

Application Note

Using the Yaskawa AC Drive “EtherNet/IP” Option with AB Controllogix / Compactlogix Programmable Controllers

Applicable Product:

EtherNet*√*IP™ CM092 or CM093 Option Kit
conformance tested

Subject: Application Note

Product: CM092/CM093

Doc#: AN.AFD.09

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INTRODUCTION

The following document describes the configuration of Allen Bradley Controllogix or Compactlogix PLCs for communicating with the CM092 or CM093 EtherNet/IP option kits for the Yaskawa 7-series AC drives. In this example, the information describes the use of the programming tools to configure and control the AC drive for operation, and defines the requirements for access to additional parameters in the drive. In general, it defines the I/O configuration requirements and PLC ladder used.

IMPORTANT! - DOCUMENT APPLICABILITY

This application example uses the Yaskawa F7 drive. Illustrations may not depict your specific Yaskawa drive. Other Yaskawa drives that may be used are G7, P7, E7 or V7.

Since each system application is typically different, the following may be accomplished in different ways using different Yaskawa 7-series AC drives. The basic principles shown herein can be built upon for specific system application requirements.

INTENDED AUDIENCE

This document assumes that the reader is familiar with Yaskawa 7-series AC drives, EtherNet/IP and EtherNet technical terminology and operation, and with PLC programming.

PLC CONFIGURATION

The following example describes the process of configuring a sample system with RS Logix 5000, used to program Controllogix or Compactlogix PLCs and to control the Yaskawa AC drives. See Figure 1 for a diagram of the example system.

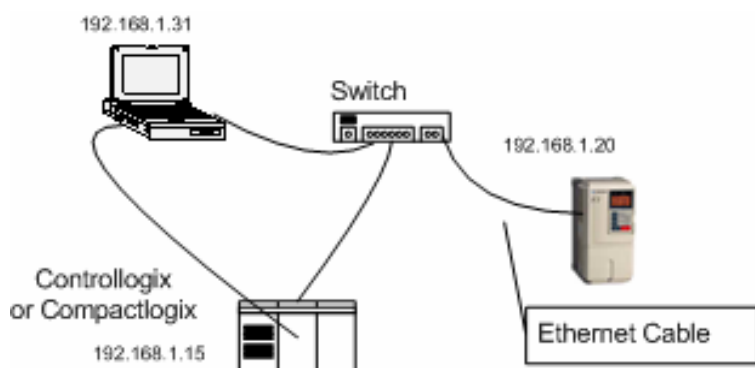


Figure 1. Example system

Install the CM092 or CM093 option on the drive as indicated in the option installation guide. (For example, the Yaskawa installation guide document IG.AFD.26 for G7, F7, P7, E7 or IG.V7.26 for the V7 drive

- Apply power to the network components.

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RS Linx Configuration

Configure RS Linx by installing an EtherNet/IP driver as shown in Figure 2. As a guideline, select the function “Browse Local Subnet” when configuring the driver if the network is confined to the example system above.

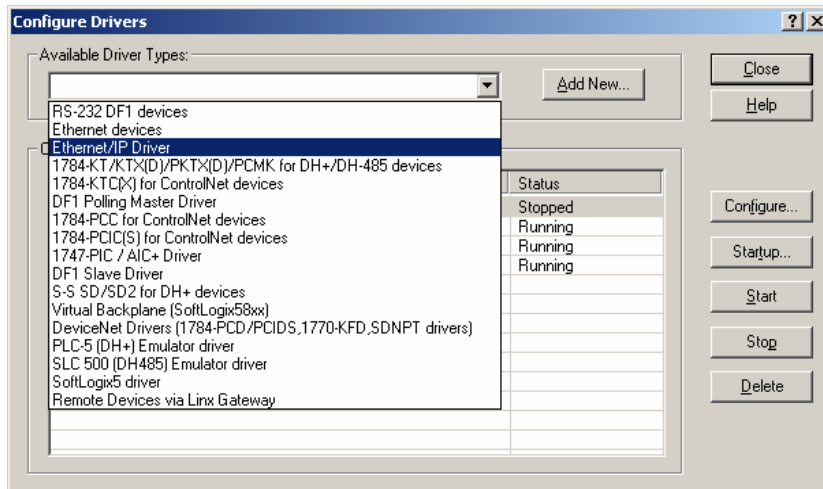


Figure 2. EtherNet/IP driver configuration

RS Logix 5000 I/O Configuration

To begin implementing the example system described and controlling the drive from the EtherNet/IP network:

- Configure the I/O in RS Logix 5000. Start RS Logix 5000 and begin a new project by selecting ->'File' and ->'New'.
- Select the correct PLC/Controller and system descriptions for the example system being created. See Figure 3.
- Click 'OK' to create the project database for the example system.

