	An inhibit condition exists – the drive cannot be started. Check drive Parameter 214 - [Start Inhibits].
			Flashing, drive running	An intermittent type 1 alarm condition is occurring. Check drive Parameter 211 - [Drive Alarm 1].
			Steady, drive running	A continuous type 1 alarm condition exists. Check drive Parameter 211 - [Drive Alarm 1].
		Red	Flashing	A fault has occurred.
			Steady	A non-resettable fault has occurred.
Adapter Status Indicators				
❷	PORT	Green	Flashing	Normal operation. The adapter is establishing an I/O connection to the drive. It will turn steady green or red.
			Steady	Normal operation. The adapter is properly connected and communicating with the drive.
	MOD	Green	Flashing	Normal operation. The adapter is operating but is not transferring I/O data to a controller.
			Steady	Normal operation. The adapter is operating and transferring I/O data to a controller.
	NET A	Green	Flashing	The adapter is properly connected, but the controller is resetting, in test mode, in program mode, or not properly configured to communicate with the adapter.
			Steady	Normal operation. The adapter is properly connected and communicating on the network.
	NET B	—	—	Not used by Remote I/O adapter.

For more details on status indicator operation, see page 6-2 and page 6-3.

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.

TIP: For PowerFlex 750-Series drives, use drive Parameter 545 - [Speed Ref A Sel] to set the drive speed Reference:

   a. Set the Port field to ‘Port 0 - PowerFlex 75x’.
   b. Set the Parameter field to point to the port in which the 20-COMM-R adapter/20-750-20COMM Communication Carrier Card are installed (for example, ‘876 - Port 6 Reference’).

      The number ‘876’ in the Parameter field of the example is the parameter in the drive that points to the port.

Configuring the Adapter

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

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

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 3-2
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)
DriveExplorer software, version 2.01 or later	http://www.ab.com/drives/driveexplorer, or DriveExplorer online help (installed with the software)
DriveExecutive software, version 3.01 or later	http://www.ab.com/drives/drivetools, or DriveExecutive online help (installed with the software)

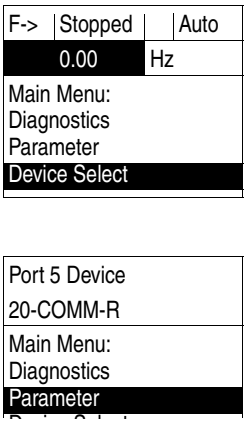
Using the PowerFlex 7-Class HIM to Access Parameters

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. We recommend 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. 3. Press the ↵ (Enter) key to enter your selection. A parameter database is constructed, and then the first parameter is displayed. 4. Edit the parameters using the same techniques that you use to edit drive parameters.	

Using an LCD HIM

Step	Example Screens
1. In the main menu, press the ▲ or ▼ key to scroll to **Device Select**. 2. Press the ↵ (Enter) key to enter your selection. 3. Press the ▲ or ▼ key to scroll to the adapter (20-COMM-R). 4. Press the ↵ (Enter) key to select the adapter. A parameter database is constructed, and then the main menu for the adapter is displayed. 5. Edit the parameters using the same techniques that you use to edit drive parameters.	

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

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

Setting the Rack Address

If adapter Configuration DIP Switches SW7 and SW8 (Figure 2.2) are both set to 'On', the value of **Parameter 03 - [RIO Addr Cfg]** determines the rack address. Note these points:

- Although the adapter supports rack addresses between 00 and 77 octal, not all controllers recognize all of the addresses, and a Remote I/O channel can support only 32 devices.
- PLC-2 controllers identify rack addresses differently than other controllers. PLC-2 controllers identify the adapter rack address as one plus the value of the parameter setting.

1. See Table 3.A to determine the decimal equivalent of the octal address to be used.

   The rack address must be unique.

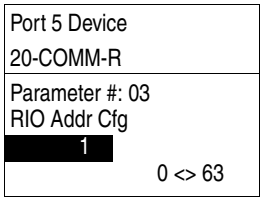
Table 3.A Rack Addresses (Decimal Equivalent versus Octal)

Decimal	Octal	Decimal	Octal	Decimal	Octal	Decimal	Octal
0	0	16	20	32	40	48	60
1	1 (Default)	17	21	33	41	49	61
2	2	18	22	34	42	50	62
3	3	19	23	35	43	51	63
4	4	20	24	36	44	52	64
5	5	21	25	37	45	53	65
6	6	22	26	38	46	54	66
7	7	23	27	39	47	55	67
8	10	24	30	40	50	56	70
9	11	25	31	41	51	57	71
10	12	26	32	42	52	58	72
11	13	27	33	43	53	59	73
12	14	28	34	44	54	60	74
13	15	29	35	45	55	61	75
14	16	30	36	46	56	62	76
15	17	31	37	47	57	63	77

2. Set the value of **Parameter 03 - [RIO Addr Cfg]** to the decimal equivalent of the octal address to be used.

   The address is entered and displayed as a decimal value, but is internally converted to an octal address.

   Important: The HIM and software tools, such as DriveExplorer or DriveExecutive, will display the address as a decimal value.



Default = 01

3. Reset the adapter (see Resetting the Adapter on page 3-8).

Setting the Baud Rate

If adapter Configuration DIP Switches SW7 and SW8 (Figure 2.2) are both set to 'On', the value of **Parameter 05 - [RIO Rate Cfg]** determines the Remote I/O baud rate.

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

Port 5 Device
20-COMM-R
Parameter #: 05 RIO Rate Cfg 0 57.6 kbps

Value	Baud Rate
0	57.6 Kbps (default)
1	115.2 Kbps
2	230.4 Kbps

2. Reset the adapter (see Resetting the Adapter on page 3-8).

Setting the Starting Module Group

If adapter Configuration DIP Switches SW7 and SW8 (Figure 2.2) are both set to 'On', the value of **Parameter 25 - [Start RIO Group]** determines the starting module group.

1. Set the value of **Parameter 25 - [Start RIO Group]** to the desired starting group.

Port 5 Device
20-COMM-R
Parameter #: 25 Start RIO Group 0 Group 0

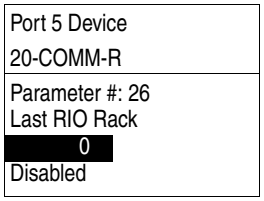
Value	Baud Rate
0	Group 0 (default)
1	Group 2
2	Group 4
3	Group 6 Do not use this value if the adapter uses a 1/2 rack, which results in an error.

2. Reset the adapter (see Resetting the Adapter on page 3-8).

Setting the Last Rack

If adapter Configuration DIP Switches SW7 and SW8 (Figure 2.2) are both set to ‘On’, the value of **Parameter 26 - [Last RIO Rack]** notifies the controller that this device is the last device on a specified rack. This parameter must be set to ‘1’ (Enabled) if the drive is the last device on a rack address that uses a PLC-2 controller. We recommend that you set this parameter to ‘1’ (Enabled) whenever a device is the last device on a rack.

1. Set the value of **Parameter 26 - [Last RIO Rack]** to the desired state.



Value	Last Rack
0	Disabled (default)
1	Enabled

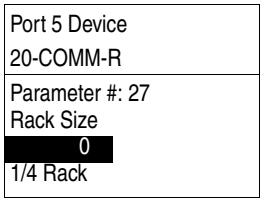
2. Reset the adapter (see Resetting the Adapter on page 3-8).

Setting the Rack Size

If adapter Configuration DIP Switches SW7 and SW8 (Figure 2.2) are both set to ‘On’, the value of **Parameter 27 - [Rack Size]** determines the rack size. With the 20-COMM-R adapter, you can use a 1/4 or 1/2 size rack. This I/O is the Discrete I/O. For more information about using I/O, see Chapter 4, Using Discrete and Block Transfer I/O.

TIP: Additional I/O, such as Reference/Feedback and Datalinks, can be transmitted using the Block Transfer I/O image.

1. Set the value of **Parameter 27 - [Rack Size]** to the size required for your application.



Value	Rack Size
0	1/4 (default)
1	1/2

2. Reset the adapter (see Resetting the Adapter on page 3-8).

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 Discrete I/O.) A ‘1’ enables the I/O and a ‘0’ disables the I/O.

1. Set the bits in **Parameter 12 - [DPI I/O Config]**.

Port 5 Device 20-COMM-R
Parameter #: 12 DPI I/O Config 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 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.

3. If you enabled one or more Datalinks, configure parameters in the drive to determine the source and destination of data in the Datalinks.

   When using Datalinks, up to 8 drive [Data In xx] parameters (300…307) and/or up to 8 [Data Out xx] parameters (310…317) must be assigned to point to the appropriate drive parameters for your application. Also, ensure that the Remote I/O adapter is the only adapter using the enabled Datalinks. See Chapter 4, Using Discrete and Block Transfer I/O for an example.

4. Reset the adapter (see Resetting the Adapter on page 3-8).

The adapter is ready to receive I/O.

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 faults:

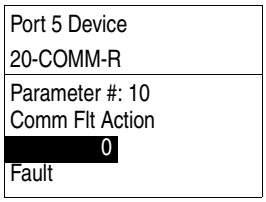
- Disrupted I/O communication by using **Parameter 10 - [Comm Flt Action]**
- An idle controller by using **Parameter 11 - [Idle Flt Action]**

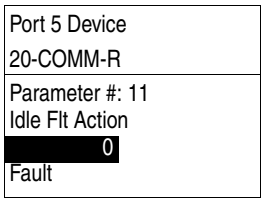
ATTENTION: Risk of injury or equipment damage exists. **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if I/O communication is disrupted or the controller is idle. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run, however, precautions should be taken to verify 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 faulted controller).

Changing the Fault Action

Set the values of **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** to an action that meets your application requirements.

Value	Action	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent '0' values for data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameters 14 - [Flt Cfg Logic]** through **23 - [Flt Cfg D2 In]**).





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

When setting **Parameter 10 - [Comm Flt Action]** or **11 - [Idle Flt Action]** to 'Send Flt Cfg', the values in the following parameters are sent to the drive after an I/O communication fault and/or idle fault occurs. You must set these parameters to values required by your application.

Parameter	Description
14 - [Flt Cfg Logic]	A 16-bit value sent to the drive for Logic Command.
15 - [Flt Cfg Ref]	A 32-bit value (0…4294967295) sent to the drive as a Reference or Datalink.
16 - [Flt Cfg x1 In] through **23 - [Flt Cfg x2 In]**	**Important:** If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.

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

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 09 - [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 09 - [Reset Module]** to '1' (Reset Module).

Port 5 Device 20-COMM-R
Parameter #: 09 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
04 - [RIO Addr Actual]	The rack address used by the adapter. This will be one of the following values: • The address set by the Rack Address Rotary Switches. • The value of **Parameter 03 - [RIO Addr Cfg]** if adapter Configuration DIP Switches SW7 and SW8 are both set to 'On'. • An old address of the switches or parameter if they have been changed and the adapter has not been reset.
06 - [RIO Rate Actual]	The baud rate used by the adapter. This will be one of the following values: • The baud rate set by adapter Configuration DIP Switches SW7 and SW8. • The value of **Parameter 05 - [RIO Rate Cfg]** if adapter Configuration DIP Switches SW7 and SW8 are both set to 'On'. • An old baud rate of the switches or parameter if they have been changed and the adapter has not been reset.
07 - [Ref/Fdbk Size]	The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
08 - [Datalink Size]	The size of the Datalinks. It will either be 16 bits or 32 bits. It is set in the drive and the adapter automatically uses the correct size.
13 - [DPI I/O Active]	The Reference/Feedback and Datalinks used by the adapter. This value is the same as **Parameter 12 - [DPI I/O Config]** unless the parameter was changed and the adapter was not reset. 0 = I/O disabled 1 = I/O enabled
24 - [Switches]	The status of the adapter Configuration DIP Switches. By default, all DIP switches are set to 'Off' (enabled), and the adapter is configured based on their settings. If both SW7 and SW8 are set to 'On', all hardware switches, including the Rack Address Rotary Switches, are disabled and the adapter is configured using values in the following adapter parameters: • **Parameter 3 - [RIO Addr Cfg]** • **Parameter 5 - [RIO Rate Cfg]** • **Parameter 25 - [Start RIO Group]** • **Parameter 26 - [Last RIO Rack]** • **Parameter 27 - [Rack Size]**.

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

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 Lite or 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 HyperTerminal software set to the X-modem protocol.

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 ControlFLASH, DriveExplorer, DriveExecutive, or HyperTerminal software

Using Discrete and Block Transfer I/O

This chapter provides information and examples about using I/O to control a connected PowerFlex drive.

About I/O

I/O is used to transfer the data which can control the PowerFlex drive and its speed. It is also used for transmitting data through Datalinks.

The Remote I/O adapter uses Discrete I/O and Block Transfer I/O to transfer I/O data. The ‘Discrete I/O’ is either 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words). The rack size is set using Configuration DIP Switch SW4 or, if the hardware switches have been disabled, adapter **Parameter 27 - [Rack Size]**. The ‘Block Transfer I/O’ includes all Block Transfer Read or Block Transfer Write messages that are 18 words or fewer.

The type of I/O that is transmitted between the drive and controller is set in **Parameter 12 - [DPI I/O Cfg]**. When you set up your I/O, note the following:

- The Logic Command/Status is always transmitted in the discrete I/O.
- The Reference is transmitted in the Discrete I/O if you are using a 1/2 rack, or in the Block Transfer I/O if you are using a 1/4 rack.
- Datalinks are always transmitted in the Block Transfer I/O.

Understanding the I/O Image

Figure 4.1 (1/4 rack) and Figure 4.2 (1/2 rack) show how data is transmitted between a controller and drive.

Rack Size	Reference Source	Feedback Destination	Datalinks
1/4	Block Transfer I/O	Block Transfer I/O	Block Transfer I/O
1/2	Discrete I/O	Discrete and Block Transfer I/O	Block Transfer I/O

Figure 4.1 Example I/O Image Using 1/4 Rack Configuration

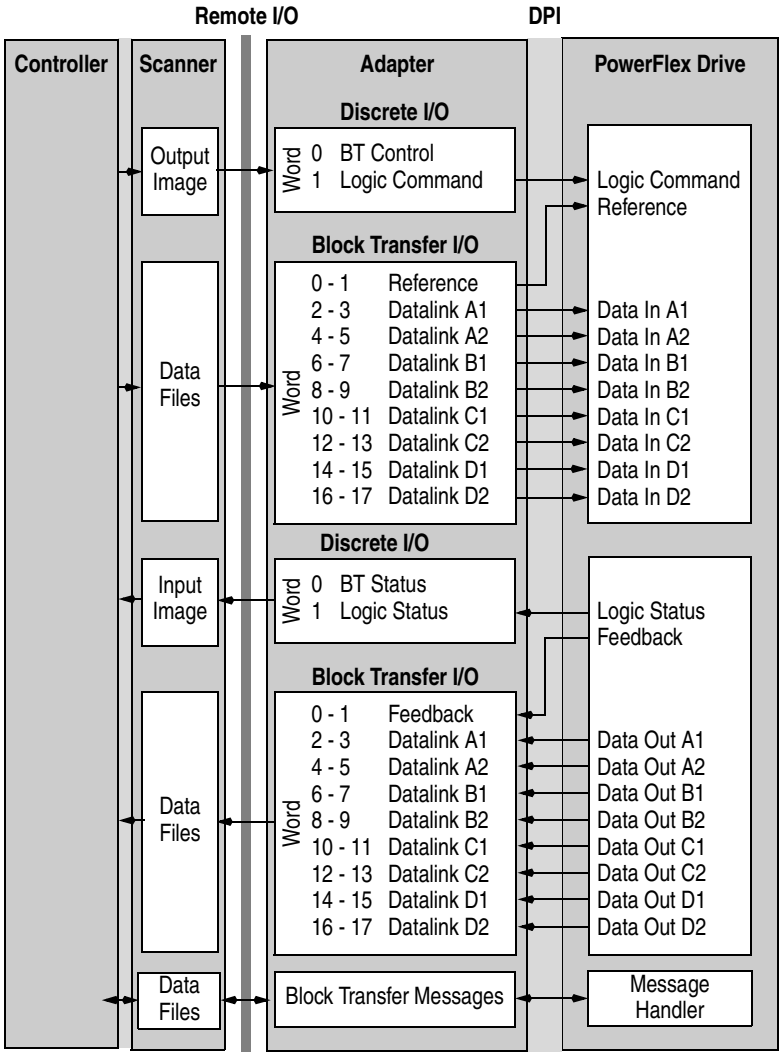
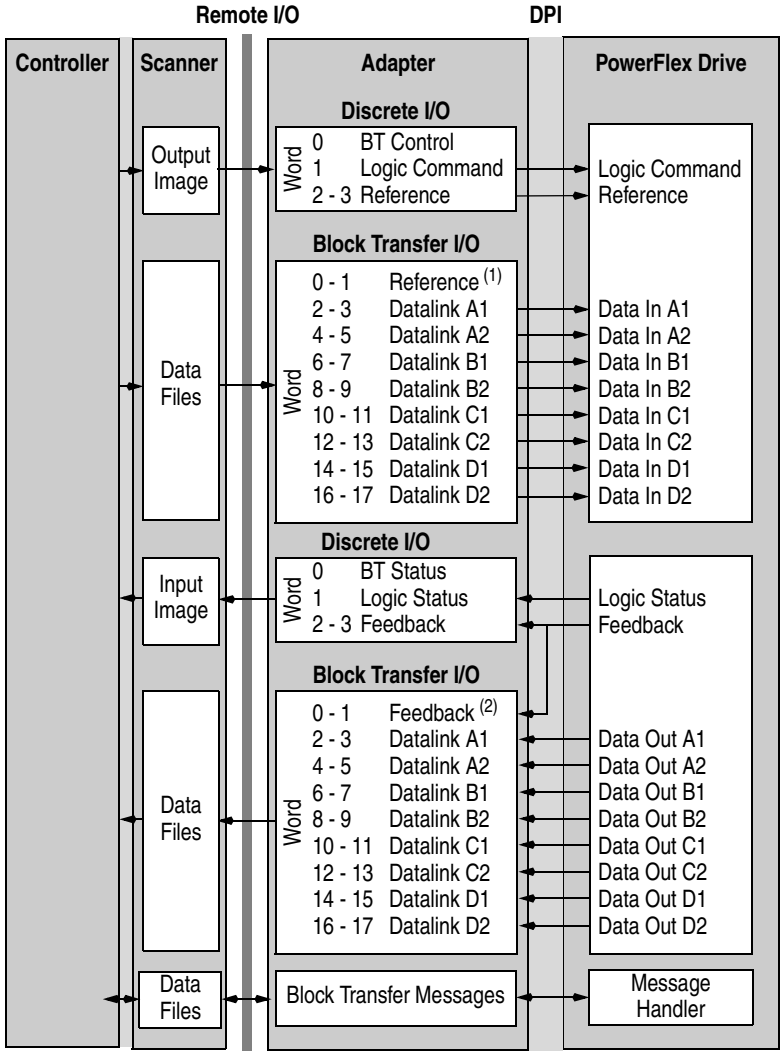


Figure 4.2 Example I/O Image Using 1/2 Rack Configuration



(1) Not used in 1/2 rack. The space is reserved so the Datalinks occupy the same Block Transfer I/O locations regardless of 1/4 rack or 1/2 rack configuration.

