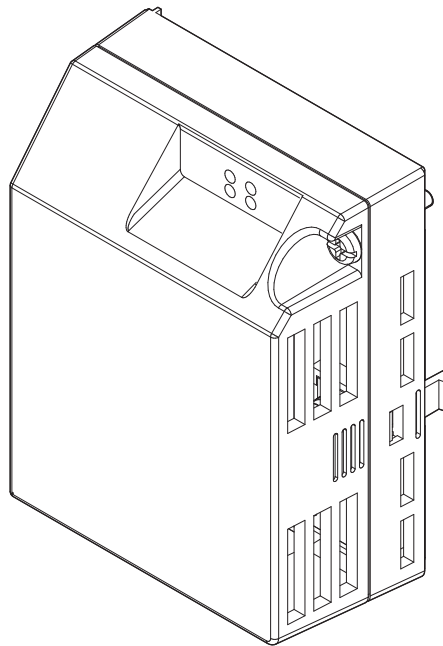


# YASKAWA AC Drive-V1000 Option EtherNet/IP Technical Manual

Type: SI-EN3/V

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



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# 1 Preface and Safety

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. **NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED.** Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

## ◆ Applicable Documentation

The following manuals are available for the SI-EN3/V option:

### Option Unit

|                                                                                    |                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Yaskawa AC Drive -V1000 Option SI-EN3/V EtherNet/IP Installation Manual</b><br>Manual No: <b>TOBP C730600 60</b>          | Read this manual first.<br>The installation manual is packaged with the option and contains a basic overview of wiring, settings, functions, and fault diagnoses.                                                                                                                                                                                                                                 |
|                                                                                    | <b>Yaskawa AC Drive -V1000 Option SI-EN3/V EtherNet/IP Technical Manual</b><br>Manual No: <b>SIEP C730600 60 (This book)</b> | The technical manual contains detailed information.<br>To obtain the technical manual access these sites:<br>U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a><br>Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a><br>Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a><br>Other areas: contact a Yaskawa representative. |

### Yaskawa Drive

|                                                                                     |                                                 |                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Yaskawa AC Drive-V1000 Quick Start Guide</b> | To obtain instruction manuals for Yaskawa products access these sites:<br>U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a><br>Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a><br>Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a><br>Other areas: contact a Yaskawa representative. |
|                                                                                     | <b>Yaskawa AC Drive-V1000 Technical Manual</b>  |                                                                                                                                                                                                                                                                                                                                                                |

## ◆ Terms

- Note:** Indicates supplemental information that is not related to safety messages.
- EtherNet/IP Option:** Yaskawa AC Drive -V1000 Option SI-EN3/V EtherNet/IP
- ≥ 1012:** Indicates a drive feature or function that is only available in drive software version 1012 or greater.

## ◆ Registered Trademarks

- EtherNet/IP is a trademark of the ODVA.
- All trademarks are the property of their respective owners.

## ◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option. The option must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

### DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

### WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

### CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

### NOTICE

Indicates an equipment damage message.

## ■ General Safety

### General Precautions

- The diagrams in this section may include options and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option should be used according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering new copies of the manual, contact a Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

### DANGER

**Heed the safety messages in this manual.**

Failure to comply will result in death or serious injury.

The operator is responsible for injuries or equipment damage caused from failure to heed the warnings in the manual.

### NOTICE

**Do not expose the drive or the option to halogen group disinfectants.**

Failure to comply may cause damage to the electrical components in the option.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

**Do not modify the drive or option circuitry.**

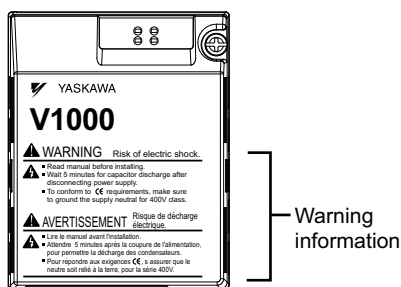
Failure to comply could result in damage to the drive or option and will void warranty.

Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified.

### ■ Option Unit Warning Labels

Warning information is displayed on the option unit as shown in the figure below. Follow all warnings and safety instructions when using the product.

When using the drive in an area that may require displaying warning information in Japanese or Chinese, a warning label is provided with the option. This label can be placed over the English and French warnings on the front of the option.



### ■ Warning Contents

#### **WARNING** Risk of electric shock.

-  ■ Read manual before installing.
- Wait 5 minutes for capacitor discharge after disconnecting power supply.
- To conform to **CE** requirements, make sure to ground the supply neutral for 400V class.

#### **AVERTISSEMENT** Risque de décharge électrique.

-  ■ Lire le manuel avant l'installation.
- Attendre 5 minutes après la coupure de l'alimentation, pour permettre la décharge des condensateurs.
- Pour répondre aux exigences **CE**, s'assurer que le neutre soit relié à la terre, pour la série 400V.

## 2 Product Overview

### ◆ About This Product

The option provides a communications connection between the drive and an ODVA EtherNet/IP network. The option connects the drive to an EtherNet/IP network and facilitates the exchange of data.

This manual explains the handling, installation and specifications of this product.

EtherNet/IP is a communications link to connect industrial devices (such as smart motor controllers, operator interfaces, and variable frequency drives) as well as control devices (such as programmable controllers and computers) to a network. EtherNet/IP is a simple, networking solution that reduces the cost and time to wire and install factory automation devices, while providing interchangeability of like components from multiple vendors.

EtherNet/IP is an open device network standard.

By installing the option to a drive, it is possible to do the following from an EtherNet/IP master device:

- operate the drive
- monitor the operation status of the drive
- change parameter settings.



### ◆ Applicable Models

The option can be used with the drive models in *Table 1*.

**Table 1 Applicable Models**

| Drive Series | Drive Model Number | Software Version <1> |
|--------------|--------------------|----------------------|
| V1000        | CIMR-V□□A□□□□□     | ≥ 1012               |

<1> See “PRG” on the drive nameplate for the software version number.

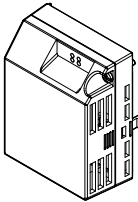
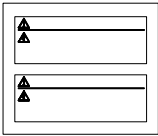
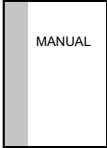
3 Receiving

Please perform the following tasks upon receipt of the option:

- Inspect the option for damage. Contact the shipper immediately if the option appears damaged upon receipt.
- Verify receipt of the correct model by checking the model number printed on the name plate of the option package.
- Contact your supplier if you have received the wrong model or the option does not function properly.

◆ Contents and Packaging

Table 2 Option Package Contents

| Description: | Option Unit                                                                       | Ground Wire                                                                       | Warning Labels                                                                     | Installation Manual                                                                 |
|--------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| —            |  |  |  |  |
| Quantity:    | 1                                                                                 | 4                                                                                 | 1                                                                                  | 1                                                                                   |

◆ Tools Required for Installation

A Phillips screwdriver (M3, M3.5 to M6 metric or #1, #2 U.S. standard <1>) is required to install the option.

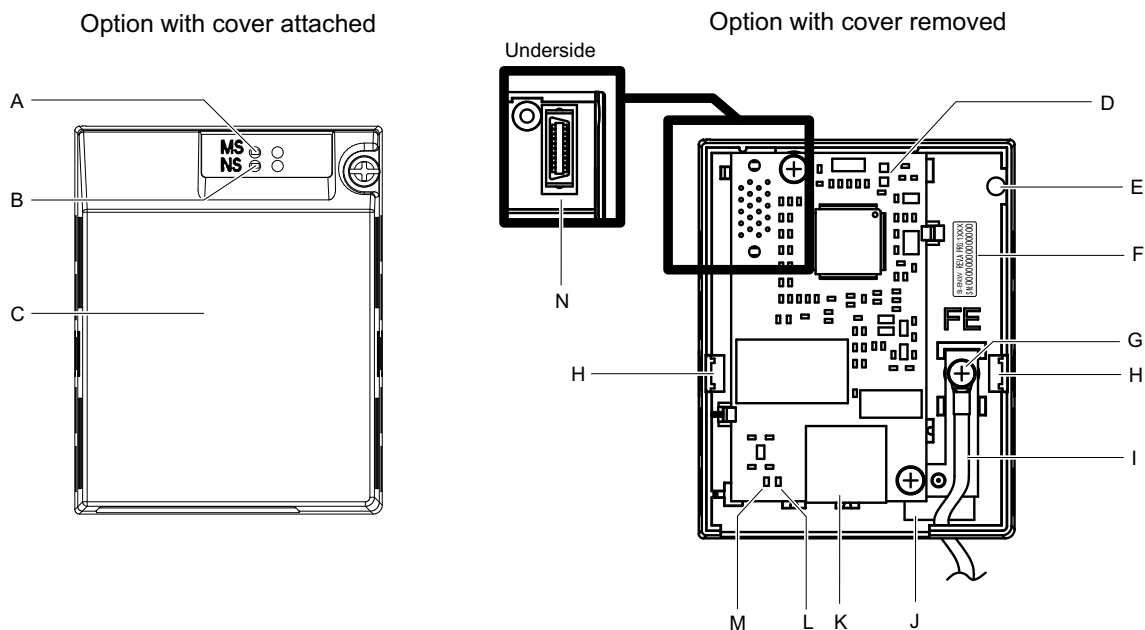
<1> Screw sizes vary by drive capacity. Select a screwdriver that matches the drive capacity.

**Note:** Tools required to prepare the option cables for wiring are not listed in this manual.



## 4 Option Components

### ◆ SI-EN3/V Option



- A – LED (MS)
- B – LED (NS)
- C – Option cover
- D – EtherNet/IP PCB
- E – Screw hole (attaching option cover)
- F – Nameplate
- G – Functional earth cable connection (FE)

- H – Mounting tabs
- I – Ground wire <1>
- J – Pass-through hole for wire
- K – Communication connector CN1 (RJ45)
- L – LED (LINK/ACT)
- M – LED (10/100)
- N – Option connector

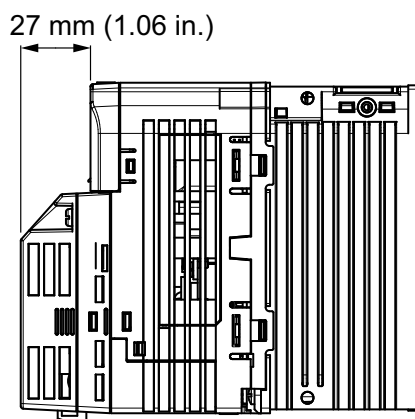
<1> Ground wires are packaged loose inside the option shipping package and must be connected during installation.

**Figure 1 Option Unit**

**Note:** For details on the LEDs, see *Refer to Option LED Display on page 11*.

### ◆ Dimensions

The installed option adds 27 mm (1.06 in.) to the total depth of the drive.



**Figure 2 Dimensions**

◆ Communication Connector CN1

The communication connector on the option is a modular RJ45 female connector designated CN1. CN1 is the connection point for a customer supplied male Ethernet network communication cable.

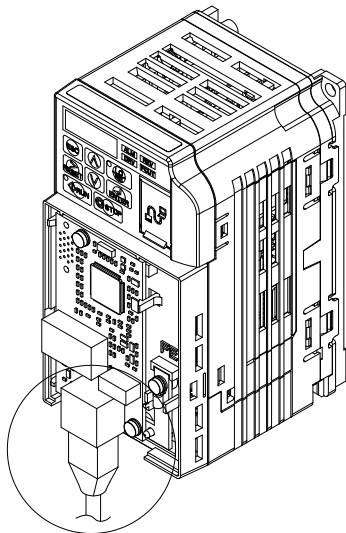
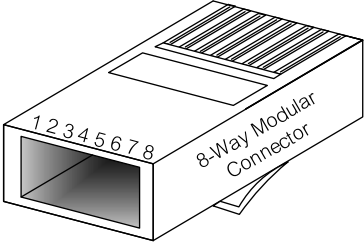


Figure 3 Communication connector CN1 (RJ45)

Table 3 Male 8-way Ethernet Modular Connector (Customer Supplied)

| Male EtherNet 8-Way Modular Connector                                              | Pin        | Description           |
|------------------------------------------------------------------------------------|------------|-----------------------|
|  | 1 (Pair 2) | Transmit data (TXD) + |
|                                                                                    | 2 (Pair 2) | Transmit data (TXD) - |
|                                                                                    | 3 (Pair 3) | Receive data (RXD) +  |
|                                                                                    | 4 (Pair 1) | Not used <1>          |
|                                                                                    | 5 (Pair 1) | Not used <1>          |
|                                                                                    | 6 (Pair 3) | Receive data (RXD) -  |
|                                                                                    | 7 (Pair 4) | Not used <1>          |
|                                                                                    | 8 (Pair 4) | Not used <1>          |

<1> Not used for 10 Mbps and 100 Mbps networks.

## ◆ Option LED Display

The option has four LEDs:

### Bi-color Status LEDs:

- Module status (MS) red/green
- Network status (NS) red/green

### Green Ethernet LEDs:

- Network speed-10/100 (MS) green
- Link status and network activity-Link/Act (NS) red/green

The operational states of the option LEDs after the power-up diagnostic LED sequence is completed are described in **Table 4**. Wait at least 2 seconds for the power-up diagnostic process to complete before verifying the states of the LEDs.

**Table 4 Option LED States**

| Name            | Indication |          | Operating Status                                  | Remarks                                                 |
|-----------------|------------|----------|---------------------------------------------------|---------------------------------------------------------|
|                 | Color      | Status   |                                                   |                                                         |
| MS              | –          | OFF      | Power supply OFF                                  | Power is not being supplied to the drive                |
|                 | Green      | ON       | Option operating                                  | The option is operating normally                        |
|                 | Green      | Flashing | Option initializing                               | The option is configuring an IP address                 |
|                 | Red        | ON       | Fatal error occurred                              | The option has detected a fatal (unrecoverable) error   |
|                 | Red        | Flashing | Non-fatal error occurred                          | The option has detected a non-fatal (recoverable) error |
|                 | Green/Red  | Flashing | Option self-test                                  | The option is in self-test mode                         |
| NS              | –          | OFF      | Offline or Power supply OFF                       | –                                                       |
|                 | Green      | ON       | Online communications established                 | The option is online and has established connections    |
|                 | Green      | Flashing | Online communications not established             | The option is online without an established connection  |
|                 | Red        | ON       | Communications error (fatal)                      | The option detected a duplicate IP address              |
|                 | Red        | Flashing | Communications time-out (non-fatal)               | A communications time-out occurred                      |
|                 | Green/Red  | Flashing | Option self-test                                  | The option is in self-test mode                         |
| 10/100<br><I>   | Green      | OFF      | 10 Mbps is established                            | –                                                       |
|                 | Green      | ON       | 100 Mbps is established                           |                                                         |
| LINK/ACT<br><I> | Green      | OFF      | Link is not established                           |                                                         |
|                 | Green      | ON       | Link is established                               |                                                         |
|                 | Green      | Flashing | Link is established and there is network activity |                                                         |

<I> Remove the cover for the option unit to check the status of the LED. Be careful not to touch the main circuit terminals or the control board in the drive.

## ■ Power-Up Diagnostics

An LED test is performed each time the drive is powered up. The initial boot sequence may take several seconds. After the LEDs have completed the diagnostic LED sequence, the option is successfully initialized. The LEDs then assume operational conditions as shown in **Table 4**.

**Table 5 Power-Up Diagnostic LED Sequence**

| Sequence | Module Status (MS) | Network Status (NS) | Time (ms) |
|----------|--------------------|---------------------|-----------|
| 1        | Green              | OFF                 | 250       |
| 2        | Red                | OFF                 | 250       |
| 3        | Green              | OFF                 | –         |
| 4        | Green              | Green               | 250       |
| 5        | Green              | Red                 | 250       |
| 6        | Green              | OFF                 | –         |

## 5 Installation Procedure

### ◆ Section Safety

#### DANGER

##### Electrical Shock Hazard

**Do not connect or disconnect wiring while the power is on.**

Failure to comply will result in death or serious injury.

Disconnect all power to the drive, wait at least five minutes after all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc.

#### WARNING

##### Electrical Shock Hazard

**Do not remove option board cover while the power is on.**

Failure to comply could result in death or serious injury.

The diagrams in this section may include option units and drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating any devices. The option should be used according to the instructions described in this manual.

**Do not allow unqualified personnel to use equipment.**

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this product.

**Do not remove option cover while the power to the drive is on.**

Failure to comply could result in death or serious injury.

**Do not use damaged wires, place excessive stress on wiring, or damage the wire insulation.**

Failure to comply could result in death or serious injury.

##### Fire Hazard

**Tighten all terminal screws to the specified tightening torque.**

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

#### NOTICE

##### Damage to Equipment

**Observe proper electrostatic discharge (ESD) procedures when handling the option, drive, and circuit boards.**

Failure to comply may result in ESD damage to circuitry.

**Never shut the power off while the drive is outputting voltage.**

Failure to comply may cause the application to operate incorrectly or damage the drive.

**Do not operate damaged equipment.**

Failure to comply may cause further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

**NOTICE****Do not use unshielded cable for control wiring.**

Failure to comply may cause electrical interference resulting in poor system performance.

Use shielded twisted-pair wires and ground the shield to the ground terminal of the drive.

**Properly connect all pins and connectors.**

Failure to comply may prevent proper operation and possibly damage equipment.

**Check wiring to ensure that all connections are correct after installing the option and connecting any other devices.**

Failure to comply may result in damage to the option.

◆ Prior to Installing the Option

Prior to installing the option, wire the drive, make necessary connections to the drive terminals, and verify that the drive functions normally without the option installed. Refer to the Quick Start Guide packaged with the drive for information on wiring and connecting the drive.

◆ Installing the Option

Refer to the instructions below to install the option.

**DANGER!** *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply could result in death or serious injury. Before installing the option, disconnect all power to the drive. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are off and measure the DC bus voltage level to confirm safe level.*

- 1. Shut off power to the drive, wait at least five minutes after confirming the DC bus voltage is safe, then loosen the screw that fastens the front cover in place and remove the front cover. This drive front cover will be replaced by the option cover. Cover removal varies depending on drive size.

