YASKAWA

Application Note:
Integrating a Yaskawa AC Drive with EtherNet/IP[TM] **Option**
With
AB ControlLogix / CompactLogix Programmable
Controllers

Contents

Introduction

The following document describes the configuration of Allen Bradley ControlLogix or CompactLogix PLCs for communicating to a Yaskawa drive with an EtherNet/IP option card. 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 A1000, P1000, V1000, Z1000, G7, P7, E7 or V7.
Since each system application is typically different, the following may be accomplished in different ways using different Yaskawa 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 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 Studio 5000 (RSLogix 5000 for v20 and lower), used to program ControlLogix or CompactLogix PLCs and to control the Yaskawa AC drives. See Figure 1 for a diagram of the example system.
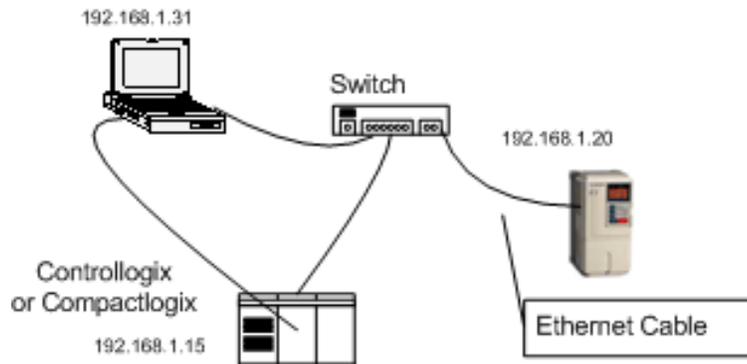
Figure 1 Example system.

Install the EtherNet/IP option on the drive as indicated in the option installation guide. (e.g. TOBPC73060058 for the A1000 drive.)
Apply power to the network components.

RSLinx Configuration

Configure RSLinx 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.
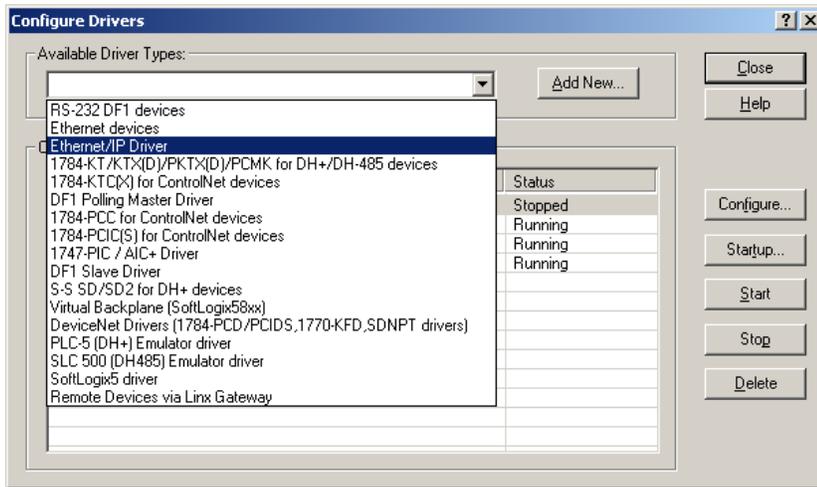
Figure 2 EtherNet/IP driver configuration in RSLinx

Studio 5000 (RSLogix 5000 for v20 and lower) I/O Configuration

To begin implementing the example system described and controlling the drive from the EtherNet/IP network:
- Configure the I/O in Studio 5000 (RSLogix 5000 for v20 and lower). Start Studio 5000 (RSLogix 5000 for v20 and lower) 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.
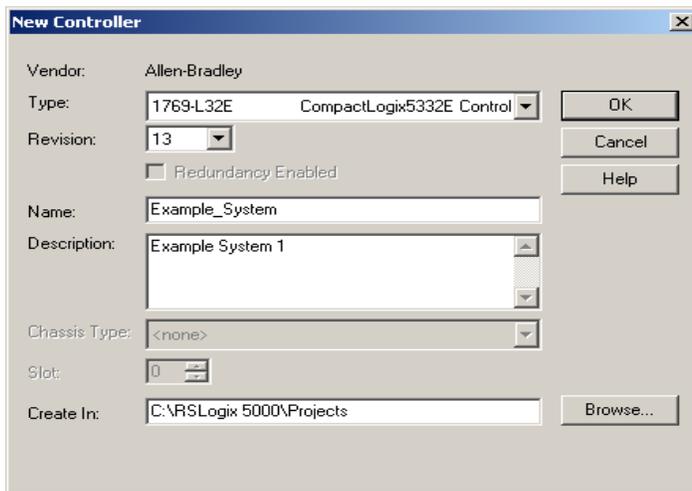
Figure 3 Example system "New Project"