(2) Feedback is transmitted in both Discrete I/O and Block Transfer I/O.

Discrete I/O Image

The Discrete I/O image is either a 1/4 rack or 1/2 rack. Use Configuration DIP Switch SW4 to select 1/4 rack or 1/2 rack or, if the hardware switches have been disabled, adapter **Parameter 27 - [Rack Size]**. The I/O that is transmitted depends on the size of the rack. Figure 4.1 shows a 1/4 rack I/O image, and Figure 4.2 shows a 1/2 rack I/O image.

Data in the Discrete I/O image is transferred between the controller and Remote I/O adapter every scan.

Block Transfer Control/Status Word

Word 0 in the Discrete I/O image is always the 16-bit Block Transfer Control/Status word. The 'Block Transfer Control' word is used for handshaking between the scanner and adapter. Do **not** change this word. The 'Block Transfer Status' word is used to determine when you can write and read Block Transfers for Explicit Messages. The section Executing Block Transfers for Explicit Messages on page 5-5 explains the bits in this word and how to use them. Block Transfer I/O does not use the Block Transfer Status word.

Logic Command/Logic Status in Discrete I/O Image

Word 1 in the Discrete I/O image is always the Logic Command/Logic Status word. The 'Logic Command' word is a 16-bit word that is used to control the drive (for example, start, stop, change direction). The 'Logic Status' word provides details about how the drive is operating. PowerFlex 750-Series drives have a 32-bit Logic Command/Status word—but when using the 20-COMM-R adapter only the first 16 bits can be used.

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.

Reference/Feedback in Discrete I/O Image

If the adapter is configured for 1/2 rack (Figure 4.2), word 2 and word 3 in the discrete I/O image are reserved for Reference/Feedback.

Word	16 -bit value	
2	Reference	Feedback
3	Not Used	0

32-bit value	
Reference (LSW)	Feedback (LSW)
Reference (MSW)	Feedback (MSW)

LSW = Least Significant Word (bits 0…15)
MSW = Most Significant Word (bits 16…31)

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 can be displayed using adapter **Parameter 07 - [Ref/Fdbk Size]**.

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

PowerFlex 70/700/700H, and PowerFlex 700L Drives with 700 Control

The Reference/Feedback value is a scaled engineering value; it is **not** in Hertz or RPM. The Reference uses a '32767' scale. The '32767' endpoint of the scale is equal to the value of drive parameter 55 - [Maximum Freq], which has a default value of 130 Hz. For these drives, default scaling is 0…15123 which is equal to 0…60.0 Hz. This is based on the formula shown below. Reference/Feedback 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/Feedback scaling also changes. To determine Reference/Feedback scaling, use the following formula:

(Parameter 82 ÷ Parameter 55) * 32767 = Scaling

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

(60 Hz ÷ 130 Hz) * 32767 = 15123

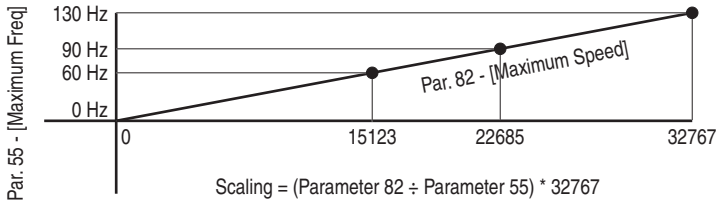
Therefore, 0…15123 = 0…60.0 Hz.

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

(90 Hz ÷ 130 Hz) * 32767 = 22685

Therefore, 0…22685 = 0…90.0 Hz.

A graphic representation of this Reference/Feedback scaling is shown below.



For PowerFlex 70 drives with enhanced control, firmware 2.xxx or later, or PowerFlex 700 drives with vector control, firmware 3.xxx or later, drive parameter 298 - [DPI Ref Select] was added to simplify scaling for the speed Reference/Feedback. When drive parameter 298 - [DPI Ref Select] is set to its default '0' (Max Freq), the speed Reference/Feedback scaling is as shown above. However, when parameter 298 - [DPI Ref Select] is set to '1' (Max Speed), the speed Reference/Feedback scaling is equal to parameter 82 - [Max Speed]:

Parameter 82 = Scaling

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

0…32767 = 0…60.0 Hz.

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

90 Hz = 32767

Speed Feedback uses the same scaling as the speed Reference.

TIP: For PowerFlex 700 drives with vector control, 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.

PowerFlex 700S and PowerFlex 700L Drives with 700S Control

The Reference/Feedback value is:

32767 = Base Motor Speed

The base speed is set using drive parameter 4 - [Motor RPM]. To set a speed Reference/Feedback above base speed, a value greater than 32767 must be entered.

For 16-bit processors, such as PLC-5 and SLC 500 controllers, the data requires manipulation to set a speed Reference above 32767 or below -32767. Please see the PowerFlex 700S AC Drives Phase II Control Reference Manual, publication PFLEX-RM003, in the Chapter 1 'Communications' section. Then go to the 'PLC 5 or SLC System' subsection and see the 'Reference/Feedback Programming' sub-subsection.

PowerFlex 753/755 Drives

The Reference/Feedback value is Hz x 1000 or RPM x 1000. Drive Parameter 300 - [Speed Units] determines whether the scaling is Hz or RPM. The default scaling is Hz, where 0…60,000 equates to 0…60.000 Hz. When Parameter 300 is set to RPM, then 0…1,765,000 equates to 0…1765.000 RPM.

For 16-bit processors, such as PLC-5 and SLC 500 controllers, the data requires manipulation to set a speed Reference above 32767 or below -32767. Please see the PowerFlex 700S AC Drives Phase II Control Reference Manual, publication PFLEX-RM003, in the Chapter 1 'Communications' section. Then go to the 'PLC 5 or SLC System' subsection and see the 'Reference/Feedback Programming' sub-subsection.

PowerFlex Digital DC Drives

The Reference/Feedback value is:

25000 = Maximum Reference Speed

The maximum reference speed is set using drive parameter 45 - [Max Ref Speed].

Block Transfer I/O Image

The Block Transfer I/O image is a Block Transfer message that contains eighteen 16-bit words. It reserves two words for the Reference/Feedback and four words for each Datalink (in case 32-bit values are used).

Figure 4.3 Block Transfer I/O Image for 16-Bit Reference and Datalinks

	Block Transfer Write	Block Transfer Read
Word 0	Reference	Feedback
1	Not Used	0
2	Datalink In A1	Datalink Out A1
3	Not Used	0
4	Datalink In A2	Datalink Out A2
5	Not Used	0
6	Datalink In B1	Datalink Out B1
7	Not Used	0
8	Datalink In B2	Datalink Out B2
9	Not Used	0
10	Datalink In C1	Datalink Out C1
11	Not Used	0
12	Datalink In C2	Datalink Out C2
13	Not Used	0
14	Datalink In D1	Datalink Out D1
15	Not Used	0
16	Datalink In D2	Datalink Out D2
17	Not Used	0

Figure 4.4 Block Transfer I/O Image for 32-Bit Reference and Datalinks

	Block Transfer Write	Block Transfer Read
Word 0	Reference (LSW)	Feedback (LSW)
1	Reference (MSW)	Feedback (MSW)
2	Datalink In A1 (LSW)	Datalink Out A1 (LSW)
3	Datalink In A1 (MSW)	Datalink Out A1 (MSW)
4	Datalink In A2 (LSW)	Datalink Out A2 (LSW)
5	Datalink In A2 (MSW)	Datalink Out A2 (MSW)
6	Datalink In B1 (LSW)	Datalink Out B1 (LSW)
7	Datalink In B1 (MSW)	Datalink Out B1 (MSW)
8	Datalink In B2 (LSW)	Datalink Out B2 (LSW)
9	Datalink In B2 (MSW)	Datalink Out B2 (MSW)
10	Datalink In C1 (LSW)	Datalink Out C1 (LSW)
11	Datalink In C1 (MSW)	Datalink Out C1 (MSW)
12	Datalink In C2 (LSW)	Datalink Out C2 (LSW)
13	Datalink In C2 (MSW)	Datalink Out C2 (MSW)
14	Datalink In D1 (LSW)	Datalink Out D1 (LSW)
15	Datalink In D1 (MSW)	Datalink Out D1 (MSW)
16	Datalink In D2 (LSW)	Datalink Out D2 (LSW)
17	Datalink In D2 (MSW)	Datalink Out D2 (MSW)

LSW = Least Significant Word (bits 0…15)
MSW = Most Significant Word (bits 16…31)

Block Transfer I/O requests must be eighteen (18) words or fewer. If a Reference or Datalink In field is not configured to be used by the adapter, any value placed in the field will be ignored by the adapter. If a Datalink Out field is not configured to be used by the adapter, the value of that field is undefined. The Feedback field will always contain the Feedback from the

drive. If a request has fewer than eighteen words, as much I/O data as will fit in the request will be used.

Reference/Feedback in Block Transfer I/O Image

Word 0 and word 1 are reserved for the Reference/Feedback. The size of the Reference (16-bits or 32-bits) is determined by the drive. If a 16-bit Reference (Figure 4.3) is used, word 1 is not used during writes and is read as zero (0) during reads.

Important: If the adapter is configured as a 1/2 rack, it uses the Reference from the Discrete I/O and ignores the Reference in the Block Transfer I/O. Feedback is transmitted in both Discrete I/O and Block Transfer I/O.

Datalinks in Block Transfer I/O Image

Words 2 through 17 are optionally enabled for Datalinks. A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks let a drive parameter value to be read or written without using an Explicit Message. When enabled, each Datalink occupies four 16-bit words in both the input and output Block Transfer I/O image. The size of Datalinks (16 bits or 32 bits) is determined by the drive. If 16-bit Datalinks (Figure 4.3) are used, the most significant word of each Datalink is not used during writes and is read as zero (0) during reads.

Rules for Using Datalinks

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

Datalink Scaling

PowerFlex 70/700/700H Drives and PowerFlex 700L Drives with 700 Control

Datalink scaling is not automatic and uses whole numbers (INTs or DINTs). See the drive documentation to determine the unit resolution for the associated parameter Datalink. For example, PowerFlex 700VC drive parameter 3 - [Output Current] has a 0.1 unit resolution. Because Datalink scaling uses whole numbers, the Output Current value is multiplied by 10 in the adapter and then sent over the network. Suppose the actual Output Current value is 35.5 amps. Reading the associated parameter Datalink received by the controller, the value would be 355. By using ladder logic, divide the value by 10 in the controller to get the correct scaling. See the drive documentation to determine if the Datalink parameter is a 16-bit or 32-bit parameter.

PowerFlex 700S, PowerFlex 700L with 700S Control, PowerFlex 753/755, and PowerFlex Digital DC Drives

Datalinks require scaling in the following way. Parameters are either 16-bit or 32-bit integers or REALs. When the parameter is a 32-bit integer, the data needs to be copied using a COP command to a DINT tag. (Because PLC-5 and SLC 500 controllers do not support 32-bit integers, the data must be separated into two 16-bit integers.) When the parameter is a REAL, the data needs to be copied using a COP command to a REAL tag. See subsequent sections in this chapter for ladder logic examples. See the drive documentation to determine if the Datalink parameter is a 16-bit or 32-bit integer parameter, or a REAL parameter.

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

This subsection only pertains to PowerFlex 70 (standard or enhanced control), PowerFlex 700 (standard control), 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 70 or PowerFlex 700 drives with the 20-COMM-R adapter in a 1/4 rack configuration.

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 by Block Transfer I/O.
- Send/receive Datalink data to/from the drive by Block Transfer I/O.
- Access the drive using Block Transfer Messaging (see Chapter 5, Using Block Transfer Messaging).

Adapter Settings for the Example Programs

All adapter hardware switches have been disabled and the following parameters have been set:

- **Parameter 3 - [RIO Addr Cfg]** = 1
- **Parameter 12 - [DPI I/O Config]** = xxx0 0011
  (Logic Command/Reference and Datalink A are enabled)
- **Parameter 25 - [Start RIO Group]** = Group 0
- **Parameter 27 - [Rack Size]** = 1/4 rack

Scanner Settings for the Example Programs

Data files, when used, are pointed out in the examples.

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 can vary if you are using a different DPI drive. See the documentation for your drive.

