842E-CM Integrated Motion Encoder on EtherNet/IP
User Manual

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-IN001_-EN-P 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.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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

⚠	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
⚠	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
⚡	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
🔥	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Table of Contents

Read this section to familiarize yourself with the rest of the manual. It provides information concerning:

- Who should use this manual
- The purpose of this manual
- Related documentation
- Conventions used in this manual

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use the encoder.

You should have a basic understanding of electrical circuitry and familiarity with relay logic. If you do not, obtain the proper training before using this product.

Purpose of This Manual

This manual is a reference guide for encoders. It describes the procedures you use to install, wire, and troubleshoot your encoder. This manual:

- Gives you an overview of the encoders
- Explains how to install and wire your encoder
- Explains how to configure the encoder in the Studio 5000™ environment

Common Techniques Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

Requirements

Studio 5000 environment version 21 or later, RSLinx® Classic software version 3.51 or later.

Requirements

System Component	Cat. No.	Description
Logix Controller Platform	1769-L18ERM 1769-L27ERM 1769-L30ERM 1769-L33ERM 1769-L36ERM	CompactLogix™ 5370 controllers with Integrated Motion on the EtherNet/IP network. Linear, device-level ring (DLR), and star topology is supported.
	1756-EN2T module 1756-EN2TR module 1756-EN3TR module	ControlLogix 1756-L7x controllers with Integrated Motion on EtherNet/IP networks. Linear, device-level ring (DLR), and star topology is supported.
Studio 5000™	N/A	Studio 5000 Logix Designer application (version 21.00 or later) provides support for programming, commissioning, and maintaining the CompactLogix and ControlLogix controller families.
RSLinx	N/A	Version 3.5 or later

Components of an Integrated Motion Application

System Overview

System Component	Cat. No.	Description
Kinetix® 5500 Servo Drives	2198-Hxxx-ERS	200V-class (single-phase or three-phase) and 400V-class (three-phase) drives operate in standalone and multi-axis shared AC, shared DC, shared AC/DC, and shared AC/DC hybrid configurations.
Rotary Servo Motors	Kinetix VP	Compatible rotary motors include the Kinetix VP (Bulletin VPL) servo motors. Induction motors with open loop volts/hertz speed control are also supported.
Cables	Motor cables	Bulletin 2090 single-cable for motor power, feedback, and 24V DC brake power.
	Communication	Ethernet cables are available in standard lengths. Shielded cable is recommended.

Terminology

Term	Definition
Axis	An axis is a logical element of a motion control system that exhibits some form of movement. Axes can be rotary or linear, physical or virtual, controlled or simply observed.
Boundary Clock	A clock that has multiple PTP ports in a domain and maintains the time scale used in the domain. It may serve as the source of time, for example, a Master clock, and may synchronize to another clock, thus being a Slave clock.
CIP	Common Industrial Protocol.
CIP Sync	CIP Sync defines extensions to CIP Common objects and device profiles to support time synchronization over CIP Networks. CIP Sync is an implementation of the IEEE 1588 standard.
Coordinated System Time (CST)	A backplane clock propagated between all modules on the ControlLogix backplane.
Coordinated Universal Time (UTC)	The time standard for *civil time*, representing time at the Prime Meridian. The time does not include time zone or daylight savings time offsets. System Time is based on UTC.
Device Level Ring (DLR)	A DLR network is a single-fault tolerant ring network intended for the interconnection of automation devices.
Get/Read	A Get/Read involves retrieving an attribute value from the perspective of Controller side of the interface.
GPS	Global Positioning System, a time source reference.
Grandmaster Clock (GM)	Within a domain, a clock that is the ultimate source of time for clock synchronization by using the CIP Sync protocol.
Greenwich Mean Time, (GMT)	Greenwich Mean Time is the mean solar time of the longitude (0°) of the former Royal Observatory at Greenwich, England, or Greenwich meridian. UTC replaced GMT as the basis for the main reference time scale or civil time in various regions on January 1, 1970.
Integrated Motion on the Ethernet/ IP Network	Defines extensions to CIP Common objects and device profiles to support motion control over CIP networks.
Integrated Motion on the Ethernet/ IP network I/O Connection	The I/O connection is the periodic bidirectional, Class 1, CIP connection between a controller and a drive that is defined as part of the Integrated Motion on the EtherNet/IP network standard.
Integrated Motion on the EtherNet/IP Network Drive	Refers to any drive device that complies with the CIP Motion standard.
Master Clock (M)	In the context of a single CIP Sync communication path, a clock that is the source of time to which all other clocks on that path synchronize. The Master clock may not be the Grandmaster. The Master clock is the reference clock for the local subnet.
Motion	Motion refers to any aspect of the dynamics of an axis. In the context of this document, it is not limited to servo drives but encompasses all forms of drive based motor control.
Open Loop	Open loop is a method of control where there is no application of feedback to force the actual motor dynamics to match the commanded dynamics. Examples of open loop control are stepper drives and variable frequency drives.
Ordinary Clock	A clock that has a single PTP port in a domain and maintains the time scale used in the domain. It may serve as the source of time, for example, a Master clock, and may synchronize to another clock, thus being a Slave clock
Precision Time Protocol (PTP)	A high-precision time synchronization protocol for networked measurement and control systems, defined by the IEEE 1588 standard.

Term	Definition
Quality of Service (QoS)	A function that guarantees a bandwidth relationship between individual applications or protocols.
Service Data Block	The service data block is a lower priority real-time data block associated with a service message from the controller that is transferred by an Integrated Motion on the EtherNet/IP network connection on a periodic basis. Service data includes service request messages to access attributes, run a drive based motion planner, or perform various drive diagnostics.
Servo drive	A drive that produces the winding current for a servo motor. The amplifier converts a low-level control signal into high voltage and current levels in order to produce torque in the motor.
Set/Write	A Set/Write involves setting an attribute to a specified value from the perspective of the Controller side of the interface.
Slave (S)	Synchronizes the local clock to the Master time. Synchronizes the local clock frequency to match the Master reference.
Synchronized	Synchronized is a condition where the local clock value on the drive is locked onto the master clock of the distributed System Time. When synchronized, the drive and controller devices may use time stamps associated with an Integrated Motion on the EtherNet/IP network connection data.
System Time	The absolute time value as defined by CIP Sync in the context of a distributed time system where all devices have a local clock that is synchronized with a common Master clock. System Time is a 64-bit integer value in units of nanoseconds or microseconds with a value of 0 corresponding to an epoch of January 1, 1970.
Time Offset	Time offset is the System Time Offset value associated with the Integrated Motion on the EtherNet/IP network connection data that is associated with the source device. The System Time Offset is a 64-bit offset value that is added to a device's local clock to generate System Time for that device.
Time Stamp	Time stamp is a system time stamp value associated with the Integrated Motion on the EtherNet/IP network connection data that conveys the absolute time when the associated data was captured, or can be also used to determine when associated data is to be applied.
Transparent Clock	A Transparent Clock improves the accuracy of time synchronization by compensating for the effect of port to port PTP packet propagation delays.
Variable Frequency Drive (VFD)	Variable Frequency Drive (VFD) is a class of drive products that seek to control the speed of a motor, typically an induction motor, through a proportional relationship between drive output voltage and commanded output frequency. Frequency drives are, therefore, sometimes referred to as Volts/Hertz drives **TIP** Not all servo drives support direct frequency control.

Related Documentation

The following documents contain additional information concerning Rockwell Automation products.

Resource	Description
1756-AP016	CIP Sync brochure
1769-UM021	CompactLogix 5370 Controllers User Manual
1770-4.1	Industrial Automation Wiring and Grounding Guidelines
2097-UM002	Kinetix 350 Single-axis EtherNet/IP Servo Drives User Manual
2198-UM001	Kinetix 5500 Servo Drives User Manual
842E-IN002	Installation Instructions 842E-CM EtherNet/IP™ Encoders, Integrated Motion Encoder on EtherNet/IP
842E-UM001	842E EtherNet/IP Absolute Encoder User Manual
C116-CA001	Sensors Catalog
ENET-RM002	Ethernet Design Considerations Reference Manual
IA-AT003	Integrated Architecture and CIP Sync Configuration Application Technique
M117-CA001	On-Machine Connectivity Catalog
MOTION-RM003	Integrated Motion on the EtherNet/IP Network Reference Manual
MOTION-UM003	Integrated Motion on the EtherNet/IP Network Configuration and Startup User Manual

IMPORTANT	For best results, grounding the encoder flange is recommended.

Numerous useful publications are available for download at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

Chapter **1**

Safety Precautions

This chapter deals with your own safety and the safety of the equipment operators.

Please read this chapter carefully before working with the 842E-CM Integrated Motion encoder on EtherNet/IP and/or the machine or system in which the encoder is used. Integrated Motion on Ethernet IP networks requires use of time synchronization. This is explained in the next chapter.

Authorized Personnel

> ⚠️ **ATTENTION:** The 842E-CM encoder must only be installed, commissioned, and serviced by authorized personnel.
>
> **ATTENTION:** Repairs to the 842E-CM encoder are allowed to be undertaken only by trained and authorized service personnel from Rockwell Automation.

The following qualifications are necessary for the various tasks:

Activity	Qualification
Mounting	Basic technical training Knowledge of the current safety regulations in the workplace
Electrical installation and replacement	Practical electrical training Knowledge of current electrical safety regulations Knowledge on the use and operation of devices in the related application (e.g., industrial robots, storage, and conveyor technology)
Commissioning, operation, and configuration	Knowledge on the current safety regulations and the use and operation of devices typically in Integrated Motion on EtherNet/IP applications Knowledge of automation systems (e.g., Rockwell ControlLogix controller) Knowledge of servo control or motion control (e.g., Kinetix for PowerFlex drives) Knowledge of EtherNet/IP and integrated motion applications Knowledge of the usage of automation software (e.g., Rockwell Logix Designer)

Correct Use

The 842E-CM Integrated Motion encoder is an instrument manufactured in accordance with recognized industrial regulations, and that meets the quality requirements as per ISO 9001:2008 as well as those of an environment management system as per ISO 14001:2009.

An encoder is a device designed to be mounted in a system, and that cannot be used independently of its intended function. For this reason, an encoder is not equipped with immediate safety devices.

Considerations for the safety of personnel and systems must be provided by the constructor of the system, as per statutory regulations.

By design, the encoder can only be operated within an EtherNet/IP network. It is necessary to comply with the EtherNet/IP specifications and guidelines for setting up a EtherNet/IP network.

In case of any other usage of, or modifications to the 842E-CM Integrated Motion encoder, e.g., opening the housing during mounting and electrical installation, or in case of modifications to the Rockwell Automation software, any claims against Rockwell Automation under warranty will be rendered void.

General Safety Notes and Protective Measures

ATTENTION: Please observe the following procedures for correct and safe use of the 842E-CM Integrated Motion encoder.

ATTENTION: The encoder is to be installed and maintained by trained and qualified personnel with knowledge of electronics, precision mechanics and control system programming. You must comply with the pertinent standards covering the technical safety stipulations.

ATTENTION: All safety regulations are to be met by all persons who are installing, operating or maintaining the device:

- The operating instructions must always be available and must always be followed.
- Unqualified personnel are not allowed to be present in the vicinity of the system during installation.
- The system is to be installed in accordance with all applicable safety regulations and the mounting instructions.
- All work safety regulations of the applicable countries are to be followed during installation.
- Failure to follow all applicable health and safety regulations may result in personal injury or damage to the system.
- The current and voltage sources in the encoder are designed in accordance with all applicable technical regulations.
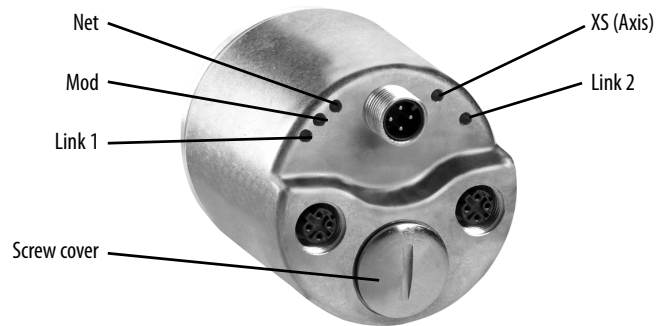
Environmental Protection   Please note the following information on disposal.

Assembly	Material	Disposal
Packaging	Cardboard	Waste paper
Shaft	Stainless steel	Scrap metal
Flange	Aluminum	Scrap metal
Housing	Aluminum Die-cast	Scrap metal
Electronic assemblies	Various	Hazardous waste

Notes:

About the Encoder

The 842E-CM Integrated Motion encoder on EtherNet/IP provides a feedback-only axis for midrange drive applications on EtherNet/IP networks.

Encoder Version	Bulletin Number
Single-turn	842E-CM-Sxxxx
Multi-turn	842E-CM-Mxxxx

Features

The 842E-CM encoder features include:
- Compatibility with star, linear, and device level ring topologies
- Robust nickel code disk for harsh ambient conditions
- Configurable resolution per revolution: 1 to 262,144
- High precision and availability
- Ball bearing spacing of 30 mm for longer life
- Face mount flange and servo flange/blind hollow shaft and through hollow shaft
- 18-bit single turn resolution
- 30-bit total resolution multi-turn resolution

CIP Sync Overview

EtherNet/IP uses CIP Sync and CIP Motion technologies to provide real-time closed-loop motion control with standard Ethernet. This topology-independent network provides a simplified integration of the entire control solution on one network.

CIP Sync provides a mechanism to synchronize clocks between controllers, I/O devices, and other automation products in your architecture with minimal user intervention. The EtherNet/IP network is the only network that supports CIP Sync time synchronization.