**NOTICE:** *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, drive, and circuit boards. Failure to comply may result in ESD damage to circuitry.*

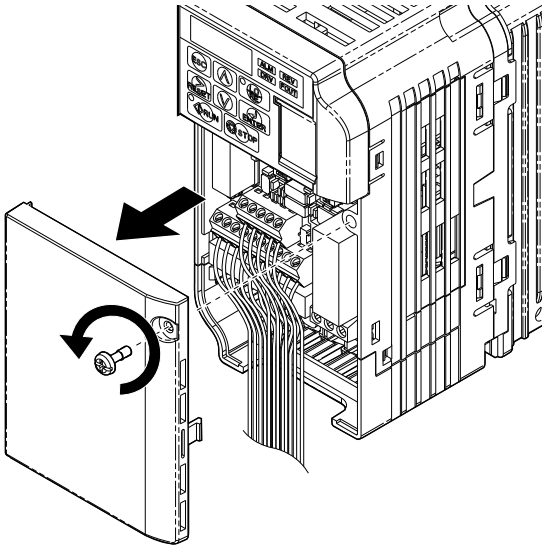


Figure 4 Remove Front Cover

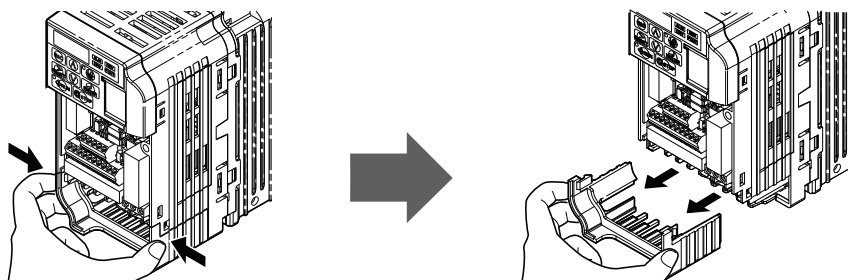
- 2. The remaining installation steps differ based on drive model. Find the drive model number on the drive nameplate and refer to the step indicated in **Table 6** based on your model number.

Table 6 Installation Steps Based on Drive Model

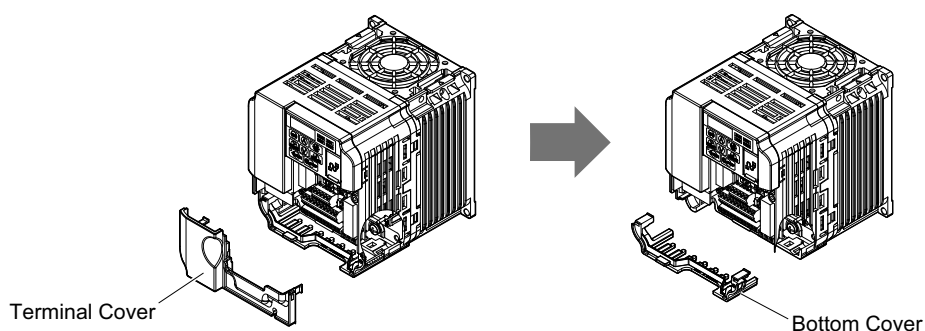
| Enclosure Type       | Drive Model    | Proceed to Step | Page |
|----------------------|----------------|-----------------|------|
| IP20/Open-Chassis    | CIMR-V□□A□□□□B | 3.              | 15   |
| IP20/NEMA Type 1 <1> | CIMR-V□□A□□□□F | 6.              | 16   |

<1> Installing the option on an IP20/NEMA Type 1 enclosure drive voids NEMA Type 1 protection while maintaining IP20 conformity.

3. For IP20/Open-Chassis models CIMR-V□□A□□□□B, Remove the bottom cover of the drive by applying pressure to the tabs on each side of the bottom cover. Pull the bottom cover away from the drive while pushing in on the tabs to release the cover from the drive. Refer to **Figure 5** for details. Refer to **Figure 6** for drive models CIMR-V□BA0006B to BA0018B, 2A0008B to 2A0069B, and 4A0001B to 4A0038B, which require removing the terminal cover prior to removing the bottom cover.

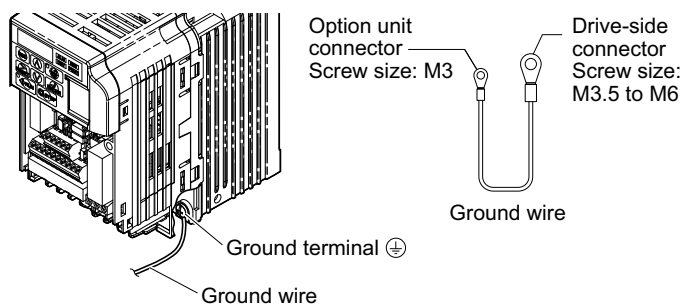


**Figure 5 Remove the Bottom Cover on an IP20/Open-Chassis Drive (Models CIMR-V□BA0001B to BA0003B and 2A0001B to 2A0006B)**



**Figure 6 Remove the Terminal Cover and Bottom Cover on an IP20/Open-Chassis Drive (Models CIMR-V□BA0006B to BA0018B; 2A0008B to 2A0069B; 4A0001B to 4A0038B)**

4. On IP20/Open-Chassis models, connect the drive side of the ground wire to the drive ground terminal.
- Note:** The four different ground wires packaged with the option connect the option to different drive models. Select the proper ground wire depending on drive size. Refer to **Table 7** for ground wire selection by drive model.



**Figure 7 Connect the Ground Wire on an IP20/Open-Chassis Drive**

**Table 7 Ground Wire Selection**

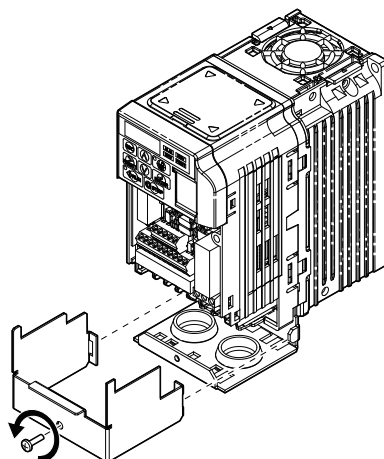
| Ground Wire Length<br>(mm/in) | Drive Model<br>CIMR-V□               |                                      |                                                                    |
|-------------------------------|--------------------------------------|--------------------------------------|--------------------------------------------------------------------|
|                               | Single-Phase<br>200 V Class          | Three-Phase<br>200 V Class           | Three-Phase<br>400 V Class                                         |
| 150/5.9                       | BA0001<br>BA0002<br>BA0003           | 2A0001<br>2A0002<br>2A0004<br>2A0006 | —                                                                  |
| 200/7.9                       | BA0006<br>BA0010<br>BA0012<br>BA0018 | 2A0010<br>2A0012<br>2A0020           | 4A0001<br>4A0002<br>4A0004<br>4A0005<br>4A0007<br>4A0009<br>4A0011 |
| 250/9.8                       | —                                    | 2A0030<br>2A0040                     | 4A0018<br>4A0023                                                   |
| 400/15.7                      | —                                    | 2A0056<br>2A0069                     | 4A0031<br>4A0038                                                   |

**5.** For IP20/Open-Chassis models, go to Step **9.** on page **18.**

**6.** For IP20/NEMA Type 1 enclosure models CIMR-V□□□□□□□F, loosen the screw on the front of the NEMA Type 1 terminal cover and remove it from the drive. Refer to **Figure 8** for details.

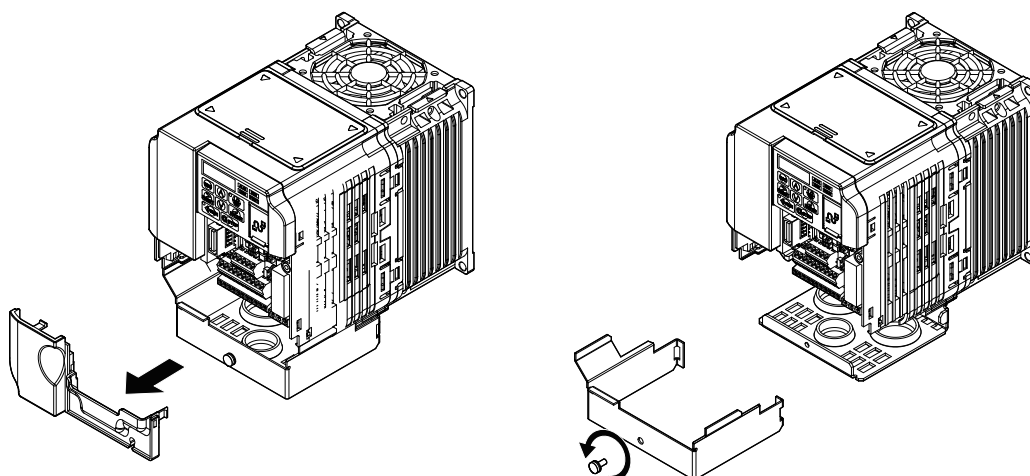
Refer to **Figure 9** for drive models CIMR-V□BA0006F to BA0018F, 2A0010F to 2A0069F, and 4A0001F to 4A0038F, which require removing the plastic terminal cover prior to removing the NEMA Type 1 terminal cover.

**Note:** Installing the option on an IP20/NEMA Type 1 enclosure drive voids NEMA Type 1 protection while maintaining IP20 conformity.



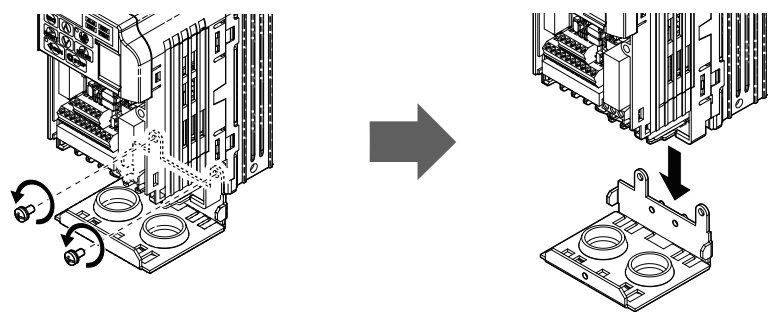
**Figure 8 Remove the NEMA Type 1 Terminal Cover (CIMR-V□BA0001F to BA0003F, 2A0001F to 2A0006F)**





**Figure 9 Remove the Terminal Cover on an IP20/NEMA Type 1 Drive**  
(Models CIMR-V□BA0006F to BA0018F; 2A0008F to 2A0069F; 4A0001F to 4A0038F)

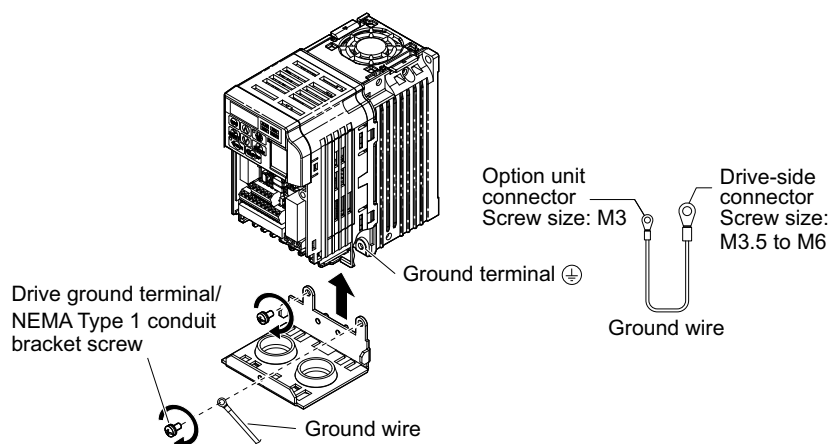
7. For models CIMR-V□BA0001F to BA0003F, 2A0001F to 2A0006F, loosen the screws attaching the NEMA Type 1 conduit bracket to the drive to remove the NEMA Type 1 conduit bracket.



**Figure 10 Remove the NEMA Type 1 Conduit Bracket**

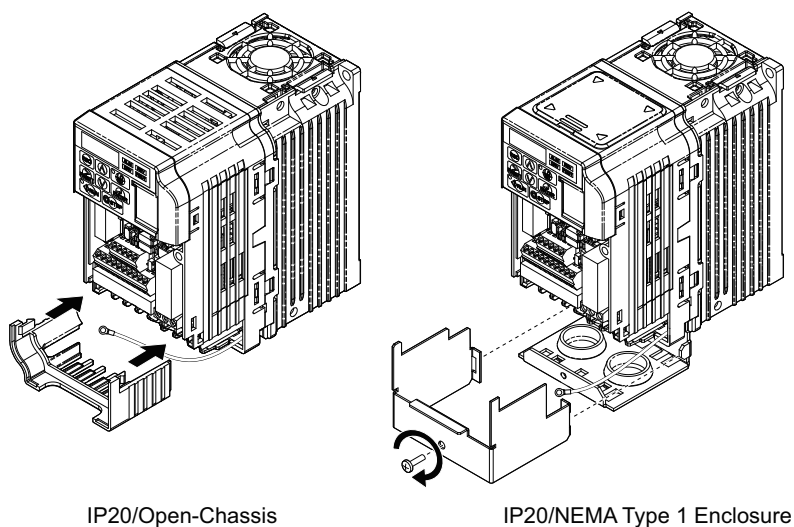
8. On NEMA Type 1 enclosure models (CIMR-V□BA0001F to BA0003F, 2A0001F to 2A0006F), the screw for the drive ground terminal also acts as one of the screws that attaches the NEMA Type 1 conduit bracket to the drive. Reattach the NEMA Type 1 conduit bracket according to **Figure 11** and connect the drive-side of the ground wire to the drive ground terminal.

**Note:** The four different ground wires packaged with the option connect the option to different drive models. Select the proper ground wire depending on drive size. Refer to **Table 7** on page 16 for ground wire selection by drive model.



**Figure 11 Reattach the NEMA Type 1 Conduit Bracket and Connect the Ground Wire for models CIMR-V□BA0001F to BA0003F, 2A0001F to 2A0006F**

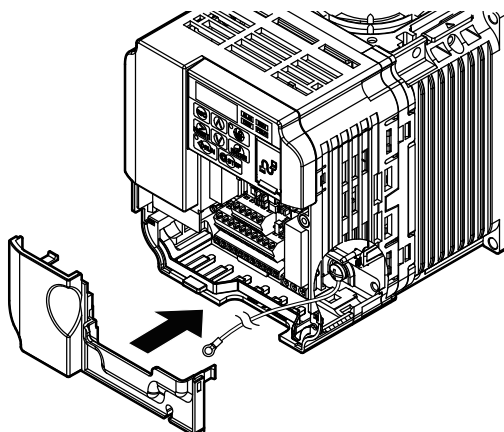
9. Reattach the bottom cover. Keep the ground wire inside of the bottom cover when reattaching.



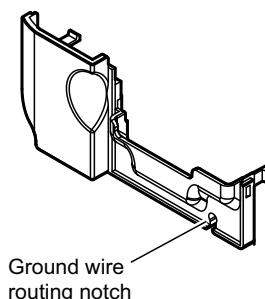
**Figure 12 Reattach the Bottom Cover**

10. On models CIMR-V□BA0006□ to BA0018□, 2A0008□ to 2A0069□, and 4A0001□ to 4A0038□, reattach the terminal cover.

Refer to **Figure 13** and **Figure 14** for drive models CIMR-V□BA0006□ to BA0018□, 2A0008□ to 2A0020□, and 4A0001□ to 4A0011□, which require routing the ground wire through the provided notch when reinstalling the terminal cover.

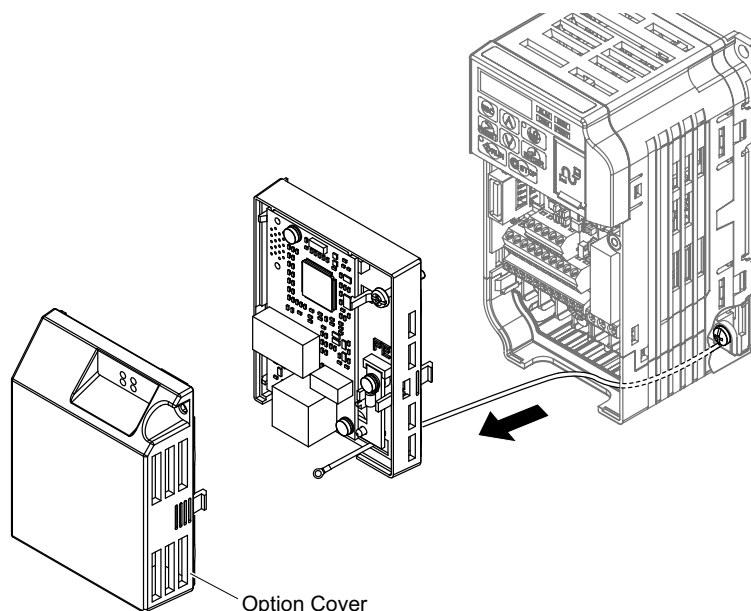


**Figure 13 Reattach the Terminal Cover**  
(Models CIMR-V□BA0006□ to BA0018□; 2A0008□ to 2A0069□; 4A0001□ to 4A0038□)



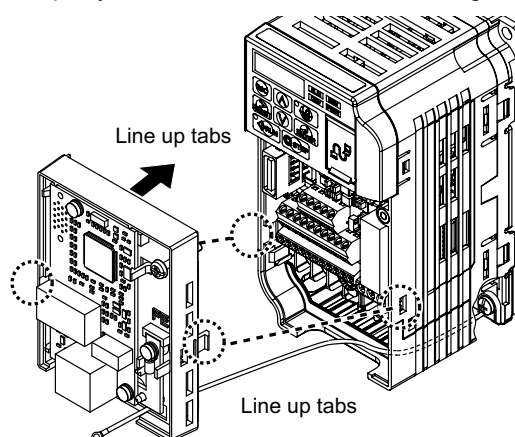
**Figure 14 Terminal Cover Ground Wire Notch**  
(Models CIMR-V□BA0006□ to BA0018□; 2A0008□ to 2A0020□; 4A0001□ to 4A0011□)

11. Remove the option cover and pass the ground wire through the inside of the drive bottom cover and into the through-hole for the ground wire at the front of the option.