ControlLogix Controller Example

Figure 4.5 ControlLogix Example Ladder Logic for Main Routine

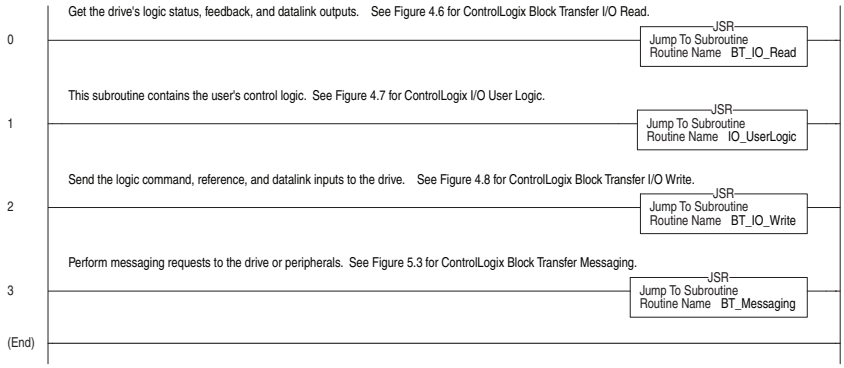
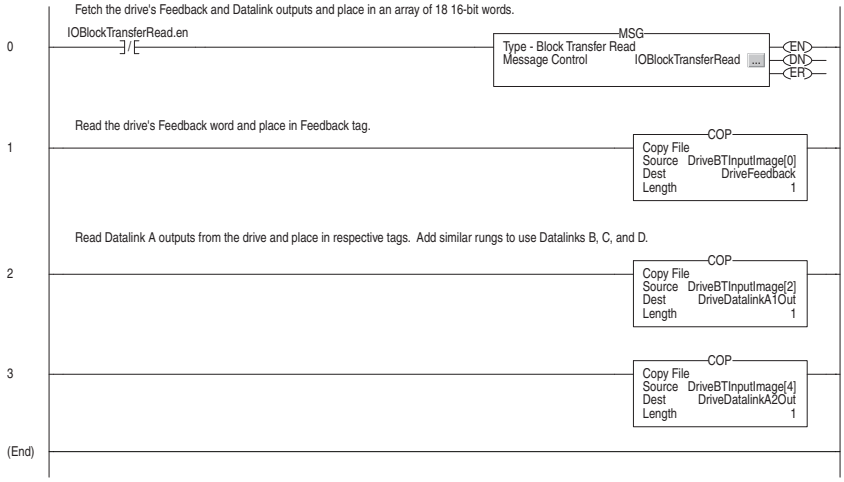


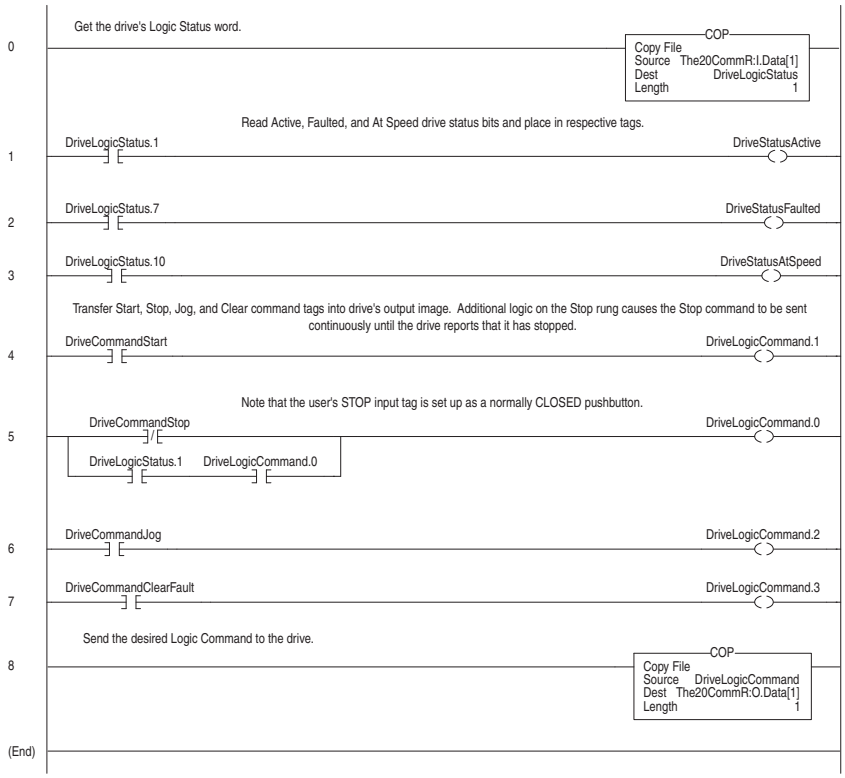
Figure 4.6 ControlLogix Example Ladder Logic for Block Transfer I/O Read



Tag Name	Type
I/O BlockTransferRead	MESSAGE
The20CommR:I	AB:RIO_4IOGROUP:I:0
DriveLogicStatus	INT
DriveBTInputImage	INT[18]
DriveFeedback	INT
DriveDatalinkA1Out	INT
DriveDatalinkA2Out	INT

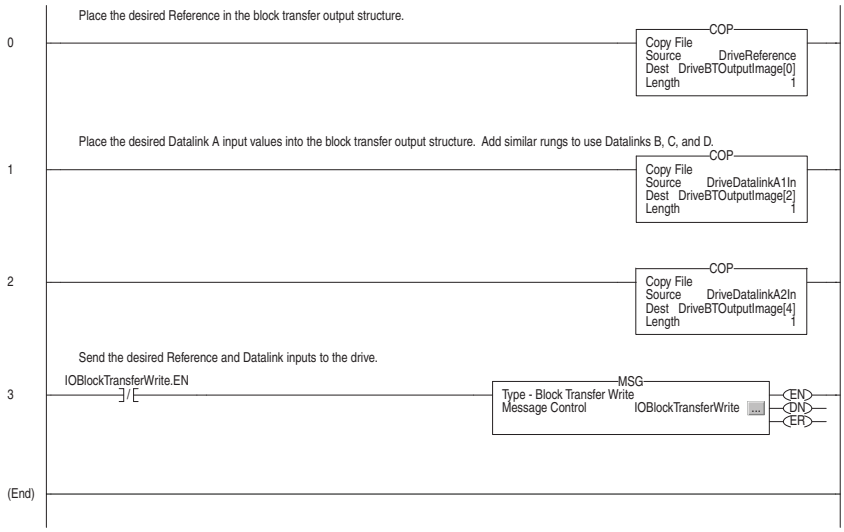
See Figure 4.3 for the Block Transfer I/O image.

Figure 4.7 ControlLogix Example I/O User Ladder Logic



Tag Name	Type
DriveLogicStatus	INT
DriveCommandStart	BOOL
DriveCommandStop	BOOL
DriveCommandJog	BOOL
DriveStatusActive	BOOL
DriveStatusFaulted	BOOL
DriveStatusAtSpeed	BOOL
DriveLogicCommand	INT

Figure 4.8 ControlLogix Example Ladder Logic for Block Transfer I/O Write



Tag Name	Type
DriveReference	INT
DriveBTOutputImage	INT[18]
DriveDatalinA1In	INT
DriveDatalinkA2In	INT
DriveLogicCommand	INT
The20CommR:O	AB:RIO_4IOGROUP:O:0
IOBlockTransferWrite	MESSAGE

See Figure 4.3 for the Block Transfer I/O image.

PLC-5 Controller Example

Figure 4.9 PLC-5 Example Ladder Logic for Main Routine

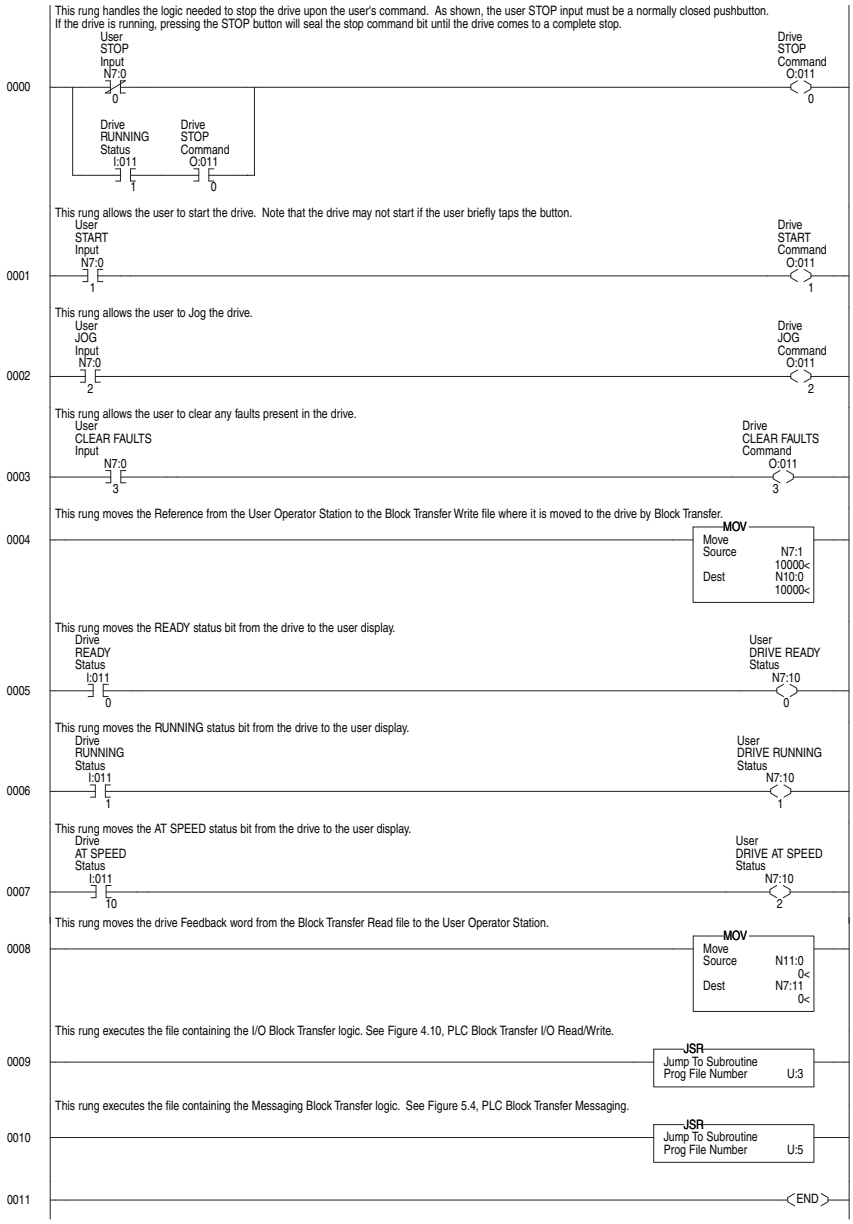
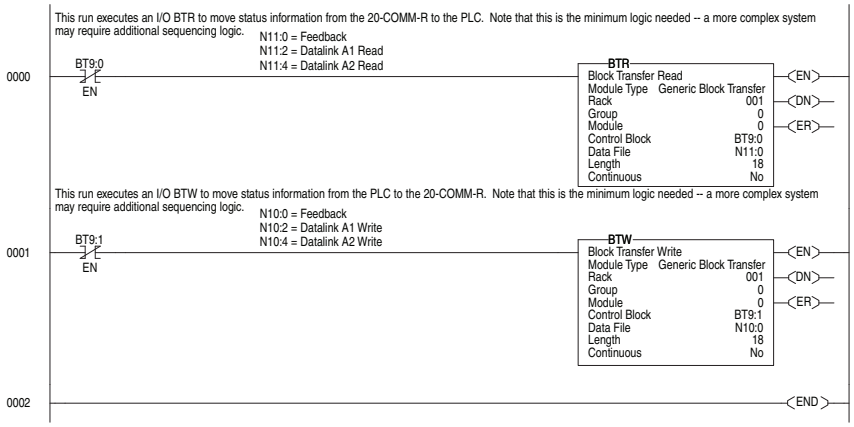


Figure 4.10 PLC-5 Example Ladder Logic for Block Transfer I/O (Read/Write)



See Figure 4.3 for the Block Transfer I/O image.

SLC 500 Controller Examples

Examples in this section are provided for SLC 500 Series C controllers with firmware revision 3.xx and higher, and for SLC 500 controllers all versions.

Series C Controller with Firmware Revision 3.xx and Higher

In a series C, firmware revision 3.xx and higher SLC processor, Block Transfer Read (BTR) and Block Transfer Write (BTW) instructions can be used. When the length of the Block Transfer is 18 words or less, the 20-COMM-R adapter knows the Block Transfer is for I/O and not for an explicit message Block Transfer (Chapter 5). Block Transfer setup is the same for a 1/4 rack or 1/2 rack configuration. This example is for Rack 1, Group 4 (the upper half rack).

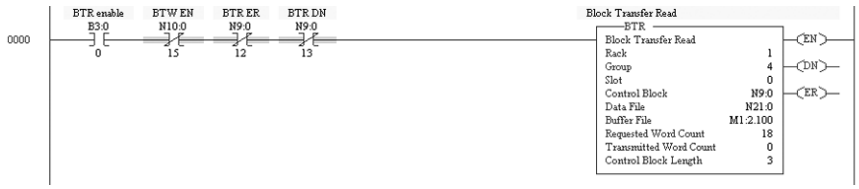
Block Transfer Read Example

The following data is used for this example.

- Rack 1
- Group 4 (upper half rack)
- Slot 0 (always 0)
- Control Block N9:0 (user defined)
- Data File N21:0 (user defined)
- Buffer File M1:x.100 (Block Transfer Reads always start with M1, where x is the slot in which the 1747-SN scanner card is in. In this example, the 1747-SN card is in slot 2.)
- Requested Word Count is 18 or less (see See Figure 4.1 on page 4-2 or See Figure 4.2 on page 4-3)
- Transmitter Word Count (always 0)
- Control Block Length (always 3)

Important: Each Block Transfer needs to be offset by 100 (M1:x.100) and the default is 3300 words, so you can perform up to 33 Block Transfers. See the advanced configuration for your 1747-SN scanner card under channel configuration.

Figure 4.11 SLC 500 Series C, FRN 3.xx and Higher, Example Ladder Logic for Block Transfer Read



Block Transfer Write Example

The following data is used for this example.

- Rack 1
- Group 4 (upper half rack)
- Slot 0 (always 0)
- Control Block N10:0 (user defined)
- Data File N22:0 (user defined)
- Buffer File M0:x.200 (Block Transfer Writes always start with M0, where x is the slot in which the 1747-SN scanner card is in. In this example, the 1747-SN card is in slot 2.)
- Requested Word Count is 18 or less (see See Figure 4.1 on page 4-2 or See Figure 4.2 on page 4-3)
- Transmitter Word Count (always 0)
- Control Block Length (always 3)

Important: Each Block Transfer needs to be offset by 100 (M0:x.200) and the default is 3300 words, so you can perform up to 33 Block Transfers. See the advanced configuration for your 1747-SN scanner card under channel configuration.

Figure 4.12 SLC 500 Series C, FRN 3.xx and Higher, Example Ladder Logic for Block Transfer Write

All Controller Versions

The SLC RIO scanner performs Block Transfers through control/status buffers that you allocate in the scanner's M0 and M1 files. The first 10 words of each file are reserved for either control words (M0) or status words (M1). Block Transfer Read/Write data starts in word 11. See the Remote I/O 1747-SN Scanner User Manual, publication 1747-UM013, for more information.

The following data is required for the example program.

Address	Value (decimal)	Description
N10:1	18	Block Transfer Write Length
N10:2	100	Rack 1, Group 0, Slot 0
N10:3	18	Block Transfer Read Length
N10:4	100	Rack 1, Group 0, Slot 0

The length of '28' words used in the COP instructions in the ladder example, reflect the 10 reserved words plus 18 words of data.

Figure 4.13 SLC 500 Example Ladder Logic for Main Routine (I/O User Logic)

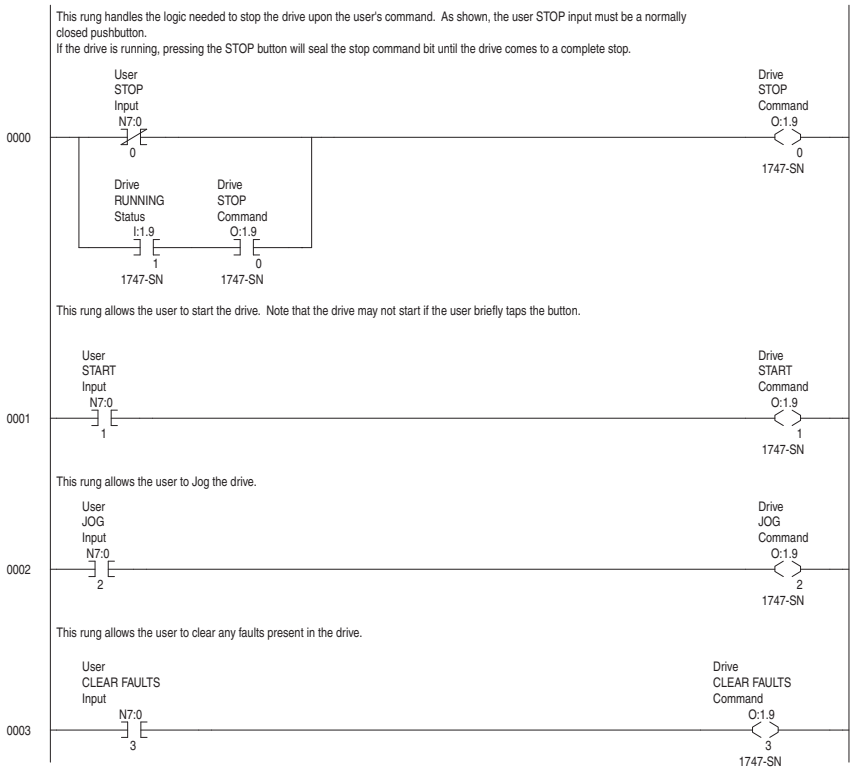


Figure 4.13 SLC 500 Example Ladder Logic for Main Routine (I/O User Logic) - continued