CIP Sync brings together CIP (Common Industrial Protocol) with the IEEE 1588-2008 standard for time synchronization. CIP Sync provides accurate real-time (Real-World Time) or Coordinated Universal Time (UTC) synchronization of controllers and devices connected over CIP networks and the ControlLogix backplane. This technology supports highly distributed applications that require time stamping, sequence of events recording, distributed motion control, and increased control coordination.

CIP Sync provides the capabilities to perform the following functions:

• Create sequence of events applications

• System-wide synchronization of time for CIP-based networks

• Integrated Motion on the EtherNet/IP network applications

Typical Configurations

This section explains typical configurations and topologies. The 842E-CM encoders can be connected in any of three network topologies: star, linear or device level ring (DLR).

| IMPORTANT	Rockwell Automation recommends that you use no more than 50 nodes on a single DLR or linear network. If your application requires more than 50 nodes, we recommend that you segment the nodes into separate, but linked, DLR or linear networks.

Star Topology
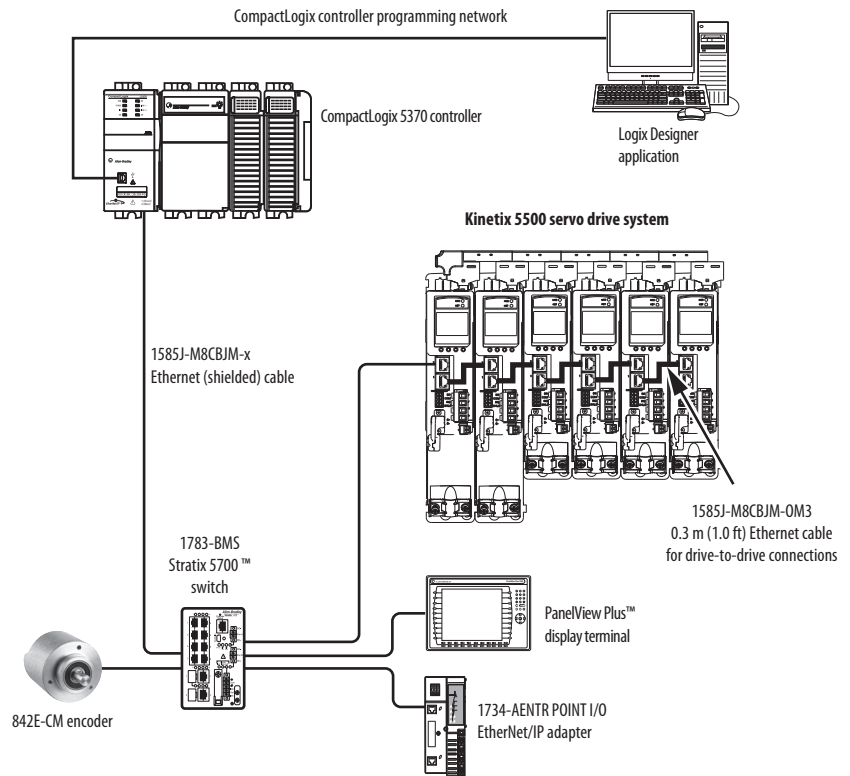
The star structure consists of a number of devices connected to a central switch.

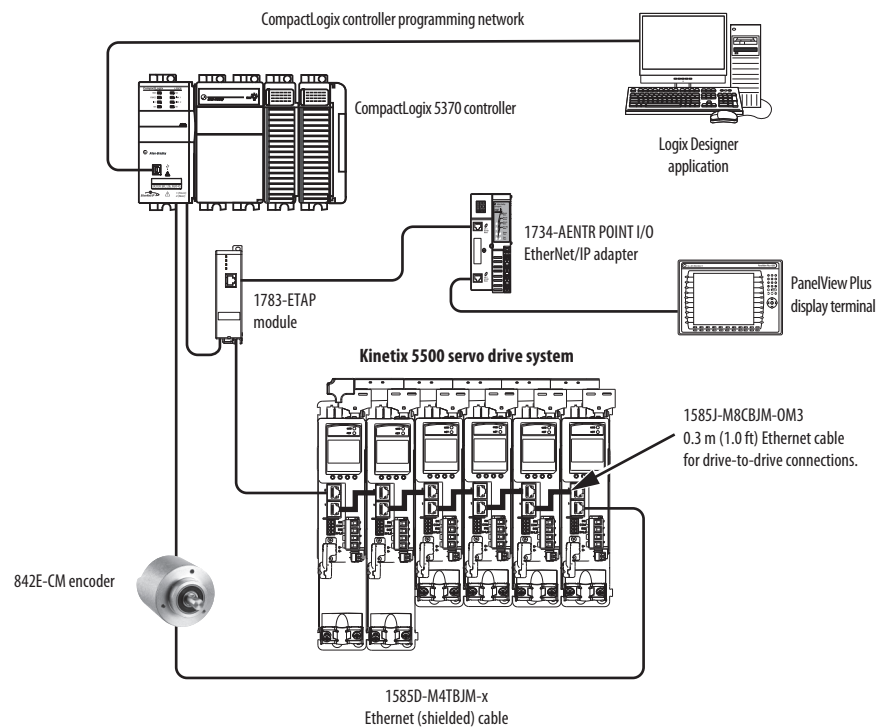| IMPORTANT	When this topology is used, make the Ethernet connection on the 842E-CM encoder to the Link 1 connection. The Link 2 Ethernet connection must remain unused.

Linear Topology

The linear topology uses the embedded switching capability to form a daisy-chain style network that has a beginning and an end. Linear topology simplifies installation and reduces wiring and installation costs, but a break in the network disconnects all devices downstream from the break. When this topology is used, both Ethernet connections on the encoder may be used. For the network connection use Link 1, Link 2, or both.
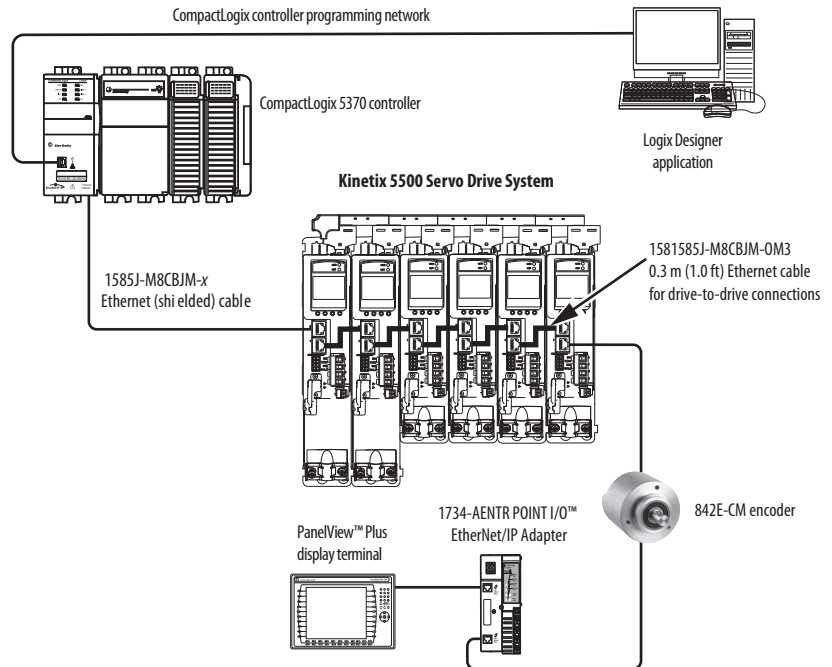
Device Level Ring Topology

A DLR network is a single-fault-tolerant ring network intended for the interconnection of automation devices. DLR topology is advantageous as it can tolerate a a break in the network. If a break is detected, the signals are sent out in both directions. With this topology, use both the Link 1 and Link 2 Ethernet connections on the 842E-CM encoder.

CompactLogix controller programming network

CompactLogix 5370 controller

Logix Designer application

1734-AENTR POINT I/O EtherNet/IP adapter

1783-ETAP module

PanelView Plus display terminal

Kinetix 5500 servo drive system

1585J-M8CBJM-OM3 0.3 m (1.0 ft) Ethernet cable for drive-to-drive connections.

842E-CM encoder

1585D-M4TBJM-x Ethernet (shielded) cable

Notes:

Installation

Mechanical

This chapter describes how to install the 842E-CM integrated motion encoder on EtherNet/IP.

Also refer to the installation sheet provided in the box, **publication No. 842E-IN002 (10000481742)**.

Shaft Rotation Direction

When you view the encoder from the shaft side, the shaft rotation is clockwise (CW) or counterclockwise (CCW), as shown.

Mounting with a Solid Shaft

1. Be sure to select the proper size flexible coupling clamp to mate to the encoder shaft, e.g., 845–FC–*–*. See encoder accessories in the *Sensors* catalog (C116-CA001).

⚠ **ATTENTION:** Do not rigidly connect the encoder shaft to the machine; this will cause premature failure of the encoder or machine bearings. Always use a flexible coupling.

2. Use the dimension drawings in the installation instructions to determine the encoder mounting hole locations (see "Related Documentation" on page 9).

3. Slide the flexible coupling onto the shaft, but do not tighten the set screws.

4. Mount the encoder and tighten with three size M4 mounting screws (not supplied).

5. Center the flexible coupling and tighten the set screws.

Mounting with a Hollow Shaft

IMPORTANT	Be sure the mating shaft is chamfered and grease-free.

1. Loosen the screw on the clamping ring with a 2.5-mm star driver.

2. Slide the encoder onto the mating shaft until the flex mount rests on the machine surface.

⚠	**ATTENTION:** The encoder should slide freely onto the shaft; if not, do not force. Check the shaft for interferences such as gouges, burrs, rust, or size.

3. Hold encoder firmly and mark the two mounting holes. (If mounting holes already exist, proceed to Step 6.)

4. Slide the encoder off. Drill and tap the marked holes to accept M4 (or equivalent) screws.

5. Slide the encoder back onto the shaft until the flex mount rests on the machine surface.

6. Attach the encoder with two M4 (or equivalent) screws.

IMPORTANT	Do not stress the flex mount while tightening the screws.

7. Tighten the clamping ring screw to 1.1 Nm (10 in–lb).

Electrical

⚠️ **ATTENTION:** Switch off the power supply. The machine/system could unintentionally start while you are connecting the devices.

Ensure that the entire machine/system is disconnected during the electrical installation.

⚠️ **ATTENTION:** Commissioning requires a thorough check by authorized personnel!

Before you operate a system equipped with the 842E-CM encoder, make sure that the system is first checked and released by authorized personnel.

Please read more in Chapter 1, Safety Precautions, page 11.

Electrical Wiring Instructions

Three electrical connections are located on the back of the housing.

A 4-pin M12 connector is used for the 24V DC power supply connection.

Two 4-pin M12 connectors are used for the Ethernet connection. The Link 1 connection is used for star networks. For ring networks, use both the Link 1 and Link 2 connectors. In a linear network, use Link 1, Link 2, or both connectors.
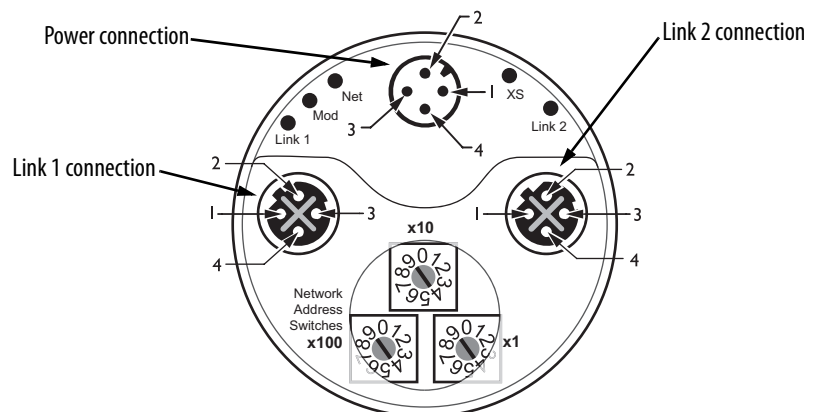
IMPORTANT For best results, grounding the encoder flange is recommended.

Also refer to publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines, available online at http://www.rockwellautomation.com/literature/, for additional installation requirements.

Pin Assignments

⚠	**ATTENTION:** Wire the voltage supply as shown. Mis-wiring can cause damage to the encoder.

Voltage supply

	Signal	Mating cable wire color	Function	
1	Vs	Brown	Supply voltage 10…30V DC	
2		White	Do not use	
3	GND	Blue	0V DC (ground)	
4		Black	Do not use	

Example: Cordset 889D-F4AC-*

Ethernet link connections – Link 1 and Link 2

Pin	Signal	Mating cable wire color	Function	
1	TxD+	White orange	Ethernet	
2	RxD+	White green	Ethernet	
3	TxD−	Orange	Ethernet	
4	RxD−	Green	Ethernet	

Example: Cordset 1585D-M4TBJM-*

Functional Specifications

Operating voltage	10…30V DC
Power consumption	3 W
Load current	200 mA
Resolution per revolution	262,144
Revolutions	4,096
Repeat accuracy	±0.002°
Error limit	±0.03°
Code direction	CW or CCW programmable
Interface	EtherNet/IP per IEC 61784-1 IEEE 1588 (IEEE 61588, Precision clock synchronization protocol for networked measurement and control systems)
Transmission speed	100 MBits/s
Duplex	Full or half

Configuring the Encoder

Configuring the 842E-CM Encoder IP Address

This section offers guidance on configuring your Ethernet connection to the 842E-CM encoder.

Ethernet Connection

Configuration, programming, and diagnosis of the encoder are performed over the standard 10/100 Mbps Ethernet communication port by using the Logix Designer application.

842E-CM Encoder Port Configuration

The IP address of the 842E-CM encoder is composed of four octets separated by three dots to conform to the Class C Subnet structure. Each octet can be configured with a number between 1 and 254.

