



# Fieldbus Universal Serial Communication Option Module

Catalog Number 20-750-USC-XT



**Allen-Bradley**

by ROCKWELL AUTOMATION

User Manual

Original Instructions

# 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.

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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.

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**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.

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These 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.

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**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.

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**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).

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The following icon may appear in the text of this document.



Identifies information that is useful and can help to make a process easier to do or easier to understand.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

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## About This Publication

This manual provides information about the 20-750-USC-XT Fieldbus Universal Serial Communication option module and how to use it with PowerFlex® drives.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at [rok.auto/literature](http://rok.auto/literature).

Resource	Description
Network Communication Option Module Installation Instructions, publication <a href="#">750COM-IN003B</a>	Describes how to install 20-750-ENET2P and 20-750-USC-XT network communication modules.
EtherNet/IP Network Devices User Manual, publication <a href="#">ENET-UM006</a>	Describes how to configure and use EtherNet/IP™ devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, publication <a href="#">ENET-RM002</a>	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
System Security Design Guidelines Reference Manual, publication <a href="#">SECURE-RM001</a>	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
UL Standards Listing for Industrial Control Products, publication <a href="#">CMPNTS-SR002</a>	Assists original equipment manufacturers (OEMs) with construction of panels, to help ensure that they conform to the requirements of Underwriters Laboratories.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication <a href="#">IC-AT001</a>	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Industrial Components Preventive Maintenance, Enclosures, and Contact Ratings Specifications, publication <a href="#">IC-TD002</a>	Provides a quick reference tool for Allen-Bradley® industrial automation controls and assemblies.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication <a href="#">SGI-1.1</a>	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Selection and Configuration tools, <a href="http://rok.auto/systemtools">rok.auto/systemtools</a>	Helps configure complete, valid catalog numbers and build complete quotes based on detailed product information.
Rockwell Automation Global SCCR tool, <a href="http://rok.auto/sccr">rok.auto/sccr</a>	Provides coordinated high-fault branch circuit solutions for motor starters, soft starters, and component drives.
Product Certifications website, <a href="http://rok.auto/certifications">rok.auto/certifications</a>	Provides declarations of conformity, certificates, and other certification details.

**Notes:**

## Overview

The Fieldbus Universal Serial Communication option module is a singular option module that supports the following serial communication protocols.

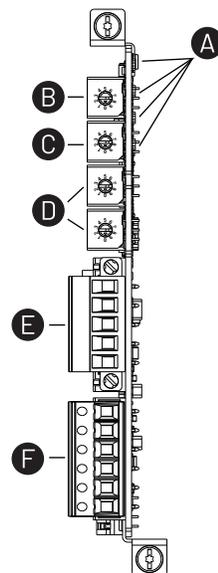
- DeviceNet® (CAN)
- CANopen (CAN)
- BACnet MSTP (485)
- Modbus RTU (485)
- RA DF1 (485)

Only one protocol can be in operation at a time. This option module supports PowerFlex® drives with TotalFORCE® control, PowerFlex 750-Series drives, and PowerFlex 6000T drives.

In this manual we refer to the PowerFlex 750-Series products with TotalFORCE control as:

- PowerFlex 755T products when referring to the group of drives, bus supplies, and common bus inverters listed below.
  - PowerFlex 755TL drive when referring to the low harmonic drive product.
  - PowerFlex 755TR drive when referring to the regenerative drive product.
  - PowerFlex 755TM drive system when referring to regenerative bus supply and common bus inverter products.
- PowerFlex 755TS drive when referring to the six-pulse rectifier standalone AC drive product.

## Components



Item	Part	Description
A	Status indicators	Four status indicators that indicate the status of the option module and network communication. See <a href="#">Chapter 9, Troubleshooting</a> .
B	Protocol selection switch	Specifies which communication protocol is used.
C	Data rate switch	Sets the data rate at which the option module communicates. See <a href="#">Set the Communication Rate via Switches on page 23</a> .
D	Node address switches	Sets the network node or MAC address of the option module. See <a href="#">Set the Node/MAC Address via Switches on page 22</a> .
E	CAN port (5-pin connector)	A 5-pin connector used for CANport and DeviceNet. .
F	RS-485 port (6-pin connector)	A 6-pin connector used for BACnet, Modbus, and RA DF1.

## Features

This option module supports the following data transfer of information:

- Logic Command
- Speed Reference Command
- Logic Status
- Reference feedback
- 16 programmable datalinks In (for all protocols except BACnet)
- 16 programmable datalinks Out (for all protocols except BACnet)

This option module can also recover a connection after a network cable connection is re-established.

Use the rotary switches on the option module to select the protocol, the node/MAC address, and the communication/data transfer speed.

The option module can be installed in ports 4, 5, and 6 except for the following restrictions.

### Option Module Compatible Ports PowerFlex 753 Drives Frames 1...7 and PowerFlex 755 Drives Frames 1...10

Option Module Cat No.	PowerFlex 753 Drives						PowerFlex 755 Drives							
	Frame 1 Ports			Frame 2...7 Ports			Frame 1 Ports			Frame 2...10 Ports				
	6	5	4	6	5	4	6	5	4	8	7	6	5	4
20-750-ENET2P	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
20-750-USC-XT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes

### Option Module Compatible Ports PowerFlex 755T Drives Frames 5...15 and PowerFlex 755TS Drives Frames 1...7

Option Module Cat. No.	PowerFlex 755T Drives					PowerFlex 755TS Drives							
	Frame 5...15 Ports					Frame 1 Ports			Frame 2...7 Ports				
	8	7	6	5	4	6	5	4	8	7	6	5	4
20-750-USC-XT	No	No	Yes	Yes	No <sup>(1)</sup>	No <sup>(1)</sup>	No <sup>(1)</sup>	Yes	No	No	Yes	Yes	No <sup>(1)</sup>

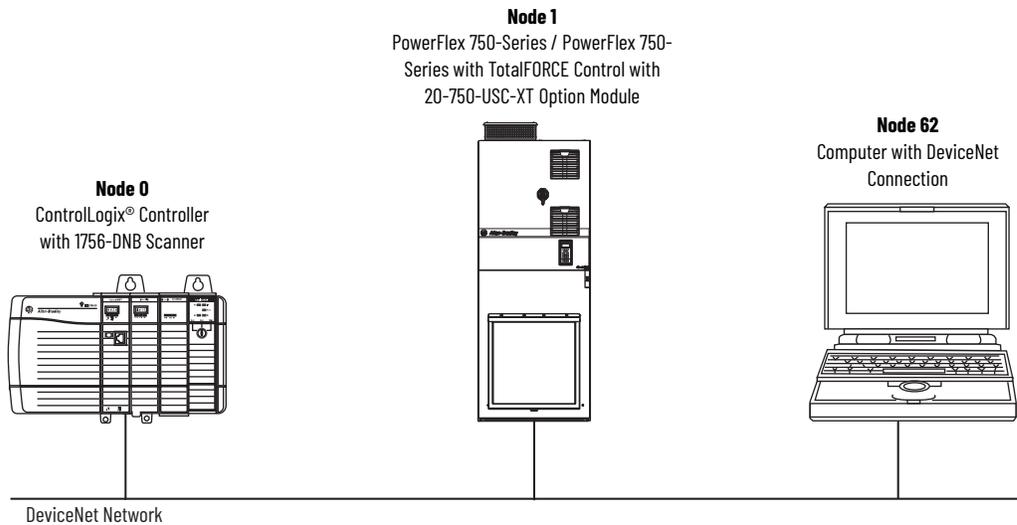
(1) For PowerFlex 755T Series B drives and PowerFlex 755TS drives: It is recommended to use another port. This option module interferes with a DPI™ cable connected to DPI Port 2 on the HIM cradle. If a DPI cable is not connected to DPI Port 2, this port can be used.

## DeviceNet (CAN)

When the DeviceNet protocol is used, the option module also supports the following features:

- the ability to operate as a DeviceNet node
- Explicit Messaging and UCMM (Unconnected Message Manager)
- Multiple data exchange methods, including Polled, Cyclic, and Change of State (COS) to transmit data between the network and option module
- Controller-device hierarchy that can be configured to transmit data to and from a controller on the network

The following diagram provides an overview of a typical DeviceNet network using this option module.

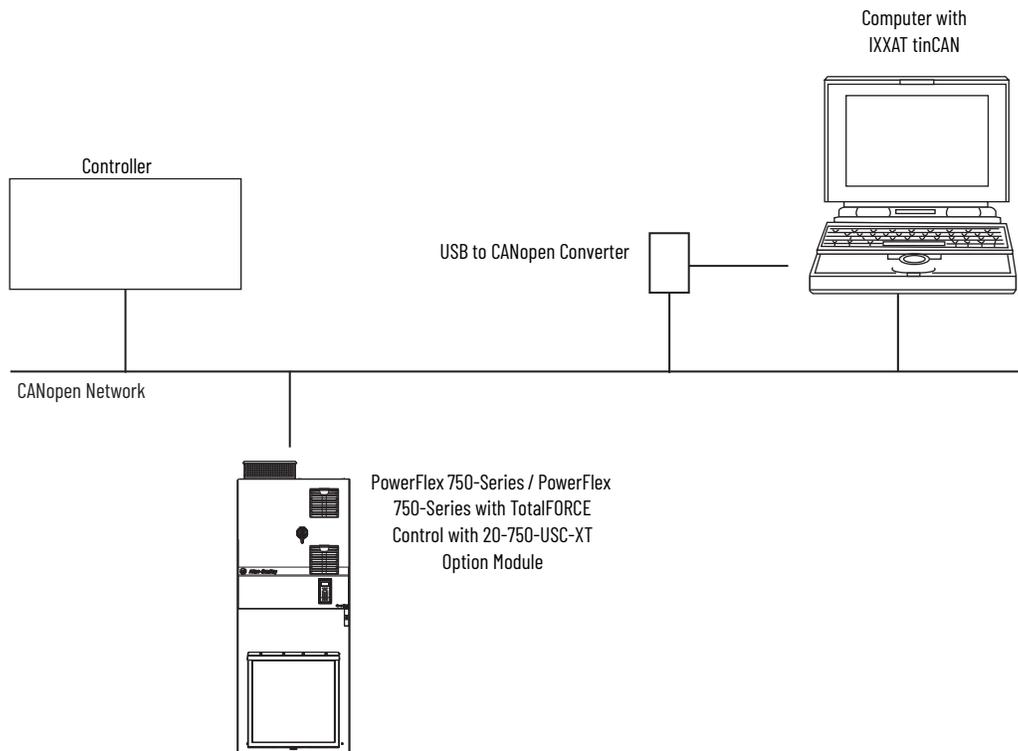


## CANopen (CAN)

When the CANopen protocol is used, the option module also supports the following features:

- CANopen communication disruptions, including Comm Flt Action and Idle Flt Action
- Support for Service Data Object (SDO) messages and Process Data Object (PDO) messages
- CiA 301
- CANopen Application Layer and Communication Profile Version 4.02, February 2002, CAN in Automation e.V.

The following diagram provides an overview of a typical CANopen network using this option module.



## BACnet MSTP (RS-485)

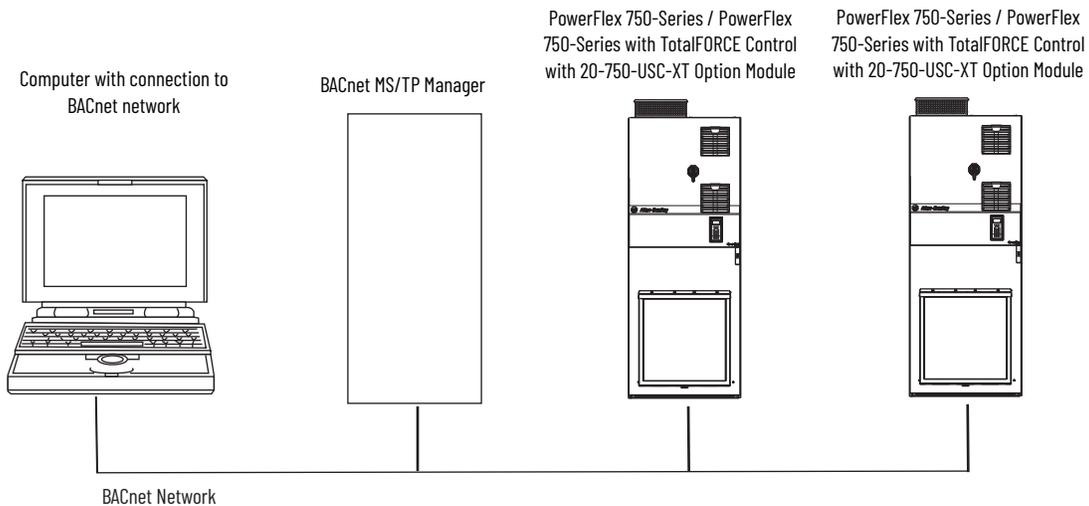
When the BACnet protocol is used, this option module also allows an RS-485 BACnet Client (Host) to access PowerFlex drives via read/write access to following BACnet objects:

- Analog Input (AI)
- Analog Output (AO)
- Analog Value (AV)
- Binary Input (BI)
- Binary Output (BO)
- Binary Value (BV)
- Device

This option module also supports the following features:

- DIP switches for BAC mode termination and bias
- BACnet communication disruptions (Comm Flt Action).

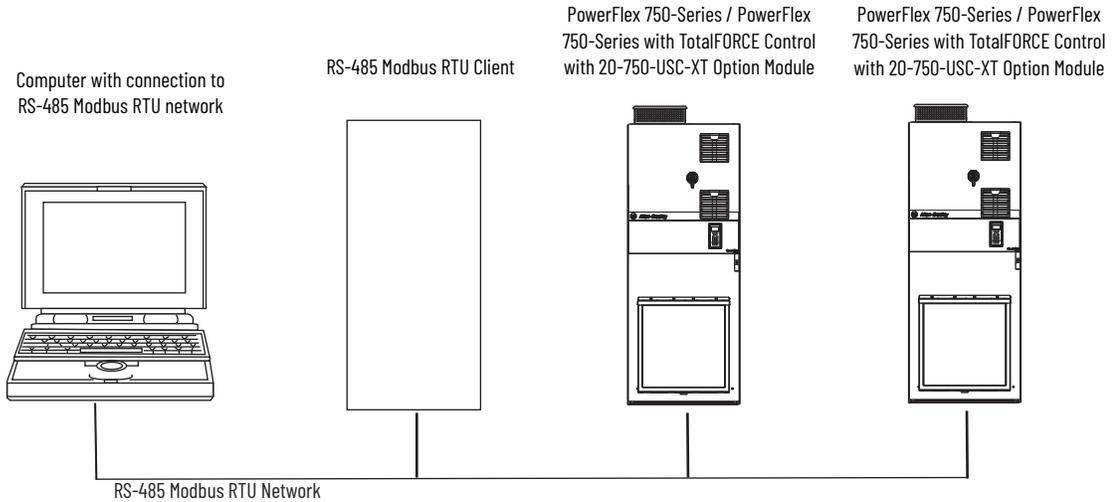
The following diagram provides an overview of a typical BACnet MSTP network using this option module.



## Modbus RTU (RS-485)

When the Modbus protocol is used, this option module also supports DPI™ parameter access and user-defined fault actions to determine how the option module and its connected host drive respond to a network failure (Comm Flt Action).

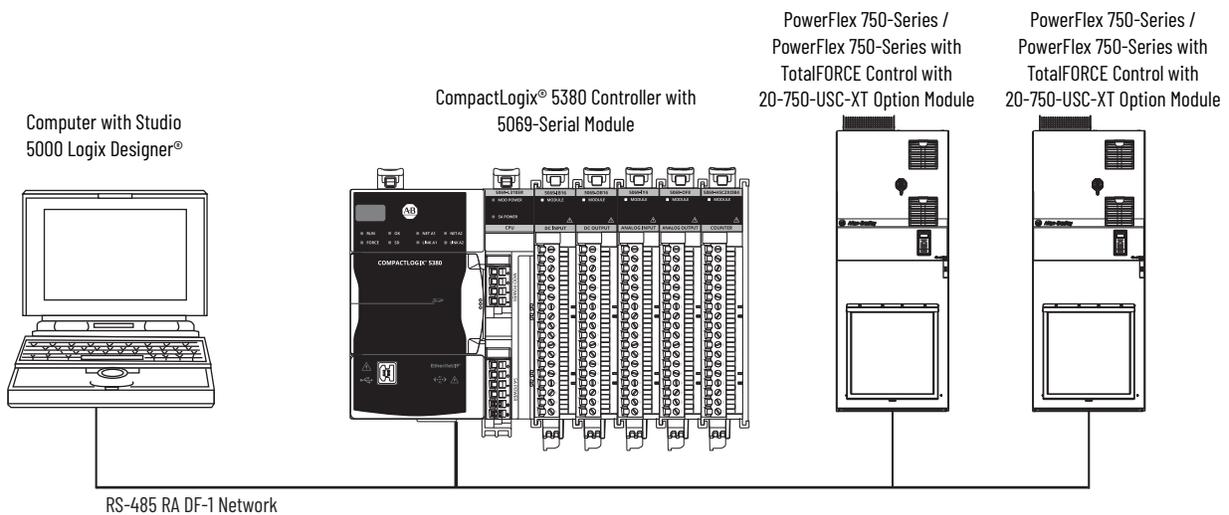
The following diagram provides an overview of a typical Modbus RTU (RS-485) network using this option module.



## RA DF1 (RS-485)

When the RA DF1 protocol is used, this option module also supports Explicit message (PCCC) and user-defined fault actions to determine how the option module and its connected host drive respond to DF1 communication disruptions (Comm Flt Action).

The following diagram provides an overview of a typical RA DF1 (RS-485) network using this option module.



## Security Considerations

To help maintain a secure system, follow these guidelines:

- Limit physical access to authorized personnel
- Implement physical barriers, such as locked cabinets
- Only purchase products from official suppliers
- Only download firmware and software from the Rockwell Automation Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc)

To secure networks and communication and data, follow these guidelines:

- Implement network technologies that filter, block, and control access to help secure networks
- Configure authorization policies to define conditions for remote access
- Select control products that offer security options

For more information see:

Resource	Description
Security Design Guide Reference Manual, publication <a href="#">SECURE-RM001</a>	Provides guidance on how to conduct vulnerability assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
Security Configuration User Manual, publication <a href="#">SECURE-UM001</a>	Describes how to configure and use Rockwell Automation products to improve the security of your industrial automation system.
CIP Security Application Technique, publication <a href="#">SECURE-AT001</a>	Describes how to plan and implement a Rockwell Automation system that supports the CIP Security™ protocol.
FactoryTalk Security Application Technique, publication <a href="#">SECURE-AT002</a>	Describes how to use FactoryTalk® Security to implement authentication and authorization in your industrial automation system. Describes how to enforce product-specific security for Studio 5000 Logix Designer®, FactoryTalk View, and FactoryTalk AssetCentre.
Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication <a href="#">ENET-TD001</a>	Provides guidelines for how to design, implement, and manage industrial Ethernet networks.

## Protected Operations

Protection mode is a state where the device is operational but has implemented defenses against disruptive changes that could take the product out of service.

### Implicit Protection Mode

Implicit protection mode helps prevent configuration changes that can affect system behavior and cause unintended and unforeseen changes.

This security enhancement is automatically triggered as soon as one of the following occurs:

- When the device has an open I/O connection
- When the drive is in a Run mode
- When the drive or device is in a firmware update mode

In protection mode, the device deactivates services that could disrupt the operation of the device, but the device continues to function. For example, configuration operations or firmware updates are disabled to not impact the operation of the device.

### Restrictions in Implicit Protection Mode

When the device is in implicit protection mode, the mode prevents the following actions:

- Change serial protocol mode settings
- Change serial protocol network rate configuration
- Change serial protocol node address configuration
- Update the module firmware
- Perform the module reset, out-of-box reset from the drive or another module
- Perform the module reset, out-of-box reset from DeviceNet/BACnet/Modbus interface on the module

## Understanding Parameter Types

This option module has two types of parameters:

- Device parameters are used to configure the option module to operate on the network.
- Host parameters are used to configure the option module Datalink transfer and various fault actions with the drive.

You can view option module Device and Host parameters with any of the following drive configuration tools:

- PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM—use the  or  key to scroll to the drive port in which the module resides, press the  (Folders) key, and use the  or  key to scroll to the DEV PARAM or HOST PARAM folder.
- Integrated Touch Display (EHim)
- Connected Components Workbench™ software

## Compatible Products

This option module is compatible with the following PowerFlex products:

- PowerFlex 755TL low harmonic standalone AC drives
- PowerFlex 755TR regenerative standalone drives
- PowerFlex 755TM drive systems with regenerative bus supplies and common bus inverters
- PowerFlex 755TS six-pulse rectifier standalone AC drives
- PowerFlex 755 AC drives
- PowerFlex 753 AC drives
- PowerFlex 6000T medium voltage drives

## Required Equipment

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

### Equipment Shipped with the Option Module

Verify that the package includes the following:

- One 20-750-USC-XT option module
- Two female mating connectors (wire side) for both serial communication ports (one connector is 5-pin, the other connection is 6-pin)

### User-supplied Equipment

The following equipment is also required:

- A screwdriver for setting the network address switches
- DeviceNet cable—we recommend a thin cable with an outside diameter of 6.9 mm (0.27 in.)

## Configuration Tool Options

Any of the following configuration tools can be used:

- 20-HIM-A6 and 20-HIM-C6S for PowerFlex drives
- Integrated touch screen display (eHIM) or standard HIM (20-750-CS6) for PowerFlex 6000T drives
- Connected Components Workbench software release 11 or later

Connected Components Workbench software is the recommended standalone software tool for use with PowerFlex drives. Download it for free from the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc).

- Controller configuration software, such as RSLogix 5000® software, version 20, or Studio 5000 Logix Designer application, version 21 and later, which also supports Automatic Device Configuration (ADC).

For versions earlier than version 30, you must install the Add-on Profile (AOP) available from the PCDC at [rok.auto/pcdc](http://rok.auto/pcdc).

- Third-party network configuration tools for BACnet, CANopen, DF1, and Modbus protocols.
- Configuring and editing parameters with the Studio 5000 Logix Designer application is not possible through this option module alone. Configuring and editing parameters using the Studio 5000 Logix Designer application is possible only if a connection to the drive is made through an embedded EtherNet/IP™ port or the ENETR/ENET2P EtherNet/IP option modules.

## Safety Precautions



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



**ATTENTION:** Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery can plan or implement the installation, startup, or configuration. Only qualified personal can perform subsequent maintenance of the drive by using the communication interface. Failure to comply can result in injury and/or equipment damage.



**ATTENTION:** Risk of equipment damage exists. The option module 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 this product. If you are unfamiliar with static control procedures, see Guarding Against Electrostatic Damage, publication [8000-4.5.2](#).



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



**ATTENTION:** Risk of injury or equipment damage exists. Host Parameters 33 - [Comm Flt Action], 34 - [Idle Flt Action], and 36 - [Msg Flt Action] let you determine the action of the option module and connected drive if I/O communication is disrupted, the controller is idle, or explicit messaging for drive control is disrupted. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, precautions should be taken to 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 controller in idle state).



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



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

**Notes:**

## Commission and Connect the Module

### Before You Begin

**IMPORTANT** Remove power from the drive before installing the option module.

Install the option module in the drive control pod. See the Network Communication Option Module Installation Instructions, publication [750COM-IN003](#) (provided with the option module), for details.

**IMPORTANT** After inserting the option module into the appropriate port, tighten the module screws to the pod mounting bracket to properly ground the module to the drive. Torque both screws to 0.45...0.67 N·m (4.0...6.0 lb·in).

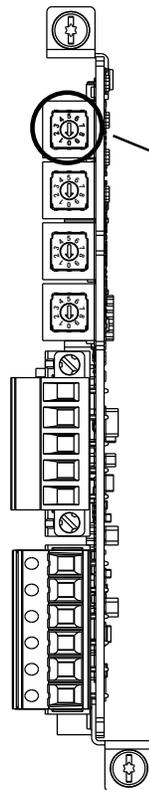


**ATTENTION: ATTENTION:** Risk of equipment damage exists. The option module contains electrostatic discharge (ESD) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the option module. If you are unfamiliar with static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

### Select the Option Module's Communication Protocol

This option module uses two methods for selecting which communication protocol is used. One method is the use of the Protocol Selection switch, which is the top switch in the following figure.

Figure 1 - Setting the Communication Protocol



Protocol Selection Switch Setting	Communication Protocol
0	DeviceNet®
1	CANopen
2	BACnet MSTP
3	Modbus RTU
4	RA DF1
5, 6, and 7	Reserved for future use
8	Factory default (When all switches, including the Protocol Selection switch, are set to '8', the factory default reset is enabled.)
9	Communication protocol is determined by software setting / DPI™ parameter

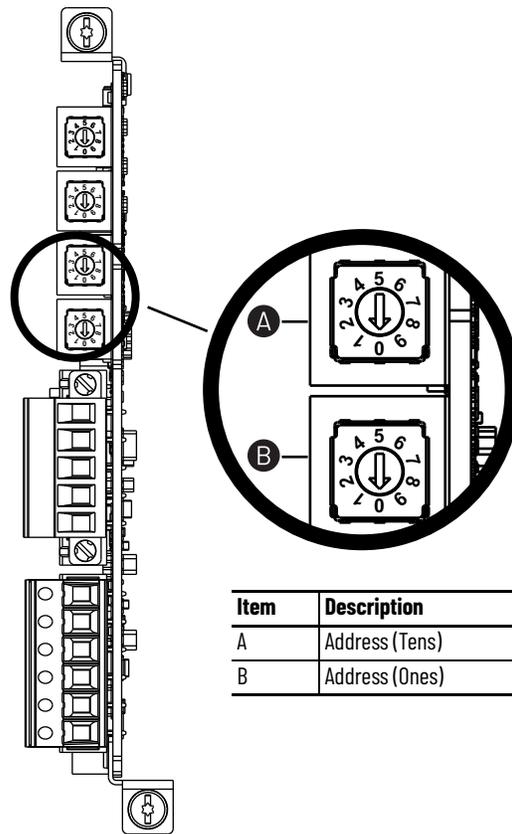
The other method is software configuration via a settable DPI parameter. Software configuration is applied once the Protocol Selection Switch is set to 9 and the DPI parameter setting that forcibly sets configuration is enabled.

### Set the Node/MAC Address via Switches

Set the option module Node/MAC address switches (bottom two switches in [Figure 2](#)) by rotating the switches to the desired value for each digit.

**IMPORTANT** Set the Node/MAC address before power is applied because the option module uses the Node/MAC address it detects when it first receives power. To change a Node/MAC address, you must set the new value and then remove and reapply power to (or reset) the option module, or disconnect and reconnect the network cable.

Figure 2 - Setting the Node Address/MAC Address Switches



Item	Description
A	Address (Tens)
B	Address (Ones)

Table 1 - DeviceNet Node Address Settings

Settings	Description
0...63	Node address that is used by the option module if switches are enabled.
64...99	Invalid settings. Option module operates using software configuration (DPI Parameter).

Table 2 - CANopen Node Settings

Settings	Description
1...99	Node address that is used by the option module if switches are enabled.

**Table 3 - BACnet MAC Address Settings**

Settings	Description
0...99	MAC address that is used by the option module if switches are enabled.

**Table 4 - Modbus Node Address Settings**

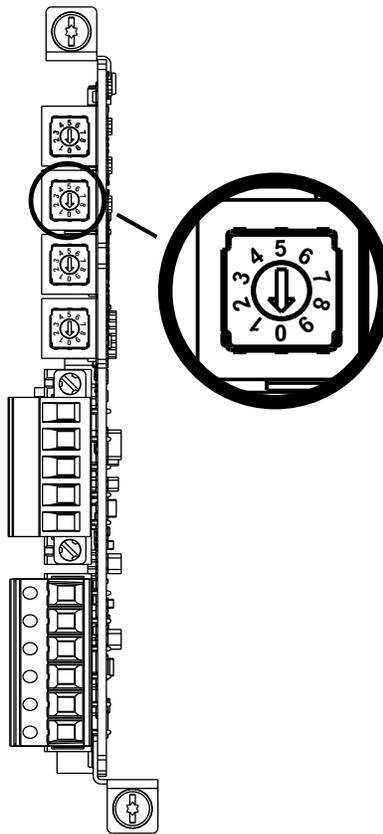
Settings	Description
1...99	Node address that is used by the option module if switches are enabled.

**Table 5 - DF1 Node Address Settings**

Settings	Description
0...99	Node address that is used by the option module if switches are enabled.

## Set the Communication Rate via Switches

Set the option module Data Rate switch (see [Figure 3](#)) by rotating the switch to the desired setting.

**Figure 3 - Setting the Data Rate Switch**

Use the information in the following tables to set the data rate according to the protocol in use.

**Table 6 - Data Rate Switch Settings for DeviceNet**

Setting	Description
0	Sets the option module to the 125 Kbps data rate
1	Sets the option module to the 250 Kbps data rate
2	Sets the option module to the 500 Kbps data rate
3	Autobaud
4	Reserved for future use
5	
6	
7	
8	Factory Default (When all rotary switches, including the Data Rate Rotary Switch, are set to '8', the factory default reset is enabled.)
9	Reserved for future use

**Table 7 - Data Rate Switch Settings for CANopen**

Setting	Description
0	Sets the option module to the 10 Kbps data rate
1	Sets the option module to the 20 Kbps data rate
2	Sets the option module to the 50 Kbps data rate
3	Sets the option module to the 125 Kbps data rate
4	Sets the option module to the 250 Kbps data rate
5	Sets the option module to the 500 Kbps data rate
6	Sets the option module to the 800 Kbps data rate
7	Sets the option module to the 1 Mbps data rate
8	Factory Default (When all rotary switches, including the Data Rate Rotary Switch, are set to '8', the factory default reset is enabled.)
9	Autobaud

**Table 8 - Data Rate Switch Settings for BACnet**

Setting	Description
0	Autobaud
1	Sets the option module to the 9600 bps communication rate
2	Sets the option module to the 19,200 bps communication rate
3	Sets the option module to the 38,400 bps communication rate
4	Sets the option module to the 57,600 bps communication rate
5	Sets the option module to the 76,800 bps communication rate
6	Sets the option module to the 115,200 bps communication rate
7	Reserved for future use
8	Factory Default (When all rotary switches, including the Data Rate Rotary Switch, are set to '8', the factory default reset is enabled.)
9	Reserved for future use

**Table 9 - Data Rate Switch Settings for Modbus**

<b>Setting</b>	<b>Description</b>
0	Sets the option module to the 1200 bps communication rate
1	Sets the option module to the 2400 bps communication rate
2	Sets the option module to the 4800 bps communication rate
3	Sets the option module to the 9600 bps communication rate
4	Sets the option module to the 19,200 bps communication rate
5	Sets the option module to the 38,400 bps communication rate
6	Sets the option module to the 57,600 bps communication rate
7	Sets the option module to the 115,200 bps communication rate
8	Factory Default (When all rotary switches, including the Data Rate Rotary Switch, are set to '8', the factory default reset is enabled.)
9	Reserved for future use

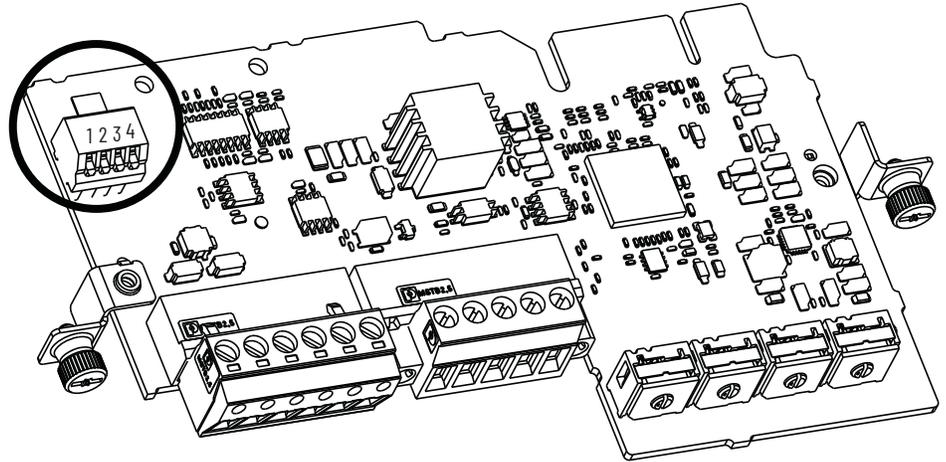
**Table 10 - Data Rate Switch Settings for DF1**

<b>Setting</b>	<b>Description</b>
0	Sets the option module to the 1200 bps communication rate
1	Sets the option module to the 2400 bps communication rate
2	Sets the option module to the 4800 bps communication rate
3	Sets the option module to the 9600 bps communication rate
4	Sets the option module to the 19,200 bps communication rate
5	Sets the option module to the 38,400 bps communication rate
6	Reserved for future use
7	
8	Factory Default (When all rotary switches, including the Data Rate Rotary Switch, are set to '8', the factory default reset is enabled.)
9	Reserved for future use

## Set the DIP Switches

The option module's TERM, -BIAS, and +BIAS switches (the DIP switches) are used to modify its built-in termination resistor and bias resistors.

Figure 4 - Location of DIP Switches on Option Module



The following table provides information about their settings.

Table 11 - DIP Switch Information

Item	Switch Name	Description	Default Position	DIP Switch On/Off Positions (shown in Off Position)
1	SW1	RS486 termination resistor On: 120 ohm termination is enabled between B(TxRx+) and A(TxRx-) port for RS-485 line. Off: 120 ohm termination is disabled.	Off	
2	SW2	-Bias resistor on B(TxRx+) port On: 511 ohm pulldown register is enabled on B(TxRx+) port for RS-485 line. Off: 511 ohm pulldown register is disabled,	Off	
3	SW3	+Bias resistor on A(TxRx-) port On: 511 ohm pullup register is enabled on A(TxRx+) port for RS-485 line. Off: 511 ohm pullup register is disabled,	Off	
4	SW4	Reserved for future use.	Off	

# Connect the Option Module to the Network

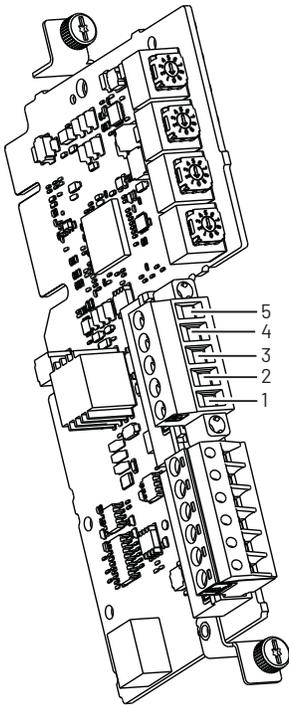
This section describes how to connect the option module to the Network.



**ATTENTION:** Risk of injury or death exists. The PowerFlex® drive can contain high voltages that can cause injury or death. Remove power from the drive, and then verify that power has been discharged before connecting the option module to the network.

1. Remove power from the drive.
2. If necessary, remove the drive cover and access the drive control pod.
3. Use static control precautions.
4. Connect one end of the communication cable to the network.
5. Route the other end of the communication cable through the bottom of the drive, and wire to the 5- or 6-pin terminal block. See the following tables for information about the connections.

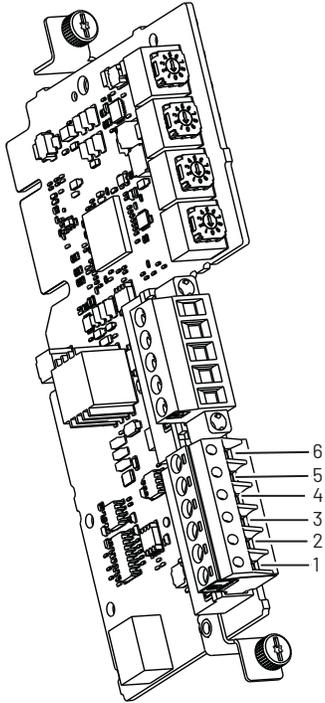
Table 12 - DeviceNet and CANopen



DeviceNet			
Terminal	Signal	Function	Diagram
1	V-	Common	
2	CAN L	Signal Low	
3	Shield	Shield	
4	Can H	Signal High	
5	V+	PowerSupply	

CANopen			
Terminal	Signal	Function	Diagram
1	V-	CAN GND	
2	CAN L	CAN L Network (dominant low)	
3	SHIELD	SHIELD	
4	CAN H	CAN H Network (dominant high)	
5	V+	CAN_V+ optional	

Table 13 - BACnet MS/TP, Modbus RTU, and DF1



BACnet MS/TP, Modbus RTU, and DF1			
Terminal	Signal	Function	Diagram
1	TERM	RC Termination	<p>When DIP Switch SW1 is on (120 ohm termination is enabled):</p> <p>When DIP Switch SW1 is off (120 ohm termination is disabled):</p>
2	A	TXRXD-	
3	B	TXRXD+	
4	COM	Signal Common	
5	SHIELD	Shield	
6	GND	Ground	

## Apply Power



- ATTENTION:** Risk of equipment damage, injury, or death exists.
- Unpredictable operation can occur if you fail to verify that parameter settings are compatible with your application. Verify that settings are compatible with your application before power is applied to the drive.
  - Wear personal protective equipment (PPE) to avoid death or injury when applying power with the drive door open.

1. Close the cabinet door for the drive.
2. Apply power to the drive.  
The option module receives its power from the drive.



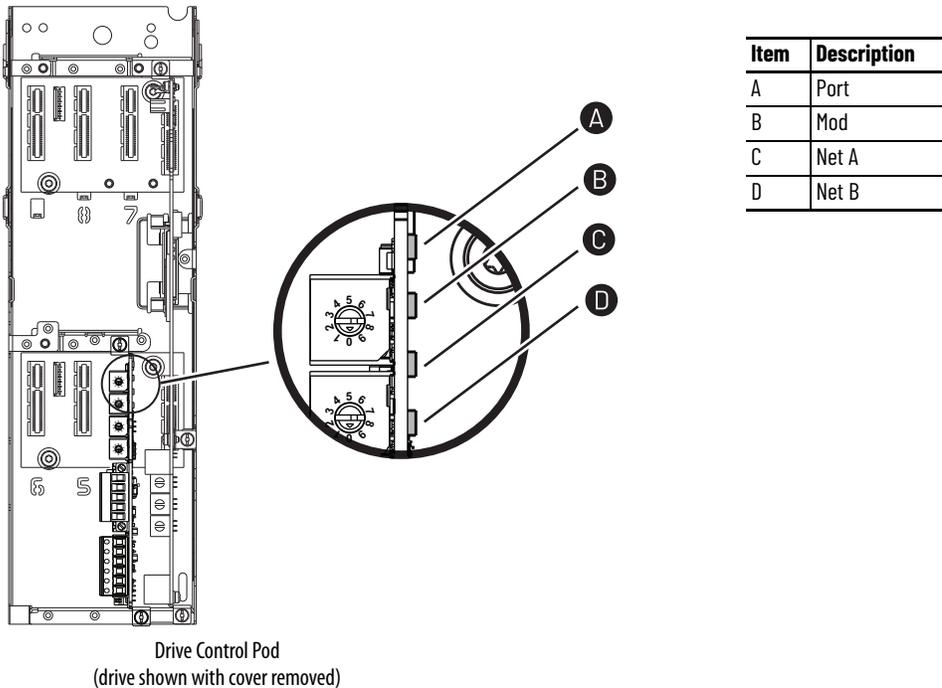
**ATTENTION:** Risk of injury or equipment damage exists. When a system is configured for the first time, there can be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing.

3. Check the status indicators either by using status parameters, HIM status, or the software tool status.  
When you apply power to the option module for the first time, its status indicator is steady green or flashes green after an initialization. If an indicator is red, there is a problem. See Status Indicators for more information.

### Startup Status Indications

The option module status indicators can be viewed with the drive cover open or removed ([Figure 5](#)). See for more information on the status indicators.

**Figure 5 - Drive and Option Module Status Indicators**



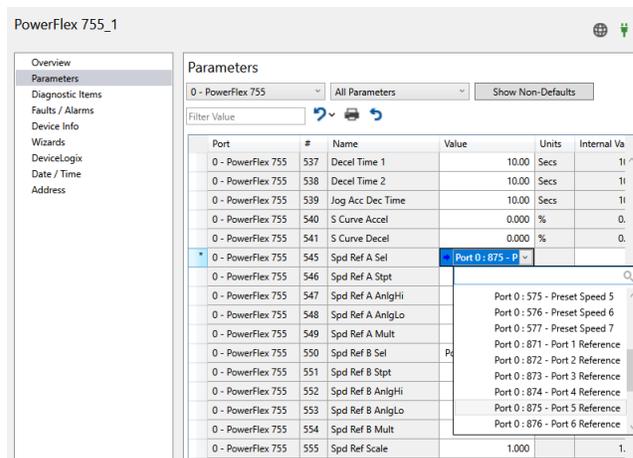
## Configuring and Verifying Key Drive Parameters

The 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 receives the Logic Command and Reference from the network.

For PowerFlex 750-Series drives:

1. Verify that drive Parameter 301 [Access Level] is set to '1' (Advanced) or '2' (Expert) to access the required parameters in this procedure.
2. Set drive Parameter 545 [Speed Ref A Sel] to reflect the port where the option module is installed. In the following illustration, parameter 545 is set to port 0 parameter 875 [Port 5 Reference], which references port 5.



3. Verify that drive Parameter 930 [Speed Ref Source] is reporting that the source of the Reference to the drive (Port 0) is the port in which the option module is installed (for example, Port 5 Reference).  
This helps ensure that any Reference that is commanded from the network can be monitored by using drive Parameter 002 [Commanded SpdRef]. If a problem occurs, this verification step provides the diagnostic capability to determine whether the drive/option module or the network is the cause.
4. If hard-wired discrete digital inputs are not used to control the drive, verify that all unused digital input drive parameters are set to '0' (Not Used).

For PowerFlex 750-Series with TotalFORCE® Control drives:

1. Verify that drive parameter 0:30 [Access Level] is set to '1' (Advanced) or '2' (Expert) to access the required parameters in this procedure.

- Set drive Parameter 10:1800 [VRef A Sel] to reflect the port where the option module is installed. In the following illustration, parameter 1800 is set to port 0 parameter 218 [Port 5 Reference], which references port 5.

Port	#	Name	Value	Units	Internal Value	Default
10 - Induction Ec...	1640	Home Ctr Opts	00000000 00100000		32	00000000 00100000
10 - Induction Ec...	1641	Home Status	00000000 00000000		0	00000000 00000000
10 - Induction Ec...	1643	Find Home Speed	6.00		6.00	6.00
10 - Induction Ec...	1644	Find Home Ramp	10.00	s	10.00	10.00
10 - Induction Ec...	1800	VRef A Sel	Port 0 : 218 - P		214	Port 0: Port 1 Refer...
10 - Induction Ec...	1801	VRef A Stpt				0000
10 - Induction Ec...	1802	VRef A Anlghi				00.00
10 - Induction Ec...	1803	VRef A Anlgl0				0.00
10 - Induction Ec...	1804	VRef A Mult				1.00
10 - Induction Ec...	1807	VRef B Sel				Stpt Z
10 - Induction Ec...	1808	VRef B Stpt				0000
10 - Induction Ec...	1809	VRef B Anlghi				00.00
10 - Induction Ec...	1810	VRef B Anlgl0				0.00
10 - Induction Ec...	1811	VRef B Mult				1.00
10 - Induction Ec...	1814	Preset Speed 1	5.00		5.00	5.00

- Verify that drive parameter 10:350 [VRef Source] is reporting that the source of the Reference to the drive (Port 0) is the port in which the option module is installed (for example, Port 5 Reference).

This helps ensure that any Reference that is commanded from the network can be monitored by using drive parameter 10:1914 [VRef Commanded]. If a problem occurs, this verification step provides the diagnostic capability to determine whether the drive, option module, or the network is the cause.

- If hard-wired discrete digital inputs are not used to control the drive, verify that all unused digital input drive parameters are set to '0' (Not Used).

**Notes:**

## Common Module Configuration

This chapter provides information that is common to all protocols. It provides basic information but excludes all required information. Use the information in the subsequent chapters to complete the configuration for various protocols.

### Use the 20-HIM-A6 or 20-HIM-C6S HIM to Access Parameters

If your drive has an enhanced PowerFlex® 20-HIM-A6 or 20-HIM-C6S HIM, it can be used to access parameters in the option module.

1. Display the Status screen, which is shown on HIM powerup.
2. Use the  or  key to scroll to the Port in which the option module is installed.
3. Press the PAR# soft key to display the Jump to Param # entry pop-up box.
4. Use the numeric keys to enter the desired parameter number, or use the ▲ or ▼ soft key to scroll to the desired parameter number.

For details on viewing and editing parameters, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication [20HIM-UM001](#).

### Use the Integrated Touch Screen Display (eHIM)

If your drive has a HIM, it can be used to access parameters in the interface.

From the Status screen (20-HIM-A6 or 20-HIM-C6S) or the Dashboard Parameters tab (eHIM), navigate to port where the option module resides.

From the port where the option module resides, you can set the source for the network address, set the IP address, subnet mask, and gateway address.

For details on how to view and edit parameters, see PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication [20HIM-UM001](#).

### Setting the Network Address

When the option module Data Rate switch is set to position '3' (Program), the value of a parameter determines the network, or node, address. See the following table for details about the parameter that is used by each protocol to specify the network address. When the Data Rate switch is set to any other position, the Network Address switch settings determine the network address.

**Network Address Configuration Parameters for Each Protocol**

Protocol	Parameter No.	Parameter Name	Default Value
DNET	14	DNT Net Addr Cfg	63
CANopen	21	COPN Addr Cfg	63
BACnet MSTP	29	BNT MAC Addr Cfg	0
Modbus RTU	37	MBS Net Addr Cfg	1
RA-DF1	47	DF1 Addr Cfg	1

1. Set the value of the appropriate parameter (see the preceding table) to a unique node address.
2. Reset the option module; see [Reset the Option Module on page 36](#).

The NET A status indicator will be steady green or flashing green if the network address is correctly configured, and the option module is connected to an operational network.

## Setting the Communication Rate

When the option module Communication Rate switch is set to position '3' (Program), the value of a parameter determines the communication, or data, rate. See the following table for the parameter that is used to specify the data rate and the data rates that are available for each protocol.

**Communication Rate Configuration Parameters for Each Protocol**

Protocol	Parameter No.	Parameter Name	Communication Rates	Default Rate
DNET	12	DNT Net Rate Cfg	0 = 125 kbps 1 = 250 kbps 2 = 500 kbps 3 = Autobaud	Autobaud
CANopen	19	COPN Rate Cfg	0 = 10 kbps 1 = 20 kbps 2 = 50 kbps 3 = 125 kbps 4 = 250 kbps 5 = 500 kbps 6 = 800 kbps 7 = 1 Mbps 8 = Autobaud	Autobaud
BACnet MSTP	27	BNT BaudRate Cfg	0 = Autobaud 1 = 9600 bps 2 = 19200 bps 3 = 38400 bps 4 = 57600 bps 5 = 76800 bps 6 = 115200 bps	Autobaud
Modbus RTU	35	MBS Net Rate Cfg	0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = 57600 bps 7 = 115200 bps	19,200 bps
RA-DF1	45	DF1 Rate Cfg	0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps	19,200 bps

1. Set the value of the appropriate parameter for the protocol you are using to the data rate you want to use. For example, if you are using the DNET protocol, and you want to use a data rate of 125 kbps, specify parameter 12 [DNT Net Rate Cfg] and a value of 0.
2. Reset the option module; see [Reset the Option Module on page 36](#).

## Setting the Communication Loss Time

See the following table for the parameters that are used to specify the communication loss, or comm loss, time for the BACnet and Modbus protocols.

Protocol	Parameter No.	Parameter Name	Seconds	Default Value
BACnet MSTP	31	BNT ComLoss Time	0...180	10
Modbus RTU	43	MBS ComLoss Time		

Set the value of the appropriate parameter (see the preceding table) to a communication loss timeout period suitable for your application.