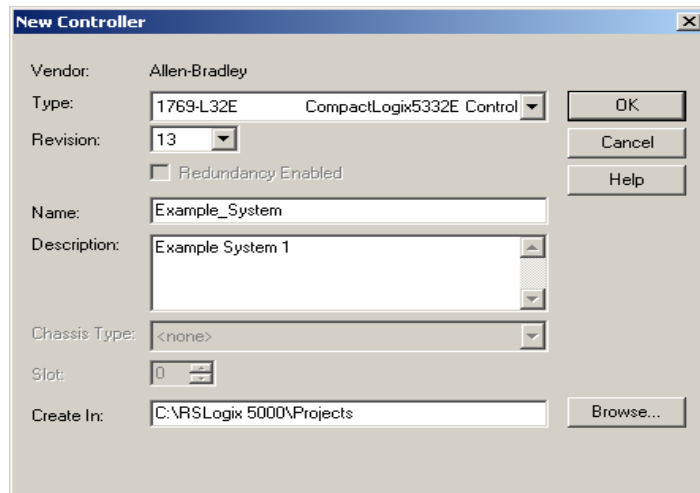


Figure 3. Example system “New Project”

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To add the Yaskawa AC drive to the I/O configuration:

- Refer to the I/O Configuration folder in the project tree and highlight the EtherNet/IP port used in the project (in this case, the EtherNet/IP port is the Local EtherNet/IP port on the 1769-L32E controller).
- Right click to enable the addition of a new I/O module to the project (in this case, the Yaskawa AC drive). See Figure 4.