There are two methods of changing the current IP address. An address can be automatically assigned to the encoder (dynamic IP address) when the encoder is connected to a DHCP (Dynamic Host Configuration Protocol) enabled server, or you can manually assign a IP address to the encoder (static IP address). Both methods of configuring the encoder's IP address are shown here.

Setting the IP Address

The 842E-CM encoder is shipped with the network address switches set to 999. You must assign the encoder an IP address using one of the two methods outlined below.

Set the IP address of the 842E-CM encoder using either one of the following methods:

1. Use the network address switches (see figure on page 26) on the encoder to set the last octet of the IP address (192.168.1.xxx).

2. Use the network address switches to enable BootP / DHCP and use a BootP utility or DHCP server to assign the IP address of the unit on powerup.

Assigning the Last Octet in an IP Address Scheme of 192.168.1.xxx Using the Network Address Switches

1. Set the three network address switches to 888.

2. Cycle power to the encoder.

3. Set the three network address switches to a valid address of 001…254.

4. Cycle power to the encoder.

5. The encoder will power up with the IP address set to 192.168.1.xxx, where xxx is the position of the three network address switches.
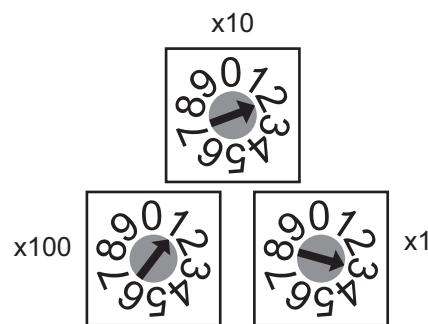
Network address switches set to 123

Assigning the IP Address Using BootP/DHCP:

Verify that the MAC ID of the encoder is in the relationship list in the BootP Utility or DHCP server before attempting to assign the encoder an IP address using this procedure.

1. Set the three network address switches to 888.

2. Cycle power to the encoder.

3. Set the three network address switches to 255 or greater (not 888).

4. Cycle power to the encoder

5. The encoder will power up and request an IP address from a BootP/DHCP server.

6. If the MAC ID of the encoder is in the relationship list, the BootP/DHCP server will assign the associated IP address to the corresponding MAC ID.
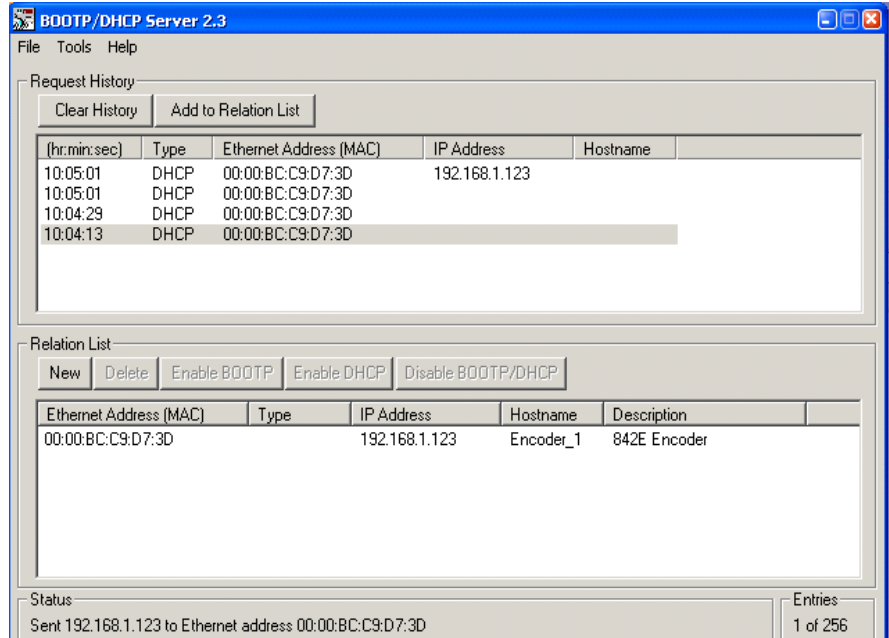
Function of Network Address Switch Settings

Setting of network address switches	Function
001-254	Sets last octet of the IP address to the value indicated (xxx in 192.168.1.xxx)
888	Restores all factory default settings in the encoder and clearing its IP address and enables DHCP.
Any other setting	Enables last settings (the encoder uses last settings stored in non-volatile memory).

> ⚠ **ATTENTION:** Disable DHCP after the new network address is set (see next step).
>
> This prevents unexpected resetting of the network address, which could result in unintended machine motion or loss of process control.

7. Disable DHCP: click once on the encoder in the relation list to highlight it. Then click Disable BOOTP/DHCP. This instructs the 842E-CM encoder to retain the IP address at the next power cycle.

Wait for the status message to show that the command was successfully sent. If the message does not appear, repeat this step.

Notes:

Configuring the 842E-CM Encoder Using the Logix Designer Application

This chapter guides you through the steps required to configure the encoder using Logix Designer software. Note that the modules presented in this chapter are configured using the Logix Designer application, version 21.

Example: Setting Up the Hardware

This example features the CompactLogix L36 ERM processor in slot 0 and a built-in EtherNet/IP connection. The encoder is connected to a Stratix 5700™ Ethernet switch.
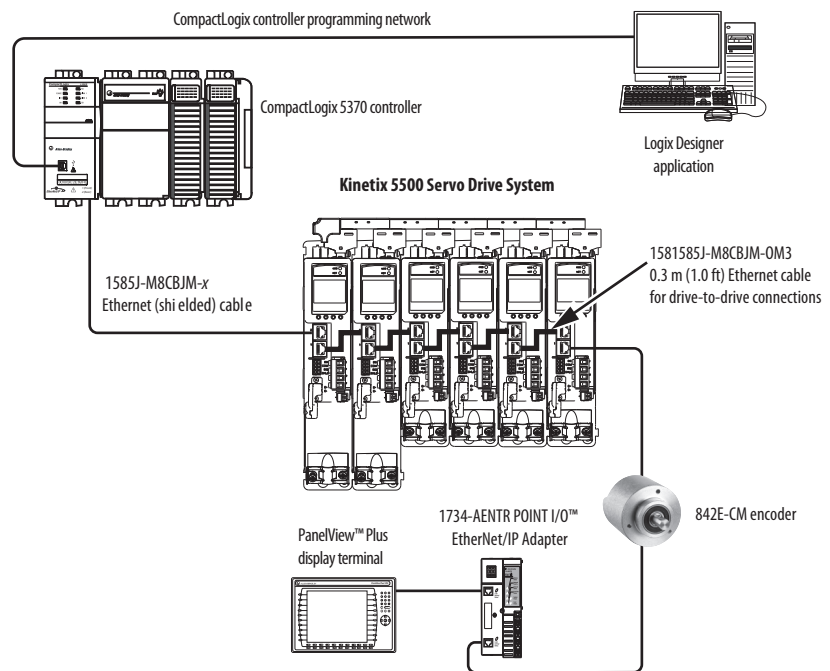
To work along with this example, configure the system as shown.
- Verify the IP addresses for your programming terminal and 842E-CM encoder.
- Verify that you properly connected all wiring and cabling.

- Be sure you configured the communication driver (for example, AB_ETH-1 or AB-ETHIP-1) in the RSLinx® software.

Checking the Integration in EtherNet/IP via RSLinx Classic

Using the tool RSLinx Classic, check again whether the set IP address is accurately detected by the control system.

The EDS file (electronic data sheet) contains all the information related to the parameters as well as the operating modes of the EtherNet/IP encoder (go to www.rockwellautomation.com/resources/eds/ and search for "842E-CM." You can register the EDS file using the EDS hardware installation tool in the Tools menu of RSLinx Classic software.

1. Start RSLinx Classic (as a rule on the Start menu on your PC/notebook in Rockwell Software, RSLinx, RSLinx Classic).

2. Click on the RSWho button in the program.
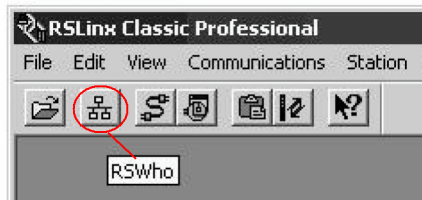
3. Then open the path AB_ETHIP1, Ethernet. The encoder can be seen with its IP address.
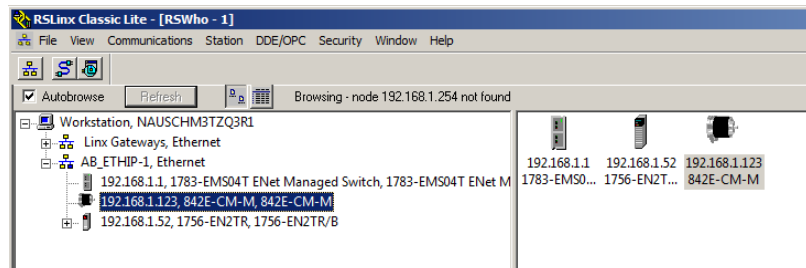
IMPORTANT	Before proceeding, install the add-on profile (see Appendix B).

4. Install the add-on profile according to the instructions in Appendix B.

Adding and Configuring the Add-on Profile in RSlogix 5000

After installing and setting up the encoder, use the encoder add-on profile to add the encoder to the project and configure it.

Adding the Encoder to Your Logix Designer Project

1. Apply power to the controller and open the Logix Designer application.

2. From the File menu, choose New. The New Controller dialog opens.
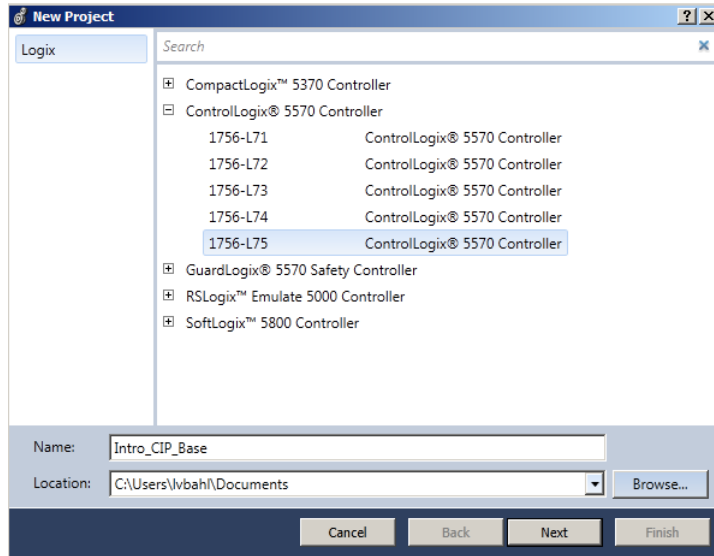
3. Select a controller and name it.

4. Click Next.

5. Select the slot your controller is in and configure it.
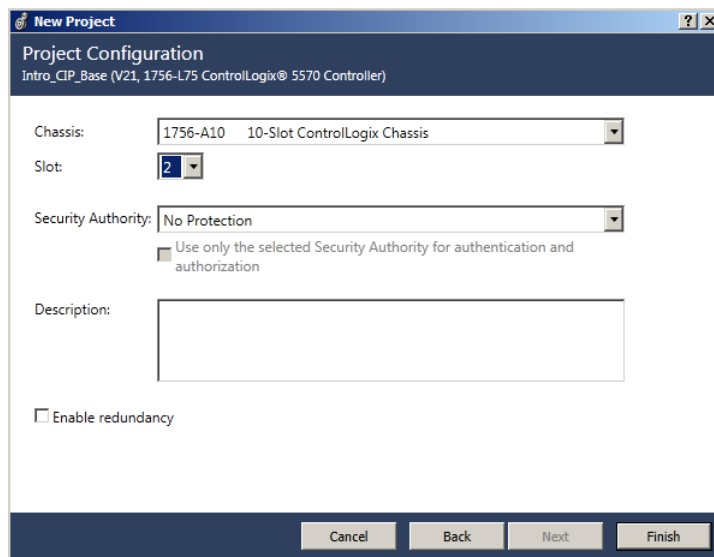
6. Click Finish.

7. Open the Controller Properties.

8. Click the Date/Time tab.
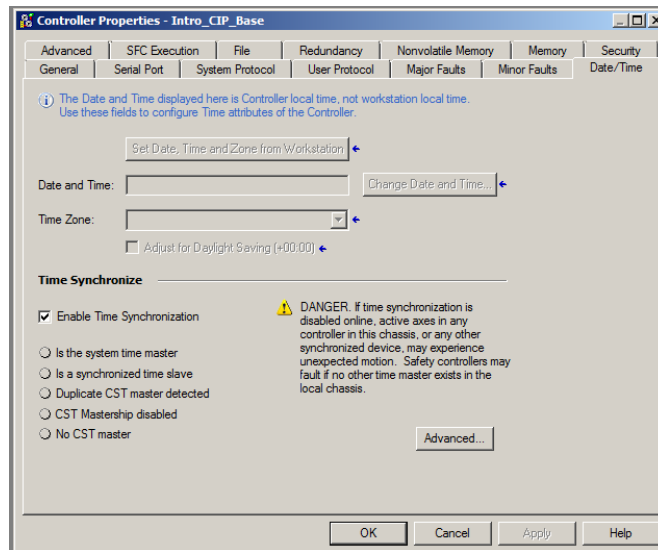
9. Check Enable Time Synchronization.

This allows the controller to participate in the Logix Time Synchronization or CIP sync. The controller will also participate in an election in the Logix system for the best GrandMaster clock.

10. Click OK.

11. If needed, in the I/O Configuration, configure an Ethernet module (enable time synchronization and motion). This must be a CIP Sync capable Ethernet bridge, such as the 1756-EN2T, EN2TR, or EN3TR.