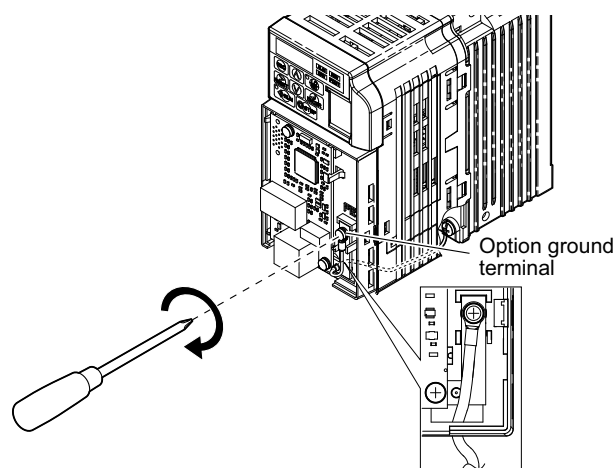
**Figure 15 Ground Wire Routing**

12. Attach the option to the drive. Properly seat the tabs on the left and right sides of the option to the drive case.



**Figure 16 Connect the Option**

13. Connect the ground wire at the option ground terminal. Tighten the screw to 0.5 to 0.6 N·m or (4.4 to 5.3 in lbs) using an M3 Phillips screwdriver.



**Figure 17 Connect the Ground Wire to the Option**

14. To connect the option to a network, firmly connect RJ45 8-pin Shielded Twisted Pair Cat 5e cable(s) into the modular connector port.

**Note:** Do not connect or disconnect the communication cable while the drive is powered up or while the drive is in operation. Failure to comply may cause a static discharge, which will cause the option card to stop working properly. Cycle power on the drive and option card to reestablish functionality.

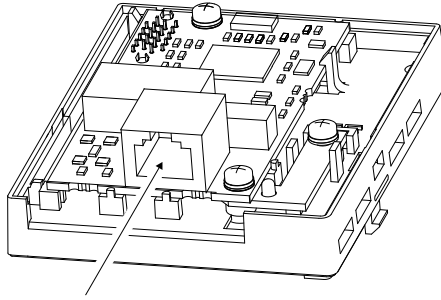


Figure 18 Communication Cable Port

### IGMP Snooping

Switches implementing IGMP Snooping are strongly recommended. When IGMP Snooping is used, devices will only receive the multicast packets in which they are interested.

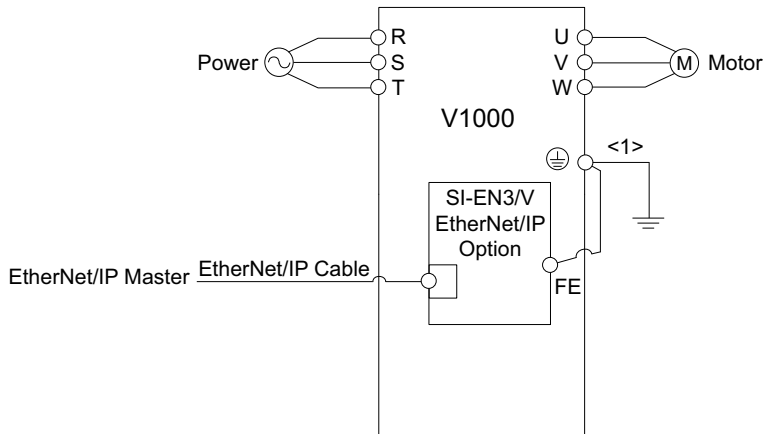
### Communication Cable Specifications

Only use cables recommended for EtherNet/Industrial Protocol (EtherNet/IP™). Using a cable not specifically recommended may cause the option or drive to malfunction.

The use of CAT5e or equivalent Shielded Twisted Pair (STP) cable is recommended.

Refer to the ODVA website for more information on network cabling (<http://www.odva.org>).

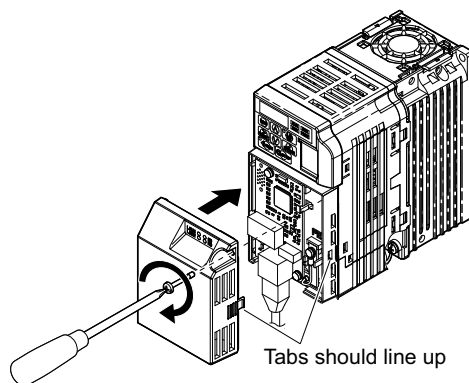
### Connection Diagram



<1> The ground wire provided in the option shipping package must be connected during installation.

Figure 19 Wiring Diagram

15. Attach the option cover by aligning the tabs with the mounting holes, seat the front cover into place, and tighten the screw on the front.



**Figure 20 Attach the Option Cover**

**Note:** Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure no cables are pinched between the front covers and the drive when replacing the covers.

16. Set drive parameters in Table 6 for proper option performance.

---

## ◆ EDS Files

For easy network implementation of drives equipped with the option, an EDS file can be obtained from:

U.S.: <http://www.yaskawa.com>

Europe: <http://www.yaskawa.eu.com>

Japan: <http://www.e-mechatronics.com>

Other areas: Contact a Yaskawa representative.

**Note:** Download the EDS file for SI-EN3/V option. The SI-EN3/V will not function as a slave in the network without the appropriate EDS file.

## 6 Related Drive Parameters

The following parameters are used to set up the drive for operation with the option. Parameter setting instructions can be found in the drive Quick Start Guide or Technical Manual.

Confirm proper setting of the all parameters in **Table 8** using the digital operator, before starting network communications.

**Table 8 Related Parameter Settings**

| No.<br>(Addr.<br>Hex)            | Name                                                             | Description                                                                                                                                                                                                                          | Values                                    |
|----------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| b1-01<br>(180)<br><1>            | Frequency Reference Selection                                    | Selects the frequency reference input source.<br>0: Operator - Digital preset speed d1-01 to d1-17<br>1: Terminals - Analog input terminal A1 or A2<br>2: MEMOBUS/Modbus communications<br>3: Option<br>4: Pulse Input (Terminal RP) | Default: 1<br>Range: 0 to 4<br>(Set to 3) |
| b1-02<br>(181)<br><1>            | Run Command Selection                                            | Selects the run command input source.<br>0: Digital Operator - RUN and STOP keys<br>1: Digital input terminals S1 to S7<br>2: MEMOBUS/Modbus communications<br>3: Option                                                             | Default: 1<br>Range: 0 to 3<br>(Set to 3) |
| F6-01<br>(3A2)                   | Operation Selection after Communications Error                   | Determines drive response when a bUS error is detected during communications with the option.<br>0: Ramp to Stop<br>1: Coast to Stop<br>2: Fast-Stop<br>3: Alarm Only <2>                                                            | Default: 1<br>Range: 0 to 3               |
| F6-02<br>(3A3)                   | External Fault Detection Conditions (EF0)                        | Sets the condition for external fault detection (EF0).<br>0: Always detected<br>1: Detected only during operation                                                                                                                    | Default: 0<br>Range: 0, 1                 |
| F6-03<br>(3A4)                   | Stopping Method for External Fault from the Communication Option | Determines drive response for external fault input (EF0) detection during option communications.<br>0: Ramp to Stop<br>1: Coast to Stop<br>2: Fast-Stop<br>3: Alarm Only <2>                                                         | Default: 1<br>Range: 0 to 3               |
| F6-07<br>(3A8)                   | NetRef/ComRef Selection Function                                 | 0: Multi-step speed reference disabled,<br>1: Multi-step speed reference allowed                                                                                                                                                     | Default: 1<br>Range: 0, 1                 |
| F6-08<br>(36A)                   | Reset Communication Related Parameters                           | Determines if communication-related parameters F6-□□ and F7-□□ are set back to original default values when the drive is initialized using parameter A1-03.<br>0: Do not reset parameters<br>1: Reset parameters                     | Default: 0<br>Range: 0, 1                 |
| F7-01<br>(3E5)<br><3> <4><br><5> | IP Address 1                                                     | Sets the static/fixed IP address.<br>Parameter F7-01 sets the most significant octet.                                                                                                                                                | Default: 192<br>Range: 0 to 255           |
| F7-02<br>(3E6)<br><3> <4><br><5> | IP Address 2                                                     | Sets the static/fixed IP address.<br>Parameter F7-02 sets the second most significant octet.                                                                                                                                         | Default: 168<br>Range: 0 to 255           |
| F7-03<br>(3E7)<br><3> <4><br><5> | IP Address 3                                                     | Sets the static/fixed IP address.<br>Parameter F7-03 sets the third most significant octet.                                                                                                                                          | Default: 1<br>Range: 0 to 255             |
| F7-04<br>(3E8)<br><3> <4><br><5> | IP Address 4                                                     | Sets the static/fixed IP address.<br>Parameter F7-04 sets the fourth most significant octet.                                                                                                                                         | Default: 20<br>Range: 0 to 255            |
| F7-05<br>(3E9)<br><5>            | Subnet Mask 1                                                    | Sets the static/fixed Subnet Mask.<br>Parameter F7-05 sets the most significant octet.                                                                                                                                               | Default: 255<br>Range: 0 to 255           |

| No.<br>(Addr.<br>Hex)                | Name                               | Description                                                                                                                                                                                                                                                                                                                                      | Values                              |
|--------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| F7-06<br>(3EA)<br><5>                | Subnet Mask 2                      | Sets the static/fixed Subnet Mask.<br>Parameter F7-06 sets the second most significant octet.                                                                                                                                                                                                                                                    | Default: 255<br>Range: 0 to 255     |
| F7-07<br>(3EB)<br><5>                | Subnet Mask 3                      | Sets the static/fixed Subnet Mask.<br>Parameter F7-07 sets the third most significant octet.                                                                                                                                                                                                                                                     | Default: 255<br>Range: 0 to 255     |
| F7-08<br>(3EC)<br><5>                | Subnet Mask 4                      | Sets the static/fixed Subnet Mask.<br>Parameter F7-08 sets the fourth most significant octet.                                                                                                                                                                                                                                                    | Default: 0<br>Range: 0 to 255       |
| F7-09<br>(3ED)<br><5>                | Gateway Address 1                  | Sets the static/fixed Gateway address.<br>Parameter F7-09 sets the most significant octet.                                                                                                                                                                                                                                                       | Default: 192<br>Range: 0 to 255     |
| F7-10<br>(3EE)<br><5>                | Gateway Address 2                  | Sets the static/fixed Gateway address.<br>Parameter F7-10 sets the second most significant octet.                                                                                                                                                                                                                                                | Default: 168<br>Range: 0 to 255     |
| F7-11<br>(3EF)<br><5>                | Gateway Address 3                  | Sets the static/fixed Gateway address.<br>Parameter F7-11 sets the third most significant octet.                                                                                                                                                                                                                                                 | Default: 1<br>Range: 0 to 255       |
| F7-12<br>(3E0)<br><5>                | Gateway Address 4                  | Sets the static/fixed Gateway address.<br>Parameter F7-12 sets the fourth most significant octet.                                                                                                                                                                                                                                                | Default: 1<br>Range: 0 to 255       |
| F7-13<br>(3F1)                       | Address Mode at Startup            | Selects how the option address is set.<br>0: Static<br>1: BOOTP<br>2: DHCP                                                                                                                                                                                                                                                                       | Default: 2<br>Range: 0 to 2         |
| F7-14<br>(3F2)                       | Duplex Mode Selection              | Selects duplex mode setting.<br>0: Half duplex forced<br>1: Auto-negotiate<br>2: Full duplex forced                                                                                                                                                                                                                                              | Default: <6><br>Range: 0 to 2       |
| F7-15<br>(3F3)<br><7>                | Communication Speed Selection      | Sets the communication speed<br>0: 10 Mbps (Available only with drive software version PRG: 1012 to 1015)<br>10: 10 Mbps<br>100: 100 Mbps                                                                                                                                                                                                        | Default: <8><br>Range: <8>          |
| F7-17<br>(3F5)                       | EtherNet/IP Speed Scaling Factor   | Sets the scaling factor for the speed monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                                | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-18<br>(3F6)                       | EtherNet/IP Current Scaling Factor | Sets the scaling factor for the output current monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                       | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-19<br>(3F7)                       | EtherNet/IP Torque Scaling Factor  | Sets the scaling factor for the torque monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                               | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-20<br>(3F8)                       | EtherNet/IP Power Scaling Factor   | Sets the scaling factor for the power monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                                | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-21<br>(3F9)                       | EtherNet/IP Voltage Scaling Factor | Sets the scaling factor for the voltage monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                              | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-22<br>(3FA)                       | EtherNet/IP Time Scaling           | Sets the scaling factor for the time monitor in EtherNet/IP Class ID 2AH Object.                                                                                                                                                                                                                                                                 | Default: 0<br>Min.: -15<br>Max.: 15 |
| F7-23 to<br>F7-32<br>(3FB to<br>404) | Dynamic Output Assembly Parameters | Parameters used in Output Assembly 116. Each parameter contains a MEMOBUS/Modbus address. The value received for Output Assembly 116 will be written to this corresponding MEMOBUS/Modbus address. A MEMOBUS/Modbus address value of 0 means that the value received for Output Assembly 116 will not be written to any MEMOBUS/Modbus register. | Default: 0                          |

## 6 Related Drive Parameters

| No.<br>(Addr.<br>Hex)                | Name                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Values     |
|--------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| F7-33 to<br>F7-42<br>(405 to<br>40E) | Dynamic Input Assembly<br>Parameters | Parameters used in Input Assembly 166. Each parameter contains a MEMOBUS/Modbus address. The value sent for Input Assembly 166 will be read from this corresponding MEMOBUS/Modbus address. A MEMOBUS/Modbus address value of 0 means that the value sent for Input Assembly 166 is not defined by the user, therefore the option default register value will be returned.<br><i>Refer to Input Assemblies (Drive Produces) on page 33</i> for definitions of the default MEMOBUS/Modbus registers. | Default: 0 |

- <1> To start and stop the drive with the EtherNet/IP master device using serial communications, set b1-02 to 3 or set the “Net Control” bit in the assemblies or Control Supervisor Object. To control the drive frequency reference of the drive via the master device, set b1-01 to 3 or set the Net Reference bit in the assemblies or AC/DC Object.
- <2> If F6-01 is set to 3, the drive will continue to operate when a fault is detected. Take safety measures, such as installing an emergency stop switch.
- <3> Cycle power for setting changes to take effect.
- <4> If F7-13 is set to 0, then all IP Addresses (F7-01 to F7-04) must be unique.
- <5> Set F7-01 to F7-12 when F7-13 is set to 0.
- <6> Default setting differs by drive software version.  
1012 to 1015: 0  
≥ 1016: 1
- <7> Set F7-15 when F7-14 is set to 0 or 2.
- <8> The setting values differ by drive software version.  
1012 to 1015  
Default: 0  
Range: 0, 10, 100  
≥ 1016  
Default: 10  
Range: 10, 100

**Table 9 Option Monitors**

| No.            | Name              | Description                                                         | Value Range                  |
|----------------|-------------------|---------------------------------------------------------------------|------------------------------|
| U6-80 to U6-83 | Online IP Address | IP Address currently available; U6-80 is the most significant octet | 0 to 255                     |
| U6-84 to U6-87 | Online Subnet     | Subnet currently available; U6-84 is the most significant octet     | 0 to 255                     |
| U6-88 to U6-91 | Online Gateway    | Gateway currently available; U6-88 is the most significant octet    | 0 to 255                     |
| U6-92          | Online Speed      | Link Speed                                                          | 10: 10 Mbps<br>100: 100 Mbps |
| U6-93          | Online Duplex     | Duplex Setting                                                      | 0: Half, 1: Full             |
| U6-98          | First Fault       | First Option Fault                                                  | –                            |
| U6-99          | Current Fault     | Current Option Fault                                                | –                            |



## 7 Configuring Messaging

This section provides information on methods used to control the drive with the option installed.

### ◆ Drive Polled Configuration

The assemblies in *Table 10* are available for polled I/O:

**Table 10 Supported Polled I/O Assemblies**

| Assembly Number (Hex) | Description                                                                   | Type   | Bytes | Page |
|-----------------------|-------------------------------------------------------------------------------|--------|-------|------|
| 20(14)                | Basic Speed Control Output                                                    | Output | 4     | 26   |
| 21(15)                | Extended Speed Control Output                                                 | Output | 4     | 26   |
| 22(16)                | Speed and Torque Control Output                                               | Output | 6     | 27   |
| 23(17)                | Extended Speed and Torque Control Output                                      | Output | 6     | 27   |
| 70(46)                | Basic Speed Control Input                                                     | Input  | 4     | 33   |
| 71(47)                | Extended Speed Control Input                                                  | Input  | 4     | 33   |
| 72(48)                | Speed and Torque Control Input                                                | Input  | 6     | 34   |
| 73(49)                | Extended Speed and Torque Control Input                                       | Input  | 6     | 35   |
| 100(64)               | (Vendor Specific Yaskawa Electric (YE) Assy)-MEMOBUS/Modbus Message Output    | Output | 5     | 28   |
| 101(65)               | (Vendor Specific Yaskawa Electric (YE) Assy)-Speed/Torque Control Output      | Output | 8     | 28   |
| 116(74)               | (Vendor Specific Yaskawa Electric (YE) Assy)-High Speed/Torque Control Output | Output | 44    | 30   |
| 150(96)               | (Vendor Specific Yaskawa Electric (YE) Assy)-MEMOBUS/Modbus Message Input     | Input  | 5     | 36   |
| 151(97)               | (Vendor Specific Yaskawa Electric (YE) Assy)-Speed/Torque Status Input        | Input  | 8     | 37   |
| 166(A6)               | (Vendor Specific Yaskawa Electric (YE) Assy)-High Speed/Torque Status Input   | Input  | 44    | 39   |

## 8 Output Assemblies (Drive Consumes)

**Note:** The convention in this manual is from the PLC perspective. As such, an assembly is called an “Output Assembly” when outputted from the PLC and received by this node. This section details “Output Assemblies” that are “Consumed” by this drive.