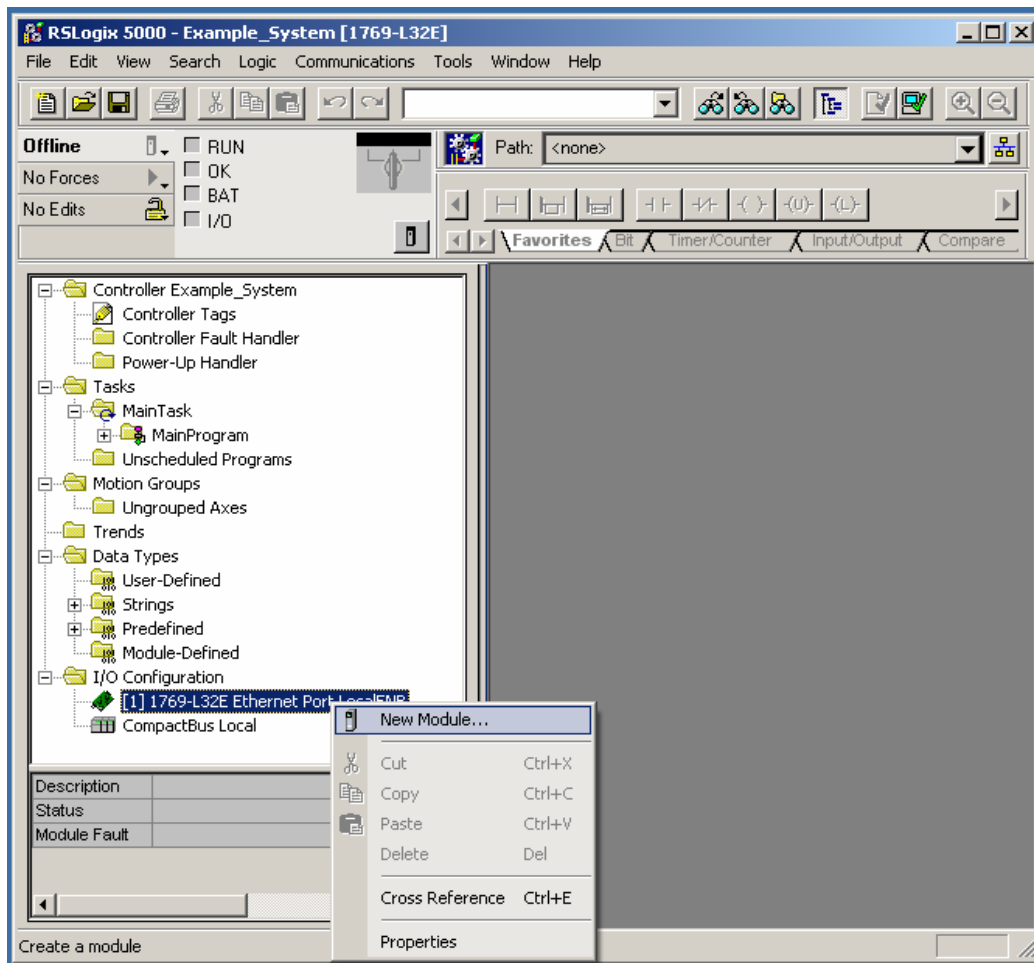


Figure 4. Example system “Adding the New Module to the I/O configuration”

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Adding the ‘New Module’ requires entering the data associated with the I/O device (in this case, the Yaskawa AC drive). A ‘Select Module Type’ dialog box appears that allows for the selection of several different types of modules.

- In this case, select the ‘ETHERNET-MODULE’ option for the Yaskawa series AC drives. See Figure 5 for an example. After the module type is selected, click ‘OK’.

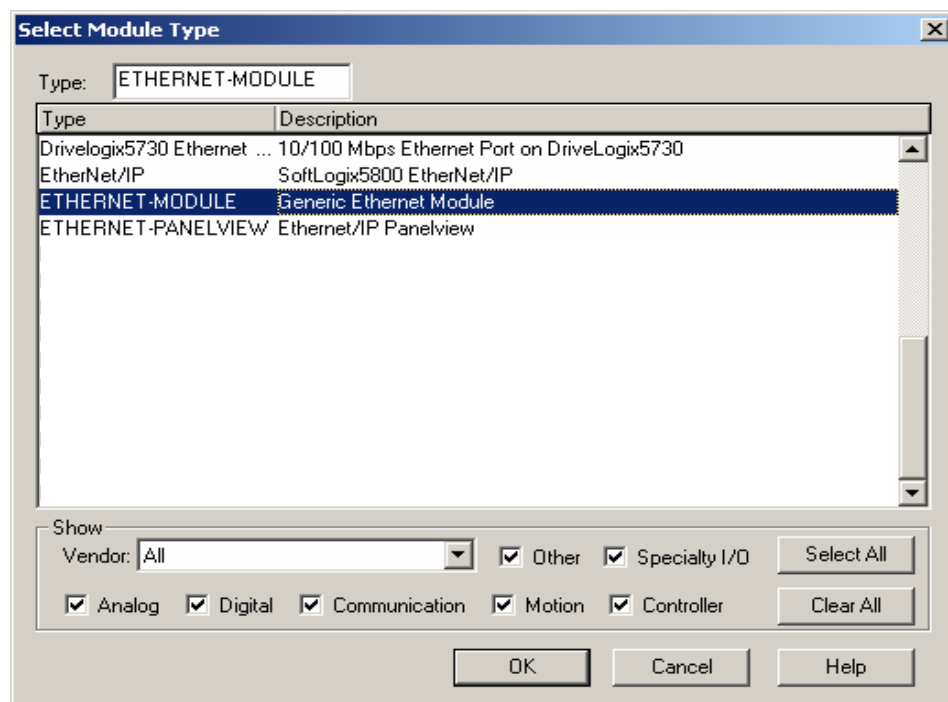


Figure 5. Select Module Type

Next, enter the Module Properties for the Yaskawa AC drive. Entries include:

- The Name and Description of the device being installed.
- The IP address for the drive.
- The assembly instances that will be used to communicate with the drive.