![Yaskawa logo]

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

- Go 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.
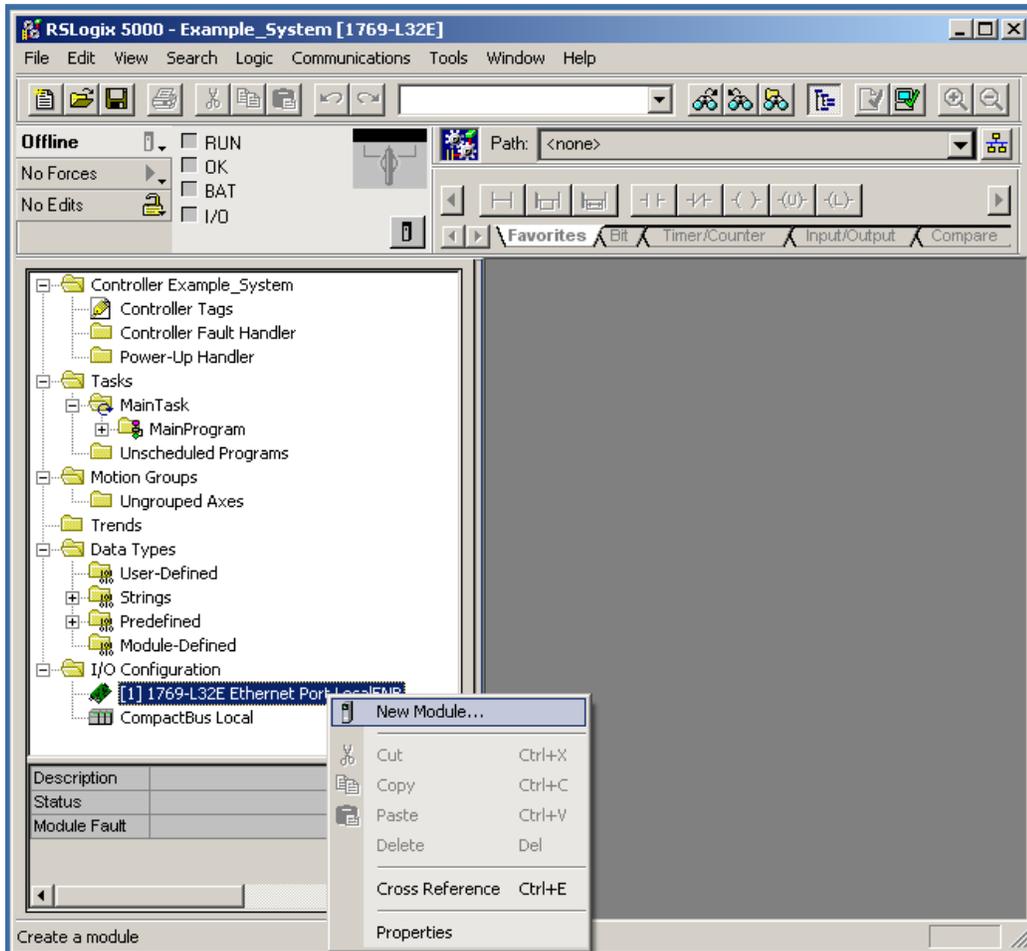
Figure 4 Example system "Adding the New Module to the I/O configuration"

