

YASKAWA AC Drive Option EtherNet/IP Installation Manual

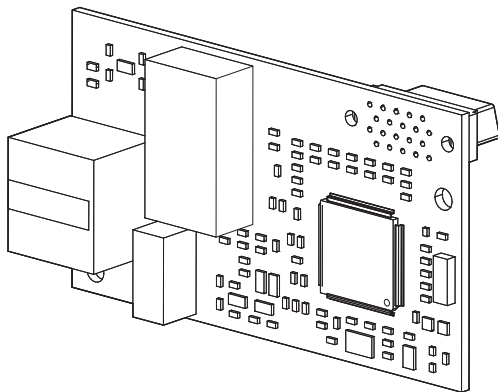
Type: SI-EN3

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

安川インバータ オプション EtherNet/IP通信 取扱説明書

形 式 SI-EN3

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1 Preface and Safety

YASKAWA Electric supplies component parts for use in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer 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 products designed to incorporate a component part 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 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 option:

SI-EN3 Option

YASKAWA AC Drive Option SI-EN3 EtherNet/IP Installation Manual Manual No: TOBP C730600 92 (This book)	This guide is packaged together with the product and contains information necessary to install the option and set related drive parameters.
YASKAWA AC Drive Option SI-EN3 EtherNet/IP Technical Manual Manual No: SIEP C730600 92	The technical manual contains detailed information about the option. Access the following sites to obtain the technical manual: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.

Yaskawa Drive

YASKAWA AC Drive Manuals	Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The most recent versions of these manuals are available for download on our documentation websites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.
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◆ Terms

- Note:** Indicates supplemental information that is not related to safety messages.
- Option:** YASKAWA AC Drive Option SI-EN3 EtherNet/IP
- Drive:**
- YASKAWA AC Drive 1000-Series (A1000, U1000, U1000L, Z1000U, Z1000)
 - YASKAWA AC Drive GA500
 - YASKAWA AC Drive GA700
 - YASKAWA AC Drive GA800
- Keypad:**
- LCD Operator for YASKAWA AC Drive 1000-Series
 - LED Operator for YASKAWA AC Drive 1000-Series
 - LCD Keypad for YASKAWA AC Drive GA500, GA700, and GA800
 - LED Keypad for YASKAWA AC Drive GA500, GA700, and GA800

◆ Registered Trademarks

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

1 Preface and Safety

◆ 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 cause death or serious injury.

WARNING

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

CAUTION

Indicates a hazardous situation, which, if not avoided, could cause 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.
- The diagrams in this manual are provided as examples only and may not pertain to all products covered by this manual.
- 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.
- Contact Yaskawa or a Yaskawa representative and provide the manual number shown on the front cover to order new copies of the manual.

DANGER

Heed the safety messages in this manual.

Failure to comply will cause death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

WARNING

Electrical Shock Hazard

Do not modify the drive or option circuitry.

Modifications to circuitry can cause serious injury or death, will cause damage to the drive and option, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.

NOTICE

Do not use steam or other disinfectants to fumigate wood for packaging the drive or option. Use alternative methods, for example heat treatment, before you package the components.

Gas from wood packaging fumigated with halogen disinfectants, for example fluorine, chlorine, bromine, iodine or DOP gas (phthalic acid ester), can cause damage to the drive and option.

2 Overview

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.

Install the option/EtherNet/IP option on a drive to perform the following functions from a EtherNet/IP master device:

- Operate the drive
- Monitor the drive operation status
- Change drive parameter settings



2 Overview

◆ Compatible Products

The option can be used with the products in [Table 1](#).

Table 1 Compatible Products

Product Series	Model(s)	Software Version <1>
A1000	CIMR-A□2A□□□□	≥ 1020
	CIMR-A□4A0002 to 4A0675	≥ 1020
	CIMR-A□4A0930 and 4A1200	≥ 3015
	CIMR-A□5A□□□□	≥ 5040 ≥ 1020
U1000	CIMR-U□□A□□□□	≥ 1010
	CIMR-U□□E□□□□	
	CIMR-U□□P□□□□	
	CIMR-U□□W□□□□	
U1000L	CIMR-U□□L□□□□	≥ 6210
	CIMR-U□□F□□□□	
	CIMR-U□□R□□□□	
	CIMR-U□□S□□□□	
Z1000U	CIMR-Z□□A□□□□	≥ 6110
	CIMR-Z□□E□□□□	
	CIMR-Z□□P□□□□	
	CIMR-Z□□W□□□□	
Z1000	CIMR-Z□□A□□□□	≥ 1016
GA500 <2>	CIPR-GA50□□□□□	≥ 1010
GA700 <2>	CIPR-GA70□□□□□	≥ 1010
GA800 <2>	CIPR-GA80□□□□□	≥ 9010

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

<2> Before you install the option on a YASKAWA AC Drive GA500, GA700, or GA800, make sure that the option software version is PRG: 4103 or later.

- Note:**
1. Refer to the option package labeling in the field designated “PRG” (four digit number)” to identify the option software version.
 2. For Yaskawa customers in the North or South America region:
If your product is not listed in [Table 1](#), refer to the web page below to confirm this manual is correct for your product. The web page provides a list of option manuals by product, and a direct link to download a PDF.

Scan QR code



Or refer to: <http://www.yaskawa.com/optionlookup>

◆ Install the Option on a GA500 Drive

An option card installation case is necessary to install the option on a GA500 drive. The option card installation case model is: JOHB-GA500. This case is sold separately. Refer to the option card installation case manual for more information about installation.

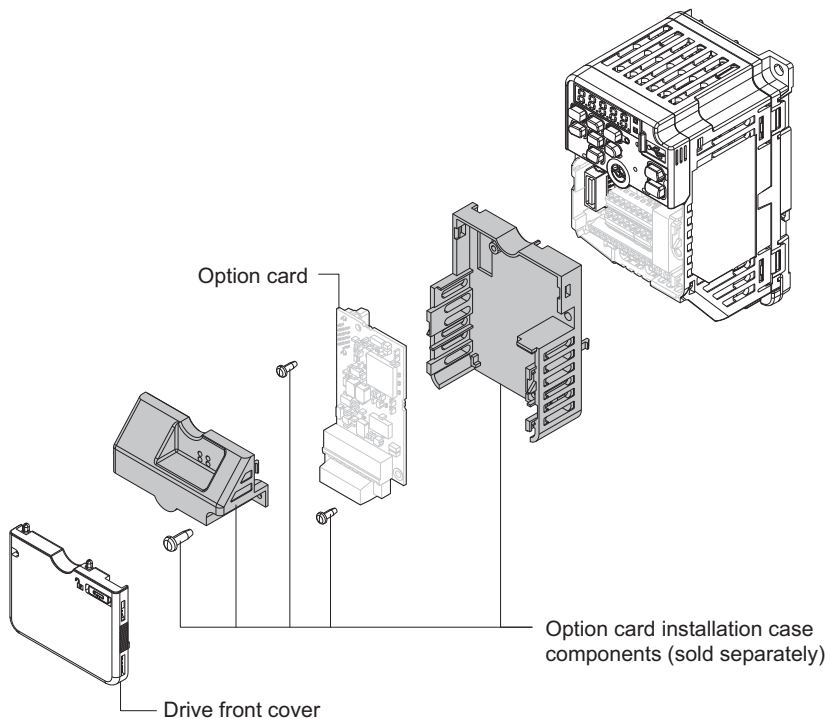


Figure 1 Option Card Installation Case

3 Receiving

After receiving the option package:

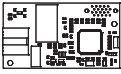
1. Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if the option or other parts appear damaged.

NOTICE: Do not use damaged parts to connect the drive and the option. Failure to comply could damage the drive and option.

2. Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to [Figure 2](#) on page 14 for details. Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Components

Table 2 Option Package Components

Description:	Option	Ground Wire <1>	Screws (M3)	LED Labels			Installation Manual
				A1000, U1000, U1000L, and Z1000U	Z1000	GA500, GA700, and GA800	
—							
Quantity:	1	1	3 <2>	1	1	1	1

<1> GA700 and GA800 drives do not use the ground wire.

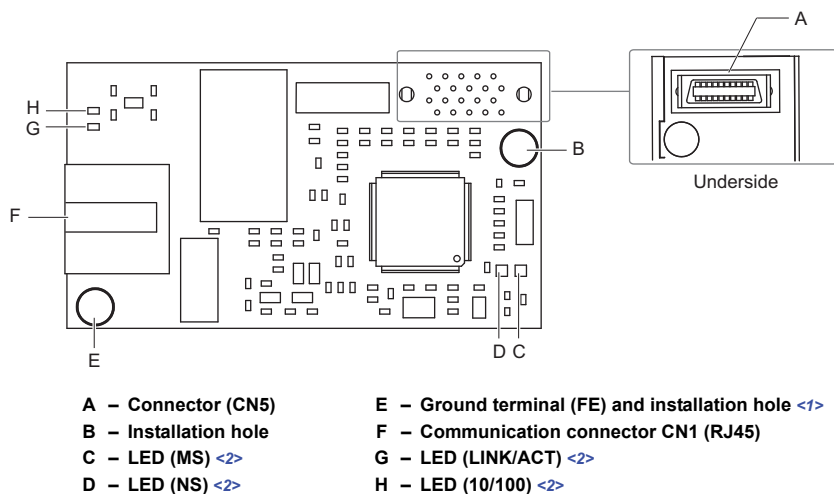
<2> GA700 and GA800 drives use two screws only.