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Variable Frequency Drive (VFD) Profile - Connection Parameters:

Standard Assemblies (See figure 6):

1. Enter Output Assembly: 21
2. Enter Input Assembly: 71
3. Set Configuration Assembly: 1 (default setting)

	Assembly Instance:	Size:	
Input:	71	2	(16-bit)
Output:	21	2	(16-bit)
Configuration:	1	0	(8-bit)

Module Properties - LocalENB (ETHERNET-MODULE 1.1)

Type: ETHERNET-MODULE Generic Ethernet Module
 Vendor: Allen-Bradley
 Parent: LocalENB
 Name: F7_Drive1_Ex
 Description: CIMR-F7U20P4_ExampleDrive1
 Comm Format: Data - INT
 Address / Host Name:
 IP Address: 192 . 168 . 1 . 20
 Host Name:

Connection Parameters

	Assembly Instance:	Size:	
Input:	71	2	(16-bit)
Output:	21	2	(16-bit)
Configuration:	1	0	(8-bit)
Status Input:			
Status Output:			

Buttons: Cancel, < Back, Next >, Finish >>, Help

Figure 6. Configuring New Module Properties (first screen)

Click "next" to configure the "Requested Packet Interval (RPI)" rate. See figure 7.

Module Properties - LocalENB (ETHERNET-MODULE 1.1)

Requested Packet Interval (RPI): 40.0 ms (1.0 - 3200.0 ms)

Inhibit Module
 Major Fault On Controller If Connection Fails While in Run Mode

Module Fault:

Buttons: Cancel, < Back, Next >, Finish >>, Help

Figure 7. Configuring New Module Properties (second screen)

Once the Module information is entered, select 'Finish' to complete the I/O configuration for the example drive. Figure 8 shows the project tree with the Yaskawa drive added.

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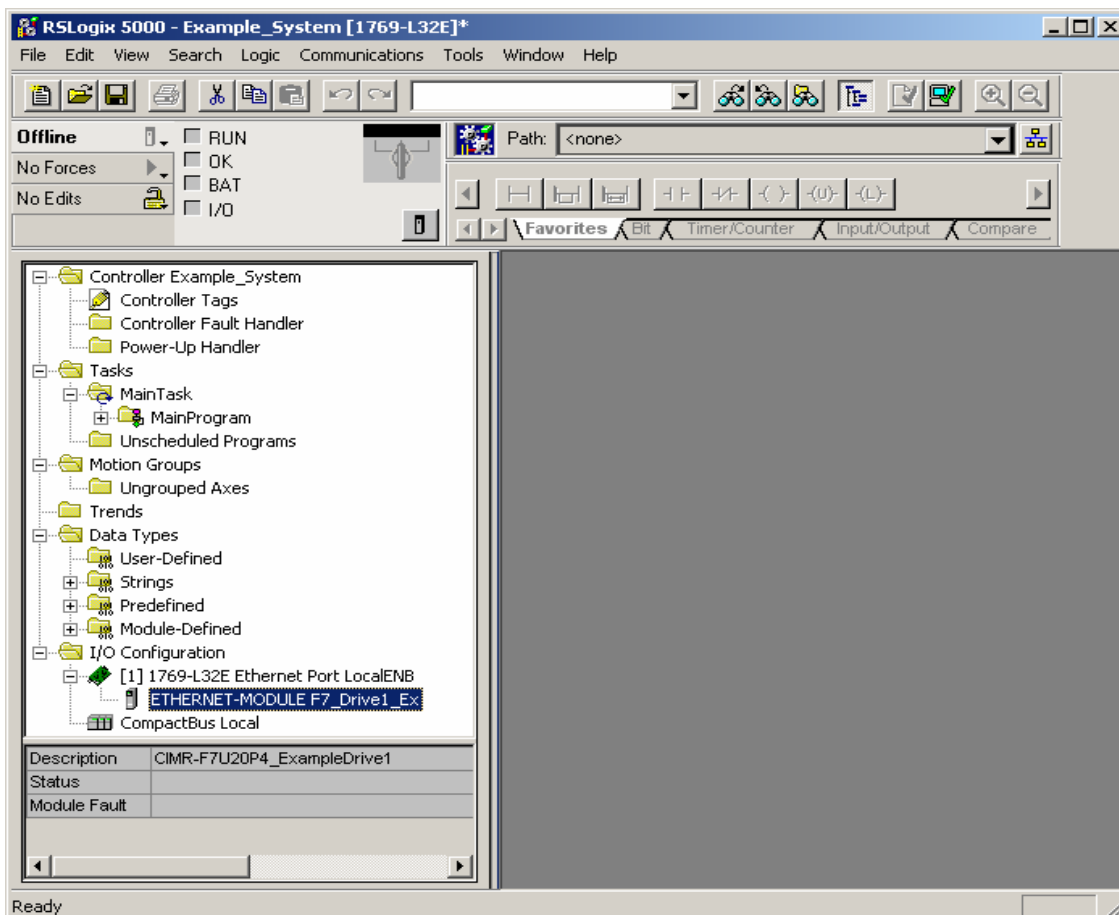


