

YASKAWA AC Drive Option

CANopen Installation Manual

Type SI-S3

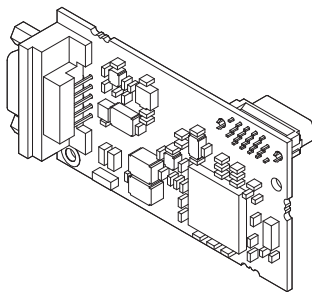
To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

安川インバータ オプション

CANopen 通信 取扱説明書

形式 SI-S3

製品を安全にお使いいただくために、この取扱説明書を必ずお読みください。
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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 CANopen Option card:

Option	
YASKAWA AC Drive Option CANopen Installation Manual Manual No.: TOBPC73060085 (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 CANopen Technical Manual Manual No.: SIEPC73060085	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.

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.

◆ Terms

- Note:** Indicates supplemental information that is not related to safety messages.
- Option:** Yaskawa AC Drive Option CANopen
- Drive:**
- YASKAWA AC Drive 1000-Series (A1000, U1000, U1000L, Z1000U)
 - 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

- CANopen is a registered trademark of the CAN in Automation (CiA).
- Other company names and product names listed in this manual are registered trademarks of those companies.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option card. The option card 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.

1 Preface and Safety

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 drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board 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 attempt to modify or alter the drive or drive circuitry in any way not explained in this manual.

Failure to comply could cause death or serious injury and will void warranty. Yaskawa is not responsible for any modification of the product made by the user. Do not modify this product.

NOTICE

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.

Do not expose the drive or the option to halogen group disinfectants. Do not pack the drive or the option in fumigated or sterilized wooden materials. Do not sterilize the entire package after packing the product.

Failure to comply could damage electrical components in the option.

2 Overview

The CANopen Option Card (Model: SI-S3) is an option card designed to connect the Yaskawa AC drive to a CANopen network.

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

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

The CANopen Option supports the following communication profiles

- DS 301 Ver. 4.02
- DSP 402 Ver. 1.1 Velocity Mode

◆ 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□□□□	
GA500	CIPR-GA50□□□□□	≥1010

Product Series	Model(s)	Software Version <f>
GA700	CIPR-GA70□□□□□	≥1010
GA800	CIPR-GA80□□□□□	≥9010

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

Note: 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>

2 Overview

◆ 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.

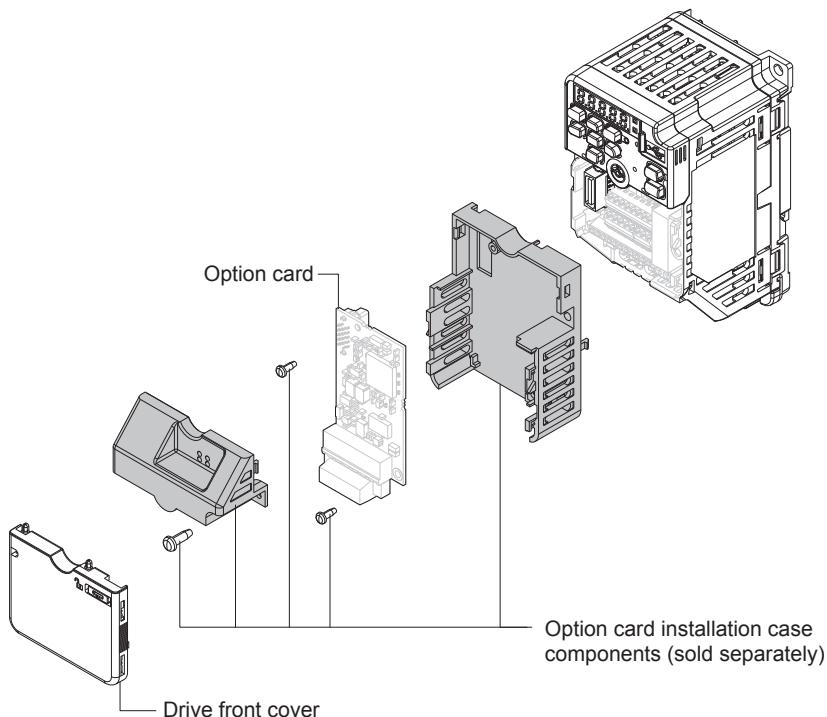


Figure 1 Option Card Installation Case

3 Receiving

After receiving the option package:

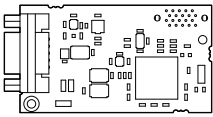
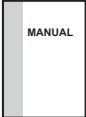
1. Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if the option or other parts appear damaged.

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 **12** for details. Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Contents and Packaging

Table 2 Contents of Package

Description:	Option Card	Ground Wire <1>	Screws (M3)	LED Labels		Installation Manual
				1000-Series	GA500, GA700, and GA800	
						
Quantity:	1	1	3 <2>	1	1	1

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

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

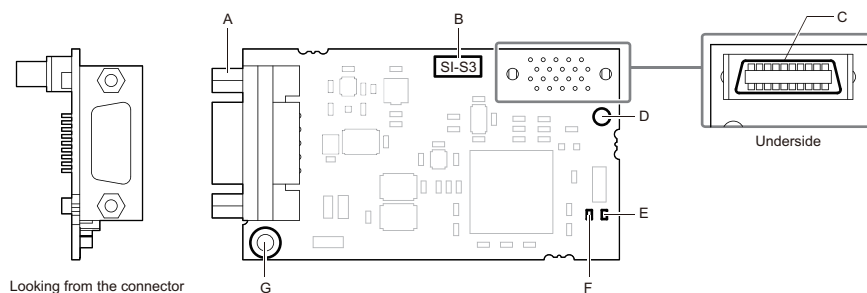
◆ Installation Tools

- 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.