◆ Installation Tools

- A Phillips screwdriver. Phillips screw sizes vary by drive capacity.
- A flat-blade screwdriver (blade depth: 0.4 mm (0.02 in), width: 2.5 mm (0.1 in)).
- A pair of diagonal cutting pliers.
- A small file or medium-grit sandpaper.

4 Option Components

◆ SI-EN3 Option



<1> Refer to Option LED Display on page 16 for details on the LEDs.

<2> Connect the provided wire during installation. Installation on GA700 and GA800 drives does not require the ground wire.

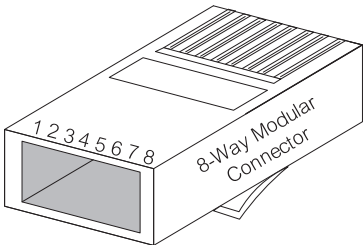
Figure 2 SI-EN3 Option Components

◆ 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.

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 <I>
	5 (Pair 1)	Not used <I>
	6 (Pair 3)	Receive data (RXD) -
	7 (Pair 4)	Not used <I>
	8 (Pair 4)	Not used <I>

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

4 Option Components

◆ 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

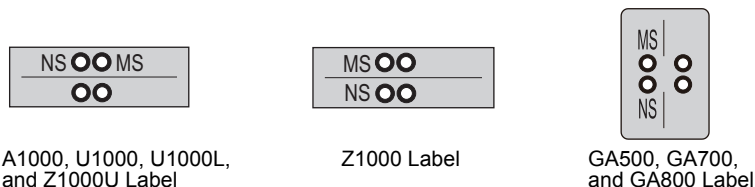


Figure 3 Option LED Labels

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

LED Name	Indication		Operating Status	Description
	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

LED Name	Indication		Operating Status	Description
	Color	Status		
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 <I>	Green	OFF	10 Mbps is established	–
	Green	ON	100 Mbps is established	
LINK/ ACT <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 drive front cover 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 inspect, connect, or disconnect any wiring while the drive is energized.

Failure to comply will cause death or serious injury.

Before servicing, disconnect all power to the equipment and wait for at least the time specified on the warning label. The internal capacitor remains charged even after the drive is de-energized. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. When all indicators are OFF, measure for unsafe voltages to confirm the drive is safe.

WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could cause death or serious injury.

The diagrams in this section may include options and drives without covers or safety shields to illustrate details. Reinstall covers and shields before operating the drive and run the drive according to the instructions described in this manual.

Do not allow unqualified personnel to perform work on the drive or option.

Failure to comply could cause death or serious injury.

Only authorized personnel familiar with installation, adjustment, and maintenance of AC drives and options may perform work.

Do not remove covers or touch circuit boards while the drive is energized.

Failure to comply could cause death or serious injury.



WARNING

Do not use damaged wires, stress the wiring, or damage the wire insulation.

Failure to comply could cause death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose or overtightened connections could cause erroneous operation and damage to the terminal block or start a fire and cause death or serious injury.

NOTICE

Damage to Equipment

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

Failure to comply could cause ESD damage to circuitry.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could damage the drive.

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

Failure to comply could further damage the equipment.

Do not use unshielded wire 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 on the option and drive.

Failure to comply could prevent proper operation and damage equipment.

Confirm that all connections are correct after installing the option and connecting peripheral devices.

Failure to comply could damage the option.

5 Installation Procedure

◆ Procedures for Installing and Wiring Options on a Drive

Procedures to install and wire the option are different for different drive models.

Refer to [Table 6](#) to check the procedures to install and wire the option on a drive.

Table 6 Procedures for Installing and Wiring Options on a Drive

Product Series	Procedures for Installing and Wiring Options on a Drive	Page
A1000	Procedure A	21
U1000	Procedure A	21
U1000L	Procedure A	21
Z1000U	Procedure A	21
Z1000	Procedure B	27
GA500	<1> <2>	—
GA700	Procedure C	33
GA800	Procedure C	33

<1> Use the option card installation case manual to install the option on GA500 drives.

<2> Before you install the option on a YASKAWA AC Drive GA500, make sure that the option software version is PRG: 4103 or later.

■ Procedure A

This section shows the procedure to install and wire the option on a 1000-series drive.

Prepare the Drive for the Option

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
Refer to [Figure 4](#) for an exploded view of the drive with the option and related components for reference in the installation procedure.

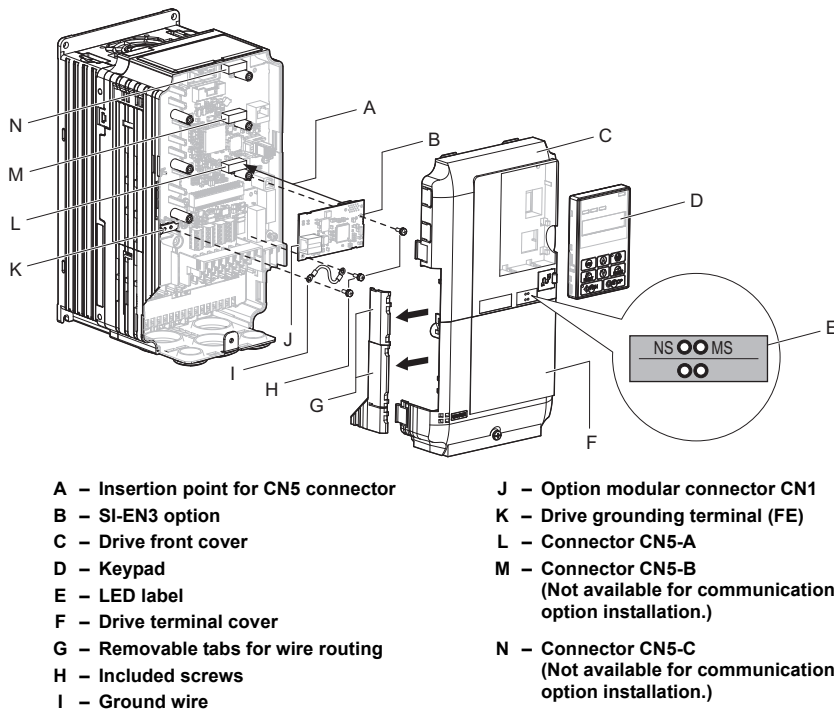


Figure 4 Drive Components with Option

5 Installation Procedure

Install the Option

Remove the front covers of the drive before you install the option.

Refer to the drive manual for information about how to remove the front covers. Different drive sizes have different cover removal procedures.

You can only install this option into the **CN5-A** connector on the drive control board.

DANGER! Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the drive is energized. Failure to comply will cause death or serious injury. Before servicing, disconnect all power to the equipment and wait for at least the time specified on the warning label. The internal capacitor remains charged even after the drive is de-energized. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. When all indicators are OFF, measure for unsafe voltages to confirm the drive is safe.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the keypad (D) and front covers (C, F). Refer to the manual packaged with the drive for details on keypad and cover removal.

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

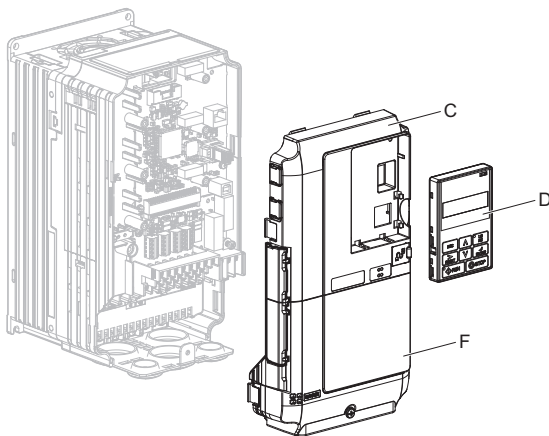


Figure 5 Remove the Keypad, Front Cover, and Terminal Cover

2. Affix the LED label (E) in the appropriate position on the drive front cover (C).

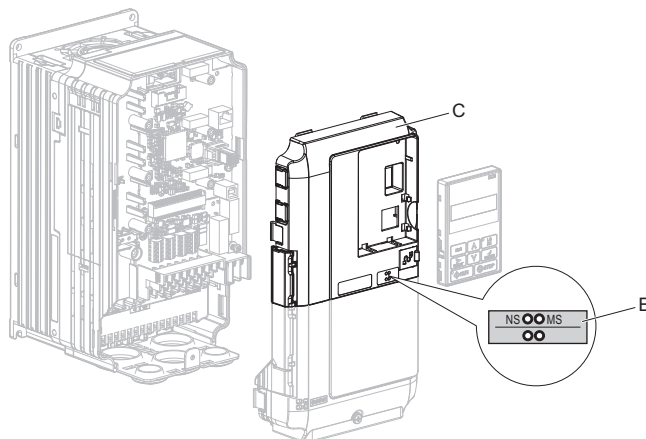


Figure 6 Affix the LED Label

3. Insert the option card (B) into the CN5-A (L) connector on the drive and fasten it into place using one of the included screws (H). Tighten the screw to 0.5 to 0.6 N·m (4.4 to 5.3 in·lb).