Figure 8. Example system “Added Yaskawa Example Drive”

After going online:

- Download the project to the PLC and verify that the newly added AC drive is available and operating correctly by indications shown in the I/O configuration icon for the drive.
- Any error messages will display an error indication in the Module Fault area listed below the project tree.

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By highlighting the ‘Controller Tags’ in the project tree, it is possible to view the newly added Yaskawa AC drive. See Figure 9 for a display of the controller tags.

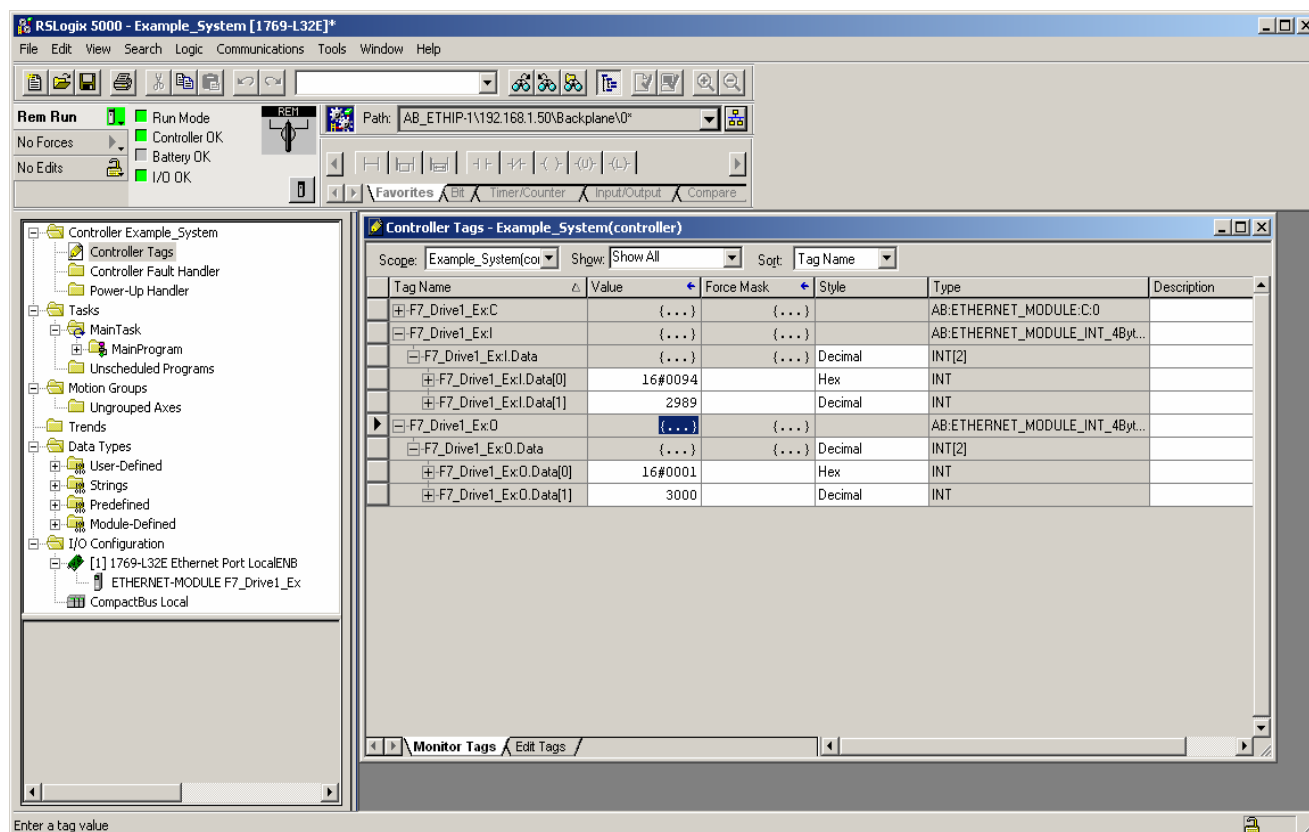


Figure 9. Example system “Example Drive Tags”

The assembly mapping will be as follows in Table 1.