Note: This manual does not list tools required to prepare option cables for wiring.

4 CANopen Option Components

◆ CANopen Option



A – Communication cable connector
(9 pin D-sub)

B – Option model number

C – Connector (CN5)

D – Installation hole

E – LED (RUN) <1>

F – LED (ERR) <1>

G – Ground terminal (FE)
(installation hole) <2>

<1> Refer to *CANopen Option Status LEDs* on page 14 for details on the LEDs.

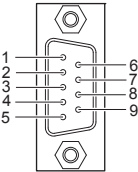
<2> Connect the provided ground wire during installation. Installation on GA700 and GA800 drives does not require the ground wire.

Figure 2 Option Components

◆ Communication connector

The CANopen Option is connected to the network using a 9 pin D-sub connector. The pin assignment is explained in [Table 3](#).

Table 3 Communication connector (9 pin D-sub)

CANopen Connector	Pin	Signal	Description
	1	—	—
	2	CAN_L	CAN_L bus line (dominant low)
	3	CAN_GND	CAN Ground
	4	—	—
	5	CAN_SHLD	CAN shield
	6	—	—
	7	CAN_H	CAN_H bus line (dominant high)
	8	—	—
	9	—	—
	—	CAN_SHLD	CAN shield

4 CANopen Option Components

◆ CANopen Option Status LEDs

The CANopen Option has two LEDs that indicate the option card or communication status. The indications are conform with the DS303, Part 3: Indicator Specification.

■ Defining Option LED States



Figure 3 Option LED Labels

Table 4 Understanding the Status LEDs

LED	Color	Display	Description
RUN	Green	On	Operational State
		Blinking	Pre-operational State
		Single flash	Stopped
		Flickering </>	Automatic bit rate detection in progress (alternately flickering with ERR LED)
ERR	Red	On	Bus off
		Blinking	Bus initialization failed (parameter setting error)
		Single flash	Fault has occurred Receiving CAN error frame (too many error frames)
		Double flash	Guard / Heartbeat event has occurred
		Flickering </>	Automatic bit rate detection in progress (alternately flickering with RUN LED)
		Off	Online

<1> Available in option card software version 3102 and later. Refer to the option package labeling in the field designated “PRG” (S + four digit number)” or the option labeling in the field designated “C/N” (S + four digit number)” to identify the option software version.

Figure 4 explains the indicator flash rates.

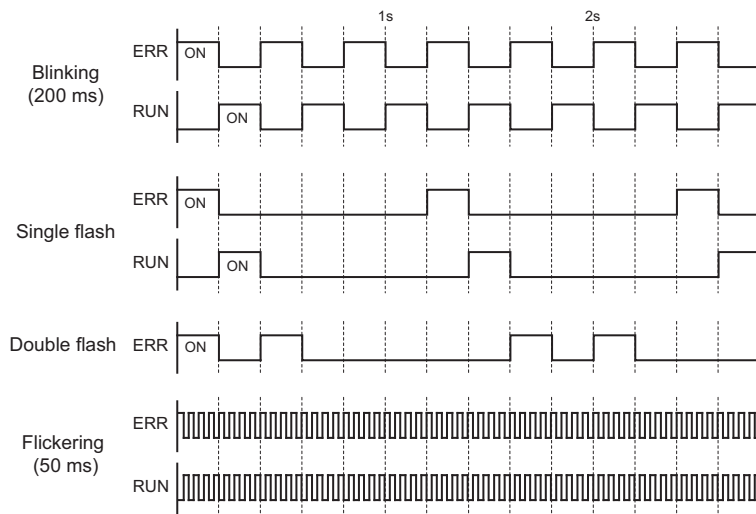


Figure 4 LED Flash Rates and Meaning

5 Installation Procedure

◆ Section Safety

DANGER

Electric 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 for installing and wiring options differ depending on the drive model.

Refer to [Table 5](#) to check the procedures for installing and wiring options on a drive.

Table 5 Procedures for Installing and Wiring Options on a Drive

Product Series	Procedures for Installing and Wiring Options on a Drive	Page
A1000	Procedure A	19
U1000	Procedure A	19
U1000L	Procedure A	19
Z1000U	Procedure A	19
GA500	<1>	–
GA700	Procedure B	25
GA800	Procedure B	25

[<1>](#) Use the option card installation case manual to install the option on GA500 drives.

■ 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 5** for an exploded view of the drive with the option and related components for reference in the installation procedure.