### ◆ Basic Speed Control Output - 20 (0x14)

| Output Instance | Byte | Bit 7                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2       | Bit 1 | Bit 0   |
|-----------------|------|-----------------------------|-------|-------|-------|-------|-------------|-------|---------|
| 20              | 0    | –                           | –     | –     | –     | –     | Fault Reset | –     | Run Fwd |
|                 | 1    | –                           |       |       |       |       |             |       |         |
|                 | 2    | Speed Reference (Low Byte)  |       |       |       |       |             |       |         |
|                 | 3    | Speed Reference (High Byte) |       |       |       |       |             |       |         |

| Name            | Description                                                                                                                                                                                                                                                                                                                  |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Run Fwd         | Forward Run Command<br>0: Stop<br>1: Forward Run                                                                                                                                                                                                                                                                             |
| Fault Reset     | Fault Reset<br>(0 to 1 transition: Fault Reset)                                                                                                                                                                                                                                                                              |
| Speed Reference | Speed Command<br>Sets drive speed reference.<br>Speed reference data:<br>Frequency reference/2 <sup>SS</sup> (SS: Speed scale)<br>Setting range: 0 to 0xFFFF<br>Example: setting a reference of 4096 with a speed scale of 2:<br>Speed reference data = $4096/2^2 = 1024 = 0x0400$ Hex or 10.24 Hz<br>Unit depends on o1-03. |

### ◆ Extended Speed Control Output - 21 (0x15)

| Output Instance | Byte | Bit 7                       | Bit 6  | Bit 5   | Bit 4 | Bit 3 | Bit 2       | Bit 1   | Bit 0   |
|-----------------|------|-----------------------------|--------|---------|-------|-------|-------------|---------|---------|
| 21              | 0    | –                           | NetRef | NetCtrl | –     | –     | Fault Reset | Run Rev | Run Fwd |
|                 | 1    | –                           |        |         |       |       |             |         |         |
|                 | 2    | Speed Reference (Low Byte)  |        |         |       |       |             |         |         |
|                 | 3    | Speed Reference (High Byte) |        |         |       |       |             |         |         |

| Name        | Description                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------|
| Run Fwd     | Forward Run Command<br>0: Stop<br>1: Forward Run                                                   |
| Run Rev     | Reverse Run Command<br>0: Stop<br>1: Reverse Run                                                   |
| Fault Reset | Fault Reset<br>(0 to 1 transition: Fault Reset)                                                    |
| NetCtrl     | Run command from Network<br>0: Depends on b1-02<br>1: Enables the run command from network         |
| NetRef      | Speed reference from Network<br>0: Depends on b1-01<br>1: Enables the speed reference from network |

| Name            | Description                                                                                                                                                                                                                                                                                                     |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Speed Reference | Speed Command<br>Sets drive speed reference.<br>Speed reference data:<br>Frequency reference/ $2^{SS}$ (SS: Speed scale)<br>Setting range: 0 to 0xFFFF<br>For example, when setting a reference of 4096 with a speed scale of 2:<br>Speed reference data = $4096/2^2 = 1024 = 0x0400$<br>Unit depends on o1-03. |

### ◆ Speed and Torque Control Output - 22 (0x16)

| Output Instance | Byte | Bit 7                                        | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2       | Bit 1 | Bit 0   |
|-----------------|------|----------------------------------------------|-------|-------|-------|-------|-------------|-------|---------|
| 22              | 0    | –                                            | –     | –     | –     | –     | Fault Reset | –     | Run Fwd |
|                 | 1    | –                                            |       |       |       |       |             |       |         |
|                 | 2    | Speed Reference (Low Byte)                   |       |       |       |       |             |       |         |
|                 | 3    | Speed Reference (High Byte)                  |       |       |       |       |             |       |         |
|                 | 4    | Torque Reference (Lower Byte), not supported |       |       |       |       |             |       |         |
|                 | 5    | Torque Reference (High Byte), not supported  |       |       |       |       |             |       |         |

| Name             | Description                                                                                                                                                                                                                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Run Fwd          | Forward Run Command<br>0: Stop<br>1: Forward Run                                                                                                                                                                                                                                                                |
| Fault Reset      | Fault Reset<br>(0 to 1 transition: Fault Reset)                                                                                                                                                                                                                                                                 |
| Speed Reference  | Speed Command<br>Sets drive speed reference.<br>Speed reference data:<br>Frequency reference/ $2^{SS}$ (SS: Speed scale)<br>Setting range: 0 to 0xFFFF<br>For example, when setting a reference of 4096 with a speed scale of 2:<br>Speed reference data = $4096/2^2 = 1024 = 0x0400$<br>Unit depends on o1-03. |
| Torque Reference | Not supported                                                                                                                                                                                                                                                                                                   |

### ◆ Extended Speed and Torque Control Output - 23 (0x17)

| Output Instance | Byte | Bit 7                                       | Bit 6  | Bit 5   | Bit 4 | Bit 3 | Bit 2       | Bit 1   | Bit 0   |
|-----------------|------|---------------------------------------------|--------|---------|-------|-------|-------------|---------|---------|
| 23              | 0    | –                                           | NetRef | NetCtrl | –     | –     | Fault Reset | Run Rev | Run Fwd |
|                 | 1    | –                                           |        |         |       |       |             |         |         |
|                 | 2    | Speed Reference (Low Byte)                  |        |         |       |       |             |         |         |
|                 | 3    | Speed Reference (High Byte)                 |        |         |       |       |             |         |         |
|                 | 4    | Torque Reference (Low Byte), not supported  |        |         |       |       |             |         |         |
|                 | 5    | Torque Reference (High Byte), not supported |        |         |       |       |             |         |         |

| Name        | Description                                      |
|-------------|--------------------------------------------------|
| Run Fwd     | Forward Run Command<br>0: Stop<br>1: Forward Run |
| Run Rev     | Reverse Run Command<br>0: Stop<br>1: Reverse Run |
| Fault Reset | Fault Reset<br>(0 to 1 transition: Fault Reset)  |

## 8 Output Assemblies (Drive Consumes)

| Name             | Description                                                                                                                                                                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NetCtrl          | Run command from Network<br>0: Depends on b1-02<br>1: Enables the run command from network                                                                                                                                                                                                                            |
| NetRef           | Speed reference from Network<br>0: Depends on b1-01<br>1: Enables the speed reference from network                                                                                                                                                                                                                    |
| Speed Reference  | Speed Command<br>Sets drive speed reference.<br>Speed reference data:<br>Frequency reference/2 <sup>SS</sup> (SS: Speed scale)<br>Setting range: 0 to 0xFFFF<br>For example, when setting a reference of 4096 with a speed scale of 2:<br>Speed reference data = $4096/2^2 = 1024 = 0x0400$<br>Unit depends on o1-03. |
| Torque Reference | Not supported                                                                                                                                                                                                                                                                                                         |

### ◆ MEMOBUS/Modbus Message Output (Vendor Specific Yaskawa Electric (YE) Assy) - 100 (0x64)

| Output Instance | Byte | Bit 7                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-----------------|------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| 100             | 0    | Function Code               |       |       |       |       |       |       |       |
|                 | 1    | Register Number (High Byte) |       |       |       |       |       |       |       |
|                 | 2    | Register Number (Low Byte)  |       |       |       |       |       |       |       |
|                 | 3    | Register Data (High Byte)   |       |       |       |       |       |       |       |
|                 | 4    | Register Data (Low Byte)    |       |       |       |       |       |       |       |

**Note:** This is a paired assembly (100/150).

| Name            | Description                    |
|-----------------|--------------------------------|
| Function Code   | MEMOBUS/Modbus Function Code   |
| Register Number | MEMOBUS/Modbus Register Number |
| Register Data   | MEMOBUS/Modbus Register Data   |

**Table 11 Function Code Decode Table**

| Function Code | MEMOBUS/Modbus Function |
|---------------|-------------------------|
| 0x00          | No Operation            |
| 0x03          | Read Register           |
| 0x10          | Write Register          |

**Note:** Refer to the MEMOBUS/Modbus Data Table in Appendix C of the Technical Manual for a list of monitor data using the MEMOBUS/Modbus message area.

### ◆ Speed/Torque Control Output (Vendor Specific Yaskawa Electric (YE) Assy) - 101 (0x65)

| Output Instance | Byte | Bit 7                                          | Bit 6                          | Bit 5                         | Bit 4                  | Bit 3                  | Bit 2                  | Bit 1       | Bit 0          |
|-----------------|------|------------------------------------------------|--------------------------------|-------------------------------|------------------------|------------------------|------------------------|-------------|----------------|
| 101             | 0    | —                                              | Multi-Function Input 7         | Multi-Function Input 6        | Multi-Function Input 5 | Multi-Function Input 4 | Multi-Function Input 3 | Run Rev     | Run Fwd        |
|                 | 1    | Multi-Function Photo Coupler 2                 | Multi-Function Photo Coupler 1 | Multi-Function Digital Output | —                      | —                      | —                      | Fault Reset | External Fault |
|                 | 2    | Speed Reference (Low Byte)                     |                                |                               |                        |                        |                        |             |                |
|                 | 3    | Speed Reference (High Byte)                    |                                |                               |                        |                        |                        |             |                |
|                 | 4    | Torque Reference (Low Byte), not supported     |                                |                               |                        |                        |                        |             |                |
| 101             | 5    | Torque Reference (High Byte), not supported    |                                |                               |                        |                        |                        |             |                |
|                 | 6    | Torque Compensation (Low Byte), not supported  |                                |                               |                        |                        |                        |             |                |
|                 | 7    | Torque Compensation (High Byte), not supported |                                |                               |                        |                        |                        |             |                |

| Output Instance                | Byte                                                                                                              |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Run Fwd                        | Forward Run Command<br>0: Stop<br>1: Forward Run                                                                  |
| Run Rev                        | Reverse Run Command<br>0: Stop<br>1: Reverse Run                                                                  |
| Multi-Function Input 3         | Terminal S3 Function Input<br>0: Terminal S3 Function (H1-03) OFF<br>1: Terminal S3 Function (H1-03) ON           |
| Multi-Function Input 4         | Terminal S4 Function Input<br>0: Terminal S4 Function (H1-04) OFF<br>1: Terminal S4 Function (H1-04) ON           |
| Multi-Function Input 5         | Terminal S5 Function Input<br>0: Terminal S5 Function (H1-05) OFF<br>1: Terminal S5 Function (H1-05) ON           |
| Multi-Function Input 6         | Terminal S6 Function Input<br>0: Terminal S6 Function (H1-06) OFF<br>1: Terminal S6 Function (H1-06) ON           |
| Multi-Function Input 7         | Terminal S7 Function Input<br>0: Terminal S7 Function (H1-07) OFF<br>1: Terminal S7 Function (H1-07) ON           |
| External Fault                 | External Fault EF0<br>0: No External Fault (EF0)<br>1: External Fault (EF0)                                       |
| Fault Reset                    | Fault Reset<br>0: No Fault Reset<br>1: Fault Reset                                                                |
| Multi-Function Digital Output  | Terminal MA/MB<br>0: MA/MB OFF<br>1: MA/MB ON<br>This function is enabled only when H2-01 is set to F.            |
| Multi-Function Photo Coupler 1 | Terminal P1<br>0: P1 OFF<br>1: P1 ON<br>This function is enabled only when H2-02 is set to F.                     |
| Multi-Function Photo Coupler 2 | Terminal P2<br>0: P2 OFF<br>1: P2 ON<br>This function is enabled only when H2-03 is set to F.                     |
| Speed Reference                | Speed Command<br>Sets drive speed reference.<br>Unit depends on o1-03.<br>Unit is not affected by Speed Scale SS. |
| Torque Reference               | Not supported                                                                                                     |
| Torque Compensation            | Not supported.                                                                                                    |

## ◆ High Speed/Torque Control Output (Vendor Specific Yaskawa Electric (YE) Assy) - 116 (0x74)

This assembly is dynamic and can be configured as to what parameters are used. The first 20 Bytes (0-19) are fixed and the next 20 Bytes can be configured using parameters F7-23 to F7-32. If an error occurs while trying to write to the dynamic parameters, the appropriate error bit in Assembly 166 will be set. If more information is needed as to the nature of the error, the extended error status can be read explicitly through Class 4, Instance 0xA6, Attribute 0x64. This will return 20 Bytes with each dynamic parameter in Assembly 116 having a Byte dedicated to its extended error status. *Refer to Input Assemblies (Drive Produces) on page 33* for more information.

| Output Instance | Byte    | Bit 7                                                       | Bit 6                          | Bit 5                         | Bit 4                  | Bit 3                   | Bit 2                   | Bit 1                   | Bit 0                  |
|-----------------|---------|-------------------------------------------------------------|--------------------------------|-------------------------------|------------------------|-------------------------|-------------------------|-------------------------|------------------------|
| 116             | 0       | –                                                           | Multi-Function Input 7         | Multi-Function Input 6        | Multi-Function Input 5 | Multi-Function Input 4  | Multi-Function Input 3  | Run Rev                 | Run Fwd                |
|                 | 1       | Multi-Function Photo Coupler 2                              | Multi-Function Photo Coupler 1 | Multi-Function Digital Output | –                      | –                       | –                       | Fault Reset             | External Fault         |
|                 | 2       | Speed Reference (Low Byte)                                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 3       | Speed Reference (High Byte)                                 |                                |                               |                        |                         |                         |                         |                        |
|                 | 4       | Torque Reference (Low Byte), not supported                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 5       | Torque Reference (High Byte), not supported                 |                                |                               |                        |                         |                         |                         |                        |
|                 | 6       | Torque Compensation (Low Byte), not supported               |                                |                               |                        |                         |                         |                         |                        |
|                 | 7       | Torque Compensation (High Byte), not supported              |                                |                               |                        |                         |                         |                         |                        |
|                 | 8       | (Reserved)                                                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 9       | –                                                           | –                              | –                             | –                      | Multi-Function Input 12 | Multi-Function Input 11 | Multi-Function Input 10 | Multi-Function Input 9 |
|                 | 10      | –                                                           | –                              | –                             | –                      | –                       | –                       | NetCtrl                 | NetRef                 |
|                 | 11      | –                                                           | –                              | –                             | –                      | –                       | –                       | –                       | –                      |
|                 | 12      | Analog Output 1 (Low Byte)                                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 13      | Analog Output 1 (High Byte)                                 |                                |                               |                        |                         |                         |                         |                        |
|                 | 14      | Analog Output 2 (Low Byte)                                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 15      | Analog Output 2 (High Byte)                                 |                                |                               |                        |                         |                         |                         |                        |
|                 | 16      | Digital Outputs (Low Byte)                                  |                                |                               |                        |                         |                         |                         |                        |
|                 | 17      | Digital Outputs (High Byte)                                 |                                |                               |                        |                         |                         |                         |                        |
|                 | 18      | Reserved                                                    |                                |                               |                        |                         |                         |                         |                        |
|                 | 19      | Reserved                                                    |                                |                               |                        |                         |                         |                         |                        |
|                 | 20 - 21 | Programmable Bytes<br>Defined by F7-23<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 22 - 23 | Programmable Bytes<br>Defined by F7-24<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 24 - 25 | Programmable Bytes<br>Defined by F7-25<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 26 - 27 | Programmable Bytes<br>Defined by F7-26<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 28 - 29 | Programmable Bytes<br>Defined by F7-27<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 30 - 31 | Programmable Bytes<br>Defined by F7-28<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |
|                 | 32 - 33 | Programmable Bytes<br>Defined by F7-29<br>Default: Not Used |                                |                               |                        |                         |                         |                         |                        |

| Output Instance | Byte    | Bit 7                                                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-----------------|---------|-------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| 116             | 34 - 35 | Programmable Bytes<br>Defined by F7-30<br>Default: Not Used |       |       |       |       |       |       |       |
|                 | 36 - 37 | Programmable Bytes<br>Defined by F7-31<br>Default: Not Used |       |       |       |       |       |       |       |
|                 | 38 - 39 | Programmable Bytes<br>Defined by F7-32<br>Default: Not Used |       |       |       |       |       |       |       |
|                 | 40 - 43 | Not Used                                                    |       |       |       |       |       |       |       |

| Parameter                      | Data                                                                                                    |
|--------------------------------|---------------------------------------------------------------------------------------------------------|
| Run Fwd                        | Forward Run Command<br>0: Stop<br>1: Forward Run                                                        |
| Run Rev                        | Reverse Run Command<br>0: Stop<br>1: Reverse Run                                                        |
| Multi-Function Input 3         | Terminal S3 Function Input<br>0: Terminal S3 Function (H1-03) OFF<br>1: Terminal S3 Function (H1-03) ON |
| Multi-Function Input 4         | Terminal S4 Function Input<br>0: Terminal S4 Function (H1-04) OFF<br>1: Terminal S4 Function (H1-04) ON |
| Multi-Function Input 5         | Terminal S5 Function Input<br>0: Terminal S5 Function (H1-05) OFF<br>1: Terminal S5 Function (H1-05) ON |
| Multi-Function Input 6         | Terminal S6 Function Input<br>0: Terminal S6 Function (H1-06) OFF<br>1: Terminal S6 Function (H1-06) ON |
| Multi-Function Input 7         | Terminal S7 Function Input<br>0: Terminal S7 Function (H1-07) OFF<br>1: Terminal S7 Function (H1-07) ON |
| External Fault                 | External Fault EF0<br>0: No External Fault (EF0)<br>1: External Fault (EF0)                             |
| Fault Reset                    | Fault Reset<br>0: No Fault Reset<br>1: Fault Reset                                                      |
| Multi-Function Digital Output  | Terminal MA/MB<br>0: MA/MB OFF<br>1: MA/MB ON<br>This function is enabled only when H2-01 is set to F   |
| Multi-Function Photo Coupler 1 | Terminal P1<br>0: P1 OFF<br>1: P1 ON<br>This function is enabled only when H2-02 is set to F            |
| Multi-Function Photo Coupler 2 | Terminal P2<br>0: P2 OFF<br>1: P2 ON<br>This function is enabled only when H2-03 is set to F            |
| Speed Reference                | Speed Reference [RPM or o1-03]                                                                          |
| Torque Reference [0.1%]        | Torque Reference [0.1%], not supported                                                                  |
| Torque Compensation [0.1%]     | Torque Compensation [0.1%], not supported                                                               |
| Digital Inputs                 | MEMOBUS/Modbus (0x49). Monitor parameter U1-10                                                          |
| NetRef                         | Network sets reference                                                                                  |
| NetCtrl                        | Network sets control                                                                                    |
| Analog Output 1                | MEMOBUS/Modbus (0x0007)                                                                                 |
| Analog Output 2                | MEMOBUS/Modbus (0x0008)                                                                                 |

## 8 Output Assemblies (Drive Consumes)

| Parameter          | Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital Outputs    | MEMOBUS/Modbus (0x0009)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Programmable Bytes | Contains the data to be written to the MEMOBUS/Modbus address defined in the given parameter. A value of 0 in the given parameter means it is not used, therefore the value received for this given parameter will not be written to any MEMOBUS/Modbus register. If the PPA is Input Assembly 166, then any errors occurring during a write will be flagged. <i>Refer to High Speed/Torque Status Input (Vendor Specific Yaskawa Electric (YE) Assy) - 166 (0xA6) on page 39.</i> |



## 9 Input Assemblies (Drive Produces)

**Note:** The convention in this manual is from the PLC perspective. An “Input Assembly” is outputted from this node and read by the PLC. This section details “Input Assemblies” that are “Produced” by this drive.