In order to control the drive (after setting the drive parameters b1-01¹ and b1-02¹ to a value of ‘3: Option Card’), set the value of the *Drive Command Tag* labeled “F7_Drive1_Ex:O.Data[0]”.

Note¹: Drive parameters n003=3 and n004=9 for V7 drives.

To access the frequency command to the drive, modify the value for the *Frequency Reference Command Tag*, labeled “F7_Drive1_Ex:O.Data[1]” corresponding to the example in this application note.

The associated response or monitor data from the drive is:

- F7_Drive1_Ex:I.Data[0] = Drive Status,
- F7_Drive1_Ex:I.Data[1] = Actual Speed.

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Controller Tag Name (Example)	Assembly Data	Description
F7_Drive1_Ex:I:Data[0]	Assembly 71 (Bytes 1 & 2)	Drive Status Word: Bit 0: Faulted Bit 1: Warning Bit 2: Running Forward Bit 3: Running Reverse Bit 4: Drive Ready Bit 5: Controlling from Network Bit 6: Frequency Reference from Network Bit 7: At Speed Commanded Bit 8-15: Not Used
F7_Drive1_Ex:I:Data[1]	Assembly 71 (Bytes 3 & 4)	Actual Speed Example (3000 = 30.00 Hz), If (o1-03 = 4) for F7 or n035 for V7 drive. Speed Value is in RPM, (1750 = 1750 RPM)
F7_Drive1_Ex:O:Data[0]	Assembly 21 (Bytes 1 & 2)	Drive Command Word: Bit 0: Run Forward Command Bit 1: Run Reverse Command Bit 2: Fault Reset Bit 3: Not Used Bit 4: Not Used Bit 5: Network Control Bit 6: Network Frequency Reference Bit 7: Not Used Bit 8-15: Not Used
F7_Drive1_Ex:O:Data[1]	Assembly 21 (Bytes 3 & 4)	Commanded Speed Example (3000 = 30.00 Hz), If (o1-03 = 4) for F7 or n035 for V7 drive. Speed Value is in RPM, (1750 = 1750 RPM)

Table 1. Tag Mapping for the Example Drive

Additional AC drives in a system would be added in a similar fashion and can be accessed via the controller tags area.

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PLC EXPLICIT MESSAGE SAMPLE

The following is a sample of a PLC ladder logic that can be used to implement Explicit Message parameter access to the CM092 or CM093. Note that the CM092 can allow up to 6 connections to be activated for accessing parameter data in the Yaskawa AC drives. The parameters are accessed from the CIP path associated with the parameter, available in the CM092 and CM093 technical manual. Refer to Yaskawa Electric America document number TM.AFD.26 or TM.V7.26.

In this example, the PLC will access:

- Class 102,
- Instance 1,
- Attribute 34,

This is analogous to the Output Frequency at which the drive is operating. In order to accomplish this, use a “Message” function in the PLC. See Figure 10 for an example of the ladder logic used.