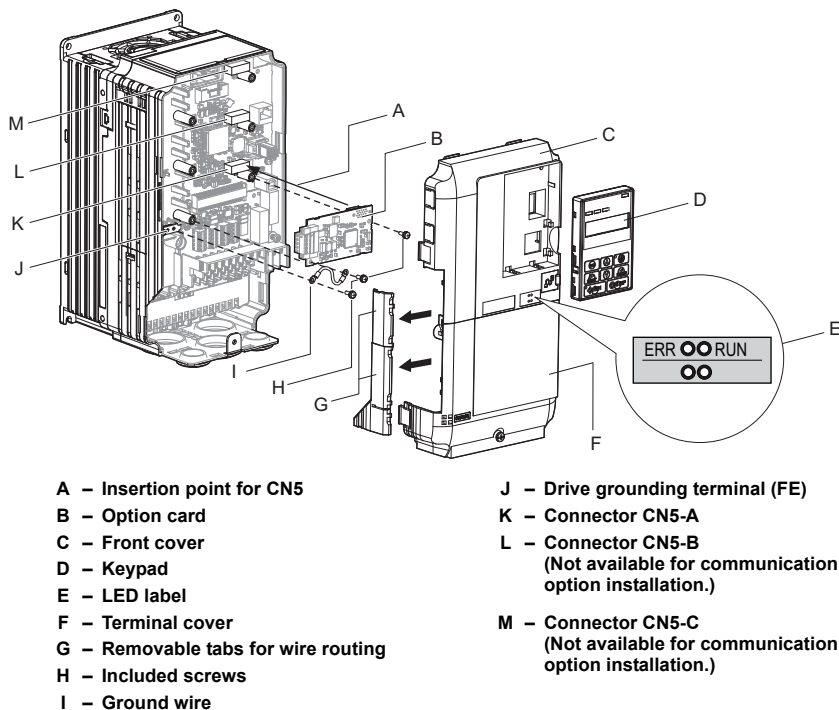


Figure 5 Drive Components with Option

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.

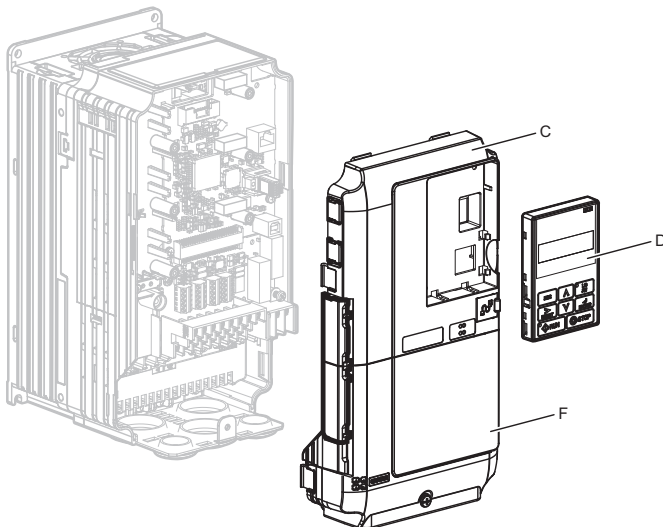


Figure 6 Remove the Keypad, Front Cover, and Terminal Cover

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

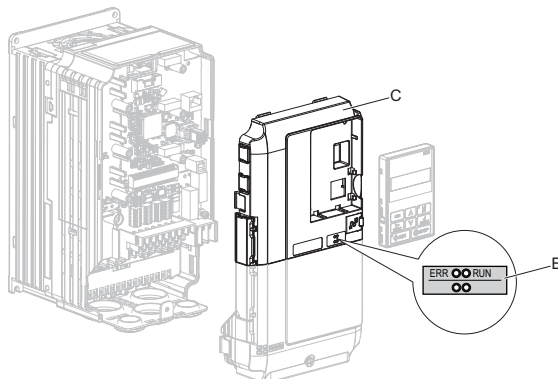


Figure 7 Affix the LED Label

3. Insert the option card (B) into the CN5-A (K) 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).

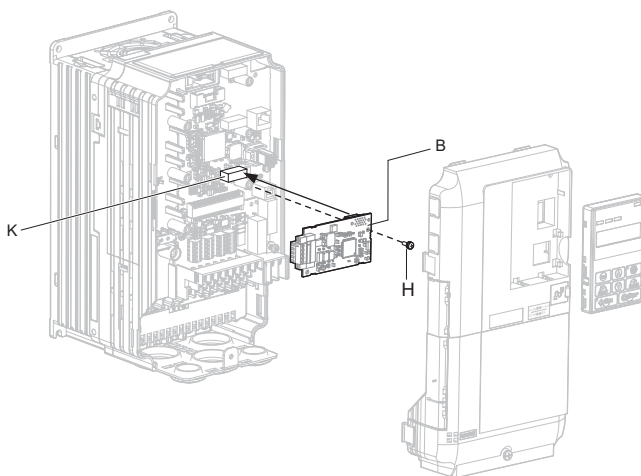


Figure 8 Insert the Option

5 Installation Procedure

4. Connect one end of the ground wire (I) to the ground terminal (J) using one of the remaining provided screws (H). Connect the other end of the ground wire (I) to the remaining ground terminal 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).

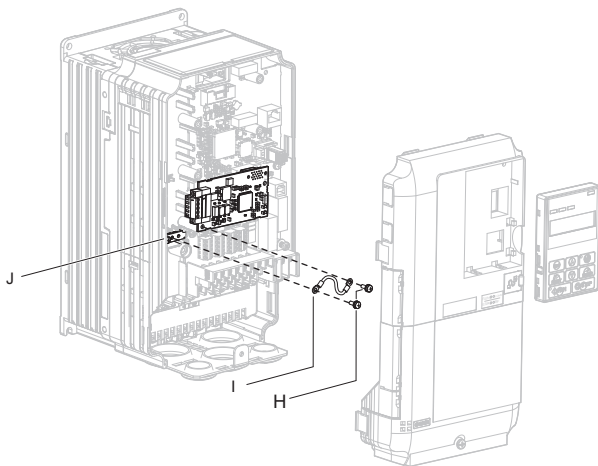
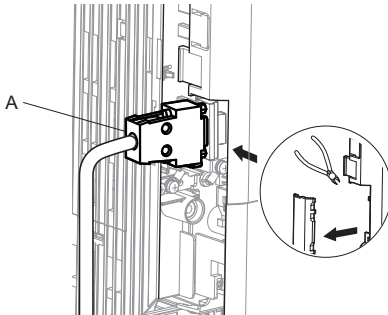