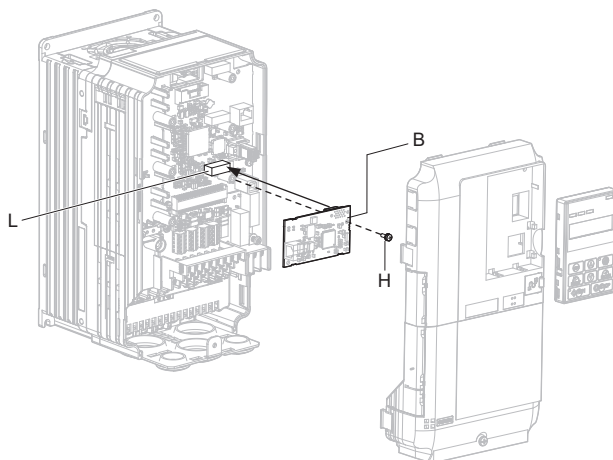


Figure 7 Insert the Option

5 Installation Procedure

4. Connect one end of the ground wire (I) to the ground terminal (K) using one of the remaining provided screws (H). Connect the other end of the ground wire (I) to the remaining ground terminal and installation hole on the option (B) using the last remaining provided screw (H). Tighten both screws to 0.5 to 0.6 N·m (4.4 to 5.3 in·lb).

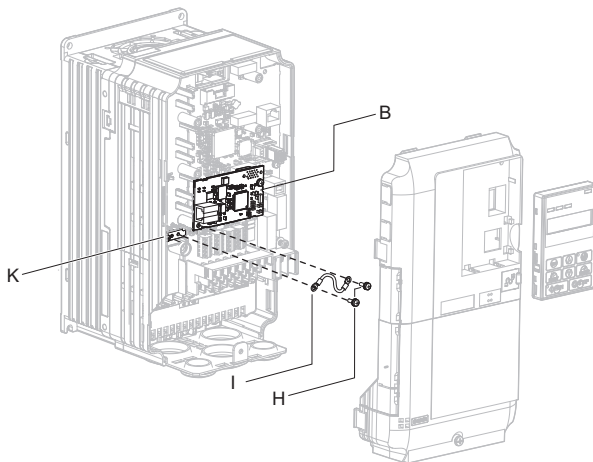
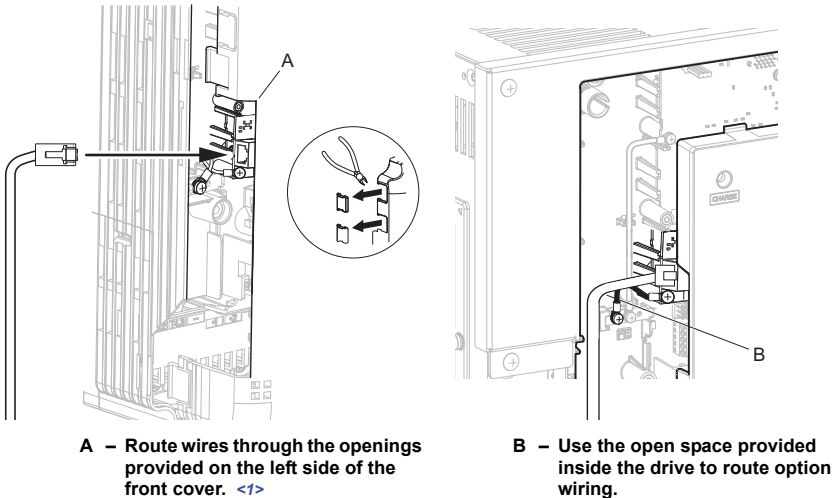


Figure 8 Connect the Ground Wire

Note: The drive has only two ground terminal screw holes (K). Two ground wires should share the same ground terminal when connecting three options.

- 5.** Route the option wiring inside the enclosure as shown in **Figure 9-B**. Take proper precautions so that the front covers will easily fit back onto the drive. Users may also choose to route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in **Figure 9-A** to create the necessary openings on these models. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.

Note: Separate communication cables from main circuit wiring and other electrical lines to avoid potential sources of electrical interference.



<1> The drive will not meet Enclosed wall-mounted type (IP20/UL Type 1) requirements if wiring is exposed outside the enclosure.

Figure 9 Wire Routing Examples

5 Installation Procedure

6. Firmly connect the Ethernet communication cable to the option modular connector (CN1).
Install Ethernet communications cables apart from main-circuit wiring and other electrical and power lines.
Ensure the cable end is firmly connected (see [Figure 23](#)). Refer to [Communication Cable Specifications on page 39](#) for details of installing.
7. Reattach the drive front covers (C, F) and the keypad (D).

NOTICE: Do not pinch cables between the front covers and the drive. Failure to comply could cause erroneous operation.

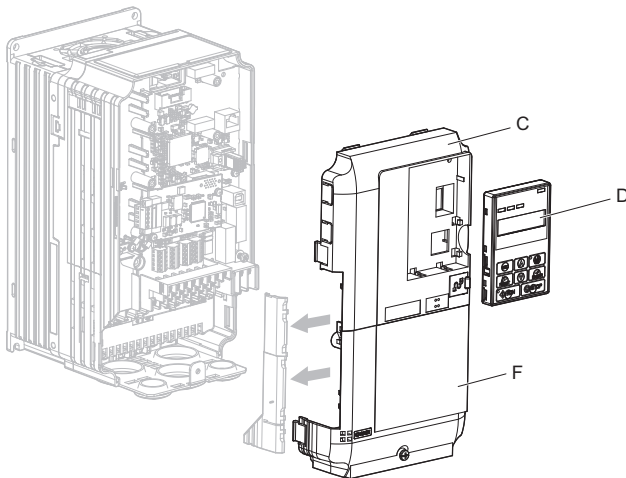


Figure 10 Replace the Front Covers and Keypad

8. Set drive parameters in [Table 7](#) for correct option performance.

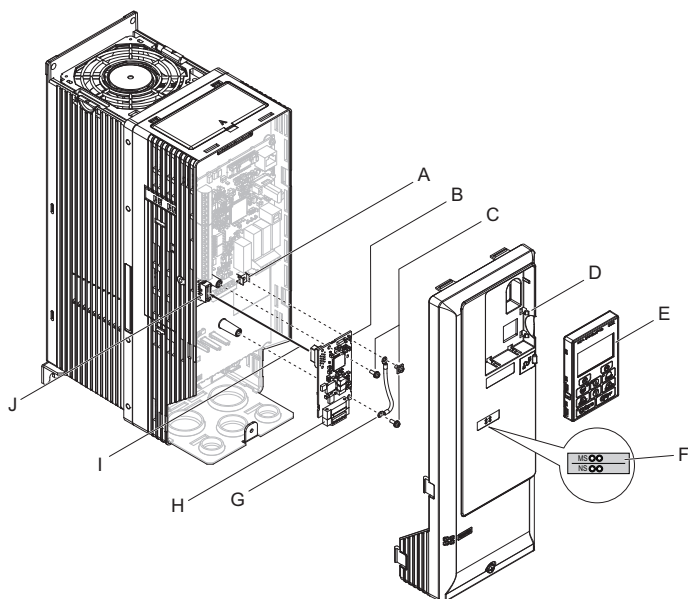
■ Procedure B

This section shows the procedure to install and wire the option on a Z1000 drive.

Prepare the Drive for 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 User Manual packaged with the drive for information on wiring and connecting the drive.

Figure 11 shows an exploded view of the drive with the option and related components for reference.



- | | |
|-----------------------------------|-------------------------------|
| A – Drive grounding terminal (FE) | F – LED label |
| B – SI-EN3 option | G – Ground wire |
| C – Mounting screw | H – Terminal block CN1 |
| D – Drive front cover | I – Insert connector CN5 here |
| E – HOA keypad | J – Connector CN5 |

Figure 11 Drive Components with Option

5 Installation Procedure

Installing the Option

Remove the front cover of the drive before you install the option.

Refer to the drive manual for information about how to remove the front covers. Different drive sizes have different cover removal procedures.

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 and wait at least the amount of time specified on the drive front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing. The internal capacitor remains charged after the power supply is turned off.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the HOA keypad (E) and front cover (D).

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.

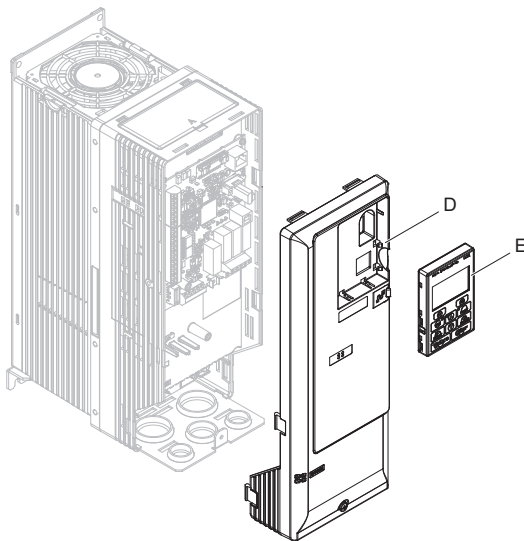


Figure 12 Remove the Front Cover and HOA Keypad

2. With the front cover and HOA keypad removed, apply the LED label (F) in the appropriate position on the drive front cover (D).

Note: Place the LED label vertically on Z1000 drives as shown in [Figure 13](#).

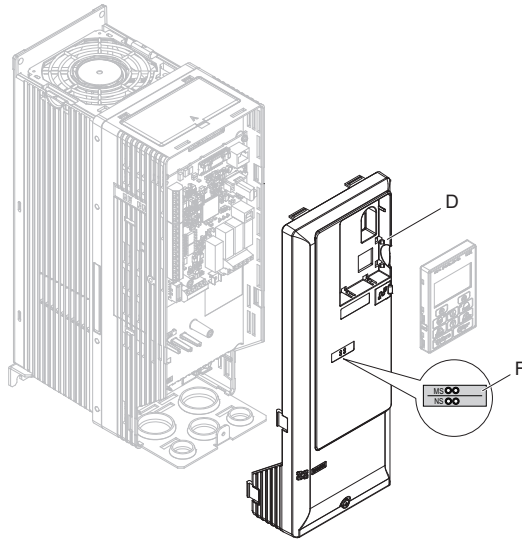


Figure 13 Apply the LED Label

5 Installation Procedure

3. Make sure the screws on the left and right sides of the option terminal block (H) are tightened with a tightening torque of 0.5 to 0.6 N·m (4.4 to 5.3 in·lb), then insert the option (B) into the CN5 connector (J) located on the drive and fasten it using one of the included screws (C).

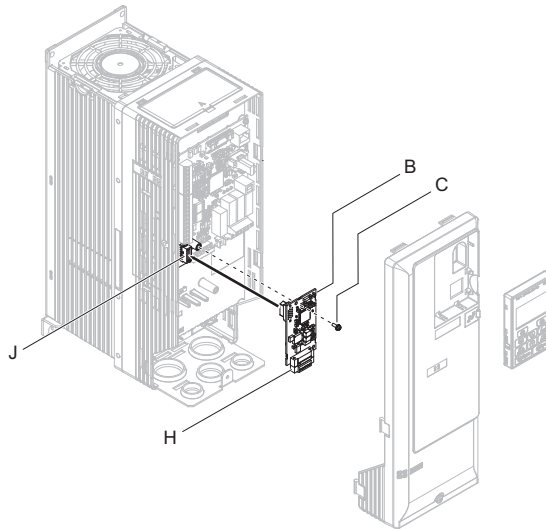


Figure 14 Insert the Option

4. Connect the ground wire (G) to the ground terminal (A) using one of the remaining provided screws (C). Connect the other end of the ground wire (G) to the ground terminal and installation hole on the option using the last remaining provided screw (C) and tighten both screws to 0.5 to 0.6 N·m (4.4 to 5.3 in·lb).

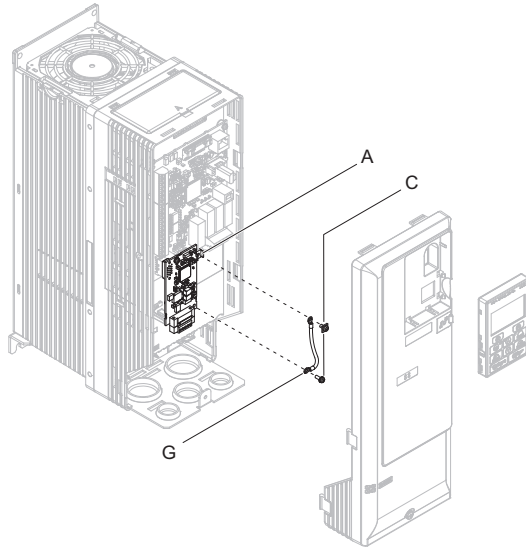


Figure 15 Connect the Ground Wire

5. Wire the communication cables.

Note: Separate communication cables from main circuit wiring and other electrical lines.

5 Installation Procedure

6. Firmly connect the Ethernet communication cable to the option modular connector (CN1).
Install Ethernet communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 23](#)). Refer to [Communication Cable Specifications on page 39](#) for details of installing.
7. Reattach the drive front cover (D) and the HOA Keypad (E).

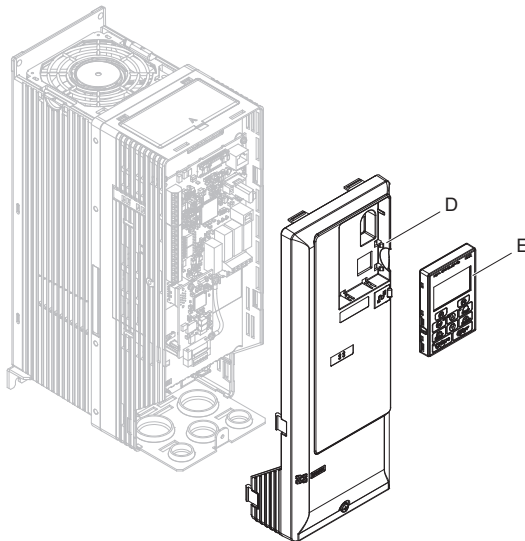


Figure 16 Replace the Front Cover and HOA Keypad

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.

8. Set drive parameters in [Table 7](#) for correct option performance.

■ Procedure C

This section shows the procedure to install and wire the option on a GA700 or GA800 drive.

Prepare the Drive for the Option

Before you install the option on a YASKAWA AC Drive GA700 or GA800, make sure that the option software version is PRG: 4103 or later.

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
Refer to **Figure 17** for an exploded view of the drive with the option and related components for reference in the installation procedure.

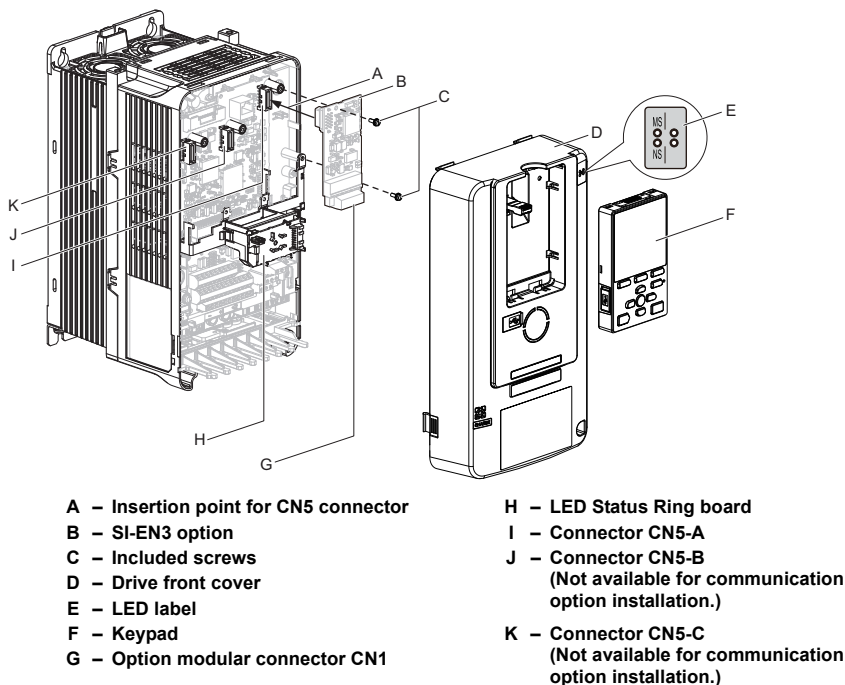


Figure 17 Drive Components with Option

5 Installation Procedure

Install the Option

Remove the front cover of the drive before you install the option.

Refer to the drive manual for information about how to remove the front cover. Different drive sizes have different cover removal procedures.

You can only install this option into the **CN5-A** connector on the drive control board.

DANGER! Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the drive is energized. Failure to comply will cause death or serious injury. Before servicing, disconnect all power to the equipment and wait for at least the time specified on the warning label. The internal capacitor remains charged even after the drive is de-energized. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. When all indicators are OFF, measure for unsafe voltages to confirm the drive is safe.

1. Affix the LED label (E) in the appropriate position on the drive front cover (D).

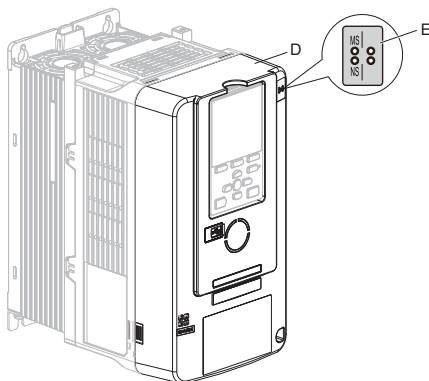


Figure 18 Affix the LED Label

2. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the front cover (D). Refer to the manual packaged with the drive for details on cover removal.