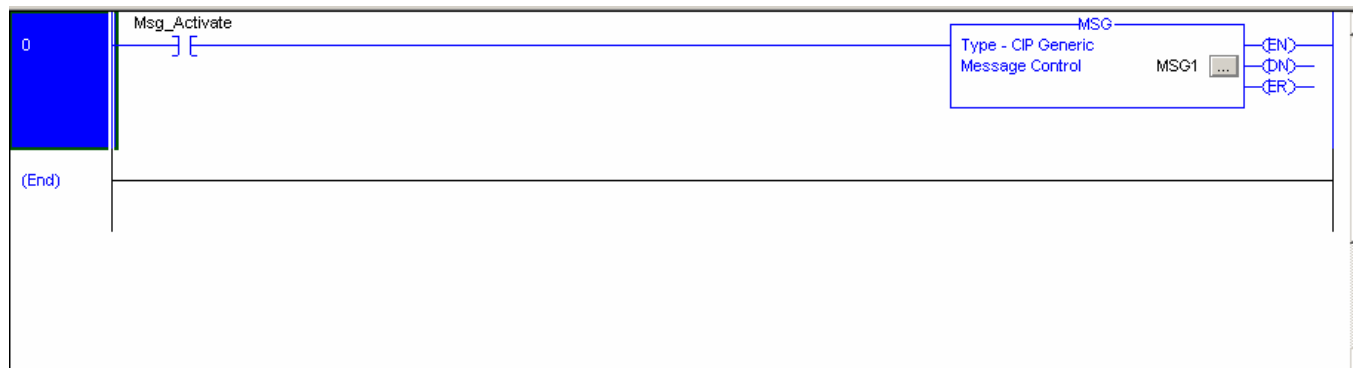


Figure 10. PLC ladder for implementing Explicit Messaging to the CM092 or CM093 EtherNet/IP Option

In this example, the Message instruction is activated by a contact called “Msg_Activate”, which will request the drive in the example system to return the data from the specified path. The ‘Message’ function is configured based upon two dialog interfaces. The first allows the configuration of the data to define the message.

For example, Figure 11 shows that the instruction will request the current value of;

- Class 102,
- Instance 1,
- Attribute 34 (the Output Frequency of the drive).

Note: The required associated tags must be configured.

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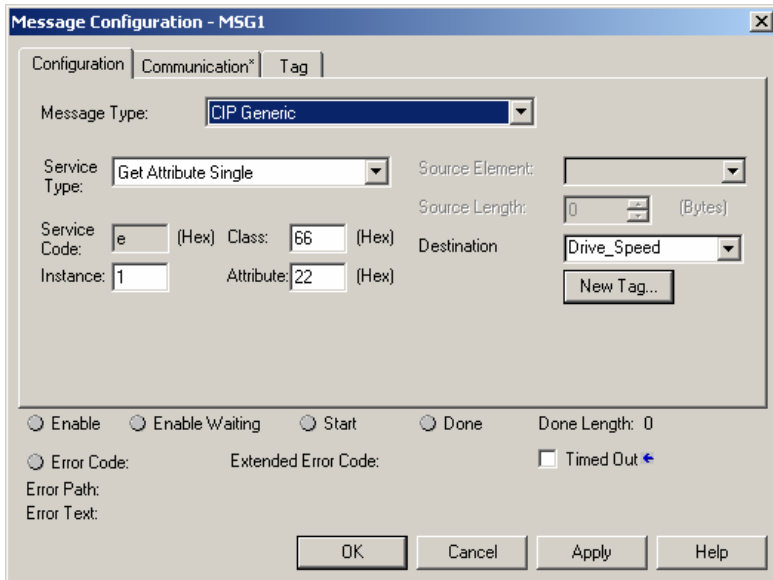


Figure 11. Message Configuration for Explicit Messaging access to the CM092 or CM093 EtherNet/IP Option, and Yaskawa AC drive parameters

In this case, since the drive is receiving a data value, the “Local PLC Destination Tag” must be indicated and configured to the Service Type and CIP Path to the data. The Message must configure the path to the device. Specify this path under the Communication Tab. An example for this instruction is shown in Figure 12.