- Select the 'ETHERNET-MODULE' option and click 'OK'.
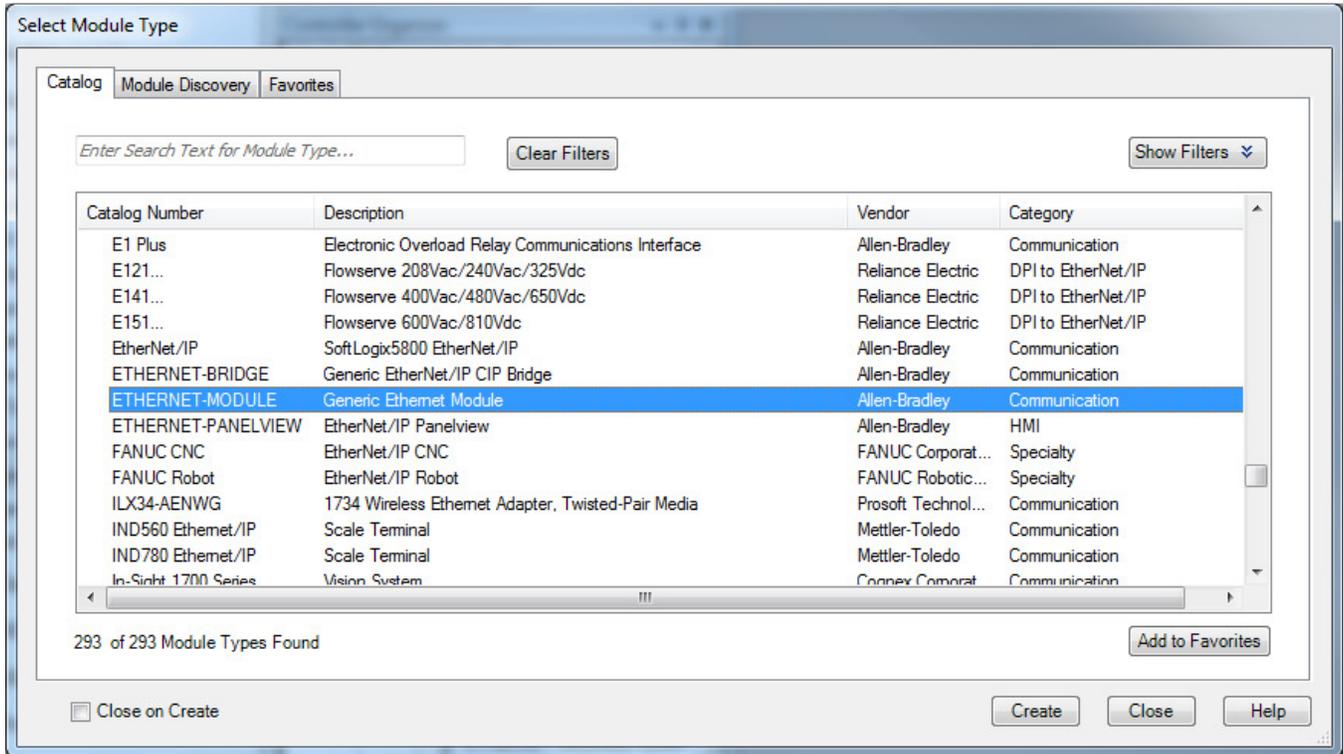
Figure 5 Select module type (ETHERNET-MODULE)

Enter the Module Properties for the Yaskawa AC drive:

1. Name of device (e.g. F7, Conveyor_1, Pump_1, etc)
2. Description of the device
3. IP address for the drive
4. Assembly instances and size that will be used to communicate with the drive.
   4.1. Input – Information from the drive to the PLC, e.g. assembly 71
   4.2. Output – Information from the PLC to the drive, e.g. assembly 21
   4.3. Configuration – Always 1 with a size of 0
5. For Comm Format, select "Data – Int" (if not already selected)
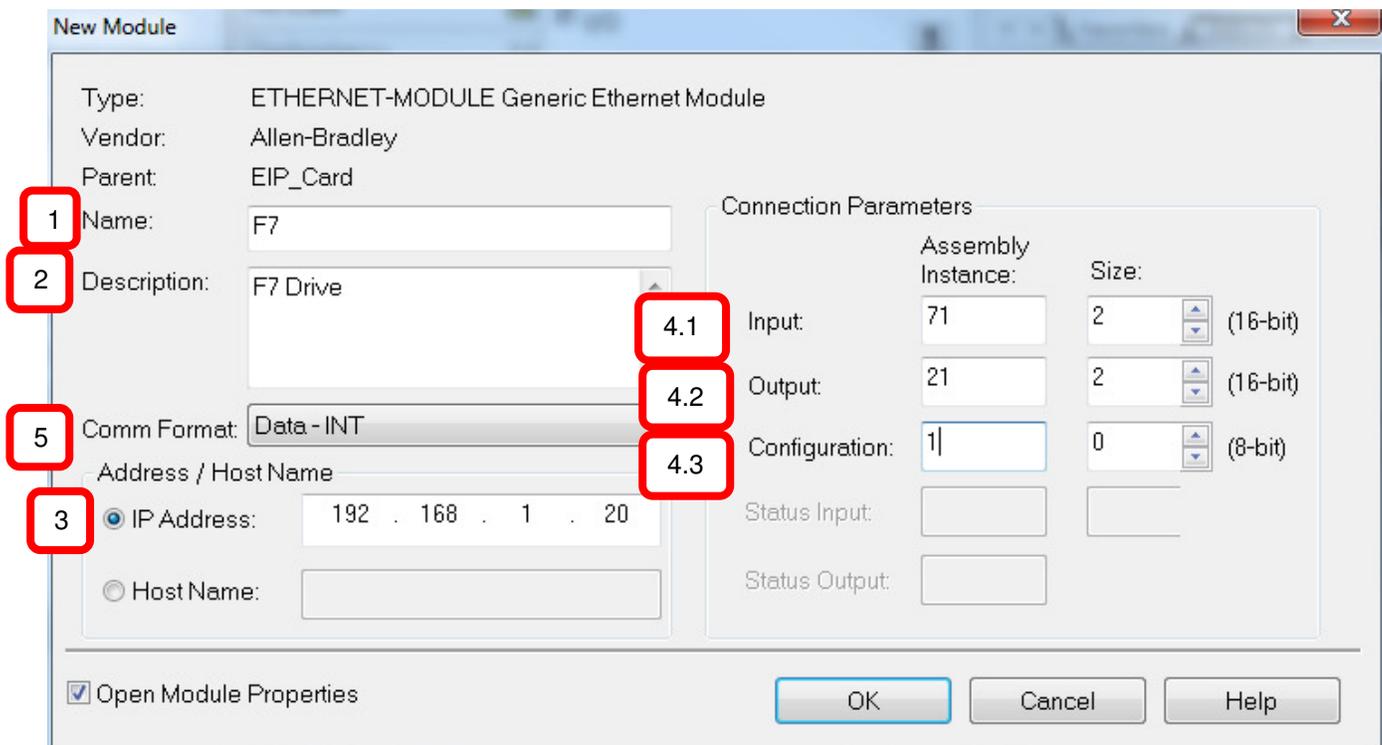
Figure 6 Module properties window

- Click "OK" to configure the "Requested Packet Interval (RPI)" rate.

- Enter the desired Request Packet Interval (RPI) time in ms and click "OK" to complete the I/O configuration. A RPI time of 100ms is generally recommended.
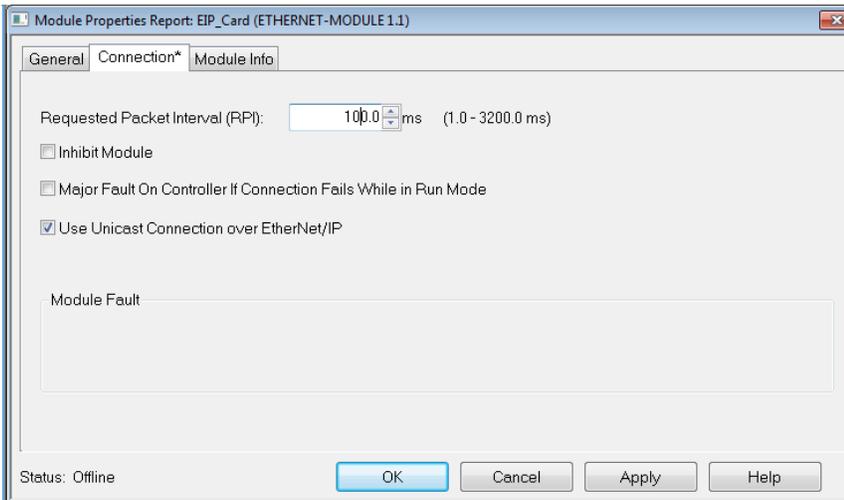
Figure 7 RPI time in ms
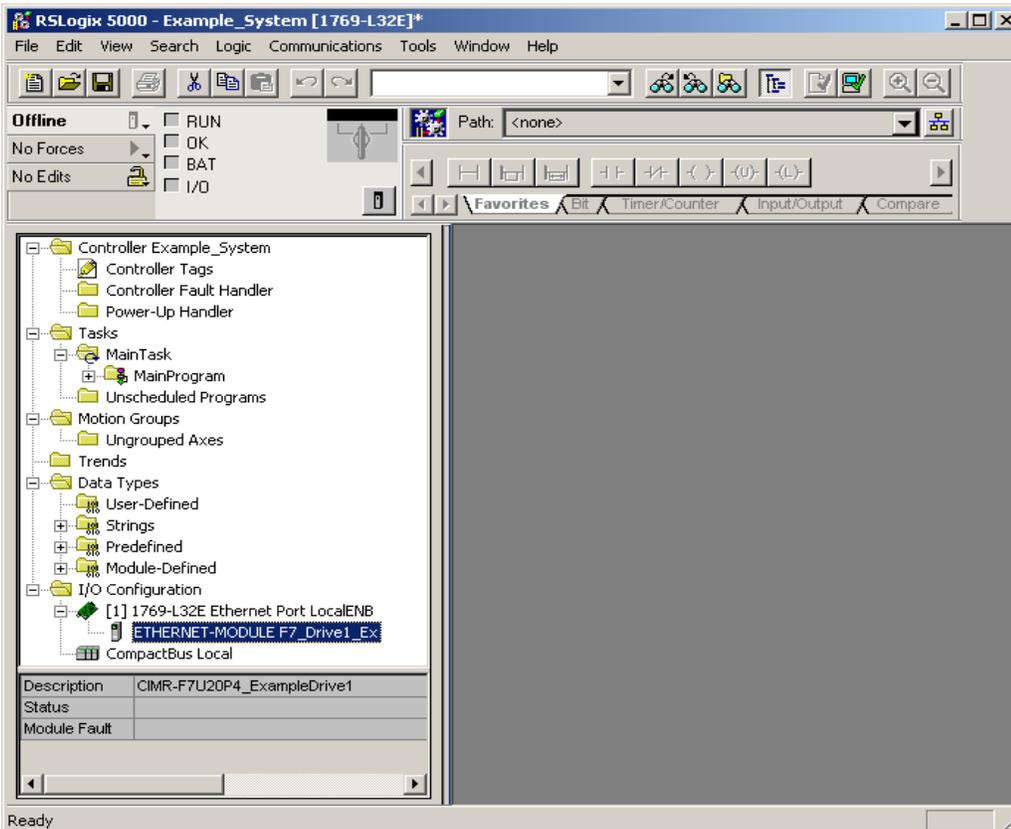
Figure 8 Example system "Added Yaskawa Example Drive"

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.