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

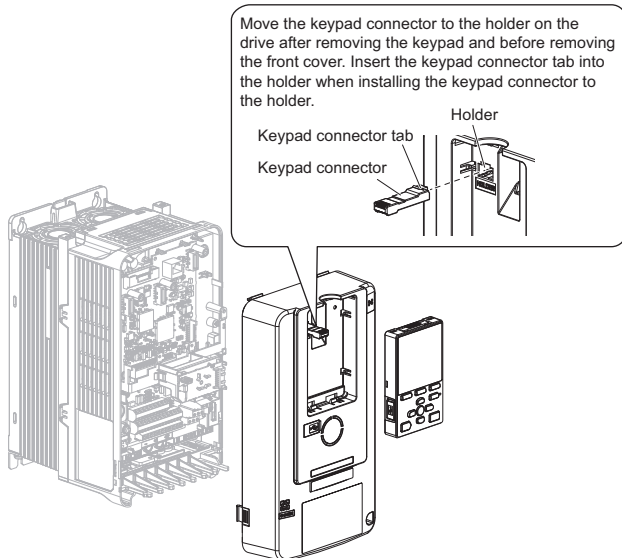


Figure 19 Remove the Front Cover and Keypad

5 Installation Procedure

3. Carefully remove the LED Status Ring board (H) and place it on the right side of the drive using the temporary placement holes. Refer to the manual packaged with the drive for details on removing the LED Status Ring board.

NOTICE: Do not remove the LED Status Ring board cable connector. Failure to comply could cause erroneous operation and damage the drive.

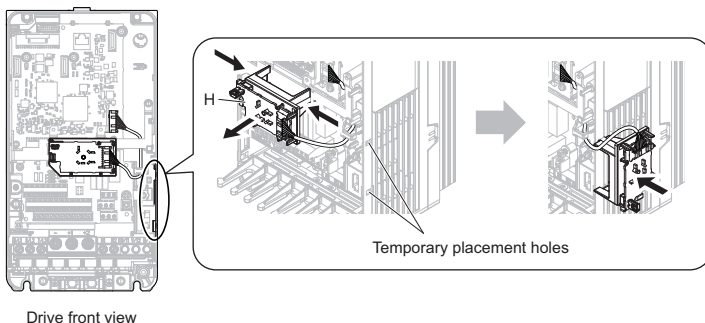


Figure 20 Remove the LED Status Ring Board

4. Insert the option card (B) into the CN5-A connector (I) on the drive and fasten it into place using the included screws (C). Tighten both screws to 0.5 to 0.6 N·m (4.4 to 5.3 in·lb).

Note: Only two screws are necessary to install the option on a GA700 or GA800 drive. A ground wire is not necessary. The option package ships with three screws and a ground wire for installation on other product series. Do not use the ground wire or the extra screw.

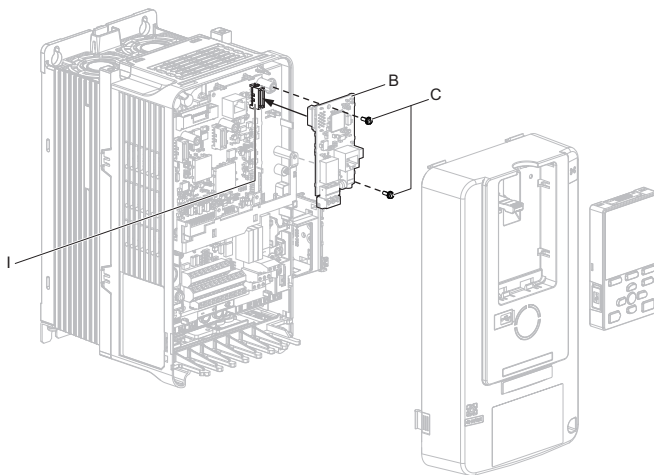


Figure 21 Insert the Option Card

5. Firmly connect the Ethernet communication cable to the option modular connector (CN1).
Install Ethernet communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 23](#)). Refer to [Communication Cable Specifications on page 39](#) for details of installing.

Note:

1. Separate communication cables from main circuit wiring and other electrical lines.
2. Maximum transmission distance is 100 m (328 ft). Minimum wiring distance between stations is 0.2 m (7.9 in).

5 Installation Procedure

6. Reattach the LED Status Ring board (H).

Use the open space provided inside the LED Status Ring board to route option wiring.

NOTICE: Do not pinch cables between the front cover or the LED Status Ring board and the drive. Failure to comply could cause erroneous operation.

7. Reattach the drive front cover (D) and the keypad (F).

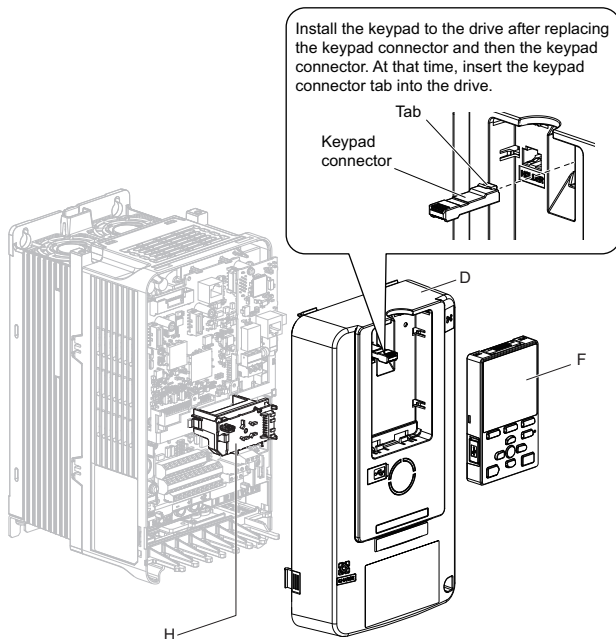


Figure 22 Replace the Front Cover and Keypad

8. Set drive parameters in [Table 7](#) for correct option performance.

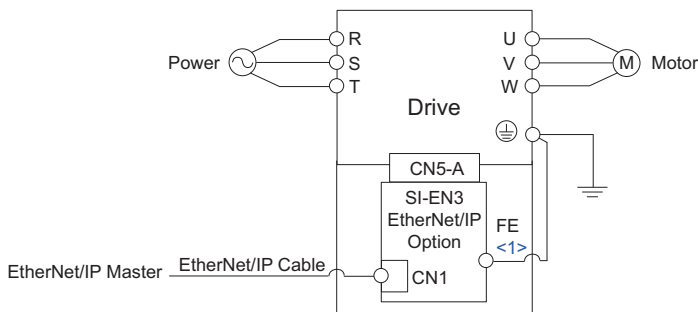
◆ IGMP Snooping

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

Use only EtherNet/IP dedicated communication cable; the Yaskawa warranty does not cover other cable types. Refer to the ODVA website (www.odva.org) for more information on network cabling.

◆ Option Connection Diagram



<1> Connect the provided ground wire for installations on 1000-series drives and GA500 drives. The ground wire is not necessary for installation on GA700 or GA800 drives.

Figure 23 Option Connection Diagram

◆ 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: Check the back cover of these manuals.

For questions, contact Yaskawa or a Yaskawa representative.

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

6 Related Drive Parameters

The parameters in [Table 7](#) set the drive for operation with the option. Confirm proper setting of all parameters in [Table 7](#) before starting network communications. Refer to the manual packaged with the drive for details on setting parameters.

Note: Hex.: MEMOBUS addresses that you can use to change parameters over network communication are represented in hexadecimal numbers.

Table 7 Related Parameter Settings

No. (Hex.)	Name	Description	Values
b1-01 (0180) <I>	Reference 1 Source	Selects the input method for frequency reference. 0: Keypad 1: Analog Input 2: Memobus/Modbus Communications 3: Option PCB 4: Pulse Train Input	Default: 1 Range: 0 to 4 (Set to 3)
b1-02 (0181) <I>	Run Command 1 Source	Selects the input method for the Run command. 0: Keypad 1: Digital Input 2: Memobus/Modbus Communications 3: Option PCB	Default: 1 Range: 0 to 3 (Set to 3)
F6-01 (03A2)	Communication Error Selection	Selects drive response when a BUS error is detected during communications with the option. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2> 4: Alarm - Run at d1-04 <2> <3> 5: Alarm - Ramp to Stop <3>	Default: 1 Range: 0 to 5 <4>
F6-02 (03A3)	Comm External Fault (EF0) Detect	Selects the condition for external fault detection (EF0). 0: Always detected 1: Detection during run only	Default: 0 Range: 0, 1
F6-03 (03A4)	Comm External Fault (EF0) Select	Selects drive response for external fault input (EF0) detection during option communications. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2>	Default: 1 Range: 0 to 3
F6-06 (03A7) <S>	Torque Reference/ Limit by Comm	Enabling this parameter allows d5-01 to determine whether the value is read as the Torque Limit value (d5-01 = 0) or the Torque Reference value (d5-01 = 1). 0: Disabled 1: Enabled <6>	Default: 0 Range: 0, 1
F6-07 (03A8)	MultiStep Ref Priority Select	0: MultiStep References Disabled 1: MultiStep References Enabled	Default: 0 <7> Range: 0, 1