By default, the timeout is set to 10 seconds. This value can be increased or decreased. Alternatively, the value can be set to zero to disable this timeout feature so that the option module does not detect a communication loss.



**ATTENTION:** Risk of injury or equipment damage exists. Device Parameters 31 [BNT ComLoss Time] and 43 [MBS ComLoss Time] let you determine how long it will take the option module to detect a network communication loss. By default, this parameter sets the timeout to 10 seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables host parameter 33 [Comm Flt Action]. Therefore, a communication fault action will be ignored. Take precautions to verify that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

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

## Set a Fault Action

By default, when communication is disrupted (for example, the network cable is disconnected), the controller is idle (in program mode or faulted), or explicit messaging for drive control is disrupted, 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 host parameter 33 [Comm Flt Action].
- An idle controller by using host parameter 34 [Idle Flt Action].
- Disrupted explicit messaging for drive control via PCCC or the CIP™ Register Object by using host parameter 36 [Msg Flt Action].



**ATTENTION:** Risk of injury or equipment damage exists. Host parameters 33 [Comm Flt Action], 34 [Idle Flt Action], and 36 [Msg Flt Action] let you determine the action of the option module and connected drive if communication is disrupted, the controller is idle, or explicit messaging for drive control is disrupted. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run; however, take precautions 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 (such as a disconnected network cable, a controller in idle state, or explicit message control disruption).

## Changing the Fault Action

Set the values of host parameters 33 [Comm Flt Action], 34 [Idle Flt Action], and 36 [Msg 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 (host parameters 37 [Flt Cfg Logic], 38 [Flt Cfg Ref], and 39 [Flt Cfg DL 01] ... 54 [Flt Cfg DL 16]).

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

If communication is disrupted and then is re-established, the drive automatically receives commands over the network again.

## Setting the Fault Configuration Parameters

When setting host parameters 33 [Comm Flt Action], 34 [Idle Flt Action], or 36 [Msg Flt Action] to 'Send Flt Cfg', the values in the following parameters are sent to the drive after a communication fault, idle fault, and/or explicit messaging for drive control fault occurs. You must set these parameters to values required by your application.

Option Module Host Parameter	Description
Parameter 37 [Flt Cfg Logic]	A 32-bit value sent to the drive for Logic Command.
Parameter 38 [Flt Cfg Ref]	A 32-bit REAL (floating point) value that is sent to the drive for Reference.
Parameter 39 [Flt Cfg DL 01] ... Parameter 54 [Flt Cfg DL 16]	A 32-bit integer value sent to the drive for a Datalink. If the destination of the datalink is a REAL (floating point) parameter, you must convert the desired value to the binary representation of the REAL value. (An internet search of 'hex to float' provides a link to a tool to do this conversion.)

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

## Reset the Option Module

Changes to switch settings and some option module parameters require you to reset the option module before the new settings take effect. You can reset the option module by power cycling the drive or by using device parameter 8 [Reset Module]. See the possible values for this parameter in the following table.

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



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

Set device parameter 8 [Reset Module] to '1' (Reset Module).

When you enter '1' (Reset Module), the option module immediately resets. An alternate method to reset the module is power-cycling the drive. When you enter '2' (Set Defaults), the option module sets all of its device and host parameters to their factory default values. (This is the same as pressing the ALL soft key when using the MEMORY folder method described later in this section.)

### IMPORTANT

When performing a Set Defaults, the drive may detect a conflict and then not allow this function to occur. If this happens, first resolve the conflict and then repeat a Set Defaults action. Common reasons for a conflict include the drive running or a controller in Run mode. After performing a Set Defaults, you must enter '1' (Reset Module) or power cycle the drive so that the new values take effect. Thereafter, this parameter will be restored to a value of '0' (Ready).



If your application allows, you can also reset the option module by cycling power to the drive (resetting the drive) or by using the HIM's Reset Device function that is located in the drive's DIAGNOSTIC folder.

## Restoring Option Module Parameters to Factory Defaults

As an alternate reset method, you can restore the option module parameters by using a MEMORY folder menu item instead of using device parameter 8 [Reset Module]. The MEMORY folder method provides two ways to restore the option module device and host parameters:

- ALL—restores ALL option module device and host parameters to their factory default values.
- MOST—restores MOST option module device and host parameters—except the following device parameters, which are used for network setup:
  - 6 [Protocol Cfg]
  - 10 [Force SwParamSel]
  - 12 [DNT Net Rate Cfg]
  - 14 [DNT Net Addr Cfg]
  - 19 [COPN Rate Cfg]
  - 21 [COPN Addr Cfg]
  - 27 [BNT BaudRate Cfg]
  - 29 [BNT MAC Addr Cfg]
  - 34 [BNT Dev InstNum]
  - 35 [MBS Net Rate Cfg]
  - 37 [MBS Net Addr Cfg]
  - 39 [MBS Parity Cfg]
  - 41 [MBS Stop Bit Cfg]
  - 45 [DF1 Rate Cfg]
  - 47 [DF1 Addr Cfg]
  - 49 [DF1 CRC/BCC Cfg]

Follow these steps to restore option module device and host parameters to their factory default values.

1. Access the Status screen, which is displayed on HIM powerup.
2. Use the  or  key to scroll to the Port in which the option module is installed.
3. Press the  key to display its last-viewed folder.
4. Use the  or  key to scroll to the MEMORY folder.
5. Use the  or  key to select **Set Defaults**.
6. Press the  (Enter) key to display the Set Defaults pop-up box.
7. Press the  (Enter) key again to display the warning pop-up box to reset Device and Host parameters to their factory default values.
8. Press the MOST soft key to restore MOST device and host parameters to factory defaults, or press the ALL soft key to restore ALL parameters. Or press the ESC soft key to cancel.

---

**IMPORTANT** When performing a Set Defaults, the drive may detect a conflict and then not allow this function to occur. If this happens, first resolve the conflict and then repeat this Set Defaults procedure. Common reasons for a conflict include the drive running or a controller in Run mode.

---

Reset the option module using device parameter 8 [Reset Module] or by cycling power to the drive so that the restored parameters take effect.

## Viewing the Option Module Status Using Parameters

You can use device parameters to view the status of the option module. Some of these parameters are common to all protocols. Other parameters pertain to specific protocols.

### Common Status Parameters

The following device parameters provide status information that is common to all protocols.

No.	Name	Description
1	Port Number	Displays DPI™ port number
3	DLs From Net Act	Displays the value of device parameter 02 [DLs From Net Cfg] at the time the drive was reset. This is the number of actual contiguous controller-to-drive datalinks that the drive is expecting.
5	DLs To Net Act	Displays the value of device parameter 04 [DLs To Net Cfg] at the time the drive was reset. This is the number of actual contiguous drive-to-controller Datalinks that the controller is expecting.
7	Protocol Act	Displays current protocol selected by either rotary switch or Protocol Cfg parameter: 0 = DeviceNet® 1 = CANopen 2 = BACnet MS/TP 3 = Modbus RTU 4 = DFI

### DeviceNet Status Parameters

The following device parameters provide status information related to the DeviceNet protocol.

No.	Name	Description
11	DNT Net Addr Src	Displays the source from which the option module's node address is taken. This is either the Node Address switches or the value of device parameter 12 [DNT Net Addr Cfg].
13	DNT Net Rate Act	Displays the actual network data rate used by the option module: 0 = 125 kps 1 = 250 kps 2 = 500 kps 3 = Autobauding 4 = Invalid
15	DNT Net Addr Act	Displays the actual network node address used by the option module.
18	DNT Interval	Displays the amount of time that a scanner will wait to check for data in the option module. When COS (Change of State) data exchange has been configured, this is the maximum amount of time between scans. Scans will occur sooner if data changes. When Cyclic data exchange has been configured, this interval is the fixed time between scans.

### CANopen Status Parameters

The following device parameters provide status information related to the CANopen protocol.

No.	Name	Description
20	COPN Rate Act	Displays the actual network data rate used by the option module: 0 = 10 kbps 1 = 20 kbps 2 = 50 kbps 3 = 125 kbps 4 = 250 kbps 5 = 500 kbps 6 = 800 kbps 7 = 1 Mbps 8 = invalid
22	COPN Addr Act	Displays the actual CANopen node address used by the option module.

## BACnet Status Parameters

The following device parameters provide status information related to the BACnet protocol.

No.	Name	Description
28	BNT communication rate Act	Displays the actual communication rate (kilobits per second) used by the option module. 0 = Autobauding 1 = 9600 bps 2 = 19200 bps 3 = 38400 bps 4 = 57600 bps 5 = 76800 bps 6 = 115200 bps 7 = invalid
30	BNT MAC Addr Act	Displays the actual network node address used by the option module.

## Modbus Status Parameters

The following device parameters provide status information related to the Modbus protocol.

No.	Name	Description
36	MBS Net Rate Act	Displays the actual communication rate (kilobits per second) used by the option module: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = 57600 bps 7 = 115200 bps 8 = invalid
38	MBS Net Addr Act	Displays the actual network node address used by the option module.
40	MBS Parity Act	Displays the actual network parity used by the option module: 0 = None 1 = odd (Modbus RTU only) 2 = even (Modbus RTU only) 3 = Invalid
42	MBS Stop Bit Act	Displays the actual number of stop bits used by the selected protocol: 0 = 1 bit 1 = 2 bits 2 = Invalid

## DF1 Status Parameters

The following device parameters provide status information related to the DF1 protocol.

No.	Name	Description
46	DF1 Rate Act	Displays the actual communication rate (kilobits per second) used by the option module: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = invalid
48	DF1 Addr Act	Displays the actual network node address used by the option module.
50	DF1 CRC BCC Act	Actual checksum or CRC selection: 0 = BCC 1 = CRC 2 = Invalid

## Update the Module Firmware

Download firmware and access product release notes from the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc). Use ControlFLASH Plus™ software to update product firmware. See the online help for more information. If the firmware update process is interrupted (by cable break or power supply issue), try the update process again.

## Complete DeviceNet Configuration

This chapter expands on the information provided in [Chapter 3](#) and provides additional information that is relevant for DeviceNet®.

### Select COS, Cyclic, or Polled Data Exchange

The data exchange is the method that the option module uses to exchange data on the DeviceNet network. Polled is the default method and it is recommended unless one of the other following data exchanges is more appropriate for your application:

- COS (Change of State)
- Cyclic
- Polled
- Polled and COS
- Polled and Cyclic

If 'Polled and COS' or 'Polled and Cyclic' is used, the option module transmits and receives I/O from polled messages. It transmits only a Logic Status and Feedback in COS or Cyclic messages. Other data is transmitted in Polled messages.

Cyclic and Polled data exchanges are configured in the scanner, so you only need to set the I/O configuration in the option module. COS data exchange must be configured in both the option module and the scanner. You need to set the I/O configuration and COS parameters in the option module.

### Set up the COS (Change of State) Data Exchange (Optional)

Set device parameter 16 [DNT COS StsMask] for the bits in the Logic Status word that should be checked for changes. For the Logic Status bit definitions, see [Appendix F](#) or the drive documentation.



The 20-HIM-A6 or 20-HIM-C6S HIM shows 32-bit Bit-type parameters in two 16-bit sets. By default, the lower 16-bit set (bits 0...15) is shown. To view the upper 16-bit set (bits 16...31), press the UPPER soft key. To view the lower 16-bit set again, press the LOWER soft key. To select each bit position, use the ◀ or ▶ soft key or the  or  numeric key.

1. Edit any of the bits as required.
  - a. Press the EDIT soft key to display the Edit COS Status Mask screen. See the following table for possible values.

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

- b. To toggle a bit between 0 or 1, press any numeric key—except the  or  key.
2. Set device parameter 17 [DNT COS Fdbk Change] for the amount of change to the feedback that is required to trigger a Change of State message.

The option module is now configured for COS data exchange. You must configure the scanner to allocate it using COS.

## About I/O Messaging

On CIP-based networks, including DeviceNet, I/O connections are used to transfer the data which controls the PowerFlex® drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in PowerFlex 750-Series drives. The option module includes the Logic Command, Logic Status, Reference, and Feedback (all as 32-bit words). This requires 8 bytes for the Input Size and 8 bytes for the Output Size in the controller's I/O image. This basic I/O must always be configured in the DeviceNet scanner using RSNetWorx™ for DeviceNet software. Additional I/O, if needed, can be set using up to 16 Datalinks to write data and/or up to 16 Datalinks to read data. When using any combination of these Datalinks, add 4 bytes for each Datalink to the basic I/O Input Size and/or Output Size.

## Understanding the I/O Image

The terms 'input' and 'output' are defined from the network's point of view. Therefore, output I/O is data that is produced by the network and consumed by the option module. Input I/O is status data that is produced by the option module and consumed as input by the network. The I/O image will vary based on how many of the drive's 32-bit Datalinks (Host parameters DL From Net 0...16 and Host DL To Net 01...16) are used.

If all available I/O is not used, the image is truncated. The image always uses consecutive words starting at word 0.

The following table shows the I/O image when using all 32-bit Datalinks.

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Logic Status
1	Reference	1	Feedback
2	DL From Net 01	2	DL To Net 01
3	DL From Net 02	3	DL To Net 02
4	DL From Net 03	4	DL To Net 03
5	DL From Net 04	5	DL To Net 04
6	DL From Net 05	6	DL To Net 05
7	DL From Net 06	7	DL To Net 06
8	DL From Net 07	8	DL To Net 07
9	DL From Net 08	9	DL To Net 08
10	DL From Net 09	10	DL To Net 09
11	DL From Net 10	11	DL To Net 10
12	DL From Net 11	12	DL To Net 11
13	DL From Net 12	13	DL To Net 12
14	DL From Net 13	14	DL To Net 13
15	DL From Net 14	15	DL To Net 14
16	DL From Net 15	16	DL To Net 15
17	DL From Net 16	17	DL To Net 16

## Using Logic Command and Status

The Logic Command is a 32-bit word of control data produced by the controller and consumed by the option module. The Logic Status is a 32-bit word of status data that is produced by the option module and consumed by the controller.

The Logic Command word is always DINT 0 in the output image and the Logic Status word is always DINT 0 in the input image.

This manual contains the bit definitions for compatible products available at the time of publication in [Appendix F, Logic Command/Status Words](#).

## Use Reference and Feedback

The Reference is a 32-bit REAL (floating point) piece of control data that is produced by the controller and consumed by the option module. The Feedback is a 32-bit REAL (floating point) piece of status data that is produced by the option module and consumed by the controller.

When using a ControlLogix® controller, the 32-bit REAL Reference word is always DINT 1 in the output image and the 32-bit REAL Feedback word is always DINT 1 in the input image. Because the I/O image is integer based and the Reference and Feedback are floating point, a COP (Copy) instruction or User-Defined Data Types (UDDT) is required to correctly write values to

the Reference and read values from the Feedback. See the ladder logic program examples in [Figure 8 on page 46](#) and [Figure 9 on page 47](#).

The Reference and Feedback 32-bit REAL values represent drive speed/velocity. The scaling for Reference and Feedback is dependent on drive parameter 300 [Speed Units] for PowerFlex 750-Series drives and parameter 0:46 [Velocity Units] for PowerFlex 750-Series with TotalFORCE® control drives.

For example, if parameter 300 or parameter 0:46 is set to Hz, a 32-bit REAL Reference value of '30.0' would equal a Reference of 30.0 Hz. If parameter 300 or 0:46 is set to RPM, a 32-bit REAL Reference value of '1020.5' would equal a Reference of 1020.5 RPM. The commanded maximum speed can never exceed the value of drive parameter 520 [Max Fwd Speed] for PowerFlex 750-Series drives and parameter 10:1392 [Max Speed Fwd] for PowerFlex 750-Series with TotalFORCE control drives.

The following table shows example References and their results for drives with these settings:

- Parameter 300 [Speed Units] or 0:46 [Velocity Units] set to Hz.
- Parameter 37 [Maximum Freq] or 10:422 [Maximum Freq] set to 130 Hz.
- Parameter 520 [Max Fwd Speed] or 10:1392 [Max Speed Fwd] set to 60 Hz.

When parameter 300 [Speed Units] or 0:46 [Velocity Units] is set to RPM, the other parameters are also in RPM.

**Table 14 - PowerFlex 750-Series Drive Example Speed Reference/Feedback Scaling**

Network Reference Value	Speed/Velocity Command Value (2)	Output Speed	Network Feedback Value
130.0	130 Hz	60 Hz (3)	60.0
65.0	65 Hz	60 Hz (3)	60.0
32.5	32.5 Hz	32.5 Hz	32.5
0.0	0 Hz	0 Hz	0.0
-32.5 (1)	32.5 Hz	32.5 Hz	32.5

(1) The effects of values less than 0.0 depend on whether the drive uses a bipolar or unipolar direction mode. See the drive documentation for details.

(2) For this example, drive parameters 300 [Speed Units] or 0:46 [Velocity Units] are set to Hz.

(3) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because drive Parameter 520 [Max Fwd Speed] or 10:1392 [Max Speed Fwd] sets 60 Hz as the maximum speed.

## Example Ladder Logic

The example ladder logic programs in this chapter are intended for and operate a PowerFlex 755TS drive.

### Functions of the Example Programs

The example programs enable you to do the following:

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

### Logic Command/Status Words

These examples use the Logic Command word and Logic Status word for PowerFlex 750-Series drives. See [Appendix F, Logic Command/Status Words](#) to view details.

## ControlLogix Controller Example

This section includes information when using a ControlLogix controller and a generic profile.

### Creating Ladder Logic Using a Generic Profile, All Versions

#### Option Module Parameter Settings for ControlLogix Controller Example

The following option module settings were used for the example ladder logic program in this section.

Parameter	Value	Option Module Device Parameters
2 [DLs From Net Cfg]	16	Sets the number of Datalinks used to write data from the network controller.
4 [DLs To Net Cfg]	16	Sets the number of Datalinks used to read data to the network controller.

Parameter	Value	Option Module Host Parameters	
		PowerFlex 750-Series	PowerFlex 750-Series with TotalFORCE Control
01 [DL From Net 01]	370 or 100110	Points to drive parameter 370 [Stop Mode A]	Points to drive parameter 10:0110 [Mtr Stop Mode A]
02 [DL From Net 02]	371 or 100111	Points to drive parameter 371 [Stop Mode B]	Points to drive parameter 10:0111 [Mtr Stop Mode B]
03 [DL From Net 03]	535 or 101915	Points to drive parameter 535 [Accel Time 1]	Points to drive parameter 10:1915 [VRef Accel Time1]
04 [DL From Net 04]	536 or 101916	Points to drive parameter 536 [Accel Time 2]	Points to drive parameter 10:1916 [VRef Accel Time1]
05 [DL From Net 05]	537 or 101917	Points to drive parameter 537 [Decel Time 1]	Points to drive parameter 10:1917 [VRef Decel Time1]
06 [DL From Net 06]	538 or 101918	Points to drive parameter 538 [Decel Time 2]	Points to drive parameter 10:1918 [VRef Decel Time1]
07 [DL From Net 07]	539 or 101896	Points to drive parameter 539 [Jog Acc Dec Time]	Points to drive parameter 10:1896 [Jog Acc Dec Time]
08 [DL From Net 08]	556 or 101894	Points to drive parameter 556 [Jog Speed 1]	Points to drive parameter 10:1894 [Jog Speed 1]
09 [DL From Net 09]	557 or 101895	Points to drive parameter 557 [Jog Speed 2]	Points to drive parameter 10:1895 [Jog Speed 2]
10 [DL From Net 10]	571 or 101814	Points to drive parameter 571 [Preset Speed 1]	Points to drive parameter 10:1814 [Preset Speed 1]
11 [DL From Net 11]	572 or 101815	Points to drive parameter 572 [Preset Speed 2]	Points to drive parameter 10:1815 [Preset Speed 2]
12 [DL From Net 12]	573 or 101816	Points to drive parameter 573 [Preset Speed 3]	Points to drive parameter 10:1816 [Preset Speed 3]
13 [DL From Net 13]	574 or 101817	Points to drive parameter 574 [Preset Speed 4]	Points to drive parameter 10:1817 [Preset Speed 4]
14 [DL From Net 14]	575 or 101818	Points to drive parameter 575 [Preset Speed 5]	Points to drive parameter 10:1818 [Preset Speed 5]
15 [DL From Net 15]	576 or 101819	Points to drive parameter 576 [Preset Speed 6]	Points to drive parameter 10:1819 [Preset Speed 6]
16 [DL From Net 16]	577 or 101820	Points to drive parameter 577 [Preset Speed 7]	Points to drive parameter 10:1820 [Preset Speed 7]
17 [DL To Net 01]	370 or 100110	Points to drive parameter 370 [Stop Mode A]	Points to drive parameter 10:110 [Mtr Stop Mode A]
18 [DL To Net 02]	371 or 100111	Points to drive parameter 371 [Stop Mode B]	Points to drive parameter 10:111 [Mtr Stop Mode B]
19 [DL To Net 03]	535 or 101915	Points to drive parameter 535 [Accel Time 1]	Points to drive parameter 10:1915 [VRef Accel Time1]
20 [DL To Net 04]	536 or 101916	Points to drive parameter 536 [Accel Time 2]	Points to drive parameter 10:1916 [VRef Accel Time1]
21 [DL To Net 05]	537 or 101917	Points to drive parameter 537 [Decel Time 1]	Points to drive parameter 10:1917 [VRef Decel Time1]
22 [DL To Net 06]	538 or 101918	Points to drive parameter 538 [Decel Time 2]	Points to drive parameter 10:1918 [VRef Decel Time1]
23 [DL To Net 07]	539 or 101896	Points to drive parameter 539 [Jog Acc Dec Time]	Points to drive parameter 10:1896 [Jog Acc Dec Time]
24 [DL To Net 08]	556 or 101894	Points to drive parameter 556 [Jog Speed 1]	Points to drive parameter 10:1894 [Jog Speed 1]
25 [DL To Net 09]	557 or 101895	Points to drive parameter 557 [Jog Speed 2]	Points to drive parameter 10:1895 [Jog Speed 2]
26 [DL To Net 10]	571 or 101814	Points to drive parameter 571 [Preset Speed 1]	Points to drive parameter 10:1814 [Preset Speed 1]
27 [DL To Net 11]	572 or 101815	Points to drive parameter 572 [Preset Speed 2]	Points to drive parameter 10:1815 [Preset Speed 2]
28 [DL To Net 12]	573 or 101816	Points to drive parameter 573 [Preset Speed 3]	Points to drive parameter 10:1816 [Preset Speed 3]
29 [DL To Net 13]	574 or 101817	Points to drive parameter 574 [Preset Speed 4]	Points to drive parameter 10:1817 [Preset Speed 4]
30 [DL To Net 14]	575 or 101818	Points to drive parameter 575 [Preset Speed 5]	Points to drive parameter 10:1818 [Preset Speed 5]
31 [DL To Net 15]	576 or 101819	Points to drive parameter 576 [Preset Speed 6]	Points to drive parameter 10:1819 [Preset Speed 6]
32 [DL To Net 16]	577 or 101820	Points to drive parameter 577 [Preset Speed 7]	Points to drive parameter 10:1820 [Preset Speed 7]



The Host [DL From Net xx] parameters are inputs into the drive that come from controller outputs (for example, data to write to a drive parameter). The Host [DL To Net xx] parameters are outputs from the drive that go to controller inputs (for example, data to read a drive parameter).

## Controller Tags

When you add the option module and drive to the I/O configuration, software automatically creates generic (non-descriptive) controller tags. In this example program, the following controller tags are used.

Name	△	Data Type	Description
Local:3:I		AB:1756_DNB...	
Local:3:O		AB:1756_DNB...	
Local:3:S		AB:1756_DNB...	

You can expand the Input and Output tags to reveal the input and output configuration. The Input tag for this example program requires 18 32-bit words of data, as shown in the following figure.

**Figure 6 - ControlLogix Controller Input Image for Drive Generic Profile Example Ladder Logic Program**

Name	△	Data Type	Description
Local:3:I		AB:1756_DNB...	
Local:3:I.StatusRegister		AB:1756_DNB...	
Local:3:I.Data		DINT[124]	
Local:3:I.Data[0]		DINT	Logic Status
Local:3:I.Data[1]		DINT	Speed Feedback
Local:3:I.Data[2]		DINT	DL To Net 01
Local:3:I.Data[3]		DINT	DL To Net 02
Local:3:I.Data[4]		DINT	DL To Net 03
Local:3:I.Data[5]		DINT	DL To Net 04
Local:3:I.Data[6]		DINT	DL To Net 05
Local:3:I.Data[7]		DINT	DL To Net 06
Local:3:I.Data[8]		DINT	DL To Net 07
Local:3:I.Data[9]		DINT	DL To Net 08
Local:3:I.Data[10]		DINT	DL To Net 09
Local:3:I.Data[11]		DINT	DL To Net 10
Local:3:I.Data[12]		DINT	DL To Net 11
Local:3:I.Data[13]		DINT	DL To Net 12
Local:3:I.Data[14]		DINT	DL To Net 13
Local:3:I.Data[15]		DINT	DL To Net 14
Local:3:I.Data[16]		DINT	DL To Net 15
Local:3:I.Data[17]		DINT	DL To Net 16

The Output tag for this example requires 18 32-bit words of data, as shown in the following figure.

**Figure 7 - ControlLogix Controller Output Image for Drive Generic Profile Example Ladder Logic Program**

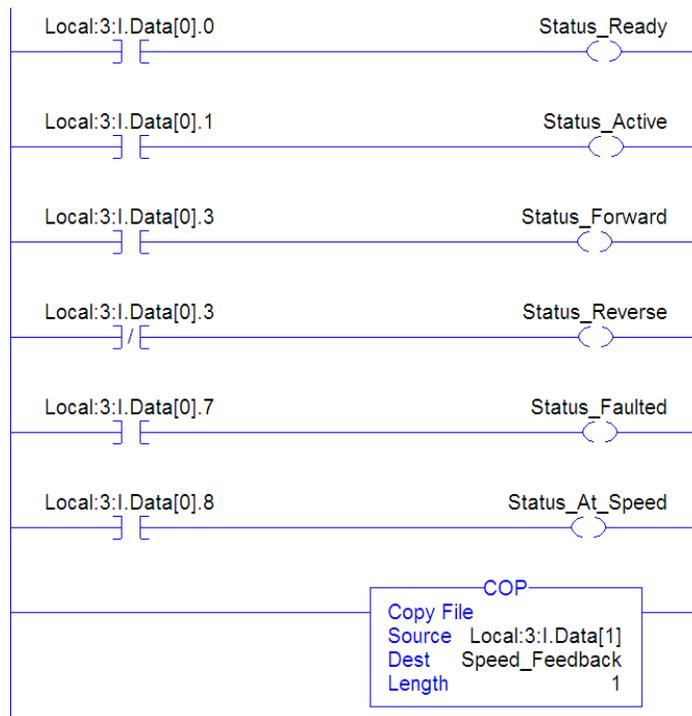
Name	△	Data Type	Description
Local:3:O		AB:1756_DNB...	
Local:3:O.CommandRegister		AB:1756_DNB...	
Local:3:O.Data		DINT[123]	
Local:3:O.Data[0]		DINT	Logic Command
Local:3:O.Data[1]		DINT	Speed Reference
Local:3:O.Data[2]		DINT	DL From Net 01
Local:3:O.Data[3]		DINT	DL From Net 02
Local:3:O.Data[4]		DINT	DL From Net 03
Local:3:O.Data[5]		DINT	DL From Net 04
Local:3:O.Data[6]		DINT	DL From Net 05
Local:3:O.Data[7]		DINT	DL From Net 06
Local:3:O.Data[8]		DINT	DL From Net 07
Local:3:O.Data[9]		DINT	DL From Net 08
Local:3:O.Data[10]		DINT	DL From Net 09
Local:3:O.Data[11]		DINT	DL From Net 10
Local:3:O.Data[12]		DINT	DL From Net 11
Local:3:O.Data[13]		DINT	DL From Net 12
Local:3:O.Data[14]		DINT	DL From Net 13
Local:3:O.Data[15]		DINT	DL From Net 14
Local:3:O.Data[16]		DINT	DL From Net 15
Local:3:O.Data[17]		DINT	DL From Net 16

*Program Tags*

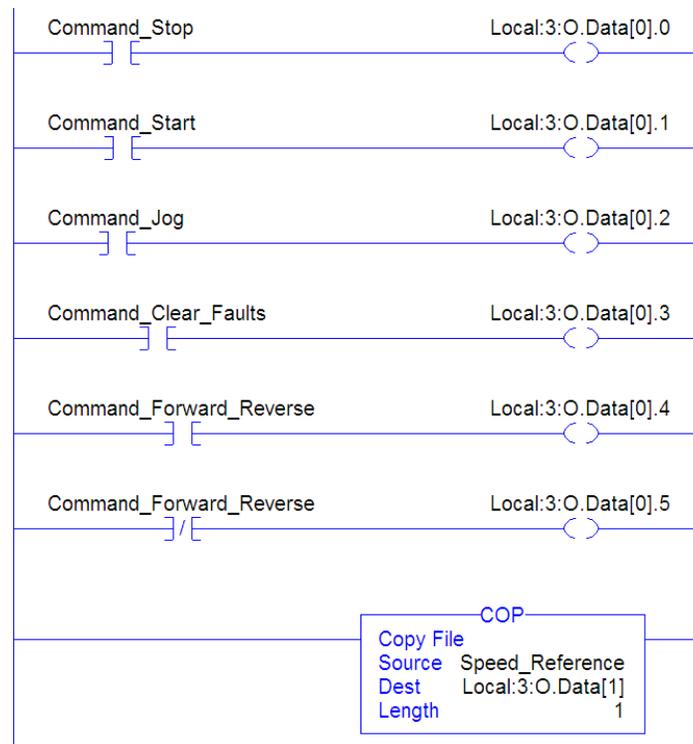
To use the Controller tags that are automatically created, create the following Program tags for this example program.

Name	△	Data Type	Description
Status_Ready		BOOL	
Status_Active		BOOL	
Status_Forward		BOOL	
Status_Reverse		BOOL	
Status_Faulted		BOOL	
Status_At_Speed		BOOL	
Command_Stop		BOOL	
Command_Start		BOOL	
Command_Jog		BOOL	
Command_Clear_Faults		BOOL	
Command_Forward_Reverse		BOOL	
⊕ Speed_Reference		REAL	
⊕ Speed_Feedback		REAL	

**Figure 8 - ControlLogix Controller Example Ladder Logic Program Using a Drive Generic Profile for Logic Status/Feedback**



**Figure 9 - ControlLogix Controller Example Ladder Logic Program Using a Drive Generic Profile for Logic Command/Reference**



#### Enable the DeviceNet Scanner

A rung in the ladder logic must be created and assigned to the 1756-DNB scanner Command Register Run bit. This rung enables the scanner to transfer I/O on the network.



**IMPORTANT** This rung must always be included in the ladder logic program.

#### Example Datalink Data

The Datalink data used in the example program is shown in [Figure 10](#). To describe the parameters to which the Datalinks are assigned, you may want to add descriptions to the automatically created generic controller tags or create a UDDT. For this example, the DL\_From\_Net tags were created to describe the drive parameters to which these Datalinks are assigned.

For example, DL\_From\_Net\_01\_Stop\_Mode\_A indicates that option module Host Parameter 01 [DL From Net 01] is assigned to drive parameter 370 [Stop Mode A] or 10:110 [Mtr Stop Mode A]. This same method applies to the DL\_To\_Net tags.

**Figure 10 - ControlLogix Controller Example Datalinks for Ladder Logic Program Using a Drive Generic Profile**

Name	Value	Style	Data Type
- DL_From_Net	{...}		DL_From_Net
+ DL_From_Net_01_Stop_Mode_A	1	Decimal	DINT
+ DL_From_Net_02_Stop_Mode_B	2	Decimal	DINT
- DL_From_Net_03_Accel_Time_1	2.5	Float	REAL
- DL_From_Net_04_Accel_Time_2	5.0	Float	REAL
- DL_From_Net_05_Decel_Time_1	7.5	Float	REAL
- DL_From_Net_06_Decel_Time_2	10.0	Float	REAL
- DL_From_Net_07_Jog_Acc_Dec_Time	12.5	Float	REAL
- DL_From_Net_08_Jog_Speed_1	10.0	Float	REAL
- DL_From_Net_09_Jog_Speed_2	15.0	Float	REAL
- DL_From_Net_10_Preset_Speed_1	20.0	Float	REAL
- DL_From_Net_11_Preset_Speed_2	25.0	Float	REAL
- DL_From_Net_12_Preset_Speed_3	30.0	Float	REAL
- DL_From_Net_13_Preset_Speed_4	35.0	Float	REAL
- DL_From_Net_14_Preset_Speed_5	40.0	Float	REAL
- DL_From_Net_15_Preset_Speed_6	45.0	Float	REAL
- DL_From_Net_16_Preset_Speed_7	50.0	Float	REAL
- DL_To_Net	{...}		DL_To_Net
+ DL_To_Net_01_Stop_Mode_A	1	Decimal	DINT
+ DL_To_Net_02_Stop_Mode_B	2	Decimal	DINT
- DL_To_Net_03_Accel_Time_1	2.5	Float	REAL
- DL_To_Net_04_Accel_Time_2	5.0	Float	REAL
- DL_To_Net_05_Decel_Time_1	7.5	Float	REAL
- DL_To_Net_06_Decel_Time_2	10.0	Float	REAL
- DL_To_Net_07_Jog_Acc_Dec_Time	12.5	Float	REAL
- DL_To_Net_08_Jog_Speed_1	10.0	Float	REAL
- DL_To_Net_09_Jog_Speed_2	15.0	Float	REAL
- DL_To_Net_10_Preset_Speed_1	20.0	Float	REAL
- DL_To_Net_11_Preset_Speed_2	25.0	Float	REAL
- DL_To_Net_12_Preset_Speed_3	30.0	Float	REAL
- DL_To_Net_13_Preset_Speed_4	35.0	Float	REAL
- DL_To_Net_14_Preset_Speed_5	40.0	Float	REAL
- DL_To_Net_15_Preset_Speed_6	45.0	Float	REAL
- DL_To_Net_16_Preset_Speed_7	50.0	Float	REAL



To determine whether a parameter is a 32-bit integer (DINT) or a REAL data type, see these publications:

- For PowerFlex 750-Series AC Drives, see the Data Type column in the chapter containing parameters in the PowerFlex 750-Series AC Drives Programming Manual, publication [750-PM001](#).
- For PowerFlex 750-Series AC Drives with TotalFORCE control, see the Data Type column in the PowerFlex Drives with TotalFORCE Control Parameters Reference Data, publication [750-RD101](#).

If a parameter is a REAL, a COP (Copy) instruction or UDDT is needed to copy the DINT to a REAL (inputs) or copy the REAL to a DINT (outputs).

## Use Datalinks

A Datalink is a mechanism that is used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be read or written to without using an Explicit Message. When enabled, each Datalink occupies one 32-bit word in a ControlLogix controller.

The following rules apply when using Datalinks:

- The target of a Datalink can be any host parameter, including those of a peripheral. For example, drive parameters 535 [Accel Time 1] or 10:1915 [VRef Accel Time1] can be the target of any or all option modules that are installed in the drive.
- The data that is passed through the drive's Datalink mechanism is determined by the settings of the following option module parameters:

- Device parameter 02 [DLs From Net Cfg]
- Device parameter 04 [DLs To Net Cfg]
- Host parameters 01...16 [DL From Net 01-16]
- Host parameters 17...32 [DL To Net 01-16]

---

**IMPORTANT** A reset is always required after configuring Datalinks so that the changes take effect.

---

- When an I/O connection that includes Datalinks is active, those Datalinks being used are locked and cannot be changed until that I/O connection becomes idle or inactive.
- 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 must change a value of a parameter frequently.

Datalinks are locked when a drive peripheral has an I/O connection with a controller. When a controller has an I/O connection to the drive, the drive does not allow a reset to defaults, configuration download, or anything else that could change the makeup of the I/O connection in a running system. The I/O connection with the controller must first be disabled to allow changes to the respective Datalinks.

Depending on the controller being used, the I/O connection can be disabled by doing the following:

- Inhibiting the module in RSLogix 5000® software
- Putting the controller in Program mode
- Placing the scanner in idle mode
- Disconnecting the drive from the network



A COP (Copy) instruction or a UDDT is needed—for REAL parameters, speed Reference, and speed Feedback only—to copy the DINT data into a REAL word for input data conversion. For output data conversion, a COP (Copy) instruction or UDDT is needed—for REAL parameters, speed Reference, and speed Feedback only—to copy the REAL data into a DINT word.

To determine whether a parameter is a 32-bit integer (DINT) or a REAL data type, see these publications:

- For PowerFlex 750-Series AC Drives, see the Data Type column in the chapter containing parameters in the PowerFlex 750-Series AC Drives Programming Manual, publication [750-PM001](#).
- For PowerFlex 750-Series AC Drives with TotalFORCE control, see the Data Type column in the PowerFlex Drives with TotalFORCE Control Parameters Reference Data, publication [750-RD101](#).

## Establish a Communication Hierarchy

This procedure is only required if Datalinks are used to write or read data of the drive or its connected peripherals. A hierarchy determines the type of device with which the option module exchanges data. In a controller-device hierarchy, the option module exchanges data with a controller, such as a scanner (1756-DNB, 1771-SDN, 1747-SDN, and so forth).

### Enable Datalinks to Write Data

The controller output image (controller outputs-to-drive) can have 0...16 additional 32-bit parameters (Datalinks). The quantity of additional parameters is configured using device parameter 2 [DLs From Net Cfg].



Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use host parameters 01, 02, and 03 to configure three Datalinks to write data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

Host parameters 1 [DL From Net 01] ...16 [DL From Net 16] control which parameters in the drive, option module, or any other connected peripheral receive values from the network. You can use the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench™ software to select the drive or peripheral by port

number and the parameter by name. As an alternate method, you can set the parameter value manually by number using this formula:

$$\text{From Net Parameter Value} = (10000 * \text{port number}) + (\text{Destination Parameter Number})$$

For example, suppose that you want to use host parameter 1 [DL From Net 01] to write to parameter 3 of an optional encoder module plugged into drive port 5. Using the formula, the value for host parameter 1 [DL From Net 01] would be  $(10000 * 5) + (3) = 50003$ .

Follow these steps to enable Datalinks to write data:

1. Set the value of device parameter 2 [DLs From Net Cfg] to the number of contiguous controller-to-drive Datalinks that are to be included in the network I/O connection.
2. Reset the option module; see [Reset the Option Module on page 36](#).
3. Since the Logic Command and Reference are always used in the option module, configure the parameters in the drive to accept the Logic Command and Reference from the option module.

When using the controller for speed/velocity reference via the option module, set two fields in drive parameter 545 [Speed Ref A Sel] for PowerFlex 750-Series drives or parameter 10:1800 [VRef A Sel] for PowerFlex 750-Series drives with TotalFORCE control.

- a. Set the Port field for the drive (for example, 0 - PowerFlex 755).
- b. Set the Parameter field to point to the port in which the option module is installed (for this example, Port 4 Reference).

Also, verify that the mask parameters in the drive (for example, parameter 324 [Logic Mask] for PowerFlex 750-Series drives or parameter 0:41 [Logic Mask] for PowerFlex 750-Series drives with TotalFORCE control) are configured to receive the desired logic from the option module. See the drive documentation for details.

After the preceding steps are complete, the option module is ready to receive input data and transfer status data to the controller. Next, configure the controller to recognize and transmit I/O to the option module.

## Enable Datalinks to Read Data

The controller input image (drive-to-controller inputs) can have 0...16 additional 32-bit parameters (Datalinks). The quantity of additional parameters is configured using device parameter 4 [DLs To Net Cfg].



Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use host parameters 17, 18, 19, 20, and 21 to configure five Datalinks to read data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

Host parameters 17 [DL To Net 01] ... 32 [DL To Net 16] configure which parameters in the drive, option module, or any other connected peripheral send values to the network. You can use the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench, to select the drive or peripheral by port number and the parameter by name. As an alternate method, set the parameter value manually by number using this formula:

$$\text{To Net Parameter Value} = (10000 * \text{Port Number}) + (\text{Origination Parameter Number})$$

For example, suppose that you want to use host parameter 17 [DL To Net 01] to read parameter 2 of an optional I/O module plugged into drive port 6. Using the formula, the value for host parameter 17 [DL To Net 01] would be  $(10000 * 6) + (2) = 60002$ .

Follow these steps to enable Datalinks to read data.

1. Set the value of device parameter 4 [DLs To Net Cfg] to the number of contiguous drive-to-controller Datalinks that are to be included in the network I/O connection.
2. Reset the option module; see [Reset the Option Module on page 36](#).

The option module is configured to send output data to the master (controller). You must now configure the controller to recognize and transmit I/O to the option module.

## Configure DeviceNet Drivers for a Workstation

This chapter provides instructions on how to configure a Rockwell Automation ControlLogix® controller to communicate with the option module and connected PowerFlex drive.

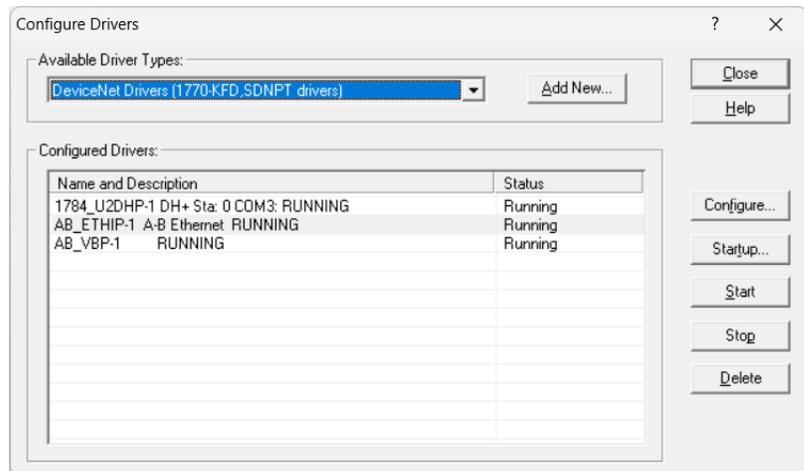
### IMPORTANT

Because the option module and PowerFlex 750-Series drives are 32-bit devices, the ControlLogix controller (also a 32-bit device) is used for example purposes in this chapter and throughout this manual. To simplify configuration and ladder logic programs, and to maximize drive performance, we recommend using only a 32-bit platform Logix controller with this option module and PowerFlex 750-Series and PowerFlex 750-Series with TotalFORCE control drives.

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

1. Start RSLinx Classic software.
2. From the Communications menu, choose Configure Drivers to display the Configure Drivers dialog box.
3. From the Available Driver Types pull-down menu, choose DeviceNet Drivers.
4. Click Add New to display the DeviceNet Driver Selection dialog box.
5. In the Available DeviceNet Drivers list, choose the computer connection adapter (1784-PCD, 1784-PCID, 1784-PCIDS, or 1770-KFD) being used to connect your computer to the network, and click Select to display the Driver Configuration dialog box.
6. Configure the driver for your computer and network settings and click OK.  
The Configure Drivers dialog box reports the progress of the configuration.
7. When the Add New RSLinx Driver dialog box appears, type a name (if desired) and click OK.

The Configure Drivers dialog box reappears with the new driver in the Configured Drivers list.

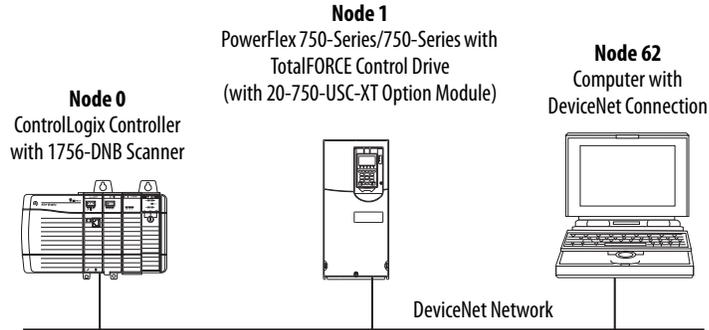


8. Click Close to close the Configure Drivers dialog box.
9. Keep RSLinx software running and verify that your computer recognizes the drive.
  - a. From the Communications menu, choose RSWho.
  - b. In the menu tree, click '+' next to the DeviceNet driver.

## Example using ControlLogix Controller and Studio 5000

After the option module is configured, the drive and option module will be a single node on the network. This section provides the steps that are needed to configure a simple DeviceNet network (see [Figure 11](#)). In our example, we will configure a ControlLogix controller with a 1756-DNB scanner to communicate with a drive using Logic Command/Status, Reference/Feedback, and 32 Datalinks (16 to read and 16 to write) over the network.

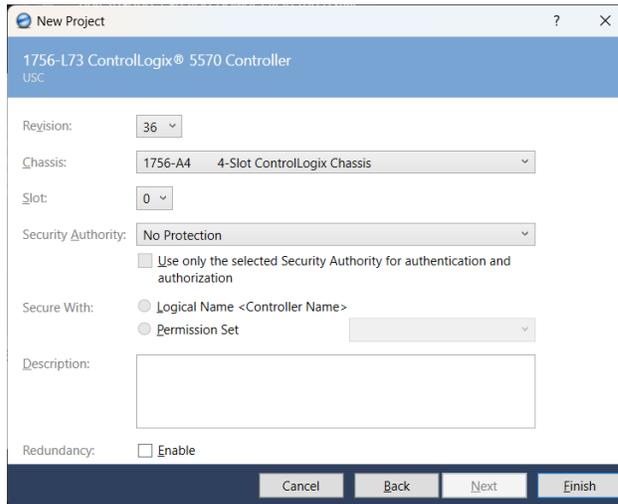
**Figure 11 - Example ControlLogix Controller DeviceNet Network**



### Adding the Scanner to the I/O Configuration

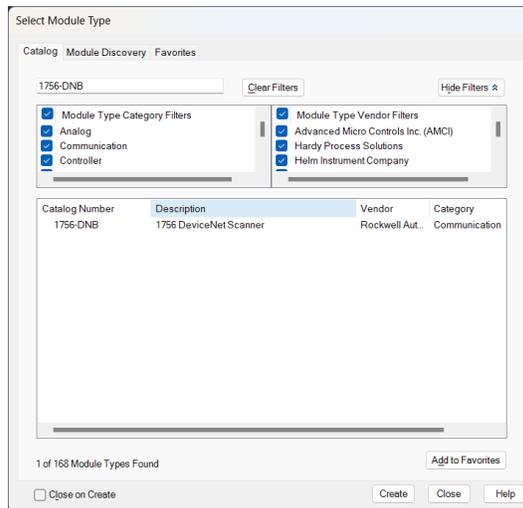
To establish communication between the controller and option module over the network, you must first add the ControlLogix controller and its scanner to the I/O configuration.

1. Start the Studio 5000 Logix Designer® application.
2. From the File menu, choose New to display the New Controller dialog box.



- a. Choose the appropriate choices for the fields in the dialog box to match your application.
  - b. Click OK.
- The RSLogix 5000 dialog box reappears with the treeview in the left pane.
3. In the treeview, right-click the I/O Configuration folder and choose New Module. The Select Module dialog box appears.

## 4. Expand the Communications group to display all available communication modules.



## 5. In the list, select the DeviceNet scanner used by your controller.

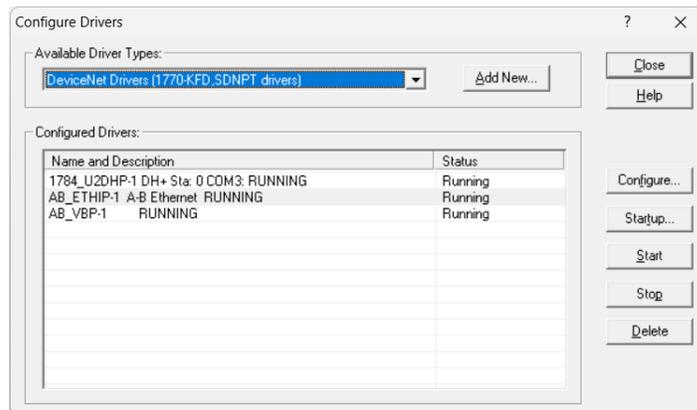
In this example, we use a 1756-DNB DeviceNet Scanner, so the 1756-DNB option is selected.