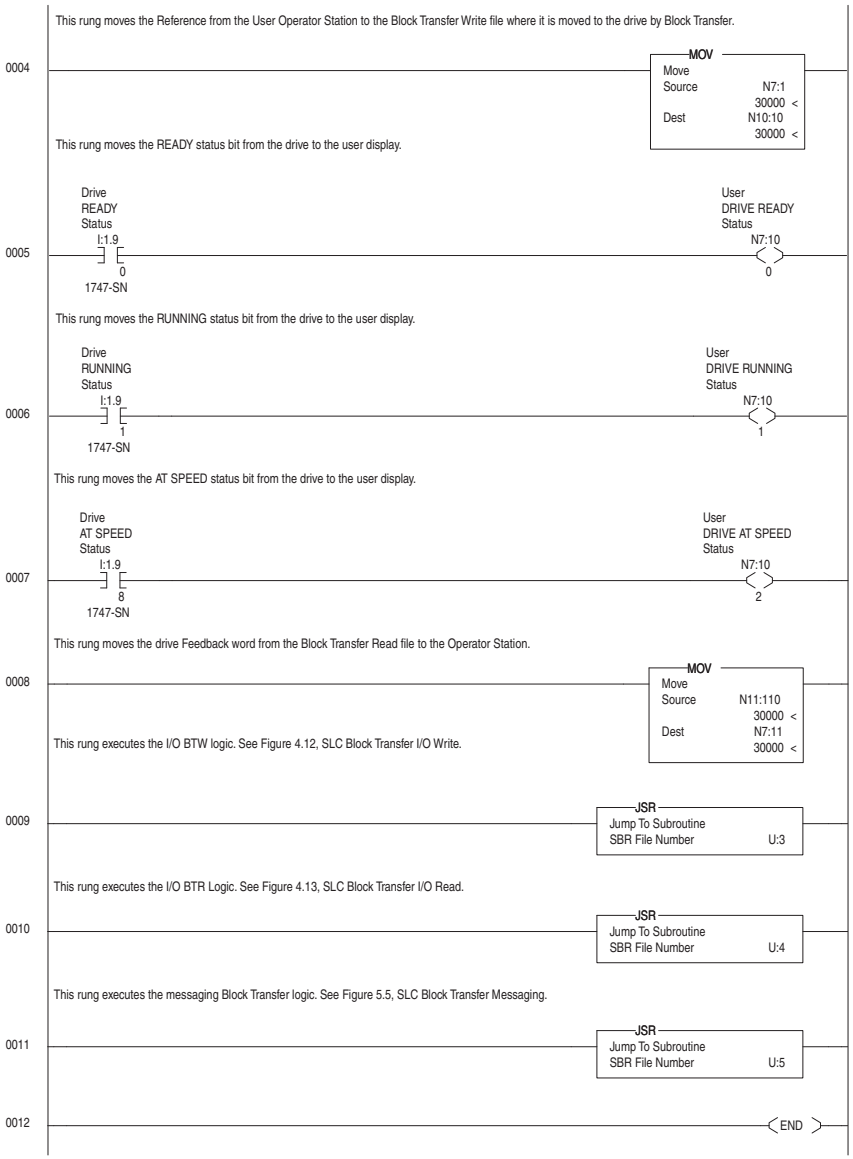
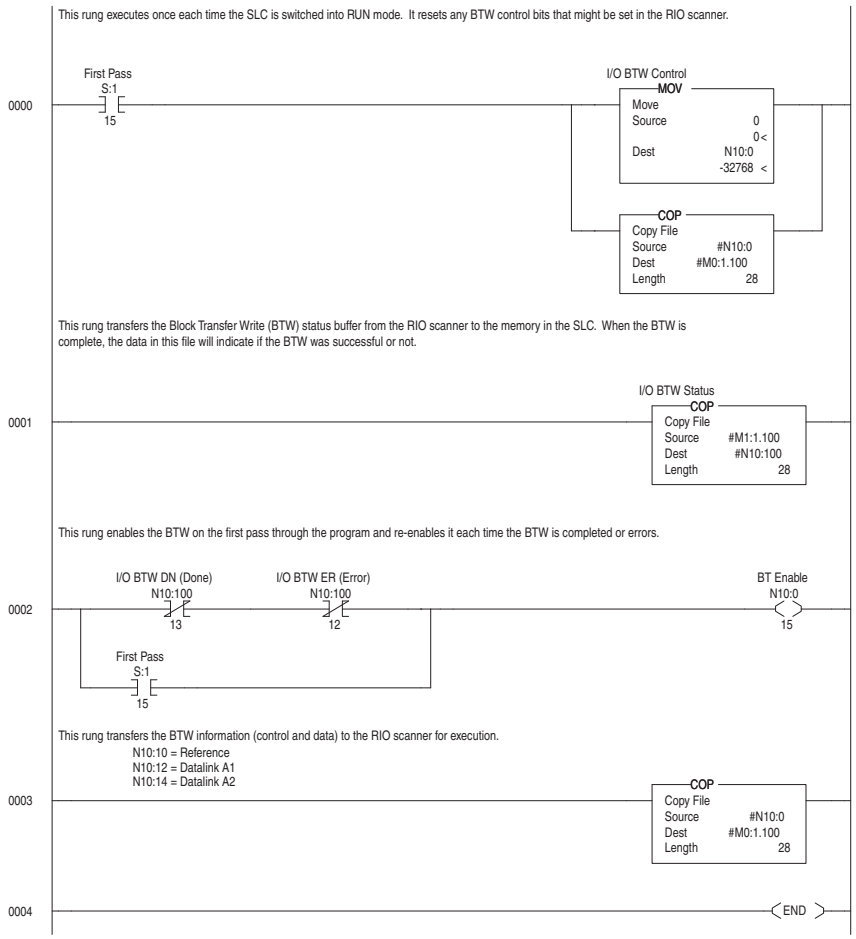
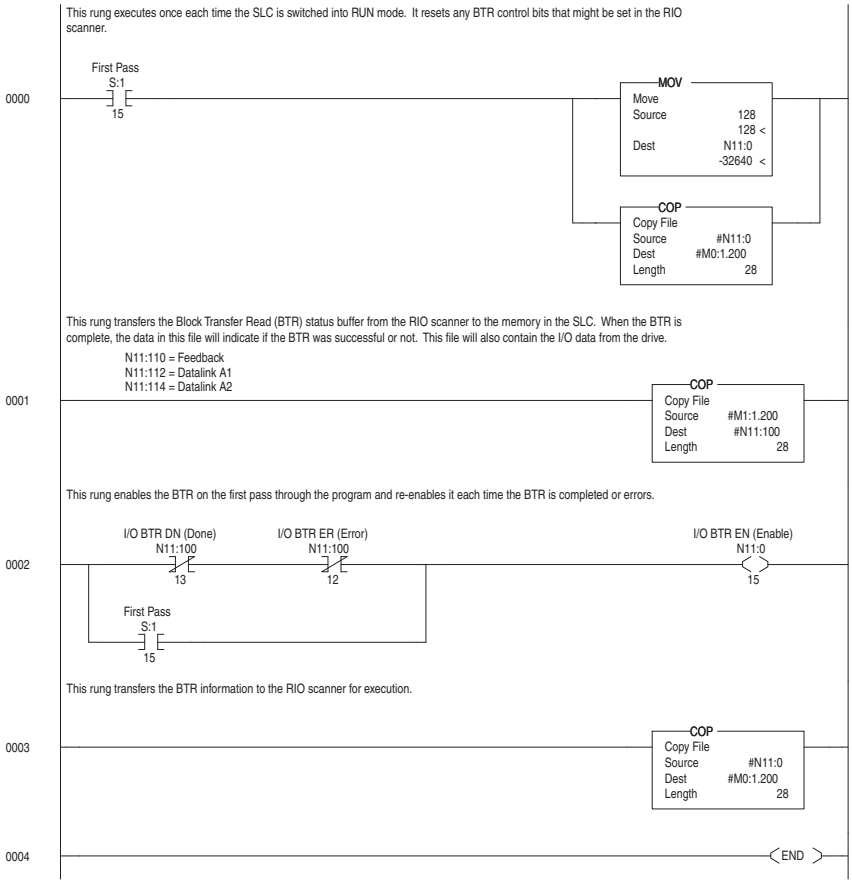


Figure 4.14 SLC 500 Example Ladder Logic for Block Transfer I/O Write



See Figure 4.3 for the Block Transfer I/O image.

Figure 4.15 SLC 500 Example Ladder Logic for Block Transfer I/O Read



See Figure 4.3 for the Block Transfer I/O image.

Using Block Transfer Messaging

This chapter provides information and examples for using Block Transfer to send Explicit Messages to control, configure, and monitor a PowerFlex 7-Class drive on a Remote I/O network.

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

ATTENTION: Risk of equipment damage exists. If Block Transfer is used to send Explicit Messages that 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 Block Transfer to send Explicit Messages to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

About Block Transfer Messaging

Block Transfer messaging is used to transfer data to the drive. The size of Block Transfer messages to the Remote I/O adapter determines their purpose.

Words	Type	Used For	See
18 or fewer	I/O	Reference/Feedback and Datalinks	Chapter 4
20, 30, or 60	Explicit	Configuring and monitoring data	This chapter
Other	Not Recognized	Do not use or an error will occur.	—

Block Transfer I/O

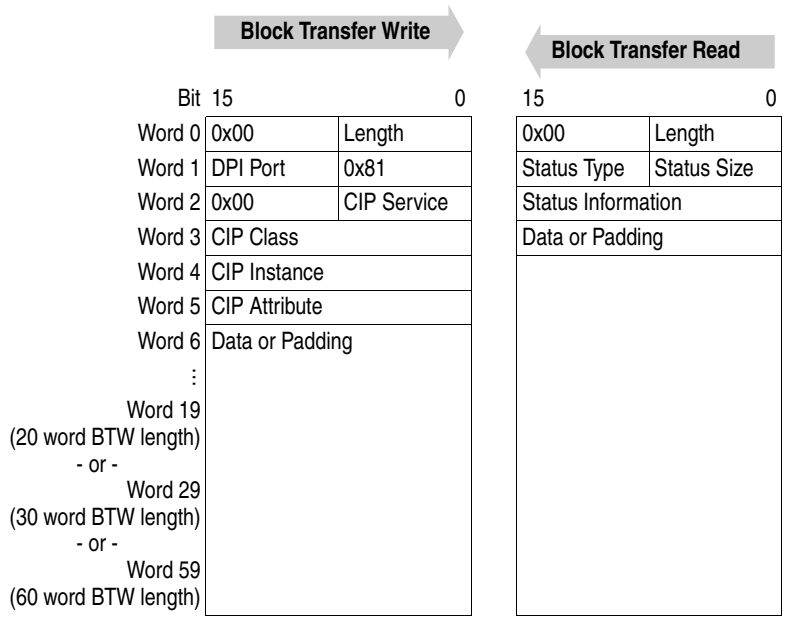
For information about Block Transfer I/O messages, see Chapter 4, Using Discrete and Block Transfer I/O.

One Block Transfer request is processed per Remote I/O rack scan, but multiple requests to a rack can be initiated. You can use Block Transfer Read messages to gather input and status data from the adapter and Block Transfer Write messages to send output and configuration data to the adapter and connected drive.

Formatting Block Transfer Messages

Using Block Transfer to Initiate Explicit Messages

Figure 5.1 Explicit Message Format



Most Significant Byte = bits 15...8
Least Significant Byte = bits 7...0

See Block Transfer Write Structure to Send Block Transfer Messages on page 5-3 for a description of each word in a Block Transfer Write used to initiate Explicit Messages.

See Block Transfer Read Structure to Receive Block Transfer Messages on page 5-4 for a description of each word in a Block Transfer Read used to receive an Explicit Message response.

Block Transfer Write Structure to Send Block Transfer Messages

Data Field	Description
Word 0	**Length** The least significant byte contains the length of the Explicit Message. The most significant byte is always zero. This is the length of the actual message in bytes, not the size of the BTW in words. This length excludes the two bytes of word 0, but includes words 1 and 2, and all of the data in the main body of the message to be sent. If using a scattered read or write with class code 0x93, the length includes the zero(s) after the last parameter as place holders. See pages C-9…C-14.
Word 1	**0x81 and DPI Port** The least significant byte contains the value 0x81. The most significant byte is the DPI port. For PowerFlex drives, you can access: 0 - Drive 1 - Device at Port 1 (HIM) 2 - Device at Port 2 3 - Device at Port 3 4 - Device at Port 4 5 - Device at Port 5 (adapter) 6 - Device at Port 6
Word 2	**CIP Service** The least significant byte contains a CIP service. The most significant byte is always zero (0). CIP services include the following: 0x0E - Get Attribute Single 0x10 - Set Attribute Single 0x4B - Get Attributes Scattered 0x4C - Set Attributes Scattered
Word 3	**CIP Class** See Appendix C, CIP Objects for a list of classes.
Word 4	**CIP Instance** See Appendix C, CIP Objects for an instances in each class.
Word 5	**CIP Attribute** See Appendix C, CIP Objects for a list of attributes in each class.
Word 6…19 Word 6…29 Word 6…59	**Data or Padding** Data required for the message. The message must be either 20 words, 30 words, or 60 words. If it is not, pad the message with zeros.

Block Transfer Read Structure to Receive Block Transfer Messages

Data Field	Description
Word 0	**Length** The least significant byte contains the length of the actual Explicit Message in bytes. The most significant byte is always zero.
Word 1	**Status Size and Status Type** If an error occurred during the Explicit Message, the least significant byte will contain the size of the status information and the most significant byte will contain the type of status (1 = DPI, 2 = CIP) information. If the Explicit Message completed without an error occurring, both of these bytes will have values of zero. 0x00 Message successful 0x01 DPI error 0x02 CIP error
Word 2	**Status Information** The least significant byte will contain the status information: *CIP* *DPI* 0x00 0x00 Message is successful. 0x0E 0x01 Service is not supported. 0x08 0x02 Service is not valid. 0x16 0x03 Class is not supported. 0x16 0x04 Instance is not supported. 0x14 0x05 Attribute is not supported. 0x09 0x06 Data value is out of range for the attribute. 0x10 0x07 The object is not in a correct state for the service. For example, certain attributes cannot be set while the drive is running. 0x13 0x08 Not enough data was provided for the message. 0x15 0x09 Too much data was provided for the message. 0x0A Router message error. 0x0B Resource unavailable. 0x0C Transport Error.
Word 3…19 Word 3…29 Word 3…59	**Data or Padding** This is the Explicit Message response data.

Executing Block Transfers for Explicit Messages

1. Enter data into the program.

   Data must be entered into a data file for a program to run. The data file that is used depends on your controller and application.

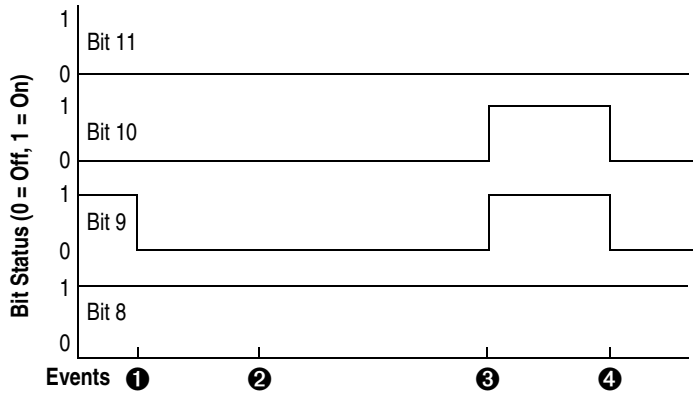
2. Run the program.

   When executing a Block Transfer message, the program must monitor the Block Transfer Status word (Word 0) in the Discrete I/O Image. Its bits are defined as shown in the following table.

Bits	Name and Description
0...7	**Node Adapter Chip** These bits are used by the node adapter chip to communicate with the master on the network. The master application should not use these bits.
8	**DATA_VALID** 0 = Data from the drive is not valid. 1 = Data from the drive is valid.
9	**Message Block Transfer Write Available** 0 = Not ready 1 = Ready to receive a Block Transfer write.
10	**Message Block Transfer Read Available** 0 = Not ready 1 = Data is available for a Block Transfer read.
11	**Message Block Transfer Error** 0 = Block Transfer message succeeded. 1 = Block Transfer message failed.
12...15	**Reserved** Do not use.

Figure 5.2 illustrates the events of a successful Block Transfer.

Figure 5.2 Block Transfer Timeline



The following table describes the main events and what a program is monitoring when performing Block Transfer messaging.

Item	Event	Description
❶	BTW Request	Before initiating a Block Transfer message, bit 8 must be 1. This setting indicates that the adapter and drive are communicating, so a Block Transfer message will reach the drive. Before initiating a Block Transfer Write message, bit 9 must be 1. This setting indicates that a Block Transfer Write can be executed.
❷	BTW Data at Adapter	Because only one Block Transfer message can be active at a time, bit 9 is set to 0 when the Block Transfer Write begins. Bit 9 and bit 10 remain at zero while the Block Transfer is being processed.
❸	BTW Complete	When the Block Transfer is complete, bit 9 and bit 10 are set to 1. This setting indicates that the program can perform either a Block Transfer Read or a Block Transfer Write. Bit 11 remains at 0 if messaging is successful. If an error occurs, it would be set to 1.
❹	BTR Request	Before initiating a Block Transfer Read message, bit 10 must be set to 1. This setting indicates that data is available to read. When the message is executed, bit 9 and bit 10 are set to 0 because only one Block Transfer can be active at a time.

3. Receive data from the program.

   After the program with Block Transfer messages has been run, the results can be seen in a data file. The data file that is used depends on your controller and application.

Example Programs

The example ladder logic programs (Figure 5.3, Figure 5.4, and Figure 5.6) can be used to demonstrate how Block Transfer can be used to send Explicit Messages from a ControlLogix, PLC or SLC controller, respectively. With these examples, Block Transfer messaging is used to read or write a parameter value from a PowerFlex 70 drive at Rack 1, Group 0, Slot 0.