- By highlighting the 'Controller Tags' in the project tree, it is possible to view the newly added Yaskawa AC drive.
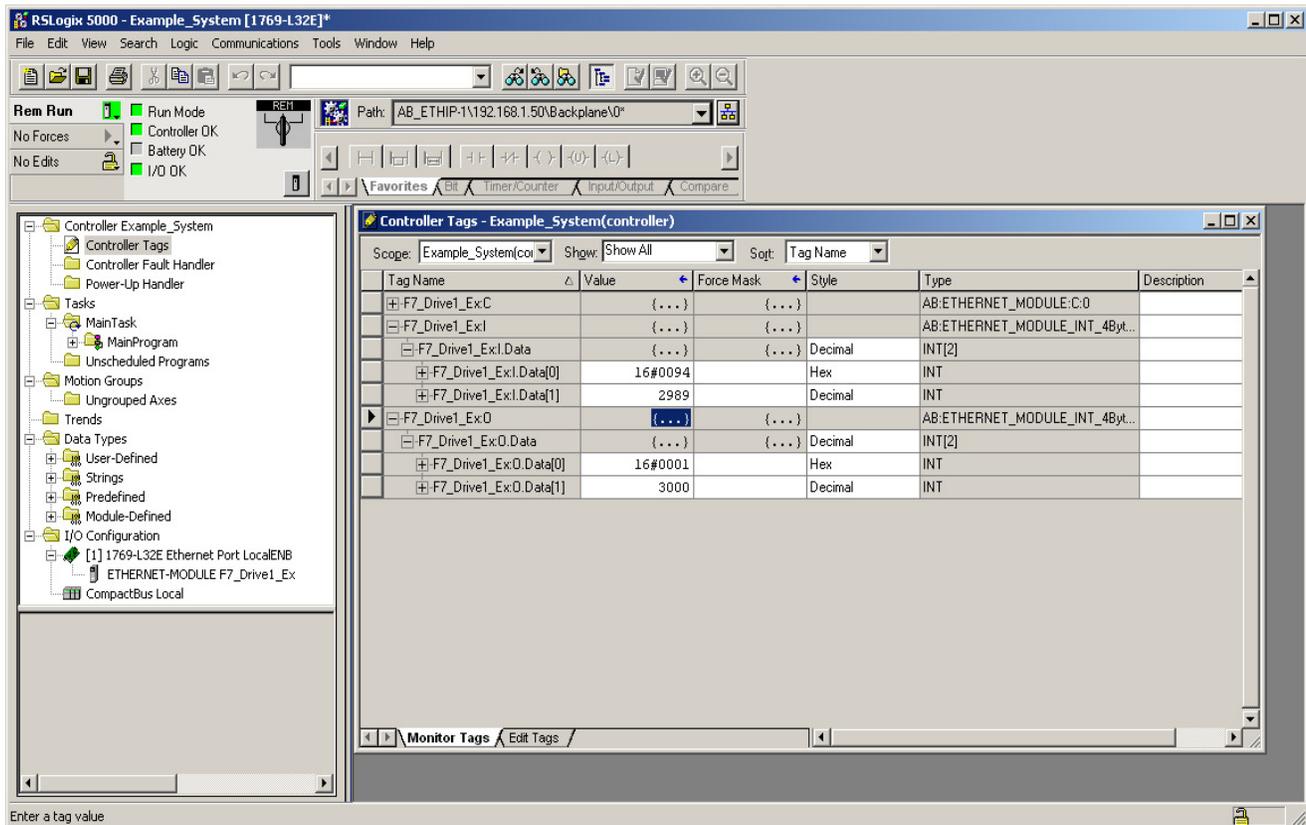
Figure 9 Example system Controller Tags

The assembly mapping will be as follows in Table 1.

In order to control the drive (after setting the drive parameters b1-01[1] and b1-02[1] to a value of '3: Option Card'), set the value of the *Drive Command Tag* labeled "F7_Drive1_Ex:O.Data[0]".
Note[1]: 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.

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.

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 Yaskawa drive. The parameters are accessed from the CIP path associated with the parameter, available in the associated EtherNet/IP option technical manual.

In this example, the PLC will access:
- Class 102 (66H)

- Instance 1 (01H)

- Attribute 34 (22H)