12. Right-click on the Ethernet port or Ethernet module of the controller and select New Module.

13. Select the desired 842E-CM encoder (single turn or multi-turn) and click Create.
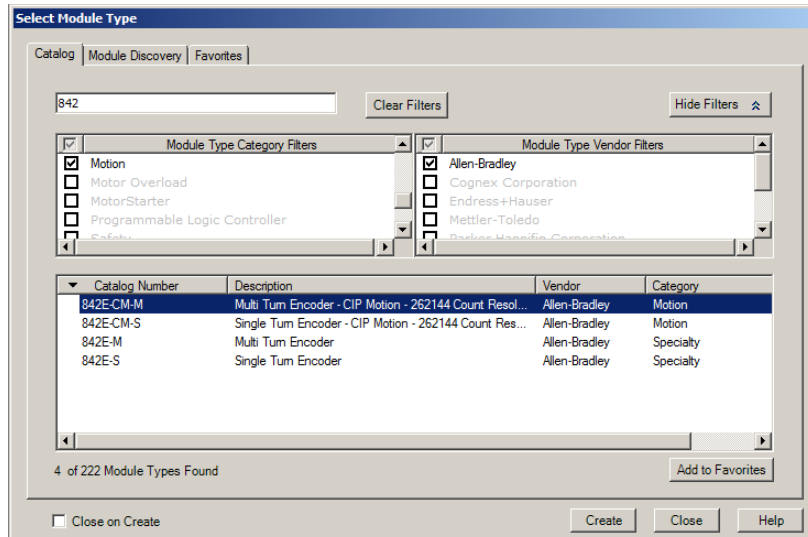
14. Close the Select Module Type dialog box. The New Module dialog box opens.

Configuring the Encoder
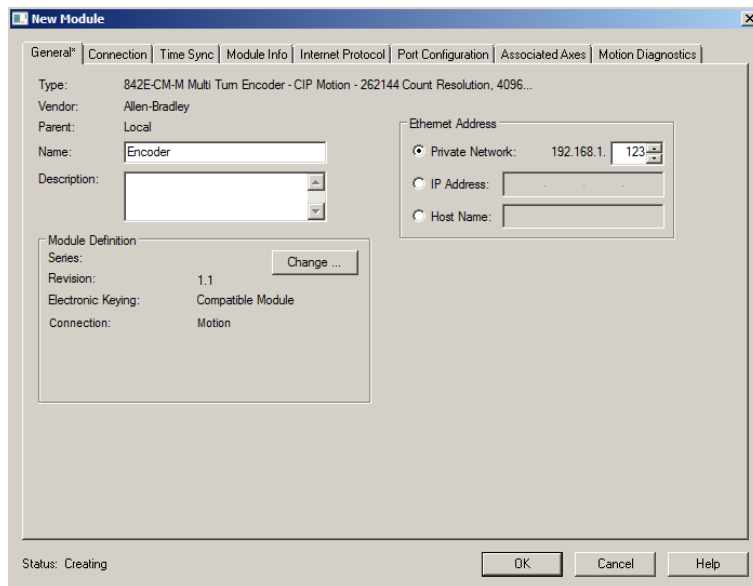
1. Configure the new encoder module.

   a. Type the encoder Name.

   b. Click an Ethernet Address option. In this example, the Private Network address is selected.

   c. Enter the address of the encoder.

2. Click the Associated Axes tab.

3. Click New Axis. The New Tag dialog box opens.
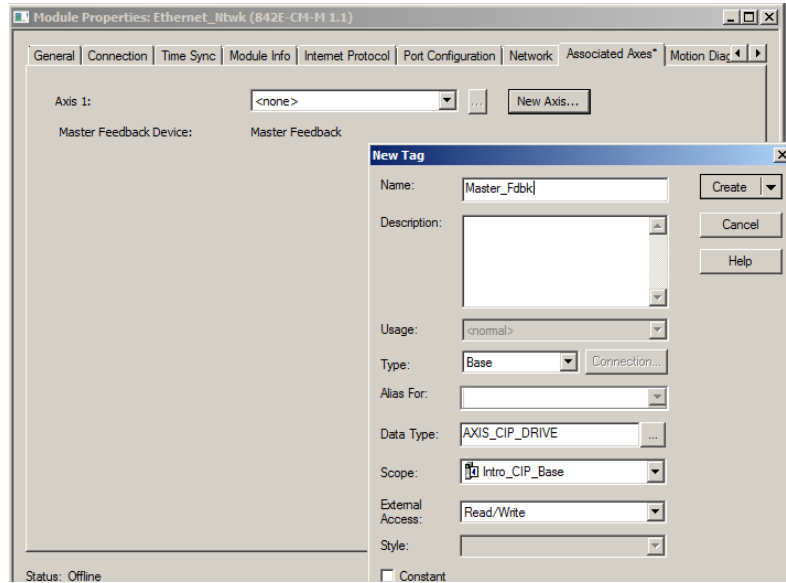
4. Name the new tag.

5. The data type will be AXIS_CIP_DRIVE.

6. Click Create. The new axis (Master_Fdbk) appears under Motion Groups>Ungrouped Axes in the Controller Organizer and is assigned as Axis 1.
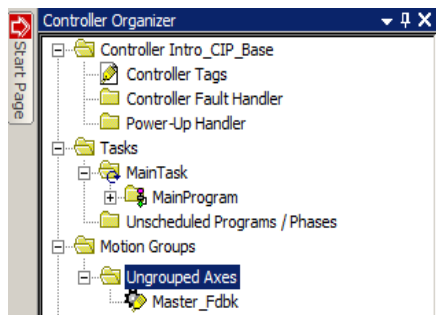
7. Click Apply.

Configuring the Motion Group

Follow these steps to configure the motion group.

1. Right-click Motion Groups in the Controller Organizer and choose New Motion Group. The New Tag dialog box opens.
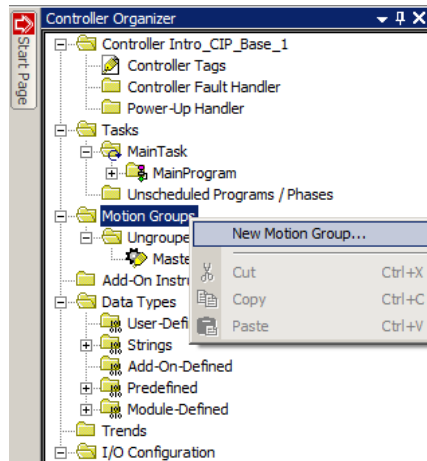
2. Type the new motion group Name.
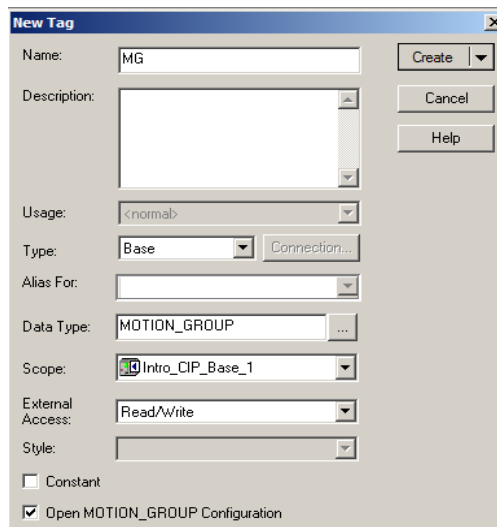
3. Click Create. The new motion group appears under the Motion Groups folder.

4. Right-click the new motion group and choose Properties. The Motion Group Properties dialog box opens.

5. Click the Axis Assignment tab and move your axes (created earlier) from Unassigned to Assigned.
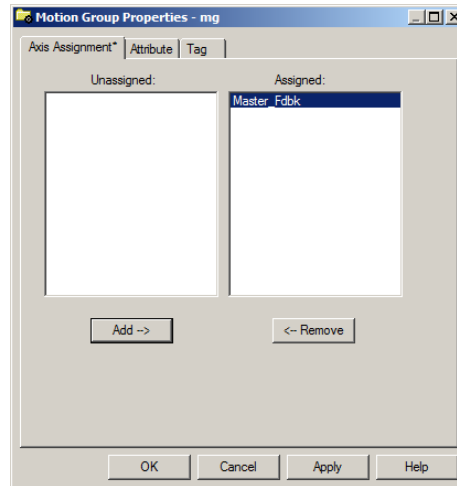
6. Click the Attribute tab and edit the default values as appropriate for your application. For this encoder, a coarse update rate from 4…32 ms is supported. If you set the coarse update rate outside that range, you will receive an error message.
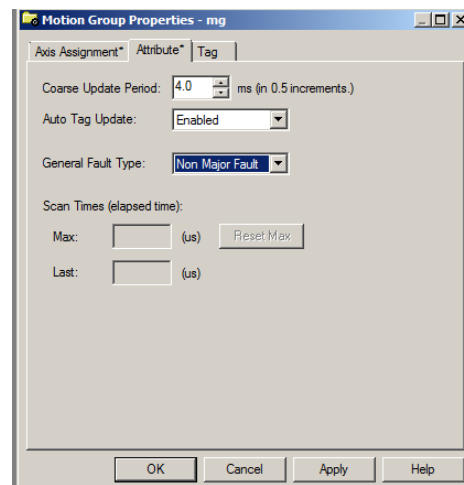
7. Click OK.

Configuring Axis Properties

Follow these steps to configure axis properties.

1. Right-click the axis in the Controller Organizer and choose Properties.

2. Select the General Category.

3. From the General pull-down menus, change configuration settings as needed for your application.

4. From the Associated Module >Module pull-down menu, choose your encoder.

5. Click Apply.
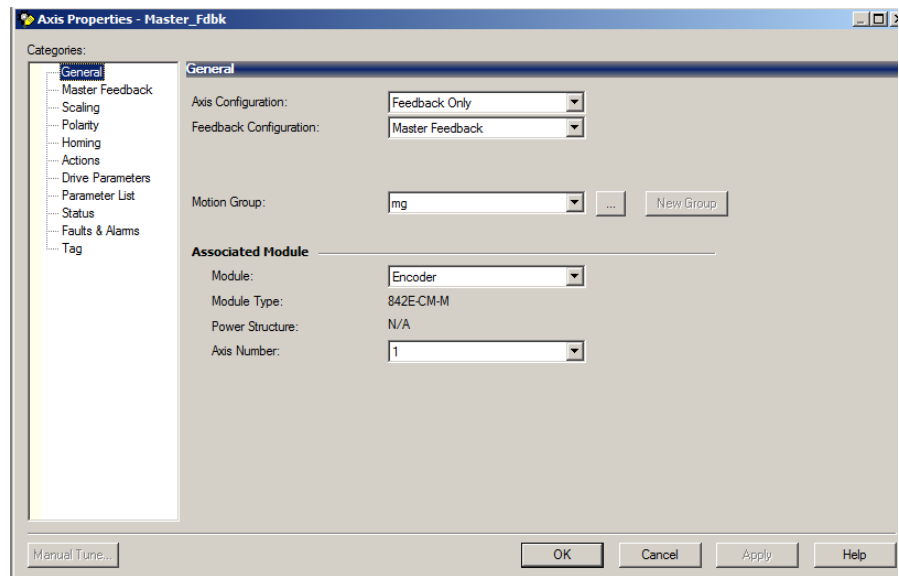
6. Select the Master Feedback category; the Master Feedback specification dialog box opens.

7. Select Type: Hiperface. This is currently the only choice for Type.

8. Set the resolution for the encoder; set the number of turns as appropriate to your encoder. The effective resolution should be displayed. The configuration for multi-turn is shown below. For single turn, Turns should be 1.
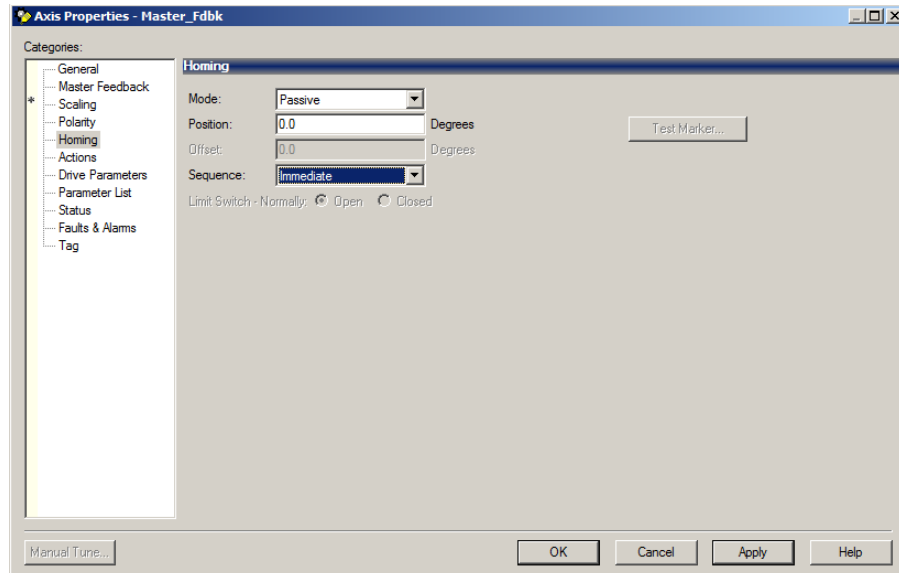
9. Click Apply.
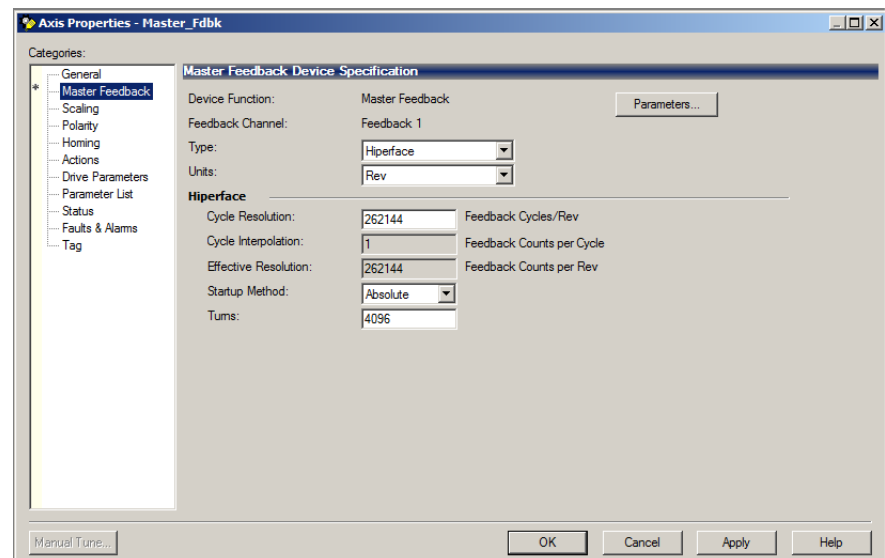
10. Select the Scaling category and edit the default values as appropriate to your application. If you make changes, click Apply.
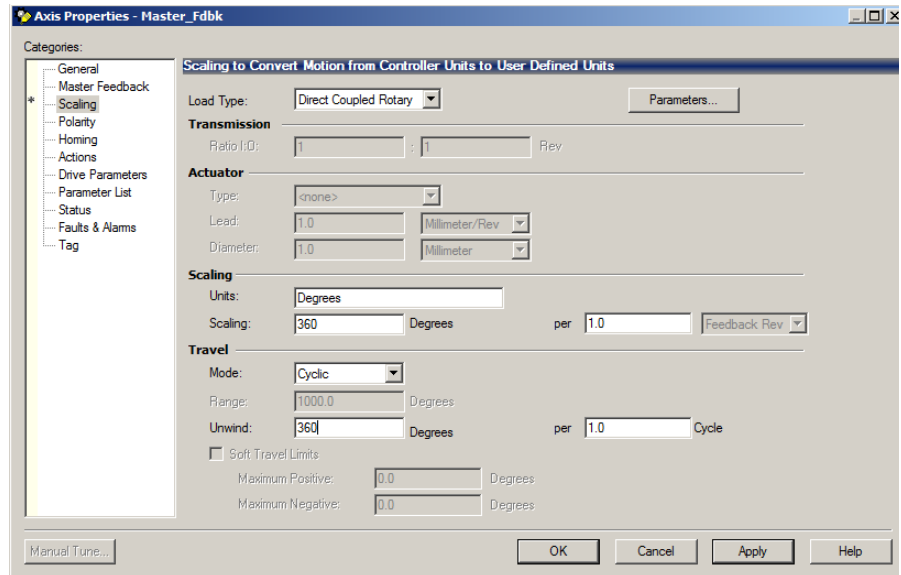
11. Select the Homing category. The default values are Passive Mode and Sequence: Immediate.


12. Enter the desired value for position. This will be the home position.

13. Select Actions. Here you can select the fault exception behavior for your device and the Soft Travel Limits. Shutdown is currently the only available exception behavior.
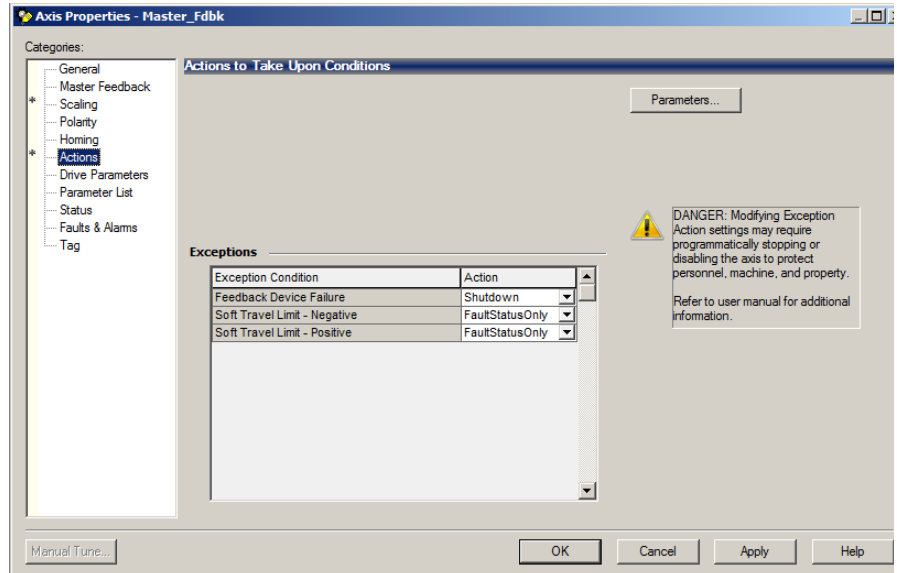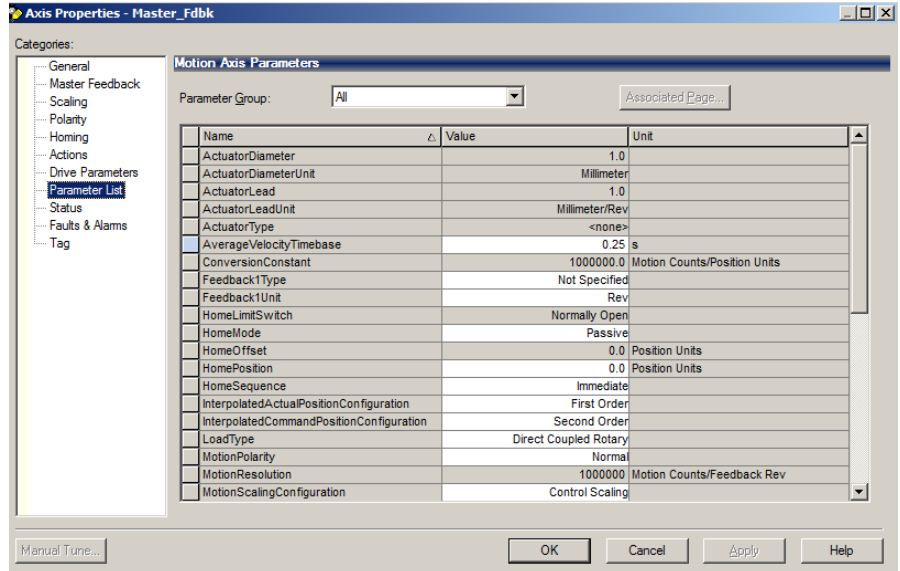
14. Select Drive Parameters. Check the boxes for desired real-time data.

IMPORTANT	Firmware revision 1.002 supports the Velocity and Acceleration parameters.
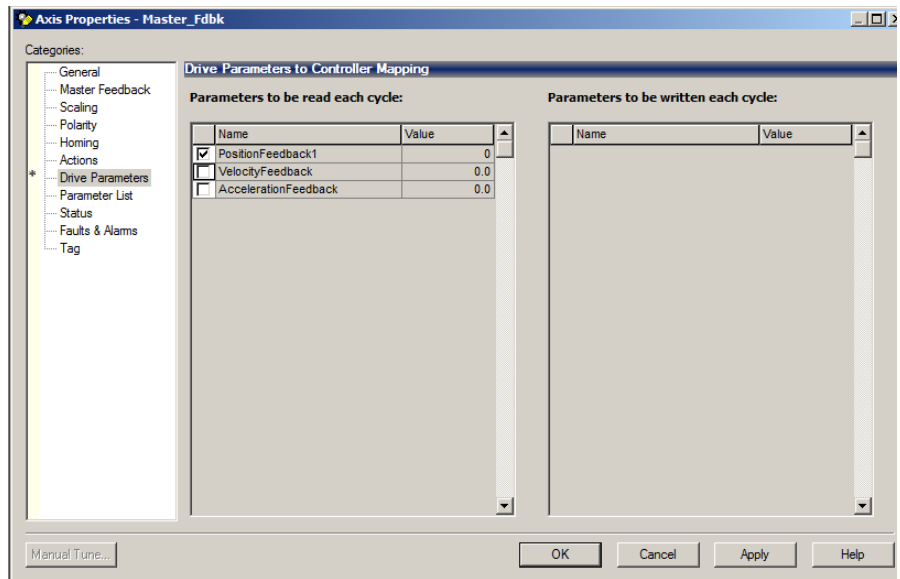
15. Select the Parameter List category. Enter the necessary changes based on your application requirements.


NOTE: Velocity Filter Bandwidth, Acceleration Filter Bandwidth, Velocity Threshold and Velocity Standstill Window cannot be set from the Parameter List. To set these parameters, use the following message instructions.

This procedure sends a Logix message to set the following parameters.

IMPORTANT	These new values are set to volatile memory and are not retained upon a power cycle. Follow the sample below or use a similar method to write the values to the encoder memory after a loss of connection to the device.

a. **Velocity Threshold:** This parameter defines a minimum absolute velocity. If the magnitude of the velocity feedback signal is less than this value, the Velocity Threshold status bit is set.
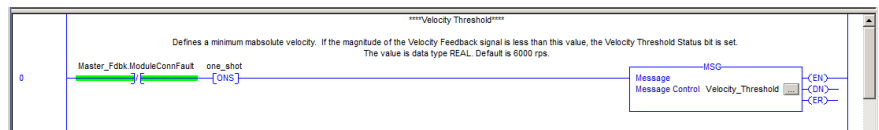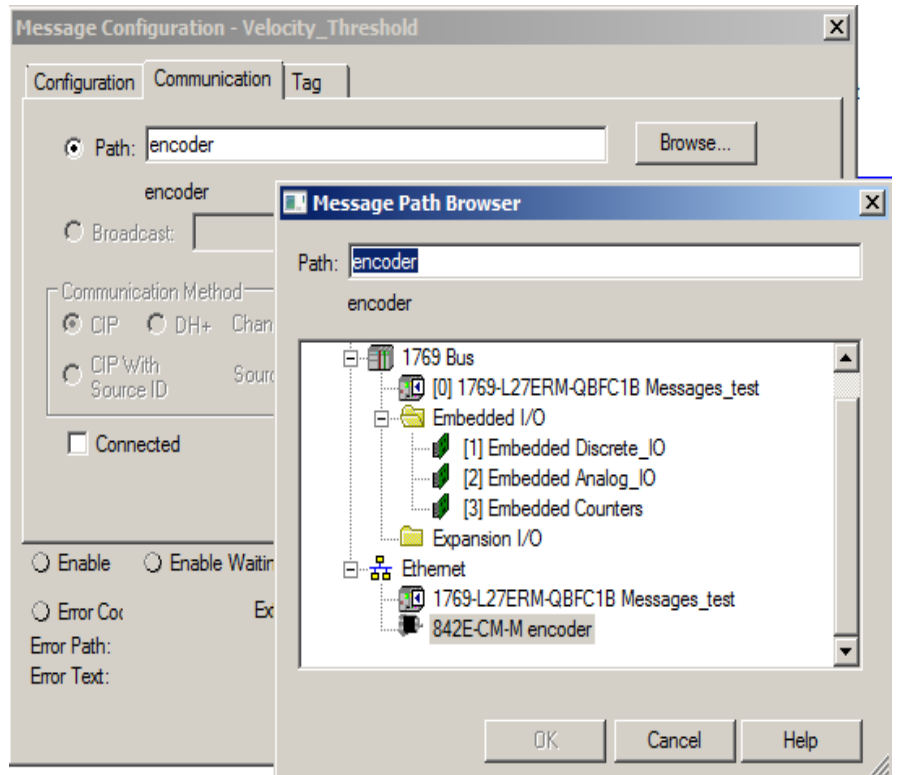
   b. Set the values in the Message Configuration dialog box as shown.

**NOTE:** The Source Element must be a REAL data type, and its default value is 6000 rps.
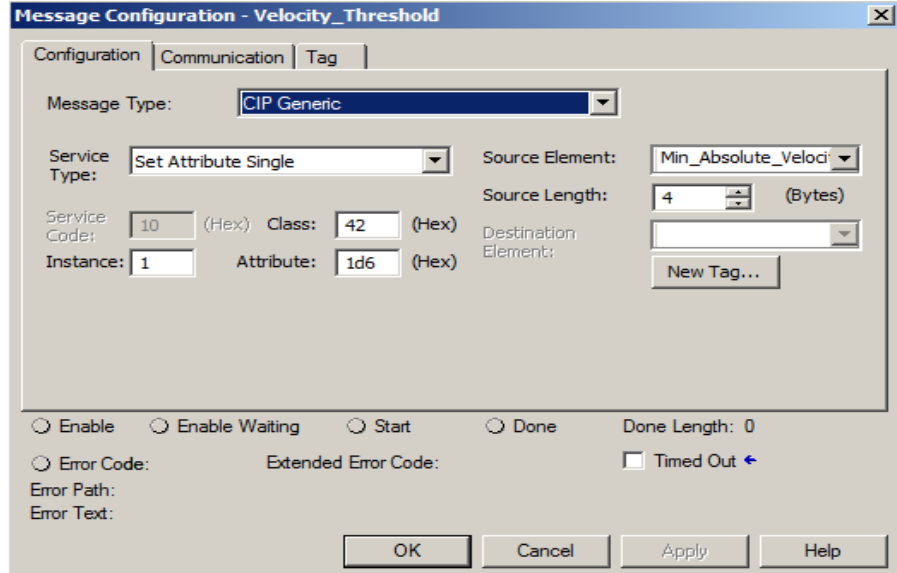
   c. Click the Communication tab and browse to the encoder tag; in this case, "encoder" as shown.

The same procedure is required for the following parameters.

Velocity Standstill Window: This value establishes a window around zero speed. When the velocity feedback signal is within this window, the Velocity Standstill status bit is set. If the Velocity Feedback signal falls outside the defined window, the Velocity Standstill status bit is cleared.

The source element must be a REAL data type; its default value is 3.0 rps.
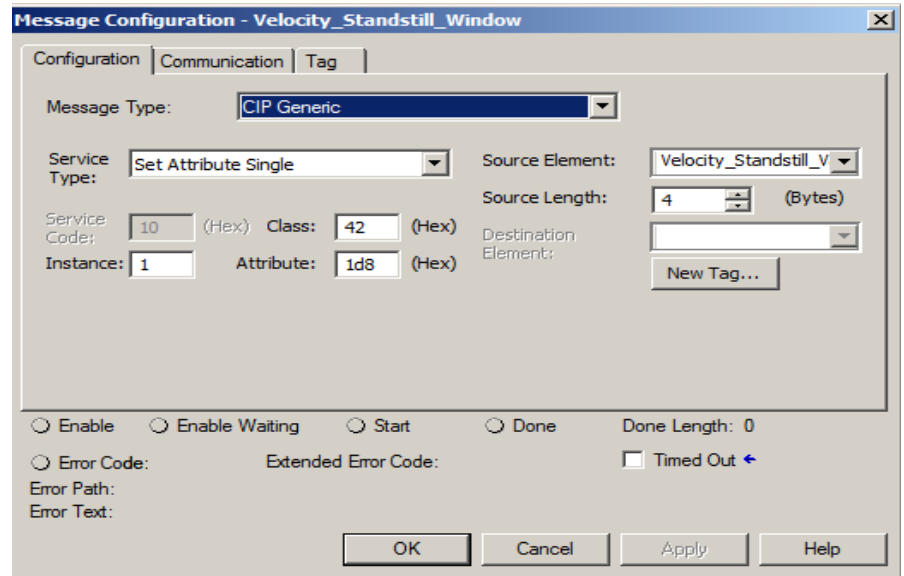
Velocity Filter Bandwidth: (equivalent to Feedback 1 Velocity Filter Bandwidth in Hz) This parameter controls the bandwidth of the low pass filter applied to the raw velocity signal from Feedback.

Default value: 100 (recommended bandwidth 1 to 1000Hz), Attribute disabled: 0

The source element must be a REAL data type.
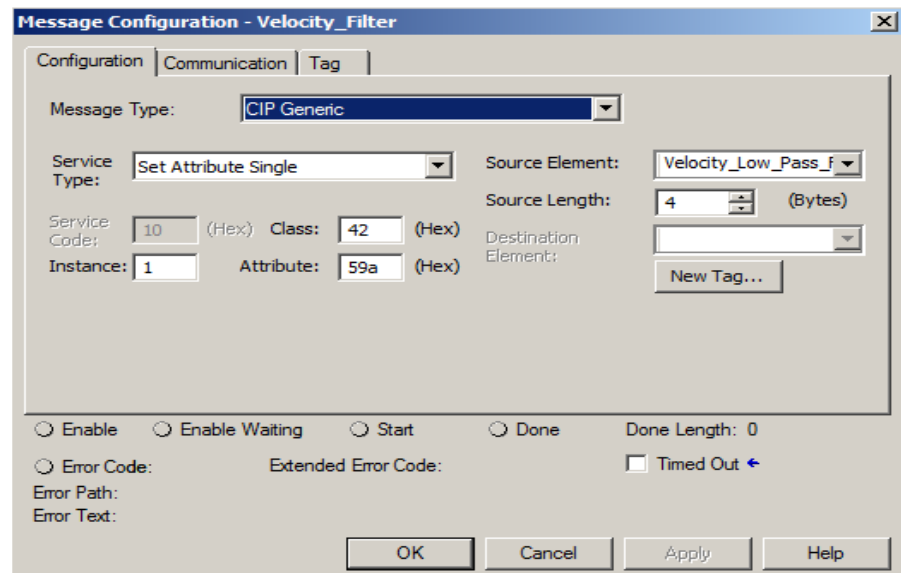
Acceleration Filter Bandwidth: (equivalent to Feedback 1 Acceleration Filter Bandwidth in Hz) This value controls the bandwidth of the low pass filter applied to the raw acceleration signal from Feedback.

Default value: 100 (recommended bandwidth 1 to 1000Hz), Attribute disabled: 0
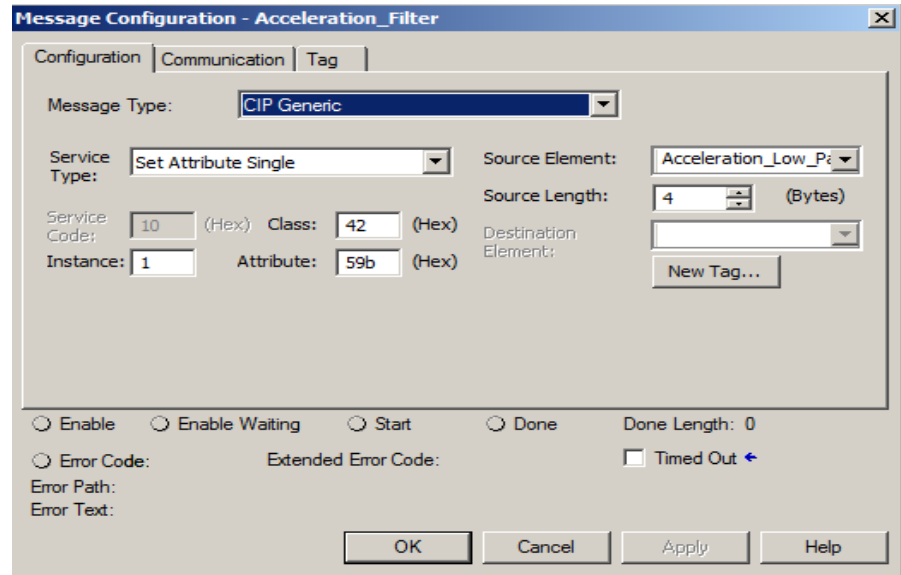
NOTE: To verify, you can issue a Service Type "Get Attribute Single" message using the same Class, Instance and Attribute data, as well as add a destination element to ensure that the correct value was successfully written into the encoder. Refer to the following example to verify the acceleration low pass filter value.
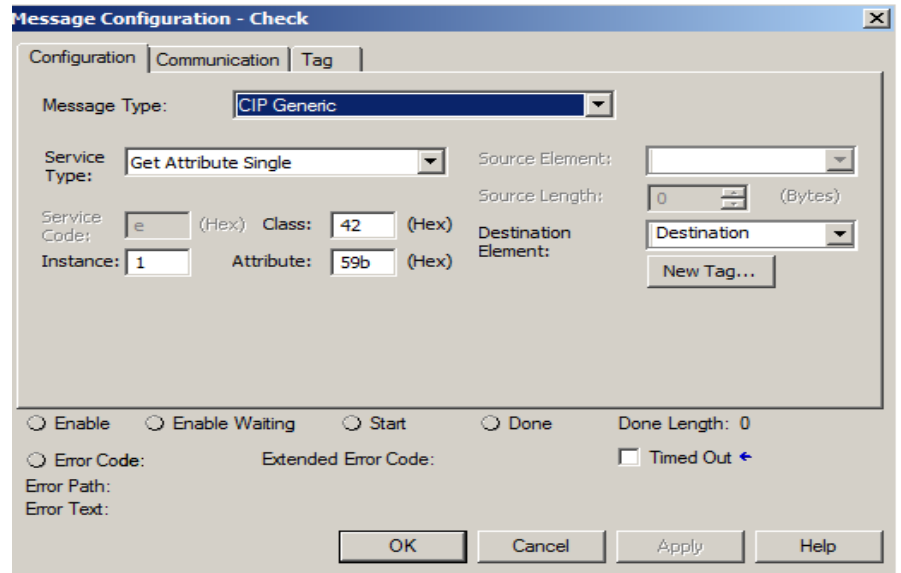
Sample code is available. Visit the Rockwell Automation Sample Code Library, and search for "CIP motion encoder" or "842E-CM."

To download the sample code with the above information, select Downloads on the following page:

http://www.rockwellautomation.com/rockwellautomation/support/

Testing the Axis

After you have configured the 842E-CM encoder and the Logix5000 controller, applied power, and are on line with the controller, follow the steps below to test the axis.

IMPORTANT	Before proceeding with testing the axis, verify that the MOD and NET status indicators are green.

1. Verify that the encoder is on line with the Logix5000 controller and the encoder does not exhibit any faults.

2. In your Logix project, select Controller Tags.

3. Select the Monitor Tags tab and scroll to your encoder data.

4. Move the encoder shaft and verify that the position values change.

Scope:	Intro_CIP_Base ▼	Show:	All Tags		
Name				Value	←	Force Mask
⊞-Master_Fdbk.MotionFaultStatus		16#0000_0000	
─Master_Fdbk.SoftTravelLimitPositiveFault		0	
─Master_Fdbk.SoftTravelLimitNegativeFault		0	
⊞-Master_Fdbk.AxisEvent		16#0000_0000	
─Master_Fdbk.WatchEventArmedStatus		0	
─Master_Fdbk.WatchEventStatus		0	
─Master_Fdbk.RegEvent1ArmedStatus		0	
─Master_Fdbk.RegEvent1Status		0	
─Master_Fdbk.RegEvent2ArmedStatus		0	
─Master_Fdbk.RegEvent2Status		0	
─Master_Fdbk.HomeEventArmedStatus		0	
─Master_Fdbk.HomeEventStatus		0	
⊞-Master_Fdbk.OutputCamStatus		16#0000_0000	
⊞-Master_Fdbk.OutputCamPendingStatus		16#0000_0000	
⊞-Master_Fdbk.OutputCamLockStatus		16#0000_0000	
⊞-Master_Fdbk.OutputCamTransitionStatus		16#0000_0000	
─Master_Fdbk.ActualPosition		326.229	
─Master_Fdbk.StrobeActualPosition		0.0	
─Master_Fdbk.StartActualPosition		0.0	
─Master_Fdbk.AverageVelocity		20.991869	
─Master_Fdbk.ActualVelocity		15.0	
─Master_Fdbk.ActualAcceleration		194.44444	
─Master_Fdbk.WatchPosition		0.0	
─Master_Fdbk.Registration1Position		0.0	
─Master_Fdbk.Registration1PositiveEdgePosition		0.0	
─Master_Fdbk.Registration1NegativeEdgePosition		0.0	
─Master_Fdbk.Registration2Position		0.0	
─Master_Fdbk.Registration2PositiveEdgePosition		0.0	
─Master_Fdbk.Registration2NegativeEdgePosition		0.0	

5. Verify that the encoder polarity is correct.

• If the polarity is correct, axis testing is complete.

- If you need to change the polarity, select Axis Properties > Polarity. Click the Inverted radio button.
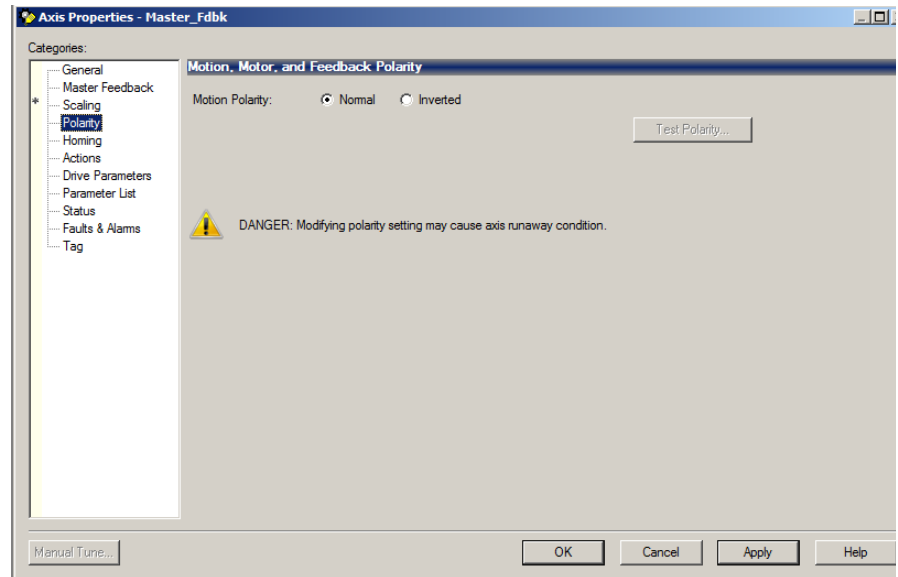
Notes:

Diagnostics and Troubleshooting

This chapter describes the diagnostic process to correct and clear fault conditions on the 842E-CM encoder. Refer to MOTION-UM003 for more information.

> ⚠️ **ATTENTION:** Cease operation if the cause of the malfunction has not been identified!
>
> Stop the machine if you cannot clearly identify the error and/or if you cannot safely eliminate the malfunction.

Interpreting Status Indicators

The Mod LED shows the device status, the Net LED shows the status of the CIP connection, and the XS LED shows the status of the internal measuring device in the 842E-CM encoder.

Five LED indicators provide status information on the back of the encoder. The figure below shows their location; the following tables describe their status.

Net
XS (Axis)
Mod
Link 2
Link 1
Screw cover
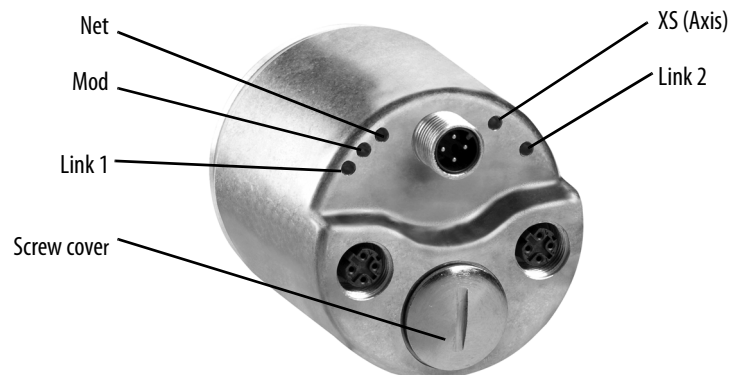
Read the LEDs according to the following tables.

Net LED	Description
OFF	No power/IP connection
Green	Connected
Green flashing	No connection
Red	Major fault
Red flashing	Minor fault / Duplicate IP

Mod LED	Description
OFF	No power
Green	Running
Green flashing	Standby
Red	Major fault
Red flashing	Minor fault
Green/red flashing	Self-test

XS (Axis) LED	Description
OFF	No power
Green	Running
Green flashing	Standby
Red flashing	Minor fault or Firmware updating
Amber	Major fault
Amber flashing	Self-test at power-on

Ethernet Link LEDs Link 1 and 2

The Ethernet link LEDs, Link 1 and Link 2, display the status of the physical connection on the Ethernet interface.

Link 1 and Link 2 LEDs	Description
OFF	No power/IP address
Green	LINK
Green flashing	Port activity
Amber	Port disabled
Amber flashing	Collision

Faults and Alarms

There are four ways to identify and view faults and alarms:

- Fault and Alarm log

- Quick View pane

- Tag Monitor, see the individual fault-related attributes

- Status Indicators

For more information, see MOTION-UM003 or Appendix C.

Troubleshoot Faults

The controller may exhibit the following types of motion faults.

Type	Description	Example
Instruction error	Caused by a motion instruction: • Instruction errors do not impact controller operation. • Look at the error code in the motion control tag to see why an instruction has an error. • Fix instruction errors to optimize execution time and make sure that your code is accurate. See Error Codes (ERR) for Motion Instructions, publication MOTION-RM002.	An instruction with a parameter out of range.
Fault	Caused by an anomaly with the servo loop: • You choose whether motion faults give the controller major faults. • Can shutdown the controller if you do not correct the fault condition.	• Loss of feedback. • Actual position exceeding an overtravel limit.

Table 1 - Encoder FLT Fault Code

Exception code on display	Exception text	Problem	Possible solutions
FLT S47 – FDBK DEVICE FAILURE	Feedback Device Failure	The feedback device has detected an internal error.	• Check feedback cable connectors • Cycle control power • Replace encoder if fault continues

Encoder Fault and Alarm Subcodes

The following table shows the sensor encoder fault and alarm subcodes communicated through the Cyclic Data Channel of the controller. Subcodes will appear in the Axis Fault Log.

Position	AxisFaultSubCode	Description	Hex value	Decimal value
1	Over temperature sensor	Temperature value of the sensor is out of range	0x1E	30
2	Light control reserve	LED current is incorrect	0x1D 0x2C	29 44
3	Frequency exceeded	Speed too high (limit exceeded)	0x1F	31
4	Position error	Amplitude error Single	0x01	1
5	Position error	Amplitude error Multi	0x21	33
6	Position error	Vector length single Vector length ($Sin^2 + cos^2$)	0x1C	28
7	Position error	Vector length multi Vector length ($Sin^2 + cos^2$)	0x23	35
8	Position error	LY Digital Random Error and LY MFP5 Error (single position)	0x20 0x2A	32 42
9	Position error	Position Multi turn error, synchronization (MA-Single, Init)	0x22 0x2B	34 43
10	Position error	Position Multi turn error, internal Interface	0x25	37
11	Position error	SSI Failure - internal communication interface	0xFF	255
12	Startup error	Startup error	0x18 0x02	24 2
13	Position or Memory error	Memory or EEPROM CheckSum error	0x06	6
14	Memory error	Memory or EEPROM I2C error	0x05	5
15	Diagnostic error	This Flag is set if the encoder detects a diagnostic error.	0x2F	47

Table 2 - Encoder Fault Code Summary

Fault code type	Description
NODE FLTxx	Exceptions that prevent normal operation of the encoder.
NODE ALARM xx	Exceptions that prevent normal operation of the encoder, but do not result in any action other than reporting the alarm to the controller.
INHIBIT Mxx	Exceptions that prevent normal operation and indicate whenever the encoder is active.

Table 3 - Node FLT Fault Codes

Exception code on display	Exception text	Problem	Possible solutions
NODE FLT 01 – LATE CTRL UPDATE	Control Connection Update Fault	Several consecutive updates from the controller have been lost.	• Remove unnecessary network devices from the motion network • Change network topology so that fewer devices share common paths • Use high performance network equipment • Use shielded cables • Separate signal wiring from power wiring
NODE FLT 02 – PROC WATCHDOG	Processor Watchdog Fault	The processor on the power board or control board failed to update in a certain amount of time.	• Cycle control power • Update the encoder firmware • Return encoder for repair if fault continues
NODE FLT 05 – CLOCK SKEW FLT	Clock Skew Fault	The controller time and the encoder's system time are not the same.	• Cycle control power • Check controller and Ethernet switch operation
NODE FLT 06 – LOST CTRL CONN	Lost Controller Connection Fault	Communication with the controller has been lost.	Check Ethernet connection Check controller and Ethernet switch operation
NODE FLT 09 – DUPLICATE IP ADDRESS	Duplicate IP Address Fault	Another device shares the same IP address on the network.	Select an IP address currently unused on the network.

Table 4 - NODE ALARM Fault Codes

Exception code on display	Exception text	Problem	Possible solutions
NODE ALARM 01 – LATE CTRL UPDATE	Control Connection Update Alarm	Updates from the controller have been late.	• Remove unnecessary network devices from the motion network • Change network topology so that fewer devices share common paths • Use high performance network equipment • Use shielded cables • Separate signal wiring from power wiring

842E-CM Exception Behavior

For 842E-CM encoders, shutdown is currently the only selectable exception behavior in the Logix Designer application from the Axis Properties dialog box, in the Actions category.

Table 5 - Exception Action Definition

Exception action	Definition
Shutdown	When the exception occurs, the encoder brings the motor to a stop by using the stopping action defined by the encoder (as in Stop encoder) and the power module is disabled. An explicit Shutdown Reset is required to restore the encoder to operation

Only selected encoder exceptions are configurable. In the fault behavior tables, the controlling attribute is given for programmable fault actions. See the Logix Designer Axis Properties screen, Actions category.
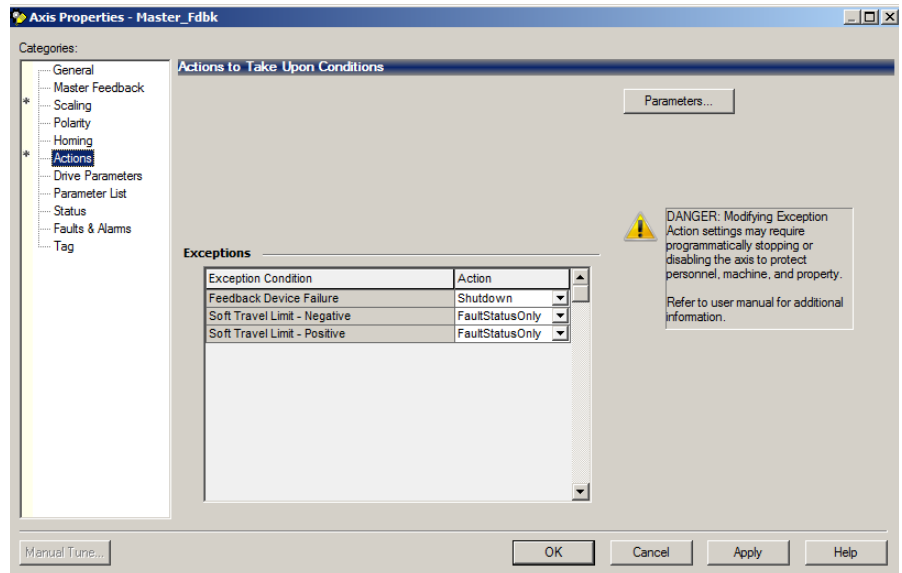
Table 6 - Encoder Behavior, FLT Sxx Fault Codes

Exception fault code	Exception text	Fault action			
		Ignore	Alarm	Minor fault	Major fault
FLT S47 – FDBK DEVICE FAILURE	Feedback device failure				X

Flash Update the 842E-CM Firmware

Introduction

This appendix explains how to flash update new firmware for the 842E-CM product. To download the latest firmware for the 842E-CM, copy the following link in your Internet browser, and click on the Go icon:

http://www.rockwellautomation.com/rockwellautomation/support/firmware/overview.page

IMPORTANT	Check the 842E-CM encoder label before flashing firmware. If the label indicates FW:1.002 (or higher), use the following procedure to update the firmware.

If the firmware version is not stated on the label, visit the Rockwell Knowledgebase and search for "842E-CM Firmware Update Procedure" to look up the appropriate firmware update method.

Performing the Update

If firmware revision 1.002 (or higher) is stated on the encoder label, proceed to update the firmware.

1. First, verify successful RSLinx Classic communications with the 842E-CM encoder via EtherNet/IP using RSWho Ethernet or EtherNet/IP driver.
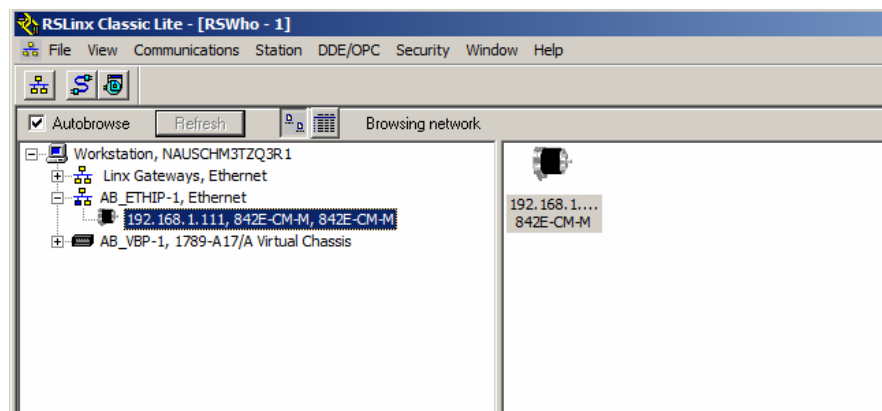
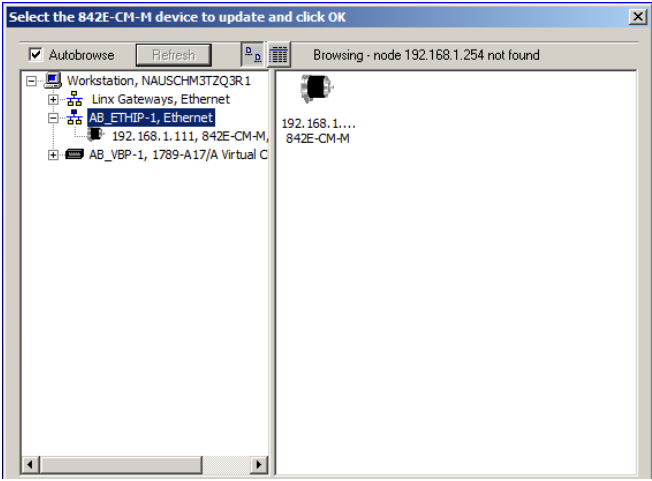**2.** Start ControlFLASH and select Network or Local network.
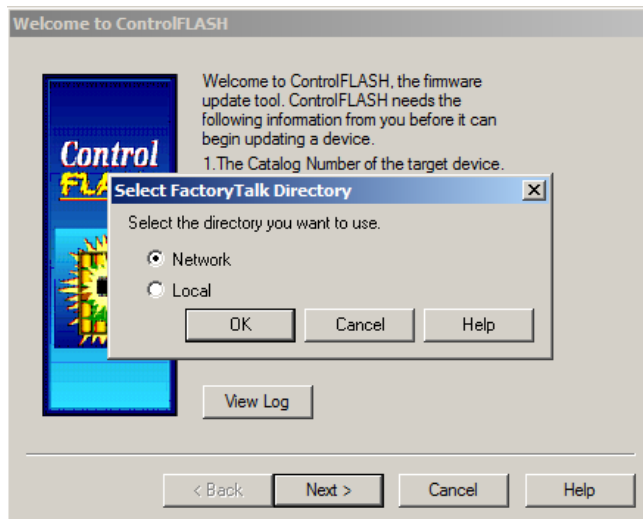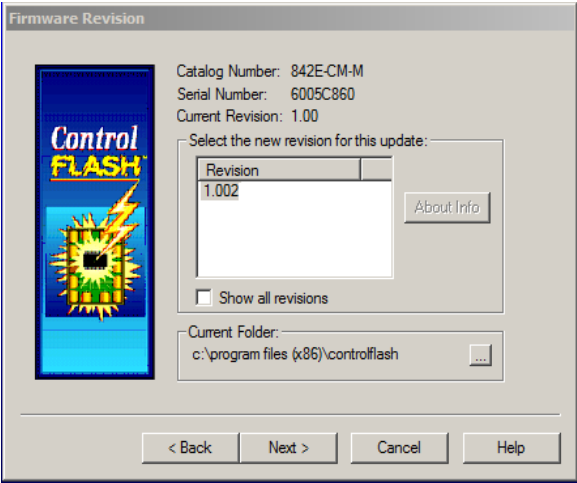

3. Click Next.
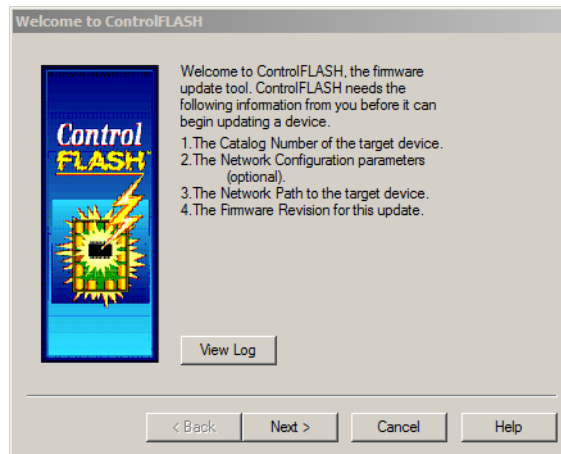
4. Select the catalog number of the 842E-CM encoder whose firmware you wish to upgrade, then click Next.
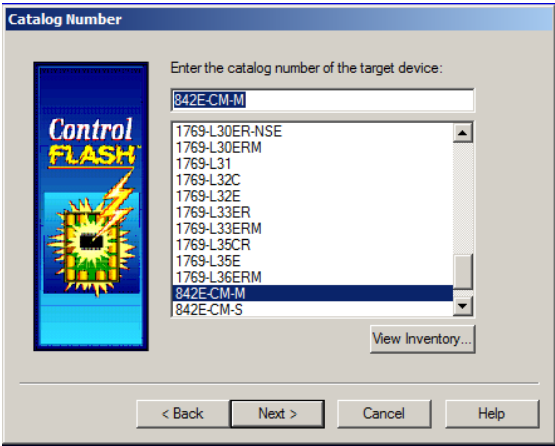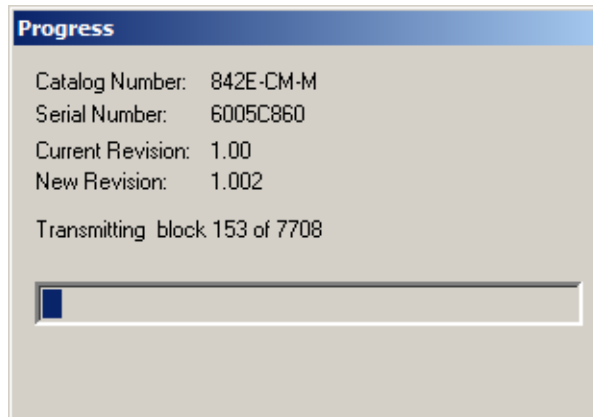
5. Select the controller in the browse window, and click OK.

6. Click Next to continue, and verify the revisions. Click Finish and Yes to initiate the upgrade.
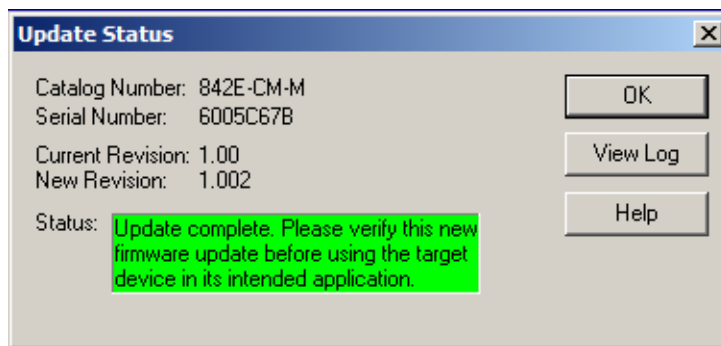
7. The next screen shows the download progress.

Progress

Catalog Number: 842E-CM-M
Serial Number: 6005C860

Current Revision: 1.00
New Revision: 1.002

Transmitting block 153 of 7708

8. If you see an error message instead, click OK to clear the window and power cycle the encoder before trying again.

9. Upon successful completion of the flash update, you see an Update complete status screen. Click OK to complete the update.

Upon s

Update Status

Catalog Number: 842E-CM-M   OK
Serial Number: 6005C67B
                                    View Log
Current Revision: 1.00
New Revision: 1.002   Help

Status: Update complete. Please verify this new firmware update before using the target device in its intended application.

Installing the Add-on Profile

Introduction

This appendix shows how to install the add-on profile (AOP) of the encoder with the RSLogix 5000 program. Add-on profiles are files that users add to their Rockwell Automation library. These files contain the pertinent information for configuring a device that will be added to the Rockwell Automation network.

The add-on profile simplifies the configuration of devices because it presents the necessary fields in an organized fashion, which allows users to set up and configure their systems in a quick and efficient manner.

The add-on profile is a folder containing numerous files for the device. It comes as an installation package.

Performing the installation

Install the add-on profile following the on-screen instructions.

1. In the file explorer, locate the directory where the installation files were extracted.

2. Click MPSetup.exe.

3. Extract the zip file to a local directory on your computer.

4. Double-click on MPSetup.exe to begin the installation.

| Name ▲	Size	Type	Date Modified
InstallNotes		File Folder	2/6/2012 2:10 PM
License		File Folder	2/6/2012 2:10 PM
MP		File Folder	2/6/2012 2:10 PM
MPI.dll	820 KB	Application Extension	1/5/2010 2:32 PM
MPSetup.exe	1,002 KB	Application	1/5/2010 2:32 PM
MPSetupCHS.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupDEU.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupENU.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupESP.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupFRA.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupITA.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupJPN.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupKOR.dll	141 KB	Application Extension	1/5/2010 2:32 PM
MPSetupPTB.dll	141 KB	Application Extension	1/5/2010 2:32 PM
shfolder.dll	22 KB	Application Extension	12/18/2009 11:58 AM

5. At the welcome screen, click on Next.
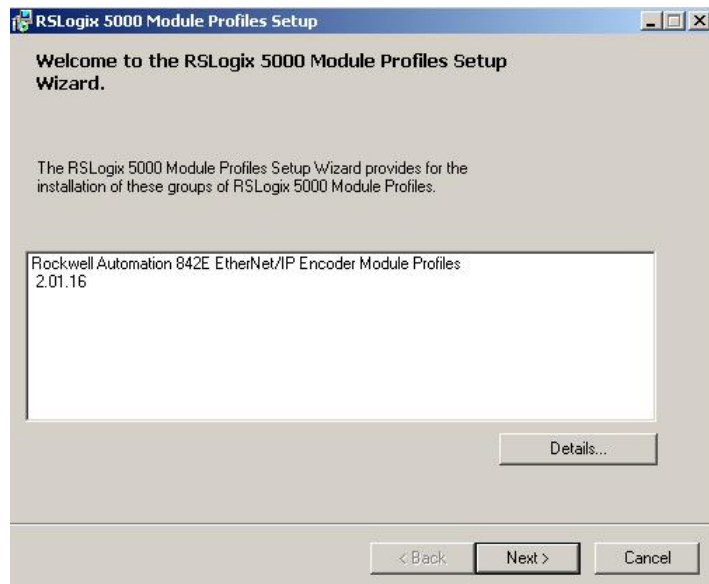
6. Click the radio button to accept the licensing terms, then click Next.
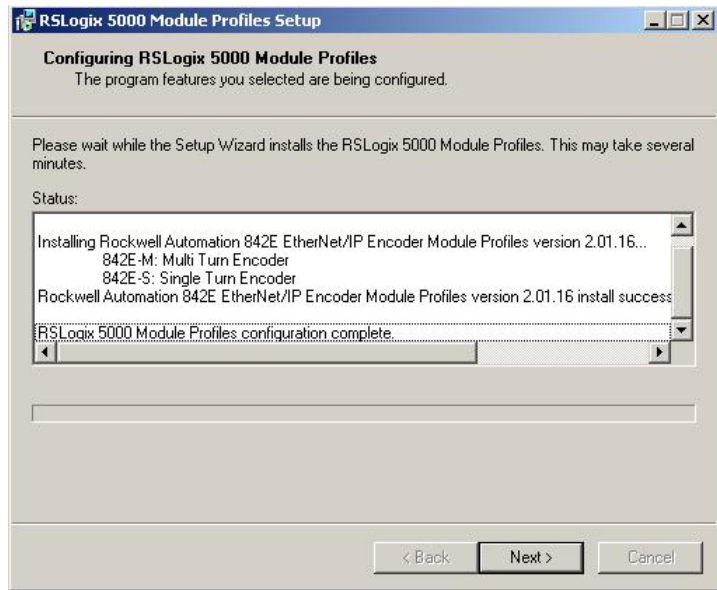
7. Click the Install radio button, then click Next.
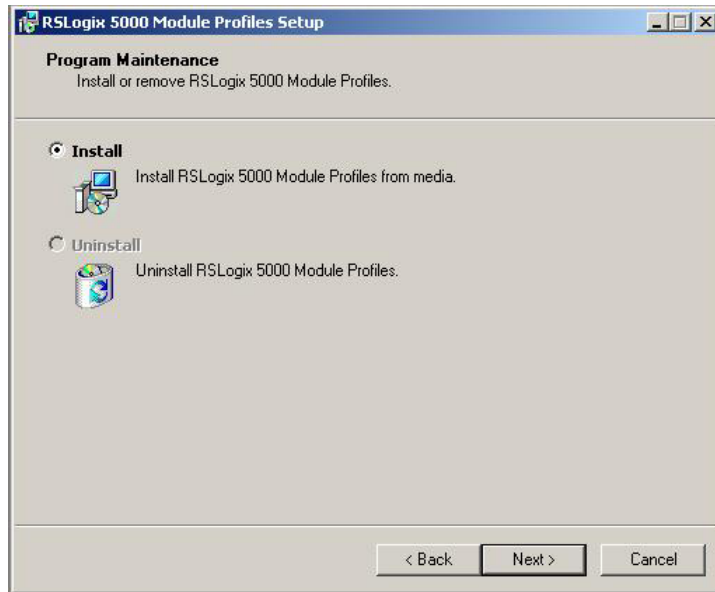
8. Click Install to begin the installation.
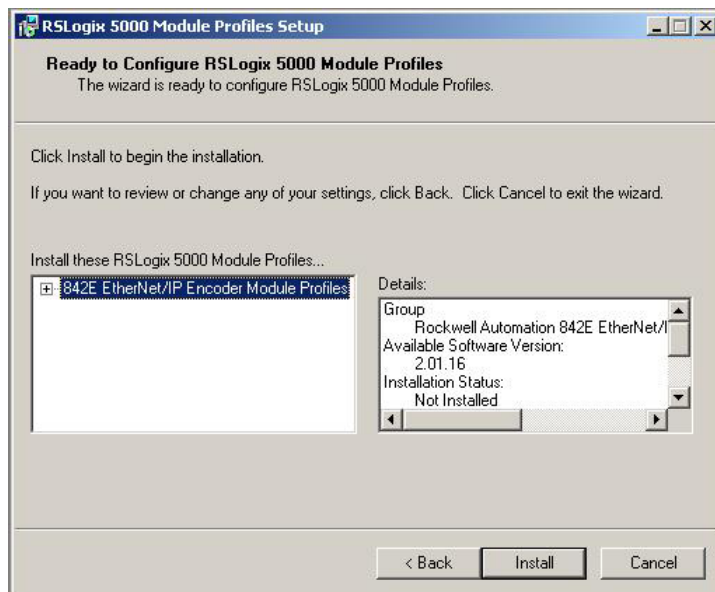
9. Click Next to install the add-on profile files.

10. Click Finish to complete the installation.

Faults and Alarms Dialog Box

The Faults and Alarms dialog box displays the current status of faults and alarms in the controller for an axis. The display is read-only except for the ability to clear logs. Fault and alarm entries are displayed only when you are online with a controller. See also Chapter 6, "Diagnostics and Troubleshooting."
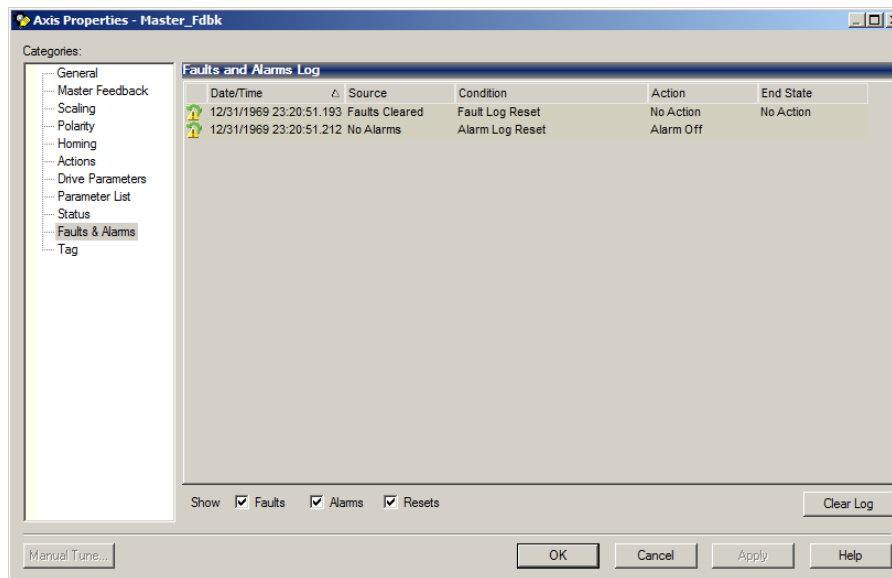
Quick View pane

The Quick View pane gives you a quick summary of faults and alarms related to the axis you select in the Controller Organizer. The information includes the type of axis, description, axis state, faults and alarms.

Data Monitor

The Data Monitor is where you can read and write the values assigned to specific tags, both online and offline.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support, you can find technical manuals, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools. You can also visit our Knowledgebase at http://www.rockwellautomation.com/knowledgebase for FAQs, technical information, support chat and forums, software updates, and to sign up for product notification updates.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect℠ support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

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

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

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

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

www.rockwellautomation.com