These example ladder programs are continuations of the Discrete and Block Transfer I/O example ladder programs in Chapter 4. The ‘Main Routine’ ladder logic in that chapter performs Jump to Subroutines (JSRs) to these examples.

ControlLogix Controller Example

Data Format for a Read and Write Parameter

The data in this example is for a PowerFlex 70 drive at Remote I/O rack.

The following set of arrays shows a read of drive parameter 1 - [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

MsgBlockTransferWrite (Request Data) to Read Drive Parameter 1 (Hex)

Int Address	Value (hex)	Description	See Page
Offset 0	000A	Length of Message = 10 bytes (A hex)	5-3
Offset 1	0081	Required Setting	5-3
Offset 2	000E	Service = Get_Attribute_Single	C-1
Offset 3	0093	Class = 93 DPI Parameter Object	C-5
Offset 4	0001	Instance = Parameter 1 (1 hex)	C-5
Offset 5	0009	Attribute = 09 DPI Parameter Value	C-6

MsgBlockTransferRead (Response Data) to Read Drive Parameter 1 (Hex)

Int Address	Value (hex)	Description	See Page
Offset 0	0004	Length of Message = 4 bytes	5-4
Offset 1	0000	The Message was Successful	5-4
Offset 2	0000		
Offset 3	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	n/a

The following set of data files shows a write of drive parameter 41 [Motor NP Volts]. The value written is 2300 (230.0V AC).

MsgBlockTransferWrite (Request Data) to Write to Drive Parameter 41 (Hex)

Int Address	Value (hex)	Description	See Page
Offset 0	000C	Length of Message = 12 bytes (C hex)	5-3
Offset 1	0081	Required Setting	5-3
Offset 2	0010	Service = Set_Attribute_Single	C-1
Offset 3	0093	Class = 93 DPI Parameter Object	C-5
Offset 4	0029	Instance = Parameter 41 (29 hex)	C-5
Offset 5	0009	Attribute = 09 DPI Parameter Value	C-6
Offset 6	08FC	Data = 2300 (8FC hex) = 230.0V AC	n/a

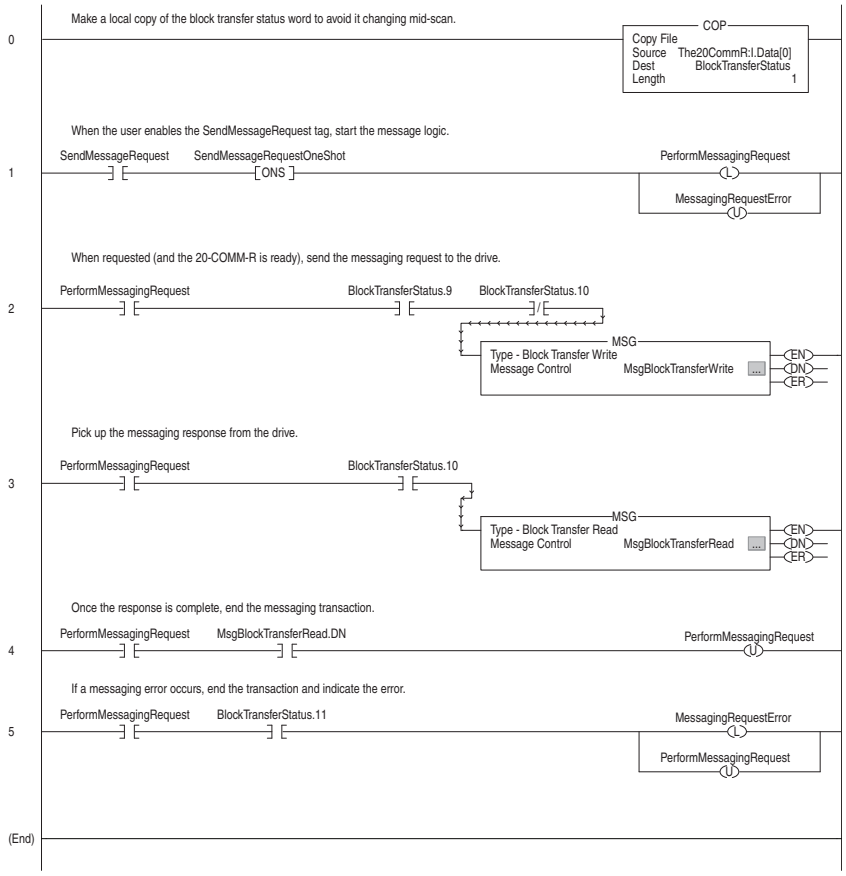
MsgBlockTransferRead (Response Data) to Write to Drive Parameter 41 (Hex)

Int Address	Value (hex)	Description	See Page
Offset 0	0002	Length of Message = 2 bytes	5-4
Offset 1	0000	The Message was Successful	5-4
Offset 2	0000		

See Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Ladder Logic Program

Figure 5.3 ControlLogix Example Ladder Logic for Block Transfer Messaging



Tag Name	Type
SendMessageRequest	BOOL
SendMessageRequestOneShot	BOOL
PerformingMessagingRequest	BOOL
MessagingRequestError	BOOL
The20CommR:I	AB:RIO_4IOGROUP:I:0
MsgBlockTransferWrite	MESSAGE
MsgBlockTransferRead	MESSAGE

PLC-5 Controller Example

Block Transfer Data Files for PLC-5 Example Program

The following set of data files shows a read of drive parameter 1 - [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

Request Data (BTW) to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N12:0	000A	Length of Message = 10 bytes (A hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	000E	Service = Get_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-5
N12:4	0001	Instance = Parameter 1 (1 hex)	C-5
N12:5	0009	Attribute = 09 DPI Parameter Value	C-6

Response Data (BTR) to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N13:0	0004	Length of Message = 4 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		
N13:3	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	n/a

The following set of data files shows a write of drive parameter 41 - [Motor NP Volts]. The value written is 2300 (230.0V AC).

Request Data (BTW) to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N12:0	000C	Length of Message = 12 bytes (C hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	0010	Service = Set_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-5
N12:4	0029	Instance = Parameter 41 (29 hex)	C-5
N12:5	0009	Attribute = 09 DPI Parameter Value	C-6
N12:6	08FC	Data = 2300 (8FC hex) = 230.0V AC	n/a

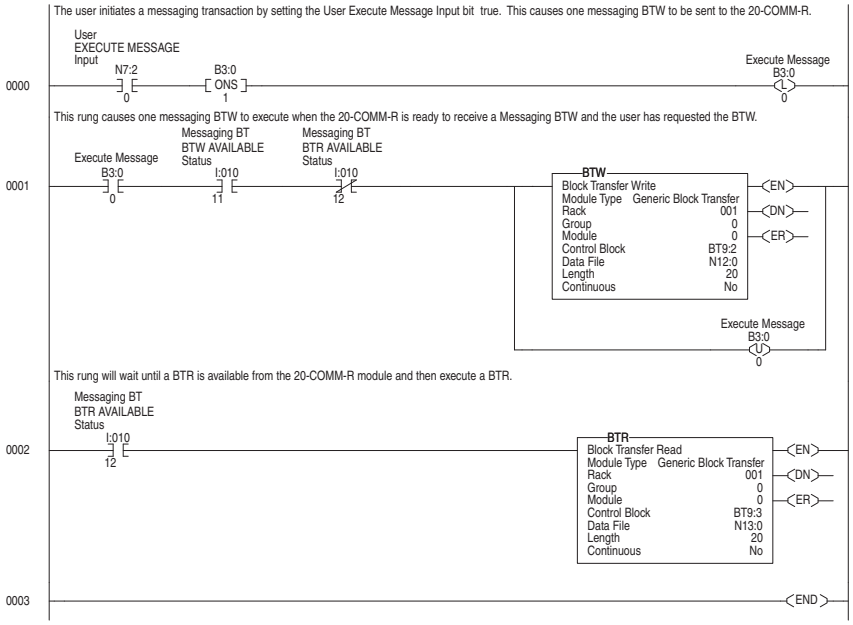
Response Data (BTR) to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N13:0	0002	Length of Message = 2 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		

See Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Ladder Logic Program

Figure 5.4 PLC-5 Example Ladder Logic for Block Transfer Messaging



The word length used in the BTW and BTR must be equal to 20, 30, or 60. It must also be greater than or equal to the byte length used in Word 0 of the message, converted to words (1 word = 2 bytes).

SLC 500 Controller Examples

Examples in this section are provided for SLC 500 Series C controllers with firmware revision 3.xx and higher, and for SLC 500 controllers all versions.

Block Transfer Data Files for Example Program—Series C Controller with Firmware Revision 3.xx and Higher

In a series C, firmware revision 3.xx and higher SLC processor, Block Transfer Read (BTR) and Block Transfer Write (BTW) instructions can be used. When the length of the Block Transfer is 20 words or higher, the 20-COMM-R adapter knows the Block Transfer is for explicit messages and not for I/O Block Transfer (Chapter 4). Block Transfer setup is the same for a 1/4 rack or 1/2 rack configuration. This example is for Rack 1, Group 4 (the upper half rack).

The following set of data files shows a read of drive parameter 1 - [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

Request and Control Data to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N12:0	000A	Length of Message = 10 bytes (A hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	000E	Service = Get_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-5
N12:4	0001	Instance = Parameter 1 (1 hex)	C-5
N12:5	0009	Attribute = 09 DPI Parameter Value	C-6

Response and Control Data to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N13:0	0004	Length of Message = 4 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		
N13:3	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	n/a

The following set of data files shows a write of drive parameter 41 - [Motor NP Volts]. The value written is 2300 (230.0V AC).

Request and Control Data to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N12:0	000C	Length of Message = 12 bytes (C hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	0010	Service = Set_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-5
N12:4	0029	Instance = Parameter 41 (29 hex)	C-5
N12:5	0009	Attribute = 09 DPI Parameter Value	C-6
N12:6	08FC	Data = 2300 (8FC hex) = 230.0V AC	n/a

Response and Control Data to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N13:0	0002	Length of Message = 2 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		

Figure 5.5 SLC 500 Series C, FRN 3.xx and Higher, Example Ladder Logic for Block Transfer Read and Block Transfer Write

The following data is used for this example.

- Rack 1
- Group 4 (upper half rack)
- Slot 0 (always 0)
- Control Block N9:0 and N10:0 (user defined)
- Data File N12:0 and N13:0 (user defined)
- Buffer File M0:x.100 and M1:x.200 (Block Transfer Writes always with start M0 and Block Transfer Reads always start with M1, where x is the slot in which the 1747-SN scanner card is in. In this example, the 1747-SN card is in slot 2.)
- Requested Word Count is 20, 40, or 60
- Transmitter Word Count (always 0)
- Control Block Length (always 3)

Important: Each Block Transfer needs to be offset by 100 (M1:x.100) and the default is 3300 words, so you can perform up to 33 Block Transfers. See the advanced configuration for your 1747-SN scanner card under channel configuration.

The Block Transfer Write is transmitted first, and then the Block Transfer Read is executed. (The BTW requests the data, and the BTR reads back the data requested.)

Block Transfer Data Files for Example Program—All SLC Versions

The following set of data files shows a read of drive parameter 1 - [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

Request and Control Data to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N12:10	000A	Length of Message = 10 bytes (A hex)	5-3
N12:11	0081	Required Setting	5-3
N12:12	000E	Service = Get_Attribute_Single	C-1
N12:13	0093	Class = 93 DPI Parameter Object	C-5
N12:14	0001	Instance = Parameter 1 (1 hex)	C-5
N12:15	0009	Attribute = 09 DPI Parameter Value	C-6

Response and Control Data to Read Drive Parameter 1 (Hex)

Address	Value (hex)	Description	See Page
N13:110	0004	Length of Message = 4 bytes	5-4
N13:111	0000	The Message was Successful	5-4
N13:112	0000		
N13:113	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	n/a

The following set of data files shows a write of drive parameter 41 - [Motor NP Volts]. The value written is 2300 (230.0V AC).

Request and Control Data to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N12:10	000C	Length of Message = 12 bytes (C hex)	5-3
N12:11	0081	Required Setting	5-3
N12:12	0010	Service = Set_Attribute_Single	C-1
N12:13	0093	Class = 93 DPI Parameter Object	C-5
N12:14	0029	Instance = Parameter 41 (29 hex)	C-5
N12:15	0009	Attribute = 09 DPI Parameter Value	C-6
N12:16	08FC	Data = 2300 (8FC hex) = 230.0V AC	n/a

Response and Control Data to Write to Drive Parameter 41 (Hex)

Address	Value (hex)	Description	See Page
N13:110	0002	Length of Message = 2 bytes	5-4
N13:111	0000	The Message was Successful	5-4
N13:112	0000		

Block Transfers are handled differently in the SLC 500 controller and require the following data for the example program.

Address	Value (decimal)	Description
N12:1	20	Block Transfer Write Length
N12:2	100	Rack 1, Group 0, Slot 0
N13:1	20	Block Transfer Read Length
N13:2	100	Rack 1, Group 0, Slot 0

See Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Ladder Logic Program

Figure 5.6 SLC 500 Example Ladder Logic for Block Transfer Messaging

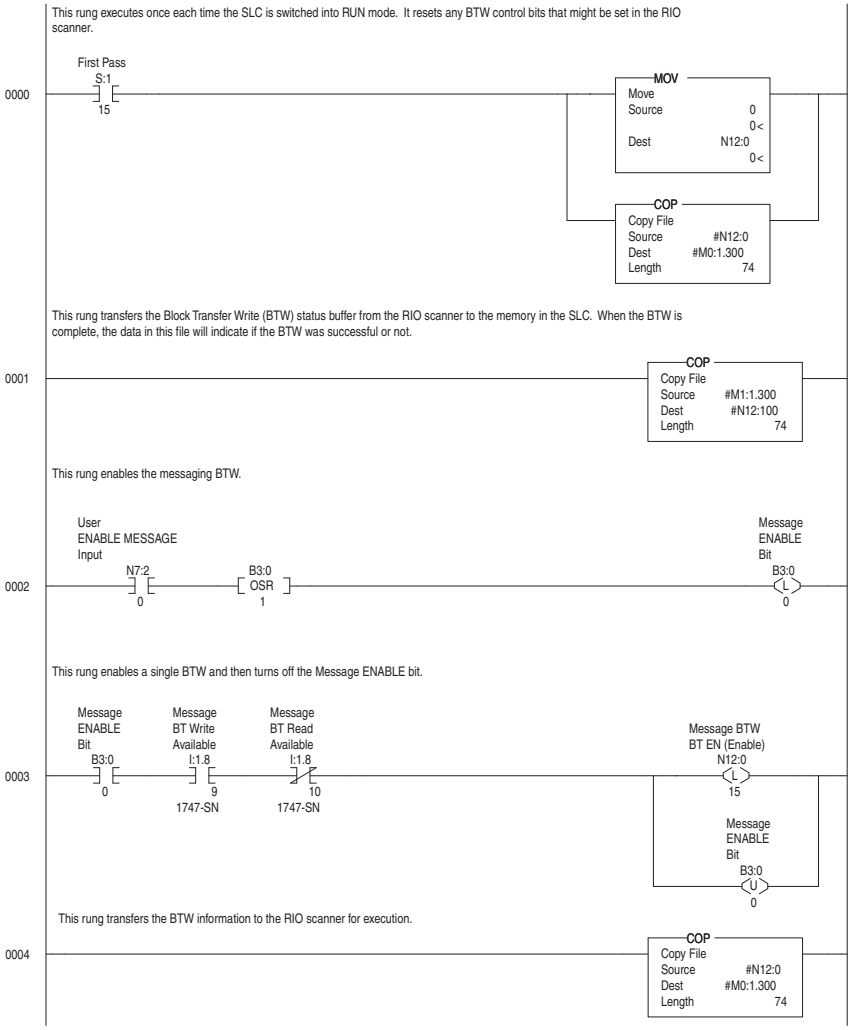
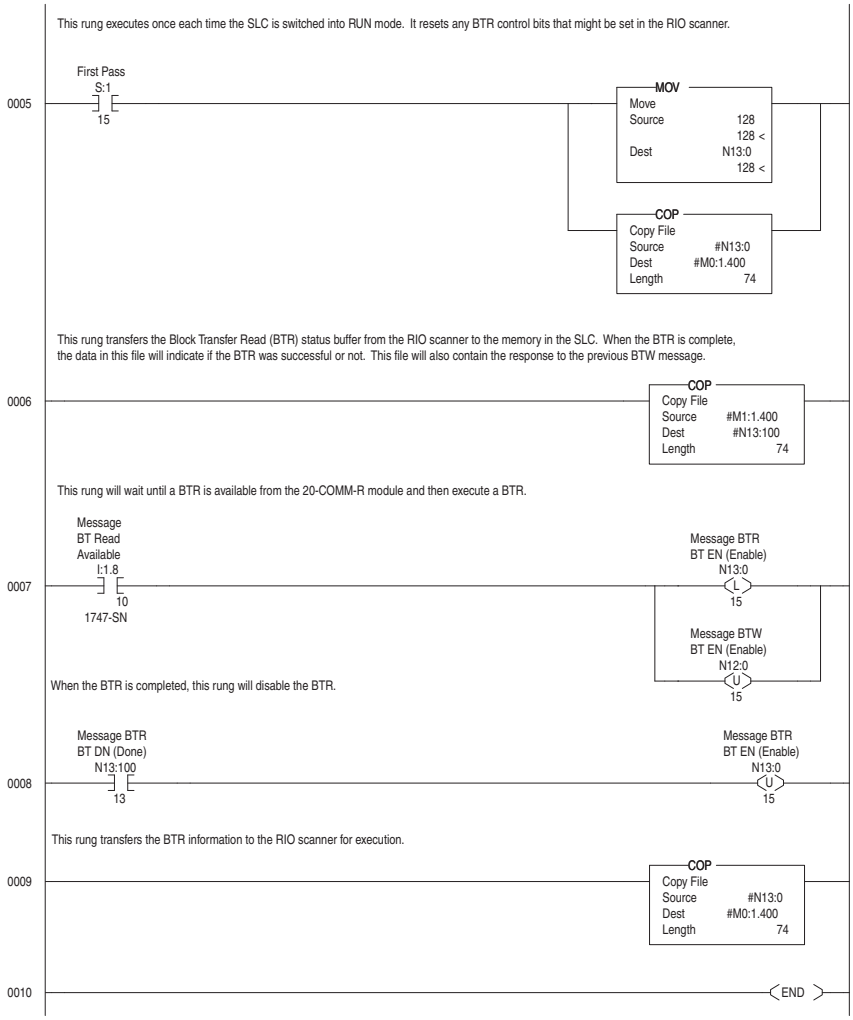