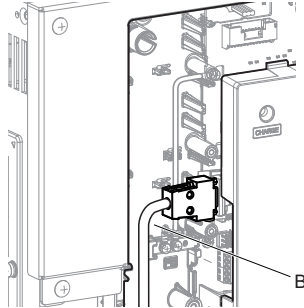
Figure 9 Connect the Ground Wire

Note: The drive has only two ground terminal screw holes (J). 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 10-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 10-A** to create the necessary openings on these models. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.



A – Route wires through the openings provided on the left side of the front cover. <1>



B – Use the open space provided inside the drive to route option wiring.

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

Figure 10 Wire Routing Examples

5 Installation Procedure

6. Firmly connect the CANopen communication cable to option communication connector 9 pin D-sub. Install CANopen communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 18](#)). Refer to [Communication Cable Specifications on page 31](#) for details.
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.

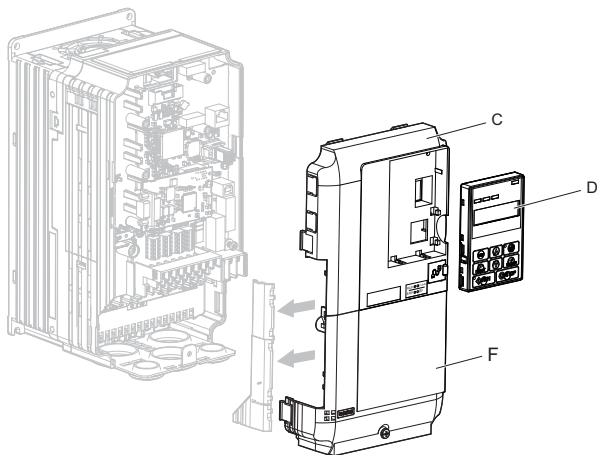


Figure 11 Replace the Front Covers and Keypad

8. Set drive parameters in [Table 6](#) for correct option performance.

■ Procedure B

This section shows the procedure to install and wire the option on a GA700 or GA800 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 12** for an exploded view of the drive with the option and related components for reference in the installation procedure.

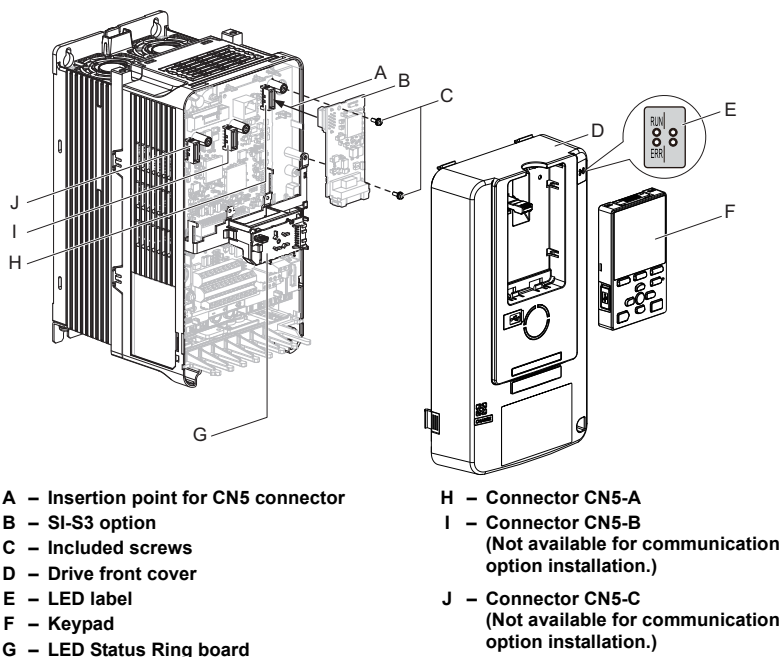


Figure 12 Drive Components with Option

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).

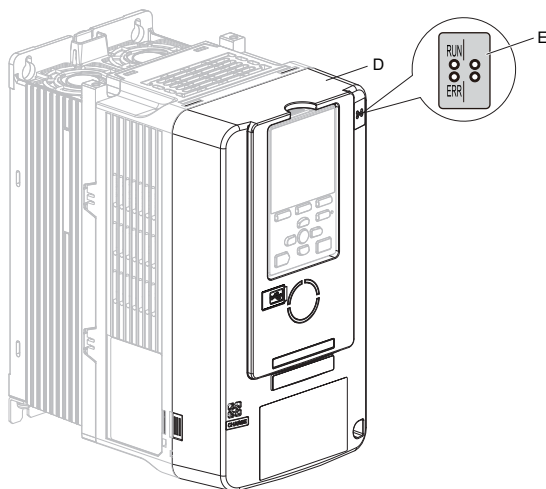


Figure 13 Affix the LED Label

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.