6 Related Drive Parameters

No. (Hex.)	Name	Description	Values
F6-08 (036A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters F6-□□ and F7-□□ are set back to original default values when the drive is initialized using parameter A1-03. 0: No Reset - Parameters retained 1: Reset - Back to factory default Note: The setting value is not changed even when F6-08 is set to 1 and the drive is initialized using A1-03.	Default: 0 <8> Range: 0, 1
F6-14 (03BB) <9>	Bus Error Auto Reset	Sets the automatic reset function for BUS [Option Communication Errors]. 0: Disabled 1: Enabled	Default: 0 Range: 0, 1
F6-15 (0B5B) <10>	Comm. Option Parameters Reload	Selects whether F6-□□/□□/□□ communication-related parameters changed are enabled. 0: Reload at Next Power Cycle 1: Reload Now 2: Cancel Reload Request Note: F6-15 is reset to 0 after setting 1 or 2.	Default: 0 Range: 0 to 2
F7-01 (03E5) <8> <11> <12>	IP Address 1	Sets the static/fixed IP address. Parameter F7-01 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-02 (03E6) <8> <11> <12>	IP Address 2	Sets the static/fixed IP address. Parameter F7-02 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-03 (03E7) <8> <11> <12>	IP Address 3	Sets the static/fixed IP address. Parameter F7-03 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-04 (03E8) <8> <11> <12>	IP Address 4	Sets the static/fixed IP address. Parameter F7-04 sets the fourth most significant octet.	Default: 20 Min: 0 Max: 255
F7-05 (03E9) <8>	Subnet Mask 1	Sets the static/fixed Subnet Mask. Parameter F7-05 sets the most significant octet.	Default: 255 Min: 0 Max: 255
F7-06 (03EA) <8>	Subnet Mask 2	Sets the static/fixed Subnet Mask. Parameter F7-06 sets the second most significant octet.	Default: 255 Min: 0 Max: 255
F7-07 (03EB) <8>	Subnet Mask 3	Sets the static/fixed Subnet Mask. Parameter F7-07 sets the third most significant octet.	Default: 255 Min: 0 Max: 255

6 Related Drive Parameters

No. (Hex.)	Name	Description	Values
F7-08 (03EC) <8>	Subnet Mask 4	Sets the static/fixed Subnet Mask. Parameter F7-08 sets the fourth most significant octet.	Default: 0 Min: 0 Max: 255
F7-09 (03ED) <8>	Gateway Address 1	Sets the static/fixed Gateway address. Parameter F7-09 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-10 (03EE) <8>	Gateway Address 2	Sets the static/fixed Gateway address. Parameter F7-10 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-11 (03EF) <8>	Gateway Address 3	Sets the static/fixed Gateway address. Parameter F7-11 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-12 (03F0) <8>	Gateway Address 4	Sets the static/fixed Gateway address. Parameter F7-12 sets the fourth most significant octet.	Default: 1 Min: 0 Max: 255
F7-13 (03F1) <8>	Address Mode at Startup	Selects how the option address is set. 0: Static <12> 1: BOOTP 2: DHCP	Default: 2 Range: 0 to 2
F7-14 (03F2)	Duplex Mode Selection	Selects duplex mode setting. 0: Half/Half 1: Auto/Auto 2: Full/Full 3: Half/Full 4: Half/Full 5: Auto/Half 6: Auto/Full 7: Full/Half 8: Full/Full	Default: 1 Range: 0 to 8
F7-15 (03F3) <13>	Communication Speed Selection	Sets the communication speed 10: 10/10 Mbps 100: 100/100 Mbps 101: 10/100 Mbps 102: 100/10 Mbps Note: Setting 10 applies to SI-EN3 because it is single port.	Default: 10 Range: <14>
F7-16 (03F4) <9>	Timeout Value	Sets the detection time for a communications timeout. Note: Set this parameter to 0.0 to disable the connection timeout function.	Default: 0.0 s Min.: 0.0 s Max.: 30.0 s
F7-17 (03F5)	EtherNet/IP Speed Scaling Factor	Sets the scaling factor for the speed monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15

No. (Hex.)	Name	Description	Values
F7-18 (03F6)	EtherNet/IP Current Scaling Factor	Sets the scaling factor for the output current monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15
F7-19 (03F7)	EtherNet/IP Torque Scaling Factor	Sets the scaling factor for the torque monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15
F7-20 (03F8)	EtherNet/IP Power Scaling Factor	Sets the scaling factor for the power monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15
F7-21 (03F9)	EtherNet/IP Voltage Scaling Factor	Sets the scaling factor for the voltage monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15
F7-22 (03FA)	EtherNet/IP Time Scaling	Sets the scaling factor for the time monitor in EtherNet/IP Class ID 2AH Object.	Default: 0 Min.: -15 Max.: 15
F7-23 to F7-27 (03FB to 03FF) F7-28 to F7-32 (0370 to 0374)	Dynamic Output Assembly Parameters	Parameters used in Output Assemblies 116, 117, 118, 119, 120. Each parameter contains a MEMOBUS/Modbus address. The value received for the Output Assembly will be written to this corresponding MEMOBUS/Modbus address. A MEMOBUS/Modbus address value of 0 means that the value received for the Output Assembly will not be written to any MEMOBUS/Modbus register.	Default: 0
F7-33 to F7-42 (0375 to 037E)	Dynamic Input Assembly Parameters	Parameters used in Input Assemblies 166, 167, 168, 169, 170. Each parameter contains a MEMOBUS/Modbus address. The value sent for the Input Assembly will be read from this corresponding MEMOBUS/Modbus address. A MEMOBUS/Modbus address value of 0 means that the value sent for the Input Assembly is not defined by the user, therefore the option default register value will be returned. <i>Refer to Input Assemblies (Drive Produces) on page 49</i> for definitions of the default MEMOBUS/Modbus registers.	Default: 0

- <1> Set b1-02 = 3 to start and stop the drive with the EtherNet/IP master device using serial communications.
Set b1-01 = 3 to control the frequency reference of the drive via the master device.
- <2> Setting this parameter to 3 or 4 will cause the drive to continue operation after detecting a fault. Take proper measures such as installing an emergency stop switch when using settings 3 or 4.
- <3> Refer to the drive manual to know if settings 4 and 5 are available. Settings 4 and 5 are available in A1000 software versions PRG: 1021 and later.
- <4> The setting range for 1000-Series drives is different for different software versions. Refer to the instruction manual of a specific drive for more information.

6 Related Drive Parameters

- <5> Control method availability of this parameter depends on product series.
- 1000-Series Drives: Parameter is available in CLV, AOLV/PM, and CLV/PM.
In AOLV/PM, this value is read as the Torque Limit.
 - GA500 Drive: Parameter is available in OLV, AOLV/PM, and EZOLV.
This value is read as the Torque Limit.
 - GA700, GA800 Drives: Parameter is available in OLV, CLV, AOLV, AOLV/PM, CLV/PM, and EZOLV.
In OLV and EZOLV, this value is read as the Torque Limit.
- <6> The setting specifies that network communications provide the torque reference or torque limit. The motor may not rotate if the PLC does not supply a torque reference or torque limit.
- <7> Default setting is 1 for GA500.
- <8> Set F7-01 to F7-12 when F7-13 is set to 0.
- <9> Available in A1000 software versions PRG: 1021 and later.
- <10> Supported in option software versions PRG: 4103 and later on non-1000-series drives.
- <11> Cycle power for setting changes to take effect. Set F6-15 to 1 (Enable), to have settings take effect immediately on non-1000 series drives.
- <12> Set F7-01 to F7-04 when F7-13 is set to 0. All IP Addresses (F7-01 to F7-04) must be unique.
- <13> Set F7-15 when F7-14 is not set to 1 (Auto Negotiate).
- <14> Default and setting range of this parameter depend on drive series.
- 1000-Series Drives, GA700, or GA800
Default: 10
Setting range: 10 to 102
 - GA500 Drives
Default: 10
Setting range: 10, 100

Table 8 Option Monitors

No.	Name	Description	Range
U6-80 to U6-83	OPT IP ADR 1 to 4	Displays IP Address currently available; • U6 -80: First octet • U6 -81: Second octet • U6 -82: Third octet • U6 -83: Forth octet	0 to 255
U6-84 to U6-87	Online Subnet 1 to 4	Displays subnet currently available; • U6 -84: First octet • U6 -85: Second octet • U6 -86: Third octet • U6 -87: Forth octet	0 to 255
U6-88 to U6-91	Online Gateway	Displays gateway currently available; • U6 -88: First octet • U6 -89: Second octet • U6 -90: Third octet • U6 -91: Forth octet	0 to 255
U6-92	Online Speed	Displays CN1 Port 1 link speed currently available.	10: 10 Mbps 100: 100 Mbps
U6-93	Online Duplex	Displays CN1 Port 1 duplex setting currently available.	0: Half, 1: Full
U6-97	OPT SPARE 4	Displays option software version.	—
U6-98	First Fault	Displays first option fault. Refer to <i>Option Fault Monitors U6-98 and U6-99 on page 59</i> for details.	—
U6-99	Current Fault	Displays current option fault. Refer to <i>Option Fault Monitors U6-98 and U6-99 on page 59</i> for details.	—

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 9](#) are available for polled I/O:

Table 9 Supported Polled I/O Assemblies

Assembly Number (Hex)	Description	Type	Bytes	Page
20 (14)	Basic Speed Control Output	Output	4	47
21 (15)	Extended Speed Control Output	Output	4	48
22 (16)	Speed and Torque Control Output	Output	6	—
23 (17)	Extended Speed and Torque Control Output	Output	6	—
70 (46)	Basic Speed Control Input	Input	4	49
71 (47)	Extended Speed Control Input	Input	4	50
72 (48)	Speed and Torque Control Input	Input	6	—
73 (49)	Extended Speed and Torque Control Input	Input	6	—
100 (64)	(Vendor Specific Yaskawa Electric (YE) Assy)-MEMOBUS/Modbus Message Output	Output	5	—
101 (65)	(Vendor Specific Yaskawa Electric (YE) Assy)-Speed/Torque Control Output	Output	8	—
115 (73)	(Vendor Specific Yaskawa Electric (YE) Assy)-Extended Speed/Torque Control Output	Output	40	—
116 (74)	(Vendor Specific Yaskawa Electric (YE) Assy)-High Speed/Torque Control Output	Output	44	—
117 (75)	(Vendor Specific Yaskawa Electric (YE) Assy)-8 Byte Dynamic Output	Output	8	—
118 (76)	(Vendor Specific Yaskawa Electric (YE) Assy)-12 Byte Dynamic Output	Output	12	—
119 (77)	(Vendor Specific Yaskawa Electric (YE) Assy)-18 Byte Dynamic Output	Output	18	—
120 (78)	(Vendor Specific Yaskawa Electric (YE) Assy)-24 Byte Dynamic Output	Output	24	—
150 (96)	(Vendor Specific Yaskawa Electric (YE) Assy)-MEMOBUS/Modbus Message Input	Input	5	—
151 (97)	(Vendor Specific Yaskawa Electric (YE) Assy)-Speed/Torque Status Input	Input	8	—

7 Configuring Messaging

Assembly Number (Hex)	Description	Type	Bytes	Page
155 (9B)	(Vendor Specific Yaskawa Electric (YE) Assy)- Extended Speed/ Torque Status Input	Input	40	—
166 (A6)	(Vendor Specific Yaskawa Electric (YE) Assy)-High Speed/Torque Status Input	Input	44	—
167 (A7)	(Vendor Specific Yaskawa Electric (YE) Assy)-8 Byte Dynamic Input	Input	8	—
168 (A8)	(Vendor Specific Yaskawa Electric (YE) Assy)-12 Byte Dynamic Input	Input	12	—
169 (A9)	(Vendor Specific Yaskawa Electric (YE) Assy)-18 Byte Dynamic Input	Input	18	—
170 (AA)	(Vendor Specific Yaskawa Electric (YE) Assy)-24 Byte Dynamic Input	Input	24	—

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	Word	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20	0	0	—	—	—	—	—	Fault Reset	—	Run Fwd
		1	—							
	1	2	Speed Reference (Low Byte)							
		3	Speed Reference (High Byte)							

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

8 Output Assemblies (Drive Consumes)

◆ Extended Speed Control Output - 21 (0x15)

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

Name	Description
Run Fwd	Forward Run Command 0: Stop 1: Forward Run
Run Rev	Reverse Run Command 0: Stop 1: Reverse Run
Fault Reset	Fault Reset (0 to 1 transition: Fault Reset)
NetCtrl	Run command from Network 0: Depends on b1-02 1: Enables the run command from network
NetRef	Speed reference from Network 0: Depends on b1-01 1: Enables the speed reference from network
Speed Reference	Speed Command Sets drive speed reference. Speed reference data: Frequency reference/ 2^{SS} (SS: Speed scale) Setting range: 0 to 0xFFFF For example, when setting a reference of 4096 with a speed scale of 2: Speed reference data = $4096/2^2 = 1024 = 0x0400$ Unit depends on o1-03.

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	Word	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
70	0	0	—	—	—	—	—	Running 1 (FWD)	—	Faulted
		1	—							
	1	2	Speed Actual (Low Byte)							
		3	Speed Actual (High Byte)							

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

9 Input Assemblies (Drive Produces)

◆ Extended Speed Control Input - 71 (0x47)

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

Name	Description
Faulted	Faulted 0: No Faults Occurred 1: Fault Occurred
Warning	Warning 0: No Warning Occurred 1: Warning Occurred
Running 1 (FWD)	Forward Running 0: Stop or Reverse Running 1: Forward Running
Running 2 (REV)	Reverse Running 0: Stop or Forward Running 1: Reverse Running
Ready	Drive Ready 0: Not Ready 1: Ready
Ctrl from Net	Status of Run command from Network 0: Run command is not from network 1: Run command is from network
Ref from Net	Status of Speed reference from Network 0: Speed reference is not from network 1: Speed reference is from network
At Speed	Speed Agree 0: No Speed Agree 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 Monitors drive output frequency. Speed actual data: Output frequency x 2 ^{SS} (SS: Speed scale) Range: 0 to 0xFFFF For example, when output frequency of 1024 with a speed scale of 2: Speed actual data = 1024 x 2 ² = 4096 = 0x1000 Unit depends on o1-03.

10 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.

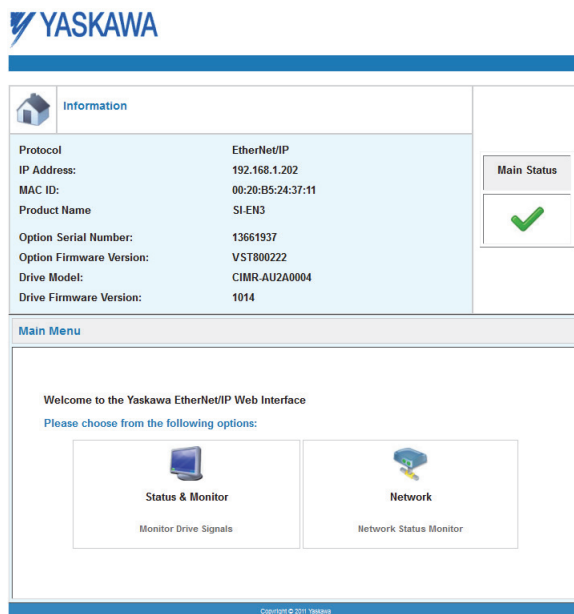


Figure 24 Main Page View

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

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

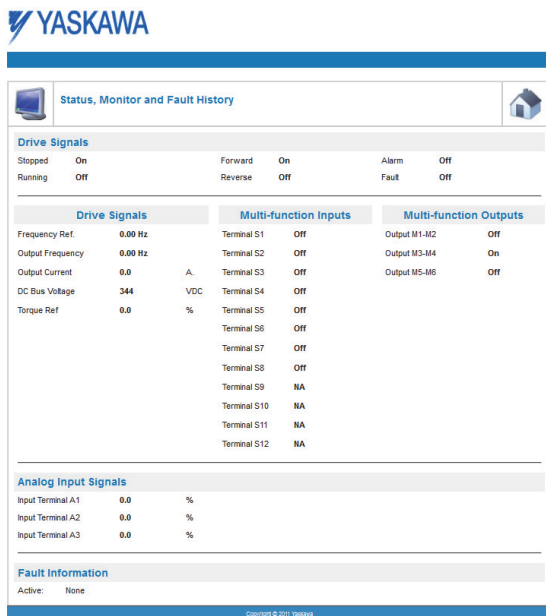


Figure 25 Drive Status Page View

◆ Network Monitor Page (Network Monitor)

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



Figure 26 Network Monitor Page View

Table 10 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) Requested Packet Interval for I/O messaging, in milliseconds, for this connection.
O2T_API	Originator to Target (ie, PLC to SI-EN3) 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 since the connection was established or statistics were reset for this connection.
T20_RPI	Target to Originator (ie, SI-EN3 to PLC) Requested Packet Interval for I/O messaging, in milliseconds, for this connection.
T20_API	Target to Originator (ie, SI-EN3 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 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.

11 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. [Table 11](#) lists causes of the errors and possible corrective actions. Refer to the drive Technical Manual for additional error codes that may appear on the drive keypad.

■ Faults

Both bUS (option communication error) and EF0 (Option Card External Fault) can appear as an alarm or as a fault. When a fault occurs, the keypad 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 11 Fault Displays, Causes, and Possible Solutions

Keypad Display		Fault Name
bus	bUS	Option Communication Error
		• After establishing initial communication, the connection was lost. • Only detected when the run command or frequency reference is assigned to the option (b1-01 = 3 or b1-02 = 3).
Cause		Possible Solution
No signal was received from the PLC.		• Check for faulty wiring. • Correct any wiring problems.
Faulty communications wiring		
An existing short circuit or communications disconnection		Check disconnected cables and short circuits and repair as needed.
A data error occurred due to electric interference.		• Counteract noise in the control circuit, main circuit, and ground wiring. • If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input. • Counteract noise in the master controller (PLC).

11 Troubleshooting

The option is not properly connected to the drive.		Reinstall the option.
Option is damaged		If there are no problems with the wiring and the error continues to occur, replace the option.
Connection Time-out		• The option Requested Packet Interval (RPI) timer timed out. • Make sure that RPI time is set properly.
Duplicate IP Address		Check if the option shares IP Address with at least one other node. Check the setting values of F7-01 to F7-04 (IP Address).
Keypad Display		Fault Name
	EF0	Option Card External Fault
		The alarm function for an external device has been triggered.
Cause		Corrective Action
An external fault was received from the PLC.		1. Remove the cause of the external fault. 2. Reset the external fault input from the PLC.
Problem with the PLC program		Check the PLC program.
PLC is in the Idle Mode.		Set the PLC to the Run Mode.
Keypad Display		Fault Name
	oFA00	Option Card Connection Error (CN5-A)
		Option is not properly connected.
Cause		Possible Solution
The option card installed into port CN5-A is incompatible with the drive.		Connect the option to the correct option port. Note: PG option cards are supported by option ports CN5-B and CN5-C only.
Keypad Display		Fault Name
	oFA01	Option Card Fault (CN5-A)
		Option is not properly connected.
Cause		Possible Solution
The option connected to option port CN5-A was changed during run.		De-energize the drive and plug the option into the drive according to Installation Procedure on page 18 .
Keypad Display		Fault Name
	oFA03, oFA04	Option Card Error (CN5-A)
		Option Card Error (CN5-A)
Cause		Possible Solution
A fault occurred in the option.		1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.