Figure 5.6 SLC 500 Example Ladder Logic for Block Transfer Messaging - continued



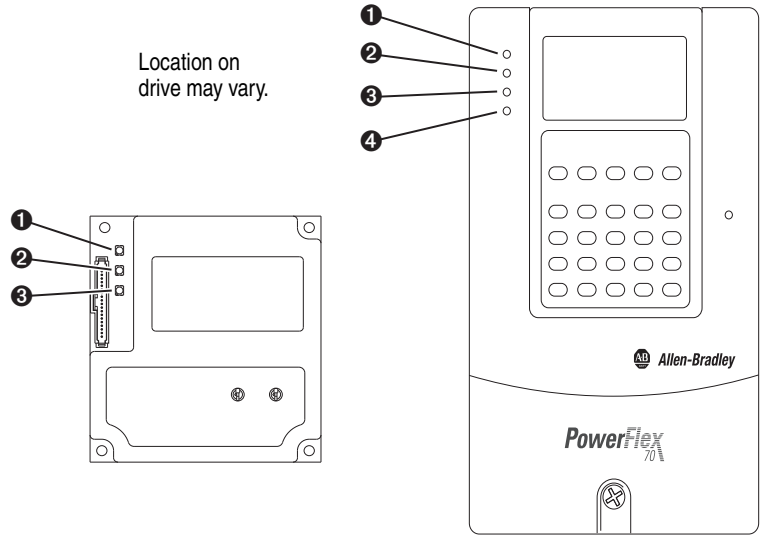
Notes:

Troubleshooting

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

Understanding the Status Indicators

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



Item	Status Indicator	Description	Page
❶	PORT	DPI Connection Status	6-2
❷	MOD	Adapter Status	6-2
❸	NET A	Remote I/O Status	6-3
❹	NET B (only on drive cover)	Not used for Remote I/O	—

PORT Status Indicator

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

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive.
Flashing Red	The adapter is not receiving a ping message from the drive.	• Verify that cables are securely connected and not damaged. Replace cables if necessary. • Cycle power to the drive.
Steady Red	The drive has refused an I/O connection from the adapter. Another DPI peripheral is using the same DPI port as the adapter.	**Important:** Cycle power to the drive after making any of the following corrections: • Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary. • Verify that the DPI drive supports Datalinks. • Configure the adapter to use a Datalink that is not already being used by another peripheral.
Steady Orange	The adapter is connected to a product that does not support Allen-Bradley DPI communications.	Connect the adapter to a product that supports Allen-Bradley DPI communications (for example, a PowerFlex 7-Class drive).
Flashing Green	The adapter is establishing an I/O connection to the drive.	• No action required. Normal behavior if no DPI I/O is enabled. This status indicator will turn steady green or red. • Verify **Parameter 12 - [DPI I/O Cfg]** settings.
Steady Green	The adapter is properly connected and is communicating with the drive.	No action required.

MOD Status Indicator

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

Status	Cause	Corrective Action
Off	The adapter is not powered or is not properly connected to the drive.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive.
Flashing Red	The adapter has failed the firmware test or the Rack Address Rotary Switch setting is invalid. The adapter firmware is being updated.	• Verify that the Rack Address Rotary Switch setting is between 0 and 77 octal or, if all hardware switches are disabled, **Parameter 3 - [RIO Addr Cfg]** is between 0 and 63 decimal. • Clear faults in the adapter. • Cycle power to the drive. • 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, update the adapter with the latest firmware revision.
Steady Red	The adapter has failed the hardware test.	• Cycle power to the drive. • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Place the scanner in RUN mode. • Program the controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller. • Normal behavior if no DPI I/O is enabled.
Steady Green	The adapter is operational and transferring I/O data.	No action required.

NET A Status Indicator

This red/green bicolor LED indicates the status for the Remote I/O network connection as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not properly connected to the network.	• Securely connect the adapter to the drive using the Internal Interface (ribbon) cable and to the network using a Remote I/O cable. • Correctly connect the Remote I/O network cable to the 3-pin Remote I/O plug. • Configure the adapter to use the baud rate at which the network is operating. • Configure the adapter to use a unique rack address on the Remote I/O network. • Apply power to the drive and network. • Apply power to the controller.
Flashing Green	The adapter is properly connected but is not transferring I/O over the network.	• Verify that the scanner is in Run mode. • Verify that the scanner is using the correct rack size for the adapter. • Verify that the adapter is configured for the correct rack size.
Steady Green	The adapter is properly connected and is communicating with the scanner on the network.	No action required.

Viewing Adapter Diagnostic Items

If you encounter unexpected communications problems, the adapter's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. Adapter diagnostic items can be viewed 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 to Access Parameters on page 3-2. 2. Press the ▲ or ▼ key to scroll to **Diagnostics**. 3. Press the ↵ (Enter) key to display the Diagnostics menu in the adapter. 4. Repeat steps 2 and 3 to enter the **Device Items** option. 5. Press the ▲ or ▼ key to scroll through the items.	Main Menu: Diagnostics Parameter Device Select Device Item # 3 Reference

Table 6.A 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. If this diagnostic item is any value other than 1, the values of items 7 through 14 (Datalink A1 In through Datalink D2 In) are not actually being transferred to the drive.
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 from 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	Field Flash Cnt	The present value of the Field Flash Counter.
24	DPI Rx Errors	The present value of the DPI CAN Receive error counter register.
25	DPI Tx Errors	The present value of the DPI CAN Transmit error counter register.
26-27	Reserved	—
28	DPI Switch 0	The present states of all Configuration DIP Switches: Bit 0 DIP SW1 state 0 = open (off), 1 = closed (on) Bit 1 DIP SW2 state 0 = open (off), 1 = closed (on) Bit 2 DIP SW3 state 0 = open (off), 1 = closed (on) Bit 3 DIP SW4 state 0 = open (off), 1 = closed (on) Bit 4 DIP SW5 state 0 = open (off), 1 = closed (on) Bit 5 DIP SW6 state 0 = open (off; always 0 because SW6 is not connected) Bit 6 DIP SW7 state 0 = open (off), 1 = closed (on) Bit 7 DIP SW8 state 0 = open (off), 1 = closed (on) Configuration DIP Switch changes do not take effect until the next time the adapter is reset.
29	Rack Address Switch	The present setting (as a decimal value) of the Rack Address Rotary Switches.

Viewing and Clearing Events

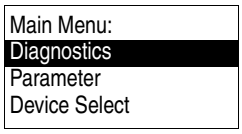
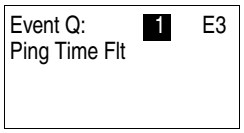
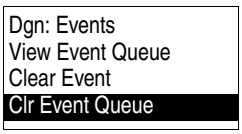
The adapter has an event queue to record significant events that occur in the operation of the adapter. When such an event occurs, an entry is put into the event queue. You can view the event queue with any of these drive configuration tools:

- 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

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 to Access Parameters on page 3-2.	
2. Press the ▲ or ▼ key to scroll to **Diagnostics**.	
3. Press the Enter key to display the Diagnostics menu in the adapter.	
4. Repeat steps 2 and 3 to enter the **Events** option and then **View Event Queue** option.	
5. Press the ▲ or ▼ key to scroll through events. The most recent event is Event 1.	
Clearing Events	
1. Access parameters in the adapter. See Using the PowerFlex 7-Class HIM to Access Parameters on page 3-2.	
2. Press the ▲ or ▼ key to scroll to **Diagnostics**.	
3. Press the Enter key to display the Diagnostics menu in the adapter.	
4. Repeat steps 2 and 3 to enter the **Events** option and then the **Clear Event** option or **Clr Event Queue** option. A message will pop up to confirm that you want to clear the message or queue.	
5. Press the Enter key to confirm your request. If **Clr Event Queue** was selected, all event queue entries will then display 'No Event'.	

Events

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

Table 6.B Adapter Events

Code	Event	Description
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus-off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The adapter is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed after start up.
6	Host Sent Reset	The drive sent a reset event message.
7	EEPROM Sum Flt	The EEPROM in the adapter is corrupt.
8	Online @ 125kbps	The adapter detected that the drive is communicating at 125 kbps.
9	Online @ 500kbps	The adapter detected that the drive is communicating at 500 kbps.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	Dup Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The adapter has logged in for Type 0 control.
13	Type 0 Time Flt	The adapter has not received a Type 0 status message within the specified time.
14	DL Login	The adapter has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The adapter has not received a Datalink message within the specified time.
17	Control Disabled	The adapter has sent a ‘Soft Control Disable’ command to the drive.
18	Control Enabled	The adapter has sent a ‘Soft Control Enable’ command to the drive.
19	Reserved	—
20	Normal Startup	The adapter successfully started up.
21	Message Timeout	A Client-Server message sent by the adapter was not completed within 1 sec.
22	DPI Fault Msg	The DPI Host drive has faulted.
23-27	Reserved	—
28	DPI Fault Clear	The drive issued this because a fault was cleared.
29	Reserved	—
30	NET Comm Flt	The adapter detected a communications fault on the network.
31	NET Sent Reset	The controller issued a reset command to the adapter.
32	NET Idle Flt	The adapter detected an ‘idle’ condition on the network.
33	NET Timeout Flt	The adapter detected a timeout on the network.
34	Flt Cfg Error	One of the Flt Cfg xx parameters is set to a value greater than 65535 and the drive requires a 16-bit value.
35	Reserved	—
36	Manual Reset	The adapter was reset by changing its Reset Module parameter.
37	Language CRC Bad	The language text memory segment is corrupt.

Specifications

This appendix presents the specifications for the adapter.

Communications

Network Protocol Network Baud Rate	 Remote I/O 57.6 Kbps, 115.2 Kbps, or 230.4 Kbps Available baud rates depend on the length of the Remote I/O cable. See Selecting Remote I/O Cables on page 2-1 for more information.
Drive Protocol Data Rates	 DPI 125 Kbps or 500 Kbps

Electrical

Consumption Drive Network	 250 mA at 5V DC supplied by the host drive None

Mechanical

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

Environmental

Temperature Operating Storage	 -10…50 °C (14…122 °F) -40…85 °C (-40…185 °F)
Relative Humidity	5…95% non-condensing
Atmosphere	**Important:** The adapter **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the adapter is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

Certification	Specification
UL	UL508C
cUL	CAN / CSA C22.2 No. 14-M91
CE (1)	EN50178 and EN61800-3
CTick	EN61800-3

(1) The PowerFlex 70 drive passes Second Environment/Industrial. If First Environment/Restricted is needed for radiated emissions, then a ferrite core (Fair-Rite part number 2643102002 or equivalent) must be added to the Remote I/O cable. The PowerFlex 700 drive passes First and Second Environment without the ferrite core.

NOTE: This is a product of category C3 according to IEC 61800-3. It is not intended for operation in a domestic environment.

Adapter Parameters

This appendix provides information about the adapter parameters. For configuration tools to monitor or change parameter values of the drive, adapter, and other connected peripherals, see Configuration Tools on page 3-1.

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.	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.	Values: 0 = 125 Kbps 1 = 500 Kbps Type: Read Only
03	**[RIO Addr Cfg]** Sets the Remote I/O rack address (displayed as a decimal value) used by the adapter if the hardware switches have been disabled. All hardware switches are disabled by setting Configuration DIP Switches SW7 and SW8 both to 'On'. (Updates **Parameter 04 - [RIO Addr Actual]** after reset).	Default: 1 Minimum: 0 Maximum: 63 decimal Type: Read/Write Reset Required: Yes
04	**[RIO Addr Actual]** Displays the Remote I/O rack address (as a decimal value) actually used by the adapter.	Minimum: 0 Maximum: 63 decimal Type: Read Only
05	**[RIO Rate Cfg]** Sets the network baud rate at which the adapter communicates if the hardware switches have been disabled. All hardware switches are disabled by setting Configuration DIP Switches SW7 and SW8 both to 'On'. (Updates **Parameter 06 - [RIO Rate Act]** after a reset.)	Default: 0 = 57.6 Kbps Values: 0 = 57.6 Kbps 1 = 115.2 Kbps 2 = 230.4 Kbps Type: Read/Write Reset Required: Yes
06	**[RIO Rate Actual]** Displays the actual network baud rate used by the adapter.	Values: 0 = 57.6 Kbps 1 = 115.2 Kbps 2 = 230.4 Kbps Type: Read Only
07	**[Ref/Fdbk Size]** Displays the size of the Reference/Feedback. The drive determines the size of the Reference/ Feedback.	Values: 0 = 16-bit 1 = 32-bit Type: Read Only
08	**[Datalink Size]** Displays the size of each Datalink word. The drive determines the size of Datalinks.	Values: 0 = 16-bit 1 = 32-bit Type: Read Only

Parameter No.	Name and Description	Details
09	**[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.	
10	**[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 10 - [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).	
11	**[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 11 - [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).	

Parameter No.	Name and Description	Details
12	**[DPI I/O Config]** 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
13	**[DPI I/O Active]** Displays the I/O that the adapter is actively transmitting. The value of this parameter will usually be equal to the value of **Parameter 12 - [DPI I/O Config]** unless the parameter was changed and the adapter was not reset.	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
14	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • **Parameter 10 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 11 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. 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
15	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • **Parameter 10 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 11 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. Adapter **Parameter 7 - [Ref/Fdbk Size]** displays the size of the Reference (16-bit or 32-bit) in the drive.	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
16 17 18 19 20 21 22 23	**[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 10 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 11 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. Adapter **Parameter 8 - [Datalink Size]** displays the size of the Datalinks (16-bit or 32-bit) in the drive.	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.
24	**[Switches]** Displays the status of the adapter Configuration DIP Switches. By default, these switches are 'enabled', and the adapter is configured based on their settings. If SW7 and SW8 are both set to 'On', all hardware switches are 'disabled' and the adapter is configured using values in the following adapter parameters: • **Parameter 3 - [RIO Addr Cfg]** • **Parameter 5 - [RIO Rate Cfg]** • **Parameter 25 - [Start RIO Group]** • **Parameter 26 - [Last RIO Rack]** • **Parameter 27 - [Rack Size]**	Bit Values: 0 = Disabled 1 = Enabled Type: Read Only
25	**[Start RIO Group]** Sets the Remote I/O starting module group if the hardware switches have been disabled. All hardware switches are disabled by setting Configuration DIP Switches SW7 and SW8 both to 'On'.	Default: 0 = Group 0 Values: 0 = Group 0 1 = Group 2 2 = Group 4 3 = Group 6 (allowed for 1/4 rack only) Type: Read/Write Reset Required: Yes
26	**[Last RIO Rack]** Sets the last (or not last) physical group within a rack address on a Remote I/O network if the hardware switches have been disabled. All hardware switches are disabled by setting Configuration DIP Switches SW7 and SW8 both to 'On'. Set this parameter to '1' (Enabled) to indicate that a drive is the last rack.	Default: 0 = Disabled Bit Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: Yes
27	**[Rack Size]** Sets the rack size if the hardware switches have been disabled. All hardware switches are disabled by setting Configuration DIP Switches SW7 and SW8 both to 'On'.	Default: 0 = 1/4 rack Bit Values: 0 = 1/4 rack 1 = 1/2 rack Type: Read/Write Reset Required: Yes

CIP Objects

This appendix presents information about the CIP (Common Industrial Protocol) objects that can be accessed for Block Transfer messages. For information on the format of Block Transfer messages and example ladder logic programs, see Chapter 5, Using Block Transfer Messaging.