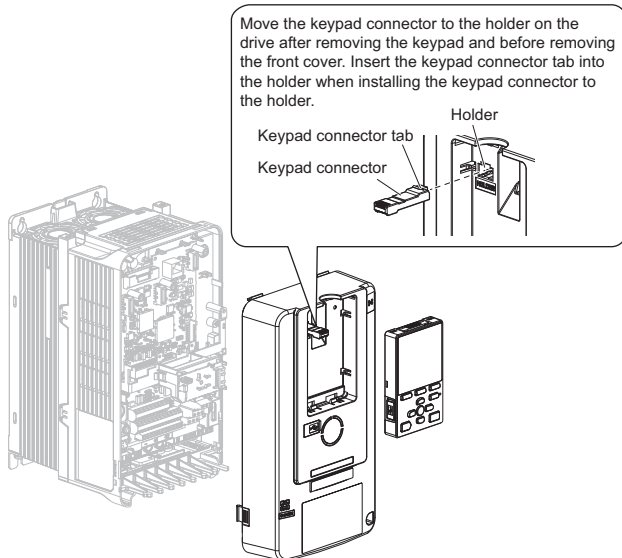


Figure 14 Remove the Front Cover and Keypad

5 Installation Procedure

3. Carefully remove the LED Status Ring board (G) 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.

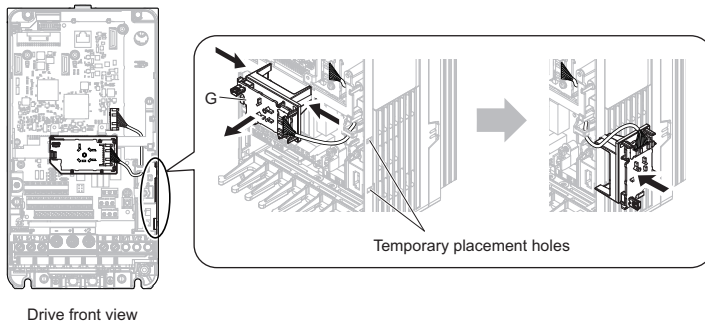


Figure 15 Remove the LED Status Ring Board

4. Insert the option card (B) into the CN5-A connector (H) 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: Installing the option card on GA700 and GA800 drives requires only two screws and does not require a ground wire. 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.

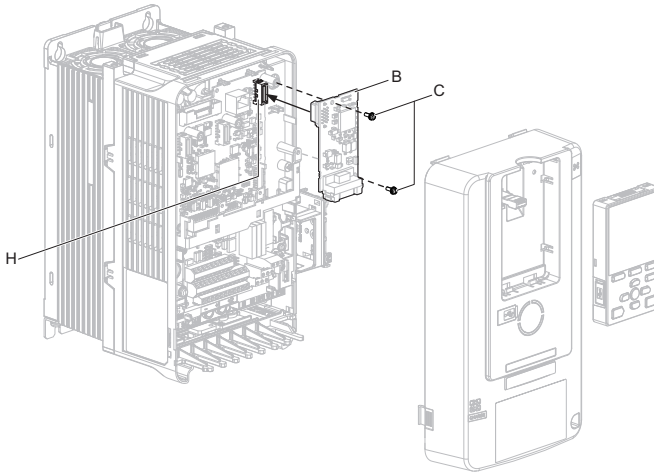


Figure 16 Insert the Option Card

5. Connect the CANopen communication cable to option communication connector 9 pin D-sub. Install CANopen communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 18](#)). Refer to [Communication Cable Specifications on page 31](#) for details of installing.

Note: 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 (G).

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).

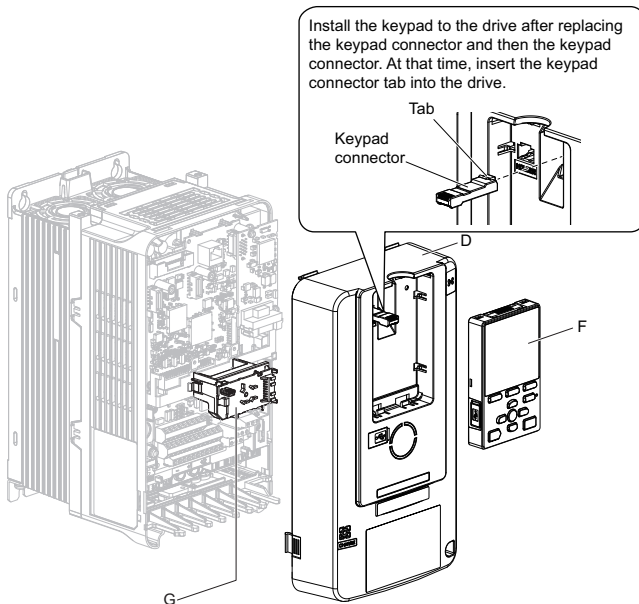


Figure 17 Replace the Front Cover and Keypad

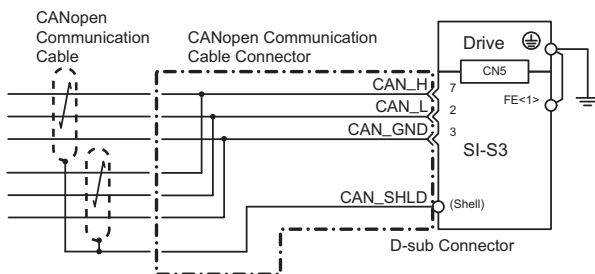
8. Set drive parameters in [Table 6](#) for correct option performance.

◆ Communication Cable Specifications

To ensure proper performance Yaskawa recommends using CANopen dedicated communication cables only.

◆ Option Connection Diagram

The CANopen option must be connected to the network using a 9 pin D-sub connector wired like shown in *Figure 18*.