### ◆ Basic Speed Control Input - 70 (0x46)

| Input Instance | Byte | Bit 7                    | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2           | Bit 1 | Bit 0   |
|----------------|------|--------------------------|-------|-------|-------|-------|-----------------|-------|---------|
| 70             | 0    | –                        | –     | –     | –     | –     | Running 1 (FWD) | –     | Faulted |
|                | 1    | –                        |       |       |       |       |                 |       |         |
|                | 2    | Speed Actual (Low Byte)  |       |       |       |       |                 |       |         |
|                | 3    | Speed Actual (High Byte) |       |       |       |       |                 |       |         |

| Parameter       | Data                                                                                                                                                                                                                                                                                                                  |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faulted         | Faulted<br>0: No Faults Occurred<br>1: Fault Occurred                                                                                                                                                                                                                                                                 |
| Running 1 (FWD) | Forward Running<br>0: Stop or Reverse Running<br>1: Forward Running                                                                                                                                                                                                                                                   |
| Speed Actual    | Actual Drive Speed<br>Monitors drive output frequency.<br>Speed actual data: Output frequency x 2 <sup>SS</sup> (SS: Speed scale)<br>Range: 0 to 0xFFFF<br>For example, when output frequency of 1024 with a speed scale of 2:<br>Speed actual data = 1024 x 2 <sup>2</sup> = 4096 = 0x1000<br>Unit depends on o1-03. |

### ◆ Extended Speed Control Input - 71 (0x47)

| Input Instance | Byte | Bit 7                    | Bit 6        | Bit 5         | Bit 4 | Bit 3           | Bit 2           | Bit 1   | Bit 0   |
|----------------|------|--------------------------|--------------|---------------|-------|-----------------|-----------------|---------|---------|
| 71             | 0    | At Speed                 | Ref from Net | Ctrl from Net | Ready | Running 2 (REV) | Running 1 (FWD) | Warning | Faulted |
|                | 1    | Drive State              |              |               |       |                 |                 |         |         |
|                | 2    | Speed Actual (Low Byte)  |              |               |       |                 |                 |         |         |
|                | 3    | Speed Actual (High Byte) |              |               |       |                 |                 |         |         |

| Name            | Description                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------------------|
| Faulted         | Faulted<br>0: No Faults Occurred<br>1: Fault Occurred                                                      |
| Warning         | Warning<br>0: No Warning Occurred<br>1: Warning Occurred                                                   |
| Running 1 (FWD) | Forward Running<br>0: Stop or Reverse Running<br>1: Forward Running                                        |
| Running 2 (REV) | Reverse Running<br>0: Stop or Forward Running<br>1: Reverse Running                                        |
| Ready           | Drive Ready<br>0: Not Ready<br>1: Ready                                                                    |
| Ctrl from Net   | Status of Run command from Network<br>0: Run command is not from network<br>1: Run command is from network |

## 9 Input Assemblies (Drive Produces)

| Name         | Description                                                                                                                                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ref from Net | Status of Speed reference from Network<br>0: Speed reference is not from network<br>1: Speed reference is from network                                                                                                                                                                                     |
| At Speed     | Speed Agree<br>0: No Speed Agree<br>1: Speed actual at speed reference                                                                                                                                                                                                                                     |
| Drive State  | Contains the value from the Control Supervisor (Class 0x29) Instance 1 Attribute 6.                                                                                                                                                                                                                        |
| Speed Actual | Actual Drive Speed<br>Monitors drive output frequency.<br>Speed actual data: Output frequency x $2^{SS}$ (SS: Speed scale)<br>Range: 0 to 0xFFFF<br>For example, when output frequency of 1024 with a speed scale of 2:<br>Speed actual data = $1024 \times 2^2 = 4096 = 0x1000$<br>Unit depends on o1-03. |

### ◆ Speed and Torque Control Input - 72 (0x48)

| Input Instance | Byte | Bit 7                                    | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2           | Bit 1 | Bit 0   |
|----------------|------|------------------------------------------|-------|-------|-------|-------|-----------------|-------|---------|
| 72             | 0    | –                                        | –     | –     | –     | –     | Running 1 (FWD) | –     | Faulted |
|                | 1    | –                                        |       |       |       |       |                 |       |         |
|                | 2    | Speed Actual (Low Byte)                  |       |       |       |       |                 |       |         |
|                | 3    | Speed Actual (High Byte)                 |       |       |       |       |                 |       |         |
|                | 4    | Torque Actual (Low Byte), not supported  |       |       |       |       |                 |       |         |
|                | 5    | Torque Actual (High Byte), not supported |       |       |       |       |                 |       |         |

| Name            | Description                                                                                                                                                                                                                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faulted         | Faulted<br>0: No Faults Occurred<br>1: Fault Occurred                                                                                                                                                                                                                                                      |
| Running 1 (FWD) | Forward Running<br>0: Stop or Reverse Running<br>1: Forward Running                                                                                                                                                                                                                                        |
| Speed Actual    | Actual Drive Speed<br>Monitors drive output frequency.<br>Speed actual data: Output frequency x $2^{SS}$ (SS: Speed scale)<br>Range: 0 to 0xFFFF<br>For example, when output frequency of 1024 with a speed scale of 2:<br>Speed actual data = $1024 \times 2^2 = 4096 = 0x1000$<br>Unit depends on o1-03. |
| Torque Actual   | Output Torque, not supported                                                                                                                                                                                                                                                                               |

## ◆ Extended Speed and Torque Control Input - 73 (0x49)

| Input Instance | Byte | Bit 7                                    | Bit 6        | Bit 5         | Bit 4 | Bit 3           | Bit 2           | Bit 1   | Bit 0   |
|----------------|------|------------------------------------------|--------------|---------------|-------|-----------------|-----------------|---------|---------|
| 73             | 0    | At Speed                                 | Ref from Net | Ctrl from Net | Ready | Running 2 (REV) | Running 1 (FWD) | Warning | Faulted |
|                | 1    | Drive State                              |              |               |       |                 |                 |         |         |
|                | 2    | Speed Actual (Low Byte)                  |              |               |       |                 |                 |         |         |
|                | 3    | Speed Actual (High Byte)                 |              |               |       |                 |                 |         |         |
|                | 4    | Torque Actual (Low Byte), not supported  |              |               |       |                 |                 |         |         |
|                | 5    | Torque Actual (High Byte), not supported |              |               |       |                 |                 |         |         |

| Name            | Description                                                                                                                                                                                                                                                                                                           |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faulted         | Faulted<br>0: No Faults Occurred<br>1: Fault Occurred                                                                                                                                                                                                                                                                 |
| Warning         | Warning<br>0: No Warning Occurred<br>1: Warning Occurred                                                                                                                                                                                                                                                              |
| Running 1 (FWD) | Forward Running<br>0: Stop or Reverse Running<br>1: Forward Running                                                                                                                                                                                                                                                   |
| Running 2 (REV) | Reverse Running<br>0: Stop or Forward Running<br>1: Reverse Running                                                                                                                                                                                                                                                   |
| Ready           | Drive Ready<br>0: Not Ready<br>1: Ready                                                                                                                                                                                                                                                                               |
| Ctrl from Net   | Status of Run command from Network<br>0: Run command is not from network<br>1: Run command is from network                                                                                                                                                                                                            |
| Ref from Net    | Status of Speed reference from Network<br>0: Speed reference is not from network<br>1: Speed reference is from network                                                                                                                                                                                                |
| At Speed        | Speed Agree<br>0: No Speed Agree<br>1: Speed actual at speed reference                                                                                                                                                                                                                                                |
| Drive State     | Contains the value from the Control Supervisor (Class 0x29) Instance 1 Attribute 6.                                                                                                                                                                                                                                   |
| Speed Actual    | Actual Drive Speed<br>Monitors drive output frequency.<br>Speed actual data: Output frequency x 2 <sup>SS</sup> (SS: Speed scale)<br>Range: 0 to 0xFFFF<br>For example, when output frequency of 1024 with a speed scale of 2:<br>Speed actual data = 1024 x 2 <sup>2</sup> = 4096 = 0x1000<br>Unit depends on o1-03. |
| Torque Actual   | Output Torque, not supported                                                                                                                                                                                                                                                                                          |

# ◆ MEMOBUS/Modbus Message Input (Vendor Specific Yaskawa Electric (YE) Assy) - 150 (0x96)

| Input Instance | Byte | Bit 7                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|----------------|------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| 150            | 0    | Function Code               |       |       |       |       |       |       |       |
|                | 1    | Register Number (High Byte) |       |       |       |       |       |       |       |
|                | 2    | Register Number (Low Byte)  |       |       |       |       |       |       |       |
|                | 3    | Register Data (High Byte)   |       |       |       |       |       |       |       |
|                | 4    | Register Data (Low Byte)    |       |       |       |       |       |       |       |

**Note:** This is a paired assembly (100/150).

**Table 12 Reply Mapping - 150**

| Byte | Write Success                               | Read Success                                | Write Failure                               | Read Failure                                | Invalid Function Code                       | Function Code Equals Zero |
|------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------|
| 0    | 0x10                                        | 0x03                                        | 0x90                                        | 0x83                                        | Function Code Or-ed with 0x80               | 0                         |
| 1    | Output Assembly Register Number (High Byte) | Output Assembly Register Number (High Byte) | Output Assembly Register Number (High Byte) | Output Assembly Register Number (High Byte) | Output Assembly Register Number (High Byte) | 0                         |
| 2    | Output Assembly Register Number (Low Byte)  | Output Assembly Register Number (Low Byte)  | Output Assembly Register Number (Low Byte)  | Output Assembly Register Number (Low Byte)  | Output Assembly Register Number (Low Byte)  | 0                         |
| 3    | 0                                           | Read Data (High Byte)                       | 0                                           | 0                                           | 0                                           | 0                         |
| 4    | 0                                           | Read Data (Low Byte)                        | Error Code                                  | Error Code                                  | 1                                           | 0                         |

**Table 13 Error Replies - 150**

| Error Code | Description                                                                                                                                                                                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x01       | Invalid Function Code                                                                                                                                                                                                                                                                                                                                                    |
| 0x02       | Invalid Register Number                                                                                                                                                                                                                                                                                                                                                  |
| 0x21       | Upper/Lower Limit Error                                                                                                                                                                                                                                                                                                                                                  |
| 0x22       | Option generated busy event. The MEMOBUS/Modbus requested operation is in the process loop but the drive is not done yet.<br>Writing “Enter” when drive is running.<br>Attempt to write data that is read only.<br>Attempt to write a parameter when drive is running.<br>During a CPF03 event attempting to write to registers other than A1-00 to A1-05, E1-03, o2-04. |
| 0x23       | Attempting to write during a drive undervoltage (Uv) event.                                                                                                                                                                                                                                                                                                              |
| 0x24       | Attempting to write while the drive is storing data.                                                                                                                                                                                                                                                                                                                     |

**Note:** Refer to the MEMOBUS/Modbus Data Table in Appendix C of the drive Technical Manual for a list of monitor data using the MEMOBUS/Modbus message area.

# ◆ Speed/Torque Status Input (Vendor Specific Yaskawa Electric (YE) Assy) - 151 (0x97)

| Output Instance | Byte | Bit 7                                    | Bit 6 | Bit 5                          | Bit 4                          | Bit 3                         | Bit 2        | Bit 1 | Bit 0   |
|-----------------|------|------------------------------------------|-------|--------------------------------|--------------------------------|-------------------------------|--------------|-------|---------|
| 151             | 0    | Faulted                                  | Alarm | Ready                          | Speed Agree                    | Reset                         | REV Running  | ZSP   | Running |
|                 | 1    | –                                        | –     | Multi-Function Photo-Coupler 2 | Multi-Function Photo-Coupler 1 | Multi-Function Digital Output | LOCAL/REMOTE | UV    | OPE     |
|                 | 2    | Output Frequency (Low Byte)              |       |                                |                                |                               |              |       |         |
|                 | 3    | Output Frequency (High Byte)             |       |                                |                                |                               |              |       |         |
|                 | 4    | Torque Actual (Low Byte), not supported  |       |                                |                                |                               |              |       |         |
|                 | 5    | Torque Actual (High Byte), not supported |       |                                |                                |                               |              |       |         |
|                 | 6    | Current Actual (Low Byte)                |       |                                |                                |                               |              |       |         |
|                 | 7    | Current Actual (High Byte)               |       |                                |                                |                               |              |       |         |

| Parameter                      | Data                                                                                                       |
|--------------------------------|------------------------------------------------------------------------------------------------------------|
| Running                        | Running<br>0: Stop<br>1: Forward or Reverse Running                                                        |
| ZSP                            | Zero Speed<br>0: Running<br>1: Stop or DC Injection Braking                                                |
| REV Running                    | Reverse Running<br>0: Not Reverse Running<br>1: Reverse Running                                            |
| Reset                          | Reset<br>0: No Reset<br>1: Reset                                                                           |
| Speed Agree                    | Speed Agree<br>0: No Speed Agree<br>1: Speed Actual at speed reference                                     |
| Ready                          | Drive Ready<br>0: Not Ready<br>1: Ready                                                                    |
| Alarm                          | Drive Alarm<br>0: No Drive Alarm<br>1: Alarm                                                               |
| Faulted                        | Drive Fault<br>0: No Drive Fault<br>1: Fault                                                               |
| OPE                            | OPE Fault<br>0: No oPE□□ Fault<br>1: oPE□□                                                                 |
| UV                             | Under Voltage<br>0: No Under Voltage<br>1: Under Voltage                                                   |
| Local/Remote                   | Status of Run command from Network<br>0: Run command is not from network<br>1: Run command is from network |
| Multi-Function Digital Output  | Terminal MA/MB<br>0: Terminal MA/MB OFF<br>1: Terminal MA/MB ON                                            |
| Multi-Function Photo-Coupler 1 | Terminal P1<br>0: Terminal P1 OFF<br>1: Terminal P1 ON                                                     |
| Multi-Function Photo-Coupler 2 | Terminal P2<br>0: Terminal P2 OFF<br>1: Terminal P2 ON                                                     |

## 9 Input Assemblies (Drive Produces)

| Parameter        | Data                                                                                                                        |
|------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Output Frequency | Actual Drive Speed<br>Monitors drive output frequency.<br>Unit depends on o1-03.<br>Unit is not affected by Speed Scale SS. |
| Torque Actual    | Output Torque, not supported                                                                                                |
| Current Actual   | Actual Output Current<br>Monitors drive output current.<br>Unit is 0.01 A.<br>Unit is not affected by Current Scale CS.     |

## ◆ High Speed/Torque Status Input (Vendor Specific Yaskawa Electric (YE) Assy) - 166 (0xA6)

If an error occurs while trying to read from the dynamic parameters, the appropriate error bit in Assembly 166 will be set. If more information about the nature of the error is needed, the extended error status can be read explicitly through Class 4, Instance 0xA6, Attribute 0x64. This will return 20 Bytes with each dynamic parameter in Assembly 166 having a Byte dedicated to its extended error status.