CIP Services

The following CIP services work with most objects in this appendix.

Service Name	Service Code		Description
	Hexadecimal	Decimal	
Get Attribute Single	0x0E	14	Read a single attribute
Set Attribute Single	0x10	16	Write to a single attribute

Common Messages

The following table lists messages that are commonly used to view and edit information in a device. Other messages can be sent using the values within each object listed.

All values are in decimal.

Message	Service	Class	Instance	Attribute	Page
Device Properties					
Clear Run Time Accumulator (value to send = 1)	14	155	0	4	C-19
Load Stored Values (value to send = 2)	16	147	0	2	C-5
Load Default Values (value to send = 3)	16	147	0	2	C-5
Read Product Family ID	14	146	0	0	C-3
Read Product Family Name	14	146	0	1	C-3
Read Real Time Clock Data	14	155	1	0	C-19
Read Reference Time Stamp Data					
Read Run Time Accumulator	14	155	timer #	2	C-19
Read User Text String	14	146	0	5	C-3
Store Values to NVS (value to send = 1)	16	147	0	2	C-5
Write Real Time Clock Data	16	155	1	2	C-19
Write User Text String	16	146	0	5	C-3
Parameters					
Read Parameter Full	14	147	Param. #	7	C-6
Read Parameter Value	14	147	Param. #	9 = NVS 10 = RAM	C-6
Read Scattered Parameter Value	75	147	0	0	C-6
Write Parameter Values	16	147	Param #	9 = NVS 10 = RAM	C-6
Write Scattered Parameter Values	76	147	0	0	C-6
Links					
Clear All Links (value to send = 1)	16	147	0	9	C-5
Clear Parameter Link (value to send = 0)	16	147	Param. #	11	C-6
Read Parameter Link	14	147	Param. #	11	C-6
Read Scattered Parameter Links	75	147	Param. #s	11	C-6
Write Parameter LInk	16	147	Param. #	11	C-6
Write Scattered Parameter Link	76	147	Param. #s	11	C-6
Faults/Event					
Clear Fault/Event (value to send = 1)	16	151	0	3	C-15
Clear Fault/Event Queue (value to send = 2)	16	151	0	3	C-15
Read Fault/Event	14	151	Fault #	1	C-16
Read Fault/Event Full	14	151	Fault #	0	C-16
Read Fault/Event Queue Size	14	151	0	2	C-15
Read Number of Entries in Queue	14	151	0	6	C-15
Read Trip Fault Queue Number	14	151	0	4	C-15
Reset Device (value to send = 3)	16	151	0	3	C-15
Alarms					
Clear Alarm (value to send = 1)	16	152	0	3	C-17
Clear Alarm Queue (value to send = 2)	16	152	0	3	C-17
Read Alarm	14	152	Alarm #	1	C-18
Read Alarm Full	14	152	Alarm #	0	C-18
Read Number of Entries in Queue	14	152	0	5	C-17
Read Alarm Queue Size	14	152	0	2	C-17

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

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

Example	Description
0	Class Attributes (Drive)
1	Drive Component 1
2	Drive Component 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Component 1
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	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	Read Only	Family Text	STRING[16]	Text identifying the device.
2	Read/Write	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	Read Only	Product Series	BYTE	1 = A 2 = B …
4	Read Only	Number of Components	BYTE	Number of components (for example, main control board, I/O boards) in the device.
5	Read/Write	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name.
6	Read Only	Status Text	STRING[12]	Text describing the status of the device.
7	Read Only	Configuration Code	BYTE	Identification of variations.
8	Read Only	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Read Only	Brand Code	WORD	0x0001 = Allen-Bradley
11	Read Only	NVS Checksum	WORD	Checksum of the Non-Volatile Storage in a device.
12	Read Only	Class Revision	WORD	2 = DPI

Attribute ID	Access Rule	Name	Data Type	Description
13	Read Only	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)
15	Read Only	Languages Supported	STRUCT of: BYTE BYTE[n]	 Number of Languages Language Codes (see Class Attribute 2)
16	Read Only	Date of Manufacture	STRUCT of: WORD BYTE BYTE	 Year Month Day
17	Read Only	Product Revision	STRUCT of: BYTE BYTE	 Major Firmware Release Minor Firmware Release
18	Read Only	Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF
19	Read/Write	Language Selected	BYTE	0 = Default (HIM will prompt at start up) 1 = Language was selected (no prompt)
20	Read/Write	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware flashed into the device.
128	Read Only	Customization Code	WORD	Code identifying the customized device.
129	Read Only	Customization Revision Number	WORD	Revision of the customized device.
130	Read Only	Customization Device Text	STRING[32]	Text identifying the customized device.

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Read Only	Component Name	STRING[32]	Name of the component
4	Read Only	Component Firmware Revision	STRUCT of: BYTE BYTE	 Major Revision Minor Revision
5	Read Only	Component Hardware Change Number	BYTE	0 = Not available
6	Read Only	First Flash Object Instance	WORD	First instance in the Flash Object used for the firmware in the component.
7	Read Only	Number of Flash Object Instances	BYTE	Number of instances in the Flash Object for this component.
8	Read Only	Component Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DPI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

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

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
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Number of Instances	WORD	Number of parameters in the device
1	Read/Write	Write Protect Password	WORD	0 = Password disabled n = Password
2	Write	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	Read Only	NVS Parameter Value Checksum	WORD	Checksum of all parameter values in a user set in NVS
4	Read Only	NVS Link Value Checksum	WORD	Checksum of parameter links in a user set in NVS
5	Read Only	First Accessible Parameter	WORD	First parameter available if parameters are protected by passwords. A “0” indicates all parameters are protected.
7	Read Only	Class Revision	WORD	2 = DPI
8	Read Only	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	Write	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
7	Read Only	DPI Online Read Full	STRUCT of: BOOL[32] CONTAINER[1] CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT BYTE[3] BYTE STRING[16]	 Descriptor (see page C-7) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (for example, Amp, Hz) Multiplier [2] Divisor [2] Base [2] Offset [2] Link (source of the value) (0 = no link) Always zero (0) Parameter name
8	Read Only	DPI Descriptor	BOOL[32]	Descriptor (see page C-7)
9	Read/Write	DPI Parameter Value	Various	Parameter value in NVS. [3]
10	Read/Write	DPI RAM Parameter Value	Various	Parameter value in temporary memory.
11	Read/Write	DPI Link	BYTE[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Read Only	Help Object Instance	WORD	ID for help text for this parameter
13	Read Only	DPI Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	 Descriptor (see page C-7) Parameter value Minimum value Maximum value Default value Parameter name Units (for example, Amp, Hz)
14	Read Only	DPI Parameter Name	STRING[16]	Parameter name
15	Read/Write	DPI Parameter Alias	STRING[16]	Customer supplied parameter name.
16	Read Only	Parameter Processing Error	BYTE	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum

(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 C-8.

(3) Do **not** continually write parameter data to NVS. See the attention on page 5-1.

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = BYTE used as an array of Boolean 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
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
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	Reserved	Must be zero
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 1)	Right bit is least significant bit (16). 000 = Reserved 001 = DWORD used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 2)	
18	Extended Data Type (Bit 3)	
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.

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

Object-Specific Services

Service Code	Implemented for:		Service Name	Allocation Size (in bytes)	
	Class	Instance		Par. Number	Par. Value
0x4B (1)	Yes	No	Get_Attributes_Scattered	2	2
0x4C (1)	Yes	No	Set_Attributes_Scattered	2	2
0x4D (2)	Yes	No	Get_Attributes_Scattered	4	4
0x4E (2)	Yes	No	Set_Attributes_Scattered	4	4

(1) Must be directed to Instance 0 and Attribute 0.

(2) These services are supported only when the adapter is used with a PowerFlex 750-Series drive.

Format for Get_Attributes_Scattered Service

The structure shown below can get up to eighteen parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated parameter value field actually contains a DPI error code.

		Request (Write Data)		Response (Read Data)	
	Word	*High Byte*	*Low Byte*	*High Byte*	*Low Byte*
	0	0x00	Length (Bytes)	0x00	Length (Bytes)
	1	DPI Port #	0x81	Status Code	Status Size
	2	0x00	CIP Service	Status Information	
	3	Class		Parameter Number	
	4	Instance		Parameter Value LSW	
	5	Attribute		Parameter Value MSW	
	6	Parameter Number		Parameter Number	
	7	Pad Word		Parameter Value LSW	
	8	Pad Word		Parameter Value MSW	
	9	Parameter Number		Parameter Number	
	10	Pad Word		Parameter Value LSW	
	11	Pad Word		Parameter Value MSW	
	12	Parameter Number		Parameter Number	
	13	Pad Word		Parameter Value LSW	
	14	Pad Word		Parameter Value MSW	
	15	Parameter Number		Parameter Number	
	16	Pad Word		Parameter Value LSW	
20 word Block Transfer	17	Pad Word		Parameter Value MSW	
	18	Parameter Number		Parameter Number	
	19	Pad Word		Parameter Value LSW	
	20	Pad Word		Parameter Value MSW	
	21	Parameter Number		Parameter Number	
	22	Pad Word		Parameter Value LSW	
	23	Pad Word		Parameter Value MSW	
	24	Parameter Number		Parameter Number	
	25	Pad Word		Parameter Value LSW	
	26	Pad Word		Parameter Value MSW	
30 word Block Transfer	27	Parameter Number		Parameter Number	
	28	Pad Word		Parameter Value LSW	
	29	Pad Word		Parameter Value MSW	

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60 word Block Transfer

Word	Request (Write Data)	Response (Read Data)
30	Parameter Number	Parameter Number
31	Pad Word	Parameter Value LSW
32	Pad Word	Parameter Value MSW
33	Pad Word	Parameter Number
34	Pad Word	Parameter Value MSW
35	Parameter Number	Parameter Number
36	Pad Word	Parameter Value LSW
37	Pad Word	Parameter Value MSW
38	Parameter Number	Parameter Number
39	Pad Word	Parameter Value LSW
40	Pad Word	Parameter Value MSW
41	Parameter Number	Parameter Number
42	Pad Word	Parameter Value LSW
43	Pad Word	Parameter Value MSW
44	Parameter Number	Parameter Number
45	Pad Word	Parameter Value LSW
46	Pad Word	Parameter Value MSW
47	Parameter Number	Parameter Number
48	Pad Word	Parameter Value LSW
49	Pad Word	Parameter Value MSW
50	Parameter Number	Parameter Number
51	Pad Word	Parameter Value LSW
52	Pad Word	Parameter Value MSW
53	Parameter Number	Parameter Number
54	Pad Word	Parameter Value LSW
55	Pad Word	Parameter Value MSW
56	Parameter Number	Parameter Number
57	Pad Word	Parameter Value LSW
58	Pad Word	Parameter Value MSW
59	Pad Word	Not Used

The data in this example is for a Get_Attributes_Scattered of PowerFlex 70 parameters 1 - [Output Freq], 3 - [Output Current] and 6 - [Output Voltage] from a device at node address 1.

Request Data for Get_Attributes_Scattered

Address	Value (hex)	Description	Page
N30:0	001C	Length = 28 bytes (1C hex)	5-3
N30:1	0081	Port = 00, 0 x 81	5-3
N30:2	004B	0 x 00, Service = Get_Attributes_Scattered	5-3
N30:3	0093	Class = 93 (DPI Parameter Object)	C-5
N30:4	0000	Instance = Class Attributes (drive)	C-5
N30:5	0000	Attribute (not used for this service)	C-5
N30:6	0001	Parameter Number 1	n/a
N30:7	0000	Pad Word	
N30:8	0000	Pad Word	
N30:9	0003	Parameter Number 3	
N30:10	0000	Pad Word	
N30:11	0000	Pad Word	
N30:12	0006	Parameter Number 6	
N30:13	0000	Pad Word	
N30:14	0000	Pad Word	

Response Data for Get_Attributes_Scattered

Address	Value (hex)	Description	Page
N30:70	0014	Length = 20 bytes (14 hex)	5-4
N30:71	0000	Status Code = 00 (successful transaction)	5-4
		Status Size = 00	5-4
N30:72	0000	Status Information = 0	5-4
N30:73	0001	Parameter Number 1	n/a
N30:74	0258	Value = 600 (258 hex) = 60.0 Hz	
N30:75	0000		
N30:76	0003	Parameter Number 3	
N30:77	0001	Value = 1 (1 hex) = 0.1A	
N30:78	0000		
N30:79	0006	Parameter Number 6	
N30:80	0864	Value = 2148 (864 hex) = 214.8V AC	
N30:81	0000		

Format for Set_Attributes_Scattered Service

The structure shown below can set up to eighteen parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated pad word field contains an error code.

		Request (Write Data)		Response (Read Data)	
	Word	*High Byte*	*Low Byte*	*High Byte*	*Low Byte*
	0	0x00	Length (Bytes)	0x00	Length (Bytes)
	1	DPI Port #	0x81	Status Code	Status Size
	2	0x00	CIP Service	Status Information	
	3	Class		Parameter Number	
	4	Instance		Pad Word or Error Code	
	5	Attribute		Pad Word	
	6	Parameter Number		Parameter Number	
	7	Parameter Value LSW		Pad Word or Error Code	
	8	Parameter Value MSW		Pad Word	
	9	Parameter Number		Parameter Number	
	10	Parameter Value LSW		Pad Word or Error Code	
	11	Parameter Value MSW		Pad Word	
	12	Parameter Number		Parameter Number	
	13	Parameter Value LSW		Pad Word or Error Code	
	14	Parameter Value MSW		Pad Word	
	15	Parameter Number		Parameter Number	
	16	Parameter Value LSW		Pad Word or Error Code	
20 word Block Transfer	17	Parameter Value MSW		Pad Word	
	18	Parameter Number		Parameter Number	
	19	Parameter Value LSW		Pad Word or Error Code	
	20	Parameter Value MSW		Pad Word	
	21	Parameter Number		Parameter Number	
	22	Parameter Value LSW		Pad Word or Error Code	
	23	Parameter Value MSW		Pad Word	
	24	Parameter Number		Parameter Number	
	25	Parameter Value LSW		Pad Word or Error Code	
	26	Parameter Value MSW		Pad Word	
30 word Block Transfer	27	Parameter Number		Parameter Number	
	28	Parameter Value LSW		Pad Word or Error Code	
	29	Parameter Value MSW		Pad Word	

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	Word	Request (Write Data)		Response (Read Data)
	30	Parameter Number		Parameter Number
	31	Parameter Value LSW		Pad Word or Error Code
	32	Parameter Value MSW		Pad Word
	33	Parameter Number		Parameter Number
	34	Parameter Value LSW		Pad Word or Error Code
	35	Parameter Value MSW		Pad Word
	36	Parameter Number		Parameter Number
	37	Parameter Value LSW		Pad Word or Error Code
	38	Parameter Value MSW		Pad Word
	39	Parameter Number		Parameter Number
	40	Parameter Value LSW		Pad Word or Error Code
	41	Parameter Value MSW		Pad Word
	42	Parameter Number		Parameter Number
	43	Parameter Value LSW		Pad Word or Error Code
	44	Parameter Value MSW		Pad Word
	45	Parameter Number		Parameter Number
	46	Parameter Value LSW		Pad Word or Error Code
	47	Parameter Value MSW		Pad Word
	48	Parameter Number		Parameter Number
	49	Parameter Value LSW		Pad Word or Error Code
	50	Parameter Value MSW		Pad Word
	51	Parameter Number		Parameter Number
	52	Parameter Value LSW		Pad Word or Error Code
	53	Parameter Value MSW		Pad Word
	54	Parameter Number		Parameter Number
	55	Parameter Value LSW		Pad Word or Error Code
	56	Parameter Value MSW		Parameter Number
60 word Block Transfer	57	Parameter Number		Pad Word or Error Coder
	58	Parameter Value LSW		Pad Word
	59	Parameter Value MSW		Not Used

The data in this example is for a Set_Attributes_Scattered of PowerFlex 70 parameters 140 - [Accel Time 1], 142 - [Decel Time 1] and 100 - [Jog Speed] to a device at node address 1.