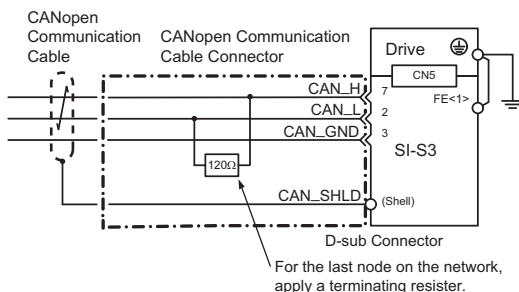
<1> Connect the provided ground wire for installations on 1000-series drives and GA500 drives. The ground wire is not necessary for installation on GA700 or GA800 drives.

Figure 18 Option Connection Diagram

5 Installation Procedure

◆ Termination Resistor Connection

Both ends of a CANopen network have to be terminated with a 120 Ω resistor. As the CANopen Option has no build in termination resistor, make sure to apply a termination resistor as shown in **Figure 19** if the CANopen Option is the last node in the network.



<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 19 Termination Resistor Connection

◆ EDS Files

For easy network implementation of drives equipped with a CANopen 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.

6 Related Parameters

The parameters in **Table 6** set the drive for operation with the option. Confirm proper setting of all parameters in **Table 6** before starting network communications. Refer to the manual packaged with the drive for details on setting parameters.

Table 6 Related Parameters

No.	Name	Description	Values
b1-01 </>	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: </> Range: 0 to 4
b1-02 </>	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
d5-01	Torque Control Selection	0: Speed Control 1: Torque Control	Default: 0 Range: 0, 1
E2-04 </>	Motor Pole Count	Set the number of motor poles described on the motor nameplate. Relevant for DSP402. YASKAWA AC Drive 1000-Series: 2 to 48 YASKAWA AC Drive GA500, GA700, GA800: 2 to 120	Default: 4 Min.: 2 Max.: 48
F6-01	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 </> 4: Alarm - Run at d1-04 </> </> 5: Alarm - Ramp to Stop </>	Default: 1 Range: 0 to 5 </>
F6-02	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

6 Related Parameters

No.	Name	Description	Values
F6-03	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 <4>	Default: 1 Range: 0 to 3
F6-06 <7>	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 <8>	Default: 0 Range: 0, 1
F6-07	MultiStep Ref Priority Select	0: MultiStep References Disabled 1: MultiStep References Enabled	Default: 0 <9> Range: 0, 1
F6-08	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 Range: 0, 1
F6-35 <10> <11>	CANopen Node ID Selection	Determines the operation when a Clear Mode command is received.	Default: 0 Min.: 0 Max.: 126
F6-36 <10>	CANopen Communication Speed	0: Auto-Detection <12> 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	Default: 6 <13> Range: 0 to 8
o1-03 <14>	Keypad Display Selection	Sets the units to display the frequency reference and output frequency. 0: 0.01 Hz 1: 0.01% (100% = E1-04) 2: r/min (enter the number of motor poles to E2-04/E4-04/E5-04) 3: User-selected units	Default: <2> Range: 0 to 3

<1> Set b1-02 = 3 to start and stop the drive with the CANopen master device using serial communications.

Set b1-01 = 3 to control the frequency reference of the drive via the master device.

<2> The default value depends on the drive used and the drive software version. For details refer to the technical manual for the drive.

- <3> E2-04 is necessary to set up when the Drive Profile DSP402 objects are used.
- <4> 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.
- <5> 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.
- <6> 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.
- <7> 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.
- <8> 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.
- <9> Default setting is 1 for GA500.
- <10> Cycle power for setting changes to take effect.
- <11> All node addresses must be unique. If a node address is set to 0, then the ERR light will flash, and AE_r will appear on the keypad screen to indicate that an address setting error has occurred.
- <12> Disabled in option card software versions up to 3101. Automatic bit rate detection is available in option card software versions 3102 and later.
- <13> Regional default settings
 - Setting 0: Europe (Drive model code: CIMR-□C□, CIPR-□C□)
- <14> Changing 01-03 changes the units for input object 2010 (Hex) (frequency reference), output object 2110 (Hex) (output frequency) and 2200 (Hex) (motor speed).

7 Bit Rate and Node ID Setup

◆ Bit Rate Setup

In order to communicate with the drive, the bit rate set in the SI-S3 option card must match the bit rate used in the network. The bit rate can be selected manually by using a drive parameter. The SI-S3 can also be set up for automatic bit rate detection.

■ Setting the Bit Rate Manually

Select the correct bit rate in drive parameter F6-36. After changing F6-36, cycle the drive power supply to enable the changes.

Table 7 Bit Rate Setting

No.	Name	Description	Default
F6-36	Communication Speed	0: Automatic Bit Rate Detection 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	6

<1> Disabled in option card software versions up to 3101. Automatic bit rate detection is available in option card software versions 3102 and later.

<2> Regional default settings

Setting 0: Europe (Drive model code: CIMR-□□□, CIPR-□□□)

■ Using Automatic Bit Rate Detection

Note: This function is available in option card software version 3102 and later.

Set drive parameter F6-36 to 0 to enable automatic bit rate detection and cycle the drive power supply.

When set to automatic bit rate detection, after power up the SI-S3 will listen to messages on the bus and adjust its bit rate setting automatically. When the bit rate is found the SI-S3 will enter pre-operational status and transmit a boot up message containing the drive's node ID. The SI-S3 will not send any messages until the bit rate is detected.