## 6. Click OK.

## 7. In the Select Major Revision popup dialog box, select the major revision of its firmware.

## 8. Click OK.

The scanner's New Module dialog box appears.



## 9. Edit the following:

Box	Setting
Name	A name to identify the scanner.
Description	Optional - description of the scanner.
Node	The node address of the DeviceNet scanner.
Slot	The slot of the DeviceNet scanner in the rack.
Revision	The minor revision of the firmware in the scanner. (You already set the major revision by selecting the scanner series in step 7.)
Electronic Keying	<b>Compatible Keying.</b> The 'Compatible Keying' setting for Electronic Keying verifies that the physical module is consistent with the software configuration before the controller and scanner make a connection. Therefore, be sure that you have set the correct revision in this dialog box. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select 'Disable Keying'. Disable Keying is recommended.
Input Size	The size of the input data for the DeviceNet scanner. We recommend using the default value of 124.

Box	Setting
Output Size	The size of the output data for the DeviceNet scanner. We recommend using the default value of 123.
Status Size	The size of the status data for the DeviceNet scanner. We recommend using the default value of 32.
Open Module Properties	When this box is checked, clicking OK opens additional module properties dialog boxes to further configure the scanner. When unchecked, clicking OK closes the scanner's New Module dialog box. For this example, uncheck this box.

10. Click OK.

The scanner is now configured for the DeviceNet network, added to the RSLogix 5000 project, and appears in the I/O Configuration folder.

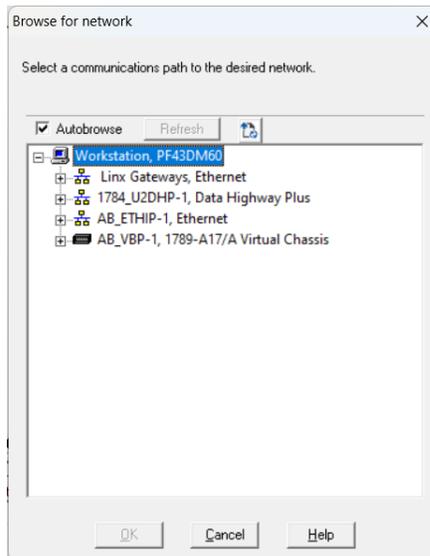


In our example, a 1756-DNB scanner appears under the I/O Configuration folder with its assigned name. For convenience, keep the project open. Later in this chapter the project needs to be downloaded to the controller.

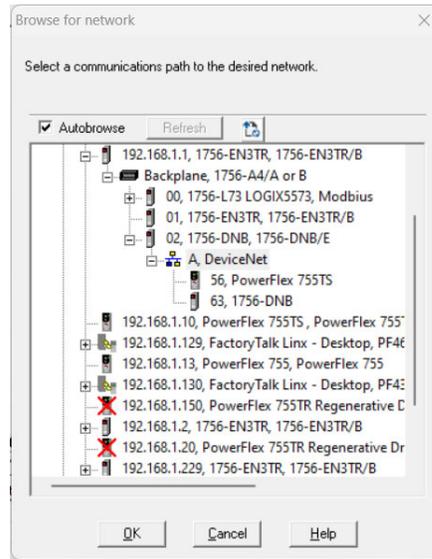
### Using RSNetWorx for DeviceNet Software to Configure and Save the I/O to the Scanner

After adding the scanner to the I/O configuration, you must now configure and save the I/O to the scanner.

1. Start RSNetWorx for DeviceNet software.
2. From the File menu, choose New to display the New File dialog box.
3. Select DeviceNet Configuration as the network configuration type.
4. Click OK.
5. From the Network menu, choose Online to display the Browse for Network dialog box.



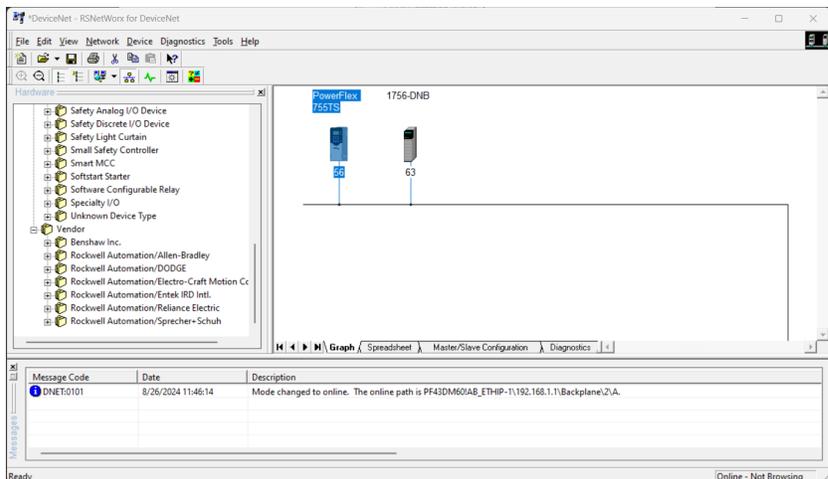
- Expand the communication path from your computer to the DeviceNet scanner. The following dialog box shows our example navigating to devices on a DeviceNet network. Depending on the communication link you are using, the navigation path may be different.



- Click OK after selecting a valid path to the DeviceNet network (for this example, A, DeviceNet).

If a message box appears about uploading or downloading information, click OK.

As the selected DeviceNet path is browsed, RSNetWorx for DeviceNet software creates a graph view window that shows a graphical representation of the devices on the network.

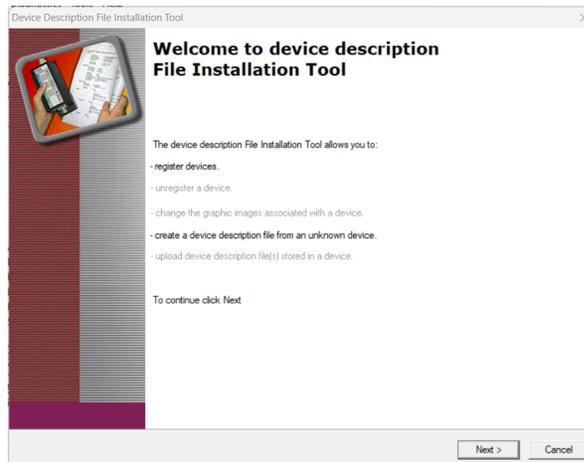


If the icon for the drive (for this example, PowerFlex 755TS) on the network appears as Unrecognized Device, use RSNetWorx for DeviceNet software to create the drive's EDS file.

- Either create the EDS file by uploading it from the online device on the network or download the EDS file from the Rockwell Automation website.

### Create the EDS File from Online Device On the Network

- a. Right-click the Unrecognized Device icon and select Register Device in the menu. The EDS Wizard appears.



- b. Click Next to start creating the EDS file.
- c. Select Create an EDS file.
- d. Click Next.

If the EDS file is already downloaded and resides on your computer, select 'Register an EDS file' and click Next. Then follow the screen prompts and disregard the remaining steps (e through m) in this procedure.

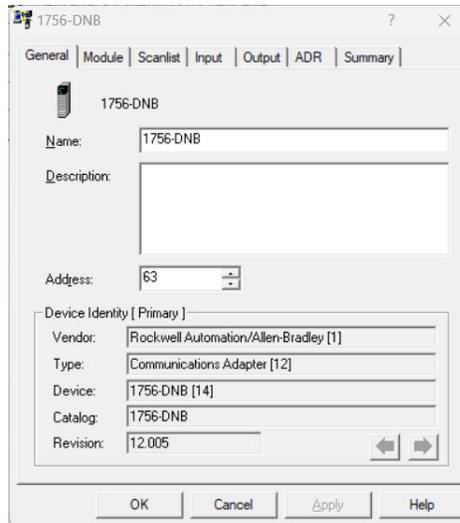
- e. Enter a description (if desired).
- f. Click Next.
- g. Check the Polled box.
- h. Enter '8' into the Input Size and Output Size boxes (which accounts for just the basic I/O).
- i. Click Next.  
RSNetWorx for DeviceNet software uploads the EDS file from the drive.
- j. Click Next to display the icon options for the node.
- k. Click Next to view a summary.
- l. Click Next again to accept it.
- m. Click Finish to finish creating the EDS file.

A new icon represents your drive and communications option module in the RSNetWorx for DeviceNet graph view window.

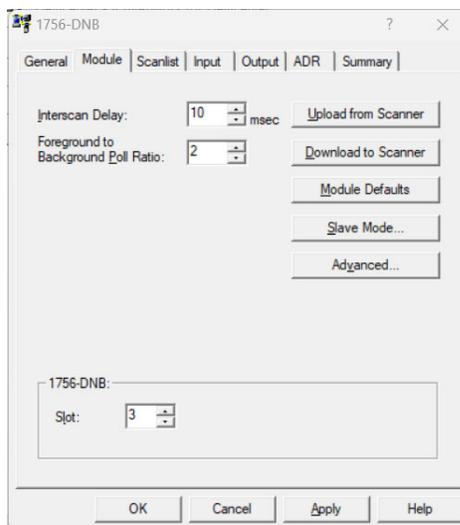
### Download the EDS File from the Product Compatibility and Download Center (PCDC)

- a. Go to [rok.auto/pcdc](http://rok.auto/pcdc) and obtain the EDS file.
- b. Launch the EDS Hardware Installation Tool by clicking the Start button and choose Programs > Rockwell Software > RSLinx Tools > EDS Hardware Installation Tool.
- c. Follow the screen prompts to add the EDS file for use with your project.
- d. The Unrecognized Device icon in the RSNetWorx for DeviceNet graph view window in step 7 should have been replaced by a drive icon (for this example, the icon for a PowerFlex 755TS drive).

9. In the graph view window, right-click the 1756-DNB icon and choose Properties to display its properties dialog box.



10. Click the Module tab to display the Scanner Configuration dialog box.
11. Click Upload to upload the 1756-DNB scanner configuration to the RSNetWorx for DeviceNet project and display the 1756-DNB Module Tab dialog box.



12. Edit the following:

Box	Setting
Interscan Delay	Sets the scanner time delay between consecutive I/O scans on the network. For this example, we recommend using the default setting of 10 milliseconds. <b>TIP:</b> When numerous drives are on the network and the drives are faulting on a Comm Loss, increasing this value may help.
Foreground...	Sets the ratio of foreground to background polls. For this example, we recommend using the default setting of 2.
Slot	Sets the slot location in which the scanner is installed. For this example, Slot 3 is selected.

13. Click Apply.

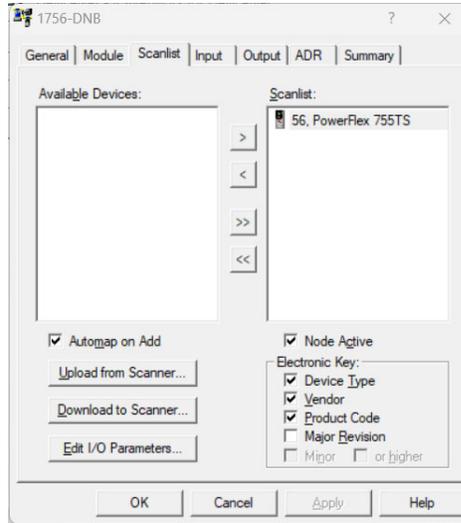
- Click the Scanlist tab to begin the drive I/O configuration.

The Available Devices box shows devices that are presently on the DeviceNet network but are not yet configured. The Scanlist box shows devices that are presently on the DeviceNet network and are configured.



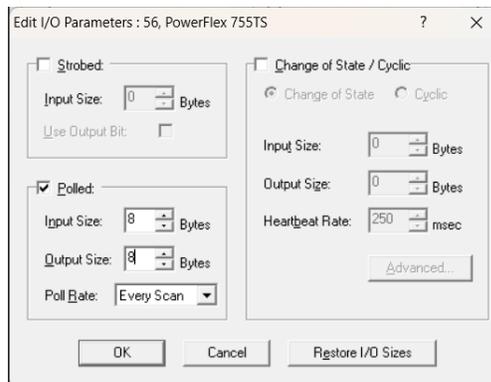
The Automap on Add box is selected by default and allows RSNetWorx for DeviceNet software to automatically map the drive I/O into the scanner in the next available registers. The mapping is based on the minimum I/O requirements (8 bytes for input and 8 bytes for output) that the scanner obtains from the drive EDS file.

- For this example, clear Automap on Add.
- Select the PowerFlex 755TS drive in the Available Devices box and click > to move it to the Scanlist box.



Checkbox	Description
Node Active	Activates/deactivates the scanlist in the 1756-DNB scanner for the selected device. For this example, keep the checkbox selected.
Device Type	Electronic Key checkboxes select how specific the device in the scanlist must be for the 1756-DNB scanner to match its compatibility for I/O operation. The more checkboxes that are checked, the more specific the device must be to operate. For this example, leave the default checkboxes (Device Type, Vendor, and Product Code) selected.
Vendor	
Product Code	
Major Revision	

- Click Edit I/O Parameters to display the Edit I/O Parameters dialog box for the PowerFlex 755TS drive that is used in this example.



- a. Select the checkboxes and options that represent the type or types of data exchange (Polled, Change of State, and Cyclic).

For this example, Polled was selected, which we recommend.

- b. Enter the number of bytes that are required for your I/O in the Input Size and Output Size boxes.

For the example in this manual, all 16 [DL From Net xx] and all 16 [DL To Net xx] are used, resulting in an Input Size of '72' and an Output Size of '72'. To determine the byte sizes for your application, either view option module Diagnostic Items 7 (Input Size) and 8 (Output Size) or calculate them.

### *View Diagnostic Items 7 and 8 for Input/Output Byte Sizes*

Use the 20-HIM-A6 or 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench™, to view Diagnostic Items 7 and 8. The option module automatically calculates the number of bytes for the Input Size and Output Size based on the values of device parameters 2 [DLs From Net Cfg] and 4 [DLs To Net Cfg] configured in the [Establish a Communication Hierarchy](#) section, starting on page 49.

### *Calculate the Input/Output Byte Sizes*

You can easily calculate the number of bytes for the Input Size and Output Size. Since the option module always uses the 32-bit Logic Command, 32-bit Feedback, 32-bit Logic Status, and 32-bit Reference, at least 8 bytes must be set for both the Input Size and Output Size. (A 32-bit word is four bytes.) If any or all of the drive's sixteen 32-bit Datalinks are used (see [Establish a Communication Hierarchy](#) section starting on page 49), increase the Input and Output Size settings accordingly.

- Input Size: Multiply the number of Datalinks that are used to write data (value of Device Parameter 2 [DLs From Net Cfg]) by 4 bytes, and add this result to the minimum 8 bytes. For example, if Parameter 2 has a value of '3', add 12 bytes (3 x 4 bytes) to the required minimum 8 bytes for a total of 20 bytes.
- Output Size: Multiply the number of Datalinks that are used to read data (value of Device Parameter 4 [DLs To Net Cfg]) by 4 bytes, and add this result to the minimum 8 bytes. For example, if Parameter 4 has a value of '7', add 28 bytes (7 x 4 bytes) to the required minimum 8 bytes for a total of 36 bytes.

18. Set the scan rate for the selected data exchange method.

For more information about scan rates, see RSNetWorx for DeviceNet software online help.

Data Exchange Method	Rate Field Pull-down Setting
Polled	Poll Rate
Change of State	Heartbeat Rate
Cyclic	Send Rate

19. Click OK.

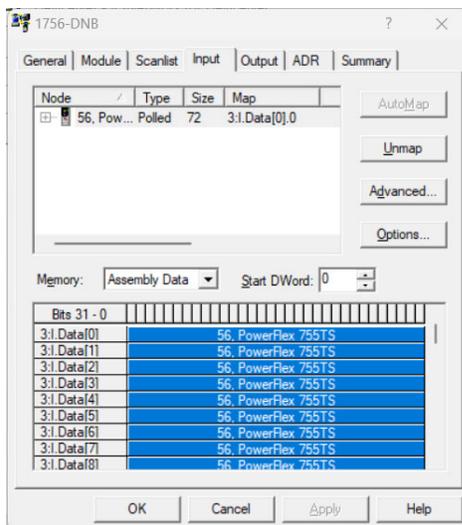
If a Scanner Configuration dialog box appears, click Yes to continue. The Edit I/O Parameters dialog box closes and then the 1756-DNB Scanlist tab dialog box reappears.

20. Click the Input tab to display the input registers for the 1756-DNB scanner.

21. Click AutoMap to map the drive input image to the 1756-DNB scanner as shown in the following example dialog box.



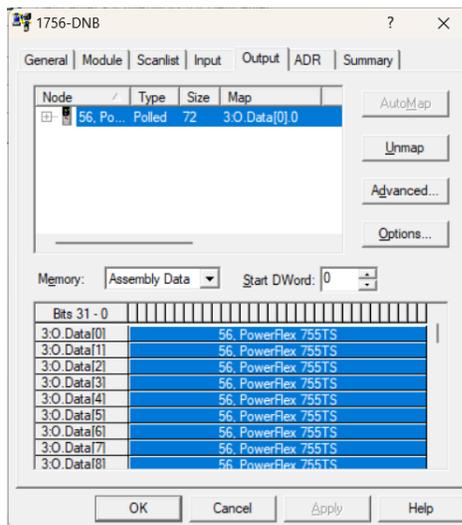
If your Studio 5000® project requires a different starting DWord (double word, 32-bit) than the default value of '0' for the drive input image, set the Start DWord field to the appropriate value.



22. Click the Output tab to display the output registers for the 1756-DNB scanner.
23. Click AutoMap to map the drive output image to the 1756-DNB scanner as shown in the example dialog box below.



If your Studio 5000 project requires a different starting DWord (double word, 32-bit) than the default value of '0' for the drive output image, set the Start DWord field to the appropriate value.



24. Click OK.  
If the Scanner Configuration dialog box appears asking to download these settings to the 1756-DNB scanner, click Yes.
25. From the File menu, choose Save.  
If this is the first time you saved the project, the Save As dialog box appears.
  - a. Navigate to a folder.
  - b. Type a file name.

- c. Click Save to save the configuration as a file on your computer.
26. When configuring the I/O for additional drives on the network, repeat steps 14...25.

---

**IMPORTANT** When all Datalinks in each drive are used (18 DINTs of I/O per drive), a maximum of 6 drives can be mapped. This is due to the amount of I/O available in the 1756-DNB scanner, which is a maximum of 124 DINTs.

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### Setting Datalinks in the Drive (Optional)

After configuring the 1756-DNB scanner, Datalinks (if used) must be set to parameters that are appropriate for your application.

Use the 20-HIM-A6, 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench, to set the Datalinks in the drive. For this example, the following Datalink values are used.

Option Module Host Parameters	Value	PowerFlex 750-Series	PowerFlex 750-Series with TotalFORCE Control
01 [DL From Net 01]	370 or 100110	Points to drive parameter 370 [Stop Mode A]	Points to drive parameter 10:0110 [Mtr Stop Mode A]
02 [DL From Net 02]	371 or 100111	Points to drive parameter 371 [Stop Mode B]	Points to drive parameter 10:0111 [Mtr Stop Mode B]
03 [DL From Net 03]	535 or 101915	Points to drive parameter 535 [Accel Time 1]	Points to drive parameter 10:1915 [VRef Accel Time1]
04 [DL From Net 04]	536 or 101916	Points to drive parameter 536 [Accel Time 2]	Points to drive parameter 10:1916 [VRef Accel Time1]
05 [DL From Net 05]	537 or 101917	Points to drive parameter 537 [Decel Time 1]	Points to drive parameter 10:1917 [VRef Decel Time1]
06 [DL From Net 06]	538 or 101918	Points to drive parameter 538 [Decel Time 2]	Points to drive parameter 10:1918 [VRef Decel Time1]
07 [DL From Net 07]	539 or 101896	Points to drive parameter 539 [Jog Acc Dec Time]	Points to drive parameter 10:1896 [Jog Acc Dec Time]
08 [DL From Net 08]	556 or 101894	Points to drive parameter 556 [Jog Speed 1]	Points to drive parameter 10:1894 [Jog Speed 1]
09 [DL From Net 09]	557 or 101895	Points to drive parameter 557 [Jog Speed 2]	Points to drive parameter 10:1895 [Jog Speed 2]
10 [DL From Net 10]	571 or 101814	Points to drive parameter 571 [Preset Speed 1]	Points to drive parameter 10:1814 [Preset Speed 1]
11 [DL From Net 11]	572 or 101815	Points to drive parameter 572 [Preset Speed 2]	Points to drive parameter 10:1815 [Preset Speed 2]
12 [DL From Net 12]	573 or 101816	Points to drive parameter 573 [Preset Speed 3]	Points to drive parameter 10:1816 [Preset Speed 3]
13 [DL From Net 13]	574 or 101817	Points to drive parameter 574 [Preset Speed 4]	Points to drive parameter 10:1817 [Preset Speed 4]
14 [DL From Net 14]	575 or 101818	Points to drive parameter 575 [Preset Speed 5]	Points to drive parameter 10:1818 [Preset Speed 5]
15 [DL From Net 15]	576 or 101819	Points to drive parameter 576 [Preset Speed 6]	Points to drive parameter 10:1819 [Preset Speed 6]
16 [DL From Net 16]	577 or 101820	Points to drive parameter 577 [Preset Speed 7]	Points to drive parameter 10:1820 [Preset Speed 7]
17 [DL To Net 01]	370 or 100110	Points to drive parameter 370 [Stop Mode A]	Points to drive parameter 10:110 [Mtr Stop Mode A]
18 [DL To Net 02]	371 or 100111	Points to drive parameter 371 [Stop Mode B]	Points to drive parameter 10:111 [Mtr Stop Mode B]
19 [DL To Net 03]	535 or 101915	Points to drive parameter 535 [Accel Time 1]	Points to drive parameter 10:1915 [VRef Accel Time1]
20 [DL To Net 04]	536 or 101916	Points to drive parameter 536 [Accel Time 2]	Points to drive parameter 10:1916 [VRef Accel Time1]
21 [DL To Net 05]	537 or 101917	Points to drive parameter 537 [Decel Time 1]	Points to drive parameter 10:1917 [VRef Decel Time1]
22 [DL To Net 06]	538 or 101918	Points to drive parameter 538 [Decel Time 2]	Points to drive parameter 10:1918 [VRef Decel Time1]
23 [DL To Net 07]	539 or 101896	Points to drive parameter 539 [Jog Acc Dec Time]	Points to drive parameter 10:1896 [Jog Acc Dec Time]
24 [DL To Net 08]	556 or 101894	Points to drive parameter 556 [Jog Speed 1]	Points to drive parameter 10:1894 [Jog Speed 1]
25 [DL To Net 09]	557 or 101895	Points to drive parameter 557 [Jog Speed 2]	Points to drive parameter 10:1895 [Jog Speed 2]
26 [DL To Net 10]	571 or 101814	Points to drive parameter 571 [Preset Speed 1]	Points to drive parameter 10:1814 [Preset Speed 1]
27 [DL To Net 11]	572 or 101815	Points to drive parameter 572 [Preset Speed 2]	Points to drive parameter 10:1815 [Preset Speed 2]
28 [DL To Net 12]	573 or 101816	Points to drive parameter 573 [Preset Speed 3]	Points to drive parameter 10:1816 [Preset Speed 3]
29 [DL To Net 13]	574 or 101817	Points to drive parameter 574 [Preset Speed 4]	Points to drive parameter 10:1817 [Preset Speed 4]
30 [DL To Net 14]	575 or 101818	Points to drive parameter 575 [Preset Speed 5]	Points to drive parameter 10:1818 [Preset Speed 5]
31 [DL To Net 15]	576 or 101819	Points to drive parameter 576 [Preset Speed 6]	Points to drive parameter 10:1819 [Preset Speed 6]
32 [DL To Net 16]	577 or 101820	Points to drive parameter 577 [Preset Speed 7]	Points to drive parameter 10:1820 [Preset Speed 7]



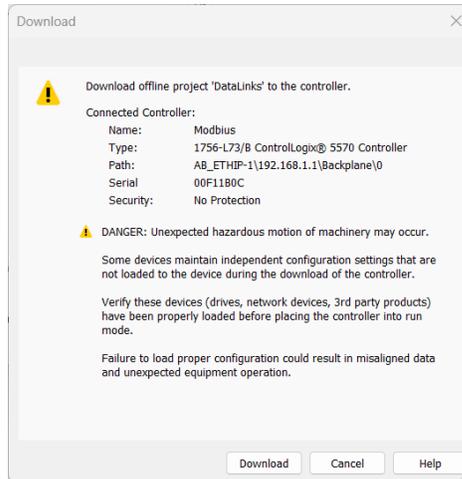
The Host [DL From Net xx] parameters are inputs into the drive that come from controller outputs (for example, data to write to a drive parameter). The Host [DL To Net xx] parameters are outputs from the drive that go to controller inputs (for example, data to read a drive parameter).

## Downloading the Project to the Controller and Going Online

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

1. From the Communications menu in the RSLogix 5000 dialog box, choose Download.

The Download dialog box appears.



If a message box reports that Studio 5000 software is unable to go online, find your controller in the Who Active dialog box. From the Communications menu, choose Who Active. After finding and selecting the controller, click Set Project Path to establish the path. If your controller does not appear, you need to add or configure the DeviceNet driver with RSLinx software. See RSLinx online help for details.

2. Click Download to download the configuration to the controller.  
When the download is successfully completed, RSLogix 5000 software goes into the Online mode and the I/O OK box in the upper left of the dialog box should be steady green.
3. From the File menu, choose Save.  
If this is the first time you saved the project, the Save As dialog box appears.
  - a. Navigate to a folder.
  - b. Type a file name.
  - c. Click Save to save the configuration as a file on your computer.
4. To help ensure that the present project configuration values are saved, RSLogix 5000 software prompts you to upload them. Click Yes to upload and save.
5. Place the controller in Remote Run or Run Mode.

## Use Message Instructions

This section provides information and examples that explain how to use Explicit Messaging with a ControlLogix controller to configure and monitor the option module and connected PowerFlex 750-Series drive.



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

## About Explicit Messaging

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

---

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

---



To message to another device in a different drive port, see the Instance table in Appendix C:

- DPI™ Parameter Object section on [page 155](#) for Device parameters.
- Host DPI Parameter Object section on [page 170](#) for Host parameters.

In the Message Configuration dialog box, set the Instance field to an appropriate value within the range that is listed for the port in which the device resides.

---

**IMPORTANT** PowerFlex 750-Series and PowerFlex 750-Series with TotalFORCE control drives have explicit messaging limitations. [Table 15](#) shows the DeviceNet Object Class code compatibilities for these drives.

---

**Table 15 - Explicit Messaging Class Code Compatibility with PowerFlex 750-Series and PowerFlex 750-Series with TotalFORCE Control Drives**

DeviceNet Object Class Code	Compatibility	Explicit Messaging Function
Parameter Object 0x0F	No	Single parameter reads/writes
DPI Parameter Object 0x93	Yes <sup>(1)</sup> with limitations	Single and scattered parameter reads/writes
Host DPI Parameter Object 0x9F	Yes <sup>(2)</sup> with limitations	Single and scattered parameter reads/writes

(1) Enables access to drive parameters (Port 0), DPI device parameters (Ports 1...6 only), and Host parameters (Ports 7...14 only). For example, DPI Parameter Object Class code 0x93 can access a Safe Speed Monitor option module in Port 6. However, Class code 0x93 cannot access, for example, the Host parameters in a 24V I/O option module in Port 5. See [DPI Parameter Object on page 155](#) for instance (parameter) numbering.

(2) Enables access to drive parameters (Port 0) and Host parameters for all ports (1...14). Host DPI Parameter Object Class code 0x9F cannot access DPI (device) parameters. For example, if a 20-750-USC-XT option module is in Port 4, its Host parameters can be accessed, but not its DPI (device) parameters. See [DPI Parameter Object on page 155](#) for instance (parameter) numbering.

## Performing Explicit Messaging

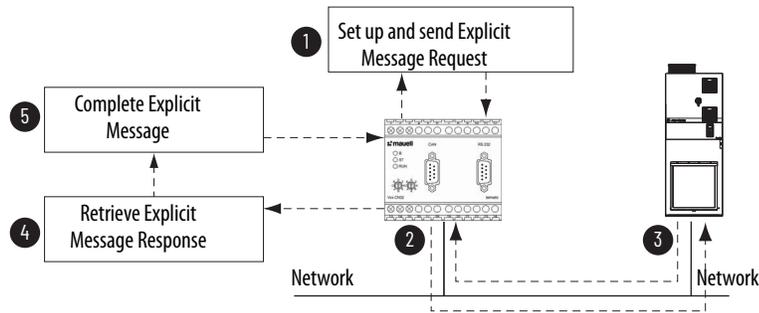
There are five basic events in the Explicit Messaging process. The details associated with each event varies depending on the type of controller being used. See the documentation for your controller.

---

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

---

Figure 12 - Explicit Message Process



Event	Description
1	You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner module (download).
2	The scanner module transmits the Explicit Message Request to the device over the network.
3	The device transmits the Explicit Message Response back to the scanner. The data is stored in the scanner buffer.
4	The controller retrieves the Explicit Message Response from the scanner's buffer (upload).
5	The Explicit Message is complete.

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

## ControlLogix Controller Examples

This section provides examples when using a ControlLogix controller. For supported classes, instances, and attributes, see [Appendix D](#).



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

**IMPORTANT** The explicit messaging examples in this section can be performed with RSLogix 5000 software, any version—or Studio 5000 Logix Designer application, version 21.00 or later.

**IMPORTANT** The read and write messaging examples in this section are for Device parameters which use Class Code 0x93. For Host parameters, use Class Code 0x9F and format the rest of the message in the same way as these examples. The Message Configuration has a Service Type of 'Parameter Read' which is Class code 0x0F, Parameter Object. Parameter Object is not supported in PowerFlex 750-Series and PowerFlex 750-Series with TotalFORCE control drives.

### Ladder Logic Program to Read a Single Parameter

A Get Attribute Single message is used to read a single parameter. This read message example reads the value of the 32-bit REAL (floating point) parameter 7 [Output Current] in PowerFlex 750-Series drives and parameter 10:3 [Output Current] in PowerFlex 750-Series with TotalFORCE control drives.

**Table 16 - Example Controller Tags to Read a Single Parameter**

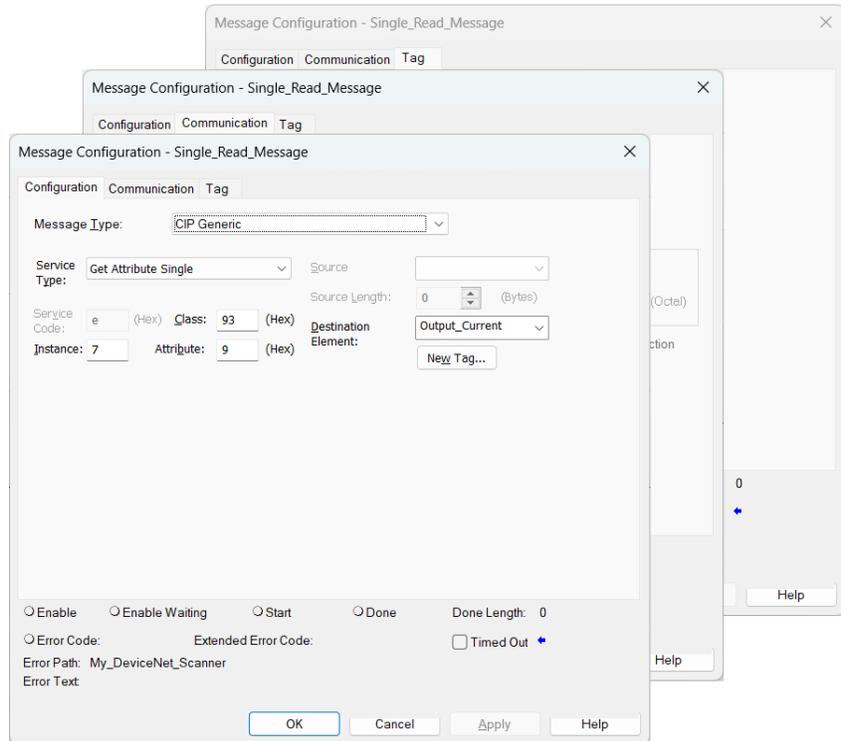
Operand	Controller Tags for Single Read Message	Data Type
XIC	Execute_Single_Read_Message	BOOL
MSG	Single_Read_Message	MESSAGE

**Figure 13 - Example Ladder Logic to Read a Single Parameter**



*Formatting a Message to Read a Single Parameter*

**Figure 14 - Get Attribute Single Message Configuration Dialog Boxes**



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

Configuration Tab	Example Value	Description
Message Type	CIP™ Generic	Used to access the DPI Parameter Object in the option module.
Service Type <sup>(1)</sup>	Get Attribute Single	This service is used to read a parameter value.
Service Code <sup>(1)</sup>	e (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) <sup>(4)</sup>	Class ID for the DPI Parameter Object.
Instance <sup>(2)</sup>	7 or 10:3 (Dec.)	Instance number is the same as parameter number.
Attribute	9 (Hex.)	Attribute number for the Parameter Value attribute.
Source Element	–	Leave blank (not applicable).
Source Length	0 bytes	Number of bytes of service data to be sent in the message.
Destination	Output_Current <sup>(5)</sup>	The tag where the data that is read is stored.
Communication Tab	Example Value	Description
Path <sup>(3)</sup>	My_DeviceNet_Scanner	The path is the route that the message will follow.
Tag Tab	Example Value	Description
Name	Single_Read_Message	The name for the message.

- (1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which is dimmed (unavailable).
- (2) The instance is the parameter number in the drive (Port 0). For example, to read parameter 4 of a peripheral in Port 5 of a PowerFlex 755TS drive, the instance would be 21504 + 4 = 21508. See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) to determine the instance number.
- (3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My\_DeviceNet\_Scanner). Then always type in a comma followed by a '2' which is the DeviceNet scanner port, followed by another comma, and then the node of the drive (for this example, '1').
- (4) See [Table 15 on page 64](#) for limitations when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.
- (5) In this example, Output Current is a 32-bit REAL floating point parameter requiring the Data Type field to be set to 'REAL' when creating the controller tag. To read a 32-bit integer parameter, set the tag Data Type field to 'DINT'. For a 16-bit parameter, set the Data Type field to 'INT'. See the drive documentation to determine the size of the parameter and its data type.

### Example Ladder Logic Program to Write a Single Parameter

A Set Attribute Single message is used to write to a single parameter. This write message example writes a value to the 32-bit REAL (floating point) parameter 535 [Accel Time 1] in PowerFlex 750-Series drives and parameter 10:1915 [VRef Accel Time1] in PowerFlex 750-Series with TotalFORCE control drives.

**Table 17 - Example Controller Tags to Write a Single Parameter**

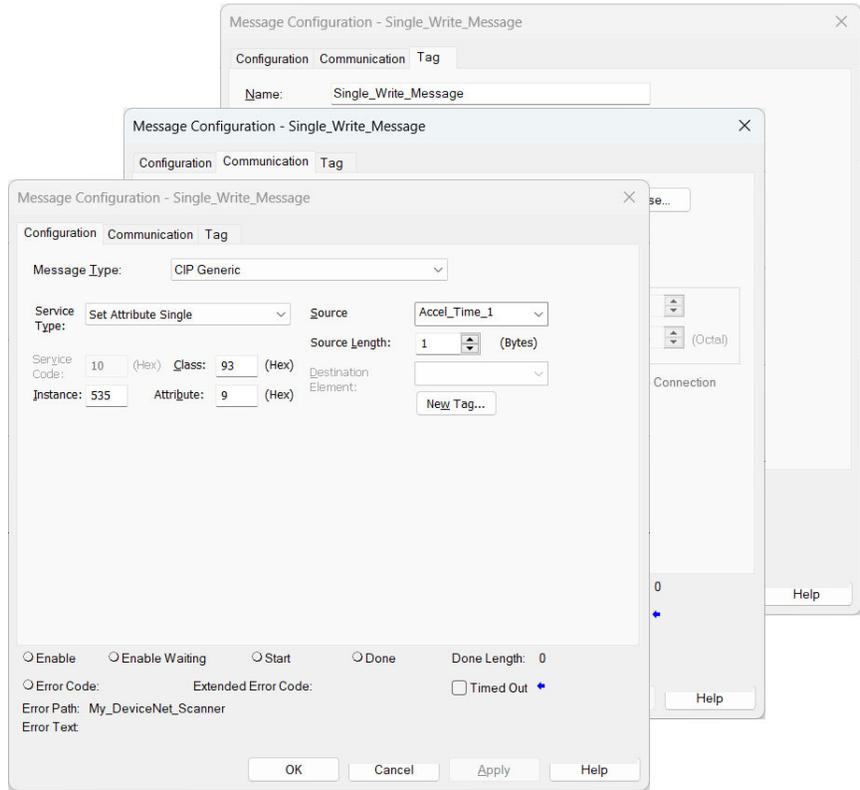
Operand	Controller Tags for Single Write Message	Data Type
XIC	Execute_Single_Write_Message	BOOL
MSG	Single_Write_Message	MESSAGE

**Figure 15 - Example Ladder Logic to Write a Single Parameter**



### Formatting a Message to Write a Single Parameter

Figure 16 - Set Attribute Single Message Configuration Dialog Boxes



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

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the option module.
Service Type <sup>(1)</sup>	Set Attribute Single	This service is used to write a parameter value.
Service Code <sup>(1)</sup>	10 (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) <sup>(5)</sup>	Class ID for the DPI Parameter Object.
Instance <sup>(2)</sup>	535 (Dec.)	Instance number is the same as parameter number.
Attribute <sup>(3)</sup>	9 or A (Hex.)	Attribute number for the Parameter Value attribute.
Source Element	Accel_Time_1 or VRef_Accel_Time_1	Name of the tag for any service data to be sent from the scanner to the option module/drive.
Source Length	4 bytes <sup>(6)</sup>	Number of bytes of service data to be sent in the message.
Destination	–	Leave blank (not applicable).
Communication Tab	Example Value	Description
Path <sup>(4)</sup>	My_DeviceNet_Scanner	The path is the route that the message will follow.
Tag Tab	Example Value	Description
Name	Single_Write_Message	The name for the message.

- (1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box, which is dimmed (unavailable).
- (2) The instance is the parameter number in the drive. For example, to write to parameter 4 of a peripheral in Port 5 of a PowerFlex 755TS drive, the instance would be 21504 + 4 = 21508. See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) to determine the instance number.
- (3) Setting the Attribute value to '9' writes the parameter value to the drive's Nonvolatile Storage (EEPROM) memory, which retains the parameter value even after the drive is power cycled. **Important:** When set to '9', the EEPROM may quickly exceed its lifecycle and cause the drive to malfunction. Setting the Attribute value to 'A' writes the parameter value to temporary memory, which deletes the parameter value after the drive is power cycled. When frequent write messages are required, we recommend using the 'A' setting.
- (4) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My\_DeviceNet\_Scanner). Then always type in a comma followed by a '2' which is the DeviceNet scanner port, followed by another comma, and then the node of the drive (for this example, '1').
- (5) See [Table 15 on page 64](#) for limitations when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.
- (6) In this example, parameter [Accel Time 1] or [VRef Accel Time1] are 32-bit REAL floating point parameters requiring the Data Type field to be set to 'REAL' when creating the controller tag. To write to a 32-bit integer parameter, set the tag Data Type field to 'DINT'. For a 16-bit parameter, set the Data Type field to 'INT'. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for example, 4 bytes for a REAL or a DINT, or 2 bytes for an INT). See the drive documentation to determine the size of the parameter and its data type.

### Example Ladder Logic Program to Read Multiple Parameters

A Scattered Read message is used to read the values of multiple parameters. This read message example reads the values of these five 32-bit REAL (floating point) parameters.

PowerFlex 750-Series Parameter	PowerFlex 750-Series with TotalFORCE Control Parameter
1 [Output Frequency]	10:1 [Output Frequency]
7 [Output Current]	10:3 [Output Current]
8 [Output Voltage]	10:2 [Output Voltage]
9 [Output Power]	10:4 [Output Power]
11 [DC Bus Volts]	0:3 [DC Bus Volts]

See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) for parameter numbering.

**Table 18 - Example Controller Tags to Read Multiple Parameters**

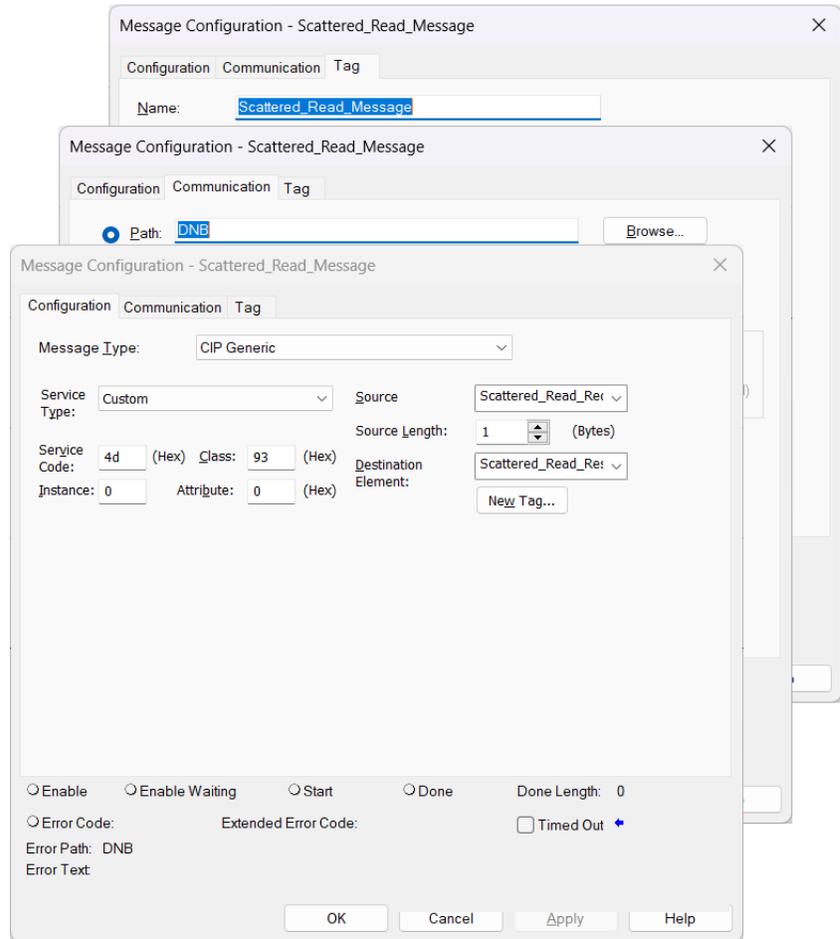
Operand	Controller Tags for Scattered Read Message	Data Type
XIC	Execute_Scattered_Read_Message	BOOL
MSG	Scattered_Read_Message	MESSAGE

**Figure 17 - Example Ladder Logic to Read Multiple Parameters**



*Formatting a Message to Read Multiple Parameters*

**Figure 18 - Scattered Read Message Configuration Dialog Boxes**



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

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the option module.
Service Type <sup>(1)</sup>	Custom	Required for scattered messages.
Service Code <sup>(1)</sup>	4d (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) <sup>(3)</sup>	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Read_Request <sup>(4)</sup>	Name of the tag for any service data to be sent from scanner to the option module/drive.
Source Length	40 bytes <sup>(4)</sup>	Number of bytes of service data to be sent in the message.
Destination	Scattered_Read_Response <sup>(5)</sup>	The tag where the data that is read is stored.
Communication Tab	Example Value	Description
Path <sup>(2)</sup>	My_DeviceNet_Scanner	The path is the route that the message will follow.
Tag Tab	Example Value	Description
Name	Scattered_Read_Message	The name for the message.

- (1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box, which is dimmed (unavailable). When reading 32-bit REAL (floating point) parameters, as in this example, data conversion using COP (Copy) instructions or UDDTs is required to correctly show the parameter values.
- (2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My\_DeviceNet\_Scanner). Then always type in a comma followed by a '2' which is the DeviceNet scanner port, followed by another comma, and then the node of the drive (for this example, '1').
- (3) See [Table 15 on page 64](#) for limitations of drives when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.
- (4) In this example, we are reading five 32-bit REAL (floating point) parameters. Each parameter being read requires two contiguous DINT registers. Therefore, a controller tag was created with its Data Type field set to 'DINT[10]'. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for this example, 40 bytes for a DINT[10] array). Scattered read messages always assume that every parameter being read is a 32-bit parameter, regardless of its actual size. Maximum message length is 128 bytes which can read up to 16 parameters, regardless of their size. For parameter numbering, see [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F).
- (5) The controller tag for 'Scattered\_Read\_Response' must be the same size as the controller tag for 'Scattered\_Read\_Request' (for this example, 40 bytes), but can be a different data type (for this example, a UDDT to handle conversion to parameter values that are a REAL data type).

### Example Scattered Read Request Data

In this message example, we use the data structure in [Figure 19](#) in the source tag named Scattered Read Request to read these five 32-bit REAL (floating point) parameters.

PowerFlex 750-Series Drive Parameter	PowerFlex 750-Series with TotalFORCE Control Drive Parameter
1 [Output Frequency]	10:1 [Output Frequency]
7 [Output Current]	10:3 [Output Current]
8 [Output Voltage]	10:2 [Output Voltage]
9 [Output Power]	10:4 [Output Power]
11 [DC Bus Volts]	0:3 [DC Bus Volts]

See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) for parameter numbering.

**Figure 19 - Example Scattered Read Request Data**

Name	Value	Data Type	Description
Scattered_Read_Request		DINT[10]	
+ Scattered_Read_Request[0]		1 DINT	Parameter Number (decimal)
+ Scattered_Read_Request[1]		0 DINT	Pad/Word
+ Scattered_Read_Request[2]		7 DINT	Parameter Number (decimal)
+ Scattered_Read_Request[3]		0 DINT	Pad/Word
+ Scattered_Read_Request[4]		8 DINT	Parameter Number (decimal)
+ Scattered_Read_Request[5]		0 DINT	Pad/Word
+ Scattered_Read_Request[6]		9 DINT	Parameter Number (decimal)
+ Scattered_Read_Request[7]		0 DINT	Pad/Word
+ Scattered_Read_Request[8]		11 DINT	Parameter Number (decimal)
+ Scattered_Read_Request[9]		0 DINT	Pad/Word

Example Scattered Read Response Data

The Scattered Read Request message reads the multiple parameters and returns their values to the destination tag (Scattered\_Read\_Response). Figure 20 shows the parameter values which, in this example, have been converted using a UDDT for correct presentation. COP (Copy) instructions could have been used for this purpose instead of a UDDT. If the parameters being read are 32-bit integers, do not COP the data to a REAL tag.

Figure 20 - Example Scattered Read Response Converted Data

Name	Value	Data Type	Description
Scattered_Read_Response	[...]	Scattered_Rea...	
Scattered_Read_Response.Output_Frequency_Par_No	1	DINT	
Scattered_Read_Response.Output_Frequency_Par_Value	60.205975	REAL	
Scattered_Read_Response.Output_Current_Par_No	7	DINT	
Scattered_Read_Response.Output_Current_Par_Value	12.570678	REAL	
Scattered_Read_Response.Output_Voltage_Par_No	8	DINT	
Scattered_Read_Response.Output_Voltage_Par_Value	418.34348	REAL	
Scattered_Read_Response.Output_Power_Par_No	9	DINT	
Scattered_Read_Response.Output_Power_Par_Value	12.3584	REAL	
Scattered_Read_Response.DC_Bus_Volts_Par_No	11	DINT	
Scattered_Read_Response.DC_Bus_Volts_Par_Value	566.5277	REAL	

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

PowerFlex 750-Series Drive Parameter	PowerFlex 750-Series with TotalFORCE Control Drive Parameter	Read Value
1 [Output Frequency]	10:1 [Output Frequency]	60.205975 Hz
7 [Output Current]	10:3 [Output Current]	12.570678 Amp
8 [Output Voltage]	10:2 [Output Voltage]	418.34348V AC
9 [Output Power]	10:4 [Output Power]	12.3584 kW
11 [DC Bus Volts]	0:3 [DC Bus Volts]	566.5277V DC

Example Ladder Logic Program to Write Multiple Parameters

A Scattered Write message is used to write to multiple parameters. This write message example writes the following values to these five 32-bit REAL (floating point) parameters.