Keypad Display		Fault Name
oFA30 to oFA43	oFA30 to oFA43	Option Card Connection Error (CN5-A)
		Communication ID error.
Cause		Possible Solution
The option card connection to port CN5-A is faulty.		1. Turn off the power. 2. Check if the option is properly plugged into the option port. 3. Replace the option if the fault continues to occur.
Keypad Display		Fault Name
oFb00	oFb00	Option Fault (CN5-B)
		Non-compatible option is connected.
Cause		Possible Solution
The option card installed into port CN5-B is incompatible with the drive.		Connect the option to the correct option port. Note: Use connector CN5-B when connecting DO-A3, AO-A3, or two PG options. Use connector CN5-C when connecting only one PG option.
Keypad Display		Fault Name
oFb02	oFb02	Option Fault (CN5-B)
		Two identical options are connected at the same time.
Cause		Possible Solution
An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.		Connect the option to the correct option port.
Keypad Display		Fault Name
oFC00	oFC00	Option Fault (CN5-C)
		Non-compatible option is connected.
Cause		Possible Solution
The option card installed into port CN5-C is incompatible with the drive.		Connect the option to the correct option port. Note: AI-A3, DI-A3, and communication options are not supported by option port CN5-C.
Keypad Display		Fault Name
oFC02	oFC02	Option Fault
		Option Flash write mode.
Cause		Possible Solution
An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.		Connect the option to the correct option port.

11 Troubleshooting

■ Minor Faults and Alarms

Keypad Display		Minor Fault Name	
	CyPo	Cycle Power to Active Parameters	
		Comm. Option Parameter Not Upgraded	
Cause		Possible Solution	Minor Fault (H2-□□ = 10)
Although F6-15 = 1 [Comm. Option Parameters Reload = Reload Now], the drive did not update the communication option parameters.		Re-energize the drive to update the communication option parameters. Note: If the option software version is not compatible or if you install an incorrect option to the drive, it will trigger an alarm.	YES

■ 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. - Attempted to change a drive constant to a value outside the setting range.	- Stop the drive. - 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.

◆ 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 keypad as shown in [Table 12](#).

Table 12 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.

11 Troubleshooting

◆ Option Compatibility

Users may connect up to 3 options simultaneously depending on the type of option. Refer to [Table 13](#) for details.

Note: You can only connect one option to the GA500. Connect the option card to the CN5 connector.

Table 13 Option Compatibility

Option Card	Connector	Number of Cards Possible
PG-B3, PG-X3	CN5-B, C	2 <1>
PG-RT3 <2> <3>, PG-F3 <2> <3>	CN5-C	1
DO-A3, AO-A3	CN5-A, B, C	1
SI-C3, SI-N3, SI-P3, SI-S3, SI-T3, SI-ET3, SI-ES3, SI-B3, SI-M3, SI-W3 <3>, SI-EM3 <3>, SI-EN3 <3>, SI-EP3, AI-A3 <4>, DI-A3 <4>, SI-EN3D, SI-EM3D	CN5-A	1

<1> When connecting two PG option cards, use both CN5-B and CN5-C. When connecting only one PG option card, use the CN5-C connector.

<2> Not available for the application with Motor 2 Selection.

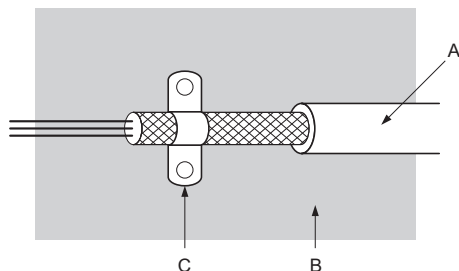
<3> Not available with 1000-Series drive models with a capacities between 450 and 630 kW.

<4> When you use the input status of AI-A3 and DI-A3 as a monitor, you can connect AI-A3 and DI-A3 to CN5-A, CN5-B, or CN5-C.

12 Option Installation

Verify the following installation conditions to suppress the radiated emissions from other devices and machinery used with this option and drives:

1. Use dedicated shield cable for the option and external device (encoder, I/O device, master), or run the wiring through a metal conduit.
2. Keep wiring as short as possible and ground the largest possible surface area of the shield to the metal panel according to [Figure 28](#).



A – Braided shield cable

C – Cable clamp (conductive)

B – Metal panel

Figure 27 Ground Area

12 Option Installation

■ Option Installation: Models PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□

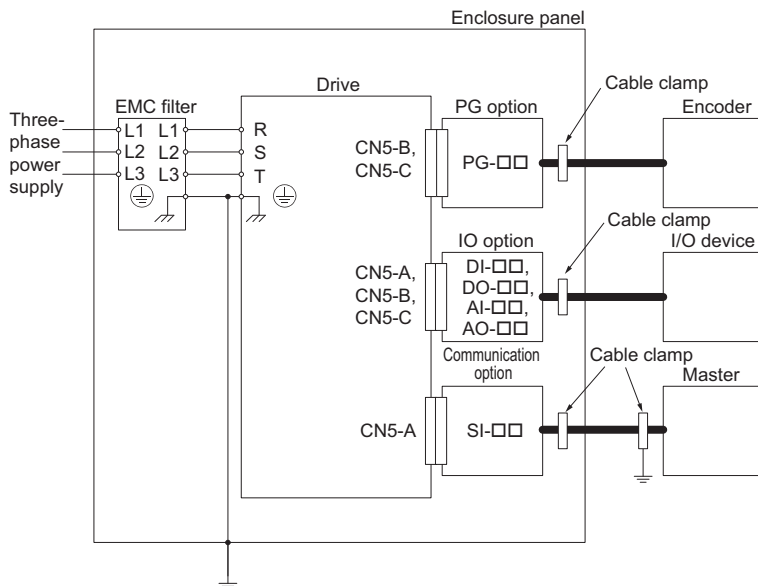


Figure 28 Option Installation (PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□)

■ Option Installation for GA500

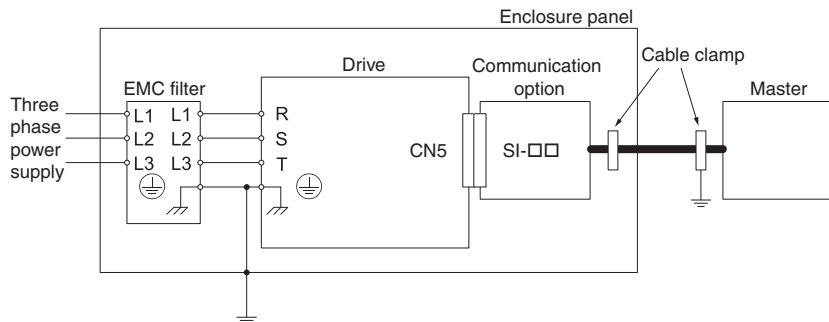


Figure 29 Option Installation for GA500

13 Specifications

Table 14 Option Specifications

Item	Specification
Model	SI-EN3
Supported Messages	Explicit: Explicit Class 3, Unconnected I/O: Class 1, Listen Only, Input Only
I/O Assembly Instance	Input: 12 types (4 to 44 Bytes) Output: 12 types (4 to 44 Bytes)
SI-EN3 Specification	Conformance Level CT 12: Passed
SI-EN3 Profile	AC Drive
Connector Type	RJ45 8-pin Straight Connector STP Cat5e cable
Physical Layer Type	Isolated Physical Layer TCP Protocol Transformer Isolated
IP Address Setting	Programmable from drive keypad or network
Communication Speed	Programmable from drive keypad or network: 10/100 Mbps, auto-negotiate
Number of Connections	I/O: 2 Explicit: 6
Duplex Mode	Half-forced, Auto-negotiate, Full-forced
Address Startup Mode	Static, BOOTP, DHCP
Ambient Temperature	-10°C to +50°C (14°F to 122°F)
Humidity	95% RH or lower with no condensation
Storage Temperature	-20°C to +60°C (-4°F to 104°F) allowed for short-term transport of the product
Area of Use	Indoors and free from: • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	1000 m (3280 ft) or lower

14 Disposal

◆ Disposal Instructions

Correctly dispose of this product and packing material as specified by applicable regional, local, and municipal laws and regulations.

◆ WEEE Directive



Figure 30 WEEE Mark

The wheeled bin symbol on this product, its manual, or its packaging identifies that you must recycle it at the end of its product life.

You must discard the product at an applicable collection point for electrical and electronic equipment (EEE).

Do not discard the product with usual waste.

14 Disposal

◆ Revision History

Revision dates and manual numbers appear on the bottom of the back cover.

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January 2019	<2>	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Back cover	Revision: Address
July 2017	<1>	Chapter 2	Addition: Note in Table 1
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