| Input Instance | Byte   | Bit 7                                                                    | Bit 6 | Bit 5                          | Bit 4                          | Bit 3                         | Bit 2        | Bit 1      | Bit 0   |
|----------------|--------|--------------------------------------------------------------------------|-------|--------------------------------|--------------------------------|-------------------------------|--------------|------------|---------|
| 166            | 0      | Faulted                                                                  | Alarm | Ready                          | Speed Agree                    | Fault Reset                   | REV Running  | Zero Speed | Running |
|                | 1      | –                                                                        | –     | Multi-Function Photo-Coupler 2 | Multi-Function Photo-Coupler 1 | Multi-Function Digital Output | LOCAL/REMOTE | Uv         | oPE     |
|                | 2      | Motor Speed (Low Byte)                                                   |       |                                |                                |                               |              |            |         |
|                | 3      | Motor Speed (High Byte)                                                  |       |                                |                                |                               |              |            |         |
|                | 4      | Torque Actual (Low Byte), not supported                                  |       |                                |                                |                               |              |            |         |
|                | 5      | Torque Actual (High Byte), not supported                                 |       |                                |                                |                               |              |            |         |
|                | 6      | PG Count Value (Low Byte)                                                |       |                                |                                |                               |              |            |         |
|                | 7      | PG Count Value (High Byte)                                               |       |                                |                                |                               |              |            |         |
|                | 8      | Frequency Command (Low Byte)                                             |       |                                |                                |                               |              |            |         |
|                | 9      | Frequency Command (High Byte)                                            |       |                                |                                |                               |              |            |         |
|                | 10     | Output Frequency (Low Byte)                                              |       |                                |                                |                               |              |            |         |
|                | 11     | Output Frequency (High Byte)                                             |       |                                |                                |                               |              |            |         |
|                | 12     | Output Current (Low Byte)                                                |       |                                |                                |                               |              |            |         |
|                | 13     | Output Current (High Byte)                                               |       |                                |                                |                               |              |            |         |
|                | 14     | Terminal A1 Input (Low Byte)                                             |       |                                |                                |                               |              |            |         |
|                | 15     | Terminal A1 Input (High Byte)                                            |       |                                |                                |                               |              |            |         |
|                | 16     | Main Circuit DC Voltage (Low Byte)                                       |       |                                |                                |                               |              |            |         |
|                | 17     | Main Circuit DC Voltage (High Byte)                                      |       |                                |                                |                               |              |            |         |
|                | 18     | Error Code (Low Byte)                                                    |       |                                |                                |                               |              |            |         |
|                | 19     | Error Code (High Byte)                                                   |       |                                |                                |                               |              |            |         |
|                | 20 </> | Parameter F7-33<br>Default: Alarm Code (Low Byte)                        |       |                                |                                |                               |              |            |         |
|                | 21 </> | Parameter F7-33<br>Default: Alarm Code (High Byte)                       |       |                                |                                |                               |              |            |         |
|                | 22 </> | Parameter F7-34<br>Default: Output Power (Low Byte)                      |       |                                |                                |                               |              |            |         |
|                | 23 </> | Parameter F7-34<br>Default: Output Power (High Byte)                     |       |                                |                                |                               |              |            |         |
|                | 24 </> | Parameter F7-35<br>Default: Terminal A2 Input (Low Byte)                 |       |                                |                                |                               |              |            |         |
|                | 25 </> | Parameter F7-35<br>Default: Terminal A2 Input (High Byte)                |       |                                |                                |                               |              |            |         |
|                | 26 </> | Parameter F7-36<br>Default: Terminal S1 to S7 Input (Low Byte)           |       |                                |                                |                               |              |            |         |
|                | 27 </> | Parameter F7-36<br>Default: Terminal S1 to S7 Input (High Byte)          |       |                                |                                |                               |              |            |         |
|                | 28 </> | Parameter F7-37<br>Default: Terminal A3 Input (Low Byte), not supported  |       |                                |                                |                               |              |            |         |
|                | 29 </> | Parameter F7-37<br>Default: Terminal A3 Input (High Byte), not supported |       |                                |                                |                               |              |            |         |
|                | 30 </> | Parameter F7-38<br>Default: PG Counter (Ch2) (Low Byte)                  |       |                                |                                |                               |              |            |         |
|                | 31 </> | Parameter F7-38<br>Default: PG Counter (CH2) (High Byte)                 |       |                                |                                |                               |              |            |         |

## 9 Input Assemblies (Drive Produces)

| Input Instance | Byte   | Bit 7                                                          | Bit 6                    | Bit 5                    | Bit 4                    | Bit 3                    | Bit 2                    | Bit 1                    | Bit 0                    |
|----------------|--------|----------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 166            | 32 <I> | Parameter F7-39<br>Default: NetRef and NetCtrl (Low Byte)      |                          |                          |                          |                          |                          |                          |                          |
|                |        | –                                                              | –                        | –                        | –                        | –                        | –                        | NetCtrl                  | NetRef                   |
|                | 33 <I> | Parameter F7-39<br>Default: NetRef and NetCtrl                 |                          |                          |                          |                          |                          |                          |                          |
|                | 34 <I> | Parameter F7-40<br>Default: Drive Software Version (Low Byte)  |                          |                          |                          |                          |                          |                          |                          |
|                | 35 <I> | Parameter F7-40<br>Default: Drive Software Version (High Byte) |                          |                          |                          |                          |                          |                          |                          |
|                | 36 <I> | Parameter F7-41<br>Default: Not Used                           |                          |                          |                          |                          |                          |                          |                          |
|                | 37 <I> | Parameter F7-33<br>Default: Not Used                           |                          |                          |                          |                          |                          |                          |                          |
|                | 38 <I> | Parameter F7-33<br>Default: Not Used                           |                          |                          |                          |                          |                          |                          |                          |
|                | 39 <I> | Parameter F7-42<br>Default: Not Used                           |                          |                          |                          |                          |                          |                          |                          |
|                | 40     | –                                                              | –                        | –                        | –                        | –                        | –                        | Assy. 116<br>F7-32 Error | Assy. 116<br>F7-31 Error |
|                | 41     | Assy. 116<br>F7-30 Error                                       | Assy. 116<br>F7-29 Error | Assy. 116<br>F7-28 Error | Assy. 116<br>F7-27 Error | Assy. 116<br>F7-26 Error | Assy. 116<br>F7-25 Error | Assy. 116<br>F7-24 Error | Assy. 116<br>F7-23 Error |
|                | 42     | –                                                              | –                        | –                        | –                        | –                        | –                        | Assy. 166<br>F7-42 Error | Assy. 166<br>F7-41 Error |
|                | 43     | Assy. 166<br>F7-40 Error                                       | Assy. 166<br>F7-39 Error | Assy. 166<br>F7-38 Error | Assy. 166<br>F7-37 Error | Assy. 166<br>F7-36 Error | Assy. 166<br>F7-35 Error | Assy. 166<br>F7-34 Error | Assy. 166<br>F7-33 Error |

<I> Selectable with F7-33 to F7-42.

| Parameter   | Data                                                                                                                     |
|-------------|--------------------------------------------------------------------------------------------------------------------------|
| Running     | Running<br>0: Stop<br>1: Forward or Reverse Running                                                                      |
| Zero Speed  | Zero Speed<br>0: Running<br>1: Stop or DC Injection Braking                                                              |
| REV Running | Reverse Running<br>0: Not Reverse Running<br>1: Reverse Running                                                          |
| Fault Reset | Fault Reset command from Network<br>0: Fault Reset command is not from network<br>1: Fault Reset command is from network |
| Speed Agree | Speed Agree<br>0: No Speed Agree<br>1: Speed actual at speed reference                                                   |
| Ready       | Drive Ready<br>0: Not Ready<br>1: Ready                                                                                  |
| Alarm       | Drive Alarm<br>0: No Drive Alarm<br>1: Alarm                                                                             |
| Faulted     | Drive Fault<br>0: No Drive Fault<br>1: Fault                                                                             |
| OPE         | OPE Fault<br>0: No oPE□□ fault<br>1: oPE□□                                                                               |
| Uv          | Under Voltage<br>0: No Under Voltage<br>1: Under Voltage                                                                 |



| Parameter                      | Data                                                                                                                         |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Local/Remote                   | Status of Run command from Network<br>0: Run command is not from Network<br>1: Run Command is from Network                   |
| Multi-Function Digital Output  | Terminal MA/MB<br>0: Terminal MA/MB OFF<br>1: Terminal MA/MB ON                                                              |
| Multi-Function Photo Coupler 1 | Terminal P1<br>0: Terminal P1 OFF<br>1: Terminal P1 ON                                                                       |
| Multi-Function Photo Coupler 2 | Terminal P2<br>0: Terminal P2 OFF<br>1: Terminal P2 ON                                                                       |
| Motor Speed                    | Monitor parameter U1-05                                                                                                      |
| Torque Reference               | Not Supported                                                                                                                |
| PG Count Value                 | Contained MEMOBUS/Modbus Address                                                                                             |
| Frequency Command              | Monitor parameter U1-01                                                                                                      |
| Output Frequency               | Actual Drive Speed<br>Monitors drive output frequency.<br>Unit depends on o1-03.<br>Unit is not affected by Speed Scale SS.  |
| Output Current                 | Actual Output Current<br>Monitors drive output current.<br>Unit is 0.01 A<br>Unit is not affected by Current Scale CS.       |
| Drive Terminal A1 Input        | MEMOBUS/Modbus (0x46)<br>Monitor parameter U1-13                                                                             |
| Main DC Voltage                | Main Circuit DC Voltage<br>Monitor parameter U1-07                                                                           |
| Error Code                     | U2-01 converted using fault code table                                                                                       |
| F7-33 Alarm Code               | Programmable: MEMOBUS/Modbus (0x7F)                                                                                          |
| F7-34 Output Power             | Programmable: MEMOBUS/Modbus (0x47)<br>Monitor parameter U1-08                                                               |
| F7-35 Terminal A2 Input        | Programmable: MEMOBUS/Modbus (0x4F)<br>Monitor parameter U1-14                                                               |
| F7-36 Drive Terminal S1 to S7  | Programmable: Only 1 - 7 available, MEMOBUS/Modbus (0x49)<br>Monitor parameter U1-10                                         |
| F7-37 Terminal A3 Input        | Programmable: MEMOBUS/Modbus (0x50)                                                                                          |
| F7-38 PG Count Value (CH 2)    | Programmable: MEMOBUS/Modbus (0xF1)<br>Serial interface Control Response                                                     |
| F7-39 NetRef (Status)          | Status of reference command from Network<br>0: Reference command is not from network<br>1: Reference command is from network |
| F7-40 Drive Software Version   | Programmable: MEMOBUS/Modbus (0x4D)<br>Monitor parameter U1-25                                                               |

Possible extended error codes are listed in **Table 14** and **Table 15**. If an error occurs, extended error code 0x02 (Register number failure) is usually set.

**Table 14 Extended Error Codes for Assembly 116/166**

| Error Code | Description               |
|------------|---------------------------|
| 0x00       | No Error                  |
| 0x01       | Sub function code failure |
| 0x02       | Register number failure   |
| 0x21       | Limit check error failure |
| 0x22       | Write failure             |
| 0x23       | Write failure at Uv       |
| 0x24       | Write failure at busy     |

**Table 15 Extended Error Codes in Class 0x04 Instance 0xA6 Attribute 0x64**

| Dynamic Parameter | Byte Containing Extended Error Code |
|-------------------|-------------------------------------|
| F7-23             | Byte 0                              |
| F7-24             | Byte 1                              |
| F7-25             | Byte 2                              |
| F7-26             | Byte 3                              |
| F7-27             | Byte 4                              |
| F7-28             | Byte 5                              |
| F7-29             | Byte 6                              |
| F7-30             | Byte 7                              |
| F7-31             | Byte 8                              |
| F7-32             | Byte 9                              |
| F7-33             | Byte 10                             |
| F7-34             | Byte 11                             |
| F7-35             | Byte 12                             |
| F7-36             | Byte 13                             |
| F7-37             | Byte 14                             |
| F7-38             | Byte 15                             |
| F7-39             | Byte 16                             |
| F7-40             | Byte 17                             |
| F7-41             | Byte 18                             |
| F7-42             | Byte 19                             |

## 10 General Class Objects

### ◆ Identity Object 1 (Class 0x01)

#### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 01                     | Get Attribute All    |
| 05                     | Reset                |
| 0E                     | Get Attribute Single |

#### ■ Attributes Supported

| Instance ID | Attribute | Name                     | Description                                                                    | Get | Set | Size                 | Range | Default                             |
|-------------|-----------|--------------------------|--------------------------------------------------------------------------------|-----|-----|----------------------|-------|-------------------------------------|
| 0           | 1         | Object Software Revision | Identity Object software revision                                              | O   | –   | Word                 | –     | 1                                   |
| 1           | 1         | Vendor ID                | Manufacturer code.<br>44 (2C H): Yaskawa Electric                              | O   | –   | Word                 | –     | 44 (Yaskawa)                        |
| 1           | 2         | Device Type              | Device profile.<br>The profile for this product is an AC drive.<br>2: AC drive | O   | –   | Word                 | –     | 2 (AC drives)                       |
| 1           | 3         | Product Code             | Product codes determined by the manufacturer.                                  | O   | –   | Word                 | –     | <I>                                 |
| 1           | 4         | Revision                 | Software revision for the option.                                              | O   | –   | Word                 | –     | Depends on software                 |
| 1           | 5         | Status                   | Shows the communication status for the drive.                                  | O   | –   | Word                 | –     | 0                                   |
| 1           | 6         | Serial Number            | Option serial number.                                                          | O   | –   | Long                 | –     | Each unit is unique                 |
| 1           | 7         | Product Name             | Product Name                                                                   | O   | –   | String<br>(14 Bytes) | –     | Product dependent<br>(i.e., CIMR-□) |
| 1           | 8         | State                    | Operation status of the drive.<br>3: Drive ready<br>4: Fault                   | O   | –   | Byte                 | –     | State of the Drive                  |

<I> Product code is 2 Bytes. The first Byte is the drive type and the second Byte is the model number of the drive.

### ◆ Assembly Object 4 (Class 0x04)

#### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |

#### ■ Attributes Supported

| Instance ID | Attribute | Name                     | Description                                                              | Get | Set | Size          | Range | Default           |
|-------------|-----------|--------------------------|--------------------------------------------------------------------------|-----|-----|---------------|-------|-------------------|
| 0           | 1         | Object Software Revision | Show the EtherNet Object software revision.                              | O   | –   | Word          | –     | 2                 |
| 20          | 3         | Data                     | Same function as the Basic Speed Control (Output Assembly)               | O   | O   | Array 4 Bytes | –     | 00 00 00 00       |
| 21          | 3         | Data                     | Same function as the Extended Speed Control (Output Assembly)            | O   | O   | Array 4 Bytes | –     | 00 00 00 00       |
| 22          | 3         | Data                     | Same function as the Speed and Torque Control (Output Assembly)          | O   | O   | Array 6 Bytes | –     | 00 00 00 00 00 00 |
| 23          | 3         | Data                     | Same function as the Extended Speed and Torque Control (Output Assembly) | O   | O   | Array 6 Bytes | –     | 00 00 00 00 00 00 |

[illegible]

## ■ 問題 9

[illegible]

## ◆ Control Supervisor Object 41 (Class 0x29)

### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |
| 05                     | Reset                |

### ■ Attributes Supported

| Instance ID | Attribute | Name                        | Description                                                                                                                                     | Get | Set | Size | Range | Default |
|-------------|-----------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|-------|---------|
| 0           | 1         | Object Software Revision    | Revision number of the Control Supervisor Object.                                                                                               | O   | –   | Word | –     | 1       |
| 1           | 3         | Run 1 (Forward Run Command) | Forward Running<br>0: Stop<br>1: Forward Running                                                                                                | O   | O   | Byte | 0,1   | 0       |
| 1           | 4         | Run 2 (Reverse Run Command) | Reverse Running<br>0: Stop<br>1: Reverse Running                                                                                                | O   | O   | Byte | 0,1   | 0       |
| 1           | 5         | NetCtrl (Command)           | Run command from Network<br>0: Depends on b1-02<br>1: Enables the run command from network                                                      | O   | O   | Byte | 0,1   | 0       |
| 1           | 6         | State                       | Drive Status.<br>2: Not Ready<br>3: Ready (Stopped)<br>4: Enabled (Run command present)<br>5: Deceleration to Stop<br>6: Fault Stop<br>7: Fault | O   | –   | Byte | –     | 3       |
| 1           | 7         | Running 1 (FWD)             | Forward Running<br>0: Stop<br>1: Forward Running                                                                                                | O   | –   | Byte | –     | 0       |
| 1           | 8         | Running 1 (REV)             | Reverse Running<br>0: Stop<br>1: Reverse Running                                                                                                | O   | –   | Byte | –     | 0       |
| 1           | 9         | Ready                       | Drive Ready<br>0: Not Ready<br>1: Ready                                                                                                         | O   | –   | Byte | –     | 1       |
| 1           | 10        | Faulted                     | Drive Fault<br>0: No Drive Fault<br>1: Fault                                                                                                    | O   | –   | Byte | –     | 0       |
| 1           | 11        | Warning                     | Warning<br>0: No Warning<br>1: Warning                                                                                                          | O   | –   | Byte | –     | 0       |
| 1           | 12        | Fault Reset                 | Fault Reset<br>0: No Fault Reset<br>1: Fault Reset                                                                                              | O   | O   | Byte | 0,1   | 0       |
| 1           | 13        | Fault Code                  | Current Fault Refer to Option Fault Code Conversion Table for details                                                                           | O   | –   | Word | –     | 0000    |
| 1           | 15        | Control from Net (Status)   | Run Command from the option<br>0: The run command is not from the option<br>1: Enables the run command from option                              | O   | –   | Byte | –     | 0       |
| 1           | 16        | NetFaultMode                | Normal 2 (Vendor Specific)                                                                                                                      | O   | –   | Byte | –     | 2       |
| 1           | 17        | Force Fault                 | External Fault<br>0: No External Fault<br>1: External Fault (EF0)<br>Triggered by the rising edge of the signal.                                | O   | O   | Byte | 0,1   | 0       |

## 10 General Class Objects

| Instance ID | Attribute | Name        | Description                                                                                                             | Get | Set | Size | Range | Default |
|-------------|-----------|-------------|-------------------------------------------------------------------------------------------------------------------------|-----|-----|------|-------|---------|
| 1           | 18        | ForceStatus | External Fault status<br>0: No External Fault<br>1: External Fault (EF0)<br>Triggered by the rising edge of the signal. | 0   | –   | Byte | –     | 0       |