Request Data for Set_Attributes_Scattered

Address	Value (hex)	Description	Page
N30:0	001C	Length = 28 bytes (1C hex)	5-3
N30:1	0081	Port = 00, 0 x 81	5-3
N30:2	004C	0 x 00, Service = Set_Attributes_Scattered	5-3
N30:3	0093	Class = 93 (DPI Parameter Object)	C-5
N30:4	0000	Instance = Class Attributes (drive)	C-5
N30:5	0000	Attribute (not used for this service)	C-5
N30:6	008C	Parameter Number 140 (8C hex)	n/a
N30:7	0032	Value = 50 (32 hex) = 5.0 seconds	
N30:8	0000		
N30:9	008E	Parameter Number 142 (8E hex)	
N30:10	0032	Value = 50 (32 hex) = 5.0 seconds	
N30:11	0000		
N30:12	0064	Parameter Number 100 (64 hex)	
N30:13	0064	Value = 100 (64 hex) = 10.0 Hz	
N30:14	0000		

Response Data for Set_Attributes_Scattered

Address	Value (hex)	Description	Page
N30:70	0014	Length = 20 bytes (14 hex)	5-4
N30:71	0000	Status Code = 00 (successful transaction)	5-4
		Status Size = 00	5-4
N30:72	0000	Status Information = 0	5-4
N30:73	008C	Parameter Number 140 (8C hex)	n/a
N30:74	0000	No Error	
N30:75	0000		
N30:76	008E	Parameter Number 142 (8E hex)	
N30:77	0000	No Error	
N30:78	0000		
N30:79	0064	Parameter Number 100 (64 hex)	
N30:80	0000	No Error	
N30:81	0000		

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.

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	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Maximum number of faults/events that the device can record in its queue
3	Write	Fault Command Write	BYTE	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Read Only	Fault Trip Instance Read	WORD	Fault that tripped the device. For adapters, this value is always 1 when faulted.
5	Read Only	Fault Data List	STRUCT of: BYTE BYTE WORD[n]	Reserved
6	Read Only	Number of Recorded Faults	WORD	Number of faults/events in the queue. A ‘0’ indicates the fault queue is empty.
7	Read Only	Fault Parameter Reference	WORD	Reserved

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Full/All Information	STRUCT of	
			WORD	Fault code
			STRUCT of:	Fault source
			BYTE	DPI port
			BYTE	DPI Device Object
			STRING[16]	Fault text
			STRUCT of:	Fault time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15]: Not used
			WORD	Reserved
			CONTAINER[n]	Reserved
1	Read Only	Basic Information	STRUCT of:	
			WORD	Fault code
			STRUCT of:	Fault source
			BYTE	DPI port
			BYTE	DPI Device Object
			STRUCT of:	Fault time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15]: Not used

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.

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	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Maximum number of alarms that the device can record in its queue
3	Write	Alarm Command Write	BYTE	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device
4	Read Only	Fault Data List	STRUCT of: BYTE BYTE WORD[n]	Reserved
5	Read Only	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	Read Only	Full/All Information	STRUCT of	
			WORD	Alarm code
			STRUCT of:	Alarm source
			BYTE	DPI port
			BYTE	DPI Device Object
			STRING[16]	Alarm text
			STRUCT of:	Alarm time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15] Reserved
			WORD	Reserved
			CONTAINER[n]	Reserved
1	Read Only	Basic Information	STRUCT of	
			WORD	Alarm code
			STRUCT of:	Alarm source
			BYTE	DPI port
			BYTE	DPI Device Object
			STRUCT of:	Alarm time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15] Reserved

DPI Time Object

Class Code

Hexadecimal	Decimal
0x9B	155

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	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Number of timers in the object, excluding the real-time clock that is predefined.
3	Read Only	First Device Specific Timer	WORD	Instance of the first timer that is not predefined.
4	Write	Time Command Write	BYTE	0 = No Operation 1 = Clear all timers (Does not clear the real-time clock or read only timers)

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Read Full	STRUCT of: STRING[16] LWORD -or- STRUCT BOOL[16]	 Name of the timer Elapsed time in milliseconds unless timer is a real-time clock (see attribute 2) See Attribute 3
1	Read Only	Timer Text	STRING[16]	Name of the timer
2	Read/Write	Timer Value	LWORD -or- STRUCT of: WORD BYTE BYTE BYTE BYTE BYTE BYTE	Elapsed time in milliseconds unless the timer is a real-time clock. Real-Time Clock Data: Milliseconds (0…999) Seconds (0…59) Minutes (0…59) Hours (0…23) Days (1…31) Months (1 = January, 12 = December) Years (since 1972)
3	Read Only	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

Notes:

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 70/700/700H, and 700L (with 700 Control) Drives

Logic Command Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Command**	**Description**
															x	Stop [1]	0 = Not Stop 1 = Stop
														x		Start [1][2]	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog (Par. 100) 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command (Par. 140) 10 = Accel Rate 2 Command (Par. 141) 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command (Par. 142) 10 = Decel Rate 2 Command (Par. 143) 11 = Hold Decel Rate
	x	x	x													Reference Select [3]	000 = No Command 001 = Ref A Select (Par. 90) 010 = Ref B Select (Par. 93) 011 = Preset 3 (Par. 103) 100 = Preset 4 (Par. 104) 101 = Preset 5 (Par. 105) 110 = Preset 6 (Par. 106) 111 = Preset 7 (Par. 107)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

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

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

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

Logic Status Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Status	Description
															x	Ready	0 = Not Ready (Par. 214) 1 = Ready
														x		Active	0 = Not Active (Running) 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm (Par. 211 & 212) 1 = Alarm
								x								Fault	0 = No Fault (Par. 243 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control (1)	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference	0000 = Ref A Auto (Par. 90) 0001 = Ref B Auto (Par. 93) 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

(1) See 'Owners' in drive User Manual for further information.

PowerFlex 700S (Phase II Control) and 700L (with 700S Control) Drives

Logic Command Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Command**	**Description**
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start (1)	0 = Not Start 1 = Start
													x			Jog 1	0 = Not Jog using [Jog Speed 1] (Par. 29) 1 = Jog using [Jog Speed 1] (Par. 29)
												x				Clear Fault (2)	0 = Not Clear Fault 1 = Clear Fault
										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Reserved	
								x								Jog 2	0 = Not Jog using [Jog Speed 2] (Par. 39) 1 = Jog using [Jog Speed 2] (Par. 39)
							x									Current Limit Stop	0 = Not Current Limit Stop 1 = Current Limit Stop
						x										Coast Stop	0 = Not Coast to Stop 1 = Coast to Stop
					x											Reserved	
				x												Reserved	
			x													Spd Ref Sel0	
		x														Spd Ref Sel1	
	x															Spd Ref Sel2	
x																Reserved	

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

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

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

Logic Status Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Status	Description
															x	Active	0 = Not Active 1 = Active
														x		Running	0 = Not Running 1 = Running
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Jogging	0 = Not Jogging 1 = Jogging
								x								Fault	0 = No Fault (Par. 323, 324, 325) 1 = Fault
							x									Alarm	0 = No Alarm (Par. 326, 327, 328) 1 = Alarm
						x										Flash Mode	0 = Not in Flash Mode 1 = In Flash Mode
					x											Run Ready	0 = Not Ready to Run (Par. 156) 1 = Ready to Run
				x												At Limit (1)	0 = Not At Limit (Par. 304) 1 = At Limit
			x													Tach Loss Sw	0 = Not Tach Loss Sw 1 = Tach Loss Sw
		x														At Zero Spd	0 = Not At Zero Speed 1 = At Zero Speed
	x															At Setpt Spd	0 = Not At Setpoint Speed 1= At Setpoint Speed
x																Enable	0 = Not Enabled 1 = Enabled

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

PowerFlex 750-Series Drives

Important: When using a 20-COMM-R adapter with a PowerFlex 750-Series drive, the upper word (bits 16…31) of the Logic Command and Logic Status words are not accessible and cannot be used.

Logic Command Word

Logic Bits																	
31…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 (2)	0 = Not Jog 1 (Par. 556) 1 = Jog 1
												x				Clear Fault (3)	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							Manual	0 = Not Manual 1 = Manual
								x								Reserved	
						x	x									Accel Time	00 = No Command 01 = Use Accel Time 1 (Par. 535) 10 = Use Accel Time 2 (Par. 536) 11 = Use Present Time
				x	x											Decel Time	00 = No Command 01 = Use Decel Time 1 (Par. 537) 10 = Use Decel Time 2 (Par. 538) 11 = Use Present Time
			x													Ref Select 1	000 = No Command 001 = Ref A Select (Par. 545) 010 = Ref B Select (Par. 550) 011 = Preset 3 (Par. 573) 100 = Preset 4 (Par. 574) 101 = Preset 5 (Par. 575) 110 = Preset 6 (Par. 576) 111 = Preset 7 (Par. 577)
		x														Ref Select 2	
	x															Ref Select 3	
x																Reserved	

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

(2) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Jog 1/Jog 2 condition will jog the drive. A transition to a '0' will stop the drive.

(3) To perform this command, the value must switch from '0' to '1'.

Logic Status Word

Logic Bits																	
31…15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Run Ready	0 = Not Ready to Run (Par. 933) 1 = Ready to Run
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accelerating	0 = Not Accelerating 1 = Accelerating
										x						Decelerating	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm (Par. 959 and 960) 1 = Alarm
								x								Fault	0 = No Fault (Par. 952 and 953) 1 = Fault
							x									At Setpt Spd	0 = Not at Setpoint Speed 1 = At Setpoint Speed
						x										Manual	0 = Manual Mode Not Active 1 = Manual Mode Active
					x											Spd Ref ID 0	00000 = Reserved 00001 = Auto Ref A (Par. 545) 00010 = Auto Ref B (Par. 550) 00011 = Auto Preset Speed 3 (Par. 573) 00100 = Auto Preset Speed 4 (Par. 574) 00101 = Auto Preset Speed 5 (Par. 575) 00110 = Auto Preset Speed 6 (Par. 576) 00111 = Auto Preset Speed 7 (Par. 577) 01000 = Reserved 01001 = Reserved 01010 = Reserved 01011 = Reserved 01100 = Reserved 01101 = Reserved 01110 = Reserved 01111 = Reserved 10000 = Man Port 0 10001 = Man Port 1 10010 = Man Port 2 10011 = Man Port 3 10100 = Man Port 4 10101 = Man Port 5 10110 = Man Port 6 10111 = Reserved 11000 = Reserved 11001 = Reserved 11010 = Reserved 11011 = Reserved 11100 = Reserved 11101 = Man Port 13 (Emb. ENET) 11110 = Man Port 14 (Drive Logix) 11111 = Alternate Man Ref Sel
				x												Spd Ref ID 1	
			x													Spd Ref ID 2	
		x														Spd Ref ID 3	
	x															Spd Ref ID 4	
x																Reserved	

PowerFlex Digital DC Drives Logic Command Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Stop (1)	0 = Not Stop 1 = Stop
														x		Start (1)(2)	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog (Par. 266) 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 = Use Accel Rate 1 (Par. 660) 10 = Use Accel Rate 2 (Par. 24) 11 = Use Present Time
				x	x											Decel Rate	00 = No Command 01 = Use Decel Rate 1 (Par. 662) 10 = Use Decel Rate 2 (Par. 32) 11 = Use Present Time
	x	x	x													Reference Select (3)	000 = No Command 001 = Ref. 1 (Spd Ref A, Par. 44) 010 = Ref. 2 (Spd Ref B, Par. 48) 011 = Ref. 3 (Preset Spd 3, Par. 156) 100 = Ref. 4 (Preset Spd 4, Par. 157) 101 = Ref. 5 (Preset Spd 5, Par. 158) 110 = Ref. 6 (Preset Spd 6, Par. 159) 111 = Ref. 7 (Preset Spd 7, Par. 160)
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 133…144) is programmed for 2-Wire Control (option 5 'Run', 6 'Run Forward', or 7 'Run Reverse').

(3) This Reference Select will not function if a digital input (parameters 133…144) is programmed for 'Speed Sel 1, 2, or 3' (option 17, 18, or 19). 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. 1403) 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. 1380) 1 = Alarm
								x								Fault	0 = No Fault (Par. 1351) 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 = Reserved 111 = No Local
x	x	x	x													Reference Source	0000 = Spd Ref A Auto (Par. 44) 0001 = Spd Ref B Auto (Par. 48) 0010 = Preset Spd 2 Auto 0011 = Preset Spd 3 Auto 0100 = Preset Spd 4 Auto 0101 = Preset Spd 5 Auto 0110 = Preset Spd 6 Auto 0111 = Preset Spd 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 = Reserved 1111 = Jog Ref

(1) See 'Owners' in drive User Manual for further information.

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 Remote I/O. 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-R Remote I/O adapter connects PowerFlex 7-Class drives to a Remote I/O network. Adapters are sometimes also called ‘cards’, ‘embedded communication options’, ‘gateways’, ‘modules’, or ‘peripherals’.

B

Baud Rate

A unit of signaling speed equal to the number of discrete conditions or signal events per second. Remote I/O networks support baud rates of 57.6 Kbps, 115.2 Kbps, or 230.4 Kbps. The baud rate that you use on a network depends on cable length. See Selecting Remote I/O Cables on page 2-1 for information on cables.

Block Transfer Messages

A block transfer message is a data transfer mechanism that allows transfers of large amounts of data. The 20-COMM-R Remote I/O adapter uses Block Transfer for two types of data.

Block Transfers that are 18 words or less in length are used to transfer I/O data such as Reference/Feedback and Datalink values. These Block Transfers are often referred to as ‘Block Transfer I/O’.

Block Transfers that are 20, 30, or 60 words in length are used to transfer Explicit Messages that can access parameters and other data in a DPI device such as a PowerFlex drive. These Block Transfers are often referred to as Block Transfer Messaging. Block Transfer Messaging is often used to read and write several parameters per Explicit Message using the ‘Get Attributes Scattered’ and ‘Set Attributes Scattered’ services.

Size in Words	Purpose	See
18 or fewer	I/O	Chapter 4, Using Discrete and Block Transfer I/O
20, 30, or 60	Explicit Messaging	Chapter 5, Using Block Transfer Messaging

A Block Transfer Read (BTR) is initiated by the controller and contains no data. The target device sends data in response to this request.

A Block Transfer Write (BTW) is initiated by the controller and contains data for the target device. The target device only acknowledges the successful receipt of the data.

C

CAN (Controller Area Network)

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

CIP (Common Industrial Protocol)

CIP is the transport and application layer protocol used by some scanners on Remote I/O networks. The protocol is used for implicit messaging (real-time I/O) and Block Transfer messaging (configuration, data collection, and diagnostics).

Client/Server Network

This type of network has a server respond to client requests. For example, the Remote I/O adapter is a server of data and responds to the requests of client devices (for example, controllers).

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 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

Datalinks

A Datalink is a type of pointer used by PowerFlex 7-Class drives to transfer data to and from the controller. Datalinks allow specified parameters to be read or written to without using explicit Block Transfer messages. When enabled, each Datalink consumes either two 16-bit or two 32-bit words in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI (Drive Peripheral Interface)

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

DPI Peripheral

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

DPI Product

A device that uses the DPI communication 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.

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.

H

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.

The 20-COMM-R adapter supports two types of I/O: Discrete and Block Transfer.

L

Last RIO Rack

The last rack switch or parameter setting notifies a controller that the adapter is the last physical device with its rack address. You must set this switch or parameter to ‘On’ or ‘enabled’ if the drive is the last device with a specific rack address and you are using a PLC-2 controller. We also recommend that you set this switch or parameter to ‘On’ or ‘enabled’ when using other controllers.

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 Appendix D.

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 Appendix D.

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

Ping

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

PowerFlex 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.

PowerFlex 750-Series (Architecture Class) Drives

The Allen-Bradley PowerFlex 750-Series of drives supports DPI and, at the time of publication, includes the PowerFlex 753 and PowerFlex 755 drives.

R

Rack Address

Each device on a network must have a rack address that the controller it intends to communicate with will recognize. A rack address and starting module group are used to identify each device on a Remote I/O network. Although the adapter supports a rack address of up to 77 Octal, not all controllers recognize all of the addresses—and Remote I/O channels can support only 32 devices. See your controller documentation for appropriate addresses. Rack addresses use an octal numbering convention.

Rack Size

The rack size determines the number of 16-bit words of discrete I/O that the Remote I/O adapter sends and receives. The Remote I/O adapter can be configured as 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words). Additional I/O can be transferred using the Block Transfer I/O image.

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.

Remote I/O Network

Remote I/O is an Allen-Bradley network interface originally designed to link remote I/O racks to PLCs over appropriate cables (‘Blue-Hose’). Remote I/O supports remote, time-critical control communications between a client controller and server devices such as a Remote I/O adapter and its connected host drive. A server device will accept only the packets that are addressed to it. Remote I/O also supports Block Transfer messaging. Remote I/O networks (sometimes called links) can support up to 32 devices on a channel.

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.

Starting Module Group

The starting module group is the word in a rack at which the group starts. It depends on the rack size. This Remote I/O adapter can be configured as a 1/4 rack, which is two words, or a 1/2 rack, which is 4 words. Adapters configured as 1/4 racks can use starting module groups 0, 2, 4, or 6. Adapters configured as 1/2 racks can use only starting module groups 0, 2, or 4.

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.

U

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 Updating the Adapter Firmware on page 3-10 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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Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
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Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

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