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.
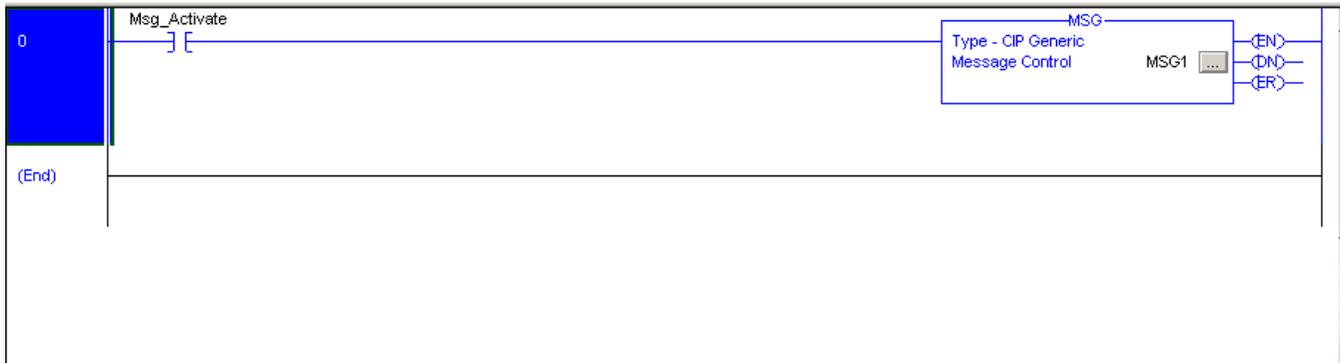
Figure 11 PLC ladder for implementing Explicit Messaging to the Yaskawa EtherNet/IP Option

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.

Configuring MSG block

To configure the MSG, you must provide the necessary information –

- Message Type – CIP Generic (for explicit message)

- Service Type – Get Attribute Single to retrieve information from the drive or Set Attribute Single to send information to the drive.

- Class, Instance and Attribute – Path to the desired parameter

- Destination – Controller tag where the information will be stored on the PLC for Get Attribute Single or sent out the drive for Set Attribute Single. e.g. Drive_Speed
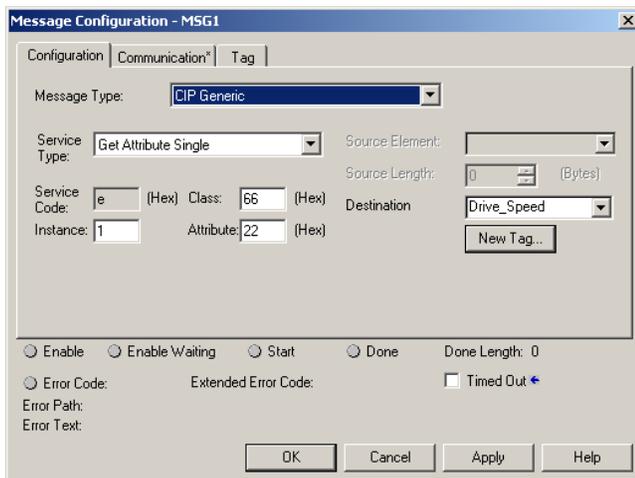
Figure 12 Message Configuration for Explicit Messaging access to the Yaskawa EtherNet/IP Option, and Yaskawa AC drive parameters

- Path – Destination device, Yaskawa drive, that the PLC will be retrieving or sending information.
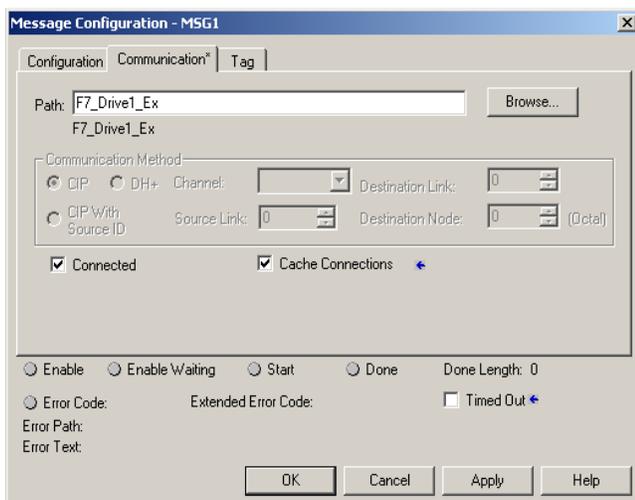
Figure 13 Message Communication path to access the Yaskawa drive.

Figure 14 "Drive_Speed" Data Value Updated From the Message Access

The information and example shown here indicate how Yaskawa AC drives can be controlled by utilizing the 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 America, Inc.
For support please call: 1-800-YASKAWA.

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