### ■ Option Fault Code Conversion Table

| Drive Fault Code (Hex)<br>(MEMOBUS/Modbus 0080 Hex) | Option Fault Code (hex) | Description                              |
|-----------------------------------------------------|-------------------------|------------------------------------------|
| 2                                                   | 3220                    | DC Bus Undervolt (Uv1)                   |
| 3                                                   | 5110                    | CTL PS Undervolt (Uv2)                   |
| 4                                                   | 3222                    | MC Answerback (Uv3)                      |
| 5                                                   | 2130                    | Short Circuit (SC)                       |
| 6                                                   | 2120                    | Ground Fault (GF)                        |
| 7                                                   | 2300                    | Over Current (oC)                        |
| 8                                                   | 3210                    | DC Bus Overvolt (ov)                     |
| 9                                                   | 4200                    | Heatsink Overtemp (oH)                   |
| 10                                                  | 4210                    | Heatsink Max Temp (oH1)                  |
| 11                                                  | 2220                    | Motor Overload (oL1)                     |
| 12                                                  | 2200                    | Drive Overload (oL2)                     |
| 13                                                  | 2221                    | Overtorque Det 1 (oL3)                   |
| 14                                                  | 2222                    | Overtorque Det 2 (oL4)                   |
| 15                                                  | 7110                    | DynBrk Transistor (rr)                   |
| 16                                                  | 7112                    | DynBrk Resistor (rH)                     |
| 17                                                  | 9000                    | External Fault 3 (EF3)                   |
| 18                                                  | 9000                    | External Fault 4 (EF4)                   |
| 19                                                  | 9000                    | External Fault 5 (EF5)                   |
| 20                                                  | 9000                    | External Fault 6 (EF6)                   |
| 21                                                  | 9000                    | External Fault 7 (EF7)                   |
| 27                                                  | 3130                    | Input Phase Loss (PF)                    |
| 28                                                  | 3130                    | Output Phase Loss (LF)                   |
| 29                                                  | 5210                    | Motor Overheat 1 (PTC Input) (oH3)       |
| 30                                                  | 5300                    | Operator Disconnected (oPr)              |
| 31                                                  | 6320                    | EEPROM R/W Error (Err)                   |
| 32                                                  | 3210                    | Motor OverHeat 2 (PTC Input) (oH4)       |
| 33                                                  | 7500                    | MEMBOUS/Modbus Com Fault (CE)            |
| 34                                                  | 7500                    | EtherNet/IP Communication Error (bUS)    |
| 37                                                  | 8321                    | Out of Control (CF)                      |
| 39                                                  | 9000                    | External Fault 0 (EF0)                   |
| 40                                                  | 8000                    | PID Feedback Loss (FbL)                  |
| 41                                                  | 8000                    | Undertorque Detection 1 (UL3)            |
| 42                                                  | 8000                    | Undertorque Detection 2 (UL4)            |
| 43                                                  | 8000                    | High Slip Braking oL (oL7)               |
| 54                                                  | 8000                    | Current Imbalance (LF2)                  |
| 55                                                  | 8000                    | Pull-Out Detection (STo)                 |
| 59                                                  | 1000                    | Too Many Speed Search Restarts (SEr)     |
| 65                                                  | 8000                    | Excessive PID Feedback (FbH)             |
| 66                                                  | 9000                    | External Fault (input terminal S1) (EF1) |
| 67                                                  | 9000                    | External Fault (input terminal S2) (EF2) |
| 68                                                  | 8000                    | Mechanical Weakening Detection 1 (oL5)   |
| 69                                                  | 8000                    | Mechanical Weakening Detection 2 (UL5)   |
| 70                                                  | 5000                    | Current Offset Fault (CoF)               |
| 73                                                  | 8000                    | DriveWorksEZ Fault (dwFL)                |
| –                                                   | 1000                    | Other faults                             |

## ◆ AC/DC Drive Object 42 (Class 0x2A)

### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |

### ■ Attributes Supported

| Instance ID | Attribute | Name                                  | Description                                                                                                                                                                                      | Get | Set | Size | Range     | Default             |
|-------------|-----------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|-----------|---------------------|
| 0           | 1         | Object Software Revision              | Revision number of AC/DC drive object                                                                                                                                                            | O   | –   | Word | –         | 1                   |
| 1           | 3         | AtReference                           | Speed Agree<br>0: –<br>1: Speed Agree                                                                                                                                                            | O   | –   | Byte | –         | 0                   |
| 1           | 4         | NetRef (Command)                      | Status of reference command from EtherNet/IP<br>0: Reference command not from option<br>1: Reference command from the option                                                                     | O   | O   | Byte | –         | 0                   |
| 1           | 6         | Drive Mode                            | Drive control mode.<br>0: V/f<br>1: OLV<br>2: OLV for PM (Read Only)                                                                                                                             | O   | O   | Byte | 0 to 2    | 0                   |
| 1           | 7         | Speed Actual                          | Actual drive speed.<br>Unit is not affected by Speed Scale (SS).                                                                                                                                 | O   | –   | Word | –         | 3                   |
| 1           | 8         | Speed Reference                       | Frequency Reference.<br>Monitors the drive's frequency reference.<br>Unit is not affected by Speed Scale (SS).                                                                                   | O   | O   | Word | –         | 0                   |
| 1           | 9         | Current Actual                        | Actual Output Current.<br>Unit is 0.01 A for drives set up to 11 kW in Heavy Duty or Normal Duty and 0.1 A for drives set up for 15 kW and above.<br>Unit is not affected by Current Scale (CS). | O   | –   | Word | –         | 0                   |
| 1           | 11        | Torque Actual                         | Not supported                                                                                                                                                                                    | O   | –   | Word | –         | 0                   |
| 1           | 12        | Torque References                     | Not supported                                                                                                                                                                                    | O   | –   | Word | –         | 0                   |
| 1           | 15        | Power Actual (W)                      | Drive Output Power Unit is affected by Power Scale (PS).                                                                                                                                         | O   | –   | Word | –         | 0                   |
| 1           | 16        | Input Voltage (V)                     | Drive Input Voltage<br>Unit is affected by Voltage Scale (VS).                                                                                                                                   | O   | –   | Word | –         | Depends on Capacity |
| 1           | 17        | Output Voltage (V)                    | Drive Output Voltage<br>Unit is affected by Voltage Scale (VS).                                                                                                                                  | O   | –   | Word | –         | 0                   |
| 1           | 18        | Accel Time (ms)                       | Acceleration Time 1 (C1-01)<br>Units set in parameter C1-10.<br>Unit is affected by Time Scale (TS).                                                                                             | O   | O   | Word | –         | 2710H               |
| 1           | 19        | Decel Time (ms)                       | Acceleration Time 1 (C1-02)<br>Units set in parameter C1-10.<br>Unit is affected by Time Scale (TS).                                                                                             | O   | O   | Word | –         | 2710H               |
| 1           | 20        | Low Speed Limit Percent of Max Speed  | Frequency Reference Lower Limit (d2-02)                                                                                                                                                          | O   | O   | Word | 0 to 1100 | 0                   |
| 1           | 21        | High Speed Limit Percent of Max Speed | Frequency Reference Upper Limit (d2-01)                                                                                                                                                          | O   | O   | Word | 0 to 1100 | 3E8H                |
| 1           | 22        | Speed Scale (-15 to 15)               | Setting for F7-17, scale of units for speed related data.                                                                                                                                        | O   | O   | Byte | -15 to 15 | 0                   |
| 1           | 23        | Current Scale (-15 to 15)             | Setting for F7-18, scale of units for current related data.                                                                                                                                      | O   | O   | Byte | -15 to 15 | 0                   |
| 1           | 24        | Torque Scale (-15 to 15)              | Setting for F7-19, scale of units for torque related data.                                                                                                                                       | O   | O   | Byte | -15 to 15 | 0                   |
| 1           | 26        | Power Scale (-15 to 15)               | Setting for F7-20, scale of units for power related data.                                                                                                                                        | O   | O   | Byte | -15 to 15 | 0                   |

## 10 General Class Objects

| Instance ID | Attribute | Name                        | Description                                                                                                 | Get | Set | Size | Range     | Default |
|-------------|-----------|-----------------------------|-------------------------------------------------------------------------------------------------------------|-----|-----|------|-----------|---------|
| 1           | 27        | Voltage Scale (-15 to 15)   | Setting for F7-21, scale of units for voltage related data.                                                 | O   | O   | Byte | -15 to 15 | 0       |
| 1           | 28        | Time Scale (-15 to 15)      | Setting for F7-22, scale of units for speed related data                                                    | O   | O   | Byte | -15 to 15 | 0       |
| 1           | 29        | Reference from Net (Status) | Status of Reference Command (1 = Network).<br>0: As set by the drive parameters (i.e., b1-01)<br>1: Network | O   | –   | Byte | –         | 0       |

### ◆ TCP/IP Object 245 (Class 0xF5)

#### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 01                     | Get Attribute All    |
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |

#### ■ Attributes Supported

| Instance ID | Attribute | Name                     | Description                                                                                                                                                                                                                                                                                    | Get | Set | Size   | Range         | Default                    |
|-------------|-----------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--------|---------------|----------------------------|
| 0           | 1         | Object Software Revision | Revision number of the TCP/IP Object                                                                                                                                                                                                                                                           | O   | –   | Word   | –             | 1                          |
| 1           | 1         | Status                   | Bits 0-3 = Interface Status<br>0: Interface has not been configured<br>1: Interface Configuration is valid, obtained from BOOTP, DHCP, or NVRAM<br>2: Interface Configuration is valid and obtained from hardware settings<br>3: Reserved<br>Bit 4 = Multicast Pending<br>Bits 5-31 = Reserved | O   | –   | DWord  | –             | –                          |
| 1           | 2         | Configuration Capability | Bit 0 = BOOTP Client<br>Bit 1 = DNS Client<br>Bit 2 = DHCP Client<br>Bit 3 = DHCP-DNS Update<br>Bit 4 = Configuration Settable<br>Bits 5-31 = Reserved                                                                                                                                         | O   | –   | DWord  | –             | –                          |
| 1           | 3         | Configuration Control    | Bits 0-3 = Startup Configuration<br>0: NVRAM<br>1: BOOTP<br>2: DHCP<br>3: Reserved<br>Bit 4 = DNS Enabled (not supported)<br>Bits 5-31 = Reserved                                                                                                                                              | O   | O   | DWord  | –             | –                          |
| 1           | 4         | Physical Link            | Struct of:<br>Path Size: Word<br>Path: EPATH                                                                                                                                                                                                                                                   | O   | –   | Struct | –             | 02H 00H 20H<br>F6H 24H 01H |
| 1           | 5         | Interface Configuration  | Struct of:<br>IP Address = Long<br>Subnet Mask = Long<br>Gateway Address = Long<br>Name Server1 = Long<br>Name Server2 = Long<br>Domain Name = STRING                                                                                                                                          | O   | O   | Struct | –             | –                          |
| 1           | 6         | Host Name                | Host Name                                                                                                                                                                                                                                                                                      | O   | O   | STRING | 64 Characters | Null                       |

**Note:** “Get Attributes All” Service shall report in attribute ascending order.



## ◆ Ethernet Link Object 246 (Class 0xF6)

### ■ Services Supported

| Service Code No. (H) | Service Name         |
|----------------------|----------------------|
| 01                   | Get Attribute All    |
| 0E                   | Get Attribute Single |
| 10                   | Set Attribute Single |

### ■ Attributes Supported

| Instance ID | Attribute | Name                     | Name                                                                                                                                                                                                                                                                                                               | Get | Set | Size             | Range | Default |
|-------------|-----------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------------------|-------|---------|
| 0           | 1         | Object Software Revision | Revision number of the Ethernet Link Object                                                                                                                                                                                                                                                                        | O   | –   | Word             | –     | 3       |
| 1           | 1         | Interface Speed          | Interface speed currently in use                                                                                                                                                                                                                                                                                   | O   | –   | UDINT            | –     | –       |
| 1           | 2         | Interface Flags          | Bit 0 = Link Status<br>Bit 1 = Duplex (0: Half/1: Full)<br>Bits 2-4 = Negotiation Status<br>0: In progress<br>1: Auto-negotiate failed<br>2: Speed found, duplex not found<br>3: Successful<br>4: Not attempted<br>Bit 5 = Manual Setting requires restart<br>Bit 6 = Local hardware fault<br>Bits 7-31 = Reserved | O   | –   | DWord            | –     | –       |
| 1           | 3         | Physical Address (MAC)   | MAC address                                                                                                                                                                                                                                                                                                        | O   | –   | Array of 6 Bytes | –     | –       |
| 1           | 6         | Interface Control        | Struct of:<br>Control Bits: Word<br>Bit 0 = Auto-negotiate<br>Bit 1 = Forced Duplex Mode<br>Bits 2-15 = Reserved<br>Forced Int Speed: Word                                                                                                                                                                         | –   | O   | Struct           | –     | –       |

**Note:** “Get Attributes All” Service shall report in attribute ascending order.

## 11 Vendor-Specific (Yaskawa) Class Objects

### ◆ Yaskawa Drive Parameters Object 100 (Class 0x64)

#### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |

This is a dynamic explicit Class Object. With this Class object any drive parameter with a MEMOBUS/Modbus address greater than 0x00FF can be accessed. The mapping of Class Object instance/attribute to MEMOBUS/Modbus address is as follows.

Given a typical MEMOBUS/Modbus Address of 0xXXYY

The EtherNet/IP Instance value is equal to XX

The EtherNet/IP Attribute value is equal to YY

As an example, to access parameter b5-12 (MEMOBUS/Modbus Address =0x01B0)

Class Object is 100 (0x64) (Always for this Class Object)

Instance = 0x01

Attribute = 0xB0

#### ■ Storing Changed Parameters

Writing a zero to 0x0900 (Enter) stores changed parameters to the non-volatile memory of the drive. Writing a 0 to 0x0910 (Accept) allows the drive to use the changed parameters. Reading Enter Command 0x0900 or Accept Command 0x910 will always return a value of 0x0001.

#### Performing a RAM-ENTER to Store Register Data

Parameter H5-11 is used to decide whether a RAM-ENTER will be done on the writes to registers in the drive. If H5-11 = 1 (default), the option will issue the RAM-ENTER with the parameter writes. If H5-11 = 0, no RAM-ENTER is issued and an ENTER command must be explicitly sent by the user for the parameter to be activated after a write.

Explicit writes to RAM-ENTER (0x910) and ROM-ENTER (0x900) are handled as special cases. If a user writes a 0 to RAM-ENTER or ROM-ENTER, the command will be executed in the drive. If a user writes a 1 to those registers, the command will not be executed but returns a success to the explicit write on the network. Writing a value other than 0 or 1 will result in an error response of Invalid Attribute Value on the network.

**Note:** Performing the RAM-ENTER increases the processing time of the writes and increases the response time to explicit writes.

## ■ Attributes Supported

| Instance ID | Attribute | Name                                      | Description                                       | Get | Set | Size | Range  | Default |
|-------------|-----------|-------------------------------------------|---------------------------------------------------|-----|-----|------|--------|---------|
| 0           | 1         | Object Software Revision                  | Yaskawa Drive Parameters object software revision | O   | –   | Word | –      | 1       |
| 1           | 00        | MEMOBUS/Modbus Register 0x0100            | Language selection                                | O   | O   | Word | 0 to 7 | 1       |
| 1           | 01        | MEMOBUS/Modbus Register 0x0101            | Parameter access level                            | O   | O   | Word | 0 to 2 | 2       |
| 1           | YY        | MEMOBUS/Modbus Registers 0x0100 to 0x01FF | MEMOBUS/Modbus Registers 0x0100 to 0x01FF         | O   | O   | Word | –      | –       |
| 2           | YY        | MEMOBUS/Modbus Registers 0x0200 to 0x02FF | MEMOBUS/Modbus Registers 0x0200 to 0x02FF         | O   | O   | Word | –      | –       |
| ...         | ...       | ...                                       | ...                                               | ... | O   | Word | –      | –       |
| 255         | YY        | MEMOBUS/Modbus Registers 0xFF00 to 0xFFFF | MEMOBUS/Modbus Registers 0xFF00 to 0xFFFF         | O   | O   | Word | –      | –       |

- Note:**
1. Attempting to set a read-only parameter results in a EtherNet/IP error code of 0x0E, Attribute Not Settable.
  2. Attempting to access an invalid parameter results in a EtherNet/IP error code of 0x09, Invalid Attribute Value.
  3. Refer to the MEMOBUS/Modbus Data Table in Appendix C of the drive Technical Manual for a list of monitor data using the MEMOBUS/Modbus message area.

## ◆ Yaskawa Monitor/Control Object 125 (Class 0x7D)

### ■ Services Supported

| Service Code No. (hex) | Service Name         |
|------------------------|----------------------|
| 0E                     | Get Attribute Single |
| 10                     | Set Attribute Single |

This is a dynamic explicit Class Object. With this Class object any parameter with a MEMOBUS/Modbus address less than 0x0100 can be accessed. This class is similar to the Drive Parameters Object Class 100, Object Class 100 differs slightly from Object Class 125. In Object Class 125 the most significant byte of MEMOBUS/Modbus address is always zero and the Instance ID remains at 1.

Given a typical MEMOBUS/Modbus Address of 0x00YY

The EtherNet/IP Instance value is equal to 0x01

The EtherNet/IP Attribute value is equal to YY

As an example, to access Drive Status (MEMOBUS/Modbus Address = 0x002C)

Class Object is 125 (0x7D) (Always for this Class Object)

Instance = 0x01

Attribute = 0x2C

### ■ Attributes Supported

| Instance ID | Attribute | MEMOBUS/Modbus Address | Description              | Get | Set | Size | Range | Default |
|-------------|-----------|------------------------|--------------------------|-----|-----|------|-------|---------|
| 0           | 1         | –                      | Object Software Revision | O   | –   | Word | –     | 1       |
| 1           | 1         | 0x0001                 | Drive Command Bits       | O   | O   | Word | –     | 0       |
| 1           | 2         | 0x0002                 | Frequency Instruction    | O   | O   | Word | –     | 4       |
| ..          | ..        | ..                     | ..                       | O   | O   | Word | –     | –       |
| 1           | 255       | 0x00FF                 | Unused                   | O   | O   | Word | –     | –       |

- Note:**
1. Attempting to set a read-only parameter results in a EtherNet/IP error code of 0x0E, Attribute Not Settable.
  2. Attempting to access an invalid parameter results in a EtherNet/IP error code of 0x09, Invalid Attribute Value.
  3. Refer to the MEMOBUS/Modbus Data Table in Appendix C of the drive Technical Manual for a list of monitor data using the MEMOBUS/Modbus message area.

# 12 Web Interface

The web server interface to the option allows management of diagnostic information through a standard web browser. The embedded web pages include:

- Main page (Information)
- Drive Status page (Status, Monitor and Fault History)
- Network Monitor page (Network Monitor)

## ◆ Main Page (information)

The embedded main page shows basic option information such as vendor ID, serial number, MAC address, and firmware version. This page also shows the status of the option and provides links to the other embedded web pages.