As long as the automatic bit rate detection is in progress, the RUN and ERR LEDs on the SI-S3 option card will flicker alternately.

- Note:**
1. There must be bus traffic that the SI-S3 can listen to in order to detect the bit rate. If there is low traffic, the bit rate detection might take a long time.
 2. The bit rate detected by the SI-S3 is not automatically saved. When cycling the drive power supply, the SI-S3 will perform bit rate detection again.
 3. Besides the master, there must be at least one other node in the network that is set to the correct bit rate. For example, the bit rate cannot be detected if the network consists of a master that is set up for a certain bit rate (controller) and one or multiple drives with an SI-S3 option card set to auto bit rate detection.

◆ Node ID Setup

The node ID can be set in drive parameter F6-35. The value range is 1 to 126. Each node ID may only be used once in the network.

After changing F6-35, cycle the drive power supply to enable the changes.

- Note:** When the node is set to 0, the ERR light will flash and "AEr" will appear on the drive keypad to indicate that an address setting error has occurred.

8 Communication Objects Overview

The following tables list up the communication objects supported by the CANopen option card. For details about the object content refer to the CANopen Option Technical Manual.

◆ Communication Profile Objects (DS 301)

Index (Hex)	Name
1000	Device Type
1001	Error Register
1003	Pre-defined Error Field
1005	COB-ID SYNC Message
1008	Manufacturer Device Name
1009	Manufacturer Hardware Version
100A	Manufacturer Software Version
100C	Guard Time
100D	Life Time Factor
100E	Node Guarding Identifier
1010	Store Parameters
1011	Restore Default Parameters
1014	COB-ID Emergency Object
1016	Consumer Heartbeat Time
1017	Producer Heartbeat Time
1018	Identity Object

◆ Manufacturer Specific Profile Objects (DS 301)

Index (Hex)		Name
Input	2000	Operation Command
	2010	Speed Command
	2020	Torque Limit
	2030	Torque Compensation
	2040	MEMOBUS/Modbus Read Command
	2050	MEMOBUS/Modbus Write Command
	2060	MEMOBUS/Modbus Unlimited Enter Command
	2070	MEMOBUS/Modbus Limited Enter Command </>
	2080 </>	Freely selectable (default: none)
	2090 </>	Freely selectable (default: none)
	20A0 </>	Freely selectable (default: none)
	20B0 </>	Freely selectable (default: none)
	20C0 </>	Freely selectable (default: none)
	3000 </>	Freely selectable (default: none)
	3100 </>	Freely selectable (default: none)

8 Communication Objects Overview

Index (Hex)		Name
Output	2100	Drive Status
	2101 <2>	Drive Status (Change of State filter support)
	2110	Output Frequency
	2111 <2>	Output Frequency (Change of State filter support)
	2120	Output Current
	2121 <2>	Output Current (Change of State filter support)
	2130	Output Torque
	2131 <2>	Output Torque (Change of State filter support)
	2140	MEMOBUS/Modbus Read Command Response
	2150	MEMOBUS/Modbus Write Command Response
	2155 <2>	PDO Parameter Write Response
	2160	MEMOBUS/Modbus Not Limited Enter Command Response
	2180 <2>	Freely selectable (default: Input terminal status)
	2190 <2>	Freely selectable (default: Analog input 1 monitor)
	21A0 <2>	Freely selectable (default: none)
	21B0 <2>	Freely selectable (default: none)
	21C0 <2>	Freely selectable (default: none)
	21D0 <2>	Freely selectable (default: none)
	21E0 <2>	Freely selectable (default: none)
	21F0 <2>	Freely selectable (default: none)
	2200	Motor Speed <3>
	2201 <2>	Motor Speed (Change of State filter support) <3>

<1> The maximum number of times data can be written to the EEPROM used for the drive is 100,000 times. Do not use this write command frequently.

<2> Available in option card software version 3102 and later.

<3> Units for motor speed are determined by o1-03. If the control mode for the drive is set to Closed Loop Vector Control (A1-02 = 5) or V/f control with simple PG feedback is disabled (H6-01≠3) in V/f Control (A1-02 = 0), then the motor speed will be 0.

◆ Drives and Motion Profile Objects (DSP 402)

The drive supports the Drive and Motion Profile DSP 402 Velocity Mode. Before using the Velocity Mode objects the following parameters have to be set up in the drive:

- Motor Pole Count:
 - E2-04
 - E4-04 for motor 2
 - E5-04 for PM motor
 - E9-08 in EZ Open Loop Vector Control <1>

<1> EZ Open Loop Vector Control is only available in YASKAWA AC Drive GA500, GA700 and GA800.

- The frequency reference and output frequency display unit has to be set to min^{-1} by setting parameter o1-03 = 2.

If these settings are not done properly, the Velocity Mode objects can not be used or deliver wrong data.

Object Type	Index (Hex)	Name
Common Entries	60FD	Digital Inputs <1>
	60FE	Digital Outputs <2>
Device Control	6040	Controlword
	6041	Statusword
	6061	Modes of operation display
Velocity Mode	6042	v1 target velocity
	6043	v1 velocity demand
	6044	v1 control effort
	6046	v1 velocity min max amount
	6048	v1 velocity acceleration
	6049	v1 velocity deceleration
	604A	v1 velocity quick stop
	604C	v1 dimension factor
	604D	v1 pole number

<1> YASKAWA specifies this object as the drive digital output monitor. (Input from the network)

<2> YASKAWA specifies this object as the drive digital inputs. (Output to the network)

8 Communication Objects Overview

◆ PDO Mapping

The drive supports 15 Receive and 16 Transmit PDOs. The tables below show the available PDOs, their default settings, and the objects that need to be set when changing the PDO configuration or the PDO mapping.

■ Receive PDOs (RxPDO)

PDO number	Receive PDO Parameter		Receive PDO Mapping	
	COB-ID (Hex)	Index (Hex)	Mapped objects (Hex)	Index (Hex)
1	200 + Node ID	1400	Subindex 1: 6040	1600
2	300 + Node ID	1401	Subindex 1: 6040 Subindex 2: 6060	1601
6	Not assigned	1405	Subindex 1: 6040 Subindex 2: 6042	1605
7	Not assigned	1406	Subindex 1: 6040 Subindex 2: 60FE sub1	1606
8	Not assigned	1407	Subindex 1: 6040 Subindex 2: 6060	1607
21	Not assigned	1414	Subindex 1: 6048 sub1 Subindex 2: 6048 sub2	1614
22	Not assigned	1415	Subindex 1: 6049 sub1 Subindex 2: 6049 sub2	1615
23	Not assigned	1416	Subindex 1: 604A sub1 Subindex 2: 604A sub2	1616
24	Not assigned	1417	Subindex 1: 604C sub1 Subindex 2: 604C sub2	1617
36	Not assigned	1423	Subindex 1: 2000	1623
37	Not assigned	1424	Subindex 1: 2010	1624
38	Not assigned	1425	Subindex 1: 2020	1625
39	Not assigned	1426	Subindex 1: 2030	1626
40	Not assigned	1427	Subindex 1: 2040 sub1	1627
41	Not assigned	1428	Subindex 1: 2050 sub1	1628

■ Transmit PDO (TxPDO)

PDO number	Transmit PDO Parameter		Transmit PDO Mapping	
	COB-ID (Hex)	Index (Hex)	Mapped objects (Hex)	Index (Hex)
1	180 + Node ID	1800	Subindex 1: 6041	1A00
2	280 + Node ID	1801	Subindex 1: 6041 Subindex 2: 6061	1A01
6	Not assigned	1805	Subindex 1: 6041 Subindex 2: 6044	1A05
7	Not assigned	1806	Subindex 1: 6041 Subindex 2: 60FD	1A06
21	Not assigned	1814	Subindex 1: 6042	1A14
22	Not assigned	1815	Subindex 1: 6043	1A15
23	Not assigned	1816	Subindex 1: 6048 sub1 Subindex 2: 6048 sub2	1A16
24	Not assigned	1817	Subindex 1: 6049 sub1 Subindex 2: 6049 sub2	1A17
25	Not assigned	1818	Subindex 1: 604A sub1 Subindex 2: 604A sub2	1A18
26	Not assigned	1819	Subindex 1: 604C sub1 Subindex 2: 604C sub2	1A19
36	Not assigned	1823	Subindex 1: 2100	1A23
37	Not assigned	1824	Subindex 1: 2110	1A24
38	Not assigned	1825	Subindex 1: 2120	1A25
39	Not assigned	1826	Subindex 1: 2130	1A26
40	Not assigned	1827	Subindex 1: 2140 sub1	1A27
41	Not assigned	1828	Subindex 1: 2150 sub1	1A28

9 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. [Table 8](#) 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 8 Fault Display 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.	Faulty communications wiring	• 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).

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.
Keypad Display		Fault Name
EF0	EF0	Option Card External Fault
		The alarm function for an external device has been triggered.
Cause		Possible Solution
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.
Keypad Display		Fault Name
oFA00	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	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 16 .
Keypad Display		Fault Name
oFA03, oFA04	oFA03, oFA04	Option Card Error (CN5-A)
		Option Card Error (CN5-A)
Cause		Possible Solutions
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.

9 Troubleshooting

Keypad Display		Fault Name
	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	Option Fault (CN5-B)
		Non-compatible option is 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: 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	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	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	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.

Keypad Display		Fault Name
PE1	PE1	Programming Error 1
		Object content mapping was changed from the default, and Node Reset was sent while the drive was running.
Cause		Possible Solution
The object dictionary settings were different from the settings stored in the EEPROM of the SI-S3, and Node Reset (NMT 81h xxh) was performed while the drive was running		• Stop the drive before performing Node Reset • Save the object dictionary settings using Store Parameters (object 1010 (hex)) before performing Node Reset.

■ Minor Faults and Alarms

Table 9 lists up alarms that might occur during operation using a communication option board. If a multi function digital output of the drive is programmed for H2-□□ = 10, the output will close if these alarms occur.

Table 9 Alarm Codes and Possible Solutions

Keypad Display		Minor Fault Name	
AEr	AEr	Station Address Error	
		Option is set to an address outside the allowable setting range.	
Cause		Possible Solution	Minor Fault (H2-□□ = 10)
CANopen Option is set to an address outside the allowable setting range.		Set F6-35 to an address within the specified range.	YES
Keypad Display		Minor Fault Name	
CALL	CALL	Serial communication transmission error	
		Communication has is not established.	

9 Troubleshooting

Cause		Possible Solution	Minor Fault (H2-□□ = 10)
Communication wiring is faulty.		• Check for wiring errors. • Correct the wiring.	YES
An existing short circuit or communications disconnection		Check disconnected cables and short circuits and repair as needed.	
Programming error on the master side.		Check communications at start-up and correct programming errors.	
Communication circuitry is damaged.		• Perform a self-diagnostics check • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative