PowerFlex 1769-SM2 Compact I/O DSI/Modbus Communications Module

Allen-Bradley

Firmware Version 1.xxx
User Manual

Allen-Bradley • Rockwell Software

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Important User Information

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

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

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

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

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

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

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

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

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

The information below summarizes the changes made to this manual since version 1769-UM013B-EN-P (January 2006):

Description	Page(s)
Changed Figures 1.3 and 1.4 to correctly show the wiring of the RJ45 daisy-chained connectors.	1-4 and 1-5
In the “Compatible Products” section, added the PowerFlex 4M and PowerFlex 40P drives.	1-6
Moved the Module Start-Up Status Indication table from Chapter 1 to Chapter 2 after the “Applying Power” section.	2-15
Added the subsection “Special Case—Data Entry for 2 Stop Bits Communication.”	3-8
Changed module Parameters 15 - [RTU Parity 1], 30 - [RTU Parity 2], and 45 - [RTU Parity 3] per 1769-SM2 firmware v2.001 update. The parameter numbers remain the same but the parameter names changed from [RTU Parity x] to [RTU Format x]. Also, in addition to parity (None, Even or Odd), the parameter function changed to include choice of stop bits (1 or 2).	3-17, B-3, B-5, and B-7
In the “Using Reference/Feedback” section, revised table to include PowerFlex 4M and PowerFlex 40P drives.	4-4
Added the new section “Using RSLinx Classic” to Chapter 8.	8-2
Updated the Logic Command word and Logic Status word information to include data for all PowerFlex 4-Class drives.	D-1 and D-2

Table of Contents

About This Manual

Related Documentation

For:	Refer to:	Publication
DriveExplorer™	http://www.ab.com/drives/driveexplorer, and DriveExplorer online help (1)	—
DriveTools™ SP (includes DriveExecutive)	http://www.ab.com/drives/drivetools, and DriveExecutive online help (1)	—
PowerFlex 4-Class HIM (22-HIM-A3 / -C2S)	HIM Quick Reference	22HIM-QR001
PowerFlex® 4 Drive	PowerFlex 4 User Manual PowerFlex 4 Quick Start	22A-UM001 22A-QS-001
PowerFlex® 4M Drive	PowerFlex 4M User Manual PowerFlex 4M Quick Start	22F-UM001 22F-QS-001
PowerFlex® 40 Drive	PowerFlex 40 User Manual PowerFlex 40 Quick Start	22B-UM001 22B-QS-001
PowerFlex® 40P Drive	PowerFlex 40P User Manual PowerFlex 40P Quick Start	22D-UM001 22D-QS-001
PowerFlex® 400 Drive	PowerFlex 400 User Manual PowerFlex 400 Quick Start	22C-UM001 22C-QS-001
RSLinx® Classic	Getting Results with RSLinx Guide, and online help (1)	LINX-GR001
RSLogix™ 500 RSLogix™ 5000	RSLogix 500 Getting Results Guide, and online help (1) RSLogix 5000 Getting Results Guide, and online help (1)	LG500-GR002 9399-RLD300GR
RSNetWorx™ for DeviceNet	RSNetWorx for DeviceNet Getting Results Guide, and online help (1)	DNET-GR001
MicroLogix™ 1500	MicroLogix 1500 Programmable Controllers User Manual MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Reference Manual	1764-UM001 1762-RM001
CompactLogix™	CompactLogix System User Manual	1769-UM007
ControlLogix®	ControlLogix Gateway System User Manual	1756-6.5.13
Modbus RTU Specification	Modbus – ida.org	—
PowerFlex 7-Class Drive Connectivity	20-COMM-H RS-485 HVAC Adapter User Manual	20COMM-UM009

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

You can view or download publications at http://literature.rockwellautomation.com. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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

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

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Local Support

Contact your local Rockwell Automation, Inc. representative for:

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

Technical Assistance

For technical assistance, please review the information in Chapter 9, Troubleshooting, first. If you still have problems, then access the Allen-Bradley Technical Support web site at www.ab.com/support/abdrives or contact Rockwell Automation, Inc.

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name. For example **Parameter 01 - [Config Mode]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.
- RSNetWorx for DeviceNet (version 4.01) and RSLinx (version 2.41) were used for the screen shots in this manual. Different versions of the software may differ in appearance and procedures.
- The firmware release is displayed as FRN X.xxx. The "FRN" signifies Firmware Release Number. The "X" is the major release number. The "xxx" is the minor update number. This manual is for Firmware release 1.xxx.

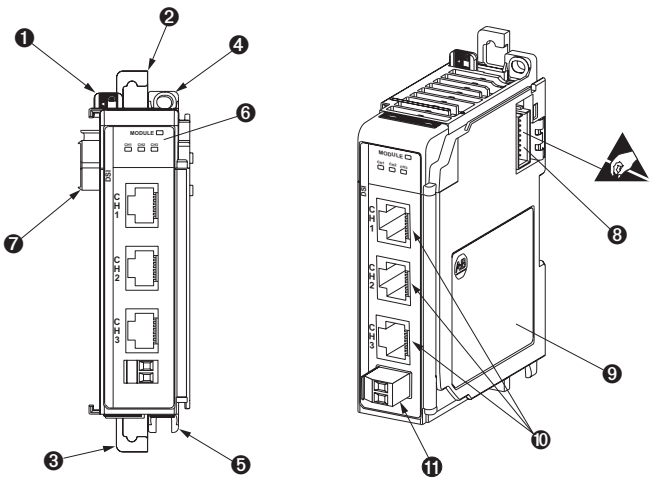
Notes:

Getting Started

The 1769-SM2 Compact I/O to DSI module provides a Compact I/O connection for PowerFlex 4-Class drives. It can be used with a MicroLogix 1500, CompactLogix, or a remote 1769-based adapter such as the 1769-ADN.

Components

Figure 1.1 Components of the Module



Item	Part
❶	Bus lever (with locking function)
❷	Upper DIN rail latch
❸	Lower DIN rail latch
❹	Upper panel mounting tab
❺	Lower panel mounting tab
❻	Module status indicators (see Chapter 9, Troubleshooting for details).

Item	Part
❼	Movable bus connector with female pins
❽	Bus connector with male pins
❾	Nameplate label
❿	DSI connectors
⓫	Terminal block for network communication shielding and earth ground wire.

Features

The 1769-SM2 Compact I/O to DSI module features include:

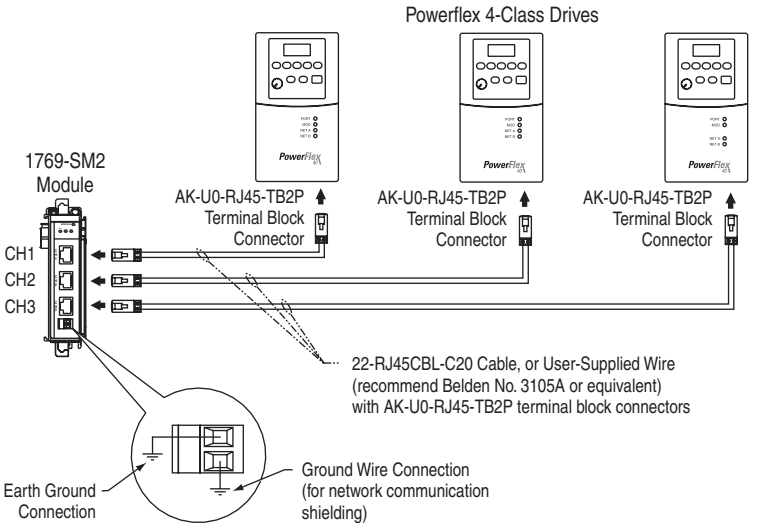
- Three Compact I/O connection channels for PowerFlex 4-Class drives. Up to 3 drives can be connected in Single mode (1 per channel) and up to 15 drives can be connected in Multi-Drive mode (5 per channel). Any channel in Multi-Drive mode can also be configured to operate as a Modbus RTU Master, allowing connectivity to a maximum of 31 other Modbus RTU Slave devices, such as PowerFlex 7-Class drives with 20-COMM-H RS485 HVAC adapters.
- Use as expansion I/O on MicroLogix 1500 and CompactLogix controllers or with a remote 1769-based adapter. It receives the required power from the Compact I/O backplane.
- Parameter-configurable I/O, including Logic Command/Reference and Logic Status/Feedback for each connected drive.
- Explicit messaging (parameter read/write, etc.) support for:
  - MicroLogix 1500 LRP Series C systems when used with RSLogix 500 v6.30 (or higher)
  - Enhanced CompactLogix processors, such as the -L31, -L32E, and -L35E

  Explicit messaging is NOT available for CompactLogix -L20 and -L30 processors, or 1769-ADN DeviceNet adapters.
- User-defined fault actions to determine how the module and connected drives respond to controllers in idle mode (Idle Action).
- Bi-color (red/green) status indicators to report the status of the module and channel communications.
- Compatibility with various configuration tools to configure the module and connected drive(s). The tools include an optional, external PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S), and drive-configuration software such as DriveExplorer v3.01 (or higher) or DriveExecutive v4.01 (or higher).

Single Mode vs. Multi-Drive Mode

Single mode is a one-to-one connection, where a channel is connected to a single PowerFlex 4-Class drive (Figure 1.2).

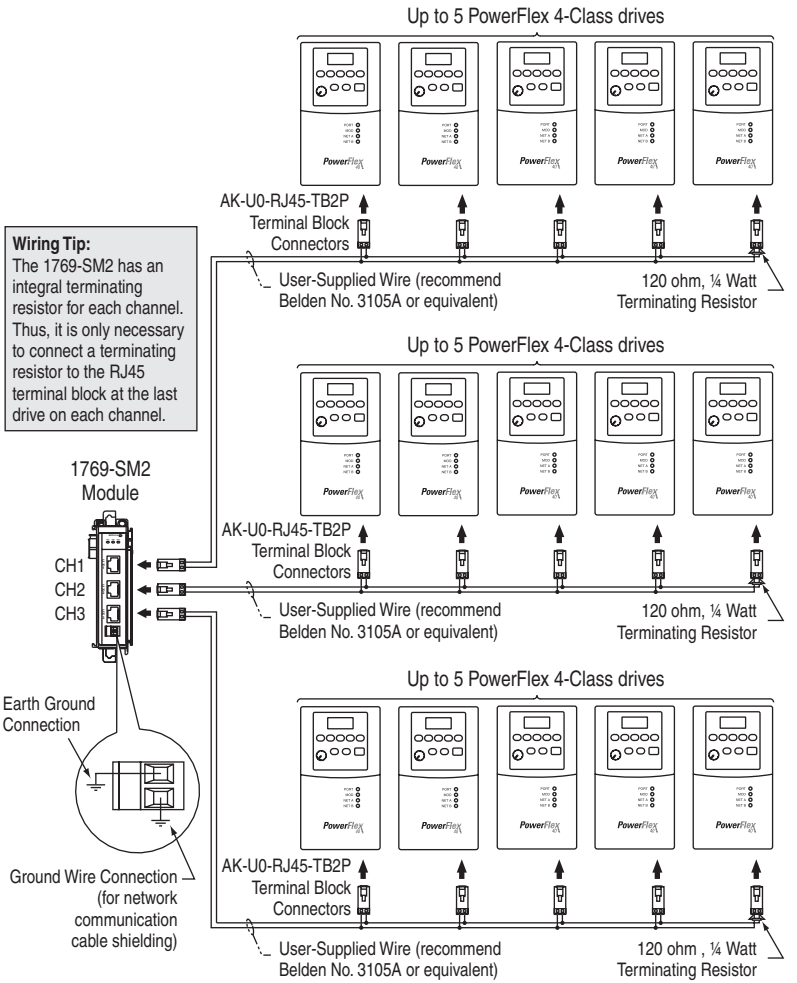
Figure 1.2 Single Mode Wiring Example



An additional DSI peripheral device, such as an external PowerFlex 4-Class HIM or Serial Converter module (22-SCM-232) with a software tool, can be used with each drive. An AK-U0-RJ45-SC1 DSI Splitter cable can be used to split the RJ45 connector on the drive into two RJ45 connectors.

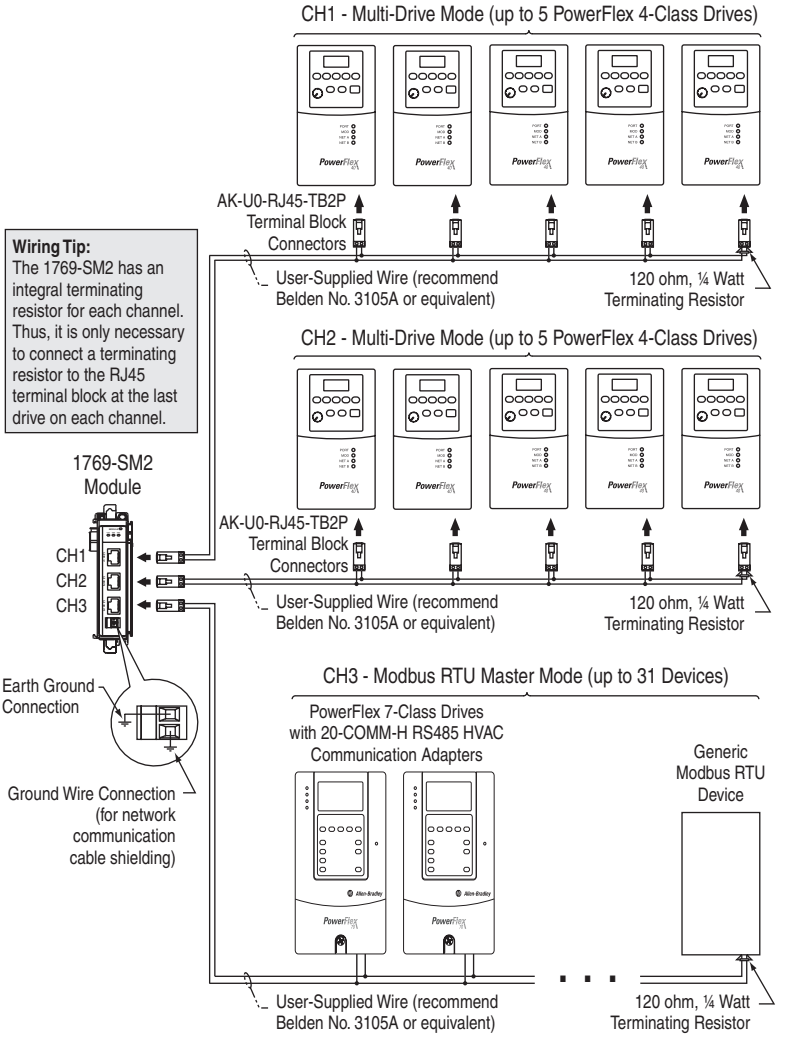
Multi-Drive mode enables increased connectivity, where one to five PowerFlex 4-Class drives can be connected per channel. All of the drives are daisy-chained to the 1769-SM2 module over RS-485 as shown in Figure 1.3.

Figure 1.3 Multi-Drive Mode Wiring Example



In Multi-Drive mode, any channel can be configured for “RTU Master” operation (Figure 1.4). This enables connection of up to 31 RTU Slave devices, such as PowerFlex 7-Class drives with 20-COMM-H RS485 HVAC adapters.

Figure 1.4 Multi-Drive Mode and Modbus RTU Master Mode Wiring Example



Benefits of Multi-Drive mode include:

- Lower hardware costs. Only one 1769-SM2 is needed for up to five PowerFlex 4-Class drives per channel (15 total).
- Controller can independently control, monitor, and read/write parameters for all five drives on each channel (same functionality as Single mode).

The trade-offs of Multi-Drive mode include:

- Since the RS-485 ports are used for daisy-chaining the drives, additional DSI peripheral devices cannot be used with the drives. This includes an optional, external PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S) or a 22-SCM-232 Serial Converter module with a software tool. The AK-U0-RJ45-SC1 DSI Splitter cable cannot be used to add a second connection for a DSI peripheral device.

Compatible Products

The 1769-SM2 module is compatible with Allen-Bradley PowerFlex 4-Class (Component class) drives and other products that support DSI. At the time of publication, compatible products include:

- PowerFlex 4 drives
- PowerFlex 4M drives
- PowerFlex 40 drives
- PowerFlex 40P drives
- PowerFlex 400 drives

When the 1769-SM2 is used in Multi-Drive as a Modbus RTU Master, other Modbus RTU Slave devices, such as PowerFlex 7-Class drives with 20-COMM-H RS485 HVAC adapters, can also be connected.

Required Equipment

Equipment Shipped with the Module

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

❑ One 1769-SM2 module
❑ This manual

User-Supplied Equipment

To install and configure the 1769-SM2 module, you must supply:

- ❑ A small flathead screwdriver
- ❑ Communications cable 22-RJ45CBL-C20
  - or-
  AK-U0-RJ45-TB2P terminal block connectors (one for each channel connection and one for each drive connection) and twisted pair network wiring (Belden No. 3105A or equivalent)
- ❑ Configuration tool, such as:
  - PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S)—required to access module parameters if not using DriveExplorer software or DriveExecutive software
  - DriveExplorer (version 3.01 or higher)
  - DriveExecutive stand-alone software (version 4.01 or higher) or bundled with the DriveTools SP suite (version 4.01 or higher)
  - RSNetWorx for DeviceNet
- ❑ Controller configuration software (such as RSLogix 500/5000)

Safety Precautions

Please read the following safety precautions carefully.

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

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

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

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. **Parameters 04 - [Idle Action 1]**, **19 - [Idle Action 2]**, and **34 - [Idle Action 3]** let you determine the action of the module and connected drives if communications are disrupted. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable or a faulted controller).

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: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

Quick Start

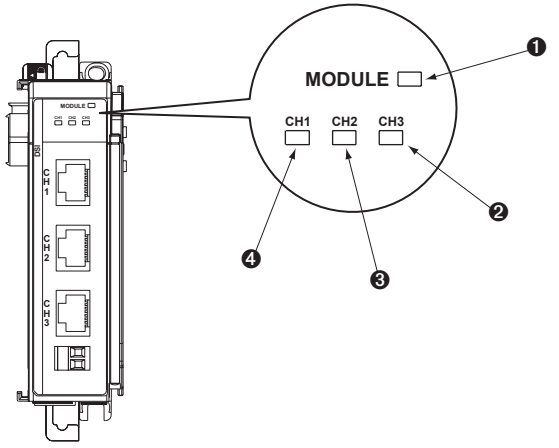
This section is provided to help experienced users quickly start using the 1769-SM2 Compact I/O to DSI module. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	Refer to…
1	**Review the safety precautions for the module.**	Throughout This Manual
2	**Verify that the drive is properly installed.**	Drive User Manual
3	**Install the module.** Verify that the controller is not powered. Connect the module to the controller backplane bus. Then connect the module to the drive(s) using communications cable 22-RJ45CBL-C20 or AK-U0-RJ45-TB2P terminal block connectors and communications network wiring.	Chapter 2, Installing the Module
4	**Apply power to the module.** The module receives power from the controller. Apply power to the controller. The MODULE indicator should be green or flashing green. If it flashes red, there is a problem. Refer to Chapter 9, Troubleshooting.	
5	**Configure the module for your application.** Set the following parameters for the module as required by your application: • I/O configuration. • Fault actions.	Chapter 3, Configuring the Module
6	**Apply power to the drive.**	Drive User Manual
7	**Configure the controller to communicate with the module.**	Depending on the type of controller and 1769-SM2 operating mode: • Chapter 6, MicroLogix 1500 Example Ladder Programs • Chapter 7, CompactLogix Example Ladder Programs • Chapter 8, ControlLogix w/ 1769-ADN DeviceNet Example Ladder Program
8	**Create a ladder logic program.** Use a programming tool such as RSLogix to create a ladder logic program that enables you to: • Control the module and connected drive. • Monitor or configure the drive using Explicit Messages.	

Status Indicators

The module uses four status indicators to report its operating status. They can be viewed on the front of the module (Figure 1.5).

Figure 1.5 Status Indicators



Item	Name
❶	MODULE
❷	CH1
❸	CH2
❹	CH3

After installing the module and applying power to the drive(s), refer to Viewing Start-Up Status Indicators on page 2-15 for possible start-up status indications and their descriptions.

Installing the Module

This chapter provides instructions for installing the 1769-SM2 as an expansion I/O module on MicroLogix 1500 and CompactLogix controllers, or with a remote 1769-based adapter.

Preparing for an Installation

Consider the following when installing the 1769-SM2 module:

- Verify that you have all required equipment. Refer to Required Equipment on page 1-6.
- A MicroLogix 1500 Base Unit or Compact I/O power supply has limits in the amount of +5V dc and +24V dc current it can supply to modules in its I/O bank. These limits depend on the catalog number (e.g. 1769-PA2) of the power supply. A bank of modules must not exceed the current limits of the MicroLogix 1500 Base Unit or I/O bank power supply.

  Refer to the *MicroLogix 1500 User Manual* (publication 1764-UM001) or the *Compact 1769 Expansion I/O Power Supplies Installation Instructions* (publication 1769-5.14).
- The module has a distance rating of four. Therefore, the module must be within four modules of the I/O bank's power supply.

ATTENTION: Risk of equipment damage exists. The 1769-SM2 module contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the module. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage* (publication 8000-4.5.2).

Removing Power

ATTENTION: Risk of equipment damage exists. Remove power before installing or removing the 1769-SM2 module. When you install or remove the module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or equipment damage by:

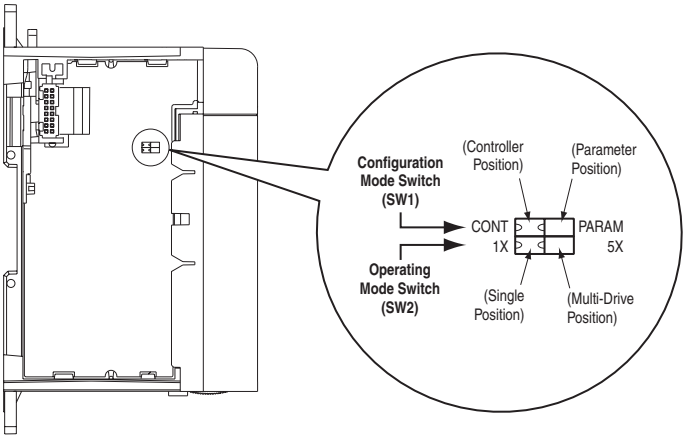
- Sending an erroneous signal to your system's field devices, causing unintended machine motion.
- Causing an explosion in a hazardous environment.

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

Setting the Configuration Mode Switch

Before installing the module, make sure its Configuration Mode Switch is correctly set. See Configuration Methods on page 3-3 for details on the Controller and Parameter configuration modes. Then set the Configuration Mode Switch (SW1 in Figure 2.1) for your application.

Figure 2.1 Configuration Mode and Single/Multi-Drive Operation Switch Locations



SW1 Setting	Description
CONT (Controller) back position	Default setting—The 1769-SM2 module uses the configuration data downloaded from the controller on power-up and when the controller is placed in run mode.
PARAM (Parameter) front position	The 1769-SM2 module uses its internal parameter settings to configure the module.

Setting the Operating Mode Switch (Single/Multi-Drive)

Before installing the module, set its Operating Mode Switch (SW2 in Figure 2.1) for Single or Multi-Drive operation. All channels (CH1, CH2, and CH3) will operate in the selected mode.

SW2 Setting	Description
1X (Single mode) back position	Default setting — sets the 1769-SM2 module for Single mode using a single drive connection (one drive per channel). **Important:** In Single mode, only one drive can be connected per channel. Connections to multiple drives must be removed since all powered and connected hosts will respond to any message sent by the module.
5X (Multi-Drive mode) front position	Sets the 1769-SM2 module for Multi-Drive mode using up to five PowerFlex 4-Class drives per channel. In Multi-Drive mode, DSI peripherals such as the 22-HIM-A3 / -C2S Human Interface Module, 22-SCM-232 serial converter, etc. CANNOT be used. They will not operate with the 1769-SM2 module or drives. The specific number of drives used in Multi-Drive mode for each channel and a unique address for each drive must be configured using 1769-SM2 module parameters. For instructions, see Setting the I/O Configuration (Multi-Drive Mode Only) on page 3-14 and Setting Drive Node Addresses (Multi-Drive Mode Only) on page 3-16. **NOTE:** In Multi-Drive mode, each channel can be independently configured for Modbus RTU Master operation by setting the respective channel's [DSI I/O Cfg] parameter to "5" (RTU Master). This enables up to 31 RTU slave devices, such as PowerFlex 7-Class drives with 20-COMM-H RS485 HVAC adapters to be connected to that channel.

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

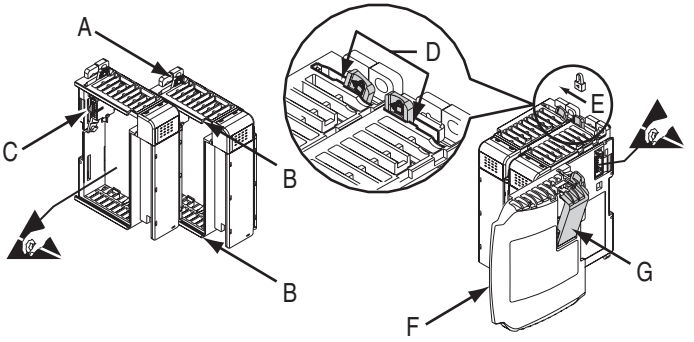
The Configuration Mode Switch (SW1) and Operating Mode Switch (SW2) settings can be verified by respectively viewing module **Parameters 01 - [Config Mode]** and **02 - [DSI Mode]** using an optional, external PowerFlex 4-Class HIM, DriveExplorer software or DriveExecutive software.

Assembling the Module to the Controller

The 1769-SM2 module can be attached to adjacent controller modules *before* or *after* mounting. For mounting instructions, see Panel Mounting on page 2-6 or DIN Rail Mounting on page 2-8. To work with a system that is already mounted, see Replacing the Module within a System on page 2-9.

Figure 2.2 and the following procedure describes how to assemble the Compact I/O system.

Figure 2.2 Assembling 1769-SM2 Module to Compact I/O System



1. Disconnect power.
2. Check that the bus lever (A) of the 1769-SM2 module is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (B) to secure the modules together.
4. Move the 1769-SM2 module back along the tongue-and-groove slots until the bus connectors (C) line up with each other.
5. Use your fingers or a small screwdriver to push the bus lever back slightly to clear the positioning tab (D).
6. Move the 1769-SM2 module's bus lever fully to the left (E) until it clicks. Ensure it is locked firmly in place.

ATTENTION: Risk of equipment damage exists. When attaching the 1769-SM2 module to a Compact I/O system, it is very important that the bus connectors are securely locked together to ensure proper electrical connection. Failure to do this may cause an electrical arc, which can cause personal injury or equipment damage.

7. Attach an end cap terminator (F) to the last module in the system by using the tongue-and-groove slots as before.

8. Lock the end cap bus terminator (G).

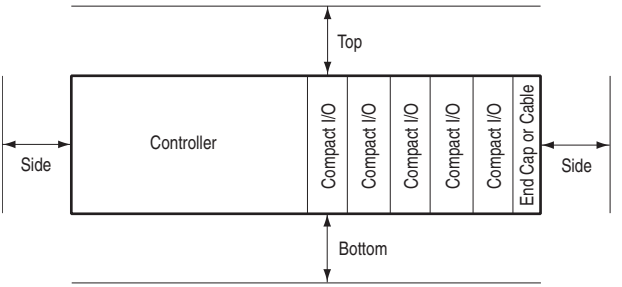
Important: A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the serial communication bus.

Mounting the Module

ATTENTION: Risk of equipment damage exists. During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the 1769-SM2 module. Debris that falls into the module could cause damage on power up.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50 mm (2 in.) of space on all sides for adequate ventilation as shown:



Allow at least 140 mm (5.5 in.) of enclosure depth to accommodate the 1769-SM2 module.

Panel Mounting

Mount the 1769-SM2 module to a panel using two screws per module. Use M4 or #8 panhead screws (not included). Mounting screws are required on every module.

Panel Mounting Using the Dimensional Drawing

NOTE: All dimensions are in mm (inches). Hole spacing tolerance is ±0.4 mm (0.016 in.).

Figure 2.3 1769-SM2 Module with MicroLogix 1500 Base Unit and Processor

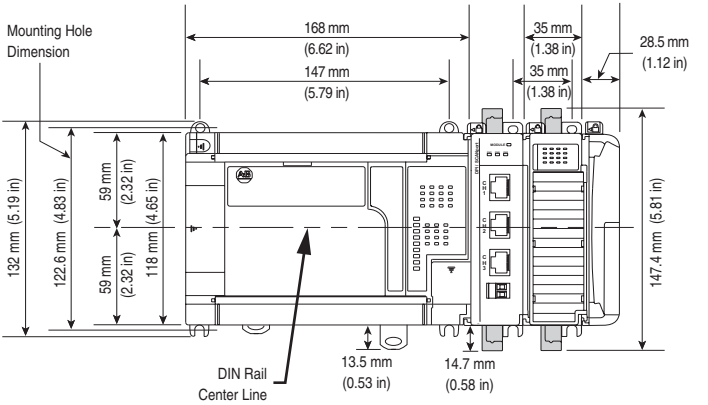


Figure 2.4 1769-SM2 Module with CompactLogix Controller

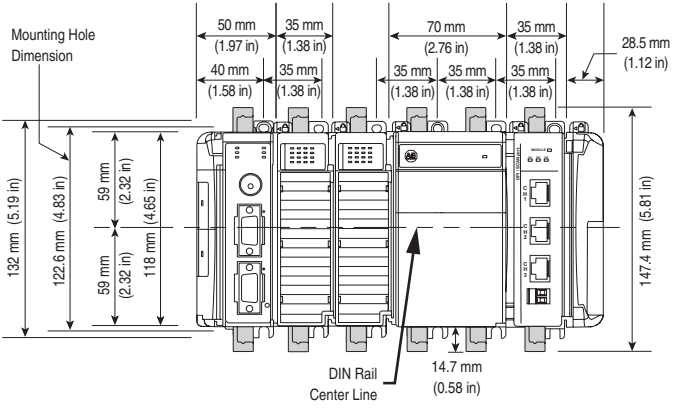
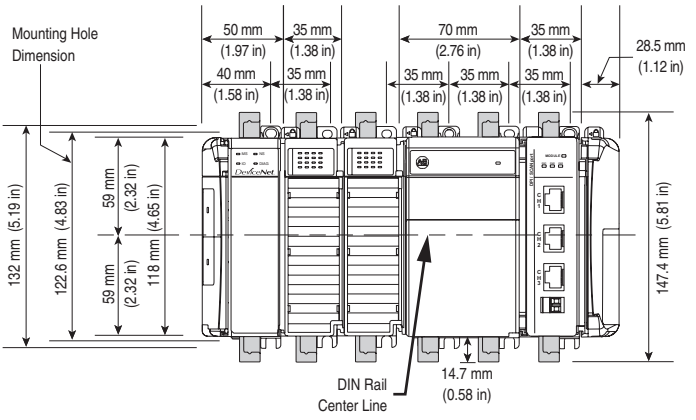


Figure 2.5 1769-SM2 Module with Remote 1769-Based Adapter



Panel Mounting Procedure Using Module as a Template

The following procedure enables you to use the assembled modules as a template for drilling holes in the panel. Due to module mounting hole tolerance, it is important to follow these steps:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw (not included).
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.

DIN Rail Mounting

The 1769-SM2 module can be mounted using these DIN rails:

- 35 x 7.5 mm (EN 50 022 - 35 x 7.5)
- 35 x 15 mm (EN 50 022 - 35 x 15)

When mounting the module to a DIN rail, make sure that the latches are closed and properly securing the module.

Replacing the Module within a System

The 1769-SM2 module can be replaced while the system is mounted to a panel (or DIN rail).

ATTENTION: Risk of equipment damage exists. Remove power before installing or removing the 1769-SM2 module. When you install or remove the module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or equipment damage by:

- Sending an erroneous signal to your system's field devices, causing unintended machine motion.
- Causing an explosion in a hazardous environment.

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

1. Remove power.
2. Unplug the communications cable from each port (CH1, CH2, CH3) on the 1769-SM2 module. Note each drive and the port to which it is connected.
3. Remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade screwdriver).
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module being removed.
5. Gently slide the disconnected 1769-SM2 module forward.

   If you feel excessive resistance, make sure that you disconnected the module from the bus and that you removed both mounting screws (or opened the DIN latches).

TIP: It may be necessary to rock the module slightly from front to back to remove it or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement 1769-SM2 module, be sure that the bus lever on the right-side adjacent module is in the unlocked (fully right) position.
7. Slide the replacement 1769-SM2 module into the open slot.

8. Connect the 1769-SM2 module and adjacent modules together by locking (fully left) the bus levers on the 1769-SM2 module and the right-side adjacent module.

9. Replace the mounting screws (or snap the module onto the DIN rail).

10. Plug the appropriate communications cable into its respective port on the 1769-SM2 module.

11. Restore 1769-SM2 module configuration using an appropriate configuration tool.

Connecting Drive(s) to the Module

NOTE: For Single or Multi-Drive mode, there is a maximum cable distance limit per channel. See DSI Cable Requirements on page A-2 for more information.

For network wiring diagram examples, see the following figures:

1769-SM2 Operating Mode	Network Wiring Diagram Example...
Single mode (Default)	Figure 1.2
Multi-Drive mode	Figure 1.3
Multi-Drive mode with Modbus RTU Master	Figure 1.4

Single Mode

When the 1769-SM2 module is operated in Single drive mode, each drive is directly connected to a channel port (CH1, CH2 or CH3) on the module. Use either a 22-RJ45CBL-C20 communications cable for each channel or AK-U0-RJ45-TB2P terminal block connectors and twisted pair network wiring (Belden No. 3105A or equivalent).

Important: When connecting a drive to the channel port using AK-U0-RJ45-TB2P terminal block connectors and twisted pair network wiring, the following drive parameters MUST be configured to the settings shown so that the 1769-SM2 module will communicate with the drive:

Drive Parameter	Setting
A103 - [Comm Data Rate]	“4” (19.2K)
A107 - [Comm Format]	“0” (RTU 8-N-1)

Changes to these drive parameters require the drive to be reset for the new settings to take effect.

When connecting a drive to the channel port using 22-RJ45CBL-C20 communications cable, the above drive parameters do not require configuration because the drive senses that a DSI peripheral is connected and it ignores these parameter settings.

Multi-Drive Mode

For Multi-Drive mode, each channel port MUST be connected to the drives via daisy-chaining using AK-U0-RJ45-TB2P terminal block connectors (one for the port connection and one for each drive connection) and twisted pair network wiring (Belden No. 3105A or equivalent). The 22-RJ45CBL-C20 communications cable and splitter cables cannot be used.

Important: The following drive parameters MUST be configured to the settings shown so that the 1769-SM2 module will communicate with the drives:

Drive Parameter	Setting
A103 - [Comm Data Rate]	“4” (19.2K)
A104 - [Comm Node Addr]	Value of Drive Addr x parameter in the 1769-SM2
A107 - [Comm Format]	“0” (RTU 8-N-1)

Changes to these drive parameters require the drive to be reset for the new settings to take effect.

Grounding the Module

The 1769-SM2 module is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used) are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, publication 1770-4.1, for additional information.

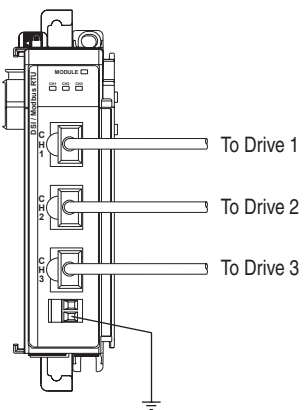
Shielded Connector Grounding Requirements

When using the 22-RJ45CBL-20 cable, which has shielded connectors, the shields are all grounded to the chassis terminal block on the 1769-SM2 module (item 11 in Figure 1.1). However, the user must:

- Install a wire from the chassis terminal block on the 1769-SM2 module to a grounded, conductive surface (i.e. metal panel). See Figure 2.6.
- Remove the shield connection to chassis ground at the drive I/O block shield terminal.

Drive	Drive I/O Block
PowerFlex 4	Terminal 16
PowerFlex 4M	Terminal 16
PowerFlex 40	Terminal 19
PowerFlex 40P	Terminal 19
PowerFlex 400	Terminal 20

Figure 2.6 Shielded Connector Grounding Details



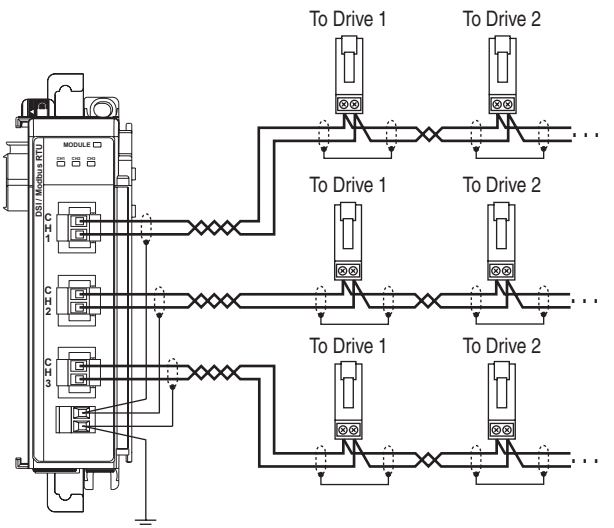
Unshielded Connector Grounding Requirements

When using twisted pair network wiring with unshielded AK-U0-RJ45-TB2P connectors, ground the RJ45 socket on the drive by connecting the drive chassis ground power terminal to the I/O block shield terminal.

Drive	Drive I/O Block
PowerFlex 4	Terminal 16
PowerFlex 4M	Terminal 16
PowerFlex 40	Terminal 19
PowerFlex 40P	Terminal 19
PowerFlex 400	Terminal 20

The 1769-SM2 module's RJ45 connectors (CH1, CH2, and CH3), which are electrically common, should be grounded by attaching a drain wire from the 1769-SM2 terminal block (item 11 in Figure 1.1) to a grounded, conductive surface (i.e. metal panel). If shielded cable (not required) is used, the cable shield should also be connected to the chassis by attaching the cable shield to the 1769-SM2 terminal block (Figure 2.7). Good wiring practice dictates that the cable shield be terminated to the chassis at only one point along the cable to prevent ground loops from occurring. The chassis terminal block on the 1769-SM2 module is provided as a convenient place for this termination.

Figure 2.7 Unshielded Connector Grounding Details



Network Cable Strain Relief

Some type of strain relief should be provided for the communication cables within 12 inches (305 mm) of the 1769-SM2 module. This may include wireways, cable ties, panel mounted strain reliefs, or some other appropriate strain relief device.

Applying Power

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

1. Apply power to the controller. The status indicators can be viewed on the front of the 1769-SM2 module after power has been applied.

2. Apply power to the drive(s). When you apply power to the 1769-SM2 module, controller, and drives for the first time, the status indicators should be green after an initialization. If the status indicators go red, there is a problem. Refer to Chapter 9, Troubleshooting.

Viewing Start-Up Status Indicators

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

Figure 2.8 Module Status Indictors

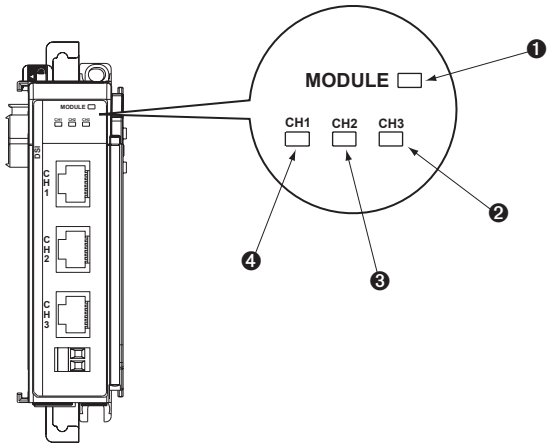


Table 2.A Module Start-Up Status Indications

Item	Status Indicator	Status(1)	Description
❶	MODULE	Green	Normal Operation. The module has established communications with the controller.
		Flashing Green	The module is establishing communications with the controller.
❷	CH1	Green	Normal Operation. CH1 is operating and is transferring I/O data between the controller and the drive(s).
		Flashing Green	Normal Operation. CH1 is operating but is not transferring I/O data between the controller and the drive(s).
❸	CH2	Green	Normal Operation. CH2 is operating and is transferring I/O data between the controller and the drive(s).
		Flashing Green	Normal Operation. CH2 is operating but is not transferring I/O data between the controller and the drive(s).
❹	CH3	Green	Normal Operation. CH3 is operating and is transferring I/O data between the controller and the drive(s).
		Flashing Green	Normal Operation. CH3 is operating but is not transferring I/O data between the controller and the drive(s).

(1) If all status indicators are off, the module is not receiving power. Refer to Chapter 2, Installing the Module, for instructions on installing the module.

For more details on status indicator operation, see page 9-2 and page 9-3.

Notes:

Configuring the Module

This chapter provides instructions and information for setting the parameters in the 1769-SM2 module.

For a list of parameters, refer to Appendix B, Module Parameters. For definitions of terms in this chapter, refer to the Glossary.

Determining I/O Image Size

Single Mode

When the module is in Single mode, the I/O image is comprised of a maximum of 7 words (Table 3.A).

Table 3.A I/O Image Table for Single Mode

Output Image	Input Image	Word		
		CH1	CH2	CH3
Module Control Word	Module Status Word	0		
Logic Command	Logic Status	1	3	5
Reference	Feedback	2	4	6

TIP: When using Single mode, it is recommended to set the I/O size to 7 Input words and 7 Output words. This accommodates one drive per channel, even if a channel is left unused for future use.

Multi-Drive Mode

When the module is in Multi-Drive mode, the I/O image is comprised of a maximum of 31 words (Table 3.B).

Table 3.B I/O Image Table for Multi-Drive Mode

	Output Image	Input Image	Word		
			CH1	CH2	CH3
	Module Control Word	Module Status Word	0		
Drive 0	Logic Command	Logic Status	1	11	21
	Reference	Feedback	2	12	22
Drive 1	Logic Command	Logic Status	3	13	23
	Reference	Feedback	4	14	24
Drive 2	Logic Command	Logic Status	5	15	25
	Reference	Feedback	6	16	26
Drive 3	Logic Command	Logic Status	7	17	27
	Reference	Feedback	8	18	28
Drive 4	Logic Command	Logic Status	9	19	29
	Reference	Feedback	10	20	30

TIP: When using Multi-Drive mode, it is recommended to set the I/O size to 31 Input words and 31 Output words. This accommodates up to 5 drives per channel, even if a channel is left unused for future use. Configure a smaller I/O size only if there is a limited amount of I/O available on a controller.

For additional information on configuring the I/O image size, refer to Chapter 4, Understanding the I/O Image.

Configuration Tools

The 1769-SM2 module stores parameters and other information in its own non-volatile memory. You must, therefore, access the module to view and edit its parameters. The following tools can be used to access the module parameters:

Tool	Refer to...
PowerFlex 4-Class HIM (22-HIM-A3 or 22-HIM-C2S)	Page 3-13
DriveExplorer Software (version 3.01 or higher)	http://www.ab.com/drives/driveexplorer, or DriveExplorer online help (installed with the software)
DriveExecutive Software (version 4.01 or higher)	http://www.ab.com/drives/drivetools, or DriveExecutive online help (installed with the software)
RSLogix 500	LG500-GR001
RSLogix 5000	9399-RLD300GR
RSNetWorx for DeviceNet	DNET-GR001

Configuration Methods

The 1769-SM2 module has two methods of configuration, which are determined by the Configuration Mode Switch (SW1 in Figure 2.1):

- Controller mode—The 1769-SM2 uses the configuration data downloaded from the controller on power-up and when the controller is placed in run mode. The data is configured using RSLogix 500, RSLogix 5000 or RSNetWorx for DeviceNet.
- Parameter mode—The 1769-SM2 uses its internal parameter settings to configure the module. The data is configured using an optional, external PowerFlex 4-Class HIM, DriveExplorer, or DriveExecutive.

Only one method can be selected, and it is used for all three channels.

Controller Mode

When the Configuration Mode Switch (SW1 in Figure 2.1) is in the default CONT (Controller) position, the 1769-SM2 uses the configuration data downloaded from the controller on power-up and when the controller is placed in run mode. Depending on the controller, configuration data is allocated and entered using RSLogix500 or RSLogix 5000.

Configuration Data

The 1769-SM2 module contains a set of 42 words of configuration data that is used to configure the module's behavior (Table 3.C). A software tool, such as RSLogix 500, RSLogix 5000 or RSNetWorx for DeviceNet is used to read/write the configuration data.

Table 3.C 1769-SM2 Module Configuration Data

Parameter Name	CH1	CH2	CH3
Idle Action	Word 0	Word 14	Word 28
Flt Cfg Logic	Word 1	Word 15	Word 29
Flt Cfg Ref	Word 2	Word 16	Word 30
DSI I/O Cfg	Word 3	Word 17	Word 31
Drive 0 Addr	Word 4	Word 18	Word 32
Drive 1 Addr	Word 5	Word 19	Word 33
Drive 2 Addr	Word 6	Word 20	Word 34
Drive 3 Addr	Word 7	Word 21	Word 35
Drive 4 Addr	Word 8	Word 22	Word 36
RTU Baud Rate	Word 9	Word 23	Word 37
RTU Format	Word 10	Word 24	Word 38
RTU Rx Delay	Word 11	Word 25	Word 39
RTU Tx Delay	Word 12	Word 26	Word 40
RTU Msg Timeout	Word 13	Word 27	Word 41

The configuration data directly correlates to the module parameters. Refer to Appendix B for more information.

Entering MicroLogix 1500 Configuration Data Using RSLogix 500 Before v6.30

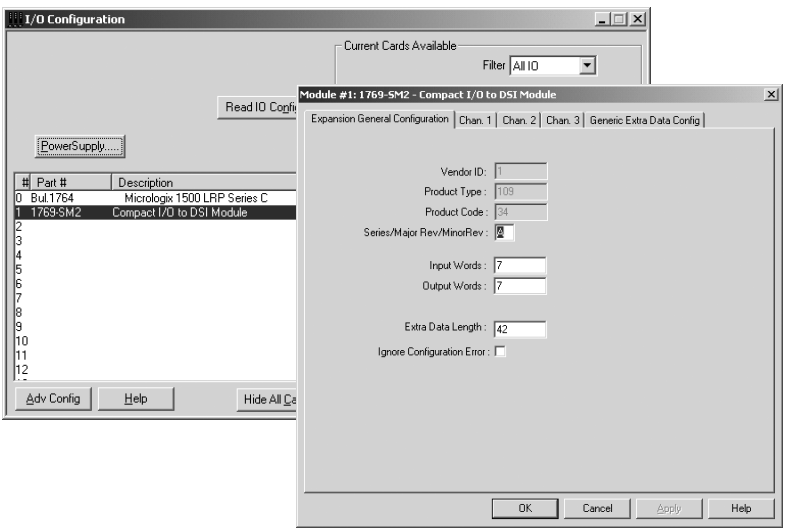
Earlier versions of RSLogix 500 can be used, but the configuration data must be entered in raw form in a Data Config table following the format in Table 3.C. However, RSLogix 500 v6.30 (or higher) is highly recommended for use with the 1769-SM2 because it contains a dedicated I/O configuration window for the module to simplify the configuration process. Version 6.30 is also required to perform explicit messaging, such as parameter reads/writes.

Entering MicroLogix 1500 Configuration Data Using RSLogix 500 v6.30 (or higher)

Allocate and enter the configuration data by performing these steps:

1. In the RSLogix 500 treeview, double-click on **I/O Configuration** to open the I/O Configuration window. Double-click the 1769-SM2 in the Current Cards Available list to add the module to the controller system. Select the "1769-SM2" row and click the **Adv Config** command button. The 1769-SM2 I/O Configuration window (Figure 3.1) appears.

Figure 3.1 I/O Configuration Window and Expansion General Configuration Screen

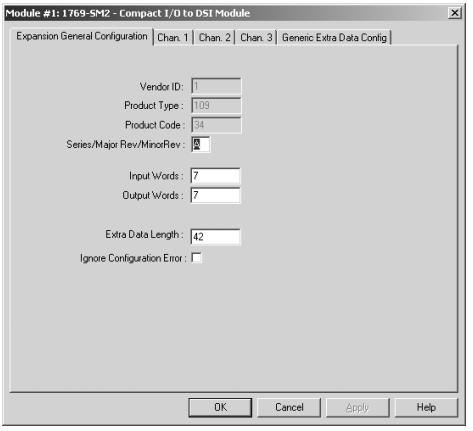


2. Enter the Series letter of the 1769-SM2, which can be determined by checking the data nameplate label on the module (item 9 in Figure 1.1).

   The I/O image of the module can be up to 31 words of Input and 31 words of Output, depending on the mode selected (Single or Multi-Drive) and the number of drives connected. A Single mode system with one drive on each channel requires 7 Input words and 7 Output words. A Multi-Drive mode system with five drives on each channel requires 31 Input words and 31 Output words. See Table 3.A or Table 3.B to determine the number of Input Words and Output Words to enter for your system.

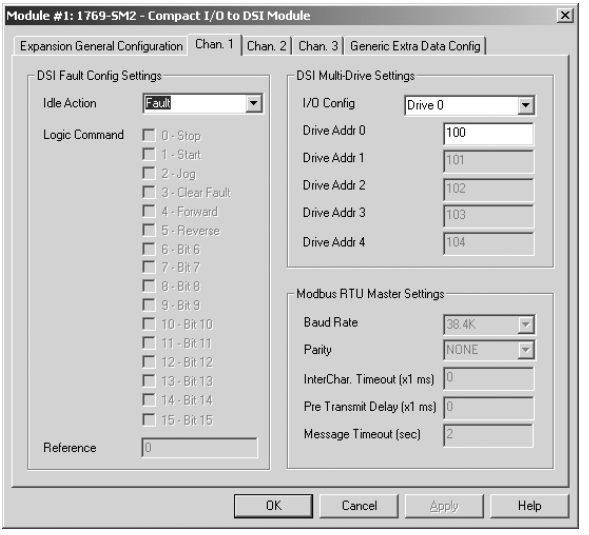
   The Extra Data Length field can only be set to a size of 0 or 42. If the controller will contain the configuration data for download to the 1769-SM2 module (Configuration Mode Switch SW1 set to CONT position), set this value to 42. If the configuration data will be contained in the 1769-SM2 parameters (Configuration Mode Switch SW1 set to PARAM position), this value should be set to 0. See Table 3.C for descriptions of these configuration words.

Figure 3.2 Expansion General Configuration Tab Screen



3. Click on the **Chan. 1** tab (Figure 3.3) and set the I/O Config data area accordingly. In this example, the 1769-SM2 is configured to fault if the controller is switched to Program mode, and one drive is connected at node address 100.

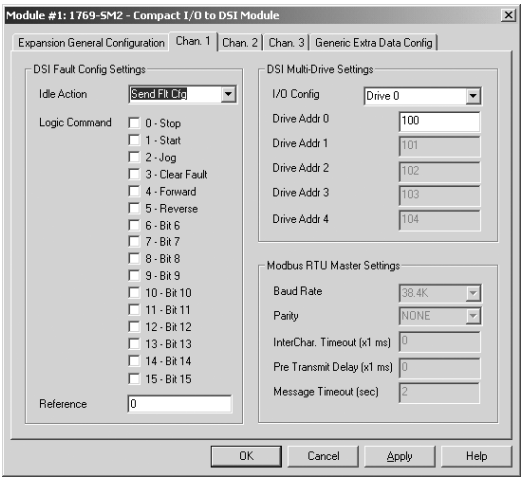
Figure 3.3 Chan. 1 Tab Data Example Screen



Important: When using Multi-Drive mode, the node addresses entered in the Drive Addr x fields must match the corresponding drive Parameter 104 - [Comm Node Addr] value in the PowerFlex 4-Class drives so that the 1769-SM2 module will communicate with the drives.

Note that the DSI Fault Config settings can only be accessed if the Idle Action is set to “Send Flt Cfg” (Figure 3.4).

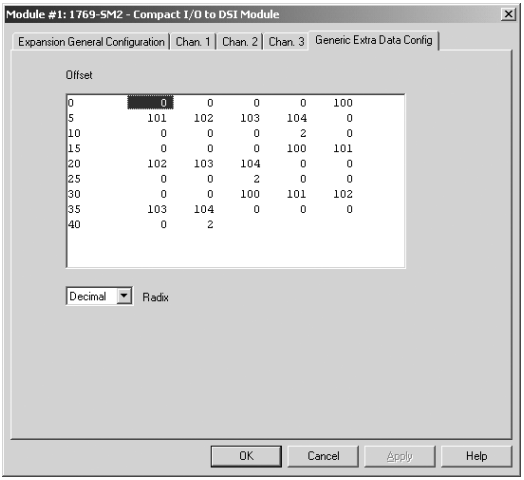
Figure 3.4 Chan. 1 Tab Data Screen with Idle Action - Send Flt Cfg Enabled



4. For each additional channel being used, select its respective tab, set the desired I/O configuration, and enable the appropriate idle action.

TIP: Alternatively, data can be entered on the Generic Extra Data Config tab (shown in Figure 3.5 for identification purposes only). However, with the easy-to-use Chan.1, Chan. 2, and Chan. 3 tabs, there is no need to enter data on the Generic Extra Data Config tab. But as a useful reference, this tab does show how the controller stores the data in the configuration words.

Figure 3.5 Generic Extra Data Config Tab Screen



See Table 3.C for descriptions of these configuration words.

5. Click **OK** when finished. The MicroLogix 1500 will download the configuration data to the 1769-SM2 module when the controller is placed in run mode.

Special Case— Data Entry for 2 Stop Bits Communication

The Chan.1, Chan. 2, and Chan 3 tabs do not allow settings that specify 2 stop bits communication in Modbus RTU operation. For this type of configuration, you must use the Generic Extra Data Config tab to enter the data by performing these steps:

1. To configure a specific 1769-SM2 module channel for 2 stop bits communication, click on the Generic Extra Data Config tab.

2. On the Generic Extra Data Config tab screen, enter the appropriate values from Table 3.D in the offset addresses highlighted in Figure 3.6.

Figure 3.6 Entering Data for 2 Stop Bits on Generic Extra Data Config Screen

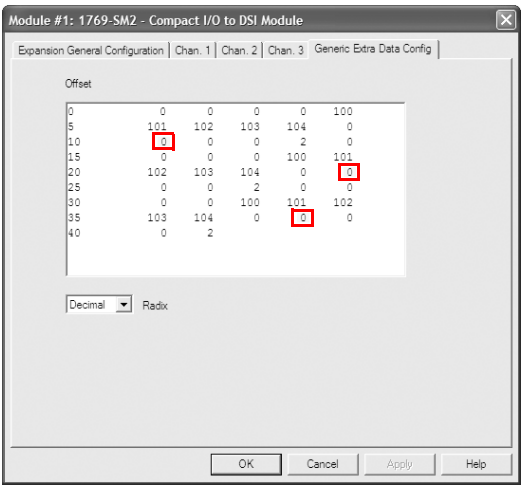
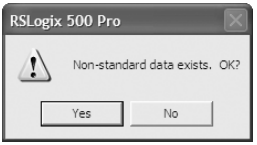


Table 3.D Entry Data for 2 Stop Bits Communication

1769-SM2 CH	Offset Address	Value	Description
1	10	3	Sets CH1 for 8-N-2 format
		4	Sets CH1 for 8-E-2 format
		5	Sets CH1 for 8-O-2 format
2	24	3	Sets CH2 for 8-N-2 format
		4	Sets CH2 for 8-E-2 format
		5	Sets CH2 for 8-O-2 format
3	38	3	Sets CH3 for 8-N-2 format
		4	Sets CH3 for 8-E-2 format
		5	Sets CH3 for 8-O-2 format

3. Click **OK** to apply the changes and close the screen. However, if you click **Apply** or leave this tab to go to another tab, you may see this message dialog box. If so, click **Yes** to apply the changes.

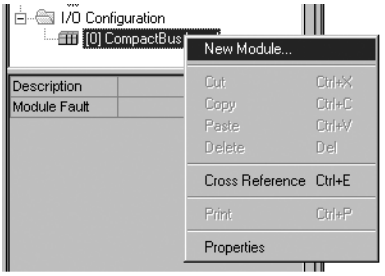


Entering CompactLogix Configuration Data Using RSLogix 5000 v10 (or higher)

Allocate and enter the configuration data by performing these steps:

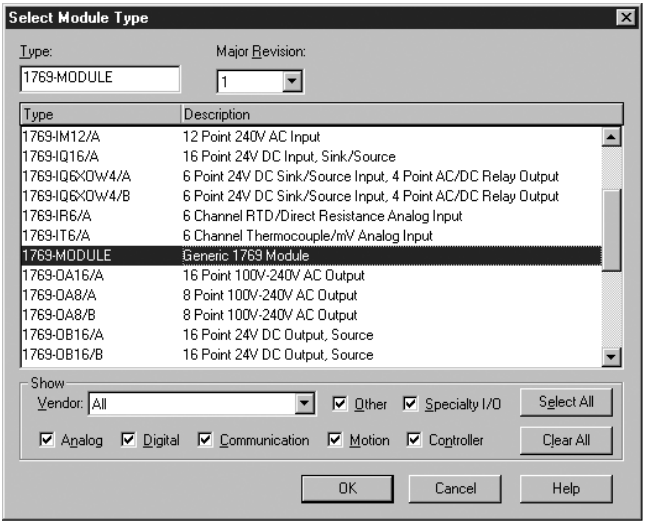
1. In the RSLogix 5000 treeview, right-click on **CompactBus Local** and select **New Module**.

Figure 3.7 Treeview Window with New Module Inset Screen



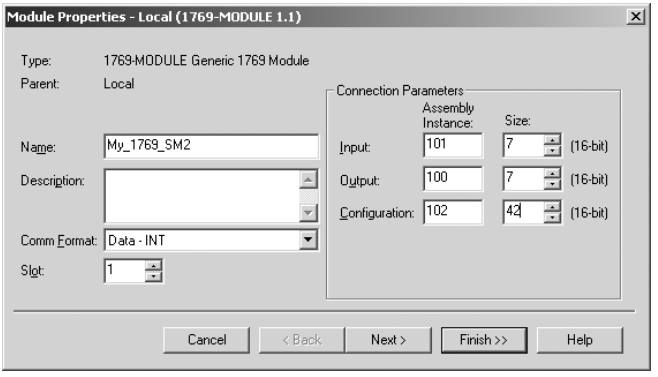
2. After the Select Module Type screen (Figure 3.8) appears, select the **1769-MODULE** and click **OK**.

Figure 3.8 Select Module Type Screen



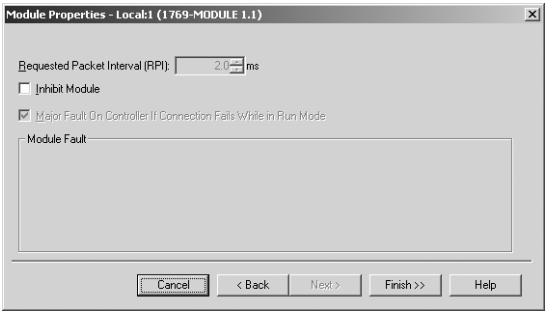
3. After the Module Properties screen (Figure 3.9) appears, enter a name for the module, such as "My_1769_SM2." Change the Comm Format to "Data - INT," which will enable the entry of Output Connection parameters (no longer grayed out). Enter the Slot location of the 1769-SM2. Enter the desired Input and Output word length (see Table 3.A or Table 3.B) and Configuration data size (Table 3.C). Click **Next >**.

Figure 3.9 Module Properties Screen



4. On the Module Properties last screen (Figure 3.10), click **Finish >>**.

Figure 3.10 Module Properties Last Screen

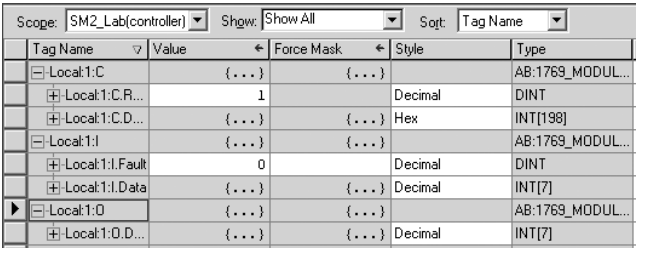


5. The treeview (Figure 3.11) now shows the 1769-MODULE.

Figure 3.11 RSLogix 5000 Treeview with Listed 1769-MODULE

6. Double-clicking on the **Controller Tags** or **Program Tags** in the treeview will display the various tags, including the tags for the 1769-SM2 module (Figure 3.12). Click on the **Monitor Tags** tab at the bottom of the window to enter the configuration data.

Figure 3.12 Controller Tags Screen



NOTE: RSLogix 5000 may create a data array that is much larger than the 42 words previously specified when the module was configured. Use words 0…41 and ignore all other words (42+). Refer to Table 3.C for configuration data words and parameter descriptions. Also note that the data entry format in Figure 3.12 is hexadecimal (16#). To change the format, click on the appropriate field in the "Style" column.

The CompactLogix will download the configuration data to the 1769-SM2 module on power-up.

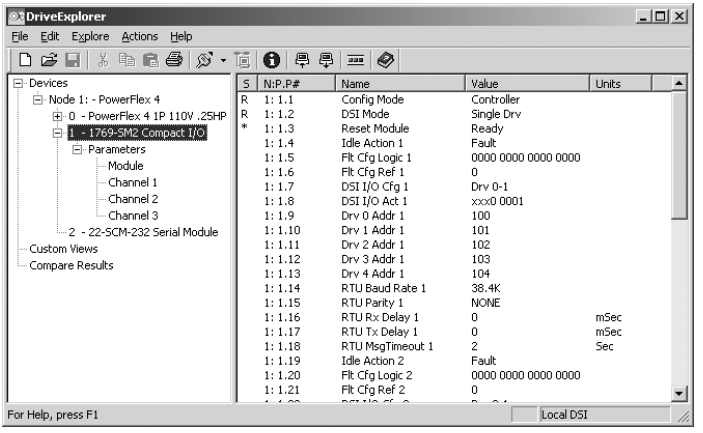
Parameter Mode

When the Configuration Mode Switch (SW1 in Figure 2.1) is in the PARAM (Parameter) position, the 1769-SM2 uses its internal parameter settings to configure the module. If any configuration data is downloaded by the controller, it will be ignored.

Important: When the Parameter mode is used, the configuration data size in the controller should be set to "0." See Controller Mode on page 3-3 for more information.

Host PowerFlex 4-Class drives can use this feature since connected DSI peripheral devices (optional, external PowerFlex 4-Class HIMs, DriveExplorer with 22-SCM-232, etc.) can access the 1769-SM2 module directly. However, the 1769-SM2 module must be set to Single mode for these DSI peripherals to work with the module.

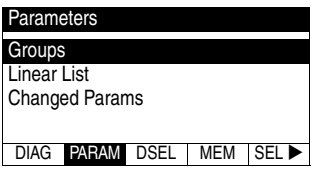
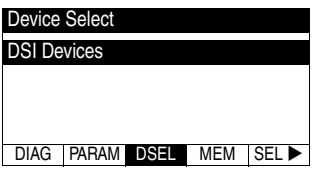
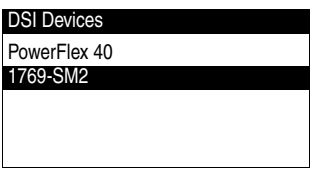
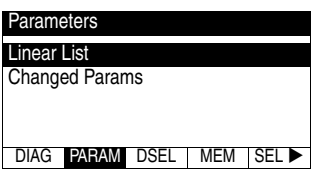
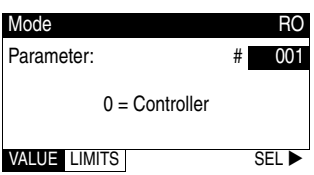
Figure 3.13 DriveExplorer Window with Mapped 1769-SM2 Compact I/O Module



Using the Optional, External PowerFlex 4-Class HIM

When using the 1769-SM2 module in Single mode, the optional, external PowerFlex 4-Class HIM (Human Interface Module) can be used to access its parameters. Basic steps to access module parameters using the HIM are shown in Table 3.E. For additional HIM information, refer to the *PowerFlex 4-Class HIM Quick Reference* (publication 22HIM-QR001).

Table 3.E Accessing Module Parameters Using the HIM (22-HIM-A3 or 22-HIM-C2S)

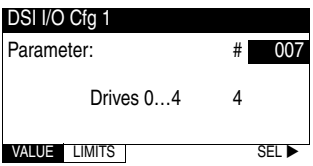
Step	Example Screens
1. Power up the drive. Then plug the external HIM into the bottom of the drive. The **Parameters** menu for the drive will be displayed.	
2. Press Sel key once to display the **Device Select** menu.	
3. Press (Enter) key to display the **DSI Devices** menu. Press Arrow to scroll to **1769-SM2**.	
4. Press (Enter) key to select the 1769-SM2. The **Parameters** menu for the module will be displayed.	
5. Press (Enter) key to access the parameters. Edit the module parameters using the same techniques that you use to edit drive parameters.	

Setting the I/O Configuration (Multi-Drive Mode Only)

The I/O configuration sets the number of drives that are connected to each channel. When the 1769-SM2 module is used in Single mode (Operating Mode Switch SW2 set to “1X”), only one PowerFlex 4-Class drive can be connected to each channel and module **Parameters 07 - [DSI I/O Cfg 1]**, **22 - [DSI I/O Cfg 2]**, and **37 - [DSI I/O Cfg 3]** have no effect. When the module is used in Multi-Drive mode (Operating Mode Switch set to “5X”), up to five PowerFlex 4-Class drives can be connected to each channel. When a channel is selected for Modbus RTU Master operation, up to 31 devices can be connected.

1. Set the value in **Parameters 07 - [DSI I/O Cfg 1]**, **22 - [DSI I/O Cfg 2]**, and **37 - [DSI I/O Cfg 3]** to respectively configure each module channel for the number of drives being used in Multi-Drive mode.

Figure 3.14 Example I/O Cfg Screen for CH1 Drive(s) in Multi-Drive Mode



Value	Description	Mode Switch Position	
		Single	Multi-Drive
0	Drive 0 (Default)	✓	✓
1	Drives 0…1	Not Applicable	✓
2	Drives 0…2		✓
3	Drives 0…3		✓
4	Drives 0…4		✓
5	RTU Master		✓

Each drive (Drive 0, Drive 1, etc.) on the node must be assigned a node address [see Setting Drive Node Addresses (Multi-Drive Mode Only) on page 3-16]. For more information on Multi-Drive mode and RTU Master mode, refer to the Multi-Drive Mode section in the chapter corresponding to your controller type:

- Chapter 6, MicroLogix 1500 Example Ladder Programs
- Chapter 7, CompactLogix Example Ladder Programs
- Chapter 8, ControlLogix w/1769-ADN DeviceNet Example Ladder Program

2. Configure the parameters in each enabled drive to accept the Logic Command and Reference from the 1769-SM2 module. For example, set PowerFlex 4/40/400 drive Parameters 36 - [Start Source] and 38 - [Speed Reference] to “5” (Comm Port) so that the drive uses the Reference from the 1769-SM2 module.

3. Reset the module (see Resetting the Module on page 3-20).

Setting an Idle Action (Single and Multi-Drive Mode)

By default, when the controller is idle, the drive responds by faulting when using I/O from the 1769-SM2 module. You can respectively configure a different response to an idle controller using **Parameters 04 - [Idle Action 1]**, **19 - [Idle Action 2]**, and **34 - [Idle Action 3]** for each channel's connected drives.

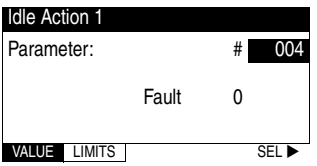
ATTENTION: Risk of injury or equipment damage exists. **Parameters 04 - [Idle Action 1]**, **19 - [Idle Action 2]**, and **34 - [Idle Action 3]** let you determine the action of each respective channel's connected PowerFlex 4-Class drives when the controller is idle. By default, each parameter faults its respective channel's drives. You can set each parameter so that the respective channel's drives continue to run. Precautions should be taken to ensure that the settings of these parameters do not create a hazard of injury or equipment damage.

Changing the Idle Action

Set the values of **Parameters 04 - [Idle Action 1]**, **19 - [Idle Action 2]**, and **34 - [Idle Action 3]** to the desired responses:

Value	Action	Description
0	Fault (default)	The drive(s) is faulted and stopped. (Default)
1	Stop	The drive(s) is stopped, but not faulted.
2	Zero Data	The drive(s) is sent 0 for Logic Command and Reference after a communications disruption. This does not command a stop.
3	Hold Last	The drive(s) continues in its present state after a communications disruption.
4	Send Flt Cfg	The drive(s) is sent the data that you set in the fault configuration parameters. For: CH1 drives, Parameters 05 - [Flt Cfg Logic 1] and 06 - [Flt Cfg Ref 1] CH2 drives, Parameters 20 - [Flt Cfg Logic 2] and 21 - [Flt Cfg Ref 2] CH3 drives, Parameters 35 - [Flt Cfg Logic 3] and 36 - [Flt Cfg Ref 3]

Figure 3.15 Example Idle Action HIM Screen for CH1 Drive(s)



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

Important: In Multi-Drive mode, the same fault action is used by all of that channel's connected drives (Drive 0…Drive 4).

ATTENTION: Idle Action is NOT available for RTU Master operation in Multi-Drive mode. The connected RTU Slave devices will take their respective internal fault actions in response to receiving no communications from the 1769-SM2 module.

Setting the Fault Configuration Parameters

If you set **Parameter 04 - [Idle Action 1]**, **19 - [Idle Action 2]**, or **34 - [Idle Action 3]** to "Send Flt Cfg," the values in the following 1769-SM2 module parameters are sent to the drive after an idle action occurs. You must set these parameters to values required by your application.

Parameter No.				
CH1	CH2	CH3	Name	Description
05	20	35	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command. Refer to Appendix D for a description of the Logic Command bits.
06	21	36	Flt Cfg Ref	A 16-bit value sent to the drive as a Reference. Format is: xxx.x Hz. for PowerFlex 4/4M/40/40P drives xxx.xx Hz. for PowerFlex 400 drives

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

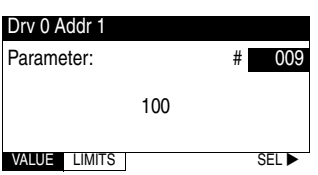
Setting Drive Node Addresses (Multi-Drive Mode Only)

When using the 1769-SM2 module in Multi-Drive mode, a unique node address must be set for each drive. Use the following parameters to set the drive node addresses:

For CH1 Drives	**Parameters 09 - [Drv 0 Addr 1]** through **13 - [Drv 4 Addr 1]**
For CH2 Drives	**Parameters 24 - [Drv 0 Addr 2]** through **28 - [Drv 4 Addr 2]**
For CH3 Drives	**Parameters 39 - [Drv 0 Addr 3]** through **43 - [Drv 4 Addr 3]**

Important: The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).

Figure 3.16 Example Node Address HIM Screen for CH1 Drive 0



Default: 100
Minimum: 1
Maximum: 247

Configuring the Modbus RTU Master Parameters

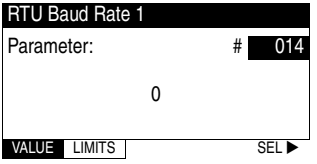
In Multi-Drive mode, any module channel can be configured for RTU Master operation by setting **Parameter 07 - [DSI I/O Cfg 1]**, **22 - [DSI I/O Cfg 2]** or **37 - [DSI I/O Cfg 3]** to "5" (RTU Master). When doing this, additional Modbus RTU Master parameters must be set to complete that channel's configuration.

Setting the RTU Baud Rate

By default, each channel set for RTU Master operation uses a 38.4K baud rate. The values of **Parameters 14 - [RTU Baud Rate 1]**, **29 - [RTU Baud Rate 2]**, and **44 - [RTU Baud Rate 3]** set the specific baud rate used by the respective channel to communicate.

1. Set the values of **Parameters 14 - [RTU Baud Rate 1]**, **29 - [RTU Baud Rate 2]**, and **44 - [RTU Baud Rate 3]** to the specific baud rate at which that channel communicates.

Figure 3.17 Example RTU Baud Rate HIM Screen for CH1 Drives



Value	Baud Rate
0	38.4K bits/sec (default)
1	19200 bits/sec
2	9600 bits/sec
3	4800 bits/sec
4	2400 bits/sec
5	1200 bits/sec
6	600 bits/sec
7	300 bits/sec

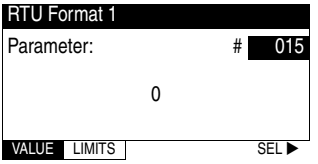
2. Reset the module (see Resetting the Module on page 3-20).

Selecting the RTU Format

By default, each channel set for RTU Master operation uses an RTU format of 8-N-1. The RTU format consists of data bits (8 data bits only), parity (None, Even or Odd), and stop bits (1 or 2).

1. Set the values of **Parameters 15 - [RTU Format 1]**, **30- [RTU Format 2]**, and **45 - [RTU Format 3]** to match the communication format required for the respective channel.

Figure 3.18 Example RTU Format HIM Screen for CH1 Drives



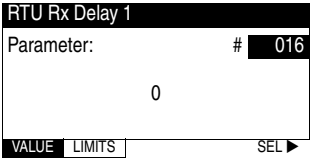
Value	Format
0	8-N-1 (default)
1	8-E-1
2	8-O-1
3	8-N-2
4	8-E-2
5	8-O-2

2. Reset the module (see Resetting the Module on page 3-20).

Setting the RTU Rx Delay Time

1. Set the values of **Parameters 16 - [RTU Rx Delay 1]**, **31- [RTU Rx Delay 2]**, and **46 - [RTU Rx Delay 3]** to establish the inter-character delay time that detects the end of a receive packet for the respective channel.

Figure 3.19 Example RTU Rx Delay HIM Screen for CH1 Drives



Default: 0 milliseconds
Minimum: 0 milliseconds
Maximum: 500 milliseconds

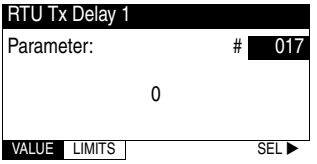
TIP: If the Modbus RTU slave is a PowerFlex 4-Class drive, set the value of **[RTU Rx Delay x]** to 2 milliseconds when the value of **[RTU Baud Rate x]** is 19200.

2. Reset the module (see Resetting the Module on page 3-20).

Setting the RTU Tx Delay Time

1. Set the values of **Parameters 17 - [RTU Tx Delay 1]**, **32- [RTU Tx Delay 2]**, and **47 - [RTU Tx Delay 3]** to establish the inter-frame delay time that delays the sending of a transmit packet for the respective channel.

Figure 3.20 Example RTU Tx Delay HIM Screen for CH1 Drives



Default: 0 milliseconds
Minimum: 0 milliseconds
Maximum: 500 milliseconds

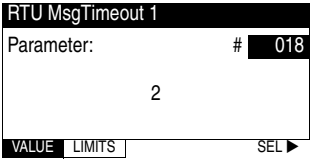
TIP: If the Modbus RTU slave is a PowerFlex 4-Class drive, set the value of **[RTU Tx Delay x]** to 8 milliseconds when the value of **[RTU Baud Rate x]** is 19200.

2. Reset the module (see Resetting the Module on page 3-20).

Setting the RTU Message Timeout

1. Set the values of **Parameters 18 - [RTU MsgTimeout 1]**, **33- [RTU MsgTimeout 2]**, and **48 - [RTU MsgTimeout 3]** to establish the amount of time that the module will wait for a response from the respective channel's drives.

Figure 3.21 Example RTU MsgTimeout HIM Screen for CH1 Drives



Default: 2 seconds
Minimum: 0 seconds
Maximum: 60 seconds

Important: The RTU Message Timeout value must be considered when determining the timeout values in the slave nodes. For example, if five RTU messages are being sent to a slave node and the slave is powered down, the overall network cycle time can increase by as much as 10 seconds (5 messages x 2 seconds timeout for each slave node).

2. Reset the module (see Resetting the Module on page 3-20).

TIP: When configured for RTU Master operation, the RTU Slave addresses do not get assigned with parameter values. The Slave address is contained in the message data as described in Chapter 5.

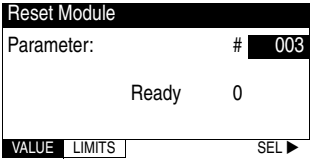
Resetting the Module

Changes to switch settings and some module parameters require that you reset the 1769-SM2 module before the new settings take effect. You can reset the module by cycling power to the module or by using **Parameter 03 - [Reset Module]**.

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

Set **Parameter 03 - [Reset Module]** to “1” (Reset Module):

Figure 3.22 Example Reset Module HIM Screen

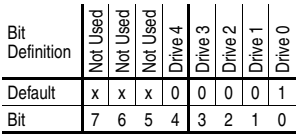
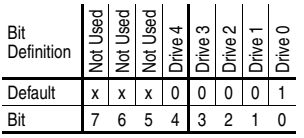
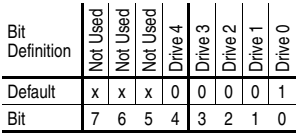


Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

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

Viewing the Module Status Using Parameters

The following parameters provide information about the status of the 1769-SM2 module. You can view these parameters at any time.

Parameter	Description
01 - [Config Mode]	The module configuration mode (Controller or Parameters).
02 - [DSI Mode]	The module operating mode (Single or Multi-Drive).
08 - [DSI I/O Act 1]	The CH1 drives that are active in Multi-Drive mode. 
09 - [Drv 0 Addr 1] **10 - [Drv 1 Addr 1]** **11 - [Drv 2 Addr 1]** **12 - [Drv 3 Addr 1]** **13 - [Drv 4 Addr 1]**	The node addresses of the daisy-chained CH1 drives (only when in Multi-Drive mode). **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).
23 - [DSI I/O Act 2]	The CH2 drives that are active in Multi-Drive mode. 
24 - [Drv 0 Addr 2] **25 - [Drv 1 Addr 2]** **26 - [Drv 2 Addr 2]** **27 - [Drv 3 Addr 2]** **28 - [Drv 4 Addr 2]**	The node addresses of the daisy-chained CH2 drives (only when module is operated in Multi-Drive mode). **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).
38 [DSI I/O Act 3]	The CH3 drives that are active in Multi-Drive mode. 
39 - [Drv 0 Addr 3] **40 - [Drv 1 Addr 3]** **41 - [Drv 2 Addr 3]** **42 - [Drv 3 Addr 3]** **43 - [Drv 4 Addr 3]**	The node addresses of the daisy-chained CH3 drives (only when module is operated in Multi-Drive mode). **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).

Flash Updating the Module

The adapter can be flash updated over the network (via EtherNet/IP using DriveExplorer Full only) or serially through a direct connection from a computer to the drive using a 1203-USB converter or 22-SCM-232 serial converter module (firmware v2.005 or higher).

Not all flash methods (DriveExplorer Lite/Full, ControlFLASH or HyperTerminal) can be used successfully in all cases. Depending on the controller and the operating mode of the 1769-SM2 module, these flash methods can be used:

Controller	1769-SM2 Operating Mode	Flash Methods to Use
MicroLogix 1500	Single	DriveExplorer Lite/Full, ControlFLASH or HyperTerminal via a 1203-USB or 22-SCM-232 converter
	Multi-Drive	Must first change the 1769-SM2 operating mode from Multi-Drive to Single before flashing. Then flash using any of the methods listed in the row above.
CompactLogix	Single	• DriveExplorer Lite/Full, ControlFLASH or HyperTerminal via a 1203-USB or 22-SCM-232 converter • ControlFLASH via the CompactLogix controller backplane
	Multi-Drive	ControlFLASH via the CompactLogix controller backplane

Important: In ALL cases, the controller must be set to Program mode—not the Run mode—to successfully flash the 1769-SM2 module.

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

Understanding the I/O Image

This chapter provides information and examples of the 1769-SM2 module I/O image, including Module Control/Status, Logic Command/ Status, and Reference/Feedback.

The I/O image for the 1769-SM2 module varies based on its selected operating mode (Single or Multi-Drive), and the settings for **Parameters 07 - [DSI I/O Cfg 1]**, **22 - [DSI I/O Cfg 2]**, and **37 - [DSI I/O Cfg 3]**.

Table 4.A 1769-SM2 Module I/O Image Table for Single Mode

Output Image	Input Image	Word		
		CH1	CH2	CH3
Module Control Word	Module Status Word	0		
Logic Command	Logic Status	1	3	5
Reference	Feedback	2	4	6

Table 4.B 1769-SM2 Module I/O Image Table for Multi-Drive Mode

	Output Image	Input Image	Word		
			CH1	CH2	CH3
	Module Control Word	Module Status Word	0		
Drive 0	Logic Command	Logic Status	1	11	21
	Reference	Feedback	2	12	22
Drive 1	Logic Command	Logic Status	3	13	23
	Reference	Feedback	4	14	24
Drive 2	Logic Command	Logic Status	5	15	25
	Reference	Feedback	6	16	26
Drive 3	Logic Command	Logic Status	7	17	27
	Reference	Feedback	8	18	28
Drive 4	Logic Command	Logic Status	9	19	29
	Reference	Feedback	10	20	30

Note that the I/O words for each channel are contiguous, keeping the required I/O space to a minimum. For example, to connect one PowerFlex 40 drive in Single mode and perform control (Logic Command/Status and Reference/Feedback), only 3 words of I/O are

needed. Likewise, five PowerFlex drives on CH1 in Multi-Drive mode using control would require 11 words of I/O.

TIP: To minimize the number of I/O words needed, connect the drive(s) starting with CH1, followed by CH2, and then CH3.

Table 4.C 1769-SM2 Module I/O Image Examples

Operating Mode	CH1 Parameter 07 - [DSI I/O Cfg 1]	CH2 Parameter 22 - [DSI I/O Cfg 2]	CH3 Parameter 37 - [DSI I/O Cfg 3]	Maximum I/O Words Used	Maximum Drives Connected
Single	"0" (Drive 0)	"0" (Drive 0)	"0" (Drive 0)	7	3 (1/channel)
Multi-Drive	"0" (Drive 0)	"0" (Drive 0)	"0" (Drive 0)	23	3 (1/channel)
	"4" (Drive 0…4)	"0" (Drive 0)	"0" (Drive 0)	23 (1)	7 (5/CH1, 1/CH2, and 1/CH3)
	"4" (Drive 0…4)	"4" (Drive 0…4)	"0" (Drive 0)	23 (2)	11 (5/CH1, 5/CH2, and 1/CH3)
	"4" (Drive 0…4)	"4" (Drive 0…4)	"4" (Drive 0…4)	31	15 (5/each CH)

(1) If CH2 and CH3 would not be used (only 5 drives connected to CH1), the I/O size in the RSLogix 500/5000 module configuration window could be set to "11" instead of "23" to save I/O space.

(2) If CH3 would not be used (only CH1 and CH2 have 5 drives each), the I/O size in the RSLogix 500/5000 module configuration window could be set to "21" instead of "23" to save I/O space.

Module Control Word

The Module Control Word (output word 0) is used for all channels, where:

Bit #	Name	Description
0	Channel 1 Enable	"0" = Disables sending output data (Logic Command/ Reference) to the respective channel's drive(s). All input (Logic Status/Feedback) data is zeroed ("0") to indicate that the data is no longer being updated.
1	Channel 2 Enable	
2	Channel 3 Enable	"1" = Enables sending output data (Logic Command/ Reference) to the respective channel's drive(s). All respective input data will also be updated.
3...15	Not used	Reserved for future use.

The Module Control Word is a "master" enable/disable switch for communications on each channel when using the module in Single or Multi-Drive mode (only DSI operation). The actual output/input data being sent/received is determined by **Parameter 07 - [DSI I/O Cfg 1]**, **Parameter 22 - [DSI I/O Cfg 2]**, and **Parameter 37 - [DSI I/O Cfg 3]**.

Important: If the Channel "x" Enable bit is transitioned from ON (1) to OFF (0), the connected PowerFlex 4-Class drives will fault.

The Channel "x" Enable bits are not used when the module is configured for Modbus RTU Master operation in Multi-Drive mode.

Module Status Word

The Module Status Word (input word 0) is used for all channels, where:

Bit #	Bit Name	Description
0	CH1 Logic Status 0 Valid	“0” = Logic Status/Feedback data for CH1 Drive 0 is not valid “1” = Logic Status/Feedback data for CH1 Drive 0 is valid
1	CH1 Logic Status 1 Valid	“0” = Logic Status/Feedback data for CH1 Drive 1 is not valid “1” = Logic Status/Feedback data for CH1 Drive 1 is valid
2	CH1 Logic Status 2 Valid	“0” = Logic Status/Feedback data for CH1 Drive 2 is not valid “1” = Logic Status/Feedback data for CH1 Drive 2 is valid
3	CH1 Logic Status 3 Valid	“0” = Logic Status/Feedback data for CH1 Drive 3 is not valid “1” = Logic Status/Feedback data for CH1 Drive 3 is valid
4	CH1 Logic Status 4 Valid	“0” = Logic Status/Feedback data for CH1 Drive 4 is not valid “1” = Logic Status/Feedback data for CH1 Drive 4 is valid
5	CH2 Logic Status 0 Valid	“0” = Logic Status/Feedback data for CH2 Drive 0 is not valid “1” = Logic Status/Feedback data for CH2 Drive 0 is valid
6	CH2 Logic Status 1 Valid	“0” = Logic Status/Feedback data for CH2 Drive 1 is not valid “1” = Logic Status/Feedback data for CH2 Drive 1 is valid
7	CH2 Logic Status 2 Valid	“0” = Logic Status/Feedback data for CH2 Drive 2 is not valid “1” = Logic Status/Feedback data for CH2 Drive 2 is valid
8	CH2 Logic Status 3 Valid	“0” = Logic Status/Feedback data for CH2 Drive 3 is not valid “1” = Logic Status/Feedback data for CH2 Drive 3 is valid
9	CH2 Logic Status 4 Valid	“0” = Logic Status/Feedback data for CH2 Drive 4 is not valid “1” = Logic Status/Feedback data for CH2 Drive 4 is valid
10	CH3 Logic Status 0 Valid	“0” = Logic Status/Feedback data for CH3 Drive 0 is not valid “1” = Logic Status/Feedback data for CH3 Drive 0 is valid
11	CH3 Logic Status 1 Valid	“0” = Logic Status/Feedback data for CH3 Drive 1 is not valid “1” = Logic Status/Feedback data for CH3 Drive 1 is valid
12	CH3 Logic Status 2 Valid	“0” = Logic Status/Feedback data for CH3 Drive 2 is not valid “1” = Logic Status/Feedback data for CH3 Drive 2 is valid
13	CH3 Logic Status 3 Valid	“0” = Logic Status/Feedback data for CH3 Drive 3 is not valid “1” = Logic Status/Feedback data for CH3 Drive 3 is valid
14	CH3 Logic Status 4 Valid	“0” = Logic Status/Feedback data for CH3 Drive 4 is not valid “1” = Logic Status/Feedback data for CH3 Drive 4 is valid
15	Config Valid	“1” = The module has a valid configuration

The data valid bits (0…14) can be used in the ladder program to determine if the received data is valid and can be used. Bit 15 provides diagnostic feedback on the status of the 1769-SM2 module configuration.

When the module is configured for RTU Master operation in Multi-Drive mode, bits 0…14 are not used and will be “0.”

Using Logic Command/Status

The *Logic Command* is a 16-bit word of control data produced by the controller and consumed by the 1769-SM2 module. The *Logic Status* is a 16-bit word of status data produced by the 1769-SM2 module and consumed by the controller.

This manual contains the bit definitions for compatible products available at the time of publication in Appendix D. For other products, refer to their documentation.

Using Reference/Feedback

The *Reference* (16 bits) is produced by the controller and consumed by the 1769-SM2 module. The *Feedback* (16 bits) is produced by the 1769-SM2 module and consumed by the controller.

Valid Reference/Feedback values for PowerFlex 4-Class drives are:

Size	Drive	Valid Values (1)
16-bit	PowerFlex 4	-240.0…240.0 Hz
	PowerFlex 4M	
	PowerFlex 40	-400.0…400.0 Hz
	PowerFlex 40P	
	PowerFlex 400	-320.00…320.00 Hz

(1) The Reference/Feedback for a PowerFlex 4-Class drive is set in Hz and not in engineering units like PowerFlex 7-Class drives. For example, “300” equates to 30.0 Hz (the decimal point is always implied) for all PowerFlex 4-Class drives—except PowerFlex 400 for which “3000” equates to 30.00 Hz. In all cases, a minus value equates to reverse motor direction, and a plus value equates to forward motor direction.

Understanding Explicit Messaging

This chapter provides information about explicit messaging.

Explicit messaging is used to read/write data that is not part of the module's I/O Image (Chapter 4), such as:

- Reading/writing drive parameters.
- Operating as a Modbus RTU Master and initiating Request/Response messages to Modbus RTU Slave devices, such as PowerFlex 7-Class drives with 20-COMM-H adapters.

The following table shows various products that can be used with the 1769-SM2 module and whether they support explicit messaging:

Products	Supports Explicit Messaging	
	Yes	No
MicroLogix 1500 LRP Series A and B, and LSP processors		✔
MicroLogix 1500 LRP Series C (or newer) and RSLogix 500 v6.30 (or higher) **Important:** This LRP processor supports messaging only for the first two I/O modules capable of messaging.	✔	
RSLogix 500 versions prior to v6.30		✔
Enhanced CompactLogix processors such as the -L31, -L32E, and -L35E	✔	
CompactLogix -L20 and -L30 processors		✔
1769-ADN DeviceNet adapter (see documentation for possible future explicit messaging support)		✔

Contact your local Rockwell Automation, Inc. representative for inquiries about the explicit message capabilities of products not specified above.

ATTENTION: Hazard 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 life cycle and cause the drive to malfunction. Do not create a program that frequently uses Explicit Messages to write parameter data to NVS.

Formatting Explicit Messages

For RSLogix 500, format each message as shown in Figure 5.1 and see Table 5.A for a description of the data required in each field. For RSLogix 5000, format each message as shown in Figure 5.2 and see Table 5.B.

Figure 5.1 RSLogix 500 Explicit Message Setup Screen

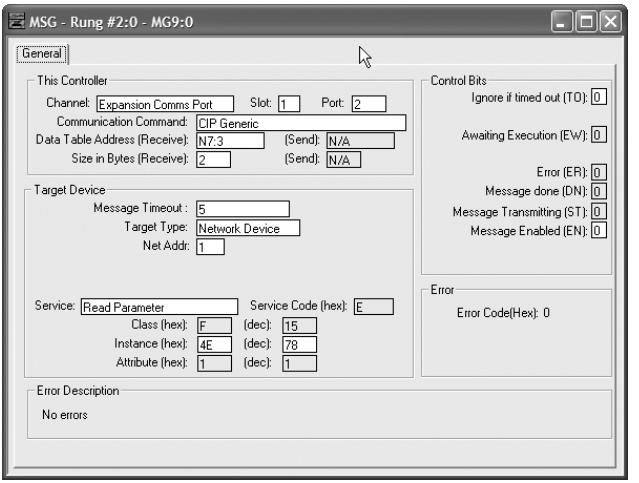


Table 5.A RSLogix 500 Explicit Message Configuration Data

This Controller Section	Description
Channel	Always use “Expansion Comms Port.”
Slot	The chassis slot occupied by the 1769-SM2 module.
Port	Always set to “2.” **Note:** This field was not configurable in earlier versions of RSLogix 500.
Communication Command	Always use “CIP Generic.”
Data Table Address (Receive)	The file and element where response service data (if any) is stored.
Size in Bytes (Receive)	Number of bytes of response service data (if any).
Data Table Address (Send)	The file and element where request service data (if any) is stored.
Size in Bytes (Send)	Number of bytes of request service data (if any).
Target Device Section	**Description**
Message Timeout	The timeout delay in seconds.
Target Type	Always use “Network Device.”
Net Addr	The number of the channel (1…3) on the 1769-SM2 module where the message will be sent. **Note:** This field was called “Channel” in earlier versions of RSLogix 500.
Service (Text or hex)	Code for the requested service.
Class (hex or dec)	The Class ID.
Instance (hex or dec)	Instance number is the same as the parameter number.
Attribute (hex or dec)	Attribute number.

Figure 5.2 RSLogix 5000 Explicit Message Setup Screen

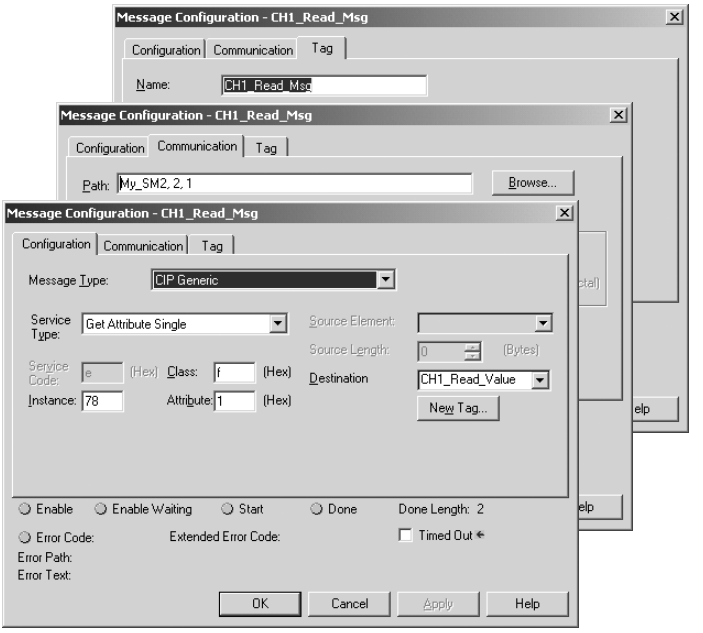


Table 5.B RSLogix 5000 Explicit Message Configuration Data

Configuration Tab	**Description**
Message Type	Always use “CIP Generic.”
Service Type	The service is used to read/write a parameter value.
Service Code	Code for the requested service.
Class	Class ID for the DSI Parameter Object.
Instance	Instance number in the Class.
Attribute	Attribute number of the Instance.
Source Element	Source of the request service data.
Source Length	Length of the request service data.
Destination	Location where the response service data (if any) is stored.
Communication Tab	**Description**
Path	Format is <Name of Module>,2,n — where “n” equals the channel number (1…3) on the 1769-SM2.
Tag Tab	**Description**
Name	The name for the message instruction.

Table 5.C shows the instance numbers to be used for message configuration:

Table 5.C Instance Numbers for Message Configuration

Instances (Dec.)	Single Mode	Multi-Drive Mode
0…16383	Instances 0…1023 in drive/module (1)	Instances 0…1023 in module
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in drive	Instances 0…1023 in Drive 0
18432…19455	Not supported	Instances 0…1023 in Drive 1
19456…20479	Not supported	Instances 0…1023 in Drive 2
20480…21503	Not supported	Instances 0…1023 in Drive 3
21504…22527	Not supported	Instances 0…1023 in Drive 4

(1) The module parameters are appended to the drive parameters for this range of instances.

Instance “1” typically equates to parameter 1. For example, when using the 1769-SM2 module in Single mode, instance “17409” is for parameter 1 in the drive.

NOTE: Instance Attribute 1 is used to access the parameter value. For additional information, refer to the CIP Parameter Object on page C-4.

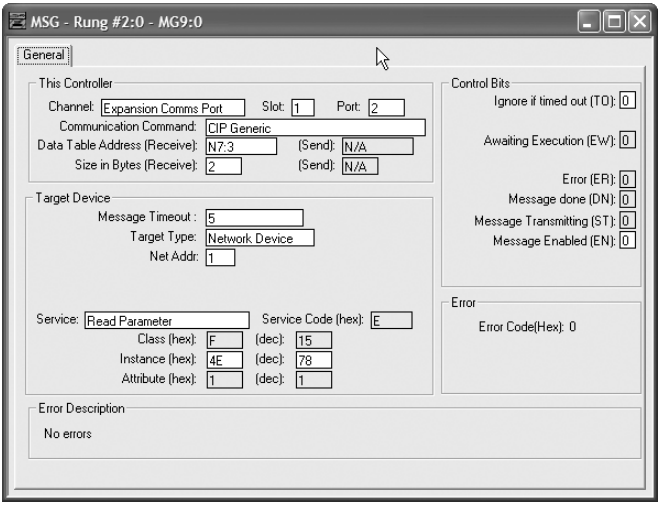
RSLogix 500 Parameter Read/Write Examples

In this example, a read and a write of PowerFlex 40 drive **Parameter 78 - [Jog Frequency]** is being done.

The RSLogix 500 Message Configuration screen example to read a parameter is shown in Figure 5.3. It is assumed that the 1769-SM2 module occupies slot 1 and is operated in Single mode, and that the drive is connected to CH1.

See Table 5.A for descriptions of the message configuration data.

Figure 5.3 RSLogix 500 Example Message Setup Screen to Read a Parameter

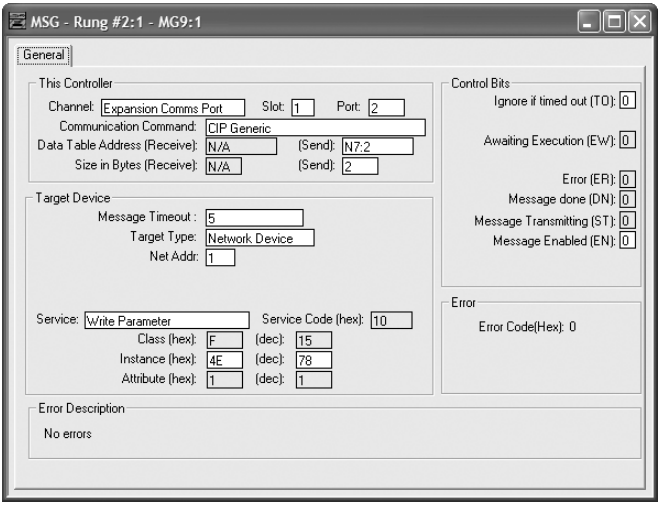


The response data for the message is stored at Data Table Address N7:3. The Size in Bytes of the response data is 2 bytes because the data size for PowerFlex 40 drive **Parameter 78 - [Jog Frequency]** is 2 bytes (1 word). No Data Table Address is specified for the request data, since the Read Parameter service has no request data.

The RSLogix 500 Message Configuration example screen to write to a parameter is shown in Figure 5.4. It is assumed that the 1769-SM2 module occupies slot 1 and is operated in Single mode, and that the drive is connected to CH1.

See Table 5.A for descriptions of the message configuration data.

Figure 5.4 RSLogix 500 Example Message Setup Screen to Write to a Parameter



The request data for the message is stored at Data Table Address N7:2. The Size in Bytes of the request data is 2 bytes because the data size for PowerFlex 40 drive **Parameter 78 - [Jog Frequency]** is 2 bytes (1 word). No Data Table Address is specified for the response data, since the Write Parameter service has no response data.

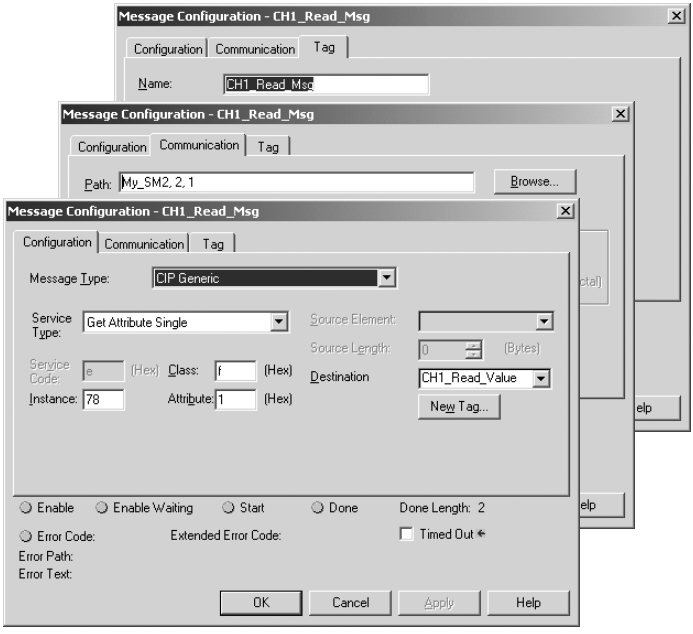
RSLogix 5000 Parameter Read/Write Examples

In this example, a read and a write of PowerFlex 40 drive **Parameter 78 - [Jog Frequency]** is being done.

The RSLogix 5000 Message Configuration example screen to read a parameter is shown in Figure 5.5. It is assumed that the 1769-SM2 module occupies slot 1 and is operated in Single mode, and that the drive is connected to CH1.

See Table 5.B for descriptions of the message configuration data.

Figure 5.5 RSLogix 5000 Example Message Setup Screen to Read a Parameter

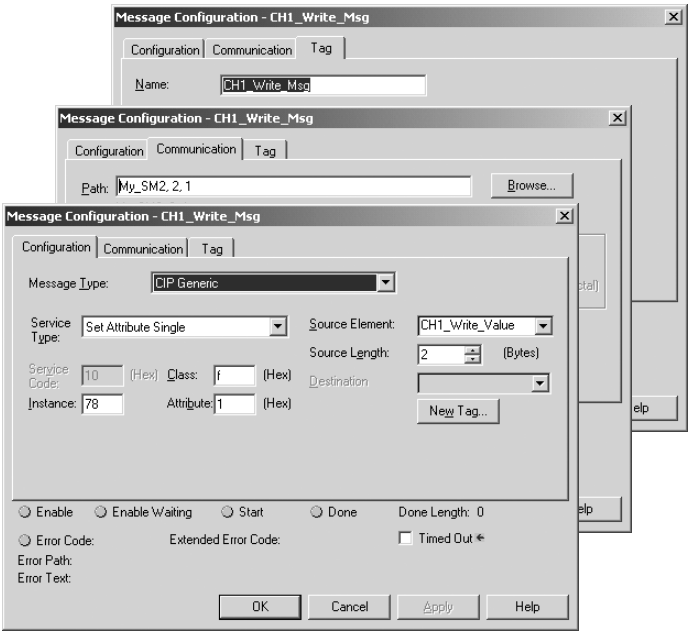


The response data for the message is stored in CH1_Read_Value. The “Get Attribute Single” Service Type (Service Code “e”) is used to read a single parameter. Class “f” refers to the CIP Parameter Object on page C-4 and Instance “78” is drive Parameter 78 - [Jog Frequency]. Instance Attribute “1” is the parameter value.

The RSLogix 5000 Message Configuration example screen to write to a parameter is shown in Figure 5.6. It is assumed that the 1769-SM2 module occupies slot 1 and is operated in Single mode, and that the drive is connected to CH1.

See Table 5.B for descriptions of the message configuration data.

Figure 5.6 RSLogix 5000 Example Message Setup Screen to Write to a Parameter



The request data for the message is stored in CH1_Write_Value. The "Set Attribute Single" Service Type (Service Code "10") is used to write a single parameter. Class "f" refers to the CIP Parameter Object on page C-4 and Instance "78" is drive Parameter 78 - [Jog Frequency]. Instance Attribute "1" is the parameter value.

Modbus RTU Master Operation Messages

In Multi-Drive mode, any channel can be configured for Modbus RTU Master operation to communicate with a variety of Rockwell Automation or 3rd Party RTU Slave devices, such as PowerFlex 7-Class drives with 20-COMM-H adapters. In the Multi-Drive ladder examples provided in this manual, CH3 is used to communicate with a PowerFlex 70 drive.

The following Modbus Function Codes are supported:

Function Code	Name	Maximum Bits/Word
01	Read Coils	512
02	Read Discrete Inputs	512
03	Read Holding Registers	32
04	Read Input Registers	32

Function Code	Name	Maximum Bits/Word
05	Write Single Coil	n/a
06	Write Single Register	n/a
15	Write Multiple Coils	512
16	Write Multiple Registers	512

The format of the Modbus command message data is:

Word	Name	Description
1	RTU Slave Address	The node address of the Modbus RTU Slave.
2	Function Code	The Modbus Function Code to perform.
3	Starting Address	The starting coil/register address in the Slave device.
4	Number of bits/words	The number of coils/registers to read/write.
5+	Data Words	Only used for write messages and contains the data to be written.

The format of the Modbus response message data is:

Word	Name	Description
1+	Data Words	Only used for read messages and contains the data that was read.

The format of the message instruction is different for Modbus RTU Master operation messaging. For RSLogix 500, format each message as shown in Figure 5.7 and see Table 5.D for a description of the data required in each field. For RSLogix 5000, format each message as shown in Figure 5.8 and see Table 5.E.

Figure 5.7 RSLogix 500 Modbus RTU Master Message Setup Screen

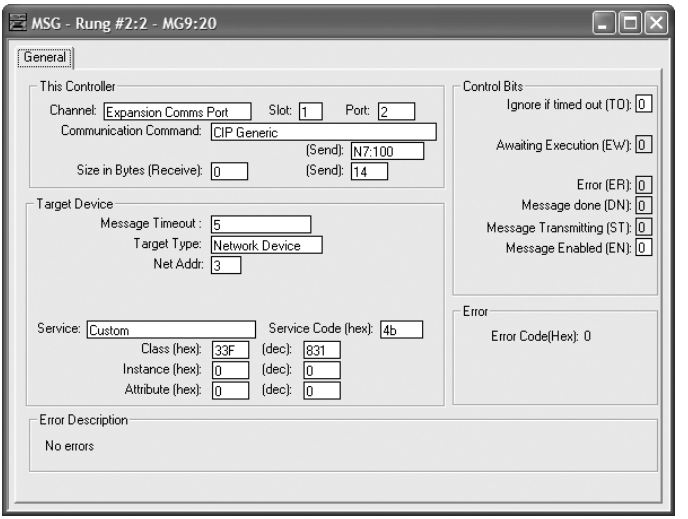


Table 5.D RSLogix 500 Modbus RTU Master Message Configuration Data

This Controller Section	Description
Channel	Always use “Expansion Comms Port.”
Slot	The chassis slot occupied by the 1769-SM2 module.
Port	Always set to “2.” **Note:** This field was not configurable in earlier versions of RSLogix 500.
Communication Command	Always use “CIP Generic.”
Send (Data Table Address)	Starting data table address of the Modbus command data.
Size in Bytes (Receive)	Number of bytes of receive data. It is set to “0” for a Modbus write message, and to the necessary length for a read message (greater than “0”).
Send (Size in Bytes)	Number of bytes of command data.
Target Device Section	**Description**
Message Timeout	Timeout delay in seconds. This value must be greater than the Message Timeout configured for the channel in the module’s I/O configuration.
Target Type	Always use “Network Device.”
Net Addr	The number of the channel (1…3) on the 1769-SM2 module where the message will be sent. **Note:** This field was called “Channel” in earlier versions of RSLogix 500.
Service	Always use “Custom.”
Service Code (hex)	Always use “4b.” This is the Execute Modbus service.
Class (hex)	Always use “33F.” This is the Class number for the Modbus RTU Master object.
Instance (hex or dec)	Not used. Leave at “0.”
Attribute (hex or dec)	Not used. Leave at “0.”

Figure 5.8 RSLogix 5000 Modbus RTU Master Message Setup Screen

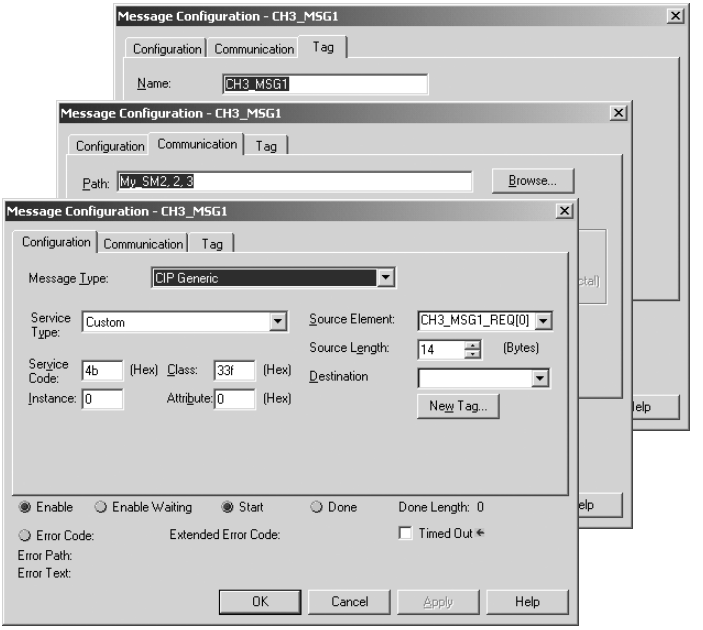


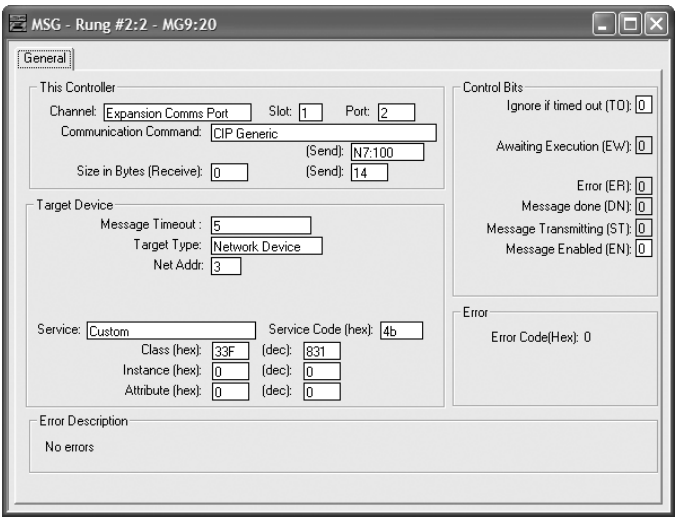
Table 5.E RSLogix 5000 Modbus RTU Master Message Configuration Data

Configuration Tab	**Description**
Message Type	Always use “CIP Generic.”
Service Type	Type of Service to execute.
Service Code	Code of the respective Service Type.
Class	Class ID for the DSI Parameter Object.
Instance	Instance number in the Class.
Attribute	Attribute number of the Instance.
Source Element	Source of the request service data.
Source Length	Length of the request service data.
Destination	Location where the response service data is stored.
Communication Tab	**Description**
Path	Format is <Name of Module>,2,n — where “n” equals the channel number (1…3) on the 1769-SM2.
Tag Tab	**Description**
Name	The name for the message instruction.

RSLogix 500 Modbus RTU Master Write Message Example

Figure 5.9 shows an example Modbus RTU Master write message setup screen. See Table 5.D for descriptions of the message configuration data.

Figure 5.9 RSLogix 500 Example Modbus RTU Master Write Message Setup Screen



In this example, Logic Command and Reference are being written to a PowerFlex 70 drive. N7:100 through N7:106 (note the send length is 14 bytes or 7 words) contain the command data where:

Data Word	Example Value	Description
N7:100	15	PowerFlex 70 node address
N7:101	16	Function Code – Write Multiple Registers
N7:102	0	Starting Register Address (40001)
N7:103	3	Number of registers to write
N7:104	18	Value for 40001 – Logic Command word
N7:105	0	Value for 40002 – not used
N7:106	8192	Value for 40003 – Reference word

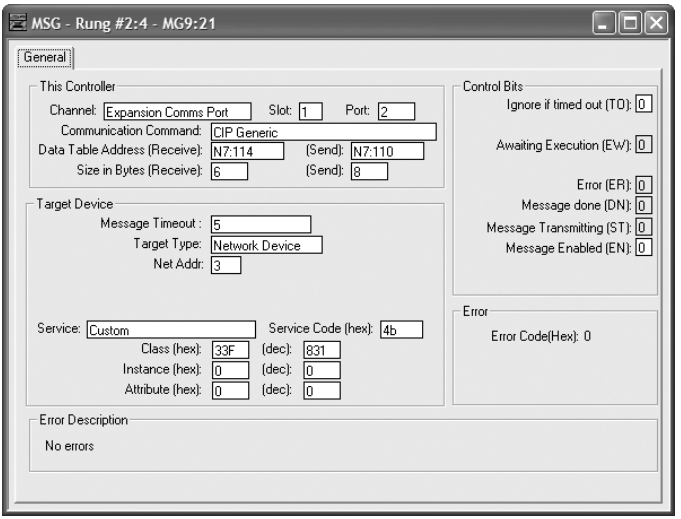
Note the Size in Bytes (Receive) is set to “0” because no data is returned for a write message.

For additional information about Modbus RTU write messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

RSLogix 500 Modbus RTU Master Read Message Example

Figure 5.10 shows an example Modbus RTU Master read message setup screen. See Table 5.D for descriptions of the message configuration data.

Figure 5.10 RSLogix 500 Example Modbus RTU Master Read Message Setup Screen



In this example, Logic Status and Feedback are being read from a PowerFlex 70 drive. N7:110 through N7:113 (note the send length is 8 bytes or 4 words) contain the command data where:

Data Word	Example Value	Description
N7:110	15	PowerFlex 70 node address
N7:111	4	Function Code – Read Input Registers
N7:112	0	Starting Register Address (30001)
N7:113	3	Number of registers to read

N7:114 through N7:116 (note the Receive length is 6 bytes or 3 words) contain the response data where:

Data Word	Example Value	Description
N7:114	3855	Value for 30001 – Logic Status word
N7:115	0	Value for 30002 – not used
N7:116	8192	Value for 30003 – Feedback word

For additional information about Modbus RTU read messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

RSLogix 5000 Modbus RTU Master Write Message Example

Figure 5.11 shows an example Modbus RTU Master write message setup screen. See Table 5.E for descriptions of the message configuration data.

Figure 5.11 RSLogix 5000 Example Modbus RTU Master Write Message Setup Screen

In this example, Logic Command and Reference are being written to a PowerFlex 70 drive. The CH3_MSG1_REQ array (14 bytes = 7 words) contains the command data where:

Data Word	Example Value	Description
CH3_MSG1_REQ [0]	15	PowerFlex 70 node address
CH3_MSG1_REQ [1]	16	Function Code – Write Multiple Registers
CH3_MSG1_REQ [2]	0	Starting Register Address (40001)
CH3_MSG1_REQ [3]	3	Number of registers to write
CH3_MSG1_REQ [4]	18	Value for 40001 – Logic Command word
CH3_MSG1_REQ [5]	0	Value for 40002 – not used
CH3_MSG1_REQ [6]	8192	Value for 40003 – Reference word

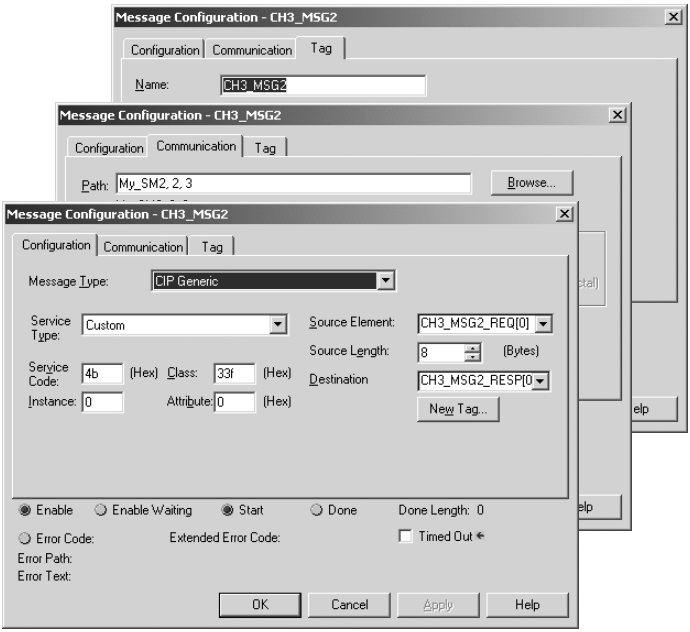
A Destination element is not needed for a write message because no data is returned.

For additional information about Modbus RTU write messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

RSLogix 5000 Modbus RTU Master Read Message Example

Figure 5.12 shows an example Modbus RTU Master read message setup screen. See Table 5.E for descriptions of the message configuration data.

Figure 5.12 RSLogix 5000 Example Modbus RTU Master Read Message Setup Screen



In this example, Logic Status and Feedback are being read from a PowerFlex 70 drive. The CH3_MSG2_REQ array (8 bytes = 4 words) contains the command data where:

Data Word	Example Value	Description
CH3_MSG2_REQ [0]	15	PowerFlex 70 node address
CH3_MSG2_REQ [1]	4	Function Code – Read Input Registers
CH3_MSG2_REQ [2]	0	Starting Register Address (30001)
CH3_MSG2_REQ [3]	3	Number of registers to read

The CH3_MSG2_RESP array contains the response data where:

Data Word	Example Value	Description
CH3_MSG2_RESP [0]	3855	Value for 30001 – Logic Status word
CH3_MSG2_RESP [1]	0	Value for 30002 – not used
CH3_MSG2_RESP [2]	8192	Value for 30003 – Feedback word

For additional information about Modbus RTU read messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

Notes:

MicroLogix 1500 Example Ladder Programs

This chapter provides ladder examples for a MicroLogix 1500 controller used with a 1769-SM2 module in Single mode and Multi-Drive mode.

Single Mode

The ladder example provided in this section is based on a 1769-SM2 module in slot 1 with one PowerFlex 4/40 drive connected to each channel (Figure 6.1). The ladder example demonstrates the following functionality for each channel:

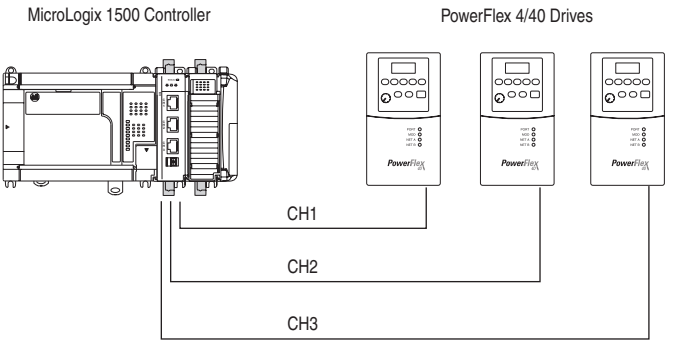
- Send a Logic Command to control the drive (for example, start, stop).
- Send a Reference to the drive and receive Feedback from the drive.
- Receive Logic Status information from the drive.
- Write and read parameters.

Explicit messaging (parameter read/write) capability varies between the RSLogix software packages and controllers:

- Versions of RSLogix 500 before v6.30 do NOT support creating a Message instruction for the 1769-SM2 module. This limits the MicroLogix 1500 to performing I/O messaging (Logic Command/ Reference, and Logic Status/Feedback) only.

- RSLogix 500 v6.30 (or higher) must be used with a MicroLogix 1500 LRP Series C (or newer) controller to create Message instructions to send explicit messages to the 1769-SM2 module.

Figure 6.1 Example MicroLogix 1500 Single Mode System Arrangement



PowerFlex 40 Drive Settings

The PowerFlex 40 drives used in the example program have the following parameter settings:

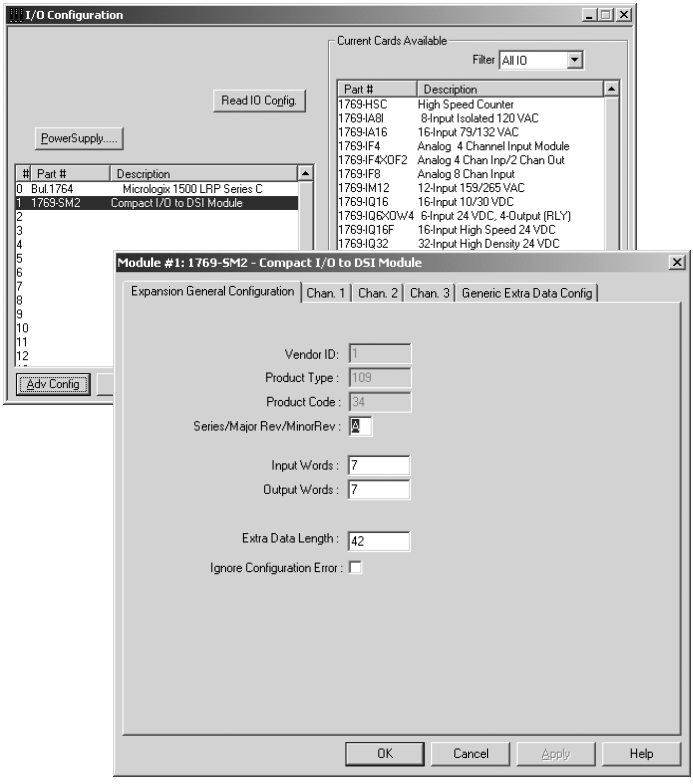
Parameter	Setting
P036 - [Start Source]	5 (Comm Port)
P038 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	100
A107 - [Comm Format]	0 (RTU 8-N-1)

1769-SM2 Module Settings

The 1769-SM2 module used in the example program has the following switch settings:

Switch	Setting
Configuration Mode Switch (SW1)	CONT position
Operating Mode Switch (SW2)	1X (Single) position

The I/O configuration in RSLogix 500 v6.30 (or higher) for the Single mode example program is:



Refer to Table 3.C for configuration data words and parameter descriptions. Also, see Chapter 4 for information about the I/O image, Module Enable/Status, Logic Command/Status, and Reference/ Feedback.

MicroLogix 1500 Example Program

Figure 6.2 Example MicroLogix 1500 Single Mode Ladder Logic Main Routine

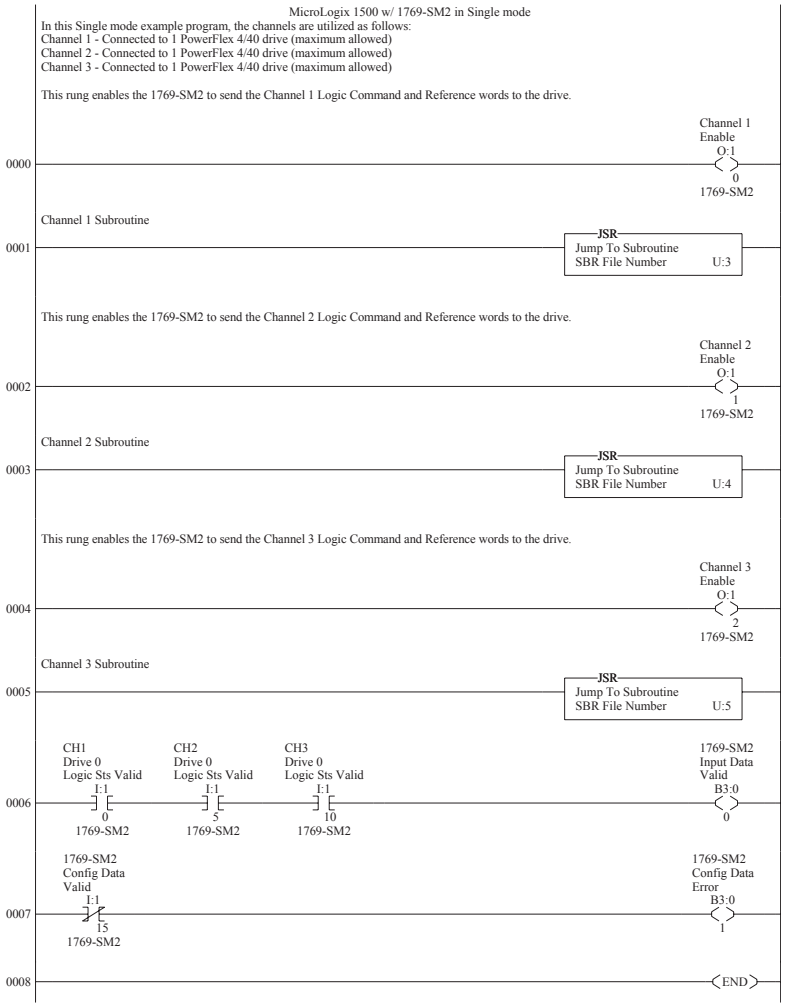


Figure 6.3 Example MicroLogix 1500 Single Mode Ladder Logic CH1 Subroutine

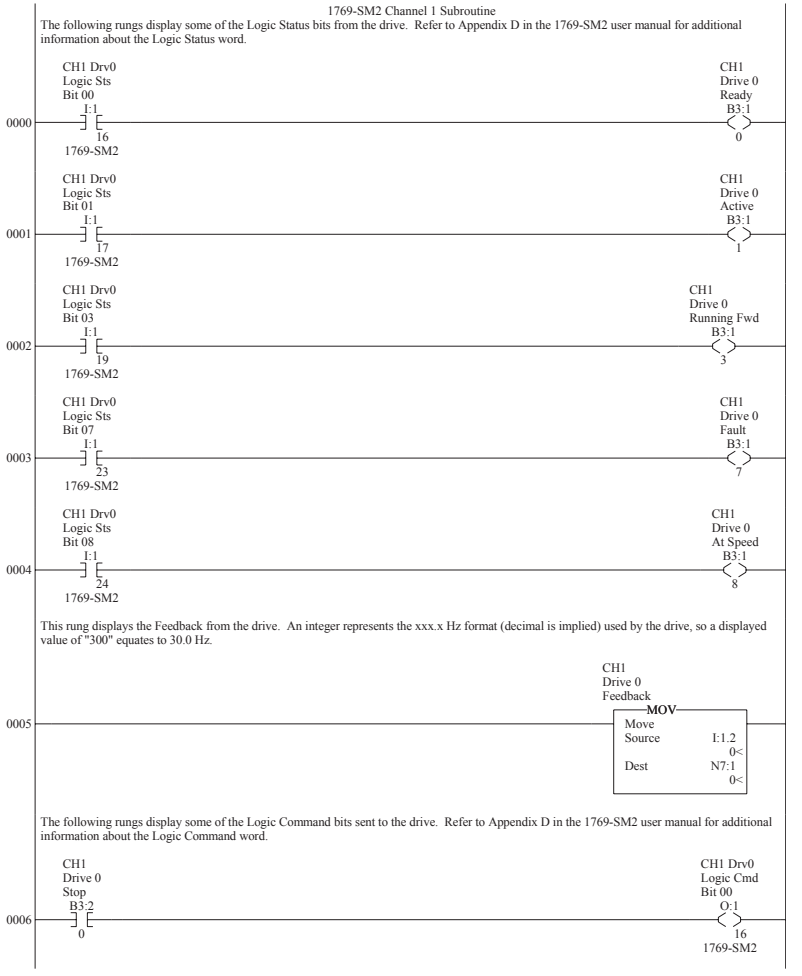
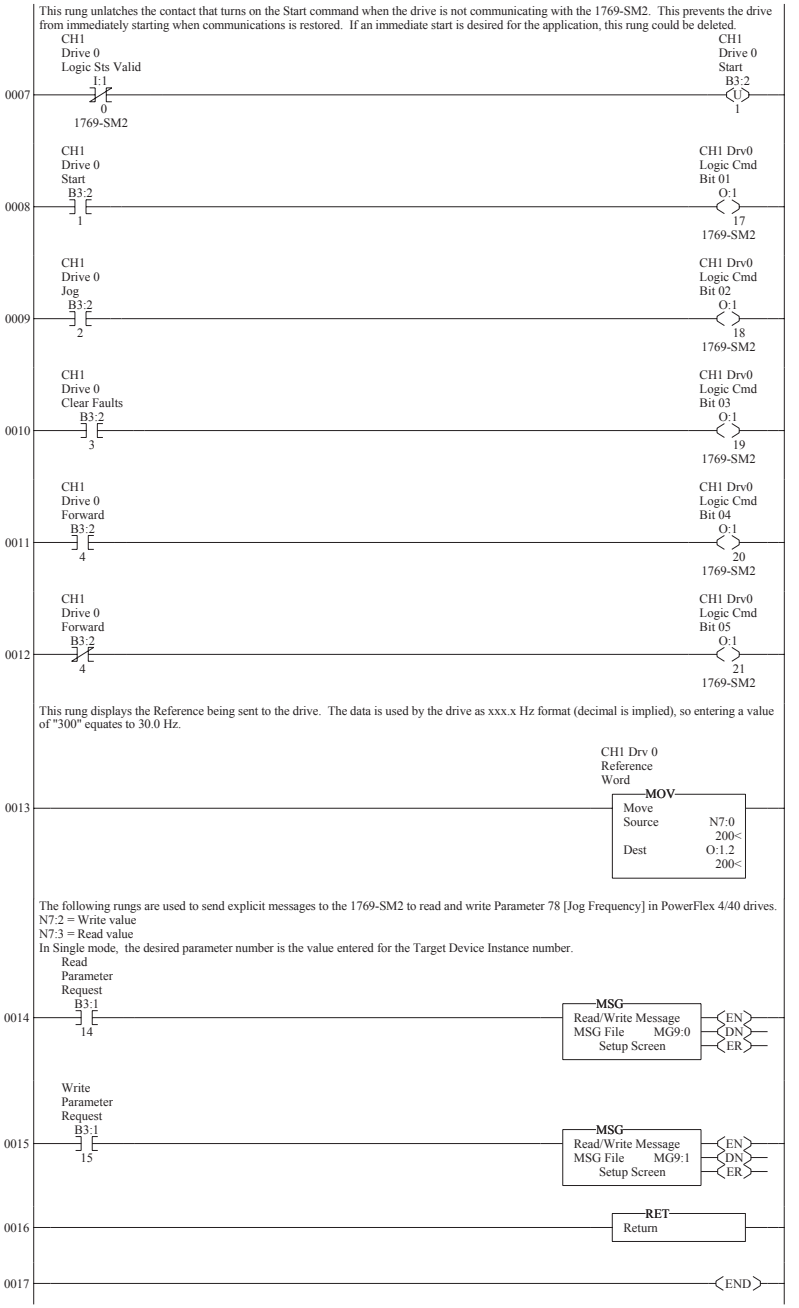
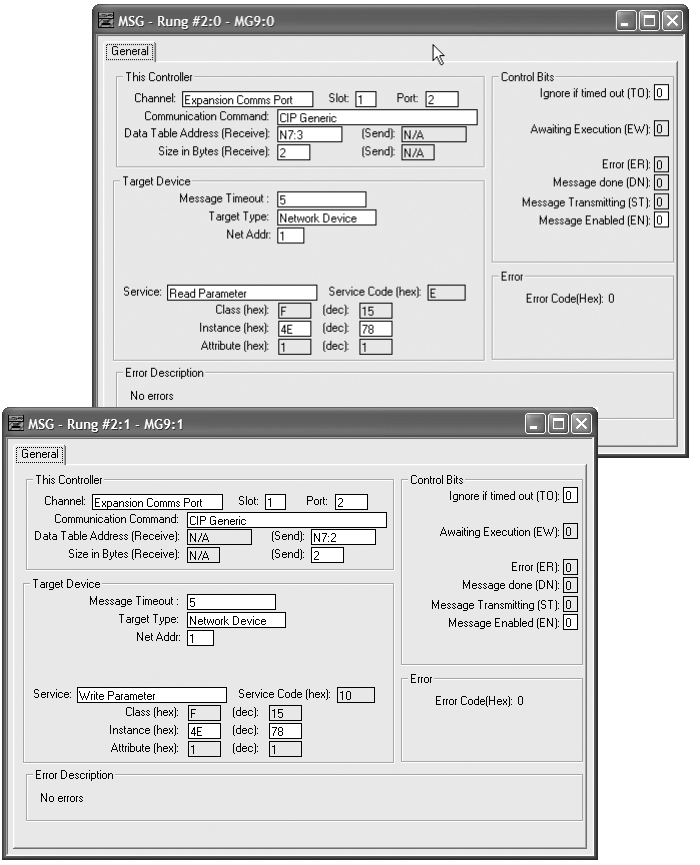


Figure 6.3 Example MicroLogix 1500 Single Mode Ladder Logic CH1 Subroutine (Continued)



The read and write message instructions for PowerFlex 40 drive Parameter 78 - [Jog Frequency] are configured as follows:

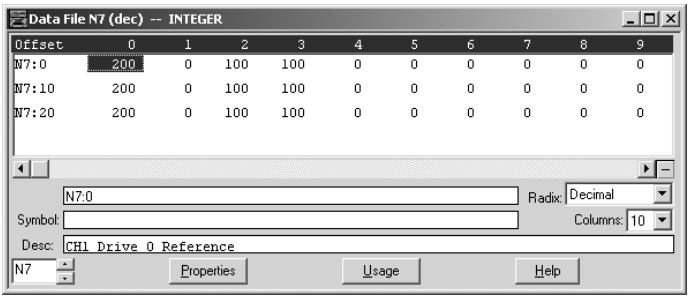


Single Mode Example Program Data Table

Integer File N7: is used to contain the input and output data to/from the three channels of the module:

N7: Word			
CH1	CH2	CH3	Description
0	10	20	Reference
1	11	21	Feedback
2	12	22	Parameter 78 Write Value
3	13	23	Parameter 78 Read Value

An example of data table values are shown below:



A value of “200” for the Reference equates to 20.0 Hz. A value of “100” for drive Parameter 78 - [Jog Frequency] equates to 10.0 Hz.

Since CH2 and CH3 ladder routines are similar to the CH1 routine, they are not provided.

Multi-Drive Mode

The ladder example provided in this section is based on a 1769-SM2 module in slot 1 with five PowerFlex 4/40 drives connected to CH1 and to CH2, and one PowerFlex 70 connected to CH3 (Figure 6.4). The ladder example demonstrates the following functionality for each channel’s drives:

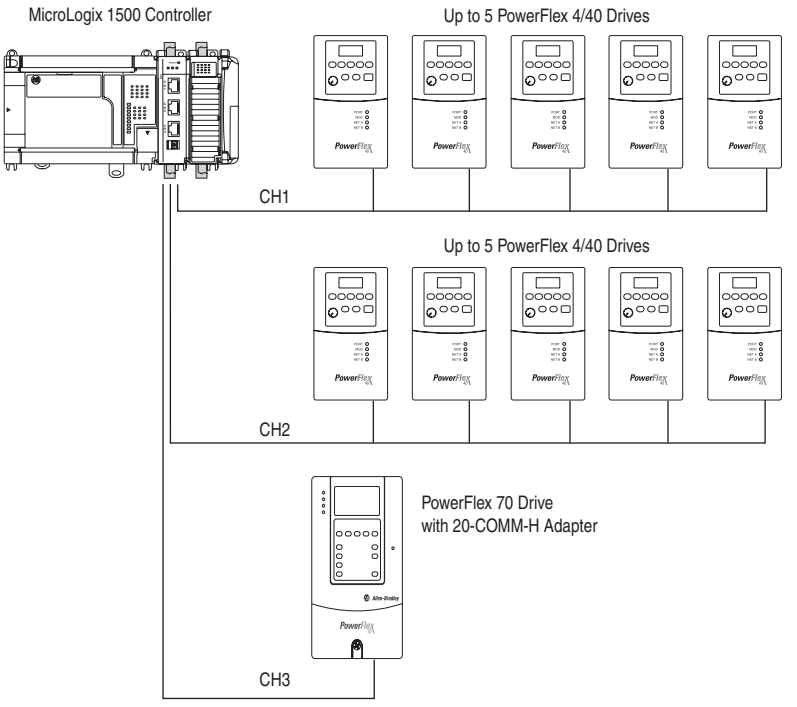
- Send a Logic Command to control the drive (for example, start, stop).
- Send a Reference to the drive and receive Feedback from the drive.
- Receive Logic Status information from the drive.
- Write and read parameters.

Explicit messaging (parameter read/write) capability varies between the RSLogix software packages and controllers:

- Versions of RSLogix 500 before v6.30 do NOT support creating a Message instruction for the 1769-SM2 module. This limits the MicroLogix 1500 to performing I/O messaging (Logic Command/ Reference, and Logic Status/Feedback) only.

- RSLogix 500 v6.30 (or higher) must be used with a MicroLogix 1500 LRP Series C (or newer) controller to create Message instructions to send explicit messages to the 1769-SM2 module.

Figure 6.4 Example MicroLogix 1500 Multi-Drive Mode System Arrangement



PowerFlex 40 Settings

The PowerFlex 40 drives used in the example program have the following parameter settings:

Parameter	Setting
P036 - [Start Source]	5 (Comm Port)
P038 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	100…104
A107 - [Comm Format]	0 (RTU 8-N-1)

PowerFlex 70 Setting

The PowerFlex 70 drive used in the example program has the following parameter setting:

Parameter	Setting
90 - [Speed Ref A Sel]	22 (DPI Port 5)

20-COMM-H Settings

The 20-COMM-H adapter used in the example program has the following parameter and switch settings:

Parameter Settings

Parameter	Setting
5 - [Net Rate Cfg]	2 (19200 Baud)
7 - [Net Parity Cfg]	1 (Odd)
16 - [DPI I/O Cfg]	00001 = Logic Command/Reference
30 - [Stop Bits Cfg]	0 (1 bit)

Switch Settings

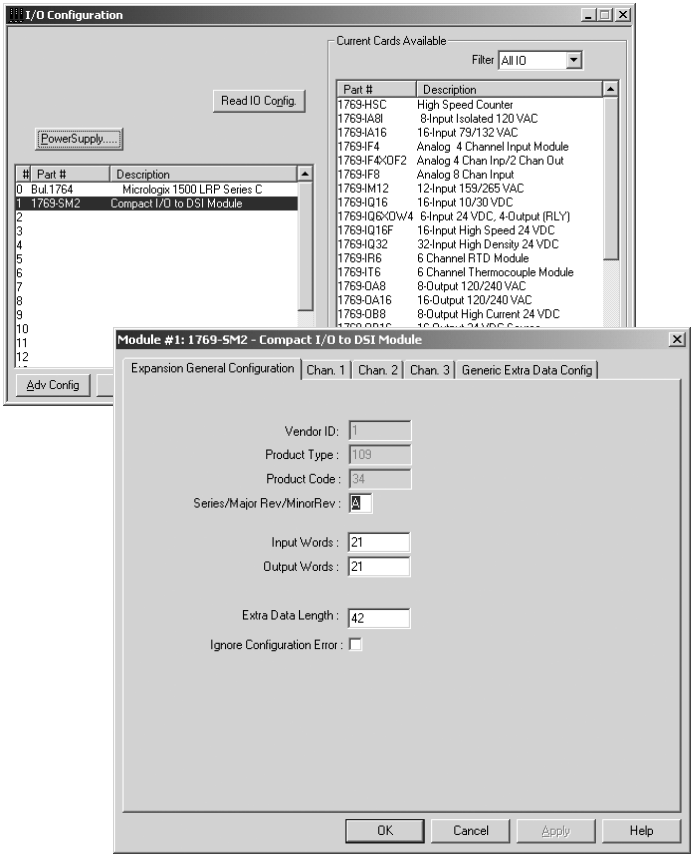
Switch	Setting
Node Address Switches	15
Network Protocol Switch	RTU position

1769-SM2 Settings

The 1769-SM2 module used in the example program has the following switch settings:

Switch	Setting
Configuration Mode Switch (SW1)	CONT position
Operating Mode Switch (SW2)	5X (Multi-Drive) position

The I/O configuration in RSLogix 500 v6.30 (or higher) for the Multi-Drive mode example program is:



Refer to Chapter 4 for information about the I/O image, Module Enable/Status, Logic Command/Status, and Reference/Feedback.

MicroLogix 1500 Multi-Drive Mode Example Program

Figure 6.5 Example MicroLogix 1500 Multi-Drive Ladder Logic Main Routine

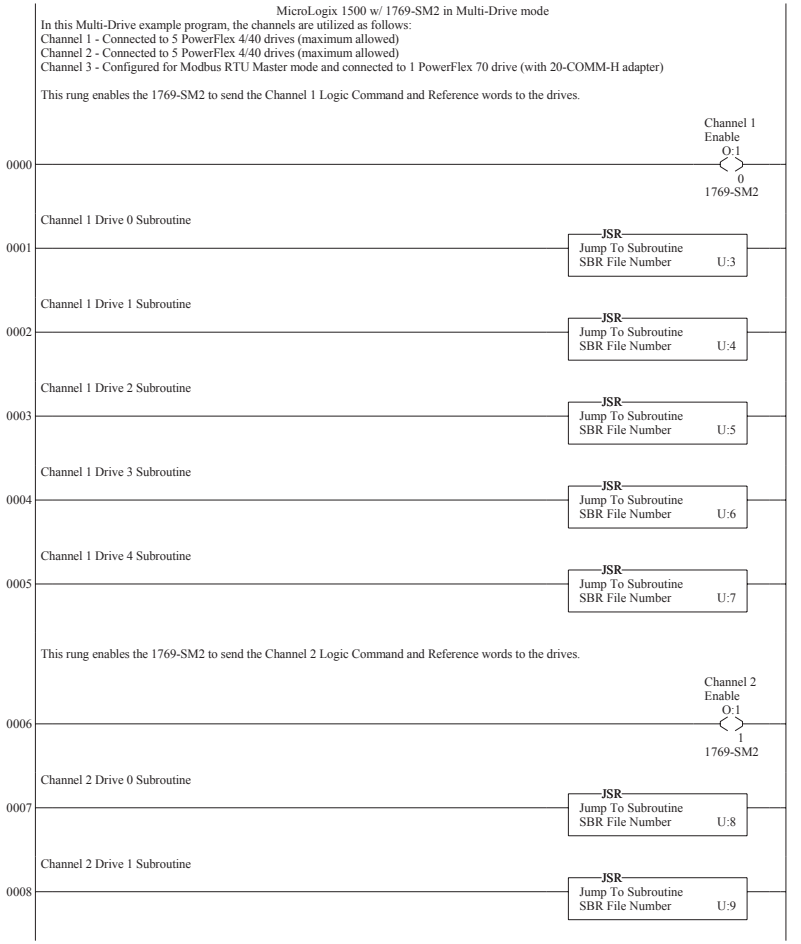


Figure 6.5 Example MicroLogix 1500 Multi-Drive Ladder Logic Main Routine (Continued)

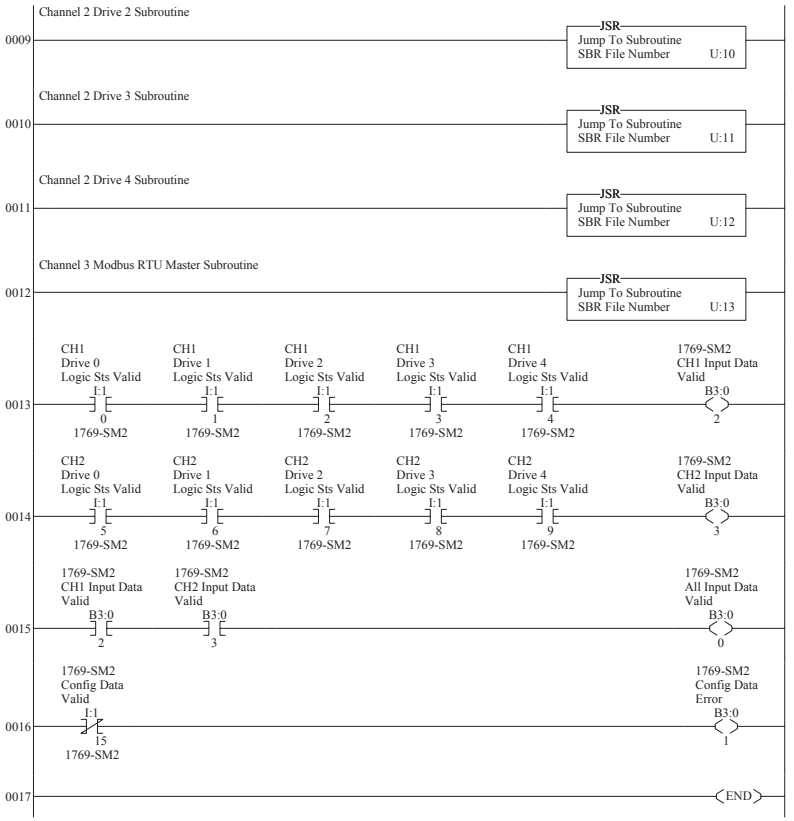


Figure 6.6 Example MicroLogix 1500 Multi-Drive Ladder Logic CH1 Drive 0 Subroutine

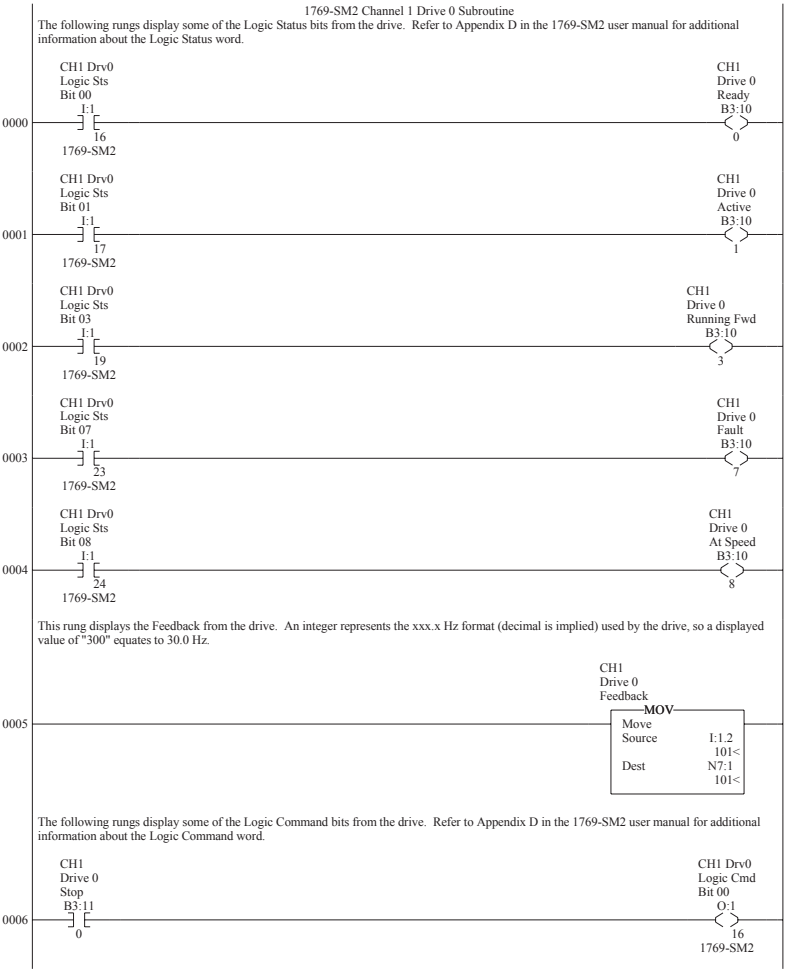
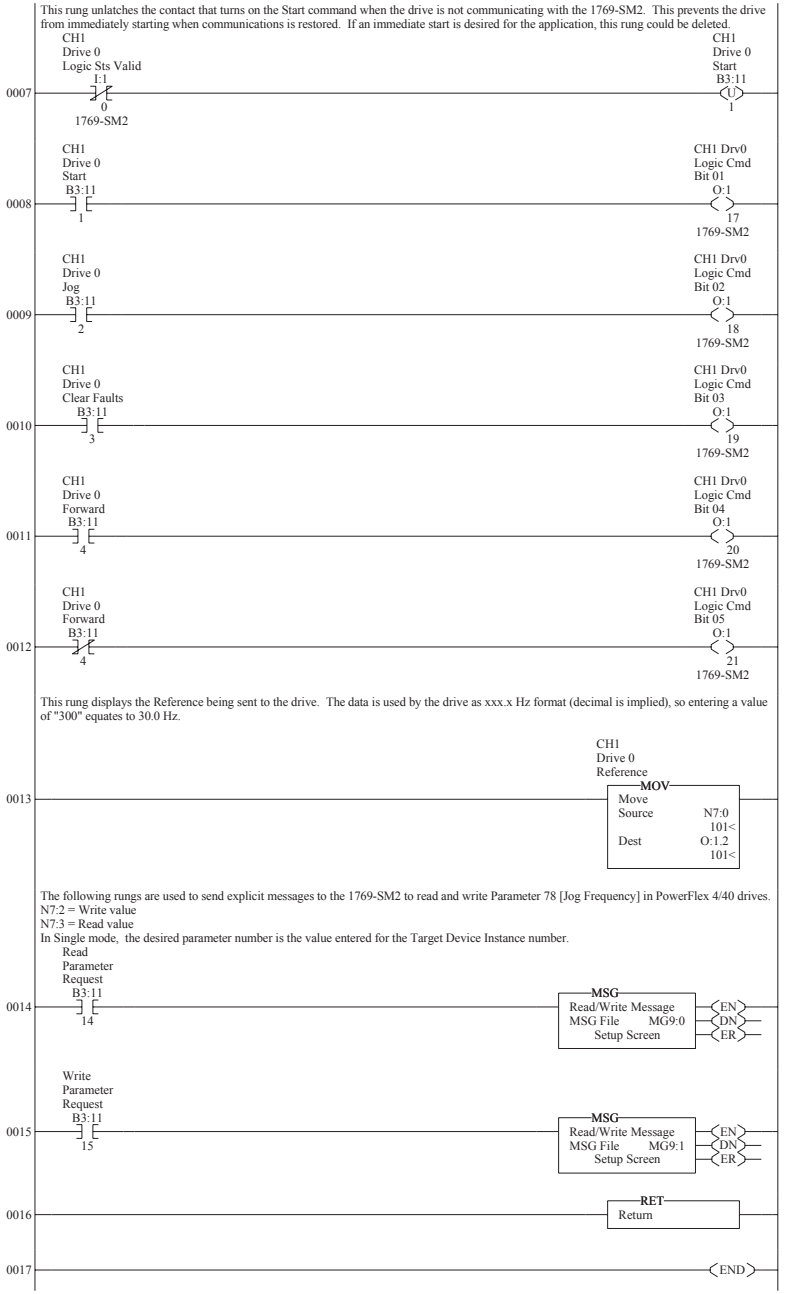
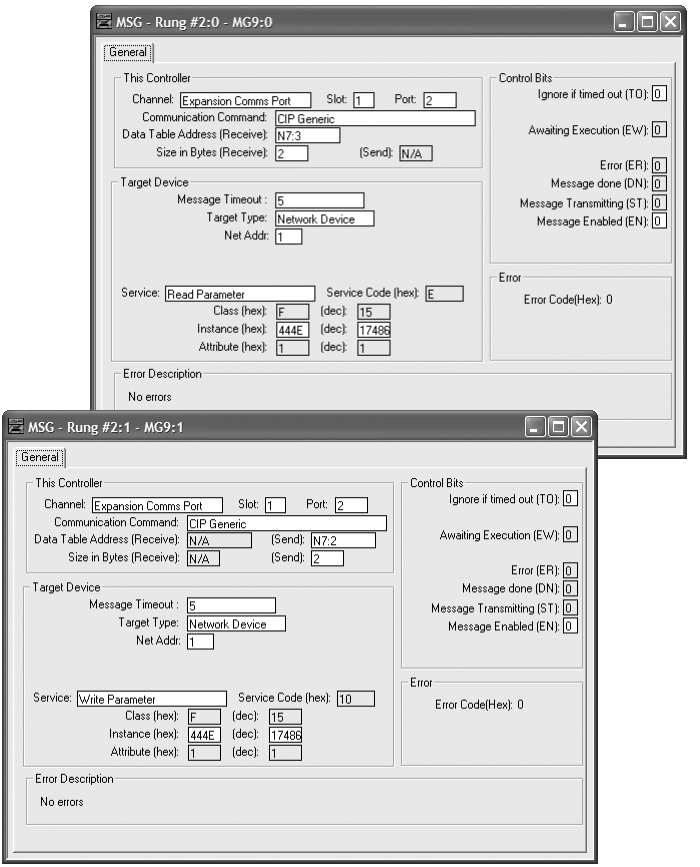


Figure 6.6 Example MicroLogix 1500 Multi-Drive Ladder Logic CH1 Drive 0 Subroutine (Continued)



The read and write message instructions for PowerFlex 40 drive Parameter 78 - [Jog Frequency] are configured as follows:



For additional information about the message setup, refer to page 5-3.

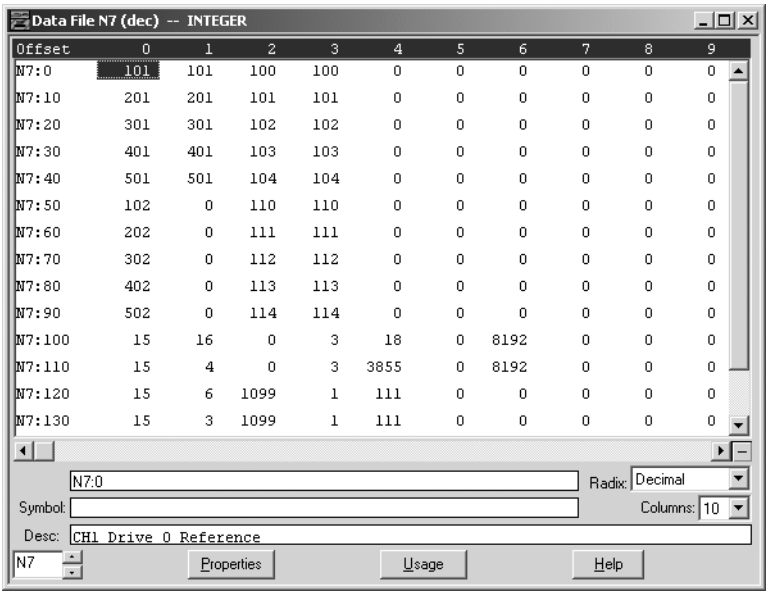
Multi-Drive Example Program Data Tables

Integer File N7: is used to contain the input and output data to/from the three channels:

N7: Words for CH1					
Drive 0	Drive 1	Drive 2	Drive 3	Drive 4	Description
0	10	20	30	40	Reference
1	11	21	31	41	Feedback
2	12	22	32	42	Parameter 78 Write Value
3	13	23	33	43	Parameter 78 Read Value

N7: Words for CH2					
Drive 0	**Drive 1**	**Drive 2**	**Drive 3**	**Drive 4**	**Description**
50	60	70	80	90	Reference
51	61	71	81	91	Feedback
52	62	72	82	92	Parameter 78 Write Value
53	63	73	83	93	Parameter 78 Read Value

An example of data table values are shown below:



A value of “101” for the Reference equates to 10.1 Hz. A value of “100” for drive Parameter 78 - [Jog Frequency] equates to 10.0 Hz.

Since the Drive 1…4 and CH2 ladder routines are similar to the CH1 Drive 0 routine, they are not provided.

CH3 Modbus RTU Master Subroutine Example

In Multi-Drive mode, any channel can be configured for Modbus RTU Master operation. In the MicroLogix 1500 Multi-Drive ladder logic example, CH3 is used to communicate with a PowerFlex 70 drive via Modbus RTU operation.

Figure 6.7 Example MicroLogix 1500 Modbus RTU Ladder Logic CH3 Subroutine

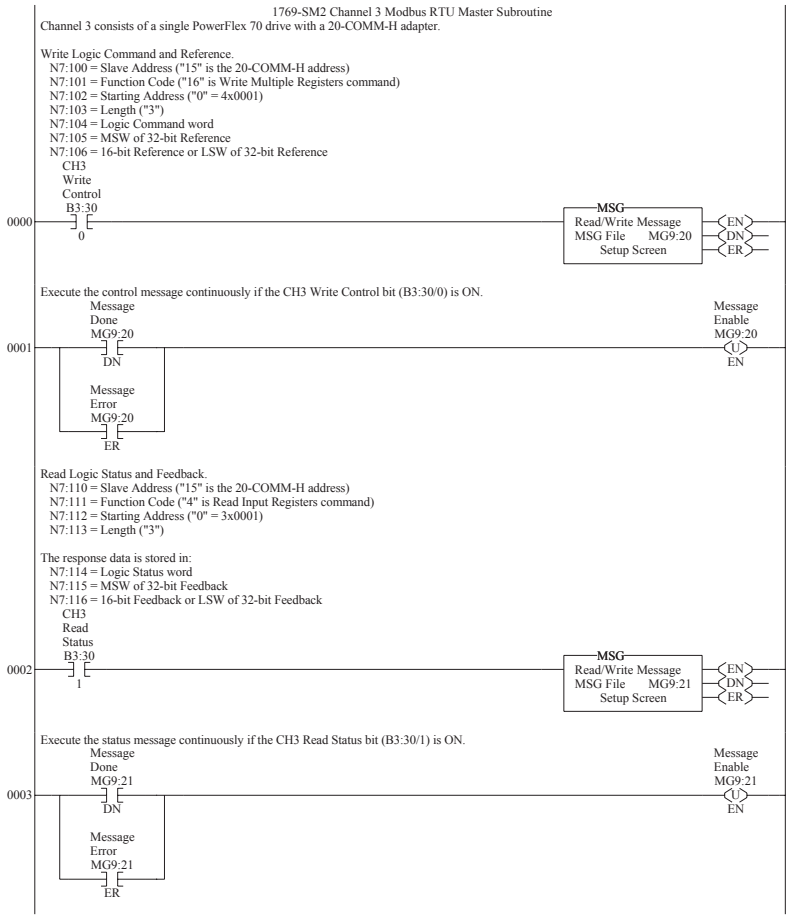
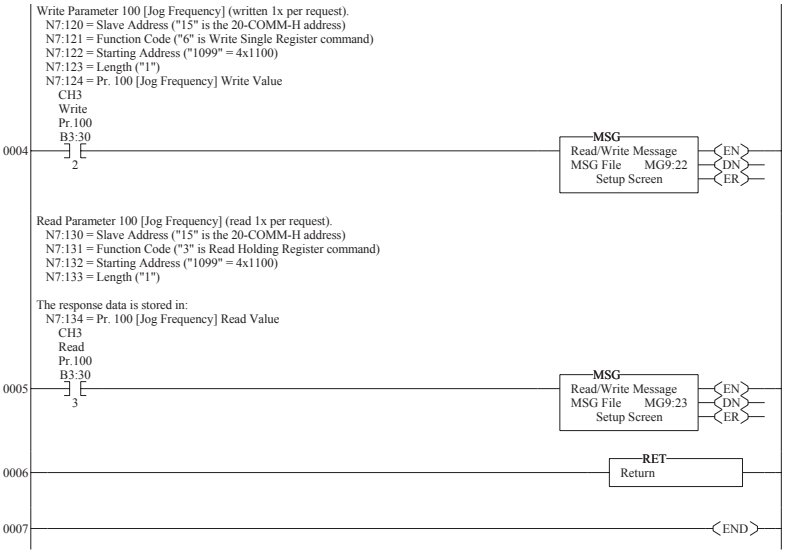
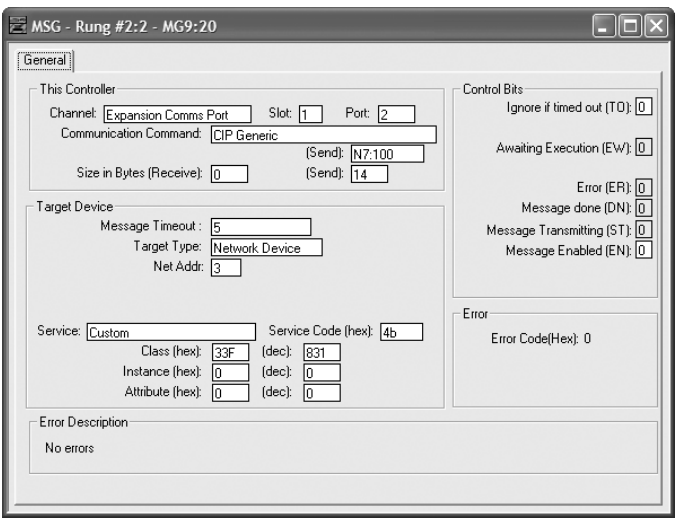


Figure 6.7 Example MicroLogix 1500 Modbus RTU Ladder Logic CH3 Subroutine (Continued)



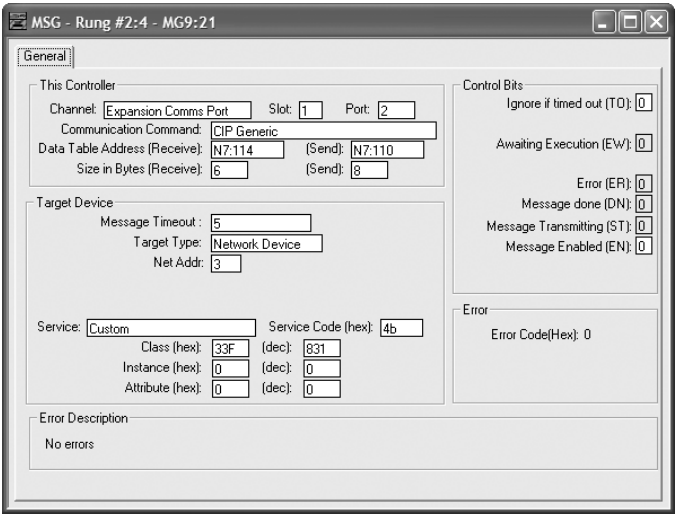
The Logic Command/Reference write message instruction on rung 0000 is configured as follows:



The format of the command data is:

Data Word	Example Value	Description
N7:100	15	PowerFlex 70 node address
N7:101	16	Function Code – Write Multiple Registers
N7:102	0	Starting Register Address (40001)
N7:103	3	Number of registers to write
N7:104	18	Value for 40001 – Logic Command word
N7:105	0	Value for 40002 – not used
N7:106	8192	Value for 40003 – Reference word

The Logic Status/Feedback read message instruction on rung 0002 is configured as follows:



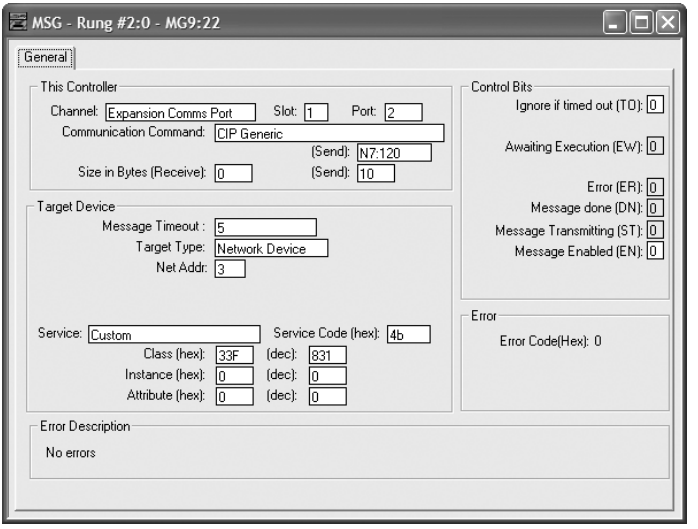
The format of the command data is:

Data Word	Example Value	Description
N7:110	15	PowerFlex 70 node address
N7:111	4	Function Code – Read Input Registers
N7:112	0	Starting Register Address (30001)
N7:113	3	Number of registers to read

The format of the response data is:

Data Word	Example Value	Description
N7:114	3855	Value for 30001 – Logic Status word
N7:115	0	Value for 30002 – not used
N7:116	8192	Value for 30003 – Feedback word

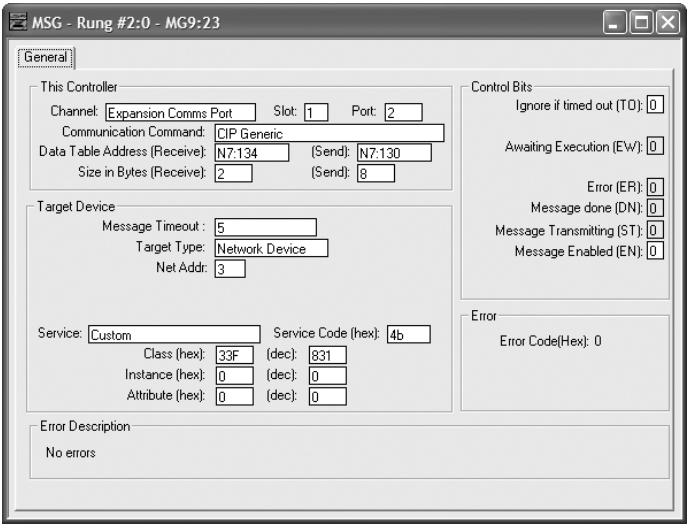
The write message instruction on rung 0004 for PowerFlex 70 drive Parameter 100 - [Jog Speed] is configured as follows:



The format of the command data is:

Data Word	Example Value	Description
N7:120	15	PowerFlex 70 node address
N7:121	6	Function Code – Write Single Registers
N7:122	1099	Starting Register Address (41100)
N7:123	1	Number of registers to write
N7:124	111	Parameter 100 write data

The read message instruction on rung 0005 for PowerFlex 70 drive Parameter 100 - [Jog Speed] is configured as follows:



The format of the command data is:

Data Word	Example Value	Description
N7:130	15	PowerFlex 70 node address
N7:131	3	Function Code – Read Holding Registers
N7:132	1099	Starting Register Address (41100)
N7:133	1	Number of registers to read

The format of the response data is:

Data Word	Example Value	Description
N7:134	111	Parameter 100 read data

For additional information about Modbus RTU Master messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

CompactLogix Example Ladder Programs

This chapter provides ladder examples for a CompactLogix controller used with a 1769-SM2 module in Single mode and Multi-Drive mode.

Single Mode

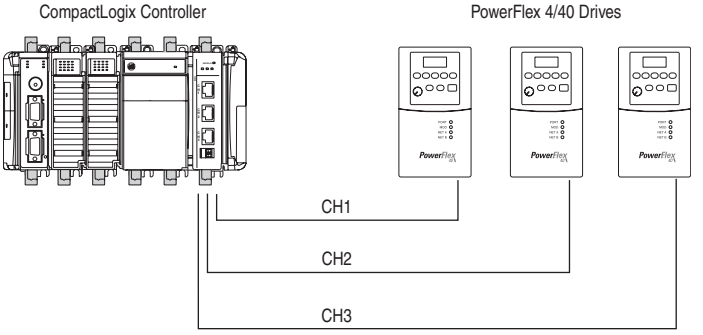
The ladder example provided in this section is based on a 1769-SM2 module in slot 1 with one PowerFlex 4/40 drive connected to each channel (Figure 7.1). The ladder example demonstrates the following functionality for each channel:

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

Explicit messaging (parameter read/write) capability varies between the RSLogix software packages and controllers:

- Explicit messaging can be used with enhanced CompactLogix processors, such as the -L31, -L32E, and -L35E.
- CompactLogix -L20 and -L30 processors do NOT have explicit messaging capability.

Figure 7.1 Example CompactLogix Single Mode System Arrangement



PowerFlex 40 Settings

The PowerFlex 40 drives used in the example program have the following parameter settings:

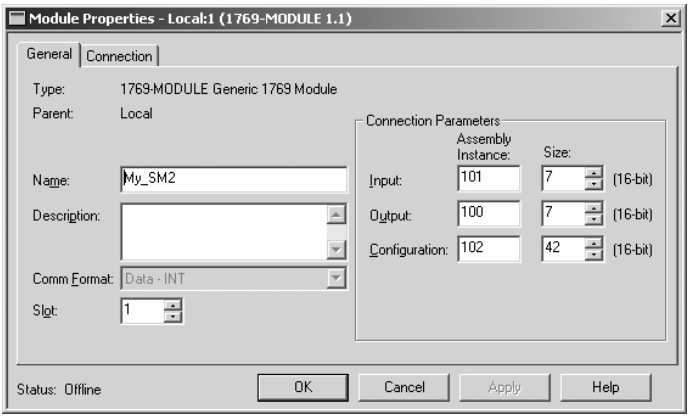
Parameter	Setting
P036 - [Start Source]	5 (Comm Port)
P038 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	100
A107 - [Comm Format]	0 (RTU 8-N-1)

1769-SM2 Settings

The 1769-SM2 module used in the example program has the following switch settings:

Switch	Setting
Configuration Mode Switch (SW1)	CONT position
Operating Mode Switch (SW2)	1X (Single) position

The I/O configuration in RSLogix 5000 for the Single mode example program is:



Refer to Chapter 4 for information about the I/O image, Module Enable/Status, Logic Command/Status, and Reference/Feedback.

CompactLogix Example Program

Figure 7.2 Example CompactLogix Ladder Logic Main Routine

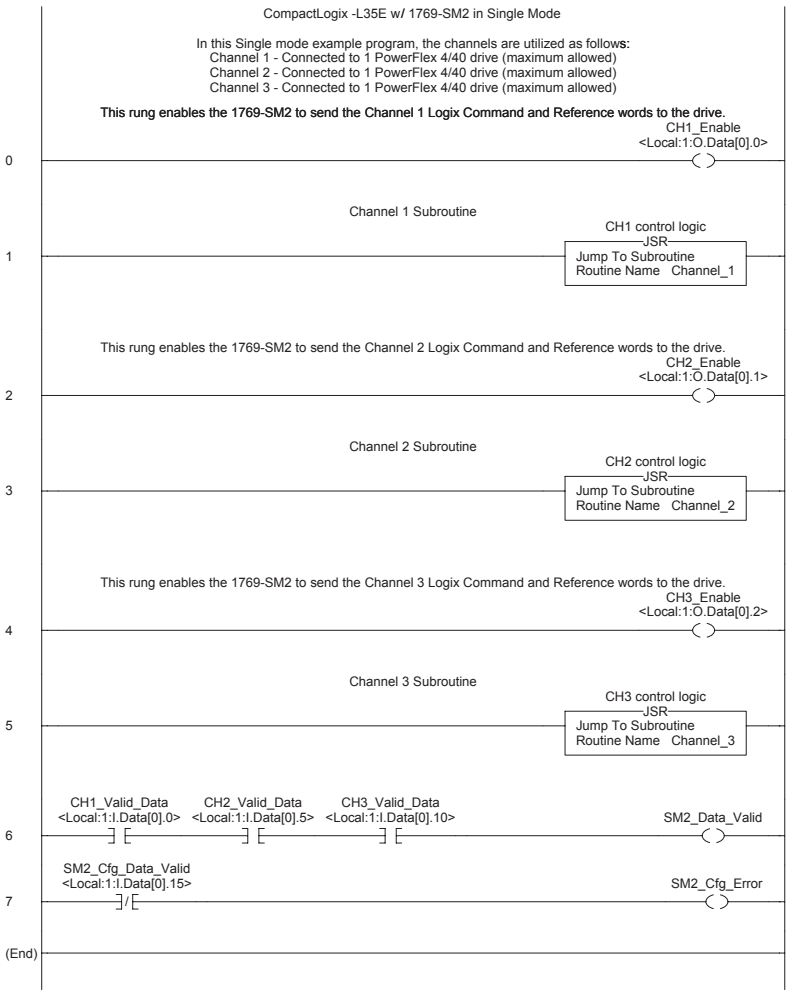


Figure 7.3 Example CompactLogix Single Mode Ladder Logic CH1 Subroutine

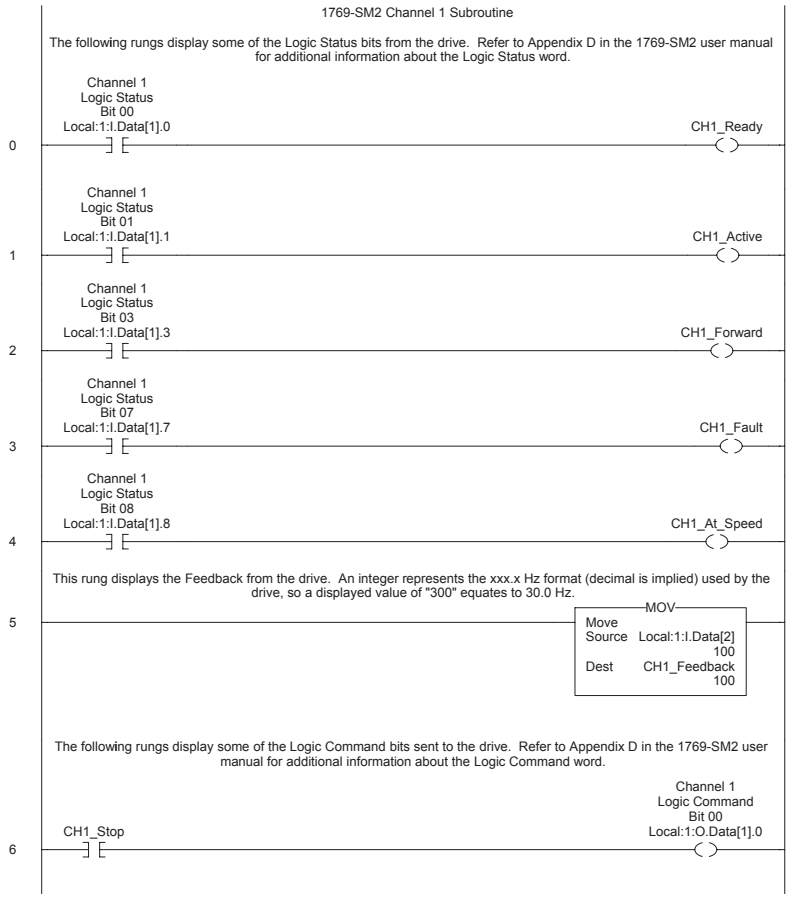


Figure 7.3 Example CompactLogix Single Mode Ladder Logic CH1 Subroutine (Continued)

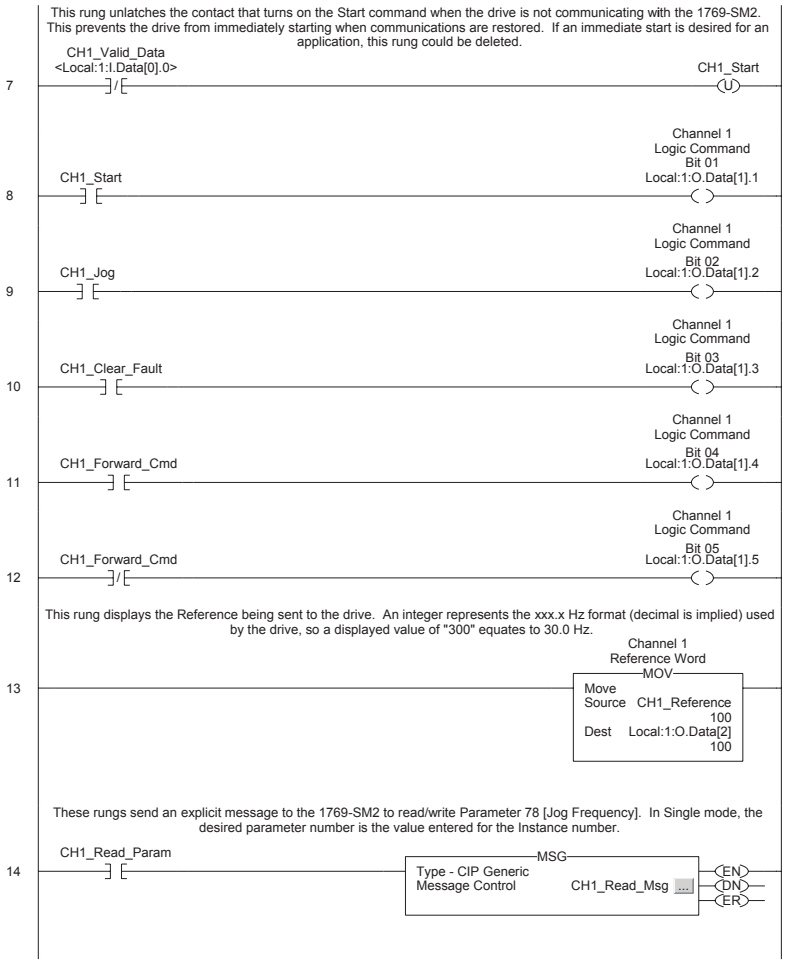
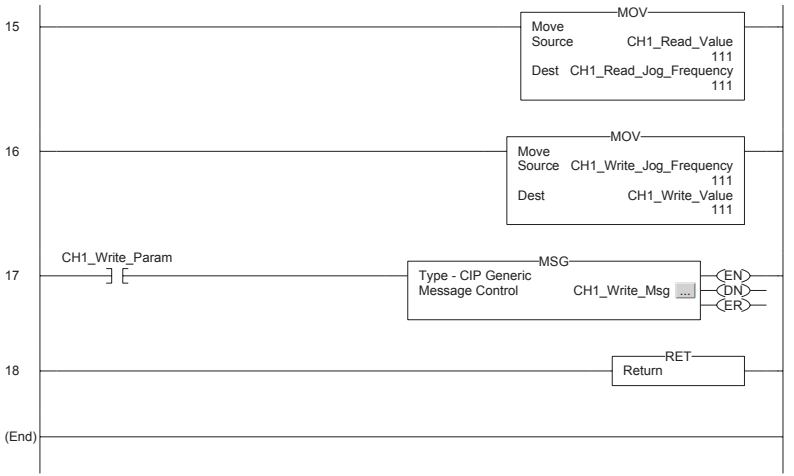
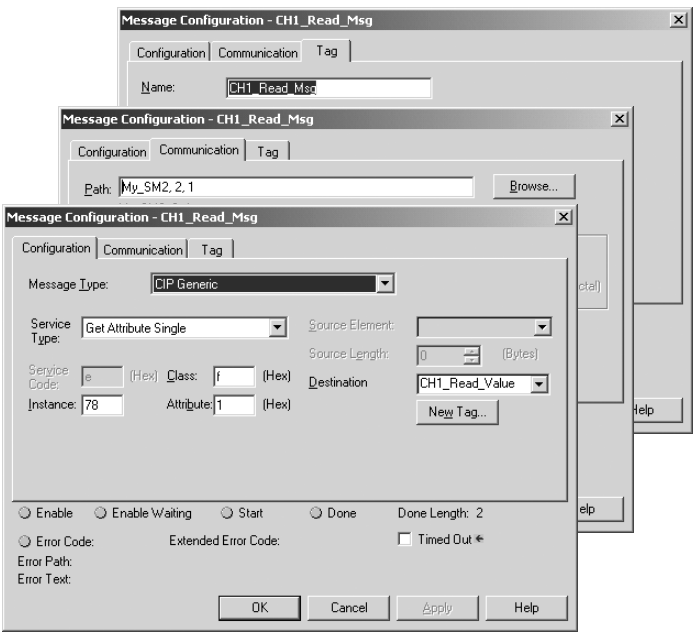


Figure 7.3 Example CompactLogix Single Mode Ladder Logic CH1 Subroutine (Continued)

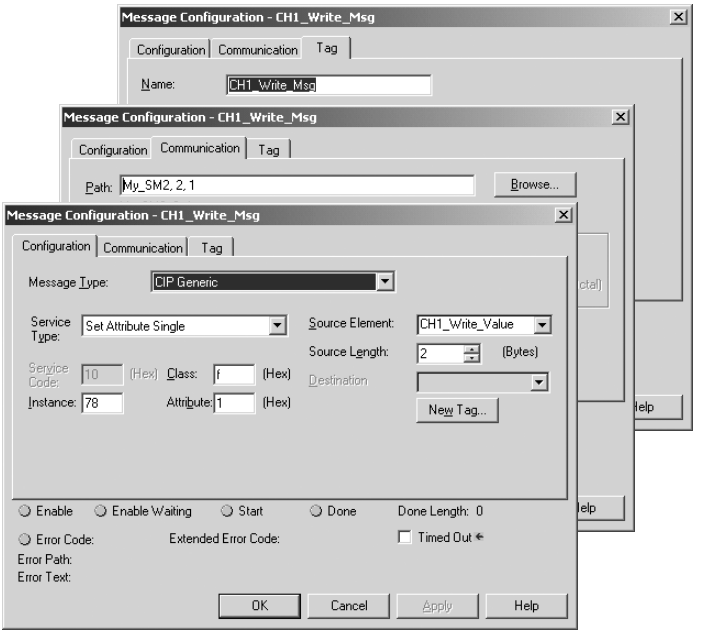


The read and write message instructions for PowerFlex 40 drive Parameter 78 - [Jog Frequency] are configured as follows:

Read Message (Rung 14)



Write Message (Rung 17)



Single Mode Example Program Tags

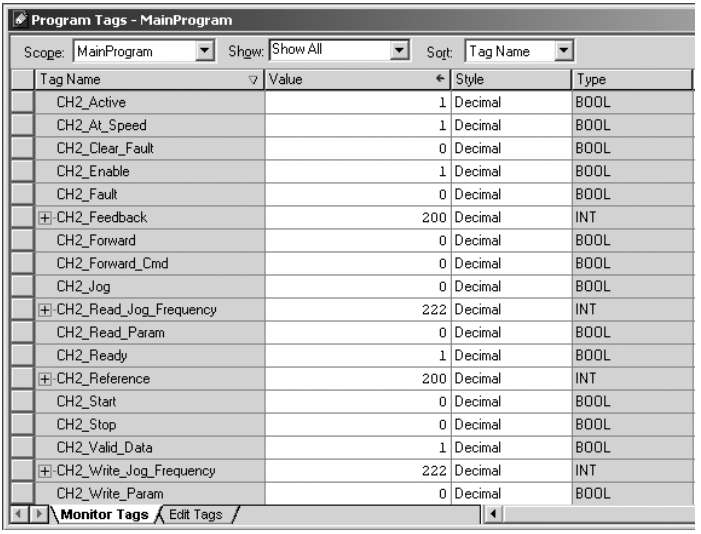
The following tags are used to contain the input and output data to/from the three channels of the module:

Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type
CH1_Active	1	Decimal	BOOL
CH1_At_Speed	1	Decimal	BOOL
CH1_Clear_Fault	0	Decimal	BOOL
CH1_Enable	1	Decimal	BOOL
CH1_Fault	0	Decimal	BOOL
CH1_Feedback	100	Decimal	INT
CH1_Forward	0	Decimal	BOOL
CH1_Forward_Cmd	0	Decimal	BOOL
CH1_Jog	0	Decimal	BOOL
CH1_Read_Jog_Frequency	111	Decimal	INT
CH1_Read_Param	0	Decimal	BOOL
CH1_Ready	1	Decimal	BOOL
CH1_Reference	100	Decimal	INT
CH1_Start	0	Decimal	BOOL
CH1_Stop	0	Decimal	BOOL
CH1_Valid_Data	1	Decimal	BOOL
CH1_Write_Jog_Frequency	111	Decimal	INT
CH1_Write_Param	0	Decimal	BOOL

Monitor Tags / Edit Tags

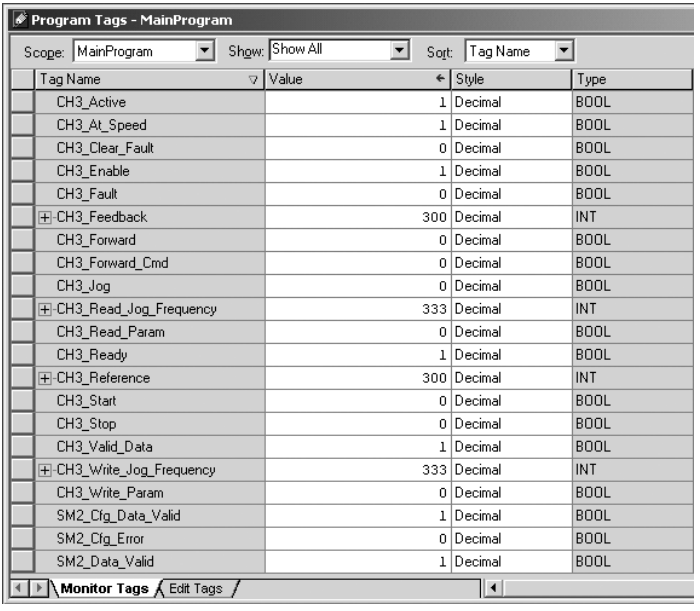


Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type
CH2_Active	1	Decimal	BOOL
CH2_At_Speed	1	Decimal	BOOL
CH2_Clear_Fault	0	Decimal	BOOL
CH2_Enable	1	Decimal	BOOL
CH2_Fault	0	Decimal	BOOL
CH2_Feedback	200	Decimal	INT
CH2_Forward	0	Decimal	BOOL
CH2_Forward_Cmd	0	Decimal	BOOL
CH2_Jog	0	Decimal	BOOL
CH2_Read_Jog_Frequency	222	Decimal	INT
CH2_Read_Param	0	Decimal	BOOL
CH2_Ready	1	Decimal	BOOL
CH2_Reference	200	Decimal	INT
CH2_Start	0	Decimal	BOOL
CH2_Stop	0	Decimal	BOOL
CH2_Valid_Data	1	Decimal	BOOL
CH2_Write_Jog_Frequency	222	Decimal	INT
CH2_Write_Param	0	Decimal	BOOL

Monitor Tags / Edit Tags



Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type
CH3_Active	1	Decimal	BOOL
CH3_At_Speed	1	Decimal	BOOL
CH3_Clear_Fault	0	Decimal	BOOL
CH3_Enable	1	Decimal	BOOL
CH3_Fault	0	Decimal	BOOL
CH3_Feedback	300	Decimal	INT
CH3_Forward	0	Decimal	BOOL
CH3_Forward_Cmd	0	Decimal	BOOL
CH3_Jog	0	Decimal	BOOL
CH3_Read_Jog_Frequency	333	Decimal	INT
CH3_Read_Param	0	Decimal	BOOL
CH3_Ready	1	Decimal	BOOL
CH3_Reference	300	Decimal	INT
CH3_Start	0	Decimal	BOOL
CH3_Stop	0	Decimal	BOOL
CH3_Valid_Data	1	Decimal	BOOL
CH3_Write_Jog_Frequency	333	Decimal	INT
CH3_Write_Param	0	Decimal	BOOL
SM2_Cfg_Data_Valid	1	Decimal	BOOL
SM2_Cfg_Error	0	Decimal	BOOL
SM2_Data_Valid	1	Decimal	BOOL

Monitor Tags / Edit Tags

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Force Mask	Style	Type
CH1_Read_Msg	{...}	{...}		MESSAGE
CH1_Read_Value	111		Decimal	INT
CH1_Write_Msg	{...}	{...}		MESSAGE
CH1_Write_Value	111		Decimal	INT
CH2_Read_Msg	{...}	{...}		MESSAGE
CH2_Read_Value	222		Decimal	INT
CH2_Write_Msg	{...}	{...}		MESSAGE
CH2_Write_Value	222		Decimal	INT
CH3_Read_Msg	{...}	{...}		MESSAGE
CH3_Read_Value	333		Decimal	INT
CH3_Write_Msg	{...}	{...}		MESSAGE
CH3_Write_Value	333		Decimal	INT

Since CH2 and CH3 ladder routines are similar to the CH1 routine, they are not provided.

Multi-Drive Mode

The ladder example provided in this section is based on a 1769-SM2 module in slot 1 with five PowerFlex 4/40 drives connected to CH1 and to CH2, and one PowerFlex 70 connected to CH3 (Figure 7.4). The ladder example demonstrates the following functionality for each channel's drives:

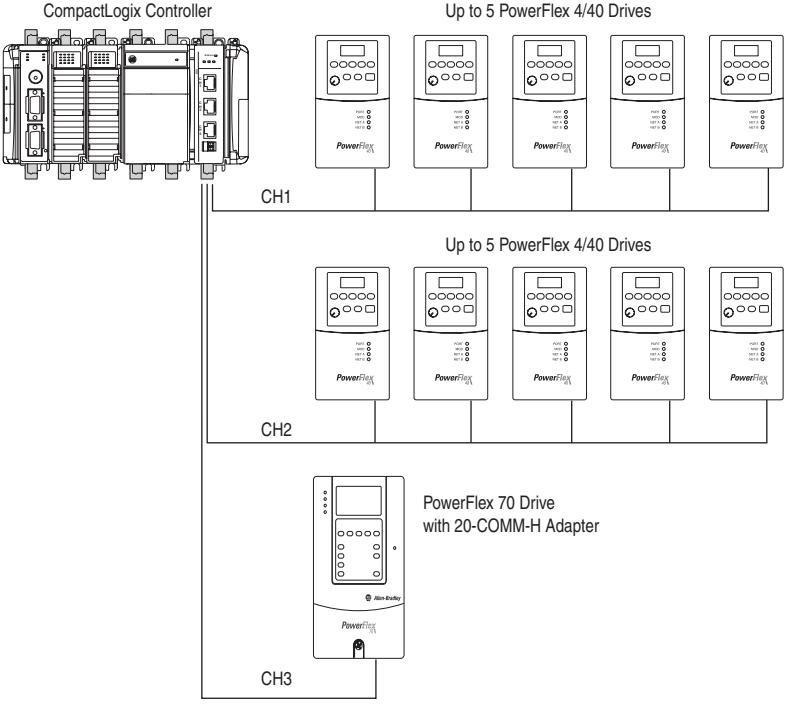
- Send a Logic Command to control the drive (for example, start, stop).
- Send a Reference to the drive and receive Feedback from the drive.
- Receive Logic Status information from the drive.
- Write and read parameters.

Explicit messaging (parameter read/write) capability varies between the RSLogix software packages and controllers:

- Explicit messaging can be used with enhanced CompactLogix processors, such as the -L31, -L32E, and -L35E.

- CompactLogix -L20 and -L30 processors do NOT have explicit messaging capability.

Figure 7.4 Example CompactLogix Multi-Drive Mode System Arrangement



PowerFlex 40 Settings

The PowerFlex 40 drives used in the example program have the following parameter settings:

Parameter	Setting
P036 - [Start Source]	5 (Comm Port)
P038 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	100…104
A107 - [Comm Format]	0 (RTU 8-N-1)

PowerFlex 70 Setting

The PowerFlex 70 drive used in the example program has the following parameter setting:

Parameter	Setting
90 - [Speed Ref A Sel]	22(DPI Port 5)

20-COMM-H Settings

The 20-COMM-H adapter used in the example program has the following parameter and switch settings:

Parameter Settings

Parameter	Setting
5 - [Net Rate Cfg]	2 (19200 Baud)
7 - [Net Parity Cfg]	1 (Odd)
16 - [DPI I/O Cfg]	00001 = Logic Command/Reference
30 - [Stop Bits Cfg]	0 (1 bit)

Switch Settings

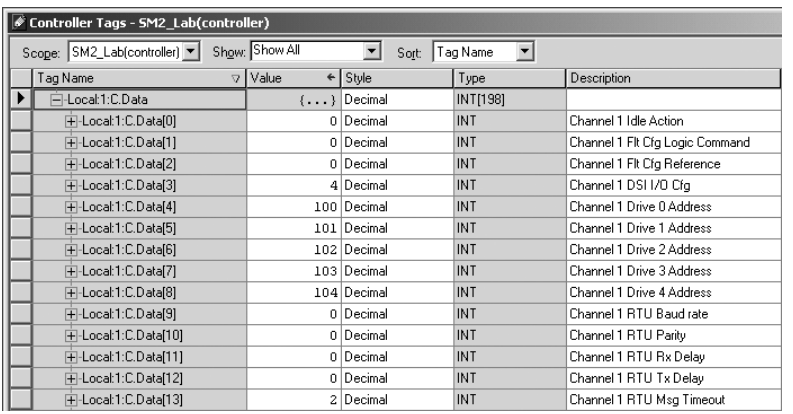
Switch	Setting
Node Address Switches	15
Network Protocol Switch	RTU position

1769-SM2 Settings

The 1769-SM2 module used in the example program has the following switch settings:

Switch	Setting
Configuration Mode Switch (SW1)	CONT position
Operating Mode Switch (SW2)	5X (Multi-Drive) position

The I/O configuration in RSLogix 5000 for the Multi-Drive mode example program is:



Tag Name	Value	Style	Type	Description
Local:1:C.Data	{...}	Decimal	INT[198]	
Local:1:C.Data[0]	0	Decimal	INT	Channel 1 Idle Action
Local:1:C.Data[1]	0	Decimal	INT	Channel 1 Flt Cfg Logic Command
Local:1:C.Data[2]	0	Decimal	INT	Channel 1 Flt Cfg Reference
Local:1:C.Data[3]	4	Decimal	INT	Channel 1 DSI I/O Cfg
Local:1:C.Data[4]	100	Decimal	INT	Channel 1 Drive 0 Address
Local:1:C.Data[5]	101	Decimal	INT	Channel 1 Drive 1 Address
Local:1:C.Data[6]	102	Decimal	INT	Channel 1 Drive 2 Address
Local:1:C.Data[7]	103	Decimal	INT	Channel 1 Drive 3 Address
Local:1:C.Data[8]	104	Decimal	INT	Channel 1 Drive 4 Address
Local:1:C.Data[9]	0	Decimal	INT	Channel 1 RTU Baud rate
Local:1:C.Data[10]	0	Decimal	INT	Channel 1 RTU Parity
Local:1:C.Data[11]	0	Decimal	INT	Channel 1 RTU Rx Delay
Local:1:C.Data[12]	0	Decimal	INT	Channel 1 RTU Tx Delay
Local:1:C.Data[13]	2	Decimal	INT	Channel 1 RTU Msg Timeout

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
Local:1:C.Data[14]	0	Decimal	INT	Channel 2 Idle Action
Local:1:C.Data[15]	0	Decimal	INT	Channel 2 Flt Cfg Logic Command
Local:1:C.Data[16]	0	Decimal	INT	Channel 2 Flt Cfg Reference
Local:1:C.Data[17]	4	Decimal	INT	Channel 2 DSI I/O Cfg
Local:1:C.Data[18]	100	Decimal	INT	Channel 2 Drive 0 Address
Local:1:C.Data[19]	101	Decimal	INT	Channel 2 Drive 1 Address
Local:1:C.Data[20]	102	Decimal	INT	Channel 2 Drive 2 Address
Local:1:C.Data[21]	103	Decimal	INT	Channel 2 Drive 3 Address
Local:1:C.Data[22]	104	Decimal	INT	Channel 2 Drive 4 Address
Local:1:C.Data[23]	0	Decimal	INT	Channel 2 RTU Baud rate
Local:1:C.Data[24]	0	Decimal	INT	Channel 2 RTU Parity
Local:1:C.Data[25]	0	Decimal	INT	Channel 2 RTU Rx Delay
Local:1:C.Data[26]	0	Decimal	INT	Channel 2 RTU Tx Delay
Local:1:C.Data[27]	2	Decimal	INT	Channel 2 RTU Msg Timeout

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
Local:1:C.Data[28]	0	Decimal	INT	Channel 3 Idle Action
Local:1:C.Data[29]	0	Decimal	INT	Channel 3 Flt Cfg Logic Command
Local:1:C.Data[30]	0	Decimal	INT	Channel 3 Flt Cfg Reference
Local:1:C.Data[31]	5	Decimal	INT	Channel 3 DSI I/O Cfg
Local:1:C.Data[32]	100	Decimal	INT	Channel 3 Drive 0 Address
Local:1:C.Data[33]	101	Decimal	INT	Channel 3 Drive 1 Address
Local:1:C.Data[34]	102	Decimal	INT	Channel 3 Drive 2 Address
Local:1:C.Data[35]	103	Decimal	INT	Channel 3 Drive 3 Address
Local:1:C.Data[36]	104	Decimal	INT	Channel 3 Drive 4 Address
Local:1:C.Data[37]	1	Decimal	INT	Channel 3 RTU Baud rate
Local:1:C.Data[38]	2	Decimal	INT	Channel 3 RTU Parity
Local:1:C.Data[39]	0	Decimal	INT	Channel 3 RTU Rx Delay
Local:1:C.Data[40]	0	Decimal	INT	Channel 3 RTU Tx Delay
Local:1:C.Data[41]	2	Decimal	INT	Channel 3 RTU Msg Timeout

Refer to Chapter 4 for information about the I/O image, Module Enable/Status, Logic Command/Status, and Reference/Feedback.

CompactLogix Multi-Drive Mode Example Program

Figure 7.5 Example CompactLogix Multi-Drive Ladder Logic Main Routine

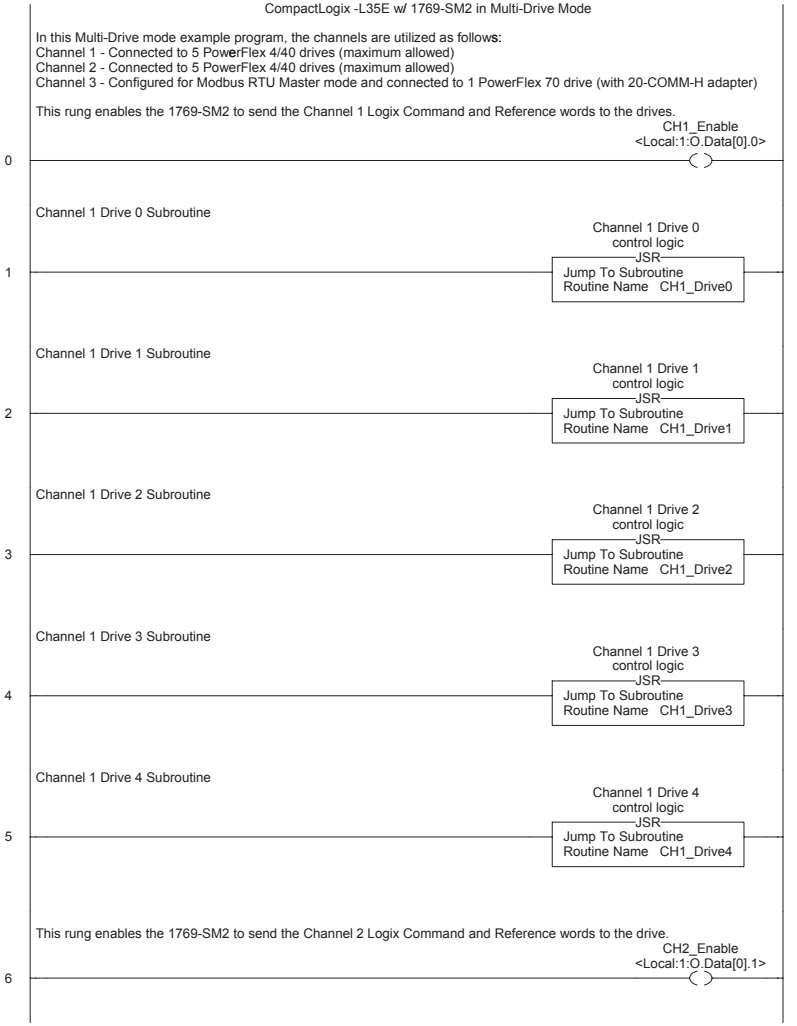


Figure 7.5 Example CompactLogix Multi-Drive Ladder Logic Main Routine (Continued)

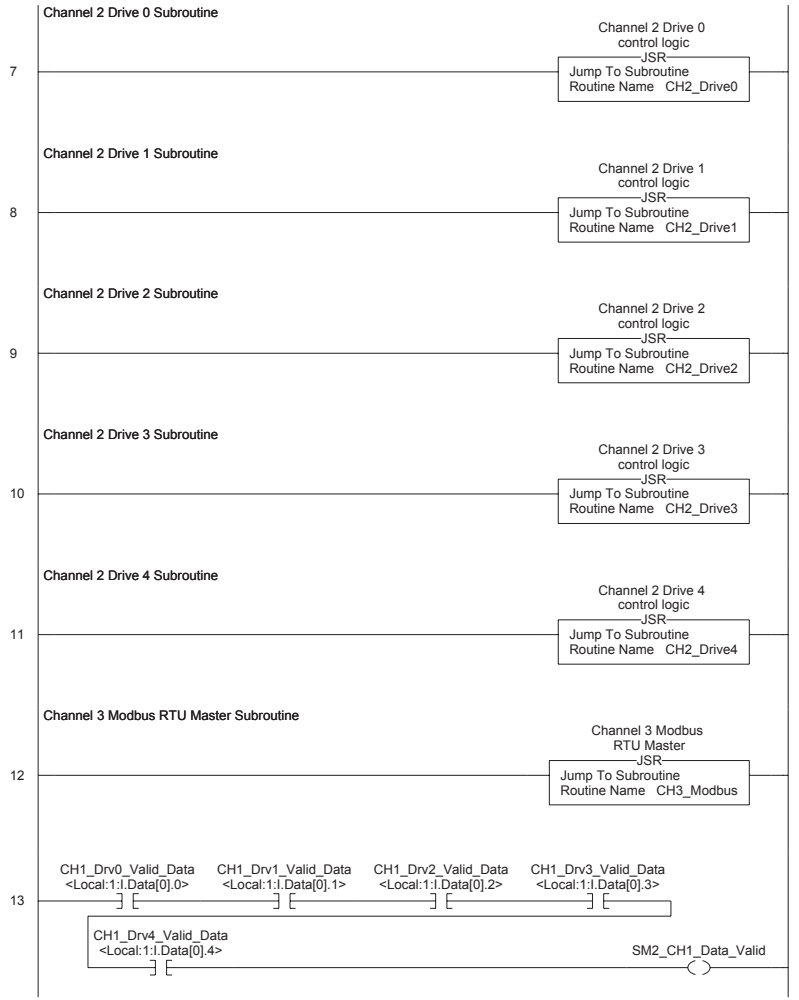


Figure 7.5 Example CompactLogix Multi-Drive Ladder Logic Main Routine (Continued)

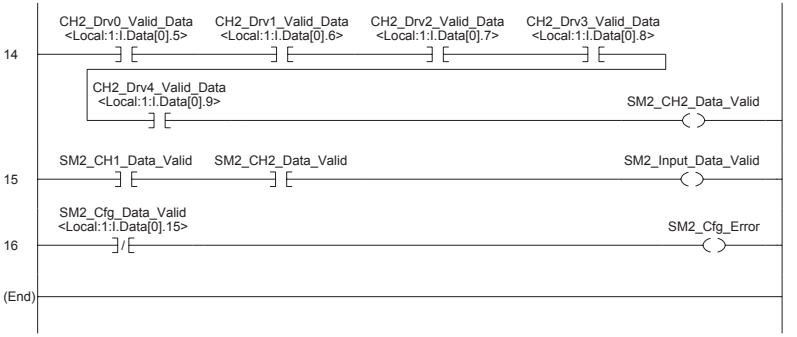


Figure 7.6 Example CompactLogix Multi-Drive Ladder Logic CH1 Drive 0 Subroutine

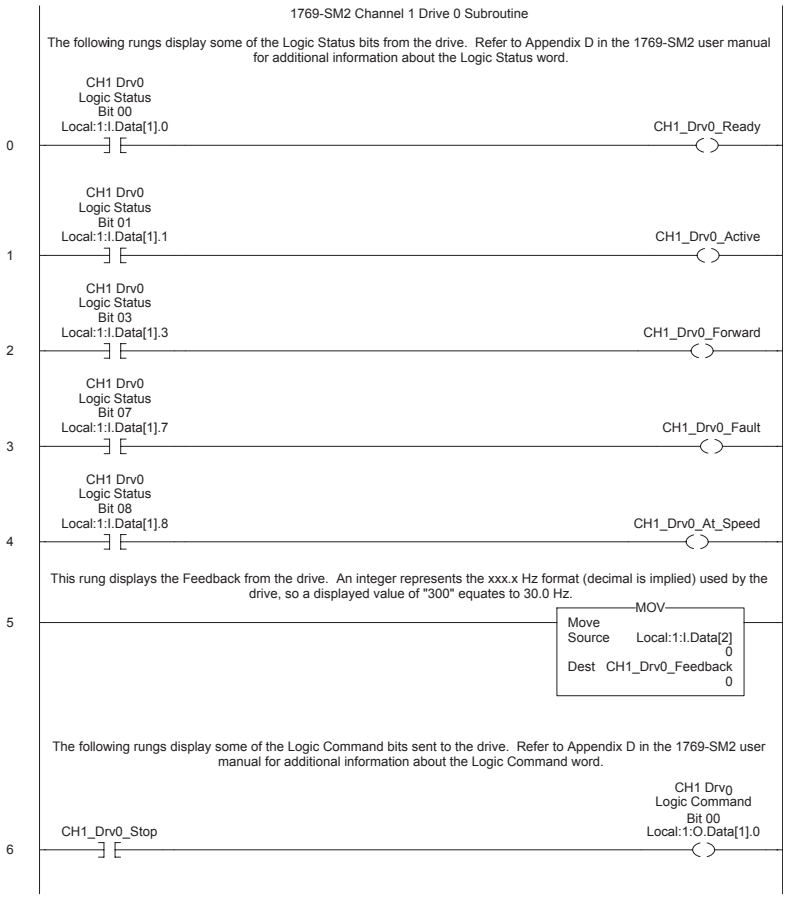


Figure 7.6 Example CompactLogix Multi-Drive Ladder Logic CH1 Drive 0 Subroutine (Continued)

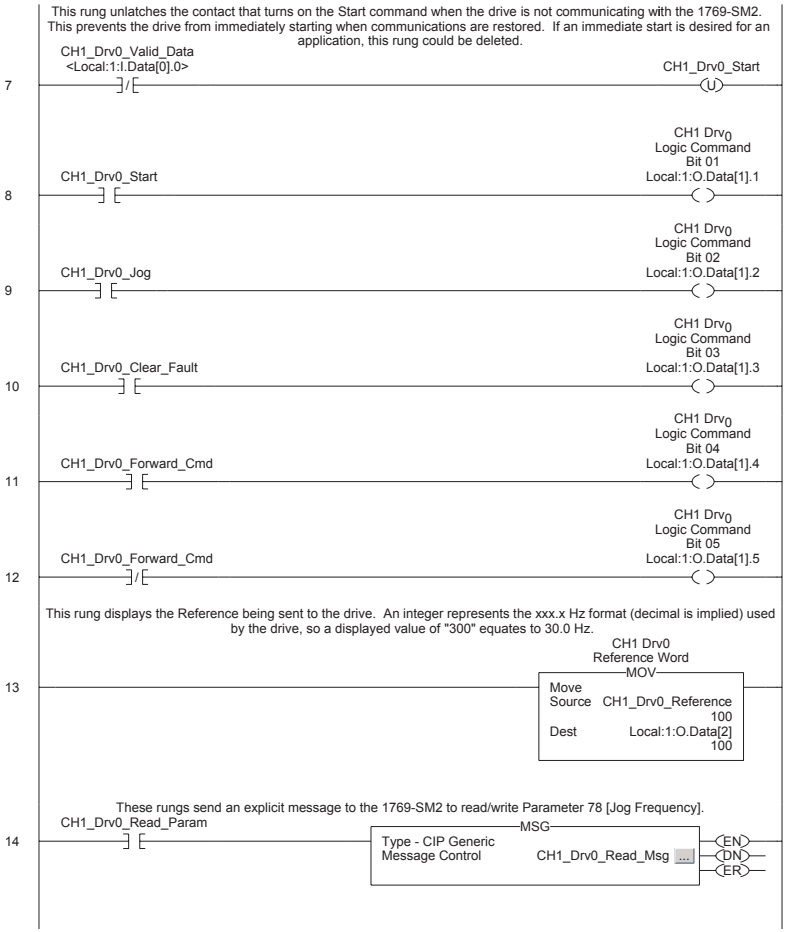
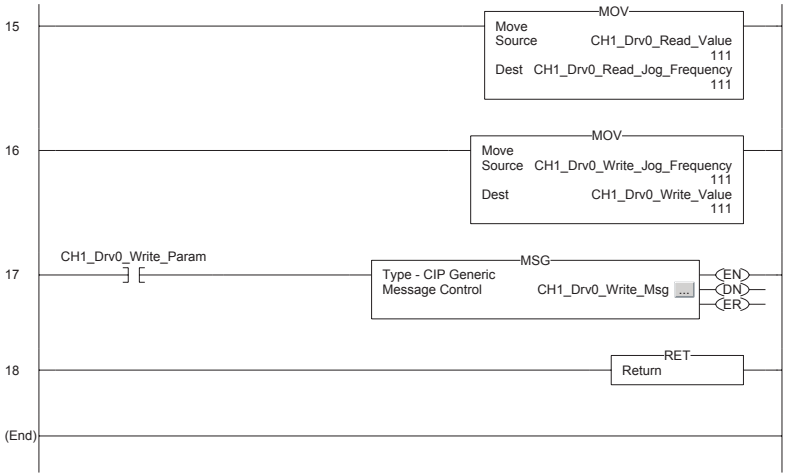
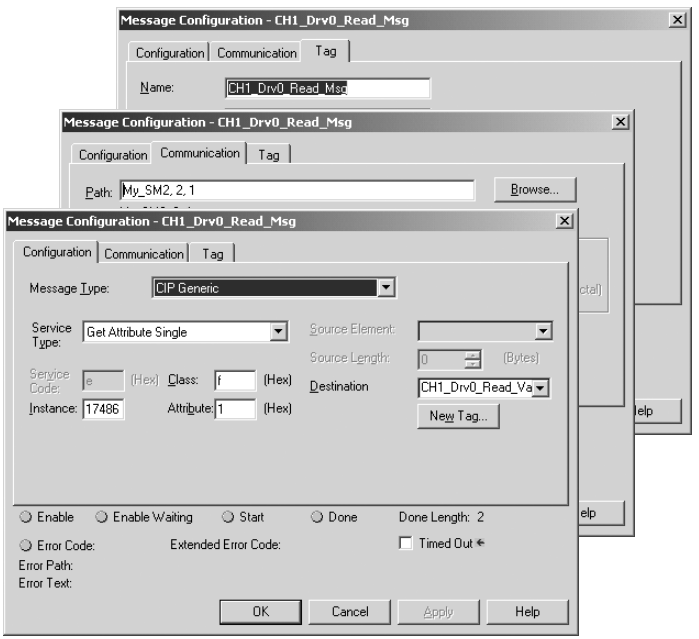


Figure 7.6 Example CompactLogix Multi-Drive Ladder Logic CH1 Drive 0 Subroutine (Continued)



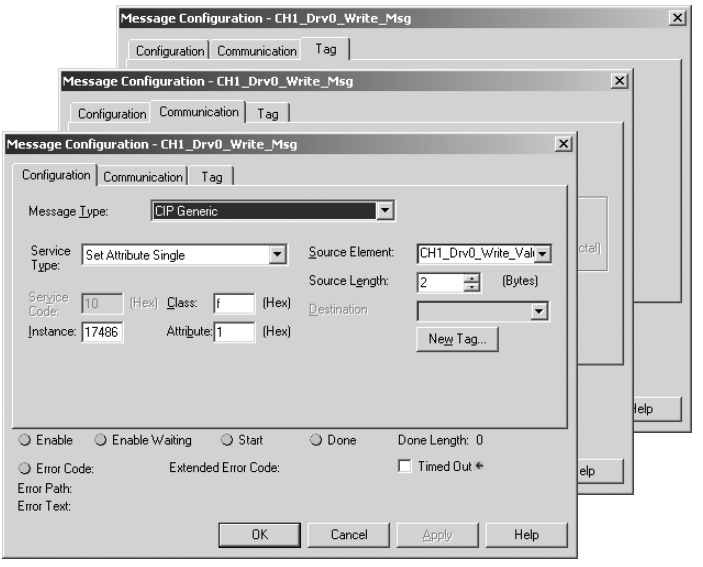
The read and write message instructions for PowerFlex 40 drive Parameter 78 - [Jog Frequency] are configured as follows:

Read Message (Rung 14)



A “17486” equates to Parameter 78 (17486 - 17408 = 78), since 17408 is Instance 0 in the drive (17409 is Parameter 1). For additional information about the message setup, refer to page 5-3.

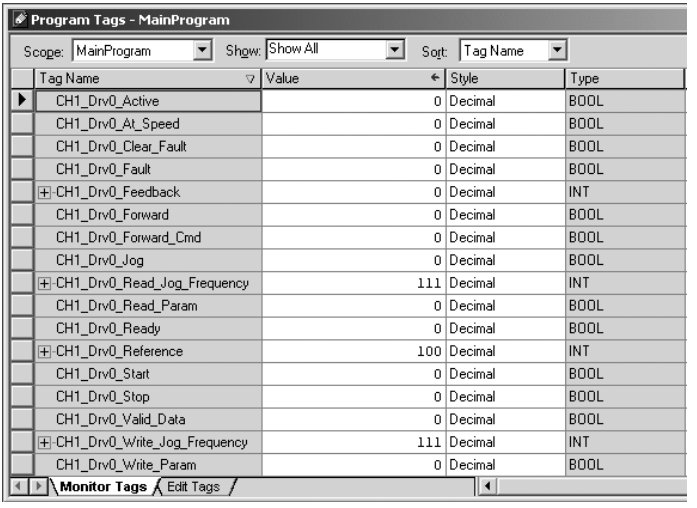
Write Message (Rung 17)



A “17486” equates to Parameter 78 (17486 - 17408 = 78), since 17408 is Instance 0 in the drive (17409 is Parameter 1). For additional information about the message setup, refer to page 5-3.

Multi-Drive Example Program Tags

The following tags are used to contain the input and output data to/from CH1 Drive 0:

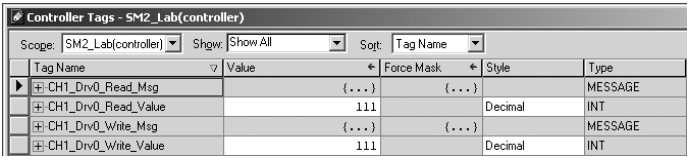


Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type
CH1_Drv0_Active	0	Decimal	BOOL
CH1_Drv0_At_Speed	0	Decimal	BOOL
CH1_Drv0_Clear_Fault	0	Decimal	BOOL
CH1_Drv0_Fault	0	Decimal	BOOL
CH1_Drv0_Feedback	0	Decimal	INT
CH1_Drv0_Forward	0	Decimal	BOOL
CH1_Drv0_Forward_Cmd	0	Decimal	BOOL
CH1_Drv0_Jog	0	Decimal	BOOL
CH1_Drv0_Read_Jog_Frequency	111	Decimal	INT
CH1_Drv0_Read_Param	0	Decimal	BOOL
CH1_Drv0_Ready	0	Decimal	BOOL
CH1_Drv0_Reference	100	Decimal	INT
CH1_Drv0_Start	0	Decimal	BOOL
CH1_Drv0_Stop	0	Decimal	BOOL
CH1_Drv0_Valid_Data	0	Decimal	BOOL
CH1_Drv0_Write_Jog_Frequency	111	Decimal	INT
CH1_Drv0_Write_Param	0	Decimal	BOOL

Monitor Tags / Edit Tags



Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Force Mask	Style	Type
CH1_Drv0_Read_Msg	{...}	{...}		MESSAGE
CH1_Drv0_Read_Value	111		Decimal	INT
CH1_Drv0_Write_Msg	{...}	{...}		MESSAGE
CH1_Drv0_Write_Value	111		Decimal	INT

Since the Drive 1…4 and CH2 ladder routines are similar to the CH1 Drive 0 routine, they are not provided.

CH3 Modbus RTU Master Subroutine Example

In Multi-Drive mode, any channel can be configured for Modbus RTU Master operation. In the CompactLogix Multi-Drive ladder logic example, CH3 is used to communicate with a PowerFlex 70 drive via Modbus RTU operation.

Figure 7.7 Example CompactLogix Modbus RTU Ladder Logic CH3 Subroutine

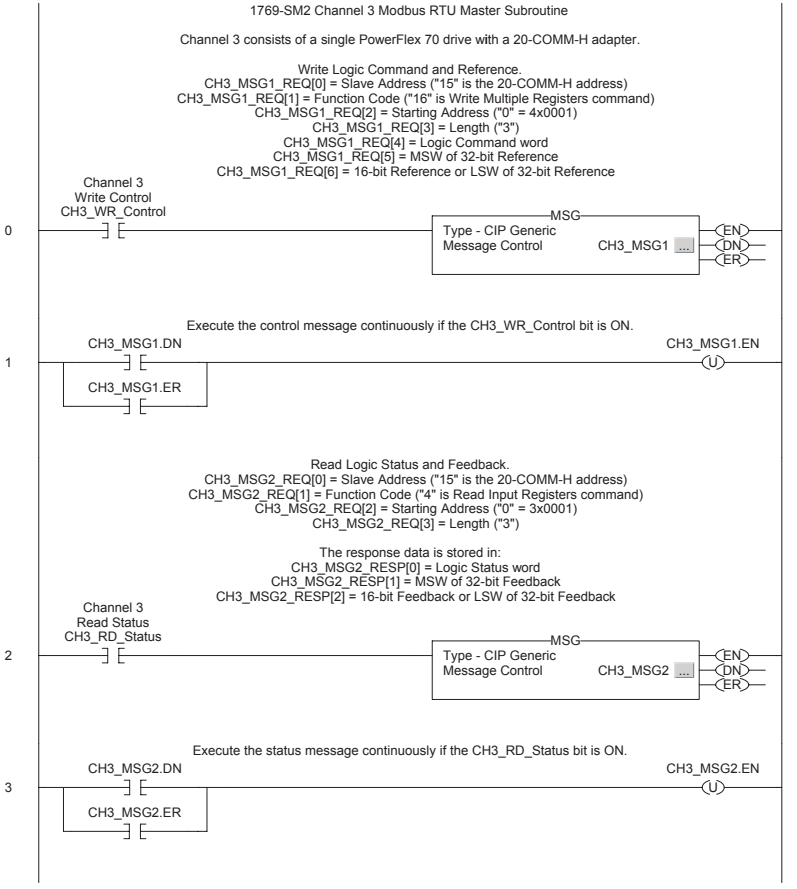
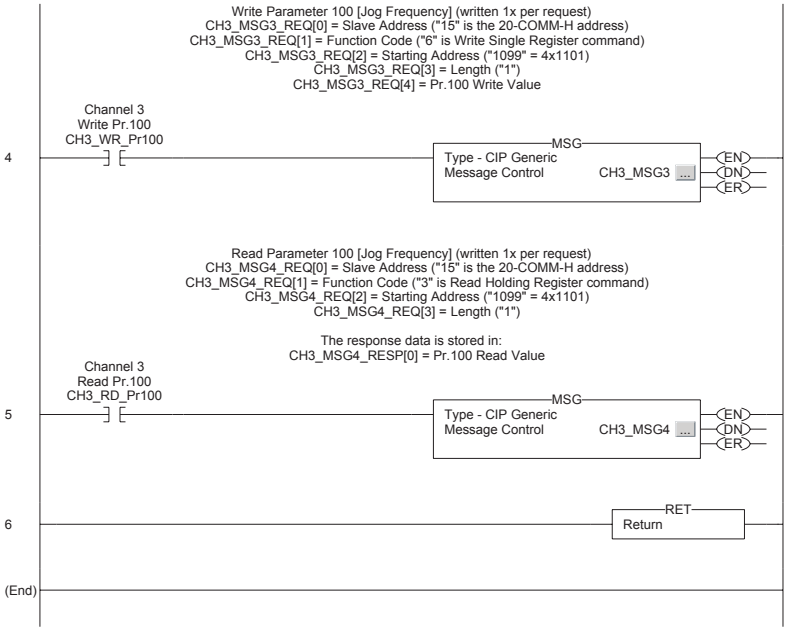
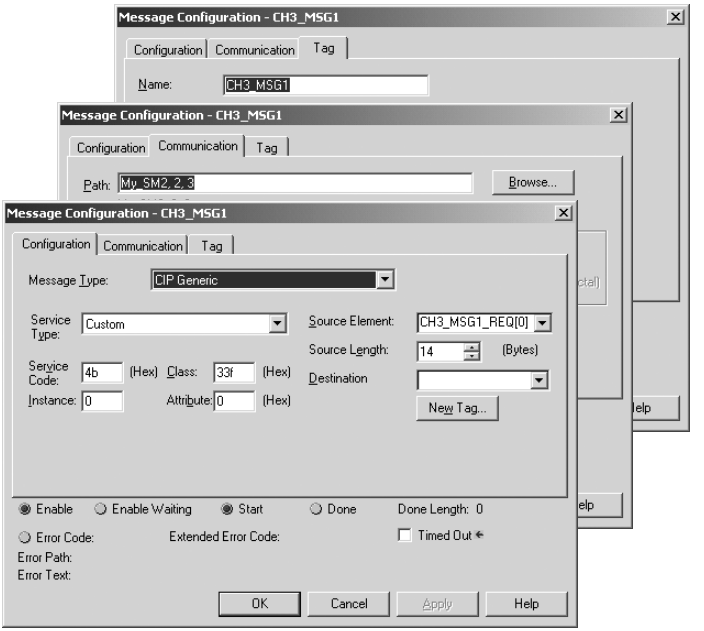


Figure 7.7 Example CompactLogix Modbus RTU Ladder Logic CH3 Subroutine (Continued)



The Logic Command/Reference write message instruction on rung 0 is configured as follows:



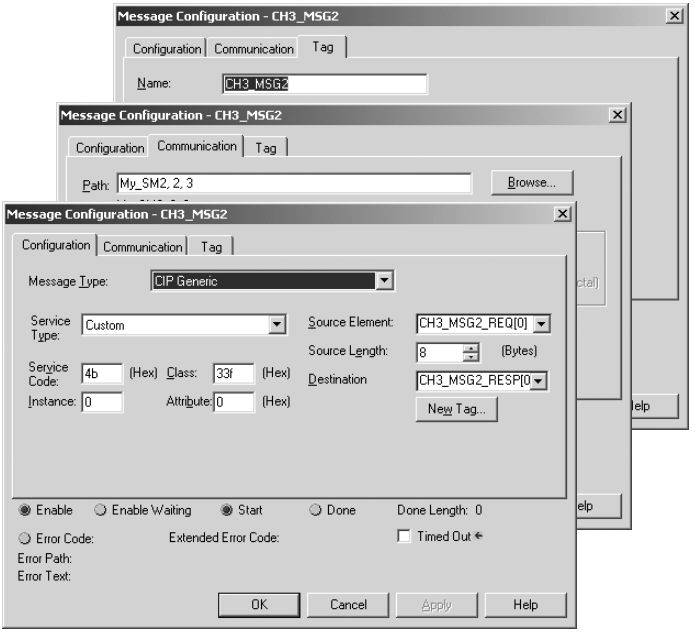
The format of the command data is:

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
CH3_MSG1	{...}		MESSAGE	
CH3_MSG1_REQ	{...}	Decimal	INT[10]	RTU Message 1 Request Data
CH3_MSG1_REQ[0]	15	Decimal	INT	PowerFlex 70 RTU Slave Address
CH3_MSG1_REQ[1]	16	Decimal	INT	Function Code
CH3_MSG1_REQ[2]	0	Decimal	INT	PowerFlex 70 Register Address
CH3_MSG1_REQ[3]	3	Decimal	INT	Length
CH3_MSG1_REQ[4]	18	Decimal	INT	PowerFlex 70 Logic Command Word
CH3_MSG1_REQ[5]	0	Decimal	INT	
CH3_MSG1_REQ[6]	8192	Decimal	INT	PowerFlex 70 Reference Word
CH3_MSG1_REQ[7]	0	Decimal	INT	
CH3_MSG1_REQ[8]	0	Decimal	INT	
CH3_MSG1_REQ[9]	0	Decimal	INT	

The Logic Status/Feedback read message instruction on rung 2 is configured as follows:



The format of the command and response data is:

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
CH3_MSG2	{...}		MESSAGE	
CH3_MSG2_REQ	{...}	Decimal	INT[10]	RTU Message 2 Request Data
CH3_MSG2_REQ[0]	15	Decimal	INT	PowerFlex 70 RTU Slave Address
CH3_MSG2_REQ[1]	4	Decimal	INT	Function Code
CH3_MSG2_REQ[2]	0	Decimal	INT	PowerFlex 70 Register Address
CH3_MSG2_REQ[3]	3	Decimal	INT	Length
CH3_MSG2_REQ[4]	0	Decimal	INT	
CH3_MSG2_REQ[5]	0	Decimal	INT	
CH3_MSG2_REQ[6]	0	Decimal	INT	
CH3_MSG2_REQ[7]	0	Decimal	INT	
CH3_MSG2_REQ[8]	0	Decimal	INT	
CH3_MSG2_REQ[9]	0	Decimal	INT	
CH3_MSG2_RESP	{...}	Decimal	INT[10]	RTU Message 2 Response Data
CH3_MSG2_RESP[0]	3855	Decimal	INT	PowerFlex 70 Logic Status Word
CH3_MSG2_RESP[1]	0	Decimal	INT	
CH3_MSG2_RESP[2]	8192	Decimal	INT	PowerFlex 70 Feedback Word
CH3_MSG2_RESP[3]	0	Decimal	INT	
CH3_MSG2_RESP[4]	0	Decimal	INT	
CH3_MSG2_RESP[5]	0	Decimal	INT	
CH3_MSG2_RESP[6]	0	Decimal	INT	
CH3_MSG2_RESP[7]	0	Decimal	INT	
CH3_MSG2_RESP[8]	0	Decimal	INT	
CH3_MSG2_RESP[9]	0	Decimal	INT	

The write message instruction on rung 4 for PowerFlex 70 drive Parameter 100 - [Jog Speed] is configured as follows:

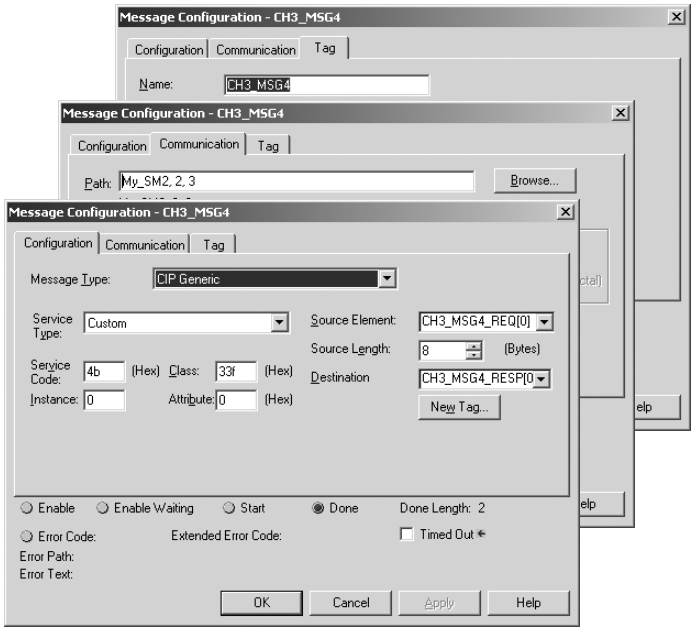
The format of the command data is:

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
CH3_MSG3_REQ	{...}	Decimal	INT[10]	RTU Message 3 Request Data
CH3_MSG3_REQ[0]	15	Decimal	INT	PowerFlex 70 RTU Slave Address
CH3_MSG3_REQ[1]	6	Decimal	INT	Function Code
CH3_MSG3_REQ[2]	1099	Decimal	INT	PowerFlex 70 Register Address
CH3_MSG3_REQ[3]	1	Decimal	INT	Length
CH3_MSG3_REQ[4]	111	Decimal	INT	PowerFlex 70 Pr.100 Write Value
CH3_MSG3_REQ[5]	0	Decimal	INT	
CH3_MSG3_REQ[6]	0	Decimal	INT	
CH3_MSG3_REQ[7]	0	Decimal	INT	
CH3_MSG3_REQ[8]	0	Decimal	INT	
CH3_MSG3_REQ[9]	0	Decimal	INT	

The read message instruction on rung 5 for PowerFlex 70 drive Parameter 100 - [Jog Speed] is configured as follows:



The format of the command and response data is:

Controller Tags - SM2_Lab(controller)

Scope: SM2_Lab(controller) Show: Show All Sort: Tag Name

Tag Name	Value	Style	Type	Description
CH3_MSG4_REQ	{...}	Decimal	INT[10]	RTU Message 4 Request Data
CH3_MSG4_REQ[0]	15	Decimal	INT	PowerFlex 70 RTU Slave Address
CH3_MSG4_REQ[1]	3	Decimal	INT	Function Code
CH3_MSG4_REQ[2]	1099	Decimal	INT	PowerFlex 70 Register Address
CH3_MSG4_REQ[3]	1	Decimal	INT	Length
CH3_MSG4_REQ[4]	0	Decimal	INT	
CH3_MSG4_REQ[5]	0	Decimal	INT	
CH3_MSG4_REQ[6]	0	Decimal	INT	
CH3_MSG4_REQ[7]	0	Decimal	INT	
CH3_MSG4_REQ[8]	0	Decimal	INT	
CH3_MSG4_REQ[9]	0	Decimal	INT	
CH3_MSG4_RESP	{...}	Decimal	INT[10]	RTU Message 4 Response Data
CH3_MSG4_RESP[0]	111	Decimal	INT	PowerFlex 70 Pr.100 Read Value
CH3_MSG4_RESP[1]	0	Decimal	INT	
CH3_MSG4_RESP[2]	0	Decimal	INT	
CH3_MSG4_RESP[3]	0	Decimal	INT	
CH3_MSG4_RESP[4]	0	Decimal	INT	
CH3_MSG4_RESP[5]	0	Decimal	INT	
CH3_MSG4_RESP[6]	0	Decimal	INT	
CH3_MSG4_RESP[7]	0	Decimal	INT	
CH3_MSG4_RESP[8]	0	Decimal	INT	
CH3_MSG4_RESP[9]	0	Decimal	INT	

For additional information about Modbus RTU Master messages for PowerFlex 7-Class drives, refer to the *20-COMM-H Adapter User Manual*, publication 20COMM-UM009.

Notes:

ControlLogix w/1769-ADN DeviceNet Example Ladder Program

This chapter provides an example of a ControlLogix controller and 1769-ADN Remote DeviceNet adapter system used with a 1769-SM2 module in Single mode.

Important: When the 1769-SM2 module is used with the 1769-ADN, the Configuration Mode switch (SW1) must be set to the "Controller" position (default). See Chapter 2 for information on Configuration Mode switch settings.

The 1769-SM2 module can be operated in Multi-Drive mode when used in a 1769-ADN system (example not provided). However, explicit messaging and Modbus RTU Master operation CANNOT be used in Single or Multi-Drive mode because, at the time of publication, the ADN does NOT support messaging.

Single Mode

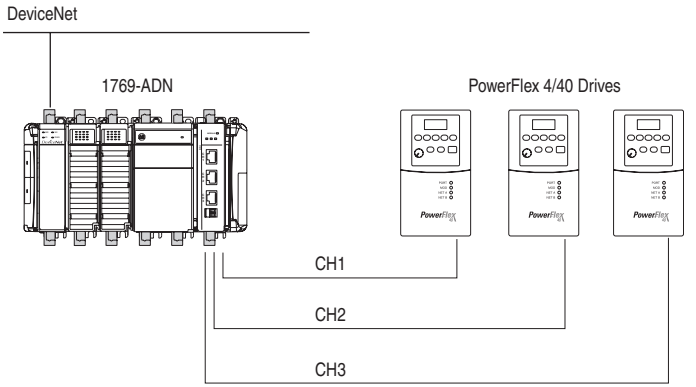
The ladder example provided in this section is based on a 1769-SM2 module in slot 1 with one PowerFlex 4/40 drive connected to each channel (Figure 8.1). The ladder example demonstrates the following functionality for each channel:

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

Explicit messaging (parameter read/write) capability varies between the RSLogix software packages and controllers:

- At the time of publication, the 1769-ADN does NOT have explicit messaging capability. Refer to ADN documentation for possible future explicit messaging support.

Figure 8.1 Example ControlLogix/1769-ADN DeviceNet Adapter in a Single Mode System Arrangement



Using RSLinx Classic

To use RSNetWorx for DeviceNet, you must first set up a driver in RSLinx. RSLinx Classic, in all its variations (Lite, Gateway, OEM, etc.), is used to provide a communication link between the computer, network, and controller. RSLinx Classic requires its network-specific driver to be configured before communications are established with network devices. To configure the RSLinx driver:

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

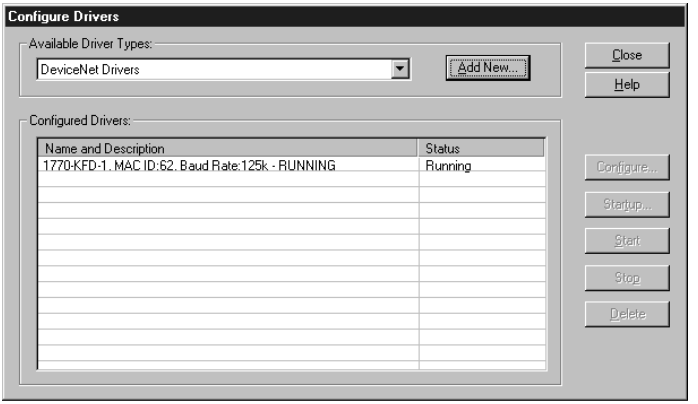
2. In the Available Drivers pull-down box, select “DeviceNet Drivers (1784-PCD/PCIDS, …drivers” and then click **Add New…** to display the DeviceNet Driver Selection screen.

3. Select the PC communication card (1770-KFD, 1771-SDNPT, etc.) for connection of your computer to the network and then click **Select**.

4. Configure the driver for your computer and network settings and click **OK**.

5. In the Add New RSLinx Driver screen, use the default name or type a new name and click **OK**. The Configure Drivers screen reappears with the new driver in the Configured Drivers list (Figure 8.2).

Figure 8.2 Configure Drivers Dialog Box with a Configured Driver



6. Click **Close** to close the Configure Drivers screen. Keep RSLinx running.

7. Verify that your computer recognizes the drive. Select **Communications > RSWho** and, in the treeview, click the "+" symbol next to the DeviceNet driver.

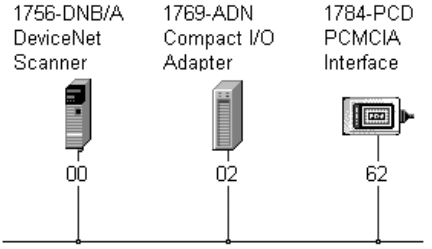
Using RSNetWorx for DeviceNet

RSNetWorx for DeviceNet is a Rockwell Software application that can be used to set up DeviceNet networks and configure connected devices.

You can view the devices on a DeviceNet network by going online. A device may appear as an unrecognized device (node 63 in Figure 8.3) if RSNetWorx for DeviceNet does not have an EDS file for it.

Step	Icon
1. After setting up a driver in RSLinx (see Using RSLinx Classic on page 8-2), start RSNetWorx for DeviceNet. 2. Select **Network > Online**. If the Browse for Network dialog box appears, RSLinx has multiple drivers configured. Select your DeviceNet network, and click **OK**. A prompt appears. 3. Click **OK** to go online. The devices on the network appear in the Configuration View. You can select Graph, Spreadsheet, or Master/Slave views. Figure 8.3 shows an example network in a Graph view.	 Shortcut to RSNetWorx

Figure 8.3 Example DeviceNet Network

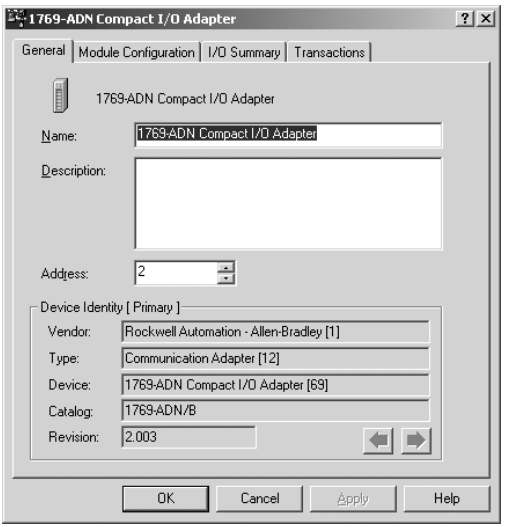


Setting Up the 1769-ADN

To configure the 1769-ADN for use with the example program using RSNetWorx for DeviceNet v3.21 (or higher), perform these steps:

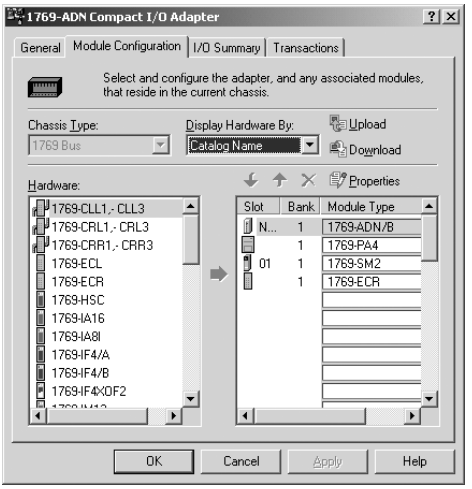
1. Double-click on the 1769-ADN adapter image in the graphic display window (Figure 8.4). In the ladder example system, the node address setting on the adapter is "2."

Figure 8.4 1769-ADN Adapter Image Screen



2. Select the Module Configuration tab and build the remote ADN system by dragging and dropping components (Figure 8.5). In the ladder example, the remote drop consists of an ADN, PA4 power supply, 1769-SM2 module, and ECR end cap terminator.

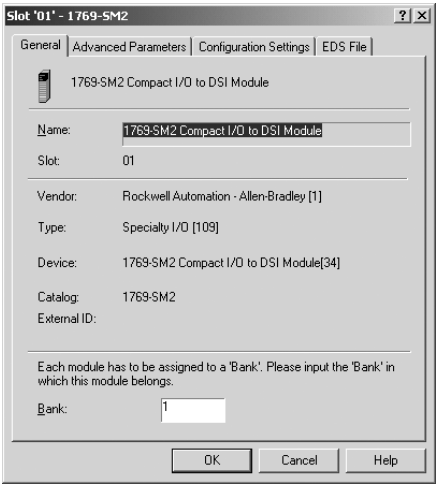
Figure 8.5 1769-ADN Adapter Module Configuration Tab Screen



The EDS file for the 1769-SM2 module is needed to configure the remote 1769-ADN DeviceNet system. If the 1769-SM2 is not listed as a selection (Figure 8.5), the EDS file will need to be downloaded from the Internet. For more information, refer to Registering the 1769-SM2 EDS File on page 8-8.

3. Select the 1769-SM2 and click on the Properties command button. A screen similar to Figure 8.6 will appear.

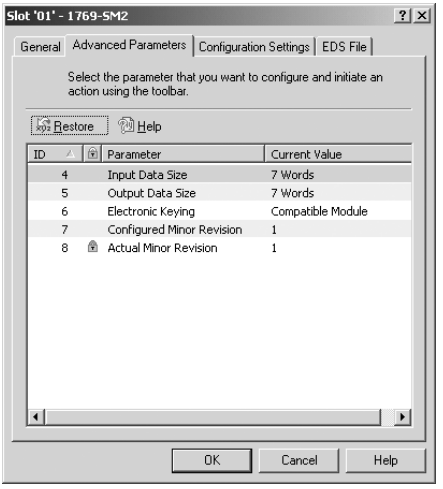
Figure 8.6 1769-SM2 Module Properties Screen



Enter a “1” in the Bank field, and click **OK**.

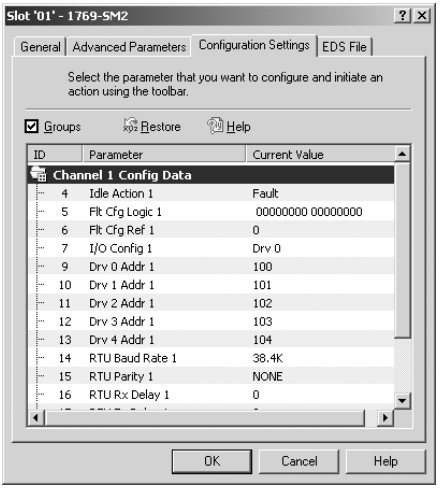
4. Select the Advanced Parameters tab (Figure 8.7). Refer to Chapter 4, Understanding the I/O Image regarding the Input and Output Data Sizes. In the ladder example, the Input and Output Data Sizes are set for 7 words each to allow for Logic Command/Reference and Logic Status/Feedback for all 3 drives.

Figure 8.7 1769-SM2 Module Advanced Parameters Tab Screen



5. Select the Configuration Settings tab. The configuration data for each channel is contained in a folder. Click on the Channel 1 folder (Figure 8.8).

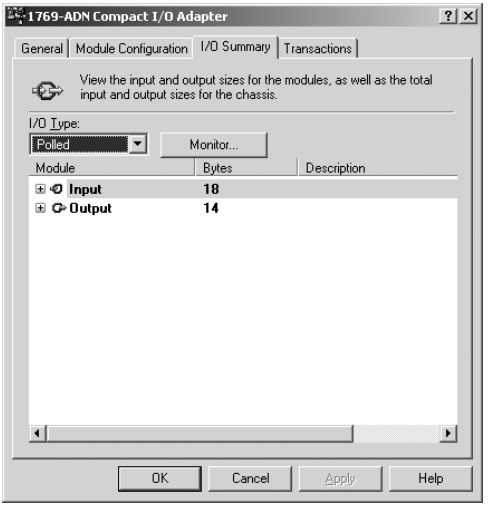
Figure 8.8 1769-SM2 Channel 1 Config Data Screen



Parameters can be adjusted by double-clicking on the desired parameter. Default settings are used for this ladder example. Click **OK** to complete the 1769-SM2 configuration.

6. Select the I/O Summary tab (Figure 8.9). The 1769-ADN uses 4 Input bytes and the 1769-SM2 module has been configured for 14 bytes (7 words) of Input and Output data. The I/O Summary below is required for the example ladder program.

Figure 8.9 1769-ADN Adapter I/O Summary Tab Screen

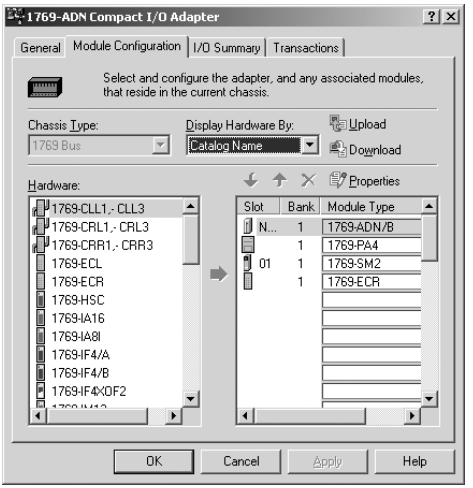


Click **OK** to complete the configuration.

Registering the 1769-SM2 EDS File

The EDS file for the 1769-SM2 module is needed to configure the remote 1769-ADN DeviceNet system. If the 1769-SM2 is not listed as a selection in the Hardware list (Figure 8.10), the EDS file will need to be downloaded from the Internet and registered using the EDS Wizard.

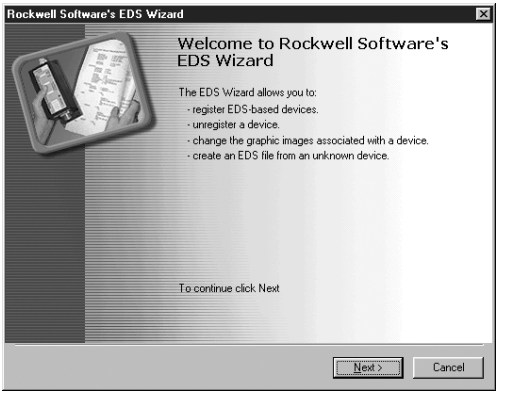
Figure 8.10 1769-ADN Adapter Module Configuration Tab Screen



1. Download the EDS file for the 1769-SM2 module from www.ab.com/networks/eds.

2. Using RSNetWorx for DeviceNet, click on **Tools > EDS Wizard** to launch the EDS Wizard (Figure 8.11).

Figure 8.11 EDS Wizard Welcome Screen

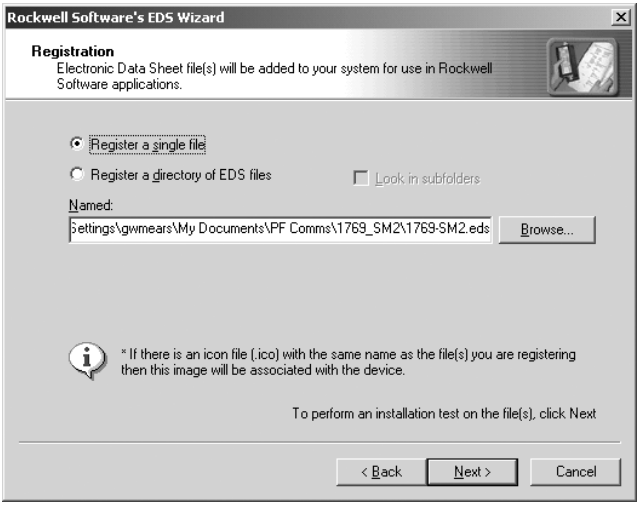


3. Click **Next >** to display the EDS Wizard Task screen (Figure 8.12). Select **Register an EDS file(s)** and click **Next >**.

Figure 8.12 EDS Wizard Task Screen

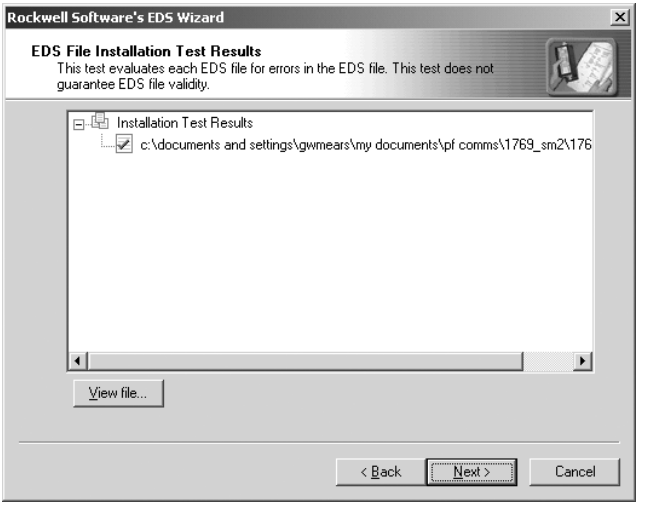
4. The EDS Wizard Registration screen (Figure 8.13) will appear. Select **Register a single file** and use the **Browse** command button to browse to the EDS file on your hard drive. Click **Next >**.

Figure 8.13 EDS Wizard Registration Screen



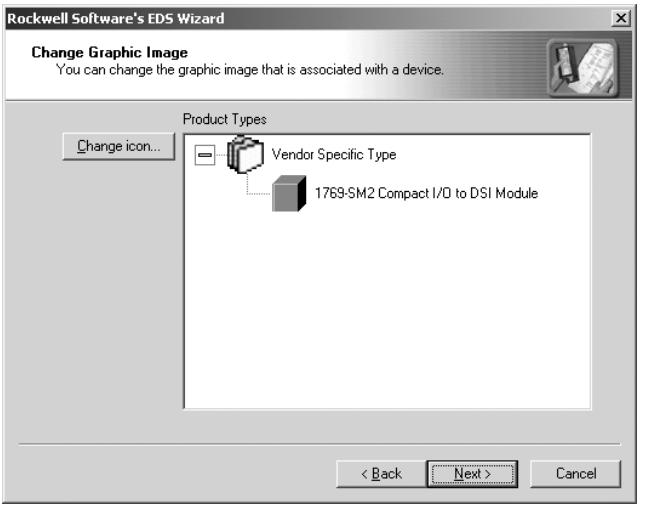
5. The EDS file is installed and tested (Figure 8.14). Click **Next >**.

Figure 8.14 EDS Wizard Installation Test Screen



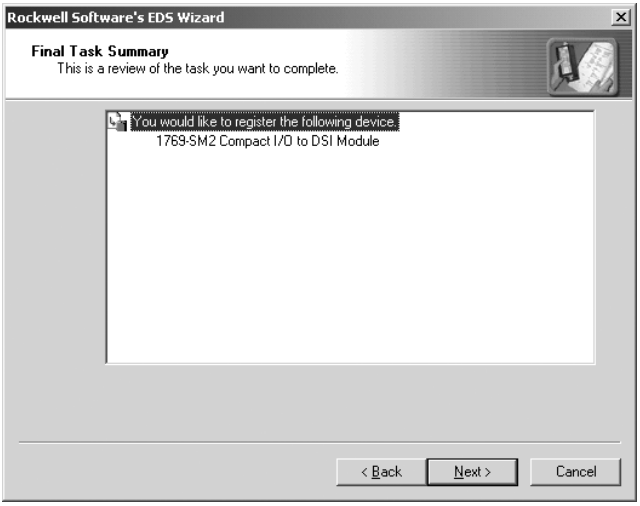
6. The EDS Wizard Change Graphic Image screen (Figure 8.15) appears, enabling the icon associated with the EDS file for the 1769-SM2 module to be changed if desired. Click **Next >**.

Figure 8.15 EDS Wizard Change Graphic Image Screen



7. The EDS Wizard Final Task Summary screen (Figure 8.16) will appear. Click **Next >** to register the 1769-SM2 module.

Figure 8.16 EDS Wizard Final Task Summary Screen



8. The EDS Wizard is now completed (Figure 8.17). Click **Finish**.

Figure 8.17 EDS Wizard Finish Screen

Earlier versions of RSNetWorx for DeviceNet require you to close and restart RSNetWorx for DeviceNet to enable the 1769-SM2 module to appear in the 1769-ADN Module Configuration tab (Figure 8.10). If you do not see the 1769-SM2 in the Hardware list, close and restart RSNetWorx for DeviceNet.

PowerFlex 40 Settings

The PowerFlex 40 drives used in the example program have the following parameter settings:

Parameter	Setting
P036 - [Start Source]	5 (Comm Port)
P038 - [Speed Reference]	5 (Comm Port)
A103 - [Comm Data Rate]	4 (19.2K)
A104 - [Comm Node Addr]	100
A107 - [Comm Format]	0 (RTU 8-N-1)

1769-SM2 Settings

The 1769-SM2 module used in the example program has the following switch settings:

Switch	Setting
Configuration Mode Switch (SW1)	CONT position
Operating Mode Switch (SW2)	1X (Single) position

ControlLogix w/1769-ADN Example Program

Figure 8.18 Example ControlLogix Ladder Logic Main Routine

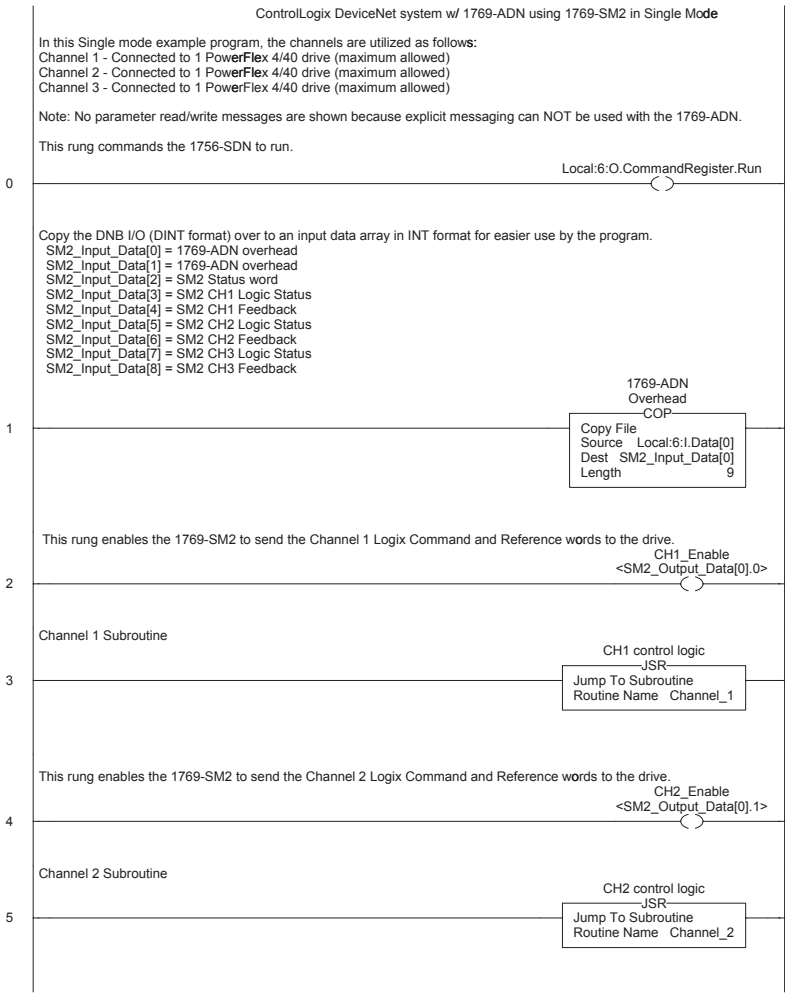


Figure 8.18 Example ControlLogix Ladder Logic Main Routine (Continued)

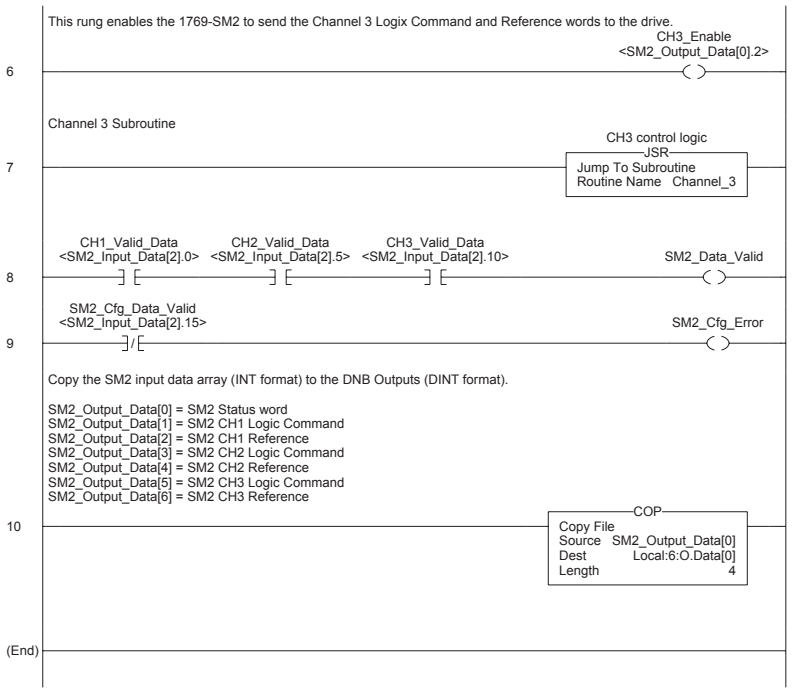


Figure 8.19 Example ControlLogix Ladder Logic CH1 Subroutine

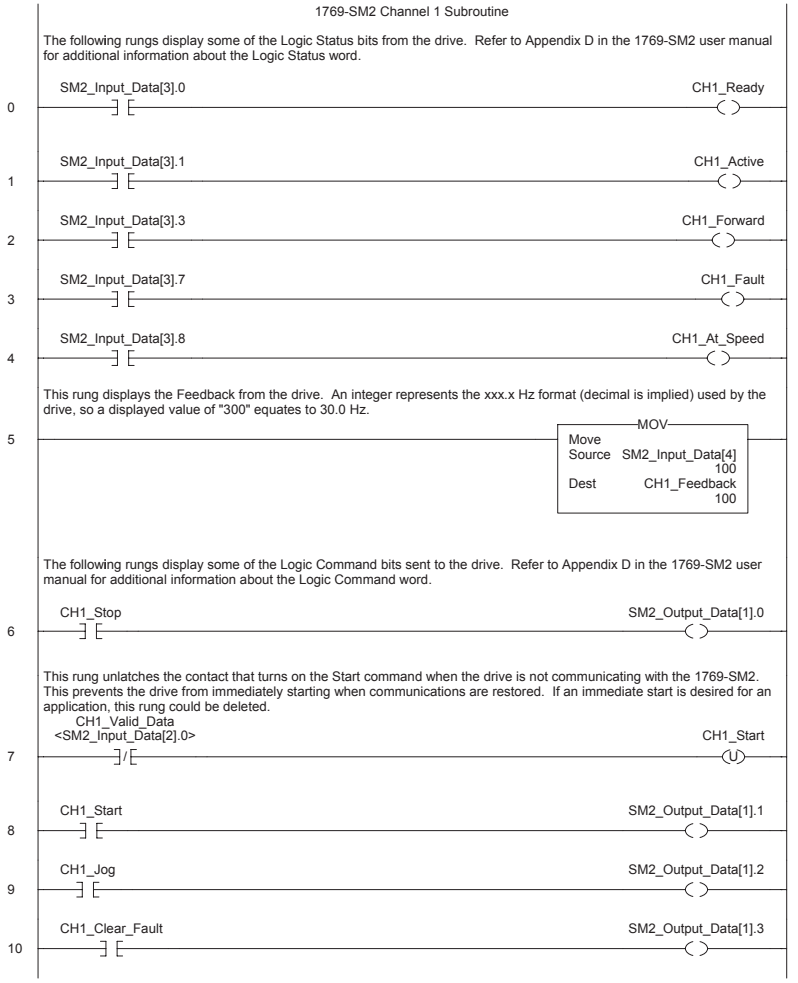


Figure 8.19 Example ControlLogix Ladder Logic CH1 Subroutine (Continued)

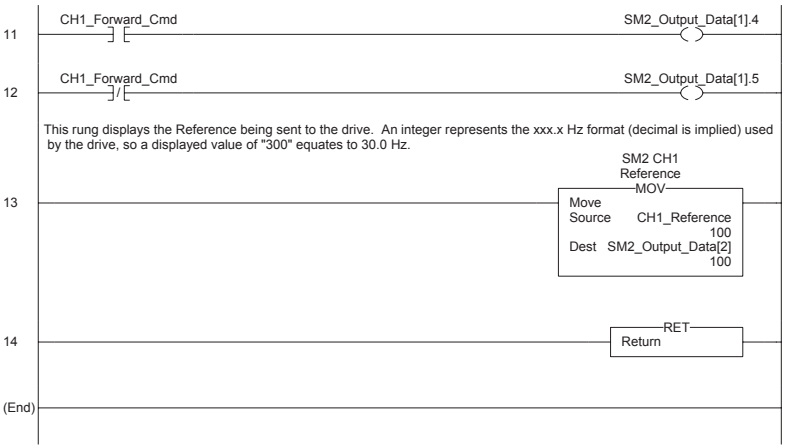


Figure 8.20 Example ControlLogix Ladder Logic CH2 Subroutine

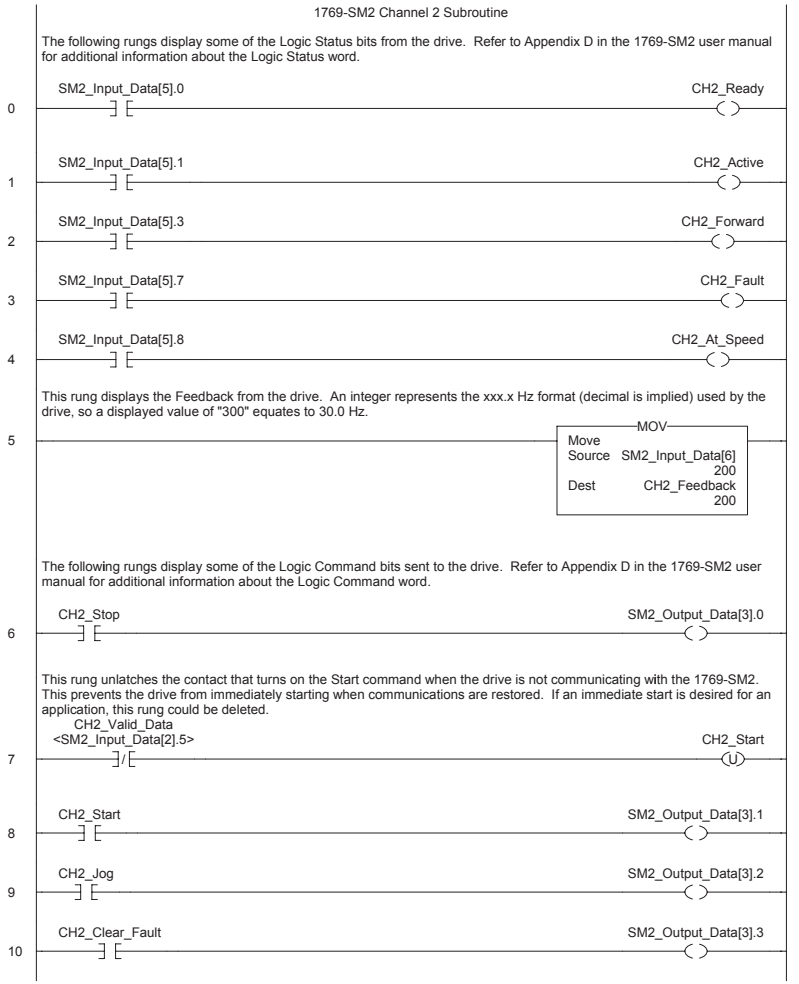


Figure 8.20 Example ControlLogix Ladder Logic CH2 Subroutine (Continued)

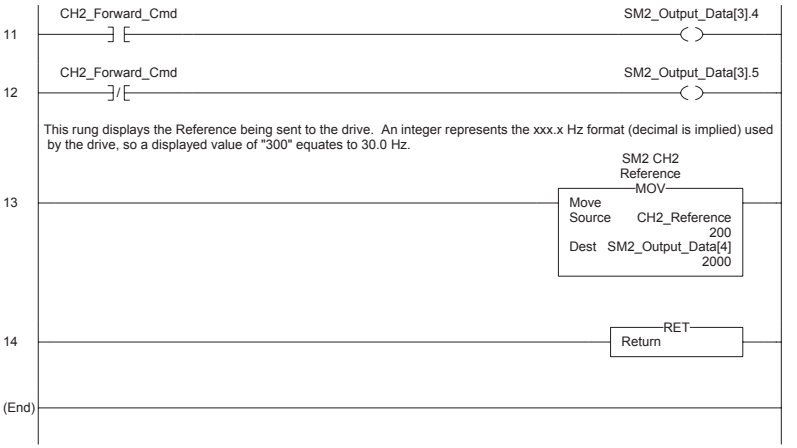


Figure 8.21 Example ControlLogix Ladder Logic CH3 Subroutine

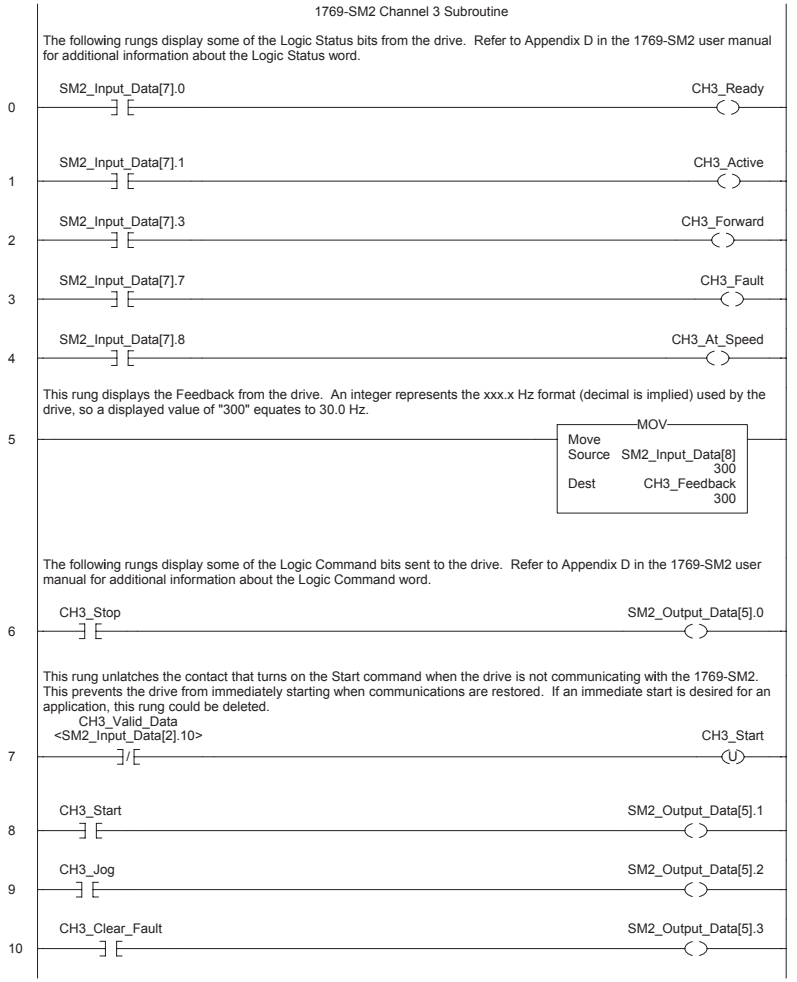
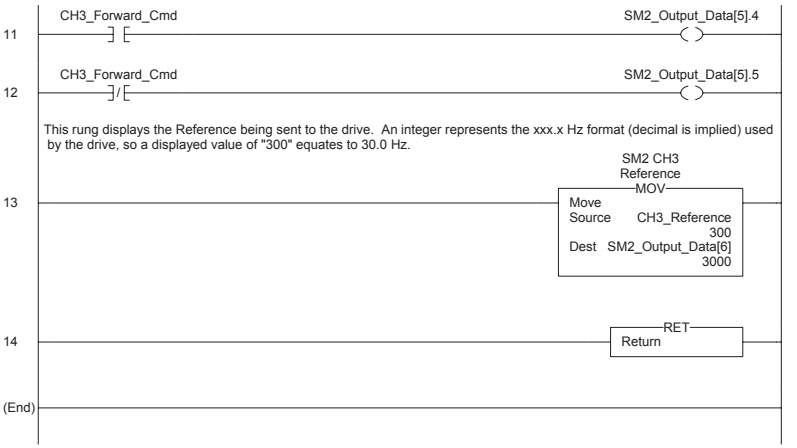


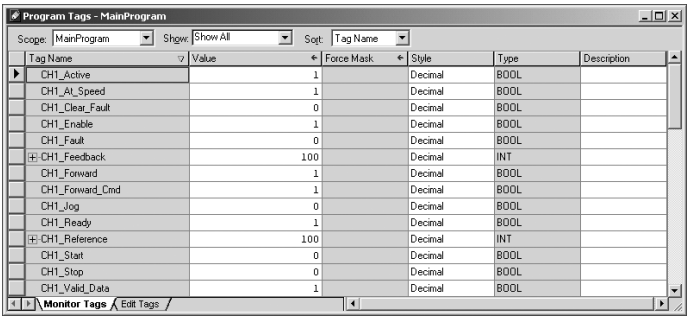
Figure 8.21 Example ControlLogix Ladder Logic CH3 Subroutine (Continued)



Example Program Data Table

In this example program, the following controller tags are used:

Figure 8.22 Controller Tags

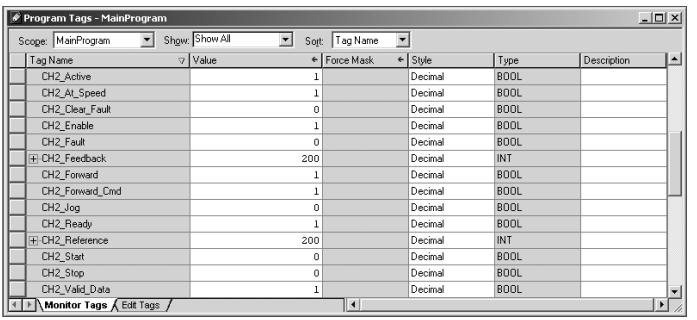


Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Force Mask	Style	Type	Description
CH1_Active	1		Decimal	BOOL	
CH1_At_Speed	1		Decimal	BOOL	
CH1_Clear_Fault	0		Decimal	BOOL	
CH1_Enable	1		Decimal	BOOL	
CH1_Fault	0		Decimal	BOOL	
CH1_Feedback	100		Decimal	INT	
CH1_Forward	1		Decimal	BOOL	
CH1_Forward_Cmd	1		Decimal	BOOL	
CH1_Jog	0		Decimal	BOOL	
CH1_Ready	1		Decimal	BOOL	
CH1_Reference	100		Decimal	INT	
CH1_Start	0		Decimal	BOOL	
CH1_Stop	0		Decimal	BOOL	
CH1_Valid_Data	1		Decimal	BOOL	

Monitor Tags / Edit Tags /

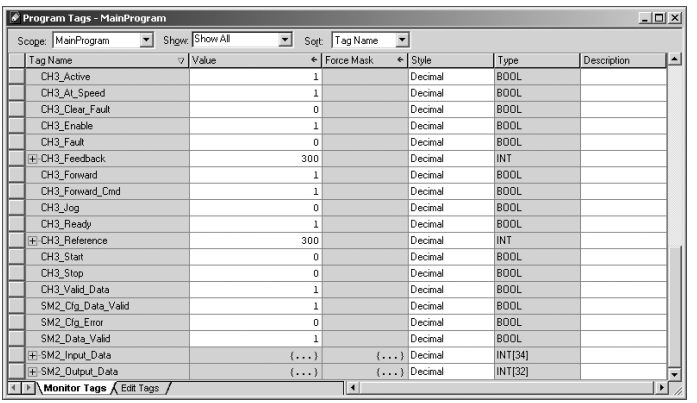


Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Force Mask	Style	Type	Description
CH2_Active	1		Decimal	BOOL	
CH2_At_Speed	1		Decimal	BOOL	
CH2_Clear_Fault	0		Decimal	BOOL	
CH2_Enable	1		Decimal	BOOL	
CH2_Fault	0		Decimal	BOOL	
CH2_Feedback	200		Decimal	INT	
CH2_Forward	1		Decimal	BOOL	
CH2_Forward_Cmd	1		Decimal	BOOL	
CH2_Jog	0		Decimal	BOOL	
CH2_Ready	1		Decimal	BOOL	
CH2_Reference	200		Decimal	INT	
CH2_Start	0		Decimal	BOOL	
CH2_Stop	0		Decimal	BOOL	
CH2_Valid_Data	1		Decimal	BOOL	

Monitor Tags / Edit Tags /



Program Tags - MainProgram

Scope: MainProgram Show: Show All Sort: Tag Name

Tag Name	Value	Force Mask	Style	Type	Description
CH3_Active	1		Decimal	BOOL	
CH3_At_Speed	1		Decimal	BOOL	
CH3_Clear_Fault	0		Decimal	BOOL	
CH3_Enable	1		Decimal	BOOL	
CH3_Fault	0		Decimal	BOOL	
CH3_Feedback	300		Decimal	INT	
CH3_Forward	1		Decimal	BOOL	
CH3_Forward_Cmd	1		Decimal	BOOL	
CH3_Jog	0		Decimal	BOOL	
CH3_Ready	1		Decimal	BOOL	
CH3_Reference	300		Decimal	INT	
CH3_Start	0		Decimal	BOOL	
CH3_Stop	0		Decimal	BOOL	
CH3_Valid_Data	1		Decimal	BOOL	
SM2_Cfg_Data_Valid	1		Decimal	BOOL	
SM2_Cfg_Error	0		Decimal	BOOL	
SM2_Data_Valid	1		Decimal	BOOL	
SM2_Input_Data	{...}	{...}	Decimal	INT[34]	
SM2_Output_Data	{...}	{...}	Decimal	INT[32]	

Monitor Tags / Edit Tags /

An example of Input/Output values are shown below:

Figure 8.23 1769-SM2 Input Data

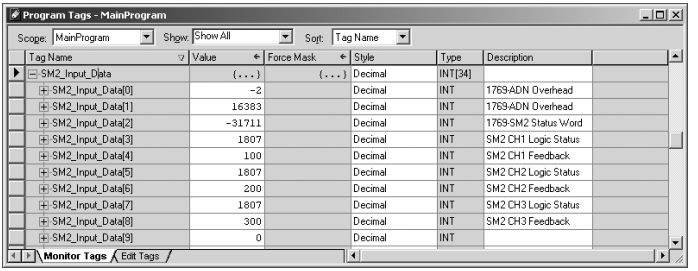
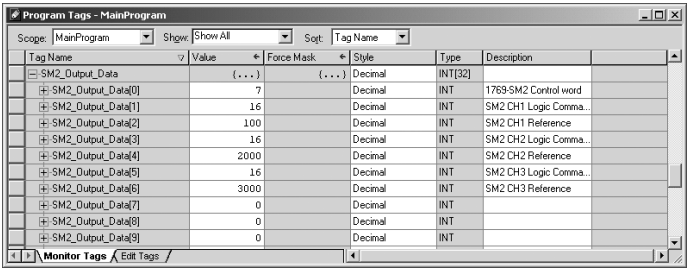


Figure 8.24 1769-SM2 Output Data



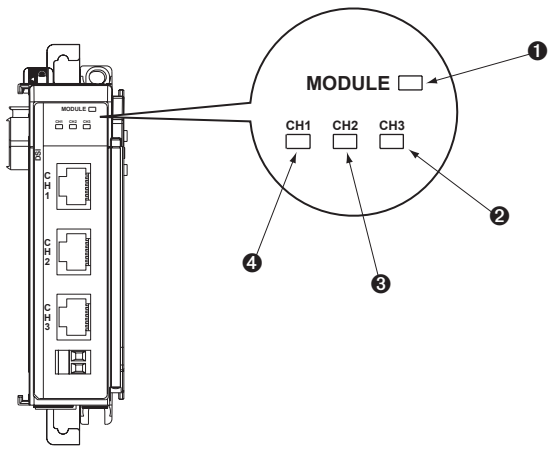
Troubleshooting

This chapter provides information for troubleshooting potential problems with 1769-SM2 module and network.

Locating the Status Indicators

The 1769-SM2 module has four status indicators. They can be viewed on the front of the module. See Figure 9.1.

Figure 9.1 Status Indicators



Item	Status Indicator	Description	Page
❶	MODULE	Module Status	9-2
❷	CH1	Channel 1 Status	9-3
❸	CH2	Channel 2 Status	9-3
❹	CH3	Channel 3 Status	9-3

MODULE Status Indicator

The MODULE status indicator is a bicolor red and green LED.

Status	Cause	Corrective Action
Off	The module is not powered.	Apply power to the module.
Flashing Red	The module's configuration data is not valid.	• Change the controller configuration data to valid settings. • Reset the module parameters to their default settings, and then reset the module.
Steady Red	The module is unable to establish communication with the controller.	Cycle power to the controller.
Flashing Green	The module is establishing communications with the controller.	Normal behavior -- no action required.
Steady Green	The module has established communications with the controller.	Normal behavior -- no action required.
Flashing Red/Green	The module is in boot mode.	Flash download the application code to the module.

CH1…CH3 Status Indicators

The CH1, CH2, and CH3 status indicators are bicolor red and green LEDs.

Status	Cause	Corrective Action
Off	The module is not powered. The channel is not connected to a PowerFlex 4-Class DSI drive. The channel is set for Modbus RTU Master operation, but is not transmitting.	• Apply power to the module. • Apply power to the PowerFlex 4-Class DSI drive. • Connect the module channel to the drive using a communications cable.
Flashing Red	In Single mode, the channel is not receiving communication from the drive. In Multi-Drive mode, the channel is not receiving communication from one or more configured drives.	• Verify that the 22-RJ45CBL-C* communications cable is securely connected and not damaged. Replace cable if necessary. • Verify the setting for the [DSI I/O Cfg x] parameter. • Verify the settings for the [Drv x Addr x] parameters. • Verify the settings for the node address and data rate parameters in the drive. • Cycle power to the drive.
Flashing Green	The channel is properly connected to the drive and is communicating, but is not sending I/O to the drive. The channel is set for Modbus RTU Master operation, and is transmitting.	No action required.
Steady Green	The channel is properly connected to the drive and is sending I/O to the drive.	No action required.

Viewing Module Diagnostic Items

Diagnostic items are provided for each respective channel.

The following diagnostic items can be accessed using DriveExplorer v3.01 (or higher).

Table 9.A Diagnostic Items for Module in Single Mode

No.	Name	Description
1	Reserved	—
2	Logic Cmd	Current value of the product-specific Logic Command being transmitted to the drive by this module.
3	Reference	Current value of the product-specific Reference being transmitted to the drive by this module.
4	Reserved	—
5	Logic Sts	Current value of the product-specific Logic Status being received from the drive by this module.
6	Feedback	Current value of the product-specific Feedback being received from the drive by this module.
7-22	Reserved	—
23	DSI Overrun Errs	Number of DSI receive overrun errors.
24	DSI Framing Errs	Number of DSI receive framing errors.
25	DSI CRC Errs	Number of DSI receive CRC errors.
26	Boot Flash Count	Number of times the boot firmware in the module has been flash updated.
27	App Flash Count	Number of times the application firmware in the module has been flash updated.

Table 9.B Diagnostic Items for Module in Multi-Drive Mode

No.	Name	Description
1	Reserved	—
2	Drv 0 Logic Cmd	Current value of the product-specific Logic Command being transmitted to Drive 0 by this module.
3	Drv 0 Reference	Current value of the product-specific Reference being transmitted to Drive 0 by this module.
4	Reserved	—
5	Drv 0 Logic Sts	Current value of the product-specific Logic Status being received from Drive 0 by this module.
6	Drv 0 Feedback	Current value of the product-specific Feedback being received from Drive 0 by this module.
7	Drv 1 Logic Cmd	Current value of the product-specific Logic Command being transmitted to Drive 1 by this module.
8	Drv 1 Reference	Current value of the product-specific Reference being transmitted to Drive 1 by this module.

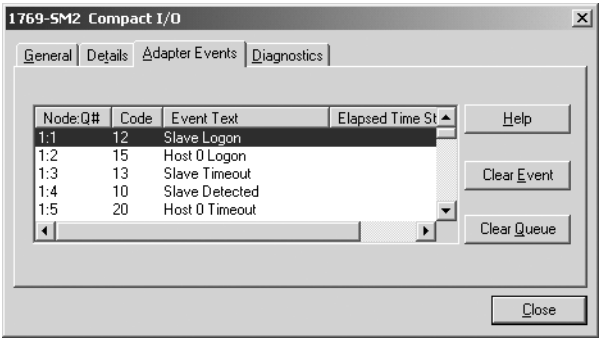
Table 9.B Diagnostic Items for Module in Multi-Drive Mode (Continued)

No.	Name	Description
9	Drv 1 Logic Sts	Current value of the product-specific Logic Status being received from Drive 1 by this module.
10	Drv 1 Feedback	Current value of the product-specific Feedback being received from Drive 1 by this module.
11	Drv 2 Logic Cmd	Current value of the product-specific Logic Command being transmitted to Drive 2 by this module.
12	Drv 2 Reference	Current value of the product-specific Reference being transmitted to Drive 2 by this module.
13	Drv 2 Logic Sts	Current value of the product-specific Logic Status being received from Drive 2 by this module.
14	Drv 2 Feedback	Current value of the product-specific Feedback being received from Drive 2 by this module.
15	Drv 3 Logic Cmd	Current value of the product-specific Logic Command being transmitted to Drive 3 by this module.
16	Drv 3 Reference	Current value of the product-specific Reference being transmitted to Drive 3 by this module.
17	Drv 3 Logic Sts	Current value of the product-specific Logic Status being received from Drive 3 by this module.
18	Drv 3 Feedback	Current value of the product-specific Feedback being received from Drive 3 by this module.
19	Drv 4 Logic Cmd	Current value of the product-specific Logic Command being transmitted to Drive 4 by this module.
20	Drv 4 Reference	Current value of the product-specific Reference being transmitted to Drive 4 by this module.
21	Drv 4 Logic Sts	Current value of the product-specific Logic Status being received from Drive 4 by this module.
22	Drv 4 Feedback	Current value of the product-specific Feedback being received from Drive 4 by this module.
23	DSI Overrun Errs	Number of DSI receive overrun errors.
24	DSI Framing Errs	Number of DSI receive framing errors.
25	DSI CRC Errs	Number of DSI receive CRC errors.
26	Boot Flash Count	Number of times the boot firmware in the module has been flash updated.
27	App Flash Count	Number of times the application firmware in the module has been flash updated.

Viewing and Clearing Events

The module has an event queue to record significant events that occur in the operation of the module. When such an event occurs, an entry is put into the event queue. You can view the event queue using DriveExplorer v3.01 (or higher) software.

Figure 9.2 DriveExplorer Event View/Clear Screen



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

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

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

Table 9.C Module Events

Code	Event	Description
Module Events		
0	No Event	Empty event queue entry.
1	Normal Startup	The module successfully started up.
2	Manual Reset	The module performed a self-reset.
3	Watchdog T/O Flt	The software watchdog detected a failure and reset the module.
4	App Updated	The application firmware has been flash updated.
5	Boot Updated	The boot firmware has been flash updated.
6	EEPROM Sum Flt	The EEPROM checksum/CRC is incorrect. The functionality of the module will be limited. Default parameters must be loaded to clear this condition.

Table 9.C Module Events (Continued)

Code	Event	Description
7-9	Reserved	—
DSI Events		
10	Slave Detected	The module detected that the slave has been connected.
11	Slave Removed	The module detected that the slave has been disconnected.
12	Slave Logon	The module has established communications with the slave.
13	Slave Timeout	The module has lost communications with the slave.
14	Slave Brand Flt	The slave brand is different than the module.
15	Host 0 Logon	The module has established communications with host 0.
16	Host 1 Logon	The module has established communications with host 1.
17	Host 2 Logon	The module has established communications with host 2.
18	Host 3 Logon	The module has established communications with host 3.
19	Host 4 Logon	The module has established communications with host 4.
20	Host 0 Timeout	The module has lost communications with host 0.
21	Host 1 Timeout	The module has lost communications with host 1.
22	Host 2 Timeout	The module has lost communications with host 2.
23	Host 3 Timeout	The module has lost communications with host 3.
24	Host 4 Timeout	The module has lost communications with host 4.
25	Host 0 Brand Flt	The host 0 brand is different than the module.
26	Host 1 Brand Flt	The host 1 brand is different than the module.
27	Host 2 Brand Flt	The host 2 brand is different than the module.
28	Host 3 Brand Flt	The host 3 brand is different than the module.
29	Host 4 Brand Flt	The host 4 brand is different than the module.
Network Events		
40	Net Link Up	The network link is established.
41	Net Link Down	The network link is lost.
42	Dup Net Addr	The module has detected that another device is using its network address. In this case, the module will not participate in any network activity.
43	Net Open	An I/O connection from the network to the module was opened.
44	Net Close	An I/O connection from the network to the module was closed.
45	Net Timeout	An I/O connection from the network to the module has timed out.
46	Net Comm Flt	The module has performed the “Comm Flt” action specified by the user.
47	Net Idle Flt	The module has performed the “Idle Flt” action specified by the user.
48	PCCC IO Open	The module has begun receiving PCCC Control messages (the PCCC Control Timeout was previously set to a non-zero value).
49	PCCC IO Close	The device sending PCCC Control messages to the module has set the PCCC Control Timeout to a value of zero.
50	PCCC IO Time Flt	The module has not received a PCCC Control message for longer than the PCCC Control Timeout.
51	Net Sent Reset	The module received a reset from the network.

Table 9.C Module Events (Continued)

Code	Event	Description
52	Msg Ctrl Open	The module has begun receiving Client-Server Control messages (the Client-Server Control Timeout was previously set to a non-zero value).
53	Msg Ctrl Close	The device sending Client-Server Control messages to the module has set the Client-Server Control Timeout to a value of zero.
54	Msg Ctrl Timeout	The module has not received a Client-Server Control message for longer than the established timeout period.

Specifications

Appendix A presents the specifications for the module.

Communications

Drive	
Protocols	DSI or Modbus RTU Master
Data Rates	DSI Operation: 19200 bps Modbus RTU Master Operation: 300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 bps

Electrical

Consumption Module data only (no Channel data)	350 mA @ 5Vdc and 0 mA @ 24Vdc supplied by the Compact I/O Power Supply
Power Supply Distance Rating	4 (the 1769-SM2 module cannot be more than 4 modules away from the power supply)

Mechanical

Dimensions	
Height	118 mm (4.65 inches)
Depth	87 mm (3.43 inches)
Width	35 mm (1.38 inches)
Weight	142g (5 oz.)

Environmental

Temperature Operating Storage	 -10…50 °C (14…122 °F) -40…85 °C (-40…185 °F)
Relative Humidity	-5…95% non-condensing
Atmosphere	**Important:** The module must not be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors, or dust. If the module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
Shock Operational Non-Operational	 30g, 11 ms 50g, 11 ms
Vibration Operational Non-Operational	 5g, 10 to 500 Hz 5g, 5 to 2000 Hz

Regulatory Compliance

UL	UL508C
cUL	CAN/CSA C22.2 No. 14-M91
CE	EN50081-2 and EN61000-6-2
CTick	AS/NZS 2064

NOTE: In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

NOTE: To meet CE and CTick certification, a ferrite core (Fair-Rite p/n 2643102002) must be added to DSI communication cables longer than 10 m (33 ft.), and the core must be attached within 305 mm (12 in.) of the 1769-SM2 module.

DSI Cable Requirements

The maximum cable distance between the 1769-SM2 module and connected PowerFlex 4-Class drives is 10 m (32.8 ft.) when 8-conductor cables are used in Single mode. The maximum cable distance when 2-conductor twisted-pair network wiring is used with RJ45 two-position terminal blocks (AK-U0-RJ45-TB2P) in Single or Multi-Drive mode is 1219 m / 4000 ft. (standard RS-485 specifications).

The installer must follow common system wiring practices and route cables away from sources of EMI.

Module Parameters

Appendix B provides information about the 1769-SM2 module parameters.

About Parameter Numbers

The parameters in the module are numbered consecutively.

Configuration Tool	Numbering Scheme
• DriveExplorer • DriveExecutive • HIM	The module parameters begin with parameter 01. For example, **Parameter 01 - [Config Mode]** is parameter 01 as indicated by this manual.

TIP: All module parameters—except **Parameters 01 - [Config Mode]**, **02 - [DSI Mode]**, and **03 - [Reset Module]**—are grouped by channel number. The respective channel number is shown at the end of the parameter name (for example, **Parameter 04 - [Idle Action 1]** for CH1).

Parameter List

Parameter No.	Name and Description	Details	
01	**[Config Mode]** Displays the module's configuration mode (Controller or Parameter) set with the Configuration Mode Switch (SW1 in Figure 2.1).	Default: Values: Type:	0 = Controller 0 = Controller 1 = Parameter Read Only
02	**[DSI Mode]** Displays the module's operating mode (Single or Multi-Drive) set with the Operating Mode Switch (SW2 in Figure 2.1).	Default: Values: Type:	0 = Single 0 = Single 1 = Multi-Drive Read Only

Parameter No.	Name and Description	Details
03	**[Reset Module]** No action if set to “0” (Ready). Resets the module if set to “1” (Reset Module). Restores the module to its factory default settings if set to “2” (Set Defaults). This parameter is a command. It will be reset to “0” (Ready) after the command has been performed.	Default: 0 = Ready Values 0 = Ready 1 = Reset Module 2 = Set Defaults Type: Read/Write Reset Required: No
	 **ATTENTION:** Risk of injury or equipment damage exists. If the module is transmitting I/O that controls the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting the module.	
04	**[Idle Action 1]** Sets the action that the module and CH1 drive(s) take if the 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 module.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	 **ATTENTION:** Risk of injury or equipment damage exists. **Parameter 04 - [Idle Action 1]** lets you determine the action of the module and CH1 connected drive(s) when the controller is idle. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).	
05	**[Flt Cfg Logic 1]** Sets the Logic Command data that is sent to the CH1 drive(s) if **Parameter 04 - [Idle Action 1]** is set to “4” (Send Flt Cfg) and the controller is idle. The bit definitions will depend on the drive(s) to which the module is connected. See Appendix D.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No
06	**[Flt Cfg Ref 1]** Sets the Reference data that is sent to the CH1 drive(s) if **Parameter 04 - [Idle Action 1]** is set to “4” (Send Flt Cfg) and the controller is idle.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read/Write Reset Required: No
07	**[DSI I/O Cfg 1]** Sets the number of CH1 drives that are used in Multi-Drive mode. Identifies the connections that would be attempted on a reset or power cycle.	Default: 0 = Drive 0 Values: 0 = Drive 0 1 = Drives 0…1 2 = Drives 0…2 3 = Drives 0…3 4 = Drives 0…4 5 = RTU Master Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details
08	**[DSI I/O Act 1]** Displays the CH1 drives that are active in Multi-Drive mode.	Default: xxx0 0000 Bit Values: 0 = Drive Active 1 = Drive Inactive Type: Read Only

Bit Definition	Not Used	Not Used	Not Used	Drive 4	Drive 3	Drive 2	Drive 1	Drive 0
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

09	**[Drv 0 Addr 1]**	Default: 100
10	**[Drv 1 Addr 1]**	Default: 100
11	**[Drv 2 Addr 1]**	Default: 100
12	**[Drv 3 Addr 1]**	Default: 100
13	**[Drv 4 Addr 1]**	Default: 100
	Sets the corresponding node addresses of the daisy-chained CH1 drives when the module is in Multi-Drive mode. **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).	Minimum: 0 Maximum: 247 Type: Read/Write Reset Required: Yes
14	**[RTU Baud Rate 1]** Sets the baud rate used by the CH1 drives when the module is in Multi-Drive mode and **Parameter 07 - [DSI I/O Cfg 1]** is set to "5" (RTU Master).	Default: 0 = 38.4K bps Values: 0 = 38.4K bps 1 = 19200 bps 2 = 9600 bps 3 = 4800 bps 4 = 2400 bps 5 = 1200 bps 6 = 600 bps 7 = 300 bps Type: Read/Write Reset Required: Yes
15	**[RTU Format 1]** Selects the RTU format used by the CH1 drives when the module is in Multi-Drive mode and **Parameter 07 - [DSI I/O Cfg 1]** is set to "5" (RTU Master). The RTU format consists of three components: data bits (8 data bits only), parity (None, Even or Odd), and stop bits (1 or 2).	Default: 0 = 8-N-1 Value: 0 = 8-N-1 1 = 8-E-1 2 = 8-O-1 3 = 8-N-2 4 = 8-E-2 5 = 8-O-2 Type: Read/Write Reset Required: Yes
16	**[RTU Rx Delay 1]** Sets the CH1 inter-character delay used to detect the end of a receive packet when the module is in Multi-Drive mode and **Parameter 07 - [DSI I/O Cfg 1]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 1.5 character times is used.	Default: 0 milliseconds Minimum: 0 milliseconds Maximum: 500 milliseconds Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details	
17	**[RTU Tx Delay 1]** Sets the CH1 inter-frame delay used to delay the sending of a transmit packet when the module is in Multi-Drive mode and **Parameter 07 - [DSI I/O Cfg 1]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 3.5 character times is used.	Default: Minimum: Maximum: Type: Reset Required:	0 milliseconds 0 milliseconds 500 milliseconds Read/Write Yes
18	**[RTU MsgTimeout 1]** Sets the amount of time in seconds that the module will wait for a response from a ModBus RTU CH1 slave when the module is in Multi-Drive mode and **Parameter 07 - [DSI I/O Cfg 1]** is set to "5" (RTU Master).	Default: Minimum: Maximum: Type: Reset Required:	2 seconds 0 seconds 60 seconds Read/Write Yes
19	**[Idle Action 2]** Sets the action that the module and CH2 drive(s) take if the 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 module.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Idle Action 2]** lets you determine the action of the module and CH2 connected drive(s) when the controller is idle. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).		
20	**[Flt Cfg Logic 2]** Sets the Logic Command data that is sent to the CH2 drive(s) if **Parameter 19 - [Idle Action 2]** is set to "4" (Send Flt Cfg) and the controller is idle. The bit definitions will depend on the drive(s) to which the module is connected. See Appendix D.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 Read/Write No
21	**[Flt Cfg Ref 2]** Sets the Reference data that is sent to the CH2 drive(s) if **Parameter 19 - [Idle Action 2]** is set to "4" (Send Flt Cfg) and the controller is idle.	Default: Minimum: Maximum: Type: Reset Required:	0 0 65535 Read/Write No
22	**[DSI I/O Cfg 2]** Sets the number of CH1 drives that are used in Multi-Drive mode. Identifies the connections that would be attempted on a reset or power cycle.	Default: Values: Type: Reset Required:	0 = Drive 0 0 = Drive 0 1 = Drives 0…1 2 = Drives 0…2 3 = Drives 0…3 4 = Drives 0…4 5 = RTU Master Read/Write Yes

Parameter No.	Name and Description	Details
23	**[DSI I/O Act 2]** Displays the CH2 drives that are active in Multi-Drive mode.	Default: xxx0 0000 Bit Values: 0 = Drive Active 1 = Drive Inactive Type: Read Only

Bit Definition	Not Used	Not Used	Not Used	Drive 4	Drive 3	Drive 2	Drive 1	Drive 0
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

24 25 26 27 28	**[Drv 0 Addr 2]** **[Drv 1 Addr 2]** **[Drv 2 Addr 2]** **[Drv 3 Addr 2]** **[Drv 4 Addr 2]** Sets the corresponding node addresses of the daisy-chained CH2 drives when the module is in Multi-Drive mode. **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).	Default: 100 Default: 100 Default: 100 Default: 100 Default: 100 Minimum: 0 Maximum: 247 Type: Read/Write Reset Required: Yes
29	**[RTU Baud Rate 2]** Sets the baud rate used by the CH2 drives when the module is in Multi-Drive mode and **Parameter 22 - [DSI I/O Cfg 2]** is set to "5" (RTU Master).	Default: 0 = 38.4K bps Values: 0 = 38.4K bps 1 = 19200 bps 2 = 9600 bps 3 = 4800 bps 4 = 2400 bps 5 = 1200 bps 6 = 600 bps 7 = 300 bps Type: Read/Write Reset Required: Yes
30	**[RTU Format 2]** Selects the RTU format used by the CH2 drives when the module is in Multi-Drive mode and **Parameter 22 - [DSI I/O Cfg 2]** is set to "5" (RTU Master). The RTU format consists of three components: data bits (8 data bits only), parity (None, Even or Odd), and stop bits (1 or 2).	Default: 0 = 8-N-1 Value: 0 = 8-N-1 1 = 8-E-1 2 = 8-O-1 3 = 8-N-2 4 = 8-E-2 5 = 8-O-2 Type: Read/Write Reset Required: Yes
31	**[RTU Rx Delay 2]** Sets the CH2 inter-character delay used to detect the end of a receive packet when the module is in Multi-Drive mode and **Parameter 22 - [DSI I/O Cfg 2]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 1.5 character times is used.	Default: 0 milliseconds Minimum: 0 milliseconds Maximum: 500 milliseconds Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details	
32	**[RTU Tx Delay 2]** Sets the CH2 inter-frame delay used to delay the sending of a transmit packet when the module is in Multi-Drive mode and **Parameter 22 - [DSI I/O Cfg 2]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 3.5 character times is used.	Default: Minimum: Maximum: Type: Reset Required:	0 milliseconds 0 milliseconds 500 milliseconds Read/Write Yes
33	**[RTU MsgTimeout 2]** Sets the amount of time in seconds that the module will wait for a response from a ModBus RTU CH2 slave when the module is in Multi-Drive mode and **Parameter 22 - [DSI I/O Cfg 2]** is set to "5" (RTU Master).	Default: Minimum: Maximum: Type: Reset Required:	2 seconds 0 seconds 60 seconds Read/Write Yes
34	**[Idle Action 3]** Sets the action that the module and CH3 drive(s) take if the 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 module.	Default: Values: Type: Reset Required:	0 = Fault 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 34 - [Idle Action 3]** lets you determine the action of the module and CH3 connected drive(s) when the controller is idle. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected drive).		
35	**[Flt Cfg Logic 3]** Sets the Logic Command data that is sent to the CH3 drive(s) if **Parameter 34 - [Idle Action 3]** is set to "4" (Send Flt Cfg) and the controller is idle. The bit definitions will depend on the drive(s) to which the module is connected. See Appendix D.	Default: Minimum: Maximum: Type: Reset Required:	0000 0000 0000 0000 0000 0000 0000 0000 1111 1111 1111 1111 Read/Write No
36	**[Flt Cfg Ref 3]** Sets the Reference data that is sent to the CH3 drive(s) if **Parameter 34 - [Idle Action 3]** is set to "4" (Send Flt Cfg) and the controller is idle.	Default: Minimum: Maximum: Type: Reset Required:	0 0 65535 Read/Write No
37	**[DSI I/O Cfg 3]** Sets the number of CH1 drives that are used in Multi-Drive mode. Identifies the connections that would be attempted on a reset or power cycle.	Default: Values: Type: Reset Required:	0 = Drive 0 0 = Drive 0 1 = Drives 0…1 2 = Drives 0…2 3 = Drives 0…3 4 = Drives 0…4 5 = RTU Master Read/Write Yes

Parameter No.	Name and Description	Details
38	**[DSI I/O Act 3]** Displays the CH3 drives that are active in Multi-Drive mode.	Default: xxx0 0000 Bit Values: 0 = Drive Active 1 = Drive Inactive Type: Read Only

Bit Definition	Not Used	Not Used	Not Used	Drive 4	Drive 3	Drive 2	Drive 1	Drive 0
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

39	**[Drv 0 Addr 3]**	Default: 100
40	**[Drv 1 Addr 3]**	Default: 100
41	**[Drv 2 Addr 3]**	Default: 100
42	**[Drv 3 Addr 3]**	Default: 100
43	**[Drv 4 Addr 3]**	Default: 100
	Sets the corresponding node addresses of the daisy-chained CH3 drives when the module is in Multi-Drive mode. **Important:** The setting for each of these parameters must match the drive Parameter 104 - [Comm Node Addr] value for each respective drive. Each drive node address must be unique (no duplicate node addresses).	Minimum: 0 Maximum: 247 Type: Read/Write Reset Required: Yes
44	**[RTU Baud Rate 3]** Sets the baud rate used by the CH3 drives when the module is in Multi-Drive mode and **Parameter 37 - [DSI I/O Cfg 3]** is set to "5" (RTU Master).	Default: 0 = 38.4K bps Values: 0 = 38.4K bps 1 = 19200 bps 2 = 9600 bps 3 = 4800 bps 4 = 2400 bps 5 = 1200 bps 6 = 600 bps 7 = 300 bps Type: Read/Write Reset Required: Yes
45	**[RTU Format 3]** Selects the RTU format used by the CH3 drives when the module is in Multi-Drive mode and **Parameter 37 - [DSI I/O Cfg 3]** is set to "5" (RTU Master). The RTU format consists of three components: data bits (8 data bits only), parity (None, Even or Odd), and stop bits (1 or 2).	Default: 0 = 8-N-1 Value: 0 = 8-N-1 1 = 8-E-1 2 = 8-O-1 3 = 8-N-2 4 = 8-E-2 5 = 8-O-2 Type: Read/Write Reset Required: Yes
46	**[RTU Rx Delay 3]** Sets the CH3 inter-character delay used to detect the end of a receive packet when the module is in Multi-Drive mode and **Parameter 37 - [DSI I/O Cfg 3]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 1.5 character times is used.	Default: 0 milliseconds Minimum: 0 milliseconds Maximum: 500 milliseconds Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details	
47	**[RTU Tx Delay 3]** Sets the CH3 inter-frame delay used to delay the sending of a transmit packet when the module is in Multi-Drive mode and **Parameter 37 - [DSI I/O Cfg 3]** is set to "5" (RTU Master). If this value is set to 0 (zero), the ModBus default delay of 3.5 character times is used.	Default: Minimum: Maximum: Type: Reset Required:	0 milliseconds 0 milliseconds 500 milliseconds Read/Write Yes
48	**[RTU MsgTimeout 3]** Sets the amount of time in seconds that the module will wait for a response from a ModBus RTU CH3 slave when the module is in Multi-Drive mode and **Parameter 37 - [DSI I/O Cfg 3]** is set to "5" (RTU Master).	Default: Minimum: Maximum: Type: Reset Required:	2 seconds 0 seconds 60 seconds Read/Write Yes

CIP/DSI Objects

Appendix C presents information about the CIP and DSI objects that can be accessed using Explicit Messages.

For information on formatting Explicit Messages and example ladder logic programs, refer to the corresponding chapter:

- Chapter 5, Understanding Explicit Messaging
- Chapter 6, MicroLogix 1500 Example Ladder Programs
- Chapter 7, CompactLogix Example Ladder Programs
- Chapter 8, ControlLogix w/1769-ADN DeviceNet Example Ladder Program

TIP: Refer to the CIP Common specification for more information about CIP objects. Information about the CIP Common specification is available on the ODVA web site (http://www.odva.org).

Supported Data Types

Data Type	Description
BYTE	8-bit unsigned integer
WORD	16-bit unsigned integer
DWORD	32-bit unsigned integer
LWORD	64-bit unsigned integer
SINT	8-bit signed integer
USINT	8-bit unsigned integer
INT	16-bit signed integer
UINT	16-bit unsigned integer
DINT	32-bit signed integer
UDINT	32-bit unsigned integer
BOOL	8-bit value -- low bit is true or false
BOOL[n]	Array of n bits
STRING[n]	Array of n characters
SHORT_STRING	1-byte length indicator + that many characters
STRUCT	Structure name only - no size in addition to elements
CONTAINER	32-bit parameter value - sign extended if necessary
TCHAR	8 or 16-bit character
REAL	32-bit floating point

CIP Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	Yes	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	1
6	Get	Max ID Number of Class Attributes	UINT	7
7	Get	Max ID Number of Instance Attributes	UINT	7

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	UINT	1 = Allen-Bradley
2	Get	Device Type	UINT	132
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	WORD	Bit 0 = Owned Bit 2 = Configured Bit 10 = Recoverable fault Bit 11 = Unrecoverable fault
6	Get	Serial Number	UDINT	Unique 32-bit number
7	Get	Product Name	SHORT_STRING	Product name and rating

CIP Parameter Object

Class Code

Hexadecimal	Decimal
0x0F	15

Instances

The parameters for the DSI devices can be accessed using the instance-offset encoding shown in the table below:

Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0…16383	Instances 0…1023 in drive/module (1)	Instances 0…1023 in module
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in drive	Instances 0…1023 in Drive 0
18432…19455	Not supported	Instances 0…1023 in Drive 1
19456…20479	Not supported	Instances 0…1023 in Drive 2
20480…21503	Not supported	Instances 0…1023 in Drive 3
21504…22527	Not supported	Instances 0…1023 in Drive 4

(1) The module parameters are appended to the drive parameters for this range of instances.

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	1
2	Get	Max Instance	UINT	Number of parameters
8	Get	Parameter Class Descriptor	WORD	0 = False, 1 = True Bit 0 = Supports parameter instances Bit 1 = Supports full attributes Bit 2 = Must do NVS save command Bit 3 = Parameters are stored in NVS
9	Get	Configuration Assembly Instance	UINT	0
10	Get	Native Language	USINT	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

CIP Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	(1)	Parameter Value	(2)	(3)
2	Get	Link Path Size	USINT	0 = No link specified n = The size of Attribute 3 in bytes
3	Get	Link Path		(4)
4	Get	Descriptor	WORD	0 = False, 1 = True Bit 1 = Supports ENUMs Bit 2 = Supports scaling Bit 3 = Supports scaling links Bit 4 = Read only Bit 5 = Monitor Bit 6 = Extended precision scaling
5	Get	Data Type	USINT	0xC2 = SINT (8-bits) 0xC3 = INT (16-bits) 0xC4 = DINT (32-bits) 0xC6 = USINT (8-bits) 0xC7 = UINT (16-bits) 0xCA = REAL (32-bits) 0xD2 = WORD (16-bits)
6	Get	Data Size	USINT	(3)
7	Get	Parameter Name String	SHORT_ STRING	(3)
8	Get	Units String	SHORT_ STRING	(3)
9	Get	Help String	SHORT_ STRING	Null string
10	Get	Minimum Value	(1)	(3)
11	Get	Maximum Value	(1)	(3)
12	Get	Default Value	(1)	(3)
13	Get	Scaling Multiplier	UINT	(3)
14	Get	Scaling Divisor	UINT	(3)
15	Get	Scaling Base	UINT	(3)
16	Get	Scaling Offset	UINT	(3)
17	Get	Multiplier Link	UINT	(3)
18	Get	Divisor Link	UINT	(3)
19	Get	Base Link	UINT	(3)
20	Get	Offset Link	UINT	(3)
21	Get	Decimal Precision	USINT	(3)

(1) Access rule is defined in bit 4 of instance attribute 4. 0 = Get/Set, 1 = Get.

(2) Specified in descriptor, data type, and data size.

(3) Value varies based on parameter instance.

(4) Refer to the CIP Common specification for a description of the link path.

CIP Parameter Object *(Continued)*

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	Yes	Yes	Get_Attributes_All
0x05	Yes	No	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4B	No	Yes	Get_Enum_String

DSI 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 (Dec.)	Single-Drive Mode	Multi-Drive Mode
0…16383	Instances 0…16383 in drive	Instances 0…16383 in Drive 0
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in module	Instances 0…1023 in Drive 1
18432…19455	Instances 0…1023 in slave	Instances 0…1023 in Drive 2
19456…20479	Not supported	Instances 0…1023 in Drive 3
20480…21503	Not supported	Instances 0…1023 in Drive 4
21504…22527	Not supported	Instances 0…1023 in module

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	BYTE	Code identifying the device.
1	Get	Family Text	STRING[16]	Text identifying the device.
2	Set	Language Code	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch

DSI Device Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Product Series	BYTE	1 = A 2 = B…
4	Get	Number of Components	BYTE	Number of components (for example, main control board, I/O boards) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	BYTE	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	WORD	0x0001 = Allen-Bradley
11	Get	NVS Checksum	WORD	Checksum of the Non-Volatile Storage in a device.
12	Get	Class Revision	WORD	2 = DSI
13	Get	Character Set Code	BYTE	0 = SCANport HIM 1 = ISO 8859-1 (Latin 1) 2 = ISO 8859-2 (Latin 2) 3 = ISO 8859-3 (Latin 3) 4 = ISO 8859-4 (Latin 4) 5 = ISO 8859-5 (Cyrillic) 6 = ISO 8859-6 (Arabic) 7 = ISO 8859-7 (Greek) 8 = ISO 8859-8 (Hebrew) 9 = ISO 8859-9 (Turkish) 10 = ISO 8859-10 (Nordic) 255 = ISO 10646 (Unicode)
14	Get	Product Option Support Bits		
15	Get	Languages Supported	STRUCT of: BYTE BYTE[n]	 Number of Languages Language Codes (See Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: WORD BYTE BYTE	 Year Month Day
17	Get	Product Revision	STRUCT of: BYTE BYTE	 Major Firmware Release Minor Firmware Release
18	Get	Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DSI Device Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Component Name	STRING[32]	Name of the component
4	Get	Component Firmware Revision	STRUCT of: BYTE BYTE	 Major Revision Minor Revision
5	Get	Component Hardware Change Number	BYTE	
6	Get	First Flash Object Instance		
7	Get	Number of Flash Object Instances		
8	Get	Component Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DSI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

Instances

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

Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0…16383	Instances 0…16383 in drive	Instances 0…16383 in Drive 0
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in module	Instances 0…1023 in Drive 1
18432…19455	Instances 0…1023 in slave	Instances 0…1023 in Drive 2
19456…20479	Not supported	Instances 0…1023 in Drive 3
20480…21503	Not supported	Instances 0…1023 in Drive 4
21504…22527	Not supported	Instances 0…1023 in module

Class Attributes

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

DSI Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
7	Get	DSI Online Read Full	STRUCT of: BOOL[32] CONTAINER(1) CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT BYTE[3] BYTE STRING[16]	 Descriptor (see pages C-12 and C-13) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (e.g., Amp, Hz) Multiplier (2) Divisor (2) Base (2) Offset (2) Link (source of the value) (0 = no link) Always zero (0) Parameter name
8	Get	DSI Descriptor	BOOL[32]	Descriptor (see pages C-12 and C-13)
9	Get/Set	DSI Parameter Value	Various	Parameter value in NVS. (3)
10	Get/Set	DSI RAM Parameter Value	Various	Parameter value in temporary memory.
11	Get/Set	DSI Link	BYTE[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	WORD	ID for help text for this parameter
13	Get	DSI Read Basic	STRUCT of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	 Descriptor (see pages C-12 and C-13) Parameter value Minimum value Maximum value Default value Parameter name Units (e.g., Amp, Hz)
14	Get	DSI Parameter Name	STRING[16]	Parameter name
15	Get	DSI Parameter Alias	STRING[16]	Customer supplied parameter name. Only supported by PowerFlex 700S at time of publication.
16	Get	Parameter Processing Error	BYTE	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. Refer to Formulas for Converting on page C-13.

(3) Do NOT continually write parameter data to NVS. Refer to the attention on page 5-1.

DSI Parameter Object *(Continued)*

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = BYTE used as an array of Boolean 001 = WORD used as an array of Boolean 010 = BYTE (8-bit integer) 011 = WORD (16-bit integer) 100 = DWORD (32-bit integer) 101 = TCHAR (8-bit (not unicode) or 16-bits (unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = Parameter can sink a link 1 = Parameter cannot sink a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Reserved	Must be zero
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 1)	Right bit is least significant bit (16). 000 = Reserved 001 = DWORD used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 2)	
18	Extended Data Type (Bit 2)	

DSI Parameter Object *(Continued)*

Descriptor Attributes (Continued)

Bit	Name	Description
19	Parameter Exists	Reserved
20	Not Used	Reserved
21	Formula Links	Reserved
22	Access Level (Bit 1)	Reserved
23	Access Level (Bit 2)	Reserved
24	Access Level (Bit 3)	Reserved
25	Writable ENUM	Reserved
26	Not a Link Source	0 = Parameter can be a source for a link 1 = Parameter cannot be a source for a link
27	Enhanced Bit ENUM	Reserved
28	Enhanced ENUM	Reserved
29	Not Used	Reserved
30	Not Used	Reserved
31	Not Used	Reserved

Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x $10^{\text{Decimal Places}}$)

Internal Value = ((Display Value x Divisor x $10^{\text{Decimal Places}}$) / (Multiplier x Base)) - Offset

Common Services

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

Object Specific Services

Service Code	Service Name
0x32	Get_Attributes_Scattered (1)
0x34	Set_Attributes_Scattered (1)

(1) The instance and attribute are ignored for these services.

The table below lists the parameters for the Get_Attributes_Scattered and Set_Attributes_Scattered object-specific service:

Name	Data Type	Description
Scattered Parameters	STRUCT of	—
Parameter Number	WORD	Parameter to read or write
Parameter Value	WORD	Parameter value to read or write (zero when reading)

Important: The STRUCT may repeat up to 55 times in a single message.

DSI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

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

Services

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

Instances

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

Instances (Dec.)	Single-Drive Mode	Multi-Drive Mode
0…16383	Instances 0…16383 in drive	Instances 0…16383 in Drive 0
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in module	Instances 0…1023 in Drive 1
18432…19455	Instances 0…1023 in slave	Instances 0…1023 in Drive 2
19456…20479	Not supported	Instances 0…1023 in Drive 3
20480…21503	Not supported	Instances 0…1023 in Drive 4
21504…22527	Not supported	Instances 0…1023 in module

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	Revision of object
2	Get	Number of Instances	WORD	Maximum number of faults/events that the device can record in its queue
3	Set	Fault Command Write	BYTE	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Get	Fault Trip Instance Read	WORD	Fault that tripped the device. For adapters, this value is always 1 when faulted.

DSI Fault Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
5	Get	Fault Data List	STRUCT of: BYTE BYTE WORD[n]	Reserved
6	Get	Number of Recorded Faults	WORD	Number of faults/events in the queue. A “0” indicates the fault queue is empty.
7	Get	Fault Parameter Reference	WORD	Reserved

Instance Attributes

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

DSI 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 (Dec.)	Single-Drive Mode	Multi-Drive Mode
0…16383	Instances 0…16383 in drive	Instances 0…16383 in Drive 0
16384…17407	Instances 0…1023 in module	Instances 0…1023 in module
17408…18431	Instances 0…1023 in module	Instances 0…1023 in Drive 1
18432…19455	Instances 0…1023 in slave	Instances 0…1023 in Drive 2
19456…20479	Not supported	Instances 0…1023 in Drive 3
20480…21503	Not supported	Instances 0…1023 in Drive 4
21504…22527	Not supported	Instances 0…1023 in module

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	WORD	1
2	Get	Number of Instances	WORD	Number of diagnostic items in the device
3	Get	ENUM Offset	WORD	DSI ENUM object instance offset

DSI Diagnostic Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Info	STRUCT of: BOOL[32] CONTAINER (1) CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT DWORD STRING[16]	 Descriptor (see pages C-12 and C-13) Value Minimum value Maximum value Default value Pad Word Pad Word Units (e.g., Amp, Hz) Multiplier (2) Divisor (2) Base (2) Offset (2) Link (source of the value) (0 = no link) Always zero (0) Parameter name
1	Get/Set	Value	Various	Diagnostic item value

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the value between display units and internal units. Refer to Formulas for Converting on page C-13.

Notes:

PowerFlex 4-Class Drives Logic Command/Status Words

Appendix D provides the definitions of the Logic Command/Logic Status words that are used for some drives that can be connected to the 1769-SM2 module. If the Logic Command/Logic Status for the drive that you are using is not listed, refer to your drive's documentation.

Logic Command Word

Logic Bits															Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Stop	0 = Not Stop 1 = Stop
														x		Start[1]	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = No Command
									x							[2]	
								x								[2]	
						x	x									Accel Rate[3]	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
				x	x											Decel Rate[3]	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select[3]	000 = No Command 001 = Freq Source (Spd Ref. par.) 010 = Freq Source (Int. Freq par.) 011 = Freq Source (Comm) 100 = Preset Freq 0 101 = Preset Freq 1 110 = Preset Freq 2 111 = Preset Freq 3
x																[2]	

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

(2) Depending on the PowerFlex 4-Class drive, the functions for bits 6, 7, and 15 change. Refer to Appendix C in the PowerFlex 4, PowerFlex 4M, PowerFlex 40 or PowerFlex 40P drive User Manual, or Appendix E for the PowerFlex 400 drive bit functions.

(3) The functions for these bits are the same for all PowerFlex 4-Class drives—including the PowerFlex 40P when it is used in the "Velocity" mode. When using the PowerFlex 40P in the "Position" mode, the bit functions are different. For details, refer to Appendix C in the PowerFlex 40P User Manual.

Logic Status Word

Logic Bits																Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
						x										Main Freq[1]	0 = Not Controlled By Comm 1 = Controlled By Comm
					x											Operation Command[1]	0 = Not Controlled By Comm 1 = Controlled By Comm
				x												Parameters[1]	0 = Not Locked 1 = Locked
			x													Digital Input 1 Status[1]	
		x														Digital Input 2 Status[1]	
	x															Digital Input 3 Status[1] [2]	
x																Digital Input 4 Status[2] [2]	

(1) The functions for these bits are the same for all PowerFlex 4-Class drives—including the PowerFlex 40P when it is used in the "Velocity" mode. When using the PowerFlex 40P in the "position" mode, the bit functions are different. For details, refer to Appendix C in the PowerFlex 40P User Manual.

(2) This status is available for only PowerFlex 40 drives with firmware version 2.xx (or higher). For PowerFlex 4 and PowerFlex 4M drives, these bits are not used.

C

CIP (Common Industrial Protocol)

CIP is the transport and application layer protocol used for messaging over EtherNet/IP, ControlNet, and DeviceNet networks. The protocol is used for implicit messaging (real time I/O) and explicit messaging (configuration, data collection, and diagnostics).

Class

A class is defined by the DeviceNet specification as “a set of objects that all represent the same kind of system component. A class is a generalization of an object. All objects in a class are identical in form and behavior, but may contain different attribute values.”

ControlFLASH

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

Controller

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

D

DeviceNet Network

An open producer/consumer Controller Area Network (CAN) which connects devices (for example, controllers, drives, and motor starters). Both I/O and explicit messages can be transmitted over the network. A DeviceNet network can support a maximum of 64 devices. Each device is assigned a unique node address and transmits data on the network at the same data rate.

A cable is used to connect devices on the network. It contains both the signal and power wires. Devices can be connected to the network with drop lines, in a daisy chain connection, or a combination of the two.

General information about DeviceNet and the DeviceNet specification are maintained by the Open DeviceNet Vendor’s Association (ODVA). ODVA is online at http://www.odva.org.

DSI (Drive Serial Interface)

DSI is based on the Modbus RTU serial communication protocol and is used by various Allen-Bradley drives, such as PowerFlex 4-Class drives.

DSI Peripheral

A device that provides an interface between DSI and a network or user. Peripheral devices are also referred to as “adapters” or “modules.” The 1769-SM2 module, 1203-USB or 22-SMC-232 converter, and PowerFlex 4-Class HIMs (22-HIM-A3 or 22-HIM-C2S) are examples of DSI peripherals.

DSI Product

A device that uses the DSI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex 4-Class drive is a DSI product. In this manual, a DSI product is also referred to as “drive” or “host.”

DriveExplorer Software

A tool for monitoring and configuring Allen-Bradley products and modules. It can be run on computers running various Microsoft Windows operating systems. DriveExplorer version 2.xx (or higher) can be used to configure this module and connected PowerFlex drives. Information about DriveExplorer software and a free lite version can be accessed at http://www.ab.com/drives/driveexplorer.

DriveTools SP Software

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

E

EDS (Electronic Data Sheet) Files

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

Explicit Messaging

Explicit Messages are used to transfer data that does not require continuous updates. They are typically used to configure, monitor, and diagnose devices over the network.

F

Flash Update

The process of updating firmware in a device. The module can be flash updated using various Allen-Bradley software tools. Refer to Flash Updating the Module on page 3-22 for more information.

H

HIM (Human Interface Module)

A device that can be used to configure and control a drive. PowerFlex 4-Class HIMs (22-HIM-A3 or 22-HIM-C2S) can be used to configure PowerFlex 4-Class drives and their connected peripherals.

Hold Last

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

I

Idle Action

An idle action determines how the module and connected drive act when the controller is switched out of run mode.

I/O Data

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

L

Logic Command/Logic Status

The Logic Command is used to control the PowerFlex 4-Class drive (for example, start, stop, direction). It consists of one 16-bit word of output to the module from the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix D.

The Logic Status is used to monitor the PowerFlex 4-Class drive (for example, operating state, motor direction). It consists of one 16-bit word of input from the module to the network. The definitions of the bits in this word depend on the drive, and are shown in Appendix D.

N

NVS (Non-Volatile Storage)

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

O

Objects

The CIP common specification defines an object as “an abstract representation of a particular component within a product.”

P

PCCC (Programmable Controller Communications Command)

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

PowerFlex 4-Class (Component Class) Drives

The Allen-Bradley PowerFlex 4-Class family of drives supports DSI and includes the PowerFlex 4, PowerFlex 4M, PowerFlex 40, PowerFlex 40P, and PowerFlex 400. These drives can be used for applications ranging from 0.2…110 kW (0.25…150 HP).

R

Reference/Feedback

The Reference is used to send a setpoint (for example, speed, frequency, torque) to the drive. It consists of one 16-bit word of output to the module from the network.

Feedback is used to monitor the speed of the drive. It consists of one 16-bit word of input from the module to the network.

RSLogix 500/5000

RSLogix software is a tool for configuring and monitoring controllers to communicate with connected devices. It is a 32-bit application that runs on various Windows operating systems. Information about RSLogix software can be found at http://www.software.rockwell.com/rslogix.

RSNetWorx for DeviceNet

A software tool for configuring and monitoring DeviceNet networks and connected devices. It is a 32-bit application that runs on various Windows operating systems. Information about RSNetWorx for DeviceNet software can be found at http://www.software.rockwell.com/rsnetworx.

RTU Baud Rate

The baud rate is the speed at which data is transferred when the 1769-SM2 module is operating in Multi-Drive mode and the DSI I/O Cfg parameter for a channel is set to “5” (RTU Master). The available baud rates are:

38.4K bps	2400 bps
19200 bps	1200 bps
9600 bps	600 bps
4800 bps	300 bps

S

Scanner

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

Status Indicators

Status indicators are LEDs that are used to report the status of the module, network, and drive. They are on the front of the module.

Z

Zero Data

When communication is disrupted (for example, the controller is idle), the module and drive can respond with zero data. Zero data results in the drive receiving zero as values for Logic Command and Reference data. If the drive was running and using the Reference from the module, it will stay running but at zero Reference.

Notes:

D

E

F

G

H

I

L

M

N

O

P

Q

R

S

T

U

W

Z

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