PowerFlex 750-Series Drive Parameter	PowerFlex 750-Series with TotalFORCE Control Drive Parameter	Write Value
536 [Accel Time 2]	10:1916 [VRef Accel Time2]	11.1 Sec
538 [Decel Time 2]	10:1918 [VRef Decel Time2]	22.2 Sec
575 [Preset Speed 5]	10:1818 [Preset Speed 5]	33.3 Hz
576 [Preset Speed 6]	10:1819 [Preset Speed 6]	44.4 Hz
577 [Preset Speed 7]	10:1820 [Preset Speed 7]	55.5 Hz

See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) for parameter numbering.

Table 19 - Example Controller Tags to Write Multiple Parameters

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

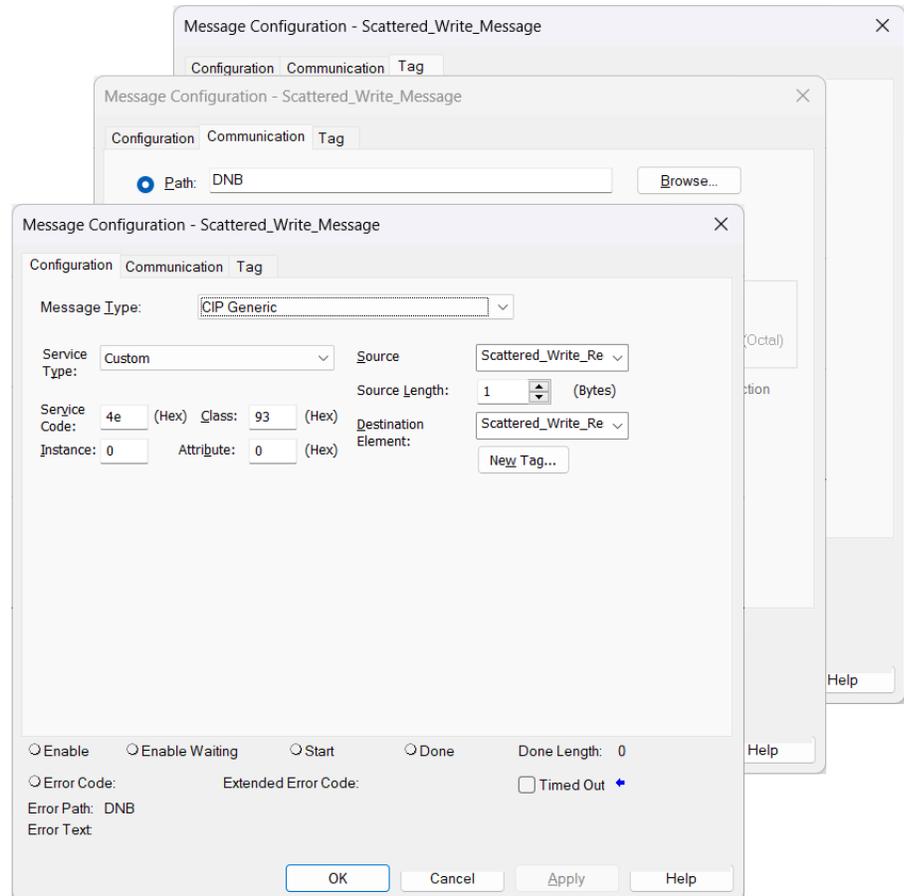
Figure 21 - Example Ladder Logic to Write Multiple Parameters



**IMPORTANT** If the explicit message scattered write must be written continuously, then use a separate explicit message single write for each parameter using DPI Parameter Object Class code 0x93 and attribute A (see [page 68](#)). Attribute A writes to RAM—not NVS (EEPROM) memory. This example scattered write message using attribute 0 writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

### Formatting a Message to Write Multiple Parameters

Figure 22 - Scattered Write Multiple Message Configuration Dialog Boxes



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

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the option module.
Service Type <sup>(1)</sup>	Custom	Required for scattered messages.
Service Code <sup>(1)</sup>	4e (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) <sup>(4)</sup>	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute <sup>(2)</sup>	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Write_Request <sup>(5)</sup>	Name of the tag for any service data to be sent from scanner to the option module/drive.
Source Length	40 bytes <sup>(5)</sup>	Number of bytes of service data to be sent in the message.
Destination	Scattered_Write_Response <sup>(6)</sup>	The tag where the data that is read is stored.
Communication Tab	Example Value	Description
Path <sup>(3)</sup>	My_DeviceNet_Scanner	The path is the route that the message will follow.
Tag Tab	Example Value	Description
Name	Scattered_Write_Message	The name for the message.

- (1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box, which is dimmed (unavailable). When writing to 32-bit REAL (floating point) parameters, as in this example, data conversion using COP (Copy) instructions, or UDDTs is required to correctly write the parameter values.
- (2) Scattered writes always write parameter values to the drive's Nonvolatile Storage (EEPROM) memory, which retains these values even after the drive is power cycled. **Important:** Be cautious as the EEPROM may quickly exceed its lifecycle and cause the drive to malfunction.
- (3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My\_DeviceNet\_Scanner). Then always type in a comma followed by a '2' which is the DeviceNet scanner port, followed by another comma, and then the node of the drive (for this example, '1').
- (4) See [Table 15 on page 64](#) for limitations when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.
- (5) In this example, we are writing to five 32-bit REAL (floating point) parameters. Each parameter being written to requires two contiguous DINT registers. Therefore, a controller tag was created with its Data Type field set to the name of the UDDT of five interleaved DINTs and REALs. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for this example, 40 bytes for an array of five scattered REAL structures). Scattered write messages always assume that every parameter being written to is a 32-bit parameter, regardless of its actual size. Maximum message length is 128 bytes, which can write up to 16 parameters, regardless of their size. For parameter numbering, see [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F).
- (6) The controller tag for 'Scattered\_Write\_Response' must be the same size as the controller tag for 'Scattered\_Write\_Request' (for this example, 40 bytes). An array of DINTs is suggested to be able to read any error codes that are returned.

### Example Scattered Write Request Data

In this message example, we use the data structure in [Figure 23](#) in the source tag (Scattered\_Write\_Request) to write new values to these 32-bit REAL (floating point) parameters:

PowerFlex 750-Series Drive Parameter	PowerFlex 750-Series with TotalFORCE Control Parameter	Write Value
536 - [Accel Time 2]	10:1916 [VRef Accel Time2]	11.1 Sec
538 - [Decel Time 2]	10:1918 [VRef Decel Time2]	22.2 Sec
575 - [Preset Speed 5]	10:1818 [Preset Speed 5]	33.3 Hz
576 - [Preset Speed 6]	10:1819 [Preset Speed 6]	44.4 Hz
577 - [Preset Speed 7]	10:1820 [Preset Speed 7]	55.5 Hz

See [DPI Parameter Object on page 155](#) (Class code 0x93) or [Host DPI Parameter Object on page 170](#) (Class code 0x9F) for parameter numbering.

Figure 23 shows the parameter values which, in this example, have been converted using a UDDT to correctly write their values. COP (Copy) instructions could have been used for this purpose instead of a UDDT. If the parameters being written to are 32-bit integers, do not COP the data to a REAL tag.

Figure 23 - Example Scattered Write Request Converted Data

Name	Value	Data Type	Description
Scattered_Write_Request	[...]	Scattered_Writ...	
Scattered_Write_Request.Accel_Time_2_Par_No		536 DINT	
Scattered_Write_Request.Accel_Time_2_Par_Value		11.1 REAL	
Scattered_Write_Request.Decel_Time_2_Par_No		538 DINT	
Scattered_Write_Request.Decel_Time_2_Par_Value		22.2 REAL	
Scattered_Write_Request.Preset_Speed_5_Par_No		575 DINT	
Scattered_Write_Request.Preset_Speed_5_Par_Value		33.3 REAL	
Scattered_Write_Request.Preset_Speed_6_Par_No		576 DINT	
Scattered_Write_Request.Preset_Speed_6_Par_Value		44.4 REAL	
Scattered_Write_Request.Preset_Speed_7_Par_No		577 DINT	
Scattered_Write_Request.Preset_Speed_7_Par_Value		55.5 REAL	

### ControlLogix Controller Example Scattered Write Response Data

The results of the message appear in the destination tag named Scattered\_Write\_Response (Figure 24). Values of '0' indicate no errors occurred.

Figure 24 - Example Scattered Write Response Data

Name	Value	Data Type	Description
Scattered_Write_Response	[...]	DINT[10]	
Scattered_Write_Response[0]		536 DINT	
Scattered_Write_Response[1]		0 DINT	
Scattered_Write_Response[2]		538 DINT	
Scattered_Write_Response[3]		0 DINT	
Scattered_Write_Response[4]		575 DINT	
Scattered_Write_Response[5]		0 DINT	
Scattered_Write_Response[6]		576 DINT	
Scattered_Write_Response[7]		0 DINT	
Scattered_Write_Response[8]		577 DINT	
Scattered_Write_Response[9]		0 DINT	

### Explanation of Request and Response Data for Read/Write Multiple Parameter Messaging

The data structures in Table 20 and Table 21 use 32-bit words and can accommodate up to 16 parameters in a single message. In the Response Message, a parameter number with Bit 15 set indicates that the associated parameter value field contains an error code (parameter number in response data will be negative).

The PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001, and the PowerFlex Drives with TotalFORCE Control Parameters Reference Data, publication 750-RD101, lists the data type for each parameter. When performing a Scattered Read of REAL data type parameters, the DINT parameter value in the Response (Destination Data) array must be COP to a REAL tag.

Table 20 - Data Structures for Scattered Read Messages

<b>Request (Source Data)</b>		<b>Response (Destination Data)</b>	
DINT 0	Parameter Number	DINT 0	Parameter Number
1	Pad	1	Parameter Value
2	Parameter Number	2	Parameter Number
3	Pad	3	Parameter Value
4	Parameter Number	4	Parameter Number
5	Pad	5	Parameter Value
6	Parameter Number	6	Parameter Number
7	Pad	7	Parameter Value
8	Parameter Number	8	Parameter Number
9	Pad	9	Parameter Value
10	Parameter Number	10	Parameter Number
11	Pad	11	Parameter Value
12	Parameter Number	12	Parameter Number
13	Pad	13	Parameter Value
14	Parameter Number	14	Parameter Number
15	Pad	15	Parameter Value
16	Parameter Number	16	Parameter Number
17	Pad	17	Parameter Value
18	Parameter Number	18	Parameter Number
19	Pad	19	Parameter Value
20	Parameter Number	20	Parameter Number
21	Pad	21	Parameter Value
22	Parameter Number	22	Parameter Number
23	Pad	23	Parameter Value
24	Parameter Number	24	Parameter Number
25	Pad	25	Parameter Value
26	Parameter Number	26	Parameter Number
27	Pad	27	Parameter Value
28	Parameter Number	28	Parameter Number
29	Pad	29	Parameter Value
30	Parameter Number	30	Parameter Number
31	Pad	31	Parameter Value
32	Parameter Number	32	Parameter Number
33	Pad	33	Parameter Value
34	Parameter Number	34	Parameter Number
35	Pad	35	Parameter Value
:		:	
62	Parameter Number	62	Parameter Number
63	Pad	63	Parameter Value

When performing a Scattered Write to REAL data type parameters, the REAL parameter value must be COP to the DINT parameter value tag in the Request (Source Data) array.

**Table 21 - Data Structures for Scattered Write Messages**

<b>Request (Source Data)</b>		<b>Response (Destination Data)</b>	
DINT 0	Parameter Number	DINT 0	Parameter Number
1	Parameter Value	1	Pad
2	Parameter Number	2	Parameter Number
3	Parameter Value	3	Pad
4	Parameter Number	4	Parameter Number
5	Parameter Value	5	Pad
6	Parameter Number	6	Parameter Number
7	Parameter Value	7	Pad
8	Parameter Number	8	Parameter Number
9	Parameter Value	9	Pad
10	Parameter Number	10	Parameter Number
11	Parameter Value	11	Pad
12	Parameter Number	12	Parameter Number
13	Parameter Value	13	Pad
14	Parameter Number	14	Parameter Number
15	Parameter Value	15	Pad
16	Parameter Number	16	Parameter Number
17	Parameter Value	17	Pad
18	Parameter Number	18	Parameter Number
19	Parameter Value	19	Pad
20	Parameter Number	20	Parameter Number
21	Parameter Value	21	Pad
22	Parameter Number	22	Parameter Number
23	Parameter Value	23	Pad
24	Parameter Number	24	Parameter Number
25	Parameter Value	25	Pad
26	Parameter Number	26	Parameter Number
27	Parameter Value	27	Pad
28	Parameter Number	28	Parameter Number
29	Parameter Value	29	Pad
30	Parameter Number	30	Parameter Number
31	Parameter Value	31	Pad
32	Parameter Number	32	Parameter Number
33	Parameter Value	33	Pad
34	Parameter Number	34	Parameter Number
35	Parameter Value	35	Pad
:		:	
62	Parameter Number	62	Parameter Number
63	Parameter Value	63	Pad

**Notes:**

## Complete CANopen Configuration

This chapter expands on the information provided in [Chapter 3](#) and provides additional information that is relevant for CANopen.

### Select COS, Cyclic, or PRTR IO Data Exchange

The data exchange (sometimes called allocation) is the method that the option module uses to exchange real-time data on the CANopen network. The real-time data is transferred using a PDO (Process Data Object). The option module can be configured to use one of the following data exchange types:

- COS (Change of State)
- Cyclic
- RTR (Remote Transmission Request)

Each PDO can have a different type of data exchange, but COS and Cyclic can only be selected for PDO1 (Status/Feedback word).

COS data exchange must be configured to set both the I/O configuration and COS parameters in the option module. Cyclic and RTR data exchanges are configured in the PLC, so you only need to set the I/O configuration in the option module. No option module parameters need to be adjusted.

### Using COS (Change of State) Data Exchange

COS means that a PDO is sent whenever the CANopen device has changed its state (for example, a value has changed).

1. Using the CANopen configuration tool, set the transmission mode of the TPDO1 (Transmit PDO) of the option module to "0" (synchronous (acyclic)) or "254" (asynchronous (Manuf. Event)).
2. Set Parameter 23 [COPN PDO1 Trig] to "0" (COS).
3. Set Parameter 24 [COPN COS StsMask] for the bits in the Logic Status word that should be checked for changes. The bit definitions for the Status Mask depends on the drive to which the option module is connected.
4. Set Parameter 25 [COPN COS Fbk Chg] for the amount of change to the Feedback that is required to trigger a Change of State message.

### Using Cyclic Data Exchange

With cyclic data exchange, a PDO is sent periodically.

1. With the CANopen configuration tool, set the transmission mode of the TPDO1 (Transmit PDO) of the adapter to "0" (synchronous) or "254" (asynchronous).
2. Set Parameter 23 [PDO1 Trigger] to "1" (Cyclic).
3. Set Parameter 26 [Cyclic Interval] for the desired time interval.

This cyclic data exchange is only possible for PDO1; however, the following procedure describes how to implement a cyclic data exchange for each PDO:

1. Using the CANopen configuration tool, set the transmission mode of the TPDO (Transmit PDO) of the adapter to a value between 1...240.
2. Using the CANopen configuration tool, set the communication cycle period to a desired value. The cyclic interval is calculated by multiplying the transmission type by the communication cycle period.

## Using RTR (Remote Transmission Request)

PDOs can be remotely requested by transmitting a CAN remote frame from the requesting PDO consumer. The corresponding PDO producer responds to this remote frame.

1. Using the CANopen configuration tool, set the transmission type of the TPDO (Transmit PDO) of the option module to "252" (synchronous) or "253" (asynchronous).
2. No option module parameters need to be adjusted.

## Network Management

This section provides information about configuring a CANopen network to communicate with the option module and its connected PowerFlex® drive.

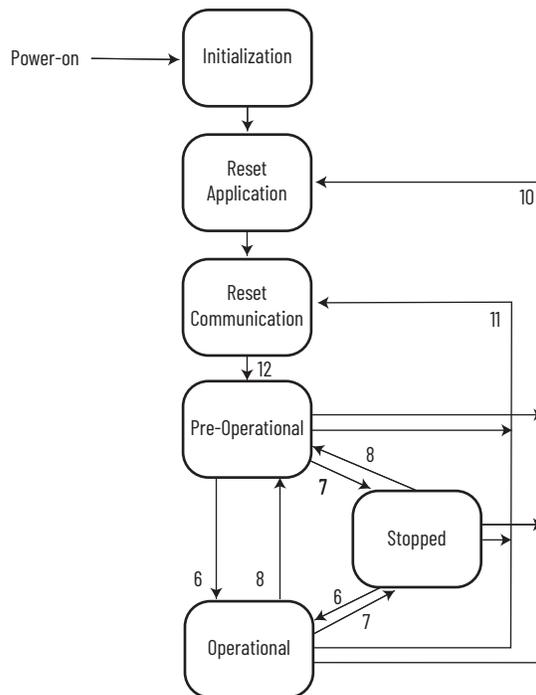
To configure the CANopen network, a variety of configuration tools of CANopen Network Management (NMT) managers are available from several manufactures, which help you manage and configure CANopen devices and systems.

Network Management (NMT) is used to control the status of all nodes in the CANopen network. It uses a manager/server hierarchy and requires a device with NMT manager functionality responsible for detecting, starting, and monitoring the NMT server states. Within any NMT server, an NMT state machine must be implemented, where the Pre-Operational state allows device configuration to take place.

Based on the CiA 301 CANopen Application Layer and Communication Profile Version 4.2.0, February 2011, CAN in Automation e.V., this option module uses the standard CANopen network management state machine. Figure 25 shows the NMT state machine, and the corresponding different transitions. There are four main states defined:

- Initialization state
- Pre-Operational state
- Operational state
- Stopped state

Figure 25 - The NMT State Machine



The numbers in the illustration correspond to the numbers within the parenthesis in the following state descriptions.

## Initialization State

This option module enters the Initialization state automatically after power-up. After the initialization is done, this option module enters into the Pre-operational state (12) through Reset Application and Reset Communication.

## Pre-operational State

In the Pre-operational state, this option module can be configured and parameterized, and allocation via SDO is possible but PDO communication is not allowed in this state. After this state is attained, the node can be switched to the Operational state when receiving a start node message (6) from an NMT manager.

## Operational State

All communication objects are active in the Operational state. This means there is PDO communication, SDO communication, synchronization, and error control, and emergency messages allowed. The option module enters the Stopped state when receiving a stop node message (7).

## Stopped State

All communications, except NMT error control, are stopped when this option module is switched into the Stopped state. This option module can be switched back to the Pre-operational state by receiving an enter pre-operational message (8).

A reset node message (10) from an NMT manager will reset the parameters of the Manufacturer-specific area (Index 2226h...2229h) to their power-on values. After setting the power-on values, the NMT substate Reset Communication is entered autonomously.

A reset communication message (11) from an NMT manager will reset the parameters of the communication profile area to their power-on values. After setting of the power-on values, the NMT initialization state is left.

## EDS File

An EDS file is needed for each device on the CANopen network. Go to the Product Compatibility and Download Center (PCDC) ([rok.auto/pcdc](http://rok.auto/pcdc)) to download EDS files.

## SDO Configuration

Service Data Objects (SDOs) are used to establish a peer-to-peer connection between two CANopen devices.

SDOs use asynchronous data transmission with acknowledge. The SDOs are used to access all CANopen objects ([Appendix D](#)) in the option module, and required for option module configuration/parameterization. Access to an individual Object is made with a multiplexer via the Index and Sub-index of the Object Dictionary.

This type of connection is based on a Client/Server-based mechanism. Configure the PLC as SDO server and install the SDO channels to the other devices (SDO clients).

## PDO Configuration

Process Data Objects (PDOs) are used to transmit the real-time data using the producer/consumer communication model. The PDOs are transmitted without any protocol overhead and without confirmation. The PDO object is used for the I/O communication.

There are two types of PDOs, depending on the transmission direction:

## CANopen Network Configuration

- TPDOs (Transmit PDOs) are used to transfer data from the option module.
- RPDOs (Receive PDOs) are used to transfer data to the option module.

The PDOs are defined via the CANopen Object Dictionary, whereby pre-defined PDOs can be selected (Default PDO mapping). The mapping can also be changed if desired. The PDO mapping is made during configuration with the help of SDOs.

Besides the PDO mapping to determine which data are available (mapped) in the selected PDO, the communication parameters that define the PDO communication behavior need to be set. This includes the transmission mode (synchronous or asynchronous) and the triggering mode which can be Change of State (COS), Cyclic, or Remote Transmission Request (RTR).

## SYNC Configuration

The synchronization object (SYNC) is used to synchronize the devices. There has to be a device in the network that is regarded as the SYNC producer. Usually, the PLC is configured as the SYNC message producer. The Communication Cycle Period (time between two SYNC messages) can be set to a desired value.

The SYNC object is used to synchronize PDO communication, trigger the transmission of a PDO, or perform the action on the last received PDO.

## Node/Life Guarding

Node/Life Guarding is used for error control to check that any CANopen device is working properly. The mechanism used for guarding is based on the manager/server relationship. The NMT manager guards all of its NMT servers cyclically (cycle time = Guard Time) by using an RTR frame. Any CANopen NMT server responds to this RTR frame to guarantee that the application program is running (Node Guarding).

Simultaneously, if an NMT server does not receive an RTR frame from the NMT manager within a specified time (Guard Time x Life Time Factor), the NMT server knows that the NMT manager must have failed. This mechanism is called Life Guarding.

Adjust the Guard Time and the Life Time Factor to desired values.

## Heartbeat

The Heartbeat mechanism is used for error control service without need for RTRs. A heartbeat producer transmits a heartbeat message cyclically. One or more heartbeat consumers receive the indication.

The relationship between producer and consumer is configurable via the object dictionary (Consumer Heartbeat Time 1 and Producer Heartbeat Time). The heartbeat consumer guards the reception of the heartbeat within the heartbeat consumer time. If the heartbeat is not received within the heartbeat consumer time, a heartbeat event is generated.

## Emergency EMCY

The emergency object is used to send fault information from the option module to the CANopen network.

The emergency object is triggered by a fault event from the drive or the option module itself. An emergency object (see [Appendix D](#)) is transmitted only once per error event.

## CANopen Object Dictionary

On CANopen, the interface between the application and CAN is achieved by an Object Dictionary. The Object Dictionary is unique for any CANopen device and represents complete access to the application in terms of the communication parameters, the application data, and the configuration parameters.

To configure the CANopen network it is necessary to access the Object Dictionary. However, some configuration tools allow network configuration directly on the application level and hide all CANopen configuration data, such as PDO mapping, or the assignment of CAN identifier.

To gain access to the Object Dictionary, Process Data Objects (PDOs) and Service Data Objects (SDOs) are used.

Index	Description
0000h	Reserved
0001h - 025Fh	Data types
0260h - 0FFFh	Reserved
1000h - 1FFFh	Communication profile area
2000h - 5FFFh	Manufacturer-specific area
6000h - 9FFFh	Device profile-specific area
A000h - BFFFh	Interface profile-specific area
C000h - FFFFh	Reserved

See [Table 75 on page 177](#) and [Table 76 on page 181](#) for more information about CANopen objects.

## Process Data Objects

On CANopen, Process Data Objects (PDOs) are used to transfer the real-time data which controls the PowerFlex drive and sets its Reference. PDOs can also be used to transfer data to and from Datalinks. A PDO message has high priority on the CAN bus. Each PDO has a unique CAN identifier, and the maximum length of a PDO message is 8 bytes.

PDO mapping and configuration are made with help of SDOs.

### RPDO

SDO 1400 - 1403h (1st - 4th RPDO communication parameter)  
SDO 1600 - 1603h (1st - 4th RPDO mapping parameter)

### TPDO

SDO 1800 - 1803h (1st - 4th TPDO communication parameter)  
SDO 1A00 - 1A03h (1st - 4th TPDO mapping parameter)

The option module provides many options for configuring and using I/O, including:

- Configuring the size of I/O by enabling or disabling the Logic Command/Reference and Datalinks
- Using a Change of State, Cyclic or RTR data exchange method

## PDO Transmission Types

The transmission type (or data exchange type) parameter of a PDO specifies the transmission mode and the triggering mode.

The transmission modes are:

- Synchronous transmission
- Asynchronous transmission

This option module supports three PDO triggering modes:

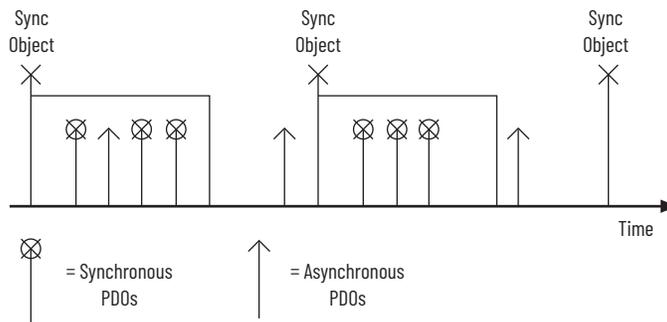
- COS (Change of State)
- Cyclic
- Remote Transmission Request (RTR)

The triggering mode is only relevant for TPDOs. For RPDOs, only the transmission mode is important. To configure the PDOs, the option module parameters have to be adjusted and other settings made using a CANopen configuration tool (for example, IXXAT CANopen Configuration Studio).

## PDO Transmission Modes

To synchronize devices, a synchronization object (SYNC object) is transmitted periodically by a synchronization application (SYNC Leader). The following illustration shows the principle of synchronous and asynchronous transmission. The time between two SYNC objects is the Communication Cycle Period.

**Figure 26 - Synchronous and Asynchronous Transmission**



**Synchronous TPDO:** The data for Synchronous TPDOs are sampled at the moment the SYNC object is received. For COS and cyclic transmission, the TPDOs are sent immediately after sampling (therefore, after the SYNC object). The data for Synchronous TPDOs are sent with the SYNC object after receiving an RTR message.

**Asynchronous TPDO:** Asynchronous TPDOs are transmitted without any correlation to a SYNC. The data for asynchronous TPDOs are sampled continuously.

**Synchronous RPDO:** The data of synchronous RPDOs is passed to the application when the next SYNC object occurs, independently of the transmission rate specified by the transmission type.

**Asynchronous RPDO:** The data of asynchronous RPDOs is passed directly to the application.

## PDO Triggering Modes

This option module supports three PDO triggering modes:

- Change of State (COS)

Triggering mode COS means that the PDO is sent when a device-specific event occurs (for example, a value has changed). COS can only be selected for the TPD01- Logic Status/Feedback (parameter 23 [COPN PDO1 Trig] is set to "0").

COS with transmission mode *asynchronous* can be configured by setting the transmission type of the TPD01 to "254" using a CANopen configuration tool. For COS with transmission mode *synchronous*, the transmission type must be set to "0."

Option module parameters 24 and 25 control the COS behavior. Parameter 24 [COPN COS StsMask] defines which bits in the Logic Status word are checked for changes, and Parameter 25 [COPN COS Fbk Ch] specifies how much the Feedback word can change before it is considered a change of state.

- Cyclic

PDOs with the cyclic triggering mode are sent periodically with a specific interval. For the transmission types 0 (synchronous) cyclic transmission and 254 (asynchronous), Parameter 23 [COPN PDO1 Trig] is set to "1" (Cyclic) and parameter 26 [COPN CyclInterval] defines this interval. This is only possible for the PDO1.

A synchronous cyclic transmission can also be implemented by setting the transmission type to a value between 1...240. Then, the cyclic interval is calculated as follows:

$$\text{Cyclic Interval} = \text{Transmission Type} \times \text{Communication Cycle Period}$$

- Remote Transmission Request (RTR)

The transmission of a PDO is initiated on receipt of a Remote Transmission Request initiated by any other device (PDO consumer). The transmission can be either synchronous or asynchronous.

### TPDO Summary

Triggering Mode	Transmission Mode	Param. 23 - [COPN PDO1 Trig]	Transmission Type <sup>(1) (2)</sup>	Transmission Type Name
COS	Synchronous	COS	0 <sup>(3)</sup>	Synchronous acyclic
	Asynchronous	COS	254 <sup>(3)</sup>	Asynchronous (Manuf. Event)
Cyclic	Synchronous	–	1...240	Synchronous cyclic
	Synchronous	Cyclic	0 <sup>(3)</sup>	Synchronous acyclic
	Asynchronous	Cyclic	254 <sup>(3)</sup>	Asynchronous (Manuf. Event)
RTR only	Synchronous	–	252	Synchronous RTR only
	Asynchronous	–	253	Asynchronous RTR only

(1) Transmission types 241...251 are reserved.

(2) The transmission type 255 - Asynchronous (Profile Event) is not used in this implementation.

(3) If transmission type 0 or 254 (COS and cyclic) is selected for TPDOs other than TPD01, the TPDO will only be transmitted on Remote Transmission Request.

### RPDO Summary

Transmission Mode	Behavior	Transmission Type <sup>(1)</sup>	Name
Synchronous	Data is passed to application after next SYNC.	0	Synchronous acyclic
		0...240	Synchronous cyclic
Asynchronous	Data is passed to application immediately.	254	Asynchronous (Manuf. Event)
		255	Asynchronous (Profile Event)

(1) The transmission types 252 and 253 are not possible for RPDOs.

## Understanding the I/O Image

The terms 'input' and 'output' are defined from the network's point of view. Therefore, output I/O is data that is produced by the network and consumed by the option module. Input I/O is status data that is produced by the option module and consumed as input by the network. The I/O image will vary based on how many of the drive's 32-bit Datalinks (Host DL From Net 01...16 and Host DL To Net 01...16) are used.

If all available I/O is not used, the image is truncated. The image always uses consecutive words starting at word 0. The following table shows the I/O image when using all 32-bit Datalinks.

**Table 22 - Network I/O Image for PowerFlex 750-Series Drives  
(32-bit Logic Command/Status, Reference/Feedback, and Datalinks)**

Word	Output I/O	Word	Input I/O
0	Logic Command	0	Logic Status
1	Reference	1	Feedback
2	DL From Net 01	2	DL To Net 01
3	DL From Net 02	3	DL To Net 02
4	DL From Net 03	4	DL To Net 03
5	DL From Net 04	5	DL To Net 04
6	DL From Net 05	6	DL To Net 05
7	DL From Net 06	7	DL To Net 06
8	DL From Net 07	8	DL To Net 07
9	DL From Net 08	9	DL To Net 08
10	DL From Net 09	10	DL To Net 09
11	DL From Net 10	11	DL To Net 10
12	DL From Net 11	12	DL To Net 11
13	DL From Net 12	13	DL To Net 12
14	DL From Net 13	14	DL To Net 13
15	DL From Net 14	15	DL To Net 14
16	DL From Net 15	16	DL To Net 15
17	DL From Net 16	17	DL To Net 16

## Use Logic Command and Status

The Logic Command is a 32-bit word of control produced by the CANopen network and consumed by the option module. The Logic Status is a 32-bit word of status produced by the option module and consumed by the CANopen network.

This manual contains the bit definitions for most compatible products available at the time of publication in [Appendix F](#). For other products, refer to their documentation.

## Use Reference and Feedback

The Reference is a 32-bit REAL (floating point) piece of control data that is produced by the controller and consumed by the option module. The Feedback is a 32-bit REAL (floating point) piece of status data that is produced by the option module and consumed by the controller.

The Reference and Feedback 32-bit REAL values represent drive speed/velocity. The scaling for the speed Reference and Feedback is dependent on drive parameter 300 [Speed Units] for PowerFlex 750-Series drives and parameter 0:46 [Velocity Units] for PowerFlex 750-Series with TotalFORCE® control drives.

For example, if parameter 300 or 0:46 is set to Hz, a 32-bit REAL Reference value of '30.0' would equal a Reference of 30.0 Hz. If parameter 300 or 0:46 is set to RPM, a 32-bit REAL Reference value of '1020.5' would equal a Reference of 1020.5 RPM. The commanded maximum speed can never exceed the value of drive parameter 520 [Max Fwd Speed] for PowerFlex 750-

Series drives and parameter 10:1392 [Max Speed Fwd] for PowerFlex 750-Series with TotalFORCE control drives.

The following table shows example References and their results for drives with these settings:

- Parameter 300 [Speed Units] or 0:46 [Velocity Units] set to Hz.
- Parameter 37 [Maximum Freq] or 10:422 [Maximum Freq] set to 130 Hz.
- Parameter 520 [Max Fwd Speed] or 10:1392 [Max Speed Fwd] set to 60 Hz.

When parameter 300 [Speed Units] or 0:46 [Velocity Units] is set to RPM, the other parameters are also in RPM.

**Table 23 - PowerFlex 750-Series Drive Example Speed Reference/Feedback Scaling**

Network Reference Value	Speed/Velocity Command Value (2)	Output Speed	Network Feedback Value
130.0	130 Hz	60 Hz (3)	60.0
65.0	65 Hz	60 Hz (3)	60.0
32.5	32.5 Hz	32.5 Hz	32.5
0.0	0 Hz	0 Hz	0.0
-32.5 (1)	32.5 Hz	32.5 Hz	32.5

(1) The effects of values less than 0.0 depend on whether the drive uses a bipolar or unipolar direction mode. See the drive documentation for details.

(2) For this example, drive parameters 300 [Speed Units] or 0:46 [Velocity Units] are set to Hz.

(3) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because drive Parameter 520 [Max Fwd Speed] or 10:1392 [Max Speed Fwd] sets 60 Hz as the maximum speed.

## Use Datalinks

A Datalink is a mechanism that is used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be read or written to without using an Explicit Message. The following rules apply when using Datalinks:

- The target of a Datalink can be any host parameter, including those of a peripheral.
- The data that is passed through the drive's Datalink mechanism is determined by the settings of the following option module parameters:

Device parameter 02 [DLs From Net Cfg]  
 Device parameter 04 [DLs To Net Cfg]  
 Host parameters 01...16 [DL From Net 01...16]  
 Host parameters 17...32 [DL To Net 01...16]

---

**IMPORTANT** A reset is always required after configuring Datalinks so that the changes take effect.

---

- When an I/O connection that includes Datalinks is active, those Datalinks being used are locked and cannot be changed until that I/O connection becomes idle or inactive.
- 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 must change a value of a parameter frequently.

## Transmit PDO Mapping

The Transmit PDOs have a default mapping as shown in the following table. The mapping can be changed if desired. Since every PDO can contain up to eight bytes of data, it is possible to map, for example, Datalink "DL To Net 01" and "DL To Net 02" to the same PDO number when using a drive with 32-bit Datalinks.

**Table 24 - Default TPDO Mapping**

TPDO#	Default Mapping	Enabled	Remap	Initial Transmission Type <sup>(1)</sup>
1	Product Logic Status (0x2201) +Feedback (0x2203)	Yes	No	254 (Asynchronous, COS)
2	DL To Net 01 (0x2214) +DL To Net 02 (0x2215)	No	Yes	253 (Asynchronous, RTR)
3	DL To Net 03 (0x2216) +DL To Net 04 (0x2217)	No	Yes	253 (Asynchronous, RTR)
4	DL To Net 05 (0x2218) +DL To Net 06 (0x2219)	No	Yes	253 (Asynchronous, RTR)
5	DL To Net 07 (0x221A) + DL To Net 08 (0x221B)	No	Yes	253 (Asynchronous, RTR)
6	DL To Net 09 (0x221C) +DL To Net 10 (0x221D)	No	Yes	253 (Asynchronous, RTR)
7	DL To Net 11 (0x221E) +DL To Net 12 (0x221F)	No	Yes	253 (Asynchronous, RTR)
8	DL To Net 13 (0x2220) +DL To Net 14 (0x2221)	No	Yes	253 (Asynchronous, RTR)
9	DL To Net 15 (0x2222) +DL To Net 16 (0x2223)	No	Yes	253 (Asynchronous, RTR)

(1) Shows the transmission types for the PDO.

## Receive PDO Mapping

The Receive PDOs have a default mapping as shown in the following table. The mapping can be changed if desired. Since every PDO can contain up to eight bytes of data, it is possible to map, for example, "DL From Net 01" and "DL From Net 02" to the same PDO number when using a drive with 32-bit Datalinks.

**Table 25 - Default Receive PDO Mapping**

RPDO #	Default Mapping	Enabled	Remap	Initial Transmission Type <sup>(1)</sup>
1	Product Logic Command (0x2200) +Reference (0x2202)	Yes	No	254 (Asynchronous)
2	DL From Net 01 (0x2204) +DL From Net 02 (0x2205)	No	Yes	254
3	DL From Net 03 (0x2206) +DL From Net 04 (0x2207)	No	Yes	254
4	DL From Net 05 (0x2208) +DL From Net 06 (0x2209)	No	Yes	254
5	DL From Net 07 (0x220A) +DL From Net 08 (0x220B)	No	Yes	254
6	DL From Net 09 (0x220C) +DL From Net 10 (0x220D)	No	Yes	254
7	DL From Net 11 (0x220E) +DL From Net 12 (0x220F)	No	Yes	254
8	DL From Net 13 (0x2210) +DL From Net 14 (0x2211)	No	Yes	254
9	DL From Net 15 (0x2212) +DL From Net 16 (0x2213)	No	Yes	254

(1) Shows the transmission types for the PDO. For RPDOs, only the transmission is important (synchronous or asynchronous).

**Table 26 - PDO Transmission Types**

Transmission Type	PDO Transmission					Description
	Cyclic	Acyclic	Synchronous	Asynchronous	RTR Only	
0		✓	✓			Synchronous (acyclic): "RTR+SYNC" or "Event <sup>(1)</sup> + SYNC"
1	✓		✓			Synchronous (cyclic every SYNC)
2	✓		✓			Synchronous (cyclic every 2nd SYNC)
3	✓		✓			Synchronous (cyclic every 3rd SYNC)
4	✓		✓			Synchronous (cyclic every 4th SYNC)
... (n: 3 ... 239)	✓		✓			Synchronous (cyclic every <i>n</i> th SYNC)
240	✓		✓			Synchronous (cyclic every 240th SYNC)
241 ... 251	Reserved					-
252			✓		✓	Synchronous RTR only
253				✓	✓	Asynchronous RTR only
254				✓		Event-driven (Event <sup>(1)</sup> or RTR)
255				✓		Same behavior as transmission type 254

(1) Triggered by one of following module-specific events:  
 – COS (Change Of State) is established as configured by module parameters 24 [COPN COS StsMask] and 25 [COPN COS Fbk Chg].  
 – Interval time is elapsed as configured by module parameter 26 [COPN CycInterval].

## Using Service Data Objects

This section provides information and examples that explain how to use Service Data Objects (SDOs) to configure and monitor the option module and connected PowerFlex drive.



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



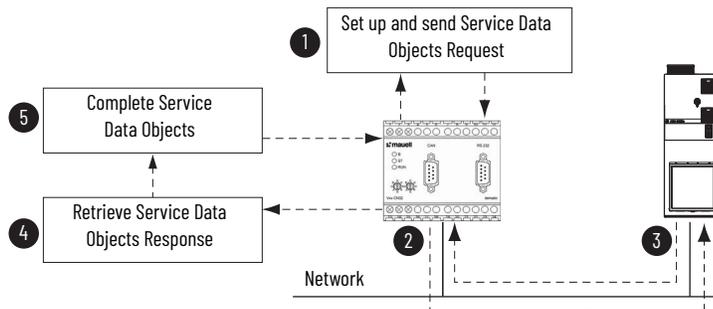
**ATTENTION:** Risk of equipment damage exists. If Explicit Messages are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its lifecycle and cause the drive to malfunction. Do not create a program that frequently uses Explicit Messages to write parameter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

### Running Service Data Objects

There are five basic events in the Service Data Objects process. The details of each step will vary depending on the type of controller. See the documentation for your controller.

**IMPORTANT** There must be a request message and a response message for all SDOs, whether you are reading or writing data.

#### Service Data Objects Process



Event	Description
1	You format the required data and set up a PLC program to send an SDO request to the option module (download).
2	The option module transmits the SDO Request to the server device over the network.
3	The server device transmits the SDO Response back to the CANopen network. The data is stored in the CANopen network buffer.
4	The controller retrieves the SDO Response from the CANopen network's buffer (upload).
5	The SDO is complete.

#### CANopen DPI Parameter Access

An option module (device) parameter can be accessed by using the CANopen objects 0x2228 and 0x2229. The parameter request is written to object 0x2228. When the acknowledgment is received, the response to the message is placed in object 0x2229, and the response can be read.

**Table 27 - Data Description for Object 0x2228 DPI Parameter Send**

Sub Index	Meaning	Type
1	Parameter Access (00 = read, 01 = write byte, 02 = write word, 03 = write 32-bit word)	Byte
2	DPI™ Port (0...6)	Byte
3	Parameter Number	16-bit Word
4	Real/Virtual (00=Real [default] / 01=Virtual)	Byte
5	Parameter value (for writing)	32-bit Word

**Table 28 - Data Description for Object 0x2229 DPI Parameter Receive**

Sub Index	Meaning	Type
1	Response Status: 0 = No Error 1 = Write only 2 = Value out of range 3 = Parameter does not exist 4 = Other error	Byte
2	Parameter value	32-bit Word

## CANopen DPI Parameter Access Communication Example

This example describes how to read device parameter 1 [Port Number]:

1. Fill out the data structure for CANopen object 0x2228 (DPI Parameter Send) as follows, filling in sub index 1 last.

Sub Index	Value
1	0x00 (Read)
2	0x05 (DPI Port 5)
3	0x01 (Parameter)

2. Send the message by writing to sub index 1.
3. Wait for the acknowledgment.
4. Read the response in object 0x2229 (DPI Parameter Receive).

Sub Index	Value
1	0x00 (Service OK)
2	0x00000005 (Parameter value)

## CANopen DPI Full Parameter Access

With the CANopen objects 0x2226 and 0x2227, all DPI objects can be accessed. The request is written to object 0x2226. When the acknowledgment is received, the response to the message is placed in object 0x2227, and the response can be read.

The DPI full object access supports messages up to 96 data bytes. That is, all explicit DPI messages (except flash download) are able to be transmitted/received.

**Table 29 - Data Description for Object 0x2226 DPI Object Send**

Sub Index	Meaning	Type
1	Service (0x00 = Get Attribute, 0x04 = Set Attribute)	Byte
2	DPI Port (0...14)	Byte
3	Class	Byte
4	Instance	16-bit Word
5	Attribute	Byte
6	Real/Virtual (0x00=Real [default] / 0x01=Virtual)	Byte
7	Length of request data in bytes (Count starts at sub index 7)	Byte
8	Data (First byte)	Byte
⋮	⋮	⋮
103	Data (Last byte)	Byte

**Table 30 - Data Description for Object 0x2227 DPI Object Receive**

Sub Index	Meaning	Type
1	Service (0x00 = OK, 0xFF = Error)	Byte
2	Length of response data in bytes (Count starts at sub index 3)	Byte
3	Data (First byte) / Error Status Value	Byte
⋮	⋮	⋮
98	Data (Last byte)	Byte

## CANopen DPI Full Access Communication Example

This example describes how to read option module parameter 1 [Port Number]:

1. Fill out the data structure for CANopen object 0x2226 (DPI Object Send) as follows, filling in sub index 1 last.

Sub Index	Value
1	0x00 (Service Get Attribute)
2	0x05 (DPI Port 5)
3	0x03 (Parameter Class)
4	0x0001 (Instance, Parameter 01)
5	0x09 (Attribute - Parameter value)
6	0x00 (Number of bytes that follows)

2. Send the message by writing to sub index 1.
3. Wait for the acknowledgment.
4. Read the response in CANopen object 0x2227 (DPI Object Receive).

Sub Index	Value
1	0x00 (Service OK)
2	0x01 (Length of response data in bytes; count starts at sub index 3)
3	0x05 (Attribute value)

## Complete BACnet Configuration

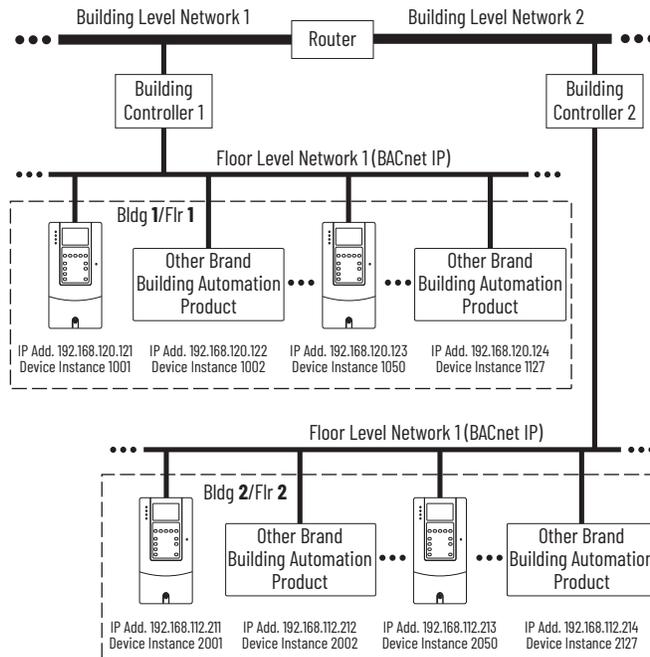
This chapter expands on the information provided in [Chapter 3](#) and provides additional information that is relevant for BACnet.

### Set the Device Instance Number

A BACnet Device Instance number is used to identify a BACnet device over the BACnet network. A Device Instance number must be unique across all subnets and routed links.

The Device Instance number could be configured depending upon the adopted network strategy. For example, the following illustration shows a building level network having two individual floor networks through a router which allows devices on each network to share the same IP address. Each device on the network in this example has a unique device instance number consisting of four digits. The first digit represents the building or floor number. The last three digits represent the fourth octet of the device's IP address.

Figure 27 - Building Automation Network Example



1. Set the value of device parameter 34 [BNT Dev InstNum] to a unique device Instance number.

This Device Instance number should not be repeated within a BACnet network. By default, the Device Instance number is set to 160000.

2. Reset the option module; see [Reset the Option Module on page 36](#) so that the new Device Instance number takes effect.

### BACnet Services

BACnet services are used for exchanging data with a device over BACnet protocol. A BACnet server offers a set of services, which can be viewed as a set of messages (request or response). The option module supports these BACnet services.

## Object Access Services

Object Access Services is a set of services that are used to read and write the values of parameters for PowerFlex® drives and option modules that are represented by BACnet objects.

The option module supports the following Object Access Services:

- Read Property Service
- Write Property Service
- Read Property Multiple Service
- Write Property Multiple Service

## Understanding BACnet Objects

BACnet devices are controlled and monitored by the use of several objects. The BACnet controller performs read and write services to these objects, and the option module translates the data between these objects and the PowerFlex drive.

When a read or write service occurs to a specific object, data in that object is refreshed from or transferred to the drive.

These are the BACnet object types supported by the option module:

- Analog Input (AI)
- Analog Output (AO)
- Analog Value (AV)
- Binary Input (BI)
- Binary Output (BO)
- Binary Value (BV)

## Drive-supported BACnet Objects

Table 31 - BACnet Object List and Associated Drive Parameters

Object	Name	PowerFlex 753 Drive Parameter	PowerFlex 755 Drive Parameter	PowerFlex 755T and PowerFlex 6000T Drive Parameter (except TM Bus Supply)	PowerFlex 755TM Bus Supply
AIO	Analog Input 0 (%)	DPI™ Port 0:260	No	No	
A00	Analog Output 0 (%)	DPI Port 0:276	No	No	
AV0	Reference A	SI		SI	No
AV1	Reference B	SI		SI	No
AV2	Output Frequency (Hz)	DPI Port 0:1		if (Motor Ref Sel = 1), use port 11:1 [Output Frequency]; else, port 10:1 [Output Frequency]	No
AV3	Output Current (Amps)	DPI Port 0:7		if (Motor Ref Sel = 1), Port 11:3 [Output Current]; else, Port 10:3 [Output Current]	No
AV4	Output Voltage (VAC)	DPI Port 0:8		if (Motor Ref Sel = 1), Port 11:2 [Output Voltage]; else, Port 10:2 [Output Voltage]	No
AV5	Output Power (kW)	DPI Port 0:9		if (Motor Ref Sel = 1), Port 11:4 [Output Power]; else, Port [10:4 Output Power]	No

Table 31 - BACnet Object List and Associated Drive Parameters (Continued)

Object	Name	PowerFlex 753 Drive Parameter	PowerFlex 755 Drive Parameter	PowerFlex 755T and PowerFlex 6000T Drive Parameter (except TM Bus Supply)	PowerFlex 755TM Bus Supply
AV6	Output Energy (kWh)	Read from Port 0:14 [Elapsed kWh]. Write, wait for Port 0:336 [Reset Meters] to go to "0"; then, set Port 0:336 [Reset Meters] to "1". This resets not only parameter 14 but also the following parameters: <ul style="list-style-type: none"> <li>• 0:13 [Elapsed MWH]</li> <li>• 0:14 [Elapsed kWh]</li> <li>• 0:16 [Elpsd Mtr MWHrs]</li> <li>• 0:17 [Elpsd Rgn MWHrs]</li> <li>• 0:18 [Elpsd Mtr kWhrs]</li> <li>• 0:19 [Elpsd Rgn kWhrs]</li> </ul>		Read from Port 0:6 [Elapsed kWh]. Write, wait for Port 0:55 [Reset Meters] to go to "0"; then, set Port 0:55 [Reset Meters] to "1". This resets not only parameter 6 but also the following parameters: <ul style="list-style-type: none"> <li>• 0:5 [Elapsed MWH]</li> <li>• 0:8 [Elpsd Mtr MWHrs]</li> <li>• 0:9 [Elpsd Rgn MWHrs]</li> <li>• 0:10 [Elpsd Mtr kWhrs]</li> <li>• 0:11 [Elpsd Rgn kWhrs]</li> <li>• 0:15 [Average Power]</li> </ul>	
AV7	Output Energy 2 (MWh)	Read from Port 0:13 [Elapsed MWH]. Write, wait for Port 0:336 [Reset Meters] to go to "0"; then, set Port 0:336 [Reset Meters] to "1". This resets parameter 14 and the following parameters: <ul style="list-style-type: none"> <li>• 0:13 [Elapsed MWH]</li> <li>• 0:14 [Elapsed kWh]</li> <li>• 0:16 [Elpsd Mtr MWHrs]</li> <li>• 0:17 [Elpsd Rgn MWHrs]</li> <li>• 0:18 [Elpsd Mtr kWhrs]</li> <li>• 0:19 [Elpsd Rgn kWhrs]</li> </ul>		Read from Port 0:5 [Elapsed MWH]. Write, wait for Port 0:55 [Reset Meters] to go to "0"; then, set Port 0:55 [Reset Meters] to "1". This resets parameter 6 and the following parameters: <ul style="list-style-type: none"> <li>• 0:5 [Elapsed MWH]</li> <li>• 0:8 [Elpsd Mtr MWHrs]</li> <li>• 0:9 [Elpsd Rgn MWHrs]</li> <li>• 0:10 [Elpsd Mtr kWhrs]</li> <li>• 0:11 [Elpsd Rgn kWhrs]</li> <li>• 0:15 [Average Power]</li> </ul>	
AV8	DC Bus Voltage (VDC)	DPI Port 0:11 [DC Bus Volts]		Port 0:3 [DC Bus Volts]	
AV9	Drive Temp (deg C)	DPI Port 0:944 [Drive Temp C]		Port 0:25 [Ctrl Pod Temp]	
AV10	PID Feedback (%)	DPI Port 0:1091 [PID Fdbk Meter]		If (Dynamic Feature = "ProcPID only" or "Torque Prove"), use Port 9:36 [PID Fdbk Meter]; else, not supported	No
AV11	PID Error (%)	DPI Port 0:1092 [PID Error Meter]		if (Dynamic Feature = "ProcPID only" or "Torque Prove"), use Port 9:12 [PID Error Meter]; else, not supported	No
AV12	Run Time (Hours)	Read from Port 0:15 [Elapsed Run Time]. Write, wait for Port 0:336 [Reset Meters] to go to "0"; then, set Port 0:336 [Reset Meters] to "2".		Read from Port 0:7 [Elapsed Run Time]. Write, wait for Port 0:55 [Reset Meters] to go to "0"; then, set Port 0:55 [Reset Meters] to "2".	
AV13	Fault 1	DPI Fault Object		DPI Fault Object	
AV14	Fault 2	DPI Fault Object		DPI Fault Object	
AV15	Fault 3	DPI Fault Object		DPI Fault Object	
AV16	Accel Time 1 (sec)	DPI Port 0:535 [Accel Time 1]		If (Motor Ref Sel = 1), use Port 11:1915 [Vref Accel Time1]; else, use Port 10:1915 [Vref Accel Time1]	No
AV17	Accel Time 2 (sec)	DPI Port 0:536 [Accel Time 2]		if (Motor Ref Sel = 1), use Port 11:1916 [Vref Accel Time2]; else, use Port 10:1916 [Vref Accel Time2]	No
AV18	Decel Time 1 (sec)	DPI Port 0:537 [Decel Time 1]		if (Motor Ref Sel = 1), use Port 11:1917 [Vref Decel Time1]; else, use Port 10:1917 [Vref Decel Time1]	No
AV19	Decel Time 2 (sec)	DPI Port 0:538 [Decel Time 2]		if (Motor Ref Sel = 1), use Port 11:1918 [Vref Decel Time2]; else, use Port 10:1918 [Vref Decel Time2]	No
AV20	Reference 1	DPI Port 0:545 [Spd Ref A Sel]		if (Motor Ref Sel = 1), use DPI Port 11:1800; else, use DPI Port 10:1800	No
AV21	Reference 2	DPI Port 0:550 [Spd Ref B Sel]		if (Motor Ref Sel = 1), use DPI Port 11:1807; else, DPI Port 10:1807	No
AV22	Mailbox1 Param	Any DPI parameter		Any DPI parameter	
AV23	Mailbox1 Value	Any DPI parameter		Any DPI parameter	
AV24	Mailbox2 Param	Any DPI parameter		Any DPI parameter	
AV25	Mailbox2 Value	Any DPI parameter		Any DPI parameter	
AV26	Mailbox3 Param	Any DPI parameter		Any DPI parameter	
AV27	Mailbox3 Value	Any DPI parameter		Any DPI parameter	
AV28	Mailbox4 Param	Any DPI parameter		Any DPI parameter	

Table 31 - BACnet Object List and Associated Drive Parameters (Continued)

Object	Name	PowerFlex 753 Drive Parameter	PowerFlex 755 Drive Parameter	PowerFlex 755T and PowerFlex 6000T Drive Parameter (except TM Bus Supply)	PowerFlex 755TM Bus Supply
AV29	Mailbox4 Value	Any DPI parameter		Any DPI parameter	
AV30	Mailbox5 Param	Any DPI parameter		Any DPI parameter	
AV31	Mailbox5 Value	Any DPI parameter		Any DPI parameter	
AV32	Mailbox6 Param	Any DPI parameter		Any DPI parameter	
AV33	Mailbox6 Value	Any DPI parameter		Any DPI parameter	
AV34	Mailbox7 Param	Any DPI parameter		Any DPI parameter	
AV35	Mailbox7 Value	Any DPI parameter		Any DPI parameter	
AV36	Mailbox8 Param	Any DPI parameter		Any DPI parameter	
AV37	Mailbox8 Value	Any DPI parameter		Any DPI parameter	
B10	Digital Input 0	DPI Port 0:220 bit 0		DPI Port 0:100 bit 0	
B11	Digital Input 1	DPI Port 0:220 bit 1	No	No	
B12	Digital Input 2	DPI Port 0:220 bit 2	No	No	
B00	Output Relay 0	DPI Port 0:227 bit 0	No	No	
BV0	RUN Ready	SI Logic Status Word bit 0		SI Logic Status Word bit 0	
BV1	Active	SI Logic Status Word bit 1		SI Logic Status Word bit 1	No
BV2	Forward/Reverse	SI Logic Status Word bit 3		SI Logic Status Word bit 3	No
BV3	Fault	SI Logic Status Word bit 7		SI Logic Status Word bit 7	
BV4	Alarm	SI Logic Status Word bit 6		SI Logic Status Word bit 6	
BV5	At Setpt Spd	SI Logic Status Word bit 8		SI Logic Status Word bit 8	No
BV6	Manual Active	SI Logic Status Word bit 9		SI Logic Status Word bit 9	No
BV7	Reserve for SI Logic Status	-		-	
BV8	Reserve for SI Logic Status	-		-	
BV9	Reserve for SI Logic Status	-		-	
BV10	Run Stop	SI Logic Command Word bit 18		SI Logic Command Word bit 18	
BV11	Rev/Fwd	SI Logic Command Word bit 4 and 5		SI Logic Command Word bit 4 and 5	No
BV12	Ref2 / Ref1 RefB/RefA	SI Logic Command Word bit 12, 13, and 14		SI Logic Command Word bit 12, 13, and 14	No
BV13	Clear Faults	SI Logic Command Word bit 3		SI Logic Command Word bit 3	
BV14	Auto/Manual	SI Logic Command Word bit 6		SI Logic Command Word bit 6	No
BV15	Reserve for SI Logic Command	-		-	
BV16	Reserve for SI Logic Command	-		-	
BV17	Reserve for SI Logic Command	-		-	
BV18	Reserve for SI Logic Command	-		-	
BV19	Reserve for SI Logic Command	-		-	
BV20	Motor Ctrl Sel	No (Initial value "0". Read value is the most recent Write value from the BACnet request.)		755T excluding bus supply, and 6000T DPI Port0:74	No

Table 31 - BACnet Object List and Associated Drive Parameters (Continued)

Object	Name	PowerFlex 753 Drive Parameter	PowerFlex 755 Drive Parameter	PowerFlex 755T and PowerFlex 6000T Drive Parameter (except TM Bus Supply)	PowerFlex 755TM Bus Supply
BV21	Motor Ref Sel	No (Initial value "0". Read value is the most recent Write value from the BACnet request.)		No (Initial value "0". Read value is the most recent Write value from the BACnet request.)	No
BV22	Reserve for TotalFORCE® Drive	-		-	
BV23	Reserved for TotalFORCE Drive	-		-	
BV24	Reserved for TotalFORCE Drive	-		-	
BV25	Reserved for TotalFORCE Drive	-		-	
BV26	Reserved for TotalFORCE Drive	-		-	
BV27	Reserved for TotalFORCE Drive	-		-	
BV28	Reserved for TotalFORCE Drive	-		-	
BV29	Reserved for TotalFORCE Drive	-		-	
BV30	Bus Supply Start Inhibit	No		No	SI Logic Status Word bit 15
BV31	Bus Supply Running	No		No	SI Logic Status Word bit 16
BV32	Bus Supply Motoring	No		No	SI Logic Status Word bit 30
BV33	Bus Supply AC Ride Thru	No		No	SI Logic Status Word bit 21
BV34	Bus Supply InPhaseLoss	No		No	SI Logic Status Word bit 22
BV35	Bus Supply AC Line Sync	No		No	SI Logic Status Word bit 23
BV36	Bus Supply kVAR OnlyAct	No		No	SI Logic Status Word bit 24
BV37	Bus Supply In Precharge	No		No	SI Logic Status Word bit 25
BV38	Reserved for Bus Supply	-		-	
BV39	Reserved for Bus Supply	-		-	
BV40	Reserved for Bus Supply	-		-	

## Object Types Supported

[Table 79 on page 190](#) in [Appendix E](#) provides a list of object types supported by the option module.

## Basic Drive Operation on the Network

This section describes how to operate a drive on the network using a combination of BACnet object types for basic control.



**ATTENTION:** Control information written to the option module by a BACnet controller is volatile. That is, it will be erased by an option module reset or power cycle. For example, if a BACnet controller writes to a Binary Output (BO) object to energize an output relay on the drive and then that drive is reset or power cycled, the drive returns the relay to its default (de-energized) state. The option module does not attempt to restore the relay to the energized state unless a BACnet controller writes to it again.

### Basic Drive Control (Start/Stop)

Write a speed reference value (in %) to the Reference 1 Analog Value object (AV0) Present Value property.

1. To start the drive, write a value of '1' to the Run/Stop Binary Value object (BV10) Present Value property.
2. To stop the drive, write a value of '0' (zero) to the Run/Stop Binary Value object (BV10) Present Value property.

### Using an Alternate Speed Reference

Follow these steps to assign an alternate speed reference to the drive.

1. Write a speed reference value (in %) to the Reference 2 Analog Value object (AV1) Present Value property.
2. Write a value of '1' to the Ref2/Ref1 Binary Value object (BV12) Present Value property.

### Changing Motor Rotation Direction

To command a reverse direction of motor rotation when the drive is running, write a value of '1' to the Rev/Fwd Binary Value object (BV11) Present Value property. To command a forward direction when the drive is running, write a value of '0' (zero) to the Rev/Fwd Binary Value object (BV11) Present Value property.

### Clearing a Drive Fault

To clear a drive fault, write a value of '1' to the Clear Faults Binary Value object (BV13) Present Value property.

## Complete Modbus RTU RS-485 Configuration

This chapter expands on the information provided in [Chapter 3](#) and provides additional information that is relevant for Modbus RTU RS-485.

### Set the Network Parity

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

Network	Possible Types of Parity
Modbus RTU	None, Even, or Odd

1. Set the value of parameter 39 [MBS Parity Cfg] to the type of parity that is used on the network.
2. Reset the option module (see [Reset the Option Module on page 36](#)). The actual network parity is then displayed by Parameter 40 [MBS Parity Act].

### Set Stop Bits (Modbus RTU only)

Parameter 41 [MBS Stop Bit Cfg] enables you to set 1 or 2 stop bits for the Modbus RTU network protocol.

1. Set the value of parameter 41 [MBS Stop Bit Cfg].
2. Reset the option module (see [Reset the Option Module on page 36](#)). The actual stop bits are then displayed by Parameter 42 [MBS Stop Bit Act].

### Understanding Modbus RTU

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

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

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

### Modbus RTU Data Formats

Modbus data types are 1-bit and 16-bit values. When writing a 32-bit register, a sequential write is required by 16-bit value.

**Table 32 - Modbus RTU Data Formats**

Modbus Type	Description	Reference
Coil Status	1-bit Discrete Output	0x
Input Status	1-bit Discrete Input	1x
Holding Register	32-bit Output Register	4x
Input Register	32-bit Input Register	3x

## Supported Modbus RTU Commands

The option module supports the Modbus RTU commands listed in the following table.

**Table 33 - Modbus RTU Commands**

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

## Data Addresses in Modbus Messages

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

- Logic Command Hi is Holding Register address 4x0002, so you address it as register "0001" in the data address field of the message.
- Feedback Hi is Input Register address 3x0004, so you address it as register "0003" in the data address field of the message.
- Start is Coil address 0x0002, so you address it as coil "0001" in the data address field of the message.
- At Setpt Spd is Input address 1x0009, so you address it as input "0008" in the data address field of the message

## Set a Timeout

To ensure proper communication with this option module, the Modbus client device may need an appropriate timeout setting. This allows the option module to prepare a reply. The following is the typical sequence and estimated process times, which can vary based on network conditions and drive operations:

1. The Modbus client device sends a request to this option module.
2. This option module receives and recognizes the Modbus packet (within 100 ms).
3. This option module sends a request to the drive and waits for a response (time depends on data size).
4. This option module receives the response from the drive, compiles it into a Modbus frame, and replies to the Modbus client device.

## Modbus Register Map

The following tables provide an overview of the Modbus register addresses and their related functions in PowerFlex® 750-Series and PowerFlex 750-Series with TotalFORCE® Control drives.

**Table 34 - Modbus Register Map, Coil Status (0x)**

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Coil Status(0x)	1	Normal Stop	Normal Stop	Normal Stop	Normal Stop
Coil Status(0x)	2	Start	Start	Start	Start
Coil Status(0x)	3	Jog 1	Jog 1	Jog 1	Reserved
Coil Status(0x)	4	Clear Fault	Clear Fault	Clear Fault	Clear Fault
Coil Status(0x)	5	Unipolar Direction bit0	Unipolar Direction bit0	Unipolar Direction bit0	Reserved
Coil Status(0x)	6	Unipolar Direction bit1	Unipolar Direction bit1	Unipolar Direction bit1	Reserved
Coil Status(0x)	7	Manual	Manual	Manual	Reserved
Coil Status(0x)	8	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	9	Accel Time Bit0	Accel Time Bit0	Accel Time Bit0	Reserved
Coil Status(0x)	10	Accel Time Bit1	Accel Time Bit1	Accel Time Bit1	Reserved
Coil Status(0x)	11	Decel Time Bit0	Decel Time Bit0	Decel Time Bit0	Reserved
Coil Status(0x)	12	Decel Time Bit1	Decel Time Bit1	Decel Time Bit1	Reserved
Coil Status(0x)	13	Reference Select Bit0	Reference Select Bit0	Reference Select Bit0	Reserved
Coil Status(0x)	14	Reference Select Bit1	Reference Select Bit1	Reference Select Bit1	Reserved
Coil Status(0x)	15	Reserved	Reference Select Bit2	Reserved	Reserved
Coil Status(0x)	16	Emerg OVRD	Emerg OVRD	Emerg OVRD	Reserved
Coil Status(0x)	17	Coast Stop	Coast Stop	Coast Stop	Reserved
Coil Status(0x)	18	Current Limit Stop	Current Limit Stop	Current Limit Stop	Reserved
Coil Status(0x)	19	Run	Run	Run	Run
Coil Status(0x)	20	Jog 2	Jog 2	Jog 2	Reserved
Coil Status(0x)	21	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	22	Reserved	Energy Pause	Reserved	Energy Pause
Coil Status(0x)	23	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	24	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	25	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	26	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	27	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	28	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	29	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	30	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	31	Reserved	Reserved	Reserved	Reserved
Coil Status(0x)	32	Reserved	Reserved	Reserved	Reserved

Table 35 - Modbus Register Map, Input Status (1x)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Input Status(1x)	1	Run Ready	Run Ready	Run Ready	Run Ready
Input Status(1x)	2	Active	Active	Active	Reserved
Input Status(1x)	3	Command Direction	Command Direction	Command Direction	Auto Restart Active
Input Status(1x)	4	Actual Direction	Actual Direction	Actual Direction	Auto Restart Countdown
Input Status(1x)	5	Accelerating	Accelerating	Accelerating	Heatsink Fan On
Input Status(1x)	6	Decelerating	Decelerating	Decelerating	Autotuning
Input Status(1x)	7	Alarm	Alarm	Alarm	Alarm
Input Status(1x)	8	Fault	Fault	Fault	Fault
Input Status(1x)	9	At Setpt Spd	At Setpt Spd	At Setpt Spd	At DC Reference
Input Status(1x)	10	Manual	Manual	Manual	DrpGn Limit
Input Status(1x)	11	Spd Ref ID 0	Spd Ref ID 0	Spd Ref ID 0	Reserved
Input Status(1x)	12	Spd Ref ID 1	Spd Ref ID 1	Spd Ref ID 1	Reserved
Input Status(1x)	13	Spd Ref ID 2	Spd Ref ID 2	Spd Ref ID 2	Reserved
Input Status(1x)	14	Spd Ref ID 3	Spd Ref ID 3	Spd Ref ID 3	Reserved
Input Status(1x)	15	Spd Ref ID 4	Spd Ref ID 4	Spd Ref ID 4	Reserved
Input Status(1x)	16	Reserved	Reserved	Reserved	StartInhibit
Input Status(1x)	17	Running	Running	Running	Running
Input Status(1x)	18	Jogging	Jogging	Jogging	Reserved
Input Status(1x)	19	Stopping	Stopping	Stopping	Reserved
Input Status(1x)	20	DC Brake	DC Brake	DC Brake	Reserved
Input Status(1x)	21	DB Active	DB Active	DB Active	Reserved
Input Status(1x)	22	Speed Mode	Speed Mode	Speed Mode	AC Ridethrough
Input Status(1x)	23	Position Mode	Position Mode	Position Mode	Input Phase Loss
Input Status(1x)	24	Torque Mode	Torque Mode	Torque Mode	AC Line Synchronized
Input Status(1x)	25	At Zero Speed	At Zero Speed	At Zero Speed	kVAR OnlyAct
Input Status(1x)	26	At Home	At Home	At Home	In Precharge
Input Status(1x)	27	At Limit	At Limit	At Limit	At Limit
Input Status(1x)	28	Current Limit	Current Limit	Current Limit	Cur Limit
Input Status(1x)	29	Bus Freq Reg	Bus Freq Reg	Bus Freq Reg	Converter Bus Regulating
Input Status(1x)	30	Enable On	Enable On	Enable On	Enable On
Input Status(1x)	31	Motor Overload	Motor Overload	Motor Overload	Motoring
Input Status(1x)	32	Regen	Regen	Regen	Regenerating

Table 36 - Modbus Register Map, Input Register (3x)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Input Register (3x)	1	Logic Status Word Lo	Logic Status Word Lo	Logic Status Word Lo	Logic Status Word Lo
Input Register (3x)	2	Logic Status Word Hi	Logic Status Word Hi	Logic Status Word Hi	Logic Status Word Hi
Input Register (3x)	3	Feedback Lo	Feedback Lo	Feedback Lo	Reserved
Input Register (3x)	4	Feedback Hi	Feedback Hi	Feedback Hi	Reserved
Input Register (3x)	5	Read User In 1 - Lo	Read User In 1 - Lo	Read User In 1 - Lo	Read User In 1 - Lo
Input Register (3x)	6	Read User In 1 - Hi	Read User In 1 - Hi	Read User In 1 - Hi	Read User In 1 - Hi
Input Register (3x)	7	Read User In 2 - Lo	Read User In 2 - Lo	Read User In 2 - Lo	Read User In 2 - Lo
Input Register (3x)	8	Read User In 2 - Hi	Read User In 2 - Hi	Read User In 2 - Hi	Read User In 2 - Hi
Input Register (3x)	9	Read User In 3 - Lo	Read User In 3 - Lo	Read User In 3 - Lo	Read User In 3 - Lo
Input Register (3x)	10	Read User In 3 - Hi	Read User In 3 - Hi	Read User In 3 - Hi	Read User In 3 - Hi
Input Register (3x)	11	Read User In 4 - Lo	Read User In 4 - Lo	Read User In 4 - Lo	Read User In 4 - Lo
Input Register (3x)	12	Read User In 4 - Hi	Read User In 4 - Hi	Read User In 4 - Hi	Read User In 4 - Hi
Input Register (3x)	13	Read User In 5 - Lo	Read User In 5 - Lo	Read User In 5 - Lo	Read User In 5 - Lo
Input Register (3x)	14	Read User In 5 - Hi	Read User In 5 - Hi	Read User In 5 - Hi	Read User In 5 - Hi
Input Register (3x)	15	Read User In 6 - Lo	Read User In 6 - Lo	Read User In 6 - Lo	Read User In 6 - Lo
Input Register (3x)	16	Read User In 6 - Hi	Read User In 6 - Hi	Read User In 6 - Hi	Read User In 6 - Hi
Input Register (3x)	17	Read User In 7 - Lo	Read User In 7 - Lo	Read User In 7 - Lo	Read User In 7 - Lo
Input Register (3x)	18	Read User In 7 - Hi	Read User In 7 - Hi	Read User In 7 - Hi	Read User In 7 - Hi
Input Register (3x)	19	Read User In 8 - Lo	Read User In 8 - Lo	Read User In 8 - Lo	Read User In 8 - Lo
Input Register (3x)	20	Read User In 8 - Hi	Read User In 8 - Hi	Read User In 8 - Hi	Read User In 8 - Hi
Input Register (3x)	21	Read Datalink (from Drive to Net) 1 - Lo	Read Datalink (from Drive to Net) 1 - Lo	Read Datalink (from Drive to Net) 1 - Lo	Read Datalink (from Drive to Net) 1 - Lo
Input Register (3x)	22	Read Datalink (from Drive to Net) 1 - Hi	Read Datalink (from Drive to Net) 1 - Hi	Read Datalink (from Drive to Net) 1 - Hi	Read Datalink (from Drive to Net) 1 - Hi
Input Register (3x)	23	Read Datalink (from Drive to Net) 2 - Lo	Read Datalink (from Drive to Net) 2 - Lo	Read Datalink (from Drive to Net) 2 - Lo	Read Datalink (from Drive to Net) 2 - Lo
Input Register (3x)	24	Read Datalink (from Drive to Net) 2 - Hi	Read Datalink (from Drive to Net) 2 - Hi	Read Datalink (from Drive to Net) 2 - Hi	Read Datalink (from Drive to Net) 2 - Hi
Input Register (3x)	25	Read Datalink (from Drive to Net) 3 - Lo	Read Datalink (from Drive to Net) 3 - Lo	Read Datalink (from Drive to Net) 3 - Lo	Read Datalink (from Drive to Net) 3 - Lo
Input Register (3x)	26	Read Datalink (from Drive to Net) 3 - Hi	Read Datalink (from Drive to Net) 3 - Hi	Read Datalink (from Drive to Net) 3 - Hi	Read Datalink (from Drive to Net) 3 - Hi
Input Register (3x)	27	Read Datalink (from Drive to Net) 4 - Lo	Read Datalink (from Drive to Net) 4 - Lo	Read Datalink (from Drive to Net) 4 - Lo	Read Datalink (from Drive to Net) 4 - Lo
Input Register (3x)	28	Read Datalink (from Drive to Net) 4 - Hi	Read Datalink (from Drive to Net) 4 - Hi	Read Datalink (from Drive to Net) 4 - Hi	Read Datalink (from Drive to Net) 4 - Hi

Table 36 - Modbus Register Map, Input Register (3x) (Continued)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Input Register (3x)	29	Read Datalink (from Drive to Net) 5 - Lo	Read Datalink (from Drive to Net) 5 - Lo	Read Datalink (from Drive to Net) 5 - Lo	Read Datalink (from Drive to Net) 5 - Lo
Input Register (3x)	30	Read Datalink (from Drive to Net) 5 - Hi	Read Datalink (from Drive to Net) 5 - Hi	Read Datalink (from Drive to Net) 5 - Hi	Read Datalink (from Drive to Net) 5 - Hi
Input Register (3x)	31	Read Datalink (from Drive to Net) 6 - Lo	Read Datalink (from Drive to Net) 6 - Lo	Read Datalink (from Drive to Net) 6 - Lo	Read Datalink (from Drive to Net) 6 - Lo
Input Register (3x)	32	Read Datalink (from Drive to Net) 6 - Hi	Read Datalink (from Drive to Net) 6 - Hi	Read Datalink (from Drive to Net) 6 - Hi	Read Datalink (from Drive to Net) 6 - Hi
Input Register (3x)	33	Read Datalink (from Drive to Net) 7 - Lo	Read Datalink (from Drive to Net) 7 - Lo	Read Datalink (from Drive to Net) 7 - Lo	Read Datalink (from Drive to Net) 7 - Lo
Input Register (3x)	34	Read Datalink (from Drive to Net) 7 - Hi	Read Datalink (from Drive to Net) 7 - Hi	Read Datalink (from Drive to Net) 7 - Hi	Read Datalink (from Drive to Net) 7 - Hi
Input Register (3x)	35	Read Datalink (from Drive to Net) 8 - Lo	Read Datalink (from Drive to Net) 8 - Lo	Read Datalink (from Drive to Net) 8 - Lo	Read Datalink (from Drive to Net) 8 - Lo
Input Register (3x)	36	Read Datalink (from Drive to Net) 8 - Hi	Read Datalink (from Drive to Net) 8 - Hi	Read Datalink (from Drive to Net) 8 - Hi	Read Datalink (from Drive to Net) 8 - Hi
Input Register (3x)	37	Read Datalink (from Drive to Net) 9 - Lo	Read Datalink (from Drive to Net) 9 - Lo	Read Datalink (from Drive to Net) 9 - Lo	Read Datalink (from Drive to Net) 9 - Lo
Input Register (3x)	38	Read Datalink (from Drive to Net) 9 - Hi	Read Datalink (from Drive to Net) 9 - Hi	Read Datalink (from Drive to Net) 9 - Hi	Read Datalink (from Drive to Net) 9 - Hi
Input Register (3x)	39	Read Datalink (from Drive to Net) 10 - Lo	Read Datalink (from Drive to Net) 10 - Lo	Read Datalink (from Drive to Net) 10 - Lo	Read Datalink (from Drive to Net) 10 - Lo
Input Register (3x)	40	Read Datalink (from Drive to Net) 10 - Hi	Read Datalink (from Drive to Net) 10 - Hi	Read Datalink (from Drive to Net) 10 - Hi	Read Datalink (from Drive to Net) 10 - Hi
Input Register (3x)	41	Read Datalink (from Drive to Net) 11 - Lo	Read Datalink (from Drive to Net) 11 - Lo	Read Datalink (from Drive to Net) 11 - Lo	Read Datalink (from Drive to Net) 11 - Lo
Input Register (3x)	42	Read Datalink (from Drive to Net) 11 - Hi	Read Datalink (from Drive to Net) 11 - Hi	Read Datalink (from Drive to Net) 11 - Hi	Read Datalink (from Drive to Net) 11 - Hi
Input Register (3x)	43	Read Datalink (from Drive to Net) 12 - Lo	Read Datalink (from Drive to Net) 12 - Lo	Read Datalink (from Drive to Net) 12 - Lo	Read Datalink (from Drive to Net) 12 - Lo
Input Register (3x)	44	Read Datalink (from Drive to Net) 12 - Hi	Read Datalink (from Drive to Net) 12 - Hi	Read Datalink (from Drive to Net) 12 - Hi	Read Datalink (from Drive to Net) 12 - Hi
Input Register (3x)	45	Read Datalink (from Drive to Net) 13 - Lo	Read Datalink (from Drive to Net) 13 - Lo	Read Datalink (from Drive to Net) 13 - Lo	Read Datalink (from Drive to Net) 13 - Lo
Input Register (3x)	46	Read Datalink (from Drive to Net) 13 - Hi	Read Datalink (from Drive to Net) 13 - Hi	Read Datalink (from Drive to Net) 13 - Hi	Read Datalink (from Drive to Net) 13 - Hi
Input Register (3x)	47	Read Datalink (from Drive to Net) 14 - Lo	Read Datalink (from Drive to Net) 14 - Lo	Read Datalink (from Drive to Net) 14 - Lo	Read Datalink (from Drive to Net) 14 - Lo
Input Register (3x)	48	Read Datalink (from Drive to Net) 14 - Hi	Read Datalink (from Drive to Net) 14 - Hi	Read Datalink (from Drive to Net) 14 - Hi	Read Datalink (from Drive to Net) 14 - Hi
Input Register (3x)	49	Read Datalink (from Drive to Net) 15 - Lo	Read Datalink (from Drive to Net) 15 - Lo	Read Datalink (from Drive to Net) 15 - Lo	Read Datalink (from Drive to Net) 15 - Lo
Input Register (3x)	50	Read Datalink (from Drive to Net) 15 - Hi	Read Datalink (from Drive to Net) 15 - Hi	Read Datalink (from Drive to Net) 15 - Hi	Read Datalink (from Drive to Net) 15 - Hi
Input Register (3x)	51	Read Datalink (from Drive to Net) 16 - Lo	Read Datalink (from Drive to Net) 16 - Lo	Read Datalink (from Drive to Net) 16 - Lo	Read Datalink (from Drive to Net) 16 - Lo
Input Register (3x)	52	Read Datalink (from Drive to Net) 16 - Hi	Read Datalink (from Drive to Net) 16 - Hi	Read Datalink (from Drive to Net) 16 - Hi	Read Datalink (from Drive to Net) 16 - Hi

Table 37 - Modbus Register Map, Holding Register(4x)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Holding Register (4x)	1	Logic Command Word Lo	Logic Command Word Lo	Logic Command Word Lo	Logic Command Word Lo
Holding Register (4x)	2	Logic Command Word Hi	Logic Command Word Hi	Logic Command Word Hi	Logic Command Word Hi
Holding Register (4x)	3	Reference Lo	Reference Lo	Reference Lo	Reserved
Holding Register (4x)	4	Reference Hi	Reference Hi	Reference Hi	Reserved
Holding Register (4x)	5	Parameter # for USER IN1	Parameter # for USER IN1	Parameter # for USER IN1	Parameter # for USER IN1
Holding Register (4x)	6	Parameter # for USER IN2	Parameter # for USER IN2	Parameter # for USER IN2	Parameter # for USER IN2
Holding Register (4x)	7	Parameter # for USER IN3	Parameter # for USER IN3	Parameter # for USER IN3	Parameter # for USER IN3
Holding Register (4x)	8	Parameter # for USER IN4	Parameter # for USER IN4	Parameter # for USER IN4	Parameter # for USER IN4
Holding Register (4x)	9	Parameter # for USER IN5	Parameter # for USER IN5	Parameter # for USER IN5	Parameter # for USER IN5
Holding Register (4x)	10	Parameter # for USER IN6	Parameter # for USER IN6	Parameter # for USER IN6	Parameter # for USER IN6
Holding Register (4x)	11	Parameter # for USER IN7	Parameter # for USER IN7	Parameter # for USER IN7	Parameter # for USER IN7
Holding Register (4x)	12	Parameter # for USER IN8	Parameter # for USER IN8	Parameter # for USER IN8	Parameter # for USER IN8
Holding Register (4x)	13	Write User Out 1 Lo	Write User Out 1 Lo	Write User Out 1 Lo	Write User Out 1 Lo
Holding Register (4x)	14	Write User Out 1 Hi	Write User Out 1 Hi	Write User Out 1 Hi	Write User Out 1 Hi
Holding Register (4x)	15	Write User Out 2 Lo	Write User Out 2 Lo	Write User Out 2 Lo	Write User Out 2 Lo
Holding Register (4x)	16	Write User Out 2 Hi	Write User Out 2 Hi	Write User Out 2 Hi	Write User Out 2 Hi
Holding Register (4x)	17	Write User Out 3 Lo	Write User Out 3 Lo	Write User Out 3 Lo	Write User Out 3 Lo
Holding Register (4x)	18	Write User Out 3 Hi	Write User Out 3 Hi	Write User Out 3 Hi	Write User Out 3 Hi
Holding Register (4x)	19	Parameter # for User Out1	Parameter # for User Out1	Parameter # for User Out1	Parameter # for User Out1
Holding Register (4x)	20	Parameter # for User Out2	Parameter # for User Out2	Parameter # for User Out2	Parameter # for User Out2
Holding Register (4x)	21	Parameter # for User Out3	Parameter # for User Out3	Parameter # for User Out3	Parameter # for User Out3
Holding Register (4x)	22	Write Datalink 1 from Net to Drive - Lo	Write Datalink 1 from Net to Drive - Lo	Write Datalink 1 from Net to Drive - Lo	Write Datalink 1 from Net to Drive - Lo
Holding Register (4x)	23	Write Datalink 1 from Net to Drive - Hi	Write Datalink 1 from Net to Drive - Hi	Write Datalink 1 from Net to Drive - Hi	Write Datalink 1 from Net to Drive - Hi
Holding Register (4x)	24	Write Datalink 2 from Net to Drive - Lo	Write Datalink 2 from Net to Drive - Lo	Write Datalink 2 from Net to Drive - Lo	Write Datalink 2 from Net to Drive - Lo
Holding Register (4x)	25	Write Datalink 2 from Net to Drive - Hi	Write Datalink 2 from Net to Drive - Hi	Write Datalink 2 from Net to Drive - Hi	Write Datalink 2 from Net to Drive - Hi
Holding Register (4x)	26	Write Datalink 3 from Net to Drive - Lo	Write Datalink 3 from Net to Drive - Lo	Write Datalink 3 from Net to Drive - Lo	Write Datalink 3 from Net to Drive - Lo
Holding Register (4x)	27	Write Datalink 3 from Net to Drive - Hi	Write Datalink 3 from Net to Drive - Hi	Write Datalink 3 from Net to Drive - Hi	Write Datalink 3 from Net to Drive - Hi
Holding Register (4x)	28	Write Datalink 4 from Net to Drive - Lo	Write Datalink 4 from Net to Drive - Lo	Write Datalink 4 from Net to Drive - Lo	Write Datalink 4 from Net to Drive - Lo

Table 37 - Modbus Register Map, Holding Register(4x) (Continued)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Holding Register (4x)	29	Write Datalink 4 from Net to Drive - Hi	Write Datalink 4 from Net to Drive - Hi	Write Datalink 4 from Net to Drive - Hi	Write Datalink 4 from Net to Drive - Hi
Holding Register (4x)	30	Write Datalink 5 from Net to Drive - Lo	Write Datalink 5 from Net to Drive - Lo	Write Datalink 5 from Net to Drive - Lo	Write Datalink 5 from Net to Drive - Lo
Holding Register (4x)	31	Write Datalink 5 from Net to Drive - Hi	Write Datalink 5 from Net to Drive - Hi	Write Datalink 5 from Net to Drive - Hi	Write Datalink 5 from Net to Drive - Hi
Holding Register (4x)	32	Write Datalink 6 from Net to Drive - Lo	Write Datalink 6 from Net to Drive - Lo	Write Datalink 6 from Net to Drive - Lo	Write Datalink 6 from Net to Drive - Lo
Holding Register (4x)	33	Write Datalink 6 from Net to Drive - Hi	Write Datalink 6 from Net to Drive - Hi	Write Datalink 6 from Net to Drive - Hi	Write Datalink 6 from Net to Drive - Hi
Holding Register (4x)	34	Write Datalink 7 from Net to Drive - Lo	Write Datalink 7 from Net to Drive - Lo	Write Datalink 7 from Net to Drive - Lo	Write Datalink 7 from Net to Drive - Lo
Holding Register (4x)	35	Write Datalink 7 from Net to Drive - Hi	Write Datalink 7 from Net to Drive - Hi	Write Datalink 7 from Net to Drive - Hi	Write Datalink 7 from Net to Drive - Hi
Holding Register (4x)	36	Write Datalink 8 from Net to Drive - Lo	Write Datalink 8 from Net to Drive - Lo	Write Datalink 8 from Net to Drive - Lo	Write Datalink 8 from Net to Drive - Lo
Holding Register (4x)	37	Write Datalink 8 from Net to Drive - Hi	Write Datalink 8 from Net to Drive - Hi	Write Datalink 8 from Net to Drive - Hi	Write Datalink 8 from Net to Drive - Hi
Holding Register (4x)	38	Write Datalink 9 from Net to Drive - Lo	Write Datalink 9 from Net to Drive - Lo	Write Datalink 9 from Net to Drive - Lo	Write Datalink 9 from Net to Drive - Lo
Holding Register (4x)	39	Write Datalink 9 from Net to Drive - Hi	Write Datalink 9 from Net to Drive - Hi	Write Datalink 9 from Net to Drive - Hi	Write Datalink 9 from Net to Drive - Hi
Holding Register (4x)	40	Write Datalink 10 from Net to Drive - Lo	Write Datalink 10 from Net to Drive - Lo	Write Datalink 10 from Net to Drive - Lo	Write Datalink 10 from Net to Drive - Lo
Holding Register (4x)	41	Write Datalink 10 from Net to Drive - Hi	Write Datalink 10 from Net to Drive - Hi	Write Datalink 10 from Net to Drive - Hi	Write Datalink 10 from Net to Drive - Hi
Holding Register (4x)	42	Write Datalink 11 from Net to Drive - Lo	Write Datalink 11 from Net to Drive - Lo	Write Datalink 11 from Net to Drive - Lo	Write Datalink 11 from Net to Drive - Lo
Holding Register (4x)	43	Write Datalink 11 from Net to Drive - Hi	Write Datalink 11 from Net to Drive - Hi	Write Datalink 11 from Net to Drive - Hi	Write Datalink 11 from Net to Drive - Hi
Holding Register (4x)	44	Write Datalink 12 from Net to Drive - Lo	Write Datalink 12 from Net to Drive - Lo	Write Datalink 12 from Net to Drive - Lo	Write Datalink 12 from Net to Drive - Lo
Holding Register (4x)	45	Write Datalink 12 from Net to Drive - Hi	Write Datalink 12 from Net to Drive - Hi	Write Datalink 12 from Net to Drive - Hi	Write Datalink 12 from Net to Drive - Hi
Holding Register (4x)	46	Write Datalink 13 from Net to Drive - Lo	Write Datalink 13 from Net to Drive - Lo	Write Datalink 13 from Net to Drive - Lo	Write Datalink 13 from Net to Drive - Lo
Holding Register (4x)	47	Write Datalink 13 from Net to Drive - Hi	Write Datalink 13 from Net to Drive - Hi	Write Datalink 13 from Net to Drive - Hi	Write Datalink 13 from Net to Drive - Hi
Holding Register (4x)	48	Write Datalink 14 from Net to Drive - Lo	Write Datalink 14 from Net to Drive - Lo	Write Datalink 14 from Net to Drive - Lo	Write Datalink 14 from Net to Drive - Lo
Holding Register (4x)	49	Write Datalink 14 from Net to Drive - Hi	Write Datalink 14 from Net to Drive - Hi	Write Datalink 14 from Net to Drive - Hi	Write Datalink 14 from Net to Drive - Hi
Holding Register (4x)	50	Write Datalink 15 from Net to Drive - Lo	Write Datalink 15 from Net to Drive - Lo	Write Datalink 15 from Net to Drive - Lo	Write Datalink 15 from Net to Drive - Lo
Holding Register (4x)	51	Write Datalink 15 from Net to Drive - Hi	Write Datalink 15 from Net to Drive - Hi	Write Datalink 15 from Net to Drive - Hi	Write Datalink 15 from Net to Drive - Hi
Holding Register (4x)	52	Write Datalink 16 from Net to Drive - Lo	Write Datalink 16 from Net to Drive - Lo	Write Datalink 16 from Net to Drive - Lo	Write Datalink 16 from Net to Drive - Lo
Holding Register (4x)	53	Write Datalink 16 from Net to Drive - Hi	Write Datalink 16 from Net to Drive - Hi	Write Datalink 16 from Net to Drive - Hi	Write Datalink 16 from Net to Drive - Hi
Holding Register (4x)	See <a href="#">Table 39</a> .	20-750-USC Device Parameter direct access	20-750-USC Device Parameter direct access	20-750-USC Device Parameter direct access	20-750-USC Device Parameter direct access
Holding Register (4x)	See <a href="#">Table 39</a> .	20-750-USC Host Parameter direct access	20-750-USC Host Parameter direct access	20-750-USC Host Parameter direct access	20-750-USC Host Parameter direct access
Holding Register (4x)	1000+ (Param # x 2)	Drive parameter port0 direct access	Drive parameter port0 direct access	Drive parameter port0 direct access	Drive parameter port0 direct access

Table 37 - Modbus Register Map, Holding Register(4x) (Continued)

Register Type	Address	Function			
		PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Holding Register (4x)	10000+ (Param # x 2)	Reserved	Drive parameter port9 direct access	Drive parameter port9 direct access	Drive parameter port9 direct access
Holding Register (4x)	20000+ (Param # x 2)	Reserved	Drive parameter port10 direct access	Drive parameter port10 direct access	Drive parameter port10 direct access
Holding Register (4x)	30000+ (Param # x 2)	Reserved	Drive parameter port11 direct access	Drive parameter port11 direct access	Drive parameter port11 direct access
Holding Register (4x)	40000+ (Param # x 2)	Reserved	Drive parameter port12 direct access	Drive parameter port12 direct access	Drive parameter port12 direct access

Table 38 - Adapter Parameter Direct Access Modbus Register Map

Modbus Register	Parameter Description
4x0101	Port Number
4x0102	DLs From Net Cfg
4x0103	DLs From Net Act
4x0104	DLs To Net Cfg
4x0105	DLs To Net Act
4x0106	Protocol Cfg
4x0107	Protocol Act
4x0108	Reset Module
4x0109	Clear Counters
4x0110	Force SwParamSel
4x0111	DNT Net Addr Src
4x0112	DNT Net Rate Cfg
4x0113	DNT Net Rate Act
4x0114	DNT Net Addr Cfg
4x0115	DNT Net Addr Act
4x0116	DNT COS StsMask Lo
4x0117 <sup>(1)</sup>	DNT COS StsMask Hi
4x0118	DNT COS Fbk Chg Lo
4x0119 <sup>(1)</sup>	DNT COS Fbk Chg Hi
4x0120	DNT Interval
4x0121	COPN Rate Cfg
4x0122	COPN Rate Act
4x0123	COPN Addr Cfg
4x0124	COPN Addr Act
4x0125	COPN PDO1 Trig
4x0126	COPN COS StsMask Lo
4x0127 <sup>(1)</sup>	COPN COS StsMask Hi
4x0128	COPN COS Fbk Chg Lo
4x0129 <sup>(1)</sup>	COPN COS Fbk Chg Hi
4x0130	COPN CycInterval

**Table 38 - Adapter Parameter Direct Access Modbus Register Map (Continued)**

<b>Modbus Register</b>	<b>Parameter Description</b>
4x0131	BNT BaudRate Cfg
4x0132	BNT BaudRate Act
4x0133	BNT MAC Addr Cfg
4x0134	BNT MAC Addr Act
4x0135	BNT ComLoss Time
4x0136	BNT Max Master
4x0137	BNT MaxMsg Frame
4x0138	BNT Dev InstNum Lo
4x0139 <sup>(1)</sup>	BNT Dev InstNum Hi
4x0140	MBS Net Rate Cfg
4x0141	MBS Net Rate Act
4x0142	MBS Net Addr Cfg
4x0143	MBS Net Addr Act
4x0144	MBS Parity Cfg
4x0145	MBS Parity Act
4x0146	MBS Stop Bit Cfg
4x0147	MBS Stop Bit Act
4x0148	MBS ComLoss Time
4x0149	MBS Ref Adjust
4x0150	DF1 Rate Cfg
4x0151	DF1 Rate Act
4x0152	DF1 Addr Cfg
4x0153	DF1 Addr Act
4x0154	DF1 CRC BCC Cfg
4x0155	DF1 CRC BCC Act
4x0156	DF1 DupMsgDetect
4x0501	DL From Net 01 Lo
4x0502 <sup>(1)</sup>	DL From Net 01 Hi
4x0503	DL From Net 02 Lo
4x0504 <sup>(1)</sup>	DL From Net 02 Hi
4x0505	DL From Net 03 Lo
4x0506 <sup>(1)</sup>	DL From Net 03 Hi
4x0507	DL From Net 04 Lo
4x0508 <sup>(1)</sup>	DL From Net 04 Hi
4x0509	DL From Net 05 Lo
4x0510 <sup>(1)</sup>	DL From Net 05 Hi
4x0511	DL From Net 06 Lo
4x0512 <sup>(1)</sup>	DL From Net 06 Hi
4x0513	DL From Net 07 Lo
4x0514 <sup>(1)</sup>	DL From Net 07 Hi
4x0515	DL From Net 08 Lo
4x0516 <sup>(1)</sup>	DL From Net 08 Hi
4x0517	DL From Net 09 Lo

**Table 38 - Adapter Parameter Direct Access Modbus Register Map (Continued)**

<b>Modbus Register</b>	<b>Parameter Description</b>
4x0518 <sup>(1)</sup>	DL From Net 09 Hi
4x0519	DL From Net 10 Lo
4x0520 <sup>(1)</sup>	DL From Net 10 Hi
4x0521	DL From Net 11 Lo
4x0522 <sup>(1)</sup>	DL From Net 11 Hi
4x0523	DL From Net 12 Lo
4x0524 <sup>(1)</sup>	DL From Net 12 Hi
4x0525	DL From Net 13 Lo
4x0526 <sup>(1)</sup>	DL From Net 13 Hi
4x0527	DL From Net 14 Lo
4x0528 <sup>(1)</sup>	DL From Net 14 Hi
4x0529	DL From Net 15 Lo
4x0530 <sup>(1)</sup>	DL From Net 15 Hi
4x0531	DL From Net 16 Lo
4x0532 <sup>(1)</sup>	DL From Net 16 Hi
4x0533	DL To Net 01 Lo
4x0534 <sup>(1)</sup>	DL To Net 01 Hi
4x0535	DL To Net 02 Lo
4x0536 <sup>(1)</sup>	DL To Net 02 Hi
4x0537	DL To Net 03 Lo
4x0538 <sup>(1)</sup>	DL To Net 03 Hi
4x0539	DL To Net 04 Lo
4x0540 <sup>(1)</sup>	DL To Net 04 Hi
4x0541	DL To Net 05 Lo
4x0542 <sup>(1)</sup>	DL To Net 05 Hi
4x0543	DL To Net 06 Lo
4x0544 <sup>(1)</sup>	DL To Net 06 Hi
4x0545	DL To Net 07 Lo
4x0546 <sup>(1)</sup>	DL To Net 07 Hi
4x0547	DL To Net 08 Lo
4x0548 <sup>(1)</sup>	DL To Net 08 Hi
4x0549	DL To Net 09 Lo
4x0550 <sup>(1)</sup>	DL To Net 09 Hi
4x0551	DL To Net 10 Lo
4x0552 <sup>(1)</sup>	DL To Net 10 Hi
4x0553	DL To Net 11 Lo
4x0554 <sup>(1)</sup>	DL To Net 11 Hi
4x0555	DL To Net 12 Lo
4x0556 <sup>(1)</sup>	DL To Net 12 Hi
4x0557	DL To Net 13 Lo
4x0558 <sup>(1)</sup>	DL To Net 13 Hi

**Table 38 - Adapter Parameter Direct Access Modbus Register Map (Continued)**

<b>Modbus Register</b>	<b>Parameter Description</b>
4x0559	DL To Net 14 Lo
4x0560 <sup>(1)</sup>	DL To Net 14 Hi
4x0561	DL To Net 15 Lo
4x0562 <sup>(1)</sup>	DL To Net 15 Hi
4x0563	DL To Net 16 Lo
4x0564 <sup>(1)</sup>	DL To Net 16 Hi
4x0565	Comm Flt Action Lo
4x0566 <sup>(1)</sup>	Comm Flt Action Hi
4x0567	Idle Flt Action Lo
4x0568 <sup>(1)</sup>	Idle Flt Action Hi
4x0569	Peer Flt Action Lo
4x0570 <sup>(1)</sup>	Peer Flt Action Hi
4x0571	Msg Flt Action Lo
4x0572 <sup>(1)</sup>	Msg Flt Action Hi
4x0573	Flt Cfg Logic Lo
4x0574 <sup>(1)</sup>	Flt Cfg Logic Hi
4x0575	Flt Cfg Ref Lo
4x0576 <sup>(1)</sup>	Flt Cfg Ref Hi
4x0577	Flt Cfg DL 01 Lo
4x0578 <sup>(1)</sup>	Flt Cfg DL 01 Hi
4x0579	Flt Cfg DL 02 Lo
4x0580 <sup>(1)</sup>	Flt Cfg DL 02 Hi
4x0581	Flt Cfg DL 03 Lo
4x0582 <sup>(1)</sup>	Flt Cfg DL 03 Hi
4x0583	Flt Cfg DL 04 Lo
4x0584 <sup>(1)</sup>	Flt Cfg DL 04 Hi
4x0585	Flt Cfg DL 05 Lo
4x0586 <sup>(1)</sup>	Flt Cfg DL 05 Hi
4x0587	Flt Cfg DL 06 Lo
4x0588 <sup>(1)</sup>	Flt Cfg DL 06 Hi
4x0589	Flt Cfg DL 07 Lo
4x0590 <sup>(1)</sup>	Flt Cfg DL 07 Hi
4x0591	Flt Cfg DL 08 Lo
4x0592 <sup>(1)</sup>	Flt Cfg DL 08 Hi
4x0593	Flt Cfg DL 09 Lo
4x0594 <sup>(1)</sup>	Flt Cfg DL 09 Hi
4x0595	Flt Cfg DL 10 Lo
4x0596 <sup>(1)</sup>	Flt Cfg DL 10 Hi
4x0597	Flt Cfg DL 11 Lo
4x0598 <sup>(1)</sup>	Flt Cfg DL 11 Hi
4x0599	Flt Cfg DL 12 Lo

**Table 38 - Adapter Parameter Direct Access Modbus Register Map (Continued)**

Modbus Register	Parameter Description
4x0600 <sup>(1)</sup>	Flt Cfg DL 12 Hi
4x0601	Flt Cfg DL 13 Lo
4x0602 <sup>(1)</sup>	Flt Cfg DL 13 Hi
4x0603	Flt Cfg DL 14 Lo
4x0604 <sup>(1)</sup>	Flt Cfg DL 14 Hi
4x0605	Flt Cfg DL 15 Lo
4x0606 <sup>(1)</sup>	Flt Cfg DL 15 Hi
4x0607	Flt Cfg DL 16 Lo
4x0608 <sup>(1)</sup>	Flt Cfg DL 16 Hi

(1) A write access to this register triggers a store/update of this parameter value to the internal module flash memory as a 32-bit value.

## Understanding the I/O Image

## Setting the Logic Command and Reference

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



**ATTENTION:** Select and use either the “Product Logic Command Discrete Outputs (0x00xx)” or the “Product Logic Command Register Output (4x0001 ... 4x0004)” as a control method, but not both. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this caution could cause bodily injury and/or damage to equipment.

On Modbus RTU, there are two ways to set the logic command: discrete outputs ([Table 39 on page 112](#)) and register outputs ([Table 40 on page 112](#)).

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

A 32-bit product logic word is buffered in the option module, holding the last logic command sent to the drive regardless of whether it was sent through the discrete outputs or through the product logic command register output. When a bit is updated through the discrete outputs or the register output, a new logic command is generated and sent to the drive.

To set the Reference, you must use a register output (Modbus Address 4x0003 and/or 4x0004). Remember that the Reference value is a scaled value; it is not an engineering value.

Table 39 - Logic Command: Discrete Outputs (to Drive from Controller)

Register Type	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies	Logic Command Bit
Coil Status(0x)	1	Normal Stop	Normal Stop	Normal Stop	Normal Stop	0
Coil Status(0x)	2	Start	Start	Start	Start	1
Coil Status(0x)	3	Jog 1	Jog 1	Jog 1	Reserved	2
Coil Status(0x)	4	Clear Fault	Clear Fault	Clear Fault	Clear Fault	3
Coil Status(0x)	5	Unipolar Direction bit0	Unipolar Direction bit0	Unipolar Direction bit0	Reserved	4
Coil Status(0x)	6	Unipolar Direction bit1	Unipolar Direction bit1	Unipolar Direction bit1	Reserved	5
Coil Status(0x)	7	Manual	Manual	Manual	Reserved	6
Coil Status(0x)	8	Reserved	Reserved	Reserved	Reserved	7
Coil Status(0x)	9	Accel Time Bit0	Accel Time Bit0	Accel Time Bit0	Reserved	8
Coil Status(0x)	10	Accel Time Bit1	Accel Time Bit1	Accel Time Bit1	Reserved	9
Coil Status(0x)	11	Decel Time Bit0	Decel Time Bit0	Decel Time Bit0	Reserved	10
Coil Status(0x)	12	Decel Time Bit1	Decel Time Bit1	Decel Time Bit1	Reserved	11
Coil Status(0x)	13	Reference Select Bit0	Reference Select Bit0	Reference Select Bit0	Reserved	12
Coil Status(0x)	14	Reference Select Bit1	Reference Select Bit1	Reference Select Bit1	Reserved	13
Coil Status(0x)	15	Reserved	Reference Select Bit2	Reserved	Reserved	14
Coil Status(0x)	16	Emerg OVRD	Emerg OVRD	Emerg OVRD	Reserved	15
Coil Status(0x)	17	Coast Stop	Coast Stop	Coast Stop	Reserved	16
Coil Status(0x)	18	Current Limit Stop	Current Limit Stop	Current Limit Stop	Reserved	17
Coil Status(0x)	19	Run	Run	Run	Run	18
Coil Status(0x)	20	Jog 2	Jog 2	Jog 2	Reserved	19
Coil Status(0x)	21	Reserved	Reserved	Reserved	Reserved	20
Coil Status(0x)	22	Reserved	Energy Pause	Reserved	Energy Pause	21

The following table shows the register outputs. These outputs must be used for writing multi-bit commands and the Reference.

Table 40 - Logic Command and Reference: Register Outputs

Register Type	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Holding Register (4x)	1	Logic Command Word Lo	Logic Command Word Lo	Logic Command Word Lo	Logic Command Word Lo
Holding Register (4x)	2	Logic Command Word Hi	Logic Command Word Hi	Logic Command Word Hi	Logic Command Word Hi
Holding Register (4x)	3	Reference Lo	Reference Lo	Reference Lo	Reserved
Holding Register (4x)	4	Reference Hi	Reference Hi	Reference Hi	Reserved

## Viewing the Logic Status and Feedback

On Modbus RTU, there are two ways to view the logic status: discrete inputs (1x00xx) and register inputs (3x0001...3x0004). You can use discrete inputs when you need to view only one bit in the logic status word.

To view the Logic Status, you must use a register input, Modbus Address 3x0001 (Logix Status Word Lo) and/or 3x0002 (Logix Status Word Hi).

To view the Feedback, you must also use a register input (Modbus Address 3x0002 and/or 3x0003).

The following table shows points to represent the status word bit by bit. These points can be used only for reading single-bit status.

**Table 41 - Logic Status: Discrete Inputs (to Controller from Drive)**

Register Type	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies	Logic Status Bit
Input Status(1x)	1	Run Ready	Run Ready	Run Ready	Run Ready	0
Input Status(1x)	2	Active	Active	Active	Reserved	1
Input Status(1x)	3	Command Direction	Command Direction	Command Direction	Auto Restart Active	2
Input Status(1x)	4	Actual Direction	Actual Direction	Actual Direction	Auto Restart Countdown	3
Input Status(1x)	5	Accelerating	Accelerating	Accelerating	Heatsink Fan On	4
Input Status(1x)	6	Decelerating	Decelerating	Decelerating	Autotuning	5
Input Status(1x)	7	Alarm	Alarm	Alarm	Alarm	6
Input Status(1x)	8	Fault	Fault	Fault	Fault	7
Input Status(1x)	9	At Setpt Spd	At Setpt Spd	At Setpt Spd	At DC Reference	8
Input Status(1x)	10	Manual	Manual	Manual	DrpGn Limit	9
Input Status(1x)	11	Spd Ref ID 0	Spd Ref ID 0	Spd Ref ID 0	Reserved	10
Input Status(1x)	12	Spd Ref ID 1	Spd Ref ID 1	Spd Ref ID 1	Reserved	11
Input Status(1x)	13	Spd Ref ID 2	Spd Ref ID 2	Spd Ref ID 2	Reserved	12
Input Status(1x)	14	Spd Ref ID 3	Spd Ref ID 3	Spd Ref ID 3	Reserved	13
Input Status(1x)	15	Spd Ref ID 4	Spd Ref ID 4	Spd Ref ID 4	Reserved	14
Input Status(1x)	16	Reserved	Reserved	Reserved	StartInhibit	15
Input Status(1x)	17	Running	Running	Running	Running	16
Input Status(1x)	18	Jogging	Jogging	Jogging	Reserved	17
Input Status(1x)	19	Stopping	Stopping	Stopping	Reserved	18
Input Status(1x)	20	DC Brake	DC Brake	DC Brake	Reserved	19
Input Status(1x)	21	DB Active	DB Active	DB Active	Reserved	20
Input Status(1x)	22	Speed Mode	Speed Mode	Speed Mode	AC Ridethrough	21
Input Status(1x)	23	Position Mode	Position Mode	Position Mode	Input Phase Loss	22
Input Status(1x)	24	Torque Mode	Torque Mode	Torque Mode	AC Line Synchronized	23
Input Status(1x)	25	At Zero Speed	At Zero Speed	At Zero Speed	kVAR OnlyAct	24
Input Status(1x)	26	At Home	At Home	At Home	In Precharge	25
Input Status(1x)	27	At Limit	At Limit	At Limit	At Limit	26
Input Status(1x)	28	Current Limit	Current Limit	Current Limit	Cur Limit	27
Input Status(1x)	29	Bus Freq Reg	Bus Freq Reg	Bus Freq Reg	Converter Bus Regulating	28
Input Status(1x)	30	Enable On	Enable On	Enable On	Enable On	29
Input Status(1x)	31	Motor Overload	Motor Overload	Motor Overload	Motoring	30
Input Status(1x)	32	Regen	Regen	Regen	Regenerating	31

The following table shows the register inputs. These inputs must be used for reading multi-bit status fields and the Feedback.

**Table 42 - Logic Status and Feedback: Register Inputs**

Register Type	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Input Register (3x)	1	Logic Status Word Lo	Logic Status Word Lo	Logic Status Word Lo	Logic Status Word Lo
Input Register (3x)	2	Logic Status Word Hi	Logic Status Word Hi	Logic Status Word Hi	Logic Status Word Hi
Input Register (3x)	3	Feedback Lo	Feedback Lo	Feedback Lo	Reserved
Input Register (3x) <sup>(1)</sup>	4	Feedback Hi	Feedback Hi	Feedback Hi	Reserved

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

## Accessing Drive Parameters

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

### Direct Access

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

When a 41000 or higher Modbus address is used, the option module assumes that the controller is accessing the drive's parameters directly. The address is determined by:

$$32\text{-bit Option Module Mode: Modbus Address} = 41000 + (\text{Drive Parameter \#} \times 2)$$

For example, Parameter 1 is accessed by Modbus Address 41002. Any attempts to access a parameter number that does not exist will return an error.

The 32-bit Option Module Mode requires a minimum of two registers to read or write, and is always an even number since two 16-bit registers are read for each 32-bit data item.

### Pointer Access

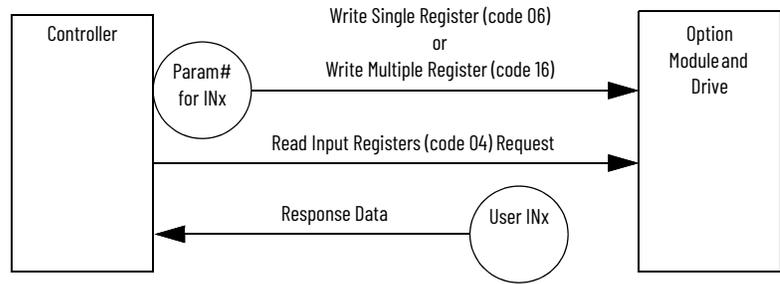
There are two components to pointer access: reading parameter values and writing parameter values.

#### *Reading Parameter Values*

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

1. Set one or more Param# for INx points in the controller to the parameter number(s) that you want to read. You can set up to eight Param# for INx points.
2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for INx points to the option module only one time per power cycle because, when the option module receives the Param# for INx points, it stores them in its RAM. The option module then continuously reads the values for the drive parameters specified in the Param# for INx points.
3. Send a message with a Read Input Registers (code 04) function. The option module reads the drive parameters that have been configured in the Param# for IN points and returns their values in the User INx points. It can return up to eight User INx points. You can perform Read Input Registers continuously, if desired.

Configurable Input Point Operations



With the option module in 32-bit mode, 8 User IN items are available.

Table 43 - Configurable Objects Inputs with Option Module in 32-bit Mode

Data Direction	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Input Register (3x)	5	Read User In 1 - Lo	Read User In 1 - Lo	Read User In 1 - Lo	Read User In 1 - Lo
Input Register (3x)	6	Read User In 1 - Hi	Read User In 1 - Hi	Read User In 1 - Hi	Read User In 1 - Hi
Input Register (3x)	7	Read User In 2 - Lo	Read User In 2 - Lo	Read User In 2 - Lo	Read User In 2 - Lo
Input Register (3x)	8	Read User In 2 - Hi	Read User In 2 - Hi	Read User In 2 - Hi	Read User In 2 - Hi
Input Register (3x)	9	Read User In 3 - Lo	Read User In 3 - Lo	Read User In 3 - Lo	Read User In 3 - Lo
Input Register (3x)	10	Read User In 3 - Hi	Read User In 3 - Hi	Read User In 3 - Hi	Read User In 3 - Hi
Input Register (3x)	11	Read User In 4 - Lo	Read User In 4 - Lo	Read User In 4 - Lo	Read User In 4 - Lo
Input Register (3x)	12	Read User In 4 - Hi	Read User In 4 - Hi	Read User In 4 - Hi	Read User In 4 - Hi
Input Register (3x)	13	Read User In 5 - Lo	Read User In 5 - Lo	Read User In 5 - Lo	Read User In 5 - Lo
Input Register (3x)	14	Read User In 5 - Hi	Read User In 5 - Hi	Read User In 5 - Hi	Read User In 5 - Hi
Input Register (3x)	15	Read User In 6 - Lo	Read User In 6 - Lo	Read User In 6 - Lo	Read User In 6 - Lo
Input Register (3x)	16	Read User In 6 - Hi	Read User In 6 - Hi	Read User In 6 - Hi	Read User In 6 - Hi
Input Register (3x)	17	Read User In 7 - Lo	Read User In 7 - Lo	Read User In 7 - Lo	Read User In 7 - Lo
Input Register (3x)	18	Read User In 7 - Hi	Read User In 7 - Hi	Read User In 7 - Hi	Read User In 7 - Hi
Input Register (3x)	19	Read User In 8 - Lo	Read User In 8 - Lo	Read User In 8 - Lo	Read User In 8 - Lo
Input Register (3x)	20	Read User In 8 - Hi	Read User In 8 - Hi	Read User In 8 - Hi	Read User In 8 - Hi
Holding Register (4x)	5	Parameter # for USER IN1	Parameter # for USER IN1	Parameter # for USER IN1	Parameter # for USER IN1
Holding Register (4x)	6	Parameter # for USER IN2	Parameter # for USER IN2	Parameter # for USER IN2	Parameter # for USER IN2
Holding Register (4x)	7	Parameter # for USER IN3	Parameter # for USER IN3	Parameter # for USER IN3	Parameter # for USER IN3
Holding Register (4x)	8	Parameter # for USER IN4	Parameter # for USER IN4	Parameter # for USER IN4	Parameter # for USER IN4
Holding Register (4x)	9	Parameter # for USER IN5	Parameter # for USER IN5	Parameter # for USER IN5	Parameter # for USER IN5

Table 43 - Configurable Objects Inputs with Option Module in 32-bit Mode (Continued)

Data Direction	Address	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE Control and PowerFlex 6000T-Series Drives	PowerFlex 755TM CBI	755TM Bus Supplies
Holding Register (4x)	10	Parameter # for USER IN6	Parameter # for USER IN6	Parameter # for USER IN6	Parameter # for USER IN6
Holding Register (4x)	11	Parameter # for USER IN7	Parameter # for USER IN7	Parameter # for USER IN7	Parameter # for USER IN7
Holding Register (4x)	12	Parameter # for USER IN8	Parameter # for USER IN8	Parameter # for USER IN8	Parameter # for USER IN8

32-bit Mode Example:

*Writing Parameter Values*



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

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

1. Set one or more Param# for OUTx points in the controller to the parameter numbers to which you want to write. A value of zero in the Param# field disables the writing of data for that specific point. See the drive user manual for the desired parameter numbers. You can set up to three Param# for OUTx points at a time.
2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for OUTx points to the option module only one time per power cycle because, when the option module receives the Param# for OUTx points, it stores them in its RAM.
3. Set the values that you want to write to the parameters in the User OUTx points. You can set up to three User OUTx points at a time.
4. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. Each time that the option module receives the values in the User OUTx points, it writes them to the drive parameters.

**Configurable Output Point Operations**

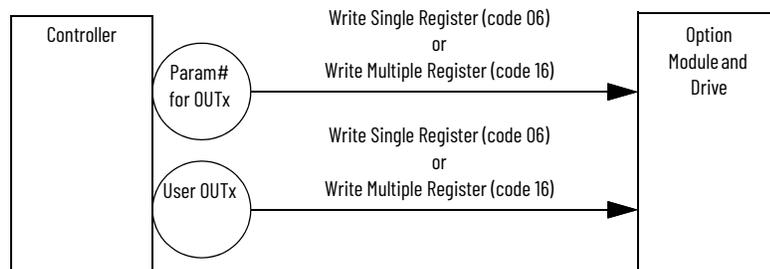


Table 44 - Configurable Objects Outputs with Option Module in 32-bit Mode

Data Direction	Address	Description	PowerFlex 750-Series Drives	PowerFlex750-Series with TotalFORCE Control Drives
Holding Register (4x)	3x0013	Write User Out 1 Lo	Utilize for write access to parameter # for User Out 1, bits 0...15	Utilize for write access to parameter # for User Out 1, bits 0...15
Holding Register (4x)	3x0014	Write User Out 1 Hi	Utilize for write access to parameter # for User Out 1, bits 16...32	Utilize for write access to parameter # for User Out 1, bits 16...32
Holding Register (4x)	3x0015	Write User Out 2 Lo	Utilize for write access to parameter # for User Out 2, bits 0...15	Utilize for write access to parameter # for User Out 2, bits 0...15
Holding Register (4x)	3x0016	Write User Out 2 Hi	Utilize for write access to parameter # for User Out 2, bits 16...32	Utilize for write access to parameter # for User Out 2, bits 16...32
Holding Register (4x)	3x0017	Write User Out 3 Lo	Utilize for write access to parameter # for User Out 3, bits 0...15	Utilize for write access to parameter # for User Out 3, bits 0...15
Holding Register (4x)	3x0018	Write User Out 3 Hi	Utilize for write access to parameter # for User Out 3, bits 16...32	Utilize for write access to parameter # for User Out 3, bits 16...32
Holding Register (4x)	3x0019	Parameter # for USER Out 1	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter
Holding Register (4x)	3x0020	Parameter # for USER Out 2	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter
Holding Register (4x)	3x0021	Parameter # for USER Out 3	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter	After write to this register, read corresponding "Write User Out X" register and write to DPI parameter

32-bit Mode Example: User OUT items are not supported when using the option module in the 32-bit mode.

## Use Broadcast Messages

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

### IMPORTANT

Every node capable of receiving a broadcast message will act upon the message, so it is required that broadcast messages are used only on networks of similar devices. Always check the Modbus addressing, Logic Command structure, Reference format, and so on, for every node device type before designing a system with broadcast messages.

The option module also enables you to independently scale the broadcast message Reference of its connected drive by using parameter 44 [MBS Ref Adjust]. The scaling factor can be set from 0...200.0%. This lets the drive Reference either match the broadcast message Reference (= 100%), scale below the broadcast message Reference (<100%), or scale above the broadcast message Reference (>100%).

**Notes:**

## Complete DF1 Network for I/O

This chapter expands on the information provided in [Chapter 3](#) and provides additional information that is relevant for DF1.

### Set the CRC/BCC Selection (DF1 only)

Two types of error checking methods are used with the DF1 protocol, Cyclic Redundancy Check (CRC) and (BCC).

1. Set the value of parameter 49 [DF1 CRC/BCC Cfg] to the method used by the network.

### Enable or Disable Duplicate Message Detection

Use parameter 51 [DupMsgDetect] to determine if the option module ignores messages with duplicate TNS IDs. Normally, this is set to 'Enable' (default). Set to 'Disable' if you are using a ProSoft 3150-DFM module or any device that does not increment the TNS ID.

**Notes:**

# Troubleshooting

## Status Indicators

Use the tables in this section to get information about the status indicators.

### DeviceNet

This section provides information about status indicators when the configured protocol is DeviceNet®.

**Table 45 - DeviceNet Port Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	The option module is not communicating with the drive via DPI™.
Steady Red	The drive has refused an I/O connection from the option module. Or, another DPI peripheral is using the same DPI port as the option module.
Flashing Orange	The option module is not compatible with the drive.
Flashing Green	The option module is establishing an I/O connection to the drive.
Steady Green	The option module is properly connected and is communicating with the drive.

**Table 46 - DeviceNet MOD Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	One or more of the following conditions is present. View the module's event queue for more information. 1. The drive is in flash mode. 2. The module has an EEPROM fault. 3. The protocol, data rate, or node address switches changed since power up. 4. A duplicate node address fault has been detected. 5. The rotary switches are set to the default set mode (8888). 6. The applied network configuration (node address) is invalid.
Flashing Green	The option module is operating normally, but is not transferring I/O data to a controller.
Steady Green	The option module is operating normally and is transferring I/O data to a controller.
Flashing Red / Green	Firmware revision 1.111 is running. After a firmware update is faulted, the option card operates using firmware revision 1.111, which is a minimally functional firmware designed to update the firmware. When firmware revision 1.111 is running, the MOD status indicator flashes red/green.

**Table 47 - DeviceNet NET A Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. No network link. 3. Firmware revision 1.111 is running.
Flashing Red	The DeviceNet I/O connection has timed out.
Steady Red	The option module failed the duplicate node address detection test or bus off. The node address switch setting is not valid.
Flashing Red/ Green	The option module received an Identify Comm Fault request.
Flashing Green	The option module is properly connected, but it is not communicating with any devices on the network.
Steady Green	The option module is properly connected and is communicating on the network.

**Table 48 - DeviceNet NET B Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. Normal operation. No error. 3. Firmware revision 1.111 is running.

## CANopen

This section provides information about status indicators when the configured protocol is CANopen.

**Table 49 - CANopen Port Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	The option module is not communicating with the drive via DPI.
Steady Red	The drive has refused an I/O connection from the option module. Or, another DPI peripheral is using the same DPI port as the option module.
Flashing Orange	The option module is not compatible with the drive.
Flashing Green	The option module is establishing DPI communication with the drive.
Steady Green	The option module is properly connected and is communicating with the drive.

**Table 50 - CANopen MOD Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	One or more of the following conditions is present. View the module's event queue for more information. 1. The drive is in flash mode. 2. The module has an EEPROM fault. 3. The protocol, data rate, or node address switches changed since power-up. 4. The rotary switches are set to the default set mode (8888). 5. The applied network configuration (node address) is invalid.
Flashing Green (about 2.5 Hz)	The option module is operating normally, but is not transferring I/O data to a controller.
Steady Green	The option module is operating normally and is transferring I/O data to a controller.
Flashing Red / Green	Firmware revision 1.111 is running. After a firmware update is faulted, the option module operates using firmware revision 1.111, which is a minimally functional firmware designed to update the firmware. When firmware revision 1.111 is running, the MOD status indicator flashes red/green.

**Table 51 - CANopen NET A Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. No network link. 3. Firmware revision 1.111 is running.
Single Flash Green <sup>(1)</sup>	At least one of the error counters of the CAN controller reached or exceeded the warning error (too many error frames).
Flashing Green	Normal operation. The option module is properly connected, but it is not communicating with any devices on the network.
Steady Green	Normal operation. The option module is properly connected and is communicating on the network.

(1) Single flash is one short flash (about 200 ms) followed by a long off phase (about 1000 ms).

**Table 52 - CANopen NET B Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. Normal operation. No error. 3. Firmware revision 1.111 is running.
Single Flash Red <sup>(1)</sup>	At least one of the error counters of the CAN controller reached or exceeded the warning error (too many error frames).
Double Flash Red <sup>(2)</sup>	A guard event (NMT server) or a heartbeat event (heartbeat consumer) has occurred.
Steady Red	The CAN controller is in bus-off state.

(1) Single flash is one short flash (about 200 ms) followed by a long off phase (about 1000 ms).

(2) Double flash is two short flashes (about 200 ms each) separated by an off phase (about 200 ms), and then followed by a long off phase (about 1000 ms).

## BACnet

This section provides information about status indicators when the configured protocol is BACnet.

**Table 53 - BACnet Port Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	The option module is not communicating with the drive via DPI.
Steady Red	The drive has refused an I/O connection from the option module. Or, another DPI peripheral is using the same DPI port as the option module.
Flashing Orange	The option module is not compatible with the drive.
Flashing Green	The option module is establishing DPI communication with the drive.
Steady Green	The option module is properly connected and is communicating with the drive.

**Table 54 - BACnet MOD Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	One or more of the following conditions is present. View the module's event queue for more information. 1. The drive is in flash mode. 2. The module has an EEPROM fault. 3. The protocol, data rate, or node address switches changed since power-up. 4. The rotary switches are set to the default set mode (8888). 5. The applied network configuration (node address) is invalid.
Flashing Green	The option module is operating normally, but is not transferring I/O data to a controller.
Steady Green	The option module is operating normally and is transferring I/O data to a controller.
Flashing Red / Green	Firmware revision 1.111 is running. After a firmware update is faulted, the option module operates using firmware revision 1.111, which is a minimally functional firmware designed to update the firmware. When firmware revision 1.111 is running, the MOD status indicator flashes red/green.

**Table 55 - BACnet NET A Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. No network link. 3. Firmware revision 1.111 is running.
Flashing Red	A network connection has timed out.
Flashing Green	Normal operation. The option module is properly connected and is communicating on the network. This status indicator flashes green each time the token is passed to the option module by another BACnet device.

**Table 56 - BACnet NET B Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. Not transmitting on the network. 3. Firmware revision 1.111 is running.
Flashing Green	Normal Operation. The option module is transmitting on the network.

## Modbus RTU

This section provides information about status indicators when the configured protocol is Modbus.

**Table 57 - Modbus Port Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	The option module is not communicating with the drive via DPI.
Steady Red	The drive has refused an I/O connection from the option module. Or, another DPI peripheral is using the same DPI port as the option module.
Flashing Orange	The option module is not compatible with the drive.
Flashing Green	The option module is establishing DPI communication with the drive.
Steady Green	The option module is properly connected and is communicating with the drive.

**Table 58 - Modbus MOD Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	One or more of the following conditions is present. View the module's event queue for more information. <ol style="list-style-type: none"> <li>1. The drive is in flash mode.</li> <li>2. The module has an EEPROM fault.</li> <li>3. The protocol, data rate, or node address switches changed since power up.</li> <li>4. The rotary switches are set to the default set mode (8888).</li> <li>5. The applied network configuration (node address) is invalid.</li> </ol>
Flashing Green	The option module is operating normally, but is not transferring I/O data to a controller.
Steady Green	The option module is operating normally and is transferring I/O data to a controller.
Flashing Red / Green	One or more of the following conditions is present: <ol style="list-style-type: none"> <li>1. Firmware revision 1.111 is running. After a firmware update is faulted, the option module operates using firmware revision 1.111, which is a minimally functional firmware designed to update the firmware. When firmware revision 1.111 is running, the MOD status indicator flashes red/green.</li> <li>2. A framing error is detected.</li> </ol>

**Table 59 - Modbus NET A Status Indicator**

Status	Cause
Off	One of the following conditions is present. <ol style="list-style-type: none"> <li>1. Power is not applied to the option module.</li> <li>2. No network link.</li> <li>3. The first incoming network command is not yet recognized.</li> <li>4. Firmware revision 1.111 is running.</li> </ol>
Flashing Red	A network connection has timed out.
Steady Red	The option module detected an error that made it incapable of communicating on the network.
Flashing Green	Online to network, but not producing or consuming I/O. If "Network Timeout" has not been set to "0" (zero), this indicates that the option module has not received any messages within the interval, but it has not yet timed out. The status indicator turns steady green when communication resumes.
Steady Green	The option module is properly connected and communicating on the network.

**Table 60 - Modbus NET B Status Indicator**

Status	Cause
Off	One of the following conditions is present. <ol style="list-style-type: none"> <li>1. Power is not applied to the option module.</li> <li>2. The option module is not transmitting on the network.</li> <li>3. Firmware revision 1.111 is running.</li> </ol>
Flashing Green	Normal Operation. The option module is transmitting on the network.

## DF1

This section provides information about status indicators when the configured protocol is DF1.

**Table 61 - DF1 Port Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	The option module is not communicating with the drive via DPI.
Steady Red	The drive has refused an I/O connection from the option module. Or, another DPI peripheral is using the same DPI port as the option module.
Flashing Orange	The option module is not compatible with the drive.
Flashing Green	The option module is establishing DPI communication with the drive.
Steady Green	The option module is properly connected and is communicating with the drive.

**Table 62 - DF1 MOD Status Indicator**

Status	Description
Off	Power is not applied to the option module.
Flashing Red	One or more of the following conditions is present. View the module's event queue for more information. 1. The drive is in flash mode. 2. The module has an EEPROM fault. 3. The protocol, data rate, or node address switches changed since power up. 4. The rotary switches are set to the default set mode (8888). 5. The applied network configuration (node address) is invalid.
Flashing Green	The option module is operating normally, but is not transferring I/O data to a controller.
Steady Green	The option module is operating normally and is transferring I/O data to a controller.
Flashing Red / Green	Firmware revision 1.111 is running. After a firmware update is faulted, the option module operates using firmware revision 1.111, which is a minimally functional firmware designed to update the firmware. When firmware revision 1.111 is running, the MOD status indicator flashes red/green.

**Table 63 - DF1 NET A Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. The option module is not properly connected to the network. 3. Firmware revision 1.111 is running.
Flashing Red	A network connection has timed out.
Steady Red	The option module detected an error that made it incapable of communicating on the network.
Flashing Green	The option module is properly connected, but is not communicating with any devices on the network.
Steady Green	The option module is properly connected and communicating on the network.

**Table 64 - DF1 NET B Status Indicator**

Status	Cause
Off	One of the following conditions is present. 1. Power is not applied to the option module. 2. The option module is not receiving data over the network. 3. Firmware revision 1.111 is running.
Flashing Green	Normal Operation. The option module is receiving data over the network.

## View Option Module Diagnostic Items

If you encounter unexpected communication problems, the option module's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. For details on viewing diagnostic items with the HIM, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication [20HIM-UM001](#).

### Diagnostic Items

No.	Name	Description	Clear Counter
1	Common Logic Cmd	The present value of the Common Logic Command being transmitted to the drive by this option module.	—
2	Prod Logic Cmd	The present value of the Product Logic Command being transmitted to the drive by this option module from the controller.	—
3	Reference	The present value of the Reference being transmitted to the drive by this option module.	—
4	Common Logic Sts	The present value of the Common Logic Status being received from the drive by this option module.	—
5	Prod Logic Sts	The present value of the Product Logic Status being received from the drive by this option module.	—
6	Feedback	The present value of the Feedback being received from the drive by this option module.	—
7	Input Size	The size of the input image in bytes transferred from the network to the drive.	—
8	Output Size	The size of the output image in bytes transferred from the drive to the network	—
9	DL Fr Net Avail	The number of Host DL From Net xx Datalinks currently available to the Option Module.	—
10	DL To Net Avail	The number of Host DL To Net xx Datalinks currently available to the Option Module.	—
11	DL Fr Net 01 Val	The present value of respective Host DL From Net xx parameter being transmitted to the drive by this option module. (If not using a Datalink, its respective value should be zero.)	—
12	DL Fr Net 02 Val		—
13	DL Fr Net 03 Val		—
14	DL Fr Net 04 Val		—
15	DL Fr Net 05 Val		—
16	DL Fr Net 06 Val		—
17	DL Fr Net 07 Val		—
18	DL Fr Net 08 Val		—
19	DL Fr Net 09 Val		—
20	DL Fr Net 10 Val		—
21	DL Fr Net 11 Val		—
22	DL Fr Net 12 Val		—
23	DL Fr Net 13 Val		—
24	DL Fr Net 14 Val		—
25	DL Fr Net 15 Val		—
26	DL Fr Net 16 Val		—
27	DL To Net 01 Val	The present value of respective Host DL To Net xx parameter being received from the drive by this option module. (If not using a Datalink, its respective value should be zero.)	—
28	DL To Net 02 Val		—
29	DL To Net 03 Val		—
30	DL To Net 04 Val		—
31	DL To Net 05 Val		—
32	DL To Net 06 Val		—
33	DL To Net 07 Val		—
34	DL To Net 08 Val		—
35	DL To Net 09 Val		—
36	DL To Net 10 Val		—
37	DL To Net 11 Val		—
38	DL To Net 12 Val		—
39	DL To Net 13 Val		—
40	DL To Net 14 Val		—
41	DL To Net 15 Val		—
42	DL To Net 16 Val		—
43	DPI Rx Errs	The present value of the DPI Receive error counter.	—
44	DPI Rx Errs Max	The maximum value (since reset) of the DPI Receive Error counter.	✓
45	DPI Tx Errs	The present value of the DPI Transmit error counter.	—
46	DPI Tx Errs Max	The maximum value (since reset) of the DPI Transmit Error counter.	✓

No.	Name	Description	Clear Counter
47	CAN Rx Errs	The present value of the CAN Receive error counter.	–
48	CAN Rx Errs Max	The maximum value (since reset) of the CAN Receive Error counter.	✓
49	CAN Tx Errs	The present value of the CAN Transmit error counter.	–
50	CAN Tx Errs Max	The maximum value (since reset) of the CAN Transmit Error counter.	✓
51	CAN Rx Frames	The value of the received CAN frame.	✓
52	CAN Tx Frames	The value of the transmitted CAN frame.	✓
53	BNT Rx Packets	The number of BACnet packets received by the option module.	✓
54	BNT Tx Packets	The number of BACnet packets transmitted by the option module.	✓
55	BNT Overrun Errs	A count of the number of BACnet receive overrun errors.	✓
56	BNT Framing Errs	A count of the number of BACnet receive framing errors.	✓
57	BNT CRC Errs	A count of the number of BACnet receive CRC errors.	✓
58	MBS Packet Sent	Number of packets sent by the option module.	✓
59	MBS Packet Rcvd	Number of OK packets received by the option module.	✓
60	MBS Bad Packet	Number of BAD packets received by the option module.	✓
61	MBS User IN 1	Current value of configurable point User IN 1 (RTU).	–
62	MBS User IN 2	Current value of configurable point User IN 2 (RTU).	–
63	MBS User IN 3	Current value of configurable point User IN 3 (RTU).	–
64	MBS User IN 4	Current value of configurable point User IN 4 (RTU).	–
65	MBS User IN 5	Current value of configurable point User IN 5 (RTU).	–
66	MBS User IN 6	Current value of configurable point User IN 6 (RTU).	–
67	MBS User IN 7	Current value of configurable point User IN 7 (RTU).	–
68	MBS User IN 8	Current value of configurable point User IN 8 (RTU).	–
69	MBS User OUT 1	Current value of configurable point User OUT 1 (RTU).	–
70	MBS User OUT 2	Current value of configurable point User OUT 2 (RTU).	–
71	MBS User OUT 3	Current value of configurable point User OUT 3 (RTU).	–
72	DF1 Packets Sent	Reports the number of DF1 packets sent by the Peripheral.	✓
73	DF1 Packets Rcvd	Reports the number of DF1 packets received by the Peripheral.	✓
74	DF1 Undlvr'd Msgs	Reports the number of DF1 packets that were sent by the Peripheral, but not acknowledged.	✓
75	DF1 ENQ's Rcvd	Reports the number of ENQ requests received by the Peripheral.	✓
76	DF1 NAK Bad Pckt	Reports the number of responses received (BCC or CRC calculated by Peripheral did not match that in the packet).	✓
77	DF1 NAK NoMemory	Report the number of requests received by the Peripheral that could not be processed due to insufficient memory available to buffer the incoming packet.	✓
78	DF1 Dup Msgs	Reports the number of duplicate messages received the Peripheral. A duplicate message is detected when the SRC, TNS, and CMD fields of two consecutive messages are identical.	✓
79	PCCC I/O Timeout	I/O Communication timeout value (secs) before Pr.10 [Comm Flt Action] is taken.	–
80	App Flash Count	Number of times the application firmware in the option module has been updated..	–
81	Protocol Sw	The present value of the option module protocol switch.	–
82	Data Rate Sw	The present value of the data rate switch.	–
83	Net Addr Sw	The present value of the node address switches.	–

## View and Clear Events

The option module has an event queue to record significant events that occur in the operation of the module. When such an event occurs, an entry consisting of the event's numeric code and a time stamp is put into the event queue. For details on viewing and clearing events using the HIM, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication [20HIM-UM001](#).

### Events

Information about events can be found in the following tables.

**Table 65 - Option Module Events**

Code	Event	Description
1	No Event	Empty event queue entry.
2	Device Power Up	The option module successfully started up.
3	Device Reset	The option module was reset
5	App Updated	If Application firmware is updated
7	Watchdog Timeout	The software detects a failure.
71	SW Value Invalid	The physical switch setting value is invalid.
75	Internal Error	Module Internal Errors
76	Event Log Error	When "Event Log Accumulation Count" exceeds 5 times within 60 seconds. At this time, "Event Log Error" is recorded and any event log does not record until power-cycle.

Table 66 - DPI Events

Code	Event	Description
8	DPI Bus Off	A bus-off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
9	DPI Ping Timeout	A ping message was not received on DPI within the specified time.
10	DPI Port Invalid	The option module was not connected to a valid port on a DPI product.
11	DPI Port Changed	The DPI port changed.
12	Reserved	
13	Reserved	
14	DPI Baud 500 kbps	The option module detected that the drive was communicating at 500 Kbps.
15	DPI Host Invalid	The option module was connected to an incompatible product.
16	DPI Dup Port	Another peripheral with the same port number is already in use.
17	Reserved	
18	Reserved	
19	Reserved	
20	Reserved	
21	Reserved	
22	Reserved	
23	Reserved	
24	DPI Msg Timeout	A Client-Server message sent by the peripheral was not completed.
25	DPI Manual Reset	The option module was reset by changing its Reset Module parameter.

Table 67 - SI Events

Code	Event	Description
26	SI Online	The option module has logged into the Serial Interface Communications.
27	SI Logon Error	The option module failed to log into the Serial Interface.
28	SI Comm Fault	The Serial Interface Communications has faulted.

Table 68 - Network Events

Code	Event	Description	DeviceNet	CANopen	BACnet	Modbus	DFI
29	Net Link Up	A network link was available for the option module.	✓				
30	Net Link Down	The network link was removed from the option module.	✓				
31	Net Dup Address	The option module uses the same address as another device on the network.	✓				
32	Net Comm Flt	The option module detected a communications fault on the network.	✓	✓	✓	✓	✓
33	Net Sent Reset	The option module received a reset from the network.	✓		✓		
34	Reserved						
35	Net Idle Fault	The option module received 'idle' packets from the network.	✓				
36	Net I/O Open	An I/O connection from the network to the option module has been opened.	✓				
37	Reserved						
38	Net I/O Size Err	The option module received an incorrectly sized I/O packet.	✓				
39	PCCC IO Close	The device sending PCCC Control messages to the option module has set the PCCC Control Timeout to zero.	✓				✓
40	PCCC IO Open	The option module has begun receiving PCCC control messages (the PCCC Control Timeout was previously set to a nonzero value).	✓				✓
41	PCCC IO Timeout	The option module has not received a PCCC Control message for longer than the PCCC Control Timeout.	✓				✓
42	Msg Ctrl Open	The timeout attribute in either the CIP™ Register or Assembly Object was written with a nonzero value, allowing control messages to be sent to the option module.	✓				
43	Msg Ctrl Close	The timeout attribute in either the CIP Register or Assembly Object was written with a zero value, disallowing control messages to be sent to the option module.	✓				

Table 68 - Network Events (Continued)

Code	Event	Description	DeviceNet	CANopen	BACnet	Modbus	DF1
44	Msg Ctrl Timeout	The timeout attribute in either the CIP Register or Assembly Object elapsed between accesses of those objects	✓				
45	Reserved						
46	Reserved						
47	Net Bus Off	The network has experienced a Bus-Off condition.	✓				
48	Net Poll Timeout	A Polled I/O connection has timed out.	✓				
49	Net IO Frag Err	A network I/O fragment was received out of sequence. Possible line noise problem.	✓				
50	Net COS Timeout	A Change of State (COS) connection has timed out.	✓				
51	Net Poll Alloc	A Polled connection has been allocated	✓				
52	Net COS Alloc	A Change of State (COS) I/O connection has been allocated.	✓				
53	Net Poll Close	A Polled I/O connection was explicitly closed.	✓				
54	Net COS Close	A Change of State (COS) I/O connection was explicitly closed.	✓				
55	Reserved						
56	Reserved						
57	Reserved						
58	COPN Guard Err	The node has not been guarded by an NMT manager with the Guard Time x LifeTime Factor period. (Enabled if Guard Time <= 0.)		✓			
59	COPN Operational	The option module has received a "Start_Remote_Node" message from the bus.		✓			
60	COPN Stopped	The option module has received a "Stop_Remote_Node" message from the bus.		✓			
61	COPN Pre-Oper	The option module has received a "Enter_PRE-OPERATIONAL_State" message from the bus.		✓			
62	COPN Reset Comm	The option module has received a "Reset_Communication" message from the bus.		✓			
63	COPN Reset Node	The option module has received a "Reset_Node" message from the bus.		✓			
64	Net Timeout Flt	Timeout occurred on network			✓	✓	
65	Net Detected	The option module has detected a network.				✓	
66	DF1 NAK	NAK received.					✓
67	Reserved						
68	Reserved						
69	Reserved						
70	Module Defaulted	The option module has been set to defaults	✓	✓	✓	✓	✓
72	COPN Heartbt Err	The network has experienced a Bus Off condition.		✓			
73	COPN Err Passive	The node has found an error passive state for CAN bus.		✓			
74	COPN Bus Off	The node has found bus off state for CAN bus.		✓			

**Notes:**

## Specifications

### Communications

Protocol	Communication Rates
DeviceNet <sup>®</sup>	125 Kbps, 250 Kbps, 500 Kbps, Autobaud
CANopen	10 Kbps, 20 Kbps, 50 Kbps, 125 Kbps, 250 Kbps, 500 Kbps, 800 Kbps, 1 Mbps, Autobaud
BACnet MS/TP	9600 bps, 19,200 bps, 38,400 bps, 57,600 bps, 76,800 bps, 115,200 bps, Autobaud
Modbus RTU	1200 bps, 2400 bps, 4800 bps, 9600 bps, 19,200 bps, 38,400 bps, 57,600 bps, 115,200 bps
DF1	1200 bps, 2400 bps, 4800 bps, 9600 bps, 19,200 bps, 38,400 bps

### Electrical

Consumption	Maximum
From host drive	cannot exceed 250 mA at 14V DC
From network	cannot exceed 20 mA at 24V DC

### Mechanical

Dimensions	
Height	83 mm (3.8")
Length	150 mm (5.9")
Width	26 mm (1.0")

Weight
81 gram (2.9 ounces)

### Environmental

Category	Details
Operational ambient (local) temperature	-20...+65 °C (-4...+149 °F)
Nonoperational ambient (storage) temperature	-40...+85 °C (-40...+185 °F)
Operational relative humidity	5...80% noncondensing
Nonoperational relative humidity	5...95% noncondensing
Shock (operational, unpackaged)	15 g peak for 11 ms duration (±1.0 ms)
Vibration (operational, unpackaged)	2.000 mm (0.080 in.) displacement, 2 g peak from 2...13.2 Hz, 0.7 g acceleration at 13.2 Hz to 2.0 g acceleration at 55 Hz, 2.0 g acceleration from 55 Hz...512 Hz per IEC 60068-2-6 with equipment fully operational while under test
Corrosion	In compliance with BSRC-8710 (Version 1.0) requirement per ANSI/ISA 71.04-2013 airborne contaminants-gases.

## Regulatory Compliance

Certification	Description
Product certifications	Rockwell Automation maintains current product certification information on its website at: <a href="http://rok.auto/certifications">rok.auto/certifications</a>
cULus	UL61800-5-1, CSA C22.2 No.14-M91
CE	EN 61800-3:2004+A1:2012, IEC 61800-5-1:2007+A11:2021
EU RoHS	European Directive (2011/65/EU + 2015/863/EU)
EU WEEE	European Directive (2012/19/EU)
KCC	IEC 61800-3
RCM	IEC 61800-3
China RoHS	GB/T 26572
Morocco	M EN 61800-5-1 2014, NM EN 61800-3 2018
UKCA	EN 61800-3
UAE	UAE Cabinet Order No. 10/217
SASO (Regulation)	Saudi Arabia RoHS Technical Regulation (TR) number MA 179-21-09-01

## Module Parameters

### Parameter Types

The option module has two types of parameters:

- Device parameters are used to configure the option module to operate on the network.
- Host parameters are used to configure the option module Datalink transfer and various fault actions with the drive.

### Device Parameters

This section contains common parameters used by all protocols as well as unique parameters for each protocol.

**Table 69 - Common Parameters (for all protocols)**

No.	Name Description	Values	Read/Write
1	<b>Port Number</b> Port Number Displays DPI™ port number.	Default: 5 Min./Max.: 0 / 7	RO
2	<b>DLs From Net Cfg</b> Datalinks From Network Configuration Sets the number of contiguous controller-to-drive Datalinks (additional parameters) that are available from the network connection. Logic Command and Reference are always enabled. This parameter controls how many of the contiguous Host [DL From Net xx] parameters (16 maximum) are active. For example, if this parameter value is set to '5', then Host parameter 1 [DL From Net 01] ... parameter 5 [DL From Net 05] will be updated. Reset required for change to take effect.	Default: 0 Min./Max.: 0 / 16	RW
3	<b>DLs From Net Act</b> Datalinks From Network Actual Displays the value of device parameter 02 [DLs From Net Cfg] at the time the drive was reset. This is the number of actual contiguous controller-to-drive Datalinks that the drive is expecting.	Default: 0 Min./Max.: 0 / 16	RO
4	<b>DLs To Net Cfg</b> Datalinks To Network Configuration Sets the number of contiguous drive-to-controller Datalinks (additional parameters) available for network connection. Logic Status and Feedback are always enabled. This parameter controls how many of the contiguous Host [DL To Net xx] parameters (16 maximum) are active. For example, if this parameter value is set to '5', then host parameter 17 [DL To Net 01] ... parameter 21 [DL To Net 05] are updated. Reset is required for changes to take effect.	Default: 0 Min./Max.: 0 / 16	RW
5	<b>DLs To Net Act</b> Datalinks From Net Actual Displays the value of device parameter 04 [DLs To Net Cfg] at the time the drive was reset. This is the number of actual contiguous drive-to-controller Datalinks that the controller is expecting.	Default: 0 Min./Max.: 0 / 16	RO
6	<b>Protocol Cfg</b> Protocol Configuration Configure protocol setting via DPI. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for changes take effect.	Default: 0 Options: 0 = DeviceNet® 1 = CANopen 2 = BACnet MS/TP 3 = Modbus RTU 4 = DF1	RW
7	<b>Protocol Act</b> Protocol Actual Display current protocol, either selected by rotary switch or by parameter 6 [Protocol Cfg]. Determined at module startup and not changed after that.	Default: 0 Options: 0 = DeviceNet 1 = CANopen 2 = BACnet MS/TP 3 = Modbus RTU 4 = DF1 5 = Invalid	RO

Table 69 - Common Parameters (for all protocols)

No.	Name Description	Values	Read/Write
8	<b>Reset Module</b> Reset Module No action if set to "Ready." Resets if set to "Reset Module." Restores the option module to its factory default settings if set to "Set Defaults." This parameter is a command. It resets to "0 =Ready" after the command is performed.	Default: 0 Options: 0 = Ready 1 = Reset Module 2 = Set Defaults	RW
9	<b>Clear Counters</b> Clear Counters Clears the network diagnostic counters.	Default: 0 Options: 0 = Ready 1 = Clear	RW
10	<b>Force SWParamSel</b> Force Soft Parameter Selection If value is "1", DPI parameter setting (Soft Parameter) is forcibly applied for protocol, rate, and node address settings.	Default: 0 Options: 0 = Disable 1 = Enable	RW

Table 70 - DeviceNet Parameters

No.	Name Description	Values	Read/Write
11	<b>DNT Net Addr Src</b> DeviceNet Network Address Source Displays the source from which the option module's node address is taken. This will be either the Node Address switches or the value of Device Parameter 14 [DNT Net Addr Cfg].	Default: 2 Options: 0 = Switches 1 = Parameters 2 = Invalid	RO
12	<b>DNT Net Rate Cfg</b> DeviceNet Network Rate Configuration Set network data rate. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 3 Options: 0 = 125 kbps 1 = 250 kbps 2 = 500 kbps 3 = Autobaud	RW
13	<b>DNT Net Rate Act</b> DeviceNet Network Rate Actual Displays the actual network data rate being used by the option module.	Default: 4 Options: 0 = 125 kbps 1 = 250 kbps 2 = 500 kbps 3 = Autobauding 4 = Invalid	RO
14	<b>DNT Net Addr Cfg</b> DeviceNet Network Address Configuration Set Network address. This setting take effect only when rotary switch position represents PGM. Reset required for change to take effect.	Default: 63 Min./Max.: 0 / 63	RW
15	<b>DNT Net Addr Act</b> DeviceNet Network Address Actual Displays the actual network node address used by the option module.	Default: 63 Min./Max.: 0 / 63	RO
16	<b>DNT COS StsMask</b> DeviceNet Change-of-State Status Word Mask Sets the mask for the 32-bit Logic Status word. Unless they are masked out, the bits in the Logic Status word are checked for changes when the option module is allocated using COS (Change of State). If a bit changes, it is reported as a change in the Change of State operation. If the mask bit is '0' (Off), the bit is ignored. If the mask bit is '1' (On), the bit is checked.	Default: 0x00000000 Min./Max.: 0x00000000 / 0xFFFFFFFF	RW
17	<b>DNT COS Fbk Chg</b> DeviceNet Change-of-State Feedback Change Sets the amount of acceptable error (positive or negative) that the Feedback word can change before it is reported as a change in the COS (Change of State) operation.	Default: 0.000 Min./Max.: 0.000 / 3.40282 x e38	RW
18	<b>DNT Interval</b> DeviceNet Interval Displays the amount of time that a scanner will wait to check for data in the option module. When COS (Change of State) data exchange has been configured, this is the maximum amount of time between scans. Scans will occur sooner if data changes. When Cyclic data exchange has been configured, this interval is the fixed time between scans.	Default: 0.000 Min./Max.: 0.000 / 65.535 sec	RO

Table 71 - CANopen Parameters

No.	Name Description	Values	Read/Write
19	<b>COPN Rate Cfg</b> CANopen Network Rate Configuration Sets network data rate. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 8 Options: 0 = 10 kbps 1 = 20 kbps 2 = 50 kbps 3 = 125 kbps 4 = 250 kbps 5 = 500 kbps 6 = 800 kbps 7 = 1 Mbps 8 = Autobaud	RW
20	<b>COPN Rate Act</b> CANopen Network Rate Actual Displays the actual network data rate being used by the option module.	Default: 8 Options: 0 = 10 kbps 1 = 20 kbps 2 = 50 kbps 3 = 125 kbps 4 = 250 kbps 5 = 500 kbps 6 = 800 kbps 7 = 1 Mbps 8 = Invalid 9 = Autobaud	RO
21	<b>COPN Addr Cfg</b> CANopen Address Configuration Sets the CANopen node address used by the option module. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 63 Min./Max.: 1 / 127	RW
22	<b>COPN Addr Act</b> CANopen Address Actual Displays the actual network node address used by the option module.	Default: 255 Min./Max.: 1 / 127	RO
23	<b>COPN PDO1 Trig</b> CANopen TPDO1 Transmission Type Sets the transmission type for TPDO1 (Status/Feedback) if transmission type "0" or "254" is configured. Reset required for change to take effect.	Default: 0 Options: 0 = COS 1 = Cyclic	RW
24	<b>COPN COS StsMask</b> CANopen Change-of-State Status Mask Sets the mask for the 32-bit Logic Status word. Unless they are masked out, the bits in the Logic Status word are checked for changes when the option module is allocated using COS (Change of State). If a bit changes, it is reported as a change in the Change of State operation. If the mask bit is '0' (Off), the bit is ignored. If the mask bit is '1' (On), the bit is checked.	Default: 0x00000000 Min./Max.: 0x00000000 / 0xFFFFFFFF	RW
25	<b>COPN COS Fbk Chg</b> CANopen Change-of-State Feedback Change Sets the hysteresis band to determine how much the Feedback word can change before it is reported as a Change of State.	Default: 0.000 Min./Max.: 0.000 / 3.40282 x e38	RW
26	<b>COPN CycInterval</b> CANopen Cyclic Transmission Interval Sets amount of time between transfers used for cyclic transmission if transmission type "0" or "254" is configured and parameter [PDO1 Trigger] is set to "1" (Cyclic).	Default: 0.02 sec Min./Max.: 0.02 / 655.35	RW

Table 72 - BACnet Parameters

No.	Name Description	Values	Read/Write
27	<b>BNT BaudRate Cfg</b> BACnet Baud Rate Configuration Sets the baud rate (bits per second) at which the option module communicates. (Updates parameter 28 [BNT BaudRate Act] after a reset.) This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 0 Options: 0 = Autobaud 1 = 9600 bps 2 = 19200 bps 3 = 38400 bps 4 = 57600 bps 5 = 76800 bps 6 = 115200 bps	RW
28	<b>BNT BaudRate Act</b> BACnet Baud Rate Actual Displays the baud rate (bits per second) actually used by the option module.	Default: 7 Options: 0 = Autobauding 1 = 9600 bps 2 = 19200 bps 3 = 38400 bps 4 = 57600 bps 5 = 76800 bps 6 = 115200 bps 7 = Invalid	RO
29	<b>BNT MAC Addr Cfg</b> BACnet MAC Address Configuration Set network address. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 0 Min./Max.: 0 / 127	RW
30	<b>BNT MAC Addr Act</b> BACnet MAC Address Actual Displays the actual network node address used by the option module.	Default: 0 Min./Max.: 0 / 127	RO
31	<b>BNT ComLoss Time</b> BACnet Communication Loss Time Sets the communication loss timeout period in seconds. The value zero disables this feature.	Default: 10 sec Min./Max.: 0 / 180 sec	RW
32	<b>BNT Max Master</b> BACnet Maximum MAC Address Sets the maximum MAC Address for any device in the BACnet MS/TP token ring. Reset required for change to take effect.	Default: 127 Min./Max.: 0 / 127	RW
33	<b>BNT MaxMsg Frame</b> BACnet Maximum Message Frame Sets the maximum number of messages that the option module can transmit while it owns the token. Reset required for change to take effect.	Default: 1 Min./Max.: 1 / 255	RW
34	<b>BNT Dev InstNum</b> BACnet Device Instance Number Sets the Device Instance Number used by the option module. Reset required for change to take effect.	Default: 160000 Min./Max.: 0 / 4194302	RW

Table 73 - Modbus Parameters

No.	Name Description	Values	Read/Write
35	<b>MBS Net Rate Cfg</b> Modbus Network Rate Configuration Sets the baud rate (bits per second) at which the option module communicates. (Updates parameter 36 [MBS Net Rate Act] after a reset). This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 4 Options: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = 57600 bps 7 = 115200 bps	RW
36	<b>MBS Net Rate Act</b> Modbus Network Rate Actual Displays the baud rate (bits per second) actually used by the option module.	Default: 8 Options: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = 57600 bps 7 = 115200 bps 8 = Invalid	RO
37	<b>MBS Net Addr Cfg</b> Modbus Network Address Configuration Set Network address. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable).	Default: 1 Min./Max.: 1 / 247	RW
38	<b>MBS Net Addr Act</b> Modbus Network Address Actual Displays the actual network node address used by the option module.	Default: 255 Min./Max.: 1 / 247	RO
39	<b>MBS Parity Cfg</b> Modbus Network Parity Configuration Configures the network parity. The available values for this parameter depend on the network protocol selected. Only valid values for the specified network are displayed. Reset required for change to take effect.	Default: 0 Options: 0 = None 1 = odd (Modbus RTU only) 2 = even (Modbus RTU only)	RW
40	<b>MBS Parity Act</b> Modbus Network Parity Actual Displays the actual network parity used by the option module.	Default: 3 Options: 0 = None 1 = odd (Modbus RTU only) 2 = even (Modbus RTU only) 3 = Invalid	RO
41	<b>MBS Stop Bit Cfg</b> Modbus Stop Bit Configuration Sets the number of stop bits used by the option module when the network protocol switch is set to "Modbus RTU." When any other protocol is selected, this parameter setting has no effect. Reset required for change to take effect.	Default: 0 Options: 0 = 1 bit 1 = 2 bits	RW
42	<b>MBS Stop Bit Act</b> Modbus Stop Bit Actual Displays the actual number of stop bits used by the selected protocol.	Default: 2 Options: 0 = 1 bit 1 = 2 bits 2 = Invalid	RO
43	<b>MBS ComLoss Time</b> Modbus Communication Loss Time Configures the time in seconds to be used to detect network communication loss.	Default: 10 sec Min./Max.: 0 / 180 sec	RW
44	<b>MBS Ref Adjust</b> Modbus Reference Adjust Sets the percent scale factor for the Reference from the network and broadcast messages (Modbus address "0"). This lets the drive's Reference either match the broadcast message Reference (=100%), scale below it (<100%), or scale above it (>100%).	Default: 100.0% Min./Max.: 0 / 200%	RW

## DF1 Parameters

No.	Name Description	Values	Read/Write
45	<b>DF1 Rate Cfg</b> DF1 Rate Configuration Sets the baud rate (bits per second) at which the option module communicates. (Updates parameter 46 [DF1 Rate Act] after a reset.) This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 4 Options: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps	RW
46	<b>DF1 Rate Act</b> DF1 Rate Actual Displays the baud rate (bits per second) actually used by the option module.	Default: 6 Options: 0 = 1200 bps 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps 5 = 38400 bps 6 = Invalid	RO
47	<b>DF1 Addr Cfg</b> DF1 Address Configuration Set Network address. This setting applies to the option module only when the mode setting rotary switch reflects 'Software Config' or parameter 10 [Force SWParamSel] is set to 1 (Enable). Reset required for change to take effect.	Default: 1 Min./Max.: 0 / 254	RW
48	<b>DF1 Addr Act</b> DF1 Address Actual Displays the actual network node address used by the option module.	Default: 255 Min./Max.: 0 / 254	RO
49	<b>DF1 CRC/BCC Cfg</b> DF1 CRC/BCC Configuration Techniques for error detection in data communications. Must match the technique used by the software or controller communicating with the option module. Reset required for change take effect.	Default: 0 Options: 0 = BCC (default) 1 = CRC	RW
50	<b>DF1 CRC/BCC Act</b> DF1 CRC/BCC Actual Actual checksum or CRC selection.	Default: 2 Options: 0 = BCC (default) 1 = CRC 2 = Invalid	RO
51	<b>DF1 DupMsgDetect</b> DF1 Duplicate Message Detection Determines if the option module ignores messages with duplicate TNS IDs. Normally set to Enable (default). Set to Disable if using a ProSoft 3150-DFM module or any device which does not increment the TNS ID.	Default: 1 Options: 0 = Disable 1 = Enable	RW

# Host Parameters

Table 74 - Host Parameters

No.	Name Description	Values	Read/Write
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16	<b>DL From Net 01</b> <b>DL From Net 02</b> <b>DL From Net 03</b> <b>DL From Net 04</b> <b>DL From Net 05</b> <b>DL From Net 06</b> <b>DL From Net 07</b> <b>DL From Net 08</b> <b>DL From Net 09</b> <b>DL From Net 10</b> <b>DL From Net 11</b> <b>DL From Net 12</b> <b>DL From Net 13</b> <b>DL From Net 14</b> <b>DL From Net 15</b> <b>DL From Net 16</b> Datalinks from Network (01...16) Sets the port number and parameter number to which the selected Datalinks should connect. Each selected port/parameter will be written with data received from the network. These are parameters that are written by the controller (outputs from the controller). If setting the value manually, the parameter value = (10000 *port number) + (destination parameter number). For example, suppose you want to use host parameter 01 [DL From Net 01] to write to Parameter 01 of an optional encoder module plugged into drive Port 5. The value for host parameter 01 [DL From Net 01] would be 50001 [(10000 * 5) + 1].	Default: 0 Min./Max.: 0 / 159999	RW
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	<b>DLs To Net 01</b> <b>DLs To Net 02</b> <b>DLs To Net 03</b> <b>DLs To Net 04</b> <b>DLs To Net 05</b> <b>DLs To Net 06</b> <b>DLs To Net 07</b> <b>DLs To Net 08</b> <b>DLs To Net 09</b> <b>DLs To Net 10</b> <b>DLs To Net 11</b> <b>DLs To Net 12</b> <b>DLs To Net 13</b> <b>DLs To Net 14</b> <b>DLs To Net 15</b> <b>DLs To Net 16</b> Datalinks To Network (01...16) Sets the port number and parameter number to which the selected Datalinks should connect. Each selected port/parameter will be read and their values transmitted over the network to the controller. These are parameters that are read by the controller (inputs to the controller). If setting the value manually, the parameter value = (10000 *port number) + (origination parameter number). For example, suppose you want to use Host Parameter 17 - [DL To Net 01] to read Parameter 02 of an optional I/O module plugged into drive Port 6. The value for Host Parameter 17 - [DL To Net 01] would be 60002 [(10000 * 6) + 2].	Default: 0 Min./Max.: 0 / 159999	RW
33	<b>Comm Flt Action</b> Communication Fault Action This setting always takes effect and is not dependent on the protocol setting. Sets the action that the option module and drive take if the option module detects that I/O communication has been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the option module. When communication is re-established, the drive automatically receives commands over the network again.  <div style="border: 1px solid black; padding: 5px;">  <p><b>ATTENTION:</b> Risk of injury or equipment damage exists. Host Parameter 33 [Comm Flt Action] lets you determine the action of the option module and connected drive if I/O communication is disrupted. By default, this parameter faults the drive. You may configure 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).</p> </div>	Default: 0 Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg	RW

Table 74 - Host Parameters (Continued)

No.	Name Description	Values	Read/Write
34	<p><b>Idle Fault Action</b> Idle Fault Action This setting takes effect when the protocol is set to DeviceNet or CANopen. When protocol is DeviceNet: Sets the action that the option module and drive take if the option module 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 option module. When the controller is put back in Run mode, the drive automatically receives commands over the network again.</p> <p>When protocol is CANopen: Sets the action that the option module and drive take if the option module moves to the Pre-operational state. This setting is effective only if I/O that controls the drive is transmitted through the option module. When the controller is put back in the Operational state, the drive automatically receives commands over the network again.</p> <hr/>  <p><b>ATTENTION:</b> Risk of injury or equipment damage exists. Host Parameter 34 [Idle Flt Action] lets you determine the action of the option module and connected drive when the controller is idle. By default, this parameter faults the drive. You may configure 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 controller in idle state).</p> <hr/>	<p>Default: 0 Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg</p>	RW
35	<p><b>Reserved for future use</b></p>	-	-
36	<p><b>Msg Flt Action</b> Message Fault Action This setting takes effect only when the protocol is set to DeviceNet. Sets the action that the option module and drive take if the option module detects that explicit messaging—only when used for drive control via the PCCC or the CIP Register Object—has been disrupted. When explicit messaging is re-established, data is automatically received/sent over the network again.</p> <hr/>  <p><b>ATTENTION:</b> Risk of injury or equipment damage exists. Host Parameter 36 [Msg Flt Action] lets you determine the action of the option module and connected drive when the controller is idle. By default, this parameter faults the drive. You may configure 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 controller in idle state).</p> <hr/>	<p>Default: 0 Options: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg</p>	RW

Table 74 - Host Parameters (Continued)

No.	Name Description	Values	Read/Write
37	<b>Flt Cfg Logic</b> Fault Configure Logic Sets the Logic Command data that is sent to the drive if any of the following is true: <ul style="list-style-type: none"> <li>• Host Parameter 33 [Comm Flt Action] is set to '4' (Send Flt Cfg) and I/O communication is disrupted.</li> <li>• Host Parameter 34 [Idle Flt Action] is set to '4' (Send Flt Cfg) and the controller is idle.</li> <li>• Host Parameter 36 [Msg Flt Action] is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted.</li> </ul> Important: The bit definitions in the Logic Command word are shown in <a href="#">Appendix F</a> .	Default: 0000 0000 0000 0000 0000 0000 0000 0000 Min.: 0000 0000 0000 0000 0000 0000 0000 0000 Max.: 1111 1111 1111 1111 1111 1111 1111 1111	RW
38	<b>Flt Cfg Ref</b> Fault Configure Reference Sets the Reference data that is sent to the drive if any of the following is true: <ul style="list-style-type: none"> <li>• Host Parameter 33 [Comm Flt Action] is set to '4' (Send Flt Cfg) and I/O communication is disrupted.</li> <li>• Host Parameter 34 [Idle Flt Action] is set to '4' (Send Flt Cfg) and the controller is idle.</li> <li>• Host Parameter 36 [Msg Flt Action] is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted.</li> </ul>	Default: 0 Min.: -3.40282 x 1038 Max.: 3.40282 x 1038	RW
39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	<b>Flt Cfg DL 01</b> <b>Flt Cfg DL 02</b> <b>Flt Cfg DL 03</b> <b>Flt Cfg DL 04</b> <b>Flt Cfg DL 05</b> <b>Flt Cfg DL 06</b> <b>Flt Cfg DL 07</b> <b>Flt Cfg DL 08</b> <b>Flt Cfg DL 09</b> <b>Flt Cfg DL 10</b> <b>Flt Cfg DL 11</b> <b>Flt Cfg DL 12</b> <b>Flt Cfg DL 13</b> <b>Flt Cfg DL 14</b> <b>Flt Cfg DL 15</b> <b>Flt Cfg DL 16</b> Fault Configure Datalink (01...16) Sets the data that is sent to the Datalink in the drive if any of the following is true: <ul style="list-style-type: none"> <li>• Host Parameter 33 [Comm Flt Action] is set to '4' (Send Flt Cfg) and I/O communication is disrupted.</li> <li>• Host Parameter 34 [Idle Flt Action] is set to '4' (Send Flt Cfg) and the controller is idle.</li> <li>• Host Parameter 36 [Msg Flt Action] is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted.</li> </ul>	Default: 0 Min.: 0 Max.: 4294967295	RW

**Notes:**

## DeviceNet Objects

This appendix presents information about the DeviceNet® objects that can be accessed using Explicit Messages. For information on the format of Explicit Messages and example ladder logic programs, see [Chapter 4, About Explicit Messaging](#).

Object	Class Code		Page	Object	Class Code		Page
	Hex.	Dec.			Hex.	Dec.	
<a href="#">Identity Object</a>	0x01	1	146	<a href="#">DPI Fault Object</a>	0x97	151	161
<a href="#">Connection Object</a>	0x05	5	147	<a href="#">DPI Alarm Object</a>	0x98	152	163
<a href="#">Register Object</a>	0x07	7	148	<a href="#">DPI Diagnostic Object</a>	0x99	153	165
<a href="#">PCCC Object</a>	0x67	103	149	<a href="#">DPI Time Object</a>	0x9B	155	167
<a href="#">DPI Device Object</a>	0x92	146	152	<a href="#">Host DPI Parameter Object</a>	0x9F	159	170
<a href="#">DPI Parameter Object</a>	0x93	147	155				



See the DeviceNet specification for more information about DeviceNet objects. Information about the DeviceNet specification is available on the ODVA website (<http://www.odva.org>).

## Supported Data Types

Data Type	Description
BOOL	8-bit value -- low bit is true or false
BOOL[x]	Array of n bits
CONTAINER	32-bit parameter value - sign extended if necessary
DINT	32-bit signed integer
INT	16-bit signed integer
LWORD	64-bit unsigned integer
REAL	32-bit floating point
SHORT_STRING	Struct of: USINT length indicator (L); USINT[L] characters
SINT	8-bit signed integer
STRINGN	Struct of: UINT character length indicator (W); UINT length indicator (L); USINT[W x L] string data
STRING[x]	Array of n characters
STRUCT	Structure name only - no size in addition to elements
TCHAR	8-bit or 16-bit character
UDINT	32-bit unsigned integer
UINT	16-bit unsigned integer
USINT	8-bit unsigned integer

## Identity Object

### Class Code

Hexadecimal	Decimal
0x01	1

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x05	Yes	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single

### Instances

The number of instances depends on the number of components in the device that is connected to the option module. This number of components can be read in Instance 0, Attribute 2.

Instance	Description
0	Class
1	Host
2...15	Peripherals on Ports 1...14

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
2	Get	Max Instance	UINT	Total number of instances

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	UINT	1 = Allen-Bradley®
2	Get	Device Type	UINT	179=PowerFlex® 750-Series via USC
3	Get	Product Code	UINT	Number identifying product name and rating
4	Get	Revision: Major Minor	STRUCT of: USINT USINT	Value varies Value varies
5	Get	Status	UINT	Bit 0 = Owned Bit 8 = Minor recoverable fault Bit 10 = Major recoverable fault
6	Get	Serial Number	UDINT	Unique 32-bit number
7	Get	Product Name	SHORT_STRING	Product name and rating

## Connection Object

### Class Code

Hexadecimal	Decimal
0x05	5

### Services

Service Code	Implemented for:	Service Name
	Instance	
0x0E	Yes	Get_Attribute_Single
0x10	Yes	Set_Attribute_Single

### Instances

Instance	Description
2	Polled I/O Connection
4	Change of State/Cyclic Connection
6...10	Explicit Message Connection

### Instance Attributes

See the DeviceNet specification for more information.

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	State	USINT	0 = Nonexistent 1 = Configuring 2 = Waiting for connection ID 3 = Established 4 = Timed out 5 = Deferred Delete
2	Get	Instance Type	USINT	0 = Explicit message 1 = I/O message
3	Get	Transport	USINT	The Transport Class Trigger for this instance
4	Get	Produced Cnxn ID	USINT	CAN Identifier to transmit on
5	Get	Consumed Cnxn ID	USINT	CAN Identifier to receive on
6	Get	Initial Comm Char	USINT	Defines the DeviceNet message groups that the Tx/Rx Cnxn's apply
7	Get	Produced Cnxn Size	UINT	Max bytes to transmit across this connection
8	Get	Consumed Cnxn Size	UINT	Max bytes to receive across this connection
9	Get/Set	EPR	UINT	Expected Packet Rate (timer resolution = 1 msec.)
12	Get/Set	Watchdog Action	USINT	0 = Transition to timed out 1 = Auto delete 2 = Auto reset 3 = Deferred Delete
13	Get	Produced Path Length	UINT	Number of bytes of data in the produced connection path
14	Get	Produced Connection Path	ARRAY of UINT	Byte stream which defines Application objects whose data is to be produced by this Connection object
15	Get	Consumed Path Length	UINT	Number of bytes of data in the consumed connection path
16	Get	Consumed Connection Path	ARRAY of USINT	Byte stream which defines Application objects whose data is to be consumed by this Connection object
17	Get/Set	Production Inhibit Time	UNIT	Defines minimum time between new data production
18	Get/Set	Connection Timeout Multiplier	UNIT	Specifies the multiplier that is applied to the expected packet rate value to derive the value for the Inactivity/Watchdog timer

## Register Object

### Class Code

Hexadecimal	Decimal
0x07	7

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

### Instances

Instance	Description
1	All polled data being read from the option module (read-only)
2	All polled data that is written to the option module (read/write)
3	Logic Status and Feedback data (read-only)
4	Logic Command and Reference data (read/write)
5	DL To Net 01 (input data from option module to scanner) (read-only)
6	DL From Net 01 (output data from scanner to option module) (read/write)
⋮	⋮
35	DL To Net 16 (input data from option module to scanner) (read-only)
36	DL From Net 16 (output data from scanner to option module) (read/write)
37	Logic Status and Feedback data (read-only)
38	Masked Logic Command <sup>(1)</sup> (read/write)
39	Logic Status data (read-only)
40	Logic Command data (read/write)
41	Feedback data (read-only)
42	Reference data (read/write)

(1) The mask command DWORD is set to the value of the first DWORD of the data where there are ones in the second DWORD of the data. Only the bits of the Logic Command that have the corresponding mask bit set are applied.

### Class Attributes

Attribute ID	Access Rule	Name
1	Read	Revision
2	Read	Maximum Instance
3	Read	Number of Instances
100	Read/Write	Timeout

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Bad Flag	BOOL	If set to 1, then attribute 4 may contain invalid data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Producer Register (drive to network) 1 = Consumer Register (network to drive)
3	Get	Size	UINT	Size of register data in bits
4	Conditional <sup>(1)</sup>	Data	ARRAY of BITS	Data to be transferred

(1) For this attribute, the Access Rule is Get if Direction = 0. The Access Rule is Set if Direction = 1.

## PCCC Object

### Class Code

Hexadecimal	Decimal
0x67	103

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x4B	No	Yes	Execute_PCCC
0x4D	No	Yes	Execute_Local_PCCC

### Instances

Supports Instance 1.

### Class Attributes

Not supported.

### Instance Attributes

Not supported.

### Message Structure for Execute\_PCCC

Request		
Name	Data Type	Description
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code; not used for all CMDs.
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	Data Type	Description
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended status; not used for all CMDs.
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

### Message Structure for Execute\_Local\_PCCC

Request		
Name	Data Type	Description
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code; not used for all CMDs
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	Data Type	Description
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended Status; not used for all CMDs
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

The option module supports the following PCCC command types:

<b>CMD</b>	<b>FNC</b>	<b>Description</b>
0x06	0x03	Identify host and some status
0x0F	0x67	PLC-5 <sup>®</sup> typed write
0x0F	0x68	PLC-5 typed read
0x0F	0x95	Encapsulate other protocol
0x0F	0xA2	SLC™ 500 protected typed read with 3 address fields
0x0F	0xAA	SLC 500 protected typed write with 3 address fields
0x0F	0x00	Word range read
0x0F	0x01	Word range write

For more information regarding PCCC commands, see the DF1 Protocol and Command Set Manual, publication [1770-6.5.16](#).

## N-Files

N-File	Description	
N42	This N-file lets you read and write some values configuring the port.	
N42:3	Time-out (read/write): Time (in seconds) allowed between messages to the N45 file. If the option module does not receive a message in the specified time, it performs the fault action that is configured in its [Comm Flt Action] parameter. A valid setting is between 1...32767 seconds (5...20 seconds is recommended).	
N42:7	Option Module Port Number (read-only): Drive port in which option module resides.	
N42:8	Peer Option Modules (read-only): Bit field of devices with peer messaging capabilities.	
N45	<p>This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true:</p> <ul style="list-style-type: none"> <li>The option module is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the option module is not mapped to the scanner.</li> <li>The option module is configured to receive I/O (for example, the [DLs From Net 01...16] parameters).</li> <li>The value of N42:3 is set to a nonzero value.</li> </ul>	
N45	<p>This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true:</p> <ul style="list-style-type: none"> <li>The option module is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the option module is not mapped to the scanner.</li> <li>The option module is configured to receive I/O (for example, the [DLs From Net 01...16] parameters).</li> <li>The value of N42:3 is set to a nonzero value.</li> </ul>	
	<i>Write</i>	<i>Read</i>
N45:0	Logic Command (least significant)	Logic Status (least significant)
N45:1	Logic Command (most significant)	Logic Status (most significant)
N45:2	Reference (least significant)	Feedback (least significant)
N45:3	Reference (most significant)	Feedback (most significant)
N45:4	DL From Net 01 (least significant)	DL To Net 01 (least significant)
N45:5	DL From Net 01 (most significant)	DL To Net 01 (most significant)
N45:6	DL From Net 02 (least significant)	DL To Net 02 (least significant)
N45:7	DL From Net 02 (most significant)	DL To Net 02 (most significant)
N45:8	DL From Net 03 (least significant)	DL To Net 03 (least significant)
N45:9	DL From Net 03 (most significant)	DL To Net 03 (most significant)
N45:10	DL From Net 04 (least significant)	DL To Net 04 (least significant)
N45:11	DL From Net 04 (most significant)	DL To Net 04 (most significant)
N45:12	DL From Net 05 (least significant)	DL To Net 05 (least significant)
N45:13	DL From Net 05 (most significant)	DL To Net 05 (most significant)
N45:14	DL From Net 06 (least significant)	DL To Net 06 (least significant)
N45:15	DL From Net 06 (most significant)	DL To Net 06 (most significant)
N45:16	DL From Net 07 (least significant)	DL To Net 07 (least significant)
N45:17	DL From Net 07 (most significant)	DL To Net 07 (most significant)
N45:18	DL From Net 08 (least significant)	DL To Net 08 (least significant)
N45:19	DL From Net 08 (most significant)	DL To Net 08 (most significant)
N45:20	DL From Net 09 (least significant)	DL To Net 09 (least significant)
N45:21	DL From Net 09 (most significant)	DL To Net 09 (most significant)
N45:22	DL From Net 10 (least significant)	DL To Net 10 (least significant)
N45:23	DL From Net 10 (most significant)	DL To Net 10 (most significant)
N45:24	DL From Net 11 (least significant)	DL To Net 11 (least significant)
N45:25	DL From Net 11 (most significant)	DL To Net 11 (most significant)
N45:26	DL From Net 12 (least significant)	DL To Net 12 (least significant)
N45:27	DL From Net 12 (most significant)	DL To Net 12 (most significant)
N45:28	DL From Net 13 (least significant)	DL To Net 13 (least significant)
N45:29	DL From Net 13 (most significant)	DL To Net 13 (most significant)
N45:30	DL From Net 14 (least significant)	DL To Net 14 (least significant)
N45:31	DL From Net 14 (most significant)	DL To Net 14 (most significant)
N45:32	DL From Net 15 (least significant)	DL To Net 15 (least significant)
N45:33	DL From Net 15 (most significant)	DL To Net 15 (most significant)
N45:34	DL From Net 16 (least significant)	DL To Net 16 (least significant)
N45:35	DL From Net 16 (most significant)	DL To Net 16 (most significant)

## DPI Device Object

### Class Code

Hexadecimal	Decimal
0x92	146

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

### Instances

The number of instances depends on the number of components in the device. The total number of components can be read in Instance 0, Class Attribute 4.

Instances		Device
(Hex.)	(Dec.)	
0x0000...0x3FFF	0...16383	Host Drive
0x4000...0x43FF	16384...17407	Option Module
0x4400...0x47FF	17408...18431	Port 1
0x4800...0x4BFF	18432...19455	Port 2
0x4C00...0x4FFF	19456...20479	Port 3
0x5000...0x53FF	20480...21503	Port 4
0x5400...0x57FF	21504...22527	Port 5
0x5800...0x5BFF	22528...23551	Port 6
0x5C00...0x5FFF	23552...24575	Port 7
0x6000...0x63FF	24576...25599	Port 8
0x6400...0x67FF	25600... 26623	Port 9
0x6800...0x6BFF	26624...27647	Port 10
0x6C00...0x6FFF	27648...28671	Port 11
0x7000...0x73FF	28672...29695	Port 12
0x7400...0x77FF	29696...30719	Port 13
0x7800...0x7BFF	30720...31743	Port 14

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

## Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	USINT	0x00 = DPI™ Peripheral 0x90 = PowerFlex 755 0xA0 = 20-750-xxxx Series Option Module 0xFF = HIM
1	Get	Family Text	STRING[16]	Text identifying the device.
2	Set	Language Code	USINT	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 9 = Dutch 10 = Korean
3	Get	Product Series	USINT	1 = A 2 = B ...
4	Get	Number of Components	USINT	Number of components (for example, main control board, I/O boards) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name.
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	USINT	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	UINT	0x0001 = Allen-Bradley
11	Get	NVS Checksum	UINT	A 16-bit checksum of the Nonvolatile Storage in a device.
12	Get	Class Revision	UINT	2 = DPI
13	Get	Character Set Code	USINT	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	Get	Languages Supported	STRUCT of: USINT USINT[n]	Number of Languages Language Codes (see Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: UINT USINT USINT	Year Month Day
17	Get	Product Revision	STRUCT of: USINT USINT	Major Firmware Release Minor Firmware Release
18	Get	Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
19	Set	Language Selected	USINT	0 = Default (HIM will prompt at startup) 1 = Language was selected (no prompt)
20	Set	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware upgraded into the device.
30	Get	International Status Text	STRINGN	Text describing the status of device with support for Unicode.
31	Get/Set	International User Definable Text	STRINGN	Text identifying the device with a user-supplied name with support for Unicode.

Attribute ID	Access Rule	Name	Data Type	Description
34	Get	Key Information	STRUCT of: UDINT UDINT UINT UINT UINT USINT USINT USINT USINT USINT USINT[16]	Rating Code Device Serial Number Customization Code Customization Revision Brand Code Family Code Config Code Language Code Major Revision Minor Revision Customer-Generated Firmware UUID
35	Get	NVS CRC	UDINT	A 32-bit CRC of the Non-Volatile Storage in a device.
39	Get	SI Driver Code	UINT	Code identifying the protocol between the device and host.
128	Get	Customization Code	UINT	Code identifying the customized device.
129	Get	Customization Revision Number	UINT	Revision of the customized device.
130	Get	Customization Device Text	STRING[32]	Text identifying the customized device.

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Component Name	STRING[32]	Name of the component
4	Get	Component Firmware Revision	STRUCT of: USINT USINT	Major Revision Minor Revision
8	Get	Component Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
9	Get	International Component Name	STRINGN	Name of the component with support for Unicode.

## DPI Parameter Object

### Class Code

Hexadecimal	Decimal
0x93	147

To access 'Host Config' parameters, use the Host DPI Parameter Object (Class Code 0x9F).

### Instances

The number of instances depends on the number of parameters in the device. The total number of parameters can be read in Instance 0, Attribute 0.

Instances		Device	Example	Description
(Hex.)	(Dec.)			
0x0000...0x3FFF	0...16383	Host Drive	0	Class Attributes (Drive)
0x4000...0x43FF	16384...17407	Option Module	1	Drive Parameter 1 Attributes
0x4400...0x47FF	17408...18431	Port 1	2	Drive Parameter 2 Attributes
0x4800...0x4BFF	18432...19455	Port 2	:	:
0x4C00...0x4FFF	19456...20479	Port 3	16384	Class Attributes (Option Module)
0x5000...0x53FF	20480...21503	Port 4	16385	Option Module Parameter 1 Attributes
0x5400...0x57FF	21504...22527	Port 5	:	:
0x5800...0x5BFF	22528...23551	Port 6		
0x5C00...0x5FFF	23552...24575	Port 7		
0x6000...0x63FF	24576...25599	Port 8		
0x6400...0x67FF	25600...26623	Port 9		
0x6800...0x6BFF	26624...27647	Port 10		
0x6C00...0x6FFF	27648...28671	Port 11		
0x7000...0x73FF	28672...29695	Port 12		
0x7400...0x77FF	29696...30719	Port 13		
0x7800...0x7BFF	30720...31743	Port 14		

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	UINT	Number of parameters in the device
1	Set	Write Protect Password	UINT	0 = Password disabled n = Password value
2	Set	NVS Command Write	USINT	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 4 = Partial defaults 5 = System defaults
3	Get	NVS Parameter Value Checksum	UINT	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	UINT	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	UINT	First parameter available if parameters are protected by passwords. A '0' indicates that all parameters are protected.
7	Get	Class Revision	UINT	2 = DPI
8	Get	First Parameter Processing Error	UINT	The first parameter that has been written with a value outside of its range. A '0' indicates no errors.
9	Set	Link Command	USINT	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DPI Offline Read Full	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER STRING[16] STRING[4] UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UNIT UNIT INT	Descriptor Offline Minimum value Offline Maximum value Offline Default value Parameter name Offline parameter units Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad byte (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset
7	Get	DPI Online Read Full	STRUCT of: BOOL[32] CONTAINER <sup>(1)</sup> CONTAINER CONTAINER CONTAINER UINT UINT STRING[4] UINT UINT UINT INT USINT[3] USINT STRING[16]	Descriptor (see <a href="#">page 158</a> ) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (for example, amps, Hz) Multiplier <sup>(2)</sup> Divisor <sup>(2)</sup> Base <sup>(2)</sup> Offset <sup>(2)</sup> Link (source of the value)(0 = no link) Always zero (0) Parameter name
8	Get	DPI Descriptor	BOOL[32]	Descriptor (see <a href="#">page 158</a> )
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. <sup>(3)</sup>
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory. Valid only for DPI drives.
11	Get/Set	DPI Link	USINT[3]	Link (parameter or function block that is the source of the value)(0 = no link)
12	Get	Help Object Instance	UINT	ID for help text for this parameter
13	Get	DPI Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	Descriptor (see <a href="#">page 158</a> ) Parameter value Minimum value Maximum value Default value Parameter name Units (for example, amps, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer-supplied parameter name.
16	Get	Parameter Processing Error	USINT	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum
18	Get	International DPI Offline Parameter Text	Struct of: STRINGN STRINGN	International parameter name International offline units
19	Get	International DPI Online Parameter Text	Struct of: STRINGN STRINGN	International parameter name International online units

Attribute ID	Access Rule	Name	Data Type	Description
20	Get	International DPI Online Read Full	Struct of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT INT USINT[3] USINT BOOL[32] STRINGN STRINGN	Descriptor Parameter value Online minimum value Online maximum value Online default value Next Previous Multiplier Divisor Base Offset Link Pad word (always zero) Extended descriptor International parameter name International online parameter units
21	Get	DPI Extended Descriptor	UDINT	Extended Descriptor (see <a href="#">page 159</a> )
22	Get	International DPI Offline Read Full	Struct of: BOOL CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UINT UINT INT BOOL[32] STRINGN STRINGN	Descriptor Offline minimum value Offline maximum value Offline default value Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad word (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset Extended DPI descriptor International DPI parameter name International DPI offline parameter units

- (1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32 bits.
- (2) This value is used in the formulas that are used to convert the parameter value between display units and internal units. See [Formulas for Converting on page 160](#).
- (3) Do NOT continually write parameter data to NVS. See the attention on [page 63](#).

## Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0).
1	Data Type (Bit 2)	000 = USINT used as an array of Boolean 001 = UINT used as an array of Boolean
2	Data Type (Bit 3)	010 = USINT (8-bit integer) 011 = UINT (16-bit integer) 100 = UDINT (32-bit integer) 101 = TCHAR ((8-bit (not Unicode) or 16-bits (Unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = May be the sink end of a link 1 = May not be the sink end of a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read-only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 4)	Bit 16 is the least significant bit.
17	Extended Data Type (Bit 5)	000 = Reserved 001 = UDINT used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
18	Extended Data Type (Bit 6)	
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates that the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field that is 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. Intelligent offline tools make use of the Limits Object to select limits and units.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DPI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

## Extended Descriptor Attributes

Bit	Name	Description
0	Indirect Mode	0 = Analog (selects entire parameters) 1 = Digital (selects individual bits within parameters)
1	Indirect Type 0	Analog input list (Instance 0xFFFF)
2	Indirect Type 1	Digital input list (Instance 0xFFFE)
3	Indirect Type 2	Feedback list (Instance 0xFFFD)
4	Indirect Type 3	Analog output list (Instance 0xFFFC)
5	Indirect Type 4	Digital output list (Instance 0xFFFB)
6	Indirect Type 5	Undefined (Instance 0xFFFA)
7	Indirect Type 6	Undefined (Instance 0xFFFF9)
8	Indirect Type 7	Undefined (Instance 0xFFFF8)
9	Indirect Type 8	Undefined (Instance 0xFFFF7)
10	Indirect Type 9	Undefined (Instance 0xFFFF6)
11	Indirect Type 10	Undefined (Instance 0xFFFF5)
12	Indirect Type 11	Undefined (Instance 0xFFFF4)
13	Indirect Type 12	Undefined (Instance 0xFFFF3)
14	Indirect Type 13	Undefined (Instance 0xFFFF2)
15	Indirect Type 14	Parameter-specific list
16	FP Max Decimals Bit 0	These 4 bits are used on REAL parameters only. They indicate the maximum number of decimal places to be displayed for small values. A value of 0 indicates not to limit the number of decimal places used.
17	FP Max Decimals Bit 1	
18	FP Max Decimals Bit 2	
19	FP Max Decimals Bit 1	
20	Extended Parameter Reference	0 = Not an Extended Parameter Reference 1 = Extended Parameter Reference An Extended Parameter Reference contains a reference to another parameter. The value is formatted the same as an analog mode Indirect Selector parameter (SSpppp, where SS = slot number of device to which this Extended Parameter Reference is pointing, and pppp = number of the parameter or diagnostic item to which this Extended Parameter Reference is pointing). An Extended Parameter Reference can only select parameters unlike an Indirect Selector. An Extended Parameter Reference could be used to configure a Datalink or show the source of a Reference (among other uses).
21	Uses Rating Table Object	This parameter has rating-dependent defaults and limits that can be obtained from the Rating Table Object. The Offline Read Full will include the default value for the smallest rating and limits that will accommodate the full range of values that are allowed in the family of devices using this particular combination of Family Code and Config Code. The Online Read Full will include the rating-dependent default and limit values for this particular combination of Family Code, Config Code, and Rating Code.
22	Writable Referenced Parameter	This bit must be zero unless the parameter is an Extended Parameter Reference. If the parameter is an Extended Parameter Reference, then: 0 = The referenced parameter may be read-only or writable. 1 = The referenced parameter must always be writable (including while running).
23	Disallow Zero	This bit must be zero unless the parameter is an Indirect Selector or Extended Parameter Reference. If the parameter is an Indirect Selector or Extended Parameter Reference, then: 0 = Allow zero 1 = Disallow zero If this bit is cleared (indicating that a value of zero is allowed), the device must support the 'Zero Text' parameter attribute so that a software tool or HIM can obtain text from the Zero Text parameter attribute. If this bit is set (indicating that a value of zero is disallowed), a software tool or HIM will not allow the user to enter a value of zero.
24	Datalink Out	This bit is used by offline tools and indicates that this is a Datalink Out parameter. Bit 20 must also be set.
25	Datalink In	This bit is used by offline tools and indicates that this is a Datalink In parameter. Bits 20 and 22 must also be set.
26	Not Writable While IO Active	This parameter cannot be written if the I/O data being exchanged between the Host and the peripheral is valid.
27	Command Parameter	This parameter commands the drive to take an action, such as 'Reset Defaults' or 'Autotune', and then returns to a value of zero. Offline software tools will not allow setting this parameter to anything other than a value of zero. If an offline file contains a Command Parameter with a nonzero value, the offline software tool will change the value to zero. Note that command parameters cannot have values that do not return to zero.
28	Current Value Is Default	This bit identifies a parameter that will not change if a 'Reset Defaults' is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the 'Disallow Zero' bit is set, this bit must be cleared. If the 'Disallow Zero' bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30, 31	Reserved	Reserved

## Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x 10<sup>Decimal Places</sup>)

Internal Value = ((Display Value x Divisor x 10<sup>Decimal Places</sup>) / (Multiplier x Base)) - Offset

## Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

## Object Specific Services

Service Code	Implemented for:		Service Name	Allocation Size (in bytes)	
	Class	Instance		Parameter Number	Parameter Value
0x4D	Yes	No	Get_Attributes_Scattered	4	4
0x4E	Yes	No	Set_Attributes_Scattered	4	4

The table below lists the parameters for the Get\_Attributes\_Scattered and Set\_Attributes\_Scattered object-specific service:

Name	Data Type	Description
Parameter Number	UDINT	Parameter to read or write
Parameter Value	UDINT	Parameter value to read or write (zero when reading)

## DPI Fault Object

### Class Code

Hexadecimal	Decimal
0x97	151

Products such as PowerFlex drives use this object for faults. Option modules use this object for events.

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	No	Set_Attribute_Single

### Instances

The number of instances depends on the maximum number of faults or events that are supported in the queue. The maximum number of faults/events can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000...0x3FFF	0...16383	Host Drive
0x4000...0x43FF	16384...17407	Option Module
0x4400...0x47FF	17408...18431	Port 1
0x4800...0x4BFF	18432...19455	Port 2
0x4C00...0x4FFF	19456...20479	Port 3
0x5000...0x53FF	20480...21503	Port 4
0x5400...0x57FF	21504...22527	Port 5
0x5800...0x5BFF	22528...23551	Port 6
0x5C00...0x5FFF	23552...24575	Port 7
0x6000...0x63FF	24576...25599	Port 8
0x6400...0x67FF	25600...26623	Port 9
0x6800...0x6BFF	26624...27647	Port 10
0x6C00...0x6FFF	27648...28671	Port 11
0x7000...0x73FF	28672...29695	Port 12
0x7400...0x77FF	29696...30719	Port 13
0x7800...0x7BFF	30720...31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Most Recent Drive Fault
2	Second Most Recent Drive Fault
:	:
16384	Class Attributes (Option Module)
16385	Most Recent Option Module Event
:	:

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of faults/events that the device can record in its queue
3	Set	Fault Command Write	USINT	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Get	Fault Trip Instance Read	UINT	Fault that tripped the device. For option modules, this value is always 1 when faulted.
5	Get	Fault Data List	STRUCT of: USINT USINT UINT[n]	Number of parameters instances Pad byte (always zero) Array of parameter instance numbers
6	Get	Number of Recorded Faults	UINT	Number of faults/events in the queue. A '0' indicates the fault queue is empty.
7	Get	Fault Parameter Reference	UINT	Reserved

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of UINT STRUCT of: USINT USINT STRING[16] STRUCT of: LWORD BOOL[16]  UINT CONTAINER[n]	Fault code Fault source DPI port DPI Device Object Fault text Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2...15]: Not used Help Object Instance Fault data
1	Get	Basic Information	STRUCT of UINT STRUCT of: USINT USINT STRUCT of: LWORD BOOL[16]	Fault code Fault source DPI port DPI Device Object Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2...15]: Not used
2	Get	International Fault Text	STRINGN	Text describing the fault with support for Unicode.

## DPI Alarm Object

### Class Code

Hexadecimal	Decimal
0x98	152

Products such as PowerFlex drives use this object for alarms or warnings. Option modules do not support this object.

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	No	Set_Attribute_Single

### Instances

The number of instances depends on the maximum number of alarms that are supported by the queue. The maximum number of alarms can be read in Instance 0, Attribute 2.

Instances			Device	Example	Description
(Hex.)	(Dec.)				
0x0000...0x3FFF	0...16383		Host Drive	0	Class Attributes (Drive)
				1	Most Recent Alarm
				2	Second Most Recent Alarm
				:	:

Only host devices can have alarms.

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of alarms that the device can record in its queue
3	Set	Alarm Command Write	USINT	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device
4	Get	Alarm Data List	STRUCT of: USINT USINT UINT[n]	Number of parameter instances Pad byte (always zero) Array of parameter instance numbers
5	Get	Number of Recorded Alarms	UINT	Number of alarms in the queue. A '0' indicates the alarm queue is empty.

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of UINT STRUCT of: USINT USINT STRING[16] STRUCT of: LWORD BOOL[16]  UINT CONTAINER[n]	Alarm code Alarm source DPI port DPI Device Object Alarm text Alarm time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2...15] Reserved Reserved Reserved
1	Get	Basic Information	STRUCT of UINT STRUCT of: USINT USINT STRUCT of: LWORD BOOL[16]	Alarm code Alarm source DPI port DPI Device Object Alarm time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2...15] Reserved
2	Get	International Alarm Text	STRINGN	Text describing the alarm with support for Unicode.

## DPI Diagnostic Object

### Class Code

Hexadecimal	Decimal
0x99	153

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

### Instances

The number of instances depends on the maximum number of diagnostic items in the device. The total number of diagnostic items can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000...0x3FFF	0...16383	Host Drive
0x4000...0x43FF	16384...17407	Option Module
0x4400...0x47FF	17408...18431	Port 1
0x4800...0x4BFF	18432...19455	Port 2
0x4C00...0x4FFF	19456...20479	Port 3
0x5000...0x53FF	20480...21503	Port 4
0x5400...0x57FF	21504...22527	Port 5
0x5800...0x5BFF	22528...23551	Port 6
0x5C00...0x5FFF	23552...24575	Port 7
0x6000...0x63FF	24576...25599	Port 8
0x6400...0x67FF	25600...26623	Port 9
0x6800...0x6BFF	26624...27647	Port 10
0x6C00...0x6FFF	27648...28671	Port 11
0x7000...0x73FF	28672...29695	Port 12
0x7400...0x77FF	29696...30719	Port 13
0x7800...0x7BFF	30720...31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Drive Diagnostic Item 1
2	Drive Diagnostic Item 2
:	:
16384	Class Attributes (Option Module)
16385	Option Module Diagnostic Item 1
:	:

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	1
2	Get	Number of Instances	UINT	Number of diagnostic items in the device
3	Get	ENUM Offset	UINT	DPI ENUM object instance offset

### Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of: BOOL[32] CONTAINER <sup>(1)</sup> CONTAINER CONTAINER CONTAINER UINT UINT STRING[4] UINT UINT UINT INT UDINT STRING[16]	Descriptor (see <a href="#">page 158</a> ) Value Minimum value Maximum value Default value Pad Word Pad Word Units (for example, amps, Hz) Multiplier <sup>(2)</sup> Divisor <sup>(2)</sup> Base <sup>(2)</sup> Offset <sup>(2)</sup> Link (source of the value) (0 = no link) Diagnostic name text
1	Get/Set	Value	Various	Diagnostic item value
2	Get	International Diagnostic Item Text	Struct of: STRINGN STRINGN	Diagnostic name text Diagnostic units text
3	Get	International Full Read All	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT INT UDINT BOOL[32] STRINGN STRINGN	Descriptor Value Minimum Maximum Default Pad word Pad word Multiplier Divisor Base Offset Pad Extended descriptor Diagnostic name text Diagnostic units text

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32 bits.  
 (2) This value is used in the formulas that are used to convert the value between display units and internal units. See [Formulas for Converting on page 160](#).

## DPI Time Object

### Class Code

Hexadecimal	Decimal
0x9B	155

### Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

### Instances

The number of instances depends on the number of timers in the device. Instance 1 is always reserved for a real-time clock although a device may not support it. The total number of timers can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000...0x3FFF	0...16383	Host Drive
0x4000...0x43FF	16384...17407	Option Module
0x4400...0x47FF	17408...18431	Port 1
0x4800...0x4BFF	18432...19455	Port 2
0x4C00...0x4FFF	19456...20479	Port 3
0x5000...0x53FF	20480...21503	Port 4
0x5400...0x57FF	21504...22527	Port 5
0x5800...0x5BFF	22528...23551	Port 6
0x5C00...0x5FFF	23552...24575	Port 7
0x6000...0x63FF	24576...25599	Port 8
0x6400...0x67FF	25600...26623	Port 9
0x6800...0x6BFF	26624...27647	Port 10
0x6C00...0x6FFF	27648...28671	Port 11
0x7000...0x73FF	28672...29695	Port 12
0x7400...0x77FF	29696...30719	Port 13
0x7800...0x7BFF	30720...31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Real Time Clock (Predefined) (not always supported)
2	Timer 1
3	Timer 2
:	:

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Number of timers in the object, excluding the real time clock that is predefined.
3	Get	First Device Specific Timer	UINT	Instance of the first timer that is not predefined.
4	Set	Time Command Write	USINT	0 = No Operation 1 = Clear all timers (Does not clear real-time clock or read-only timers)
5	Get	Number of Supported Time Zones	UINT	Number of time zones that are described in the Time Zone List attribute.
6	Get	Time Zone List	STRUCT	Identifies a time zone.
7	Get/Set	Active Time Zone ID	UINT	The ID field of the Time Zone List structure for the desired time zone.
8	Get	Active Time Zone Data	Struct of: INT USINT USINT USINT USINT USINT USINT USINT INT USINT USINT USINT USINT USINT USINT	Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second
9	Get/Set	Custom Time Zone Data	Struct of: INT USINT USINT USINT USINT USINT USINT USINT INT USINT USINT USINT USINT USINT USINT USINT	Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second

## Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Read Full	STRUCT of: STRING[16] 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	Get	Timer Text	STRING[16]	Name of the timer
2	Get/Set	Timer Value	LWORD -or- STRUCT of: UINT USINT USINT USINT USINT USINT	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	Get	Timer Descriptor	BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2...15]: Not used
4	Get	International Read Full	Struct of: STRINGN STRUCT BOOL[16]	International timer text Timer value Timer descriptor
5	Get	International Timer Text	STRINGN	Name of this timer
6	Get	Clock Status	BOOL[32]	Identifies clock status
8	Get/Set	Number of Leap Seconds	INT	Identifies the current number of Leap Seconds.
9	Get	Clock Options	BOOL[32]	Identifies the optional functionality available in the device's System Clock.
10	Get/Set	Clock Options Enable	BOOL[32]	Identifies which of the clock's options are enabled.

## Host DPI Parameter Object Class Code

Hexadecimal	Decimal
0x9F	159

To access 'Device' parameters, use the DPI Parameter Object (Class Code 0x93).

### 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		Device	Example	Description
(Hex.)	(Dec.)			
0x0000...0x3FFF	0...16383	Reserved	16384	Class Attributes (Option Module)
0x4000...0x43FF	16384...17407	Option Module	16385	Option Module Parameter 1 Attributes
0x4400...0x47FF	17408...18431	Port 1	16386	Option Module Parameter 2 Attributes
0x4800...0x4BFF	18432...19455	Port 2	:	:
0x4C00...0x4FFF	19456...20479	Port 3	17408	Class Attributes (HIM)
0x5000...0x53FF	20480...21503	Port 4	17409	HIM Parameter 1 Attributes
0x5400...0x57FF	21504...22527	Port 5	17410	HIM Parameter 2 Attributes
0x5800...0x5BFF	22528...23551	Port 6	:	:
0x5C00...0x5FFF	23552...24575	Port 7		
0x6000...0x63FF	24576...25599	Port 8		
0x6400...0x67FF	25600...26623	Port 9		
0x6800...0x6BFF	26624...27647	Port 10		
0x6C00...0x6FFF	27648...28671	Port 11		
0x7000...0x73FF	28672...29695	Port 12		
0x7400...0x77FF	29696...30719	Port 13		
0x7800...0x7BFF	30720...31743	Port 14		

### Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	UINT	Number of parameters in the device
1	Set	Write Protect Password	UINT	0 = Password disabled n = Password
2	Set	NVS Command Write	USINT	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory
3	Get	NVS Parameter Value Checksum	UINT	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	UINT	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	UINT	First parameter available if parameters are protected by passwords. A '0' indicates that all parameters are protected.
7	Get	Class Revision	UINT	2 = DPI
8	Get	First Parameter Processing Error	UINT	The first parameter that has been written with a value outside of its range. A '0' indicates no errors.
9	Set	Link Command	USINT	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

## Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DPI Offline Read Full	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER STRING[16] STRING[4] UINT UINT UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UNIT UNIT INT	Descriptor Offline Minimum value Offline Maximum value Offline Default value Parameter name Offline parameter units Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad byte (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset
7	Get	DPI Online Read Full	STRUCT of: BOOL[32] CONTAINER <sup>(1)</sup> CONTAINER CONTAINER CONTAINER UINT UINT STRING[4] UINT UINT UINT INT USINT[3] USINT STRING[16]	Descriptor (see <a href="#">page 173</a> ) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (for example, amps, Hz) Multiplier <sup>(2)</sup> Divisor <sup>(2)</sup> Base <sup>(2)</sup> Offset <sup>(2)</sup> Link (source of the value) (0 = no link) Always zero (0) Parameter name
8	Get	DPI Descriptor	BOOL[32]	Descriptor (see <a href="#">page 173</a> )
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. <sup>(3)</sup>
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory. Valid only for DPI drives.
11	Get/Set	DPI Link	USINT[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	UINT	ID for help text for this parameter
13	Get	DPI Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	Descriptor (see <a href="#">page 173</a> ) Parameter value Minimum value Maximum value Default value Parameter name Units (for example, amps, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer supplied parameter name.
16	Get	Parameter Processing Error	USINT	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum

Attribute ID	Access Rule	Name	Data Type	Description
18	Get	International DPI Offline Parameter Text	Struct of: STRINGN STRINGN	International parameter name International offline units
19	Get	International DPI Online Parameter Text	Struct of: STRINGN STRINGN	International parameter name International online units
20	Get	International DPI Online Read Full	Struct of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT UINT INT USINT[3] USINT BOOL[32] STRINGN STRINGN	Descriptor Parameter value Online minimum value Online maximum value Online default value Next Previous Multiplier Divisor Base Offset Link Pad word (always zero) Extended descriptor International parameter name International online parameter units
21	Get	DPI Extended Descriptor	UDINT	Extended Descriptor (see <a href="#">page 174</a> )
22	Get	International DPI Offline Read Full	Struct of: BOOL CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UINT UINT UINT INT BOOL[32] STRINGN STRINGN	Descriptor Offline minimum value Offline maximum value Offline default value Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad word (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset Extended DPI descriptor International DPI parameter name International DPI offline parameter units

- (1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32 bits.
- (2) This value is used in the formulas that are used to convert the parameter value between display units and internal units. See [Formulas for Converting on page 175](#).
- (3) Do NOT continually write parameter data to NVS. See the attention on [page 63](#).

## Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0).
1	Data Type (Bit 2)	000 = USINT used as an array of Boolean 001 = UINT used as an array of Boolean
2	Data Type (Bit 3)	010 = USINT (8-bit integer) 011 = UINT (16-bit integer) 100 = UDINT (32-bit integer) 101 = TCHAR ((8-bit (not Unicode) or 16 bits (Unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = May be the sink end of a link 1 = May not be the sink end of a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = read-only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 4)	Bit 16 is the least significant bit.
17	Extended Data Type (Bit 5)	000 = Reserved 001 = UDINT used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
18	Extended Data Type (Bit 6)	
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates that the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field that is 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. Intelligent offline tools make use of the Limits Object to select limits and units.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DPI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

## Extended Descriptor Attributes

Bit	Name	Description
0	Indirect Mode	0 = Analog (selects entire parameters) 1 = Digital (selects individual bits within parameters)
1	Indirect Type 0	Analog input list (Instance 0xFFFF)
2	Indirect Type 1	Digital input list (Instance 0xFFFFE)
3	Indirect Type 2	Feedback list (Instance 0xFFFFD)
4	Indirect Type 3	Analog output list (Instance 0xFFFFC)
5	Indirect Type 4	Digital output list (Instance 0xFFFFB)
6	Indirect Type 5	Undefined (Instance 0xFFFFA)
7	Indirect Type 6	Undefined (Instance 0xFFFF9)
8	Indirect Type 7	Undefined (Instance 0xFFFF8)
9	Indirect Type 8	Undefined (Instance 0xFFFF7)
10	Indirect Type 9	Undefined (Instance 0xFFFF6)
11	Indirect Type 10	Undefined (Instance 0xFFFF5)
12	Indirect Type 11	Undefined (Instance 0xFFFF4)
13	Indirect Type 12	Undefined (Instance 0xFFFF3)
14	Indirect Type 13	Undefined (Instance 0xFFFF2)
15	Indirect Type 14	Parameter-specific list
16	FP Max Decimals Bit 0	These 4 bits are used on REAL parameters only. They indicate the maximum number of decimal places to be displayed for small values. A value of 0 indicates not to limit the number of decimal places used.
17	FP Max Decimals Bit 1	
18	FP Max Decimals Bit 2	
19	FP Max Decimals Bit 1	
20	Extended Parameter Reference	0 = Not an Extended Parameter Reference 1 = Extended Parameter Reference An Extended Parameter Reference contains a reference to another parameter. The value is formatted the same as an analog mode Indirect Selector parameter (SSpppp, where SS = slot number of device to which this Extended Parameter Reference is pointing, and pppp = number of the parameter or diagnostic item to which this Extended Parameter Reference is pointing). An Extended Parameter Reference can only select parameters unlike an Indirect Selector. An Extended Parameter Reference could be used to configure a Datalink or show the source of a Reference (among other uses).
21	Uses Rating Table Object	This parameter has rating-dependent defaults and limits that can be obtained from the Rating Table Object. The Offline Read Full will include the default value for the smallest rating and limits that will accommodate the full range of values that are allowed in the family of devices using this particular combination of Family Code and Config Code. The Online Read Full will include the rating-dependent default and limit values for this particular combination of Family Code, Config Code, and Rating Code.
22	Writable Referenced Parameter	This bit must be zero unless the parameter is an Extended Parameter Reference. If the parameter is an Extended Parameter Reference, then: 0 = The referenced parameter may be read-only or writable. 1 = The referenced parameter must always be writable (including while running).
23	Disallow Zero	This bit must be zero unless the parameter is an Indirect Selector or Extended Parameter Reference. If the parameter is an Indirect Selector or Extended Parameter Reference, then: 0 = Allow zero 1 = Disallow zero If this bit is cleared (indicating that a value of zero is allowed), the device must support the 'Zero Text' parameter attribute so that a software tool or HIM can obtain text from the Zero Text parameter attribute. If this bit is set (indicating that a value of zero is disallowed), a software tool or HIM will not allow the user to enter a value of zero.
24	Datalink Out	This bit is used by offline tools and indicates that this is a Datalink Out parameter. Bit 20 must also be set.
25	Datalink In	This bit is used by offline tools and indicates that this is a Datalink In parameter. Bits 20 and 22 must also be set.
26	Not Writable While IO Active	This parameter cannot be written if the I/O data being exchanged between the Host and the peripheral is valid.
27	Command Parameter	This parameter commands the drive to take an action, such as 'Reset Defaults' or 'Autotune', and then returns to a value of zero. Offline software tools will not allow setting this parameter to anything other than a value of zero. If an offline file contains a Command Parameter with a nonzero value, the offline software tool will change the value to zero. Note that command parameters cannot have values that do not return to zero.
28	Current Value Is Default	This bit identifies a parameter that will not change if a 'Reset Defaults' is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the 'Disallow Zero' bit is set, this bit must be cleared. If the 'Disallow Zero' bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30, 31	Reserved	Reserved

## Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x 10<sup>Decimal Places</sup>)

Internal Value = ((Display Value x Divisor x 10<sup>Decimal Places</sup>) / (Multiplier x Base)) - Offset

## Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

## Object Specific Services

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

The table below lists the parameters for the Get\_Attributes\_Scattered and Set\_Attributes\_Scattered object-specific service:

Name	Data Type	Description
Parameter Number	UDINT	Parameter to read or write
Parameter Value	UDINT	Parameter value to read or write (zero when reading)

**Notes:**

## CANopen Objects

### CANopen Object Tables

This appendix presents information about the CANopen objects implemented in this adapter. The tables in this section describe the implemented CANopen objects.

**Table 75 - Communication Profile Area**

Index	Sub Index	Type	Access	Name and Description
0x1000	0	U32	Read	Device Type. Describes the type of device.
0x1001	0	U8	Read	Error register. Indicates error status which is defined by "Table C.D" on "Emergency Object" sheet.
0x1003	0	U8	Read/Write	Pre-defined error field. Number of errors. Writing a 0 to this sub index clears the list. The error list starts at sub index 1.
	1	U32	Read	Standard Error Field 32-bit field Error code (bit 15...0): Emergency Error Code Additional Info. (bit 31...16): Byte 3 and 4 of MSEF (Manufacturer-specific error field) A list of errors that have occurred. Sub index 1 contains the most recent error.
	2	U32	Read	
	3	U32	Read	
	4	U32	Read	
	5	U32	Read	
0x1005	0	U32	Read/Write	COB-ID Sync-message. This is the ID for the sync message.
0x1008	0	Visible string	Constant	Manufacturer device name: "Universal Comm" (Family text from DPI Device object)
0x1009	0	Visible string	Constant	Manufacturer hardware version (Hardware series from CIP Identity Object, Instance Attribute 0x72(114)) Initial Product Release: "A" Character Length: 1...16
0x100A	0	Visible string	Constant	Manufacturer software version (Product revision from DPI Device object as "SW V.MAJOR.MINOR" string) *Same as NVS file version.
0x100C	0	U16	Read/Write	Guard time This parameter is used together with Life time factor for the Life guarding protocol. The NMT master guards the node at this period in milliseconds.
0x100D	0	U8	Read/Write	Life time factor. If the node has not been guarded in the time period Life-time factor x Guard time, a "Guard Error" event is logged and a remote node error is indicated through the "Life Guarding event" service.
0x1010	0	U8	Constant	Store parameters. Number of entries
	1	U32	Read/Write	Save all parameters
	2	U32	Read/Write	Save communication parameters
0x1011	0	U8	Constant	Restore default parameters. Number of entries
	1	U32	Read/Write	Restore all parameters
	2	U32	Read/Write	Restore communication parameter
0x1014	0	U32	Constant	COB-ID Emergency message. This is the ID for the Emergency object
0x1016	0	U8	Constant	Consumer Heartbeat Time. Number of entries
	1	U32	Read/Write	Consumer Heartbeat Time 1
0x1017	0	U16	Read/Write	Producer Heartbeat Time

Table 75 - Communication Profile Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x1018	0	U8	Constant	Identity object. Number of entries
	1	U32	Read	Vendor ID (00 0000BAh)
	2	U32	Read	Product code (EDA0h)
	3	U32	Read	Revision number (Major.Minor) Major: 16-bit Unsigned Value, start from "1". <ul style="list-style-type: none"> <li>Major value should be incremented when CiA protocol certificate update.</li> </ul> Minor: 16-bit Unsigned Value, start from "0". <ul style="list-style-type: none"> <li>Minor value should be incremented when indicating firmware update with no major value update.</li> </ul>
0x1200	0	U8	Constant	SDO server parameter. Number of entries
	1	U32	Constant	COB-ID client to server
	2	U32	Read	COB-ID server to client
0x1400	0	U8	Constant	Receive PDO1 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO1
	2	U8	Read/Write	Transmission type
0x1401	0	U8	Constant	Receive PDO2 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO2
	2	U8	Read/Write	Transmission type
0x1402	0	U8	Constant	Receive PDO3 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO3
	2	U8	Read/Write	Transmission type
0x1403	0	U8	Constant	Receive PDO4 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO4
	2	U8	Read/Write	Transmission type
0x1404	0	U8	Constant	Receive PDO5 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO5
	2	U8	Read/Write	Transmission type
0x1405	0	U8	Constant	Receive PDO6 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO6
	2	U8	Read/Write	Transmission type
0x1406	0	U8	Constant	Receive PDO7 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO7
	2	U8	Read/Write	Transmission type
0x1407	0	U8	Constant	Receive PDO8 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO8
	2	U8	Read/Write	Transmission type
0x1408	0	U8	Constant	Receive PDO9 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO9
	2	U8	Read/Write	Transmission type
0x1600	0	U8	Constant	Receive PDO1 mapping. Number of mapped application objects (2).
	1	U32	Constant	Mapped object #1
	2	U32	Constant	Mapped object #2
0x1601	0	U8	Read/Write	Receive PDO2 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2

Table 75 - Communication Profile Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x1602	0	U8	Read/Write	Receive PDO3 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1603	0	U8	Read/Write	Receive PDO4 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1604	0	U8	Read/Write	Receive PDO5 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1605	0	U8	Read/Write	Receive PDO6 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1606	0	U8	Read/Write	Receive PDO7 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1607	0	U8	Read/Write	Receive PDO8 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1608	0	U8	Read/Write	Receive PDO9 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1800	0	U8	Constant	Transmit PDO1 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO1
	2	U8	Read/Write	Transmission type
0x1801	0	U8	Constant	Transmit PDO2 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO2
	2	U8	Read/Write	Transmission type
0x1802	0	U8	Constant	Transmit PDO3 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO3
	2	U8	Read/Write	Transmission type
0x1803	0	U8	Constant	Transmit PDO4 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO4
	2	U8	Read/Write	Transmission type
0x1804	0	U8	Constant	Transmit PDO5 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO5
	2	U8	Read/Write	Transmission type
0x1805	0	U8	Constant	Transmit PDO6 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO6
	2	U8	Read/Write	Transmission type
0x1806	0	U8	Constant	Transmit PDO7 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO7
	2	U8	Read/Write	Transmission type
0x1807	0	U8	Constant	Transmit PDO8 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO8
	2	U8	Read/Write	Transmission type

Table 75 - Communication Profile Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x1808	0	U8	Constant	Transmit PDO9 parameter. Number of entries (= 2)
	1	U32	Read/Write	COB ID used by PDO9
	2	U8	Read/Write	Transmission type
0x1A00	0	U8	Constant	Transmit PDO1 mapping. Number of mapped application objects (2).
	1	U32	Constant	Mapped object #1
	2	U32	Constant	Mapped object #2
0x1A01	0	U8	Read/Write	Transmit PDO2 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A02	0	U8	Read/Write	Transmit PDO3 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A03	0	U8	Read/Write	Transmit PDO4 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A04	0	U8	Read/Write	Transmit PDO5 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A05	0	U8	Read/Write	Transmit PDO6 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A06	0	U8	Read/Write	Transmit PDO7 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A07	0	U8	Read/Write	Transmit PDO8 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2
0x1A08	0	U8	Read/Write	Transmit PDO9 mapping. Number of mapped application objects (2).
	1	U32	Read/Write	Mapped object #1
	2	U32	Read/Write	Mapped object #2

Table 76 - Manufacturer Specific Area

Index	Sub Index	Type	Access	Name and Description
0x2001	0	U8	Read	Device Parameter #1 (Port Number)
0x2002	0	U8	Read/Write	Device Parameter #2 (DLs From Net Cfg)
0x2003	0	U8	Read	Device Parameter #3 (DLs From Net Act)
0x2004	0	U8	Read/Write	Device Parameter #4 (DLs To Net Cfg)
0x2005	0	U8	Read	Device Parameter #5 (DLs To Net Act)
0x2006	0	U8	Read/Write	Device Parameter #6 (Protocol Cfg)
0x2007	0	U8	Read	Device Parameter #7 (Protocol Act)
0x2008	0	U8	Read/Write	Device Parameter #8 (Reset Module)
0x2009	0	U8	Read/Write	Device Parameter #9 (Clear Counters)
0x200A	0	U8	Read/Write	Device Parameter #10 (Force Soft Device Parameter Sel)
0x200B	0	-	-	Reserve for future use (does not implement Device Parameter)
0x200C	0	-	-	Reserve for future use (does not implement Device Parameter)
0x200D	0	-	-	Reserve for future use (does not implement Device Parameter)
0x200E	0	-	-	Reserve for future use (does not implement Device Parameter)
0x200F	0	-	-	Reserve for future use (does not implement Device Parameter)
0x2010	0	-	-	Reserve for future use (does not implement Device Parameter)
0x2011	0	-	-	Reserve for future use (does not implement Device Parameter)
0x2012	0	-	-	Reserve for future use (does not implement Device Parameter)
0x2013	0	U8	Read/Write	Device Parameter #19 (COPN Rate Cfg)
0x2014	0	U8	Read	Device Parameter #20 (COPN Rate Act)
0x2015	0	U8	Read/Write	Device Parameter #21 (COPN Addr Cfg)
0x2016	0	U8	Read	Device Parameter #22 (COPN Addr Act)
0x2017	0	U8	Read/Write	Device Parameter #23 (COPN PDO1 Trigger)
0x2018	0	U32	Read/Write	Device Parameter #24 (COPN COS Status Mask)
0x2019	0	REAL32	Read/Write	Device Parameter #25 (COPN COS Fdbk Change)
0x201A	0	U16	Read/Write	Device Parameter #26 (COPN Cyc Interval)
0x201B	0	U32	Read/Write	Host Parameter #1 DL From Net 01
0x201C	0	U32	Read/Write	Host Parameter #2 DL From Net 02
0x201D	0	U32	Read/Write	Host Parameter #3 DL From Net 03
0x201E	0	U32	Read/Write	Host Parameter #4 DL From Net 04
0x201F	0	U32	Read/Write	Host Parameter #5 DL From Net 05
0x2020	0	U32	Read/Write	Host Parameter #6 DL From Net 06
0x2021	0	U32	Read/Write	Host Parameter #7 DL From Net 07
0x2022	0	U32	Read/Write	Host Parameter #8 DL From Net 08
0x2023	0	U32	Read/Write	Host Parameter #9 DL From Net 09
0x2024	0	U32	Read/Write	Host Parameter #10 DL From Net 10
0x2025	0	U32	Read/Write	Host Parameter #11 DL From Net 11
0x2026	0	U32	Read/Write	Host Parameter #12 DL From Net 12
0x2027	0	U32	Read/Write	Host Parameter #13 DL From Net 13
0x2028	0	U32	Read/Write	Host Parameter #14 DL From Net 14
0x2029	0	U32	Read/Write	Host Parameter #15 DL From Net 15
0x202A	0	U32	Read/Write	Host Parameter #16 DL From Net 16
0x202B	0	U32	Read/Write	Host Parameter #17 DL To Net 01
0x202C	0	U32	Read/Write	Host Parameter #18 DL To Net 02
0x202D	0	U32	Read/Write	Host Parameter #19 DL To Net 03

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x202E	0	U32	Read/Write	Host Parameter #20 DL To Net 04
0x202F	0	U32	Read/Write	Host Parameter #21 DL To Net 05
0x2030	0	U32	Read/Write	Host Parameter #22 DL To Net 06
0x2031	0	U32	Read/Write	Host Parameter #23 DL To Net 07
0x2032	0	U32	Read/Write	Host Parameter #24 DL To Net 08
0x2033	0	U32	Read/Write	Host Parameter #25 DL To Net 09
0x2034	0	U32	Read/Write	Host Parameter #26 DL To Net 10
0x2035	0	U32	Read/Write	Host Parameter #27 DL To Net 11
0x2036	0	U32	Read/Write	Host Parameter #28 DL To Net 12
0x2037	0	U32	Read/Write	Host Parameter #29 DL To Net 13
0x2038	0	U32	Read/Write	Host Parameter #30 DL To Net 14
0x2039	0	U32	Read/Write	Host Parameter #31 DL To Net 15
0x203A	0	U32	Read/Write	Host Parameter #32 DL To Net 16
0x203B	0	U32	Read/Write	Host Parameter #33 Comm Flt Action
0x203C	0	U32	Read/Write	Host Parameter #34 Idle Flt Action
0x203D	0	U32	Read/Write	Host Parameter #35 Peer Flt Action
0x203E	0	U32	Read/Write	Host Parameter #36 Msg Flt Action
0x203F	0	U32	Read/Write	Host Parameter #37 Flt Cfg Logic
0x2040	0	U32	Read/Write	Host Parameter #38 Flt Cfg Ref
0x2041	0	U32	Read/Write	Host Parameter #39 Flt Cfg DL 01
0x2042	0	U32	Read/Write	Host Parameter #40 Flt Cfg DL 02
0x2043	0	U32	Read/Write	Host Parameter #41 Flt Cfg DL 03
0x2044	0	U32	Read/Write	Host Parameter #42 Flt Cfg DL 04
0x2045	0	U32	Read/Write	Host Parameter #43 Flt Cfg DL 05
0x2046	0	U32	Read/Write	Host Parameter #44 Flt Cfg DL 06
0x2047	0	U32	Read/Write	Host Parameter #45 Flt Cfg DL 07
0x2048	0	U32	Read/Write	Host Parameter #46 Flt Cfg DL 08
0x2049	0	U32	Read/Write	Host Parameter #47 Flt Cfg DL 09
0x204A	0	U32	Read/Write	Host Parameter #48 Flt Cfg DL 10
0x204B	0	U32	Read/Write	Host Parameter #49 Flt Cfg DL 11
0x204C	0	U32	Read/Write	Host Parameter #50 Flt Cfg DL 12
0x204D	0	U32	Read/Write	Host Parameter #51 Flt Cfg DL 13
0x204E	0	U32	Read/Write	Host Parameter #52 Flt Cfg DL 14
0x204F	0	U32	Read/Write	Host Parameter #53 Flt Cfg DL 15
0x2050	0	U32	Read/Write	Host Parameter #54 Flt Cfg DL 16

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x2101	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI™ Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2102	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2103	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x2104	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2105	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2106	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x2107	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2108	0	U8	Constant	DPI Fault objects. Number of entries (= 12)
	1	U16	Read	Fault code
	2	U8	Read	Fault Source - DPI Port Number
	3	U8	Read	Fault Source - Device Object Instance
	4	U8	Read	Fault Time Stamp - Least Significant Byte
	5	U8	Read	Fault Time Stamp
	6	U8	Read	Fault Time Stamp
	7	U8	Read	Fault Time Stamp
	8	U8	Read	Fault Time Stamp
	9	U8	Read	Fault Time Stamp
	10	U8	Read	Fault Time Stamp
	11	U8	Read	Fault Time Stamp - Most Significant Byte
	12	U16	Read	Fault Time Stamp - Timer Descriptor
0x2200	0	U32	Read/Write/Write	Product Logic Command (32 bit)
0x2201	0	U32	Read	Product Logic Status (32 bit)
0x2202	0	REAL32	Read/Write/Write	Reference
0x2203	0	REAL32	Read	Feedback
0x2204	0	U32	Read/Write/Write	DL From Net 01
0x2205	0	U32	Read/Write/Write	DL From Net 02
0x2206	0	U32	Read/Write/Write	DL From Net 03
0x2207	0	U32	Read/Write/Write	DL From Net 04
0x2208	0	U32	Read/Write/Write	DL From Net 05
0x2209	0	U32	Read/Write/Write	DL From Net 06
0x220A	0	U32	Read/Write/Write	DL From Net 07
0x220B	0	U32	Read/Write/Write	DL From Net 08
0x220C	0	U32	Read/Write/Write	DL From Net 09
0x220D	0	U32	Read/Write/Write	DL From Net 10

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x220E	0	U32	Read/Write/Write	DL From Net 11
0x220F	0	U32	Read/Write/Write	DL From Net 12
0x2210	0	U32	Read/Write/Write	DL From Net 13
0x2211	0	U32	Read/Write/Write	DL From Net 14
0x2212	0	U32	Read/Write/Write	DL From Net 15
0x2213	0	U32	Read/Write/Write	DL From Net 16
0x2214	0	U32	Read	DL To Net 01
0x2215	0	U32	Read	DL To Net 02
0x2216	0	U32	Read	DL To Net 03
0x2217	0	U32	Read	DL To Net 04
0x2218	0	U32	Read	DL To Net 05
0x2219	0	U32	Read	DL To Net 06
0x221A	0	U32	Read	DL To Net 07
0x221B	0	U32	Read	DL To Net 08
0x221C	0	U32	Read	DL To Net 09
0x221D	0	U32	Read	DL To Net 10
0x221E	0	U32	Read	DL To Net 11
0x221F	0	U32	Read	DL To Net 12
0x2220	0	U32	Read	DL To Net 13
0x2221	0	U32	Read	DL To Net 14
0x2222	0	U32	Read	DL To Net 15
0x2223	0	U32	Read	DL To Net 16
0x2226	0	U8	Constant	DPI Object Send. Number of entries (= 0x67)
	1	U8	Read/Write	Service (0x00 = Get Attribute, 0x04 = Set Attribute)
	2	U8	Read/Write	Port (0...14)
	3	U8	Read/Write	Class
	4	U16	Read/Write	Instance
	5	U8	Read/Write	Attribute
	6	U8	Read/Write	Real/Virtual (0x00: Real[Default], 0x01:Virtual)
	7	U8	Read/Write	Length of request in bytes. (Count starts at sub index 8)
	8...103	U8	Read/Write	Data
0x2227	0	U8	Constant	DPI Object Receive. Number of entries (= 0x62)
	1	U8	Read	Service (0x00 = OK, 0xFF = Error)
	2	U8	Read	Length of response in bytes.(Count starts at sub index 3)
	3...98	U8	Read	Data
0x2228	0	U8	Constant	DPI Parameter send. Number of entries (= 0x05)
	1	U8	Read/Write	Access (00 = read, 01 = write byte, 02 = write word, 03 = write 32-bit word)
	2	U8	Read/Write	DPI Port (0...6)
	3	U16	Read/Write	Parameter number
	4	U8	Read/Write	Real/Virtual (0x00: Real[Default], 0x01:Virtual)
	5	U32	Read/Write	Parameter value

Table 76 - Manufacturer Specific Area (Continued)

Index	Sub Index	Type	Access	Name and Description
0x2229	0	U8	Constant	DPI Parameter receive. Number of entries (= 0x02)
	1	U8	Read	Response status (0x00 = No Error, 0x01 = Write only, 0x02 = Value out of range, 0x03 = Parameter does not exist, 0x04 = Other error)
	2	U32	Read	Parameter value

## Emergency Object

The emergency object consists of a total of 8 data bytes. The first 3 bytes are defined by the CANopen specification, and the remaining 5 bytes are manufacturer specific.

**Table 77 - Emergency Object Format**

Byte	0	1	2	3	4	5	6	7
Content	Emergency error code (See <a href="#">Table 78</a> )		Error register	Manufacturer-specific error files; Byte 3 and Byte 4 = 0, Byte 5 = DPI Port, Byte 6 and 7 = DPI fault code (Byte 6 = LSB)				

**Table 78 - Implemented Emergency Error Codes**

Emergency Error Code	Error register (Index 1001h)	Meaning	Manufacturer-specific error field (MSEF)
0000h	0000 0000b	Error reset or no error	Byte 3...7 = 0
1000h	1000 0001b	Generic Error	[Host drive Fault occurs] Byte 3 = 0 Byte 4 = 0 Byte 5 = DPI Port number from Host drive Byte 6 and 7 = DPI fault code from Host drive (Byte 6 = LSB) [DPI Access Error occurs] Byte 3 = DPI Error Code (07h: Object state conflict) Byte 4 = 0 Byte 5 = DPI Port number Byte 6 and 7 = 0
8120h	0001 0001b	CAN in error passive mode	Byte 3...7 = 0
8130h	0001 0001b	Life guard error or heartbeat error (Life Guarding Error)	Byte 3...7 = 0
8130h	0001 0001b	Life guard error or heartbeat error (Consumer Heartbeat Error)	Byte 3 = Heartbeat producer Node-ID Byte 4...7 = 0
8210h	0001 0001b	PDO not processed due to length error	Byte 3...4 = PDO number (Byte 3=LSB) Byte 5...7 = 0

## BACnet Protocol Implementation Conformance Statement

Vendor Name:	Rockwell Automation
Product Name:	PowerFlex® 750-Series AC Drives
Product Model Number:	20-750-USC-XT
Applications Software Version:	4.000.6
Firmware Revision:	1.001.46
BACnet Protocol Revision:	16

### Product Description

DPI™ to BACnet MS/TP communication option module for PowerFlex 750-Series drives.

### BACnet Standardized Device Profile (Annex L)

- BACnet Operator Workstation (B-OWS)
- BACnet Advanced Operator Workstation (B-AWS)
- BACnet Operator Display (B-OD)
- BACnet Building Controller (B-BC)
- BACnet Advanced Application Controller (B-AAC)
- BACnet Application Specific Controller (B-ASC)
- BACnet Smart Sensor (B-SS)
- BACnet Smart Actuator (B-SA)

### List all BACnet Interoperability Building Blocks Supported (Annex K)

#### Data Sharing

- Data Sharing - Read Property-B (DS-RP-B)
- Data Sharing - Write Property-B (DS-WP-B)
- Data Sharing - Read Property Multiple-B (DS-RPM-B)
- Data Sharing - Write Property Multiple-B (DS-WPM-B)

#### Device Management

- Device Management - Dynamic Device Binding-B (DM-DDB-B)
- Device Management - Dynamic Object Binding-B (DM-DOB-B)
- Device Management - Device Communication Control-B (DM-DCC-B)
- Device Management - Re-initialize Device-B (DM-RD-B)

## Segmentation Capability

- Able to transmit segmented messages
- Able to receive segmented messages
- Segmented response accepted

## Standard Object Types Supported

The following table lists the object types supported by the option module. Dynamic object creation and deletion is not supported. The property access rules use the following key:

R = Read Only; the property is supported for this object type

W = Read/Write; the property is supported for this object type

C = Commandable; the property is supported for this object type

**Table 79 - Supported Standard Object Types**

Property	Analog Input	Analog Output	Analog Value	Binary Input	Binary Output	Binary Value	Device
APDU Timeout							R
Application Software Version							R
Database Revision							R
Description	R	R	R	R	R	R	W <sup>(1)</sup>
Device Address Binding							R
Event State	R	R	R	R	R	R	
Firmware Revision							R
Location							W <sup>(2)</sup>
Max APDU Length Accepted							R
Max Info Frames							W <sup>(3)</sup>
Max Master							W <sup>(4)</sup>
Model Name							R
Number of APDU Retries							R
Object Identifier	R	R	R	R	R	R	R
Object List							R
Object Name	R	R	R	R	R	R	R
Object Type	R	R	R	R	R	R	R
Out of Service	R	R	R	R	R	R	
Polarity				R	R		
Present Value	R	C	C <sup>(5)</sup>	R	C	C <sup>(5)</sup>	
Priority Array		R	R <sup>(6)</sup>		R	R <sup>(6)</sup>	
Protocol Object Types Supported							R
Protocol Revision							R
Protocol Services Supported							R
Protocol Version							R
Relinquish Default		R	R <sup>(6)</sup>		R	R <sup>(6)</sup>	
Segmentation Supported							R
Status Flags	R	R	R	R	R	R	
System Status							
Units	R	R	R				
Vendor Identifier							R
Vendor Name							R

(1) This property will accept a maximum of 16 single-byte-characters when written.  
 (2) This property will accept a maximum of 32 single-byte characters when written.  
 (3) This property will accept a value between 1...255 inclusive when written.  
 (4) This property will accept a value between 0...127 inclusive when written.  
 (5) This property is commandable for some instances of this object. Otherwise it is read/write.  
 (6) This property is supported only for instances of this object where the Present Value property is commandable.

## Data Link Layer Options

- BACnet IP, (Annex J)
- BACnet IP, (Annex J), Foreign Device
- ISO 8802-3, Ethernet (Clause 7)
- ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
- ATA 878.1, EIA-485 ARCNET (Clause 8), baud rates: \_\_\_\_\_
- MS/TP master (Clause 9), baud rates: 9600, 19200, 38400, 57600, 76800, 115200
- MS/TP slave (Clause 9), baud rate(s): \_\_\_\_\_
- Point-To-Point, EIA 232 (Clause 10), baud rates: \_\_\_\_\_
- Point-To-Point, modem, (Clause 10), baud rates: \_\_\_\_\_
- LonTalk, (Clause 11), medium: \_\_\_\_\_
- BACnet/ZigBee (ANNEX O)
- Other: \_\_\_\_\_

## Device Address Binding

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)  Yes  No

## Networking Options

- Router, Clause 6 - List all routing configurations, for example, ARCNET-Ethernet, Ethernet-MS/TP, and so forth.
- Annex H, BACnet Tunneling Router over IP
- BACnet/IP Broadcast Management Device (BBMD)

Does the BBMD support registrations by Foreign Devices?  Yes  No

Does the BBMD support network address translation?  Yes  No

## Network Security Options

- Non-secure Device - is capable of operating without BACnet Network Security
- Secure Device - is capable of using BACnet Network Security (NS-SD BIBB)
  - Multiple Application-Specific Keys
  - Supports encryption (NS-ED BIBB)
  - Key Server (NS-KS BIBB)

## Character Sets Supported

- ISO 10646 (UTF-8)     IBM/Microsoft™ DBCS     ISO 8859-1
- ISO 10646 (UCS-2)     ISO 10646 (UCS-4)     JIS X 0208

**Notes:**

## Logic Command/Status Words

### Drive Products

The logic command and logic status words for PowerFlex® products are listed in the following tables.

Table 80 - Logic Status Word

Bit	Logic Status on SI			
	AC Drives			Bus Supplies
	PowerFlex 750-Series Drives	PowerFlex 750-Series Drives with TotalFORCE® Control / 6000T-Series Drives	PowerFlex 755TM CBI	PowerFlex 755TM Bus Supplies
0	Run Ready	Run Ready	Run Ready	Run Ready
1	Active	Active	Active	Reserved
2	Command Direction	Command Direction	Command Direction	Auto Restart Active
3	Actual Direction	Actual Direction	Actual Direction	Auto Restart Countdown
4	Accelerating	Accelerating	Accelerating	Heat Sink Fan On
5	Decelerating	Decelerating	Decelerating	Autotuning
6	Alarm	Alarm	Alarm	Alarm
7	Fault	Fault	Fault	Fault
8	At Setpt Spd	At Setpt Spd	At Setpt Spd	At DC Reference
9	Manual	Manual	Manual	DrpGn Limit
10	Spd Ref ID	Spd Ref ID	Spd Ref ID	Reserved
11				Reserved
12				Reserved
13				Reserved
14				Reserved
15	Reserved	Reserved	Reserved	StartInhibit
16	Running	Running	Running	Running
17	Jogging	Jogging	Jogging	Reserved
18	Stopping	Stopping	Stopping	Reserved
19	DC Brake	DC Brake	DC Brake	Reserved
20	DB Active	DB Active	DB Active	Reserved
21	Speed Mode	Speed Mode	Speed Mode	AC Ridethrough
22	Position Mode	Position Mode	Position Mode	Input Phase Loss
23	Torque Mode	Torque Mode	Torque Mode	AC Line Synchronized
24	At Zero Speed	At Zero Speed	At Zero Speed	kVAR OnlyAct
25	At Home	At Home	At Home	In Precharge
26	At Limit	At Limit	At Limit	At Limit
27	Current Limit	Current Limit	Current Limit	Cur Limit
28	Bus Freq Reg	Bus Freq Reg	Bus Freq Reg	Converter Bus Regulating
29	Enable On	Enable On	Enable On	Enable On
30	Motor Overload	Motor Overload	Motor Overload	Motoring
31	Regen	Regen	Regen	Regenerating

Table 81 - Logic Command Words

Bit	Logic Command				
	AC drives			Bus Supplies	
	750-Series Drives	750-Series Drives with TotalFORCE Control / 6000T-Series Drives	755TM CBI	755TM Bus Supplies	
0	Normal Stop	Normal Stop	Normal Stop	Normal Stop	
1	Start	Start	Start	Start	
2	jog1	jog1	jog1	Reserved	
3	Clear Fault	Clear Fault	Clear Fault	Clear Fault	
4	Forward	Forward	Forward	Reserved	
5	Reverse	Reverse	Reverse		
6	Manual	Manual	Manual	Reserved	
7	Reserved	Reserved	Reserved	Reserved	
8	Accel Time	Accel Time	Accel Time	Reserved	
9					
10	Decel Time	Decel Time	Decel Time	Reserved	
11					
12	Ref Select	Ref Select	Ref Select	Reserved	
13					
14	Reserved	Emerg OVRD	Emerg OVRD	Reserved	
15	Coast Stop	Coast Stop	Coast Stop	Reserved	
16	Current Limit Stop	Current Limit Stop	Current Limit Stop	Reserved	
17	Run	Run	Run	Run	
18	Jog2	Jog2	Jog2	Reserved	
19	Reserved	Reserved	Reserved	Reserved	
20		Energy Pause	Reserved	Energy Pause	
21		Reserved	Reserved	Reserved	Reserved
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

**Notes:**

# Rockwell Automation Support

Use these resources to access support information.

<b>Technical Support Center</b>	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	<a href="http://rok.auto/support">rok.auto/support</a>
<b>Local Technical Support Phone Numbers</b>	Locate the telephone number for your country.	<a href="http://rok.auto/phonesupport">rok.auto/phonesupport</a>
<b>Technical Documentation Center</b>	Quickly access and download technical specifications, installation instructions, and user manuals.	<a href="http://rok.auto/techdocs">rok.auto/techdocs</a>
<b>Literature Library</b>	Find installation instructions, manuals, brochures, and technical data publications.	<a href="http://rok.auto/literature">rok.auto/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	<a href="http://rok.auto/pcdc">rok.auto/pcdc</a>

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