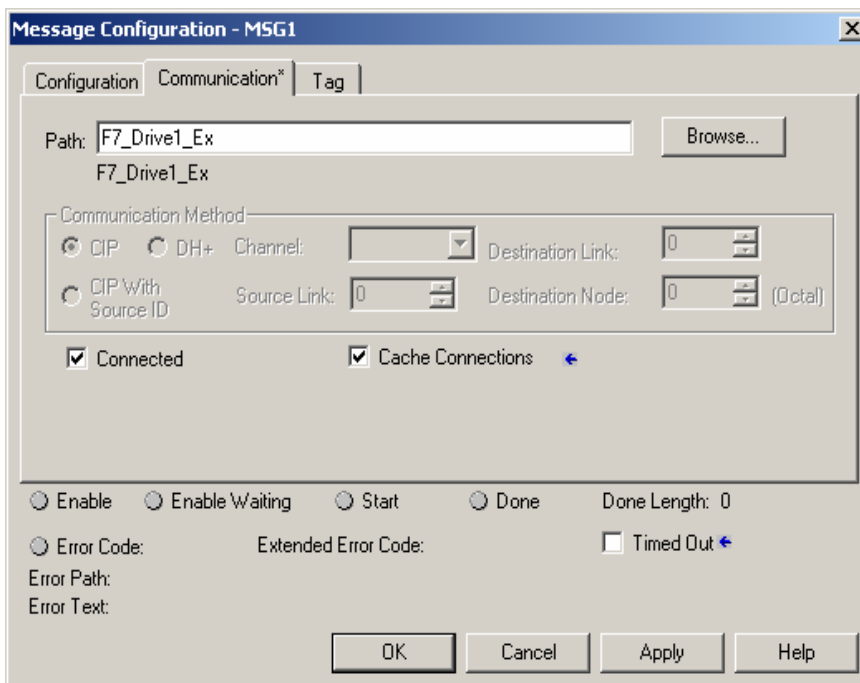


Figure 12. Message Communication Tab

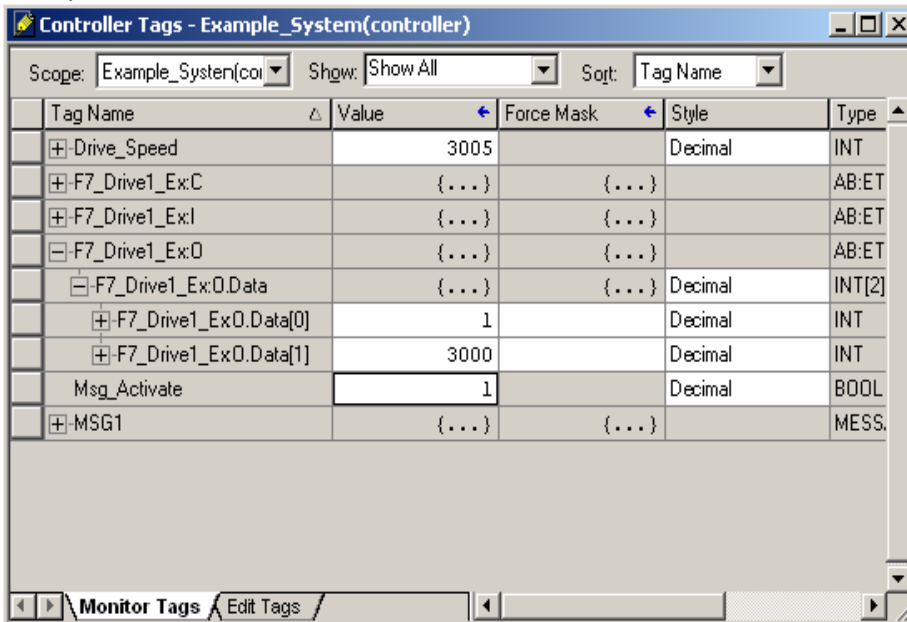
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The path chosen is to the system example drive configured earlier in the I/O configuration. The “Drive Speed” Tag updated with the drive Output Frequency is visible by activating the Msg_Activation contact. See Figure 13. for an example.



Tag Name	Value	Force Mask	Style	Type
+ Drive_Speed	3005		Decimal	INT
+ F7_Drive1_Ex:C	{...}	{...}		AB:ET
+ F7_Drive1_Ex:I	{...}	{...}		AB:ET
- F7_Drive1_Ex:O	{...}	{...}		AB:ET
- F7_Drive1_Ex:O.Data	{...}	{...}	Decimal	INT[2]
+ F7_Drive1_Ex:O.Data[0]	1		Decimal	INT
+ F7_Drive1_Ex:O.Data[1]	3000		Decimal	INT
Msg_Activate	1		Decimal	BOOL
+ MSG1	{...}	{...}		MESS.

Figure 13. “Drive_Speed” Data Value Updated From the Message Access

In summary, the information and example shown here indicate how Yaskawa AC drives can be controlled by utilizing the CM092 or CM093 EtherNet/IP option interface. The descriptions indicate how to configure, control and monitor the drives through a Controllogix or CompactLogix PLC, and how to access other associated drive parameters through explicit messaging.

For questions or comments regarding this example, please feel free to contact Yaskawa Electric America, Inc. For support please call: 1-800-YASKAWA.

USE OF TECHNICAL INFORMATION!

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