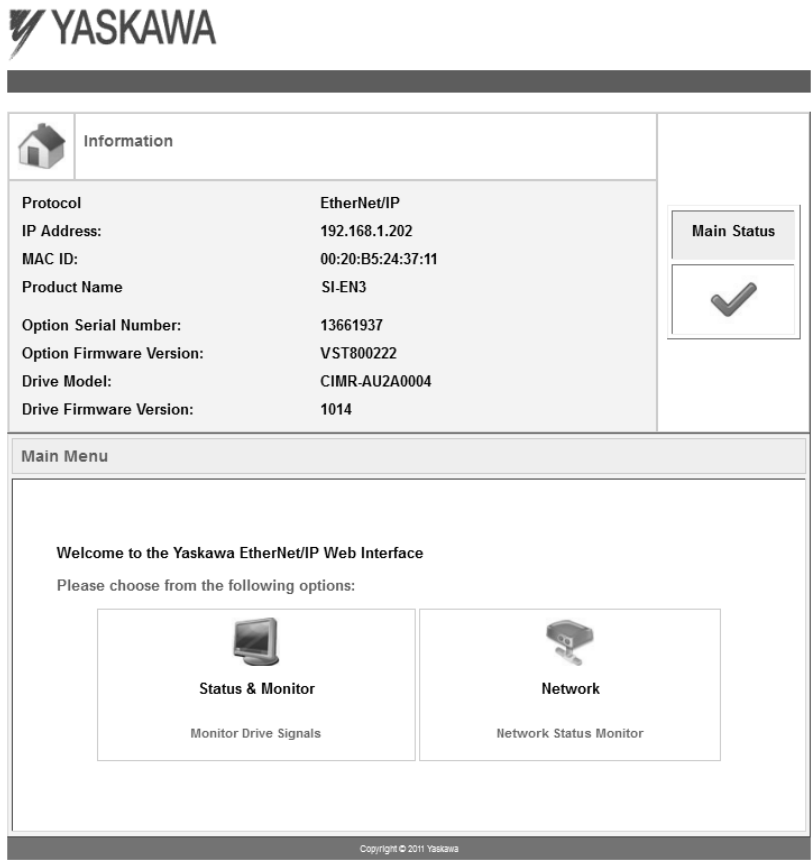


Figure 21 Main Page View

## ◆ Drive Status Page (Status, Monitor and Fault History)

The embedded drive status page shows basic I/O information and drive state information.

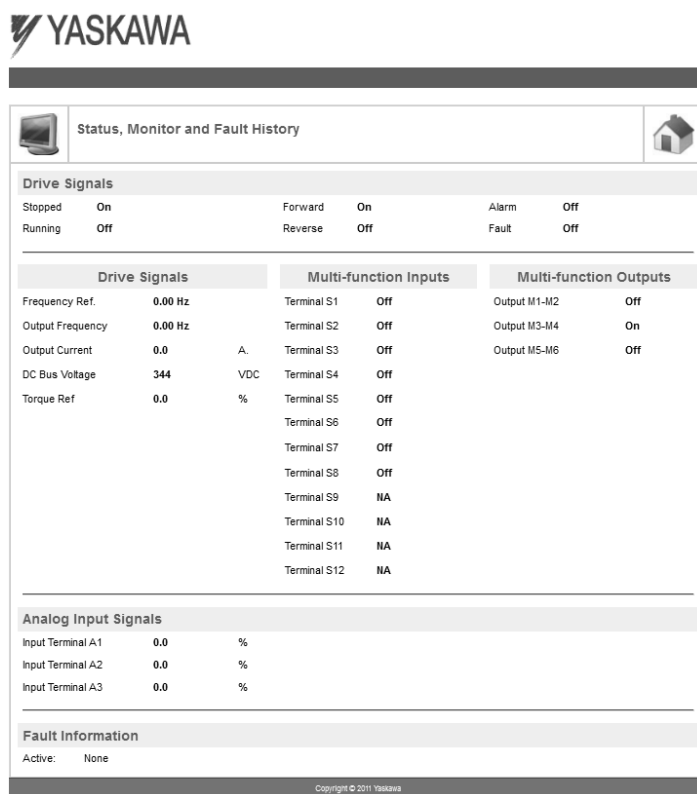


Figure 22 Drive Status Page View

## ◆ Network Monitor Page (Network Monitor)

The embedded network monitor page shows the status of the option network traffic and open I/O connections.



Figure 23 Network Monitor Page View

Table 16 Network Monitor Explanations

| Network Monitor              | Explanation                                                                                                                                             |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Msg Tx OK                    | Cumulative number of messages transmit successfully from the option.                                                                                    |
| Msg Rx OK                    | Cumulative number of messages received successfully to the option.                                                                                      |
| Current Connections          | Current number of open connections.                                                                                                                     |
| Msg Tx Dropped               | Cumulative number of messages dropped due to output network buffer being full and unable to hold the new message.                                       |
| Msg Rx Dropped               | Cumulative number of messages dropped due to input network buffer being full and unable to hold the new message.                                        |
| Collisions                   | Cumulative number of collisions.                                                                                                                        |
| Msg Tx Errors                | Cumulative number of transmit errors.                                                                                                                   |
| Msg Rx Errors                | Cumulative number of receive errors.                                                                                                                    |
| Tx Retry                     | Cumulative number of transmit errors.                                                                                                                   |
| Originator IP Address        | The IP address of the network node making this connection.                                                                                              |
| Time out Multiplier          | The value here specifies the multiplier applied to the expected packet rate (API) to obtain the value used by the inactivity timer for this connection. |
| O2T_RPI                      | Originator to Target (ie, PLC to SI-EN3/V) Requested Packet Interval for I/O messaging, in milliseconds, for this connection.                           |
| O2T_API                      | Originator to Target (ie, PLC to SI-EN3/V) Actual Packet Interval for I/O messaging, in milliseconds, for this connection.                              |
| Consume Msg Cnt              | Number of I/O messages consumed (ie, received) from the SI-EN3/V since the connection was established or statistics were reset for this connection.     |
| T20_RPI                      | Target to Originator (ie, SI-EN3/V to PLC) Requested Packet Interval for I/O messaging, in milliseconds, for this connection.                           |
| T20_API                      | Target to Originator (ie, SI-EN3/V to PLC) Actual Packet Interval for I/O messages, in milliseconds, for this connection.                               |
| Produce Msg Cnt              | Number of IO messages produced (ie, transmit) from the SI-EN3/V since the connection was established or statistics were reset for this connection.      |
| Reset Statistics Connection1 | Clicking this resets the Consume Msg Cnt and the Produce Msg Cnt for this connection to start counting from zero.                                       |

**Note:** Network monitors are reset when the power supply is cycled.

## 13 Troubleshooting

### ◆ Drive-Side Error Codes

Drive-side error codes appear on the drive digital operator. Causes of the errors and corrective actions are listed in *Table 17*. For additional error codes that may appear on the drive digital operator, refer to the drive Technical Manual.

#### ■ Faults

Both bUS (option communication error) and EF0 (External fault input from the option) can appear as an alarm or as a fault. When a fault occurs, the digital operator ALM LED remains lit. When an alarm occurs, the ALM LED flashes.

If communication stops while the drive is running, use the following questions as a guide to help remedy the fault:

- Is the option properly installed?
- Is the communication line properly connected to the option? Is it loose?
- Is the controller program working? Has the controller/PLC CPU stopped?
- Did a momentary power loss interrupt communications?

**Table 17 Fault Display and Possible Solutions**

| LED Operator Display                              |     | Fault Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| bUS                                               | bUS | Option Communication Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                   |     | <ul style="list-style-type: none"><li>• After establishing initial communication, the connection was lost</li><li>• Only detected when the run command or frequency reference is assigned to the option (b1-01 = 3 or b1-02 = 3)</li></ul>                                                                                                                                                                                                                                                                                                 |
| Cause                                             |     | Possible Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Master controller (PLC) has stopped communicating |     | <ul style="list-style-type: none"><li>• Check that power is supplied to the PLC</li><li>• Check that PLC is not in program mode</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                  |
| Communication cable is not connected properly     |     | <ul style="list-style-type: none"><li>• Check for faulty wiring</li><li>• Correct any wiring problems</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A data error occurred due to noise                |     | <ul style="list-style-type: none"><li>• Inspect items that can minimize the effects of electrical noise</li><li>• Counteract noise in the control circuit, main circuit, and ground wiring</li><li>• If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil</li><li>• Make sure the cable used meets the EtherNet/IP requirements</li><li>• Make sure the option ground wire is connected between option FE terminal and the drive ground terminal connected to earth ground</li></ul> |
| Option is damaged                                 |     | If there are no problems with the wiring and the error continues to occur, replace the option.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Connection Time-out                               |     | <ul style="list-style-type: none"><li>• The option Requested Packet Interval (RPI) timer timed out</li><li>• Make sure that RPI time is set properly</li></ul>                                                                                                                                                                                                                                                                                                                                                                             |
| Duplicate IP Address                              |     | Check if the option shares IP Address with at least one other node.<br>Check the setting values of F7-01 to F7-04.                                                                                                                                                                                                                                                                                                                                                                                                                         |

| LED Operator Display                                            |     | Fault Name                                                                                                                                                                                    |
|-----------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EF0                                                             | EF0 | Option Card External Fault                                                                                                                                                                    |
|                                                                 |     | The alarm function for an external device has been triggered.                                                                                                                                 |
| Cause                                                           |     | Corrective Action                                                                                                                                                                             |
| An external fault is being sent from the upper controller (PLC) |     | <ul style="list-style-type: none"><li>• Remove the cause of the external fault</li><li>• Reset the external fault input from the PLC device</li></ul>                                         |
| Problem with the PLC program                                    |     | Check the program used by the PLC and make the appropriate corrections.                                                                                                                       |
| PLC is in the Idle Mode.                                        |     | <ul style="list-style-type: none"><li>• Set the PLC to the Run Mode.</li><li>• Set the drive parameter F6-54 to 0 (Enabled) not to detect errors while the PLC is in the Idle Mode.</li></ul> |

| LED Operator Display                         |       | Fault Name                                           |
|----------------------------------------------|-------|------------------------------------------------------|
| oFA00                                        | oFA00 | Option Card Fault                                    |
|                                              |       | Option is not properly connected.                    |
| Cause                                        |       | Possible Solution                                    |
| Non-compatible option connected to the drive |       | Connect an option that is compatible with the drive. |

## 13 Troubleshooting

| LED Operator Display                                     |       | Fault Name                                                                |
|----------------------------------------------------------|-------|---------------------------------------------------------------------------|
| oFRO1                                                    | oFA01 | Option Card Fault                                                         |
|                                                          |       | Option is not properly connected.                                         |
| Cause                                                    |       | Possible Solution                                                         |
| Problem with the connectors between the drive and option |       | Turn the power off and check the connectors between the drive and option. |

| LED Operator Display  |       | Fault Name                     |
|-----------------------|-------|--------------------------------|
| oFA03                 | oFA03 | Option Card Fault              |
|                       |       | Option self-diagnostics error. |
| Cause                 |       | Possible Solution              |
| Option hardware fault |       | Replace the option.            |

| LED Operator Display  |       | Fault Name               |
|-----------------------|-------|--------------------------|
| oF804                 | oFA04 | Option Card Fault        |
|                       |       | Option flash write mode. |
| Cause                 |       | Possible Solution        |
| Option hardware fault |       | Replace the option.      |

| LED Operator Display  |                | Fault Name              |
|-----------------------|----------------|-------------------------|
| oFA30<br>to<br>oFA43  | oFA30 to oFA43 | Option Card Fault       |
|                       |                | Communication ID error. |
| Cause                 |                | Possible Solution       |
| Option hardware fault |                | Replace the option.     |

### ■ Minor Faults and Alarms

| LED Operator Display                                                              |      | Minor Fault Name                                                                                                                                       |                             |
|-----------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| CALL                                                                              | CALL | Serial communication transmission error                                                                                                                |                             |
|                                                                                   |      | Communication is not established.                                                                                                                      |                             |
| Cause                                                                             |      | Possible Solution                                                                                                                                      | Minor Fault<br>(H2-□□ = 10) |
| Communication wiring is faulty, there is a short circuit, or improper connection. |      | Check for wiring errors: <ul style="list-style-type: none"><li>• Correct the wiring</li><li>• Remove ground shorts and reconnect loose wires</li></ul> | YES                         |
| Programming error on the master side.                                             |      | Check communications at start-up and correct programming errors.                                                                                       |                             |
| Communication circuitry is damaged.                                               |      | <ul style="list-style-type: none"><li>• Perform a self-diagnostics check</li><li>• Replace the drive if the fault continues to occur</li></ul>         |                             |



## ■ Explicit Message Communications Errors

When there is a problem with a request message sent from the master in explicit communications, the drive will return one of the following error codes.

| Error Code (hex) | Description             | Cause                                                                                                                                                                 | Possible Solution                                            |
|------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 08               | Service not supported   | The service code is incorrect.                                                                                                                                        | Correct the service code.                                    |
| 09               | Invalid attribute value | The attribute is incorrect.                                                                                                                                           | Correct the attribute.                                       |
| 0C               | Object state conflict   | Attempted to change an drive constant that cannot be changed while the drive is running.                                                                              | Stop the drive.                                              |
| 0E               | Attribute not settable  | Attempted to change a read-only attribute.                                                                                                                            | Correct the service code or attribute setting.               |
| 13               | Not enough data         | The data size is incorrect.                                                                                                                                           | Correct the data size.                                       |
| 14               | Attribute not supported | Attempted to execute a service not defined for the attribute.                                                                                                         | Correct the service code or attribute setting.               |
| 15               | Too much data           | The data size is incorrect.                                                                                                                                           | Correct the data size.                                       |
| 16               | Object does not exist   | An unsupported object was specified.                                                                                                                                  | Correct the class or instance setting.                       |
| 1F               | Vendor-specific error   | Attempted to change a drive constant that cannot be changed while the drive is running.<br>Attempted to change a drive constant to a value outside the setting range. | Stop the drive.<br>Specify a value within the setting range. |
| 20               | Invalid parameter       | Attempted to change to a data value outside the setting range.                                                                                                        | Specify a data value within the setting range.               |

**Note:** Refer to the MEMOBUS/Modbus Data Table in the Technical Manual for a list of monitor data using the MEMOBUS/Modbus message area.

## ◆ Option Error Codes

### ■ Option Fault Monitors U6-98 and U6-99

The option can declare error/warning conditions via drive monitor parameters on the drive digital operator as shown in *Table 18*.

**Table 18 Option Fault Monitor Descriptions**

| Fault Condition      | Fault Declared | Status Value (U6-98/U6-99) | Description                                                                       |
|----------------------|----------------|----------------------------|-----------------------------------------------------------------------------------|
| No Fault             | n/a            | 0                          | No faults.                                                                        |
| Force Fault          | EF0            | 3                          | Network sent a message to force this node to the fault state.                     |
| Network Link Down    | BUS ERROR      | 1100                       | No network link to option.                                                        |
| Connection Time-out  | BUS ERROR      | 1101                       | The node timer (Requested Packet Interval) timed out.                             |
| Duplicate IP Address | BUS ERROR      | 1102                       | This node and at least one other node have the same IP Address.                   |
| Default MAC Address  | None           | 1103                       | Factory default MAC Address programmed into the option. Return for reprogramming. |

Two drive monitor parameters, U6-98 and U6-99 assist the user in network troubleshooting.

- U6-98 displays the first declared fault since the last power cycle. U6-98 is only cleared upon drive power-up.
- U6-99 displays the present option status. U6-99 is cleared upon a network-issued fault reset and upon power-up.

If another fault occurs while the original fault is still active, parameter U6-98 retains the original fault value and U6-99 stores the new fault status value.

# 14 Specifications

## ◆ Specifications

Table 19 Option Specifications

| Item                          | Specification                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model</b>                  | SI-EN3/V                                                                                                                                     |
| <b>Supported Messages</b>     | <ul style="list-style-type: none"> <li>• Explicit: Explicit Class 3, Unconnected</li> <li>• I/O: Class 1, Listen Only, Input Only</li> </ul> |
| <b>I/O Assembly Instance</b>  | <ul style="list-style-type: none"> <li>• Input: 7 types (4 to 44 Bytes)</li> <li>• Output: 7 types (4 to 44 Bytes)</li> </ul>                |
| <b>SI-EN3/V Specification</b> | Conformance Level A5: Passed                                                                                                                 |
| <b>SI-EN3/V Profile</b>       | AC Drive                                                                                                                                     |
| <b>Connector Type</b>         | RJ45 8-pin Straight Connector STP Cat 5e cable                                                                                               |
| <b>Physical Layer Type</b>    | <ul style="list-style-type: none"> <li>• Isolated Physical Layer</li> <li>• TCP Protocol Transformer Isolated</li> </ul>                     |
| <b>IP Address Setting</b>     | Programmable from drive keypad or network                                                                                                    |
| <b>Communication Speed</b>    | Programmable from drive keypad or network:<br>10/100 Mbps, auto-negotiate                                                                    |
| <b>Number of Connections</b>  | <ul style="list-style-type: none"> <li>• I/O: 2</li> <li>• Explicit: 6</li> </ul>                                                            |
| <b>Duplex Mode</b>            | Half-forced, Auto-negotiate, Full-forced                                                                                                     |
| <b>Address Startup Mode</b>   | Static, BOOTP, DHCP                                                                                                                          |
| <b>Ambient Temperature</b>    | -10 °C to +50 °C (14 °F to 122 °F)                                                                                                           |
| <b>Humidity</b>               | 95% RH or lower with no condensation                                                                                                         |
| <b>Storage Temperature</b>    | -20 °C to +60 °C (-4 °F to 140 °F) allowed for short-term transport of the product                                                           |
| <b>Area of Use</b>            | Indoor (free of corrosive gas, airborne particles, etc.)                                                                                     |
| <b>Altitude</b>               | 1000 m (3280 ft.) or lower                                                                                                                   |

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# YASKAWA AC Drive-V1000 Option EtherNet/IP Technical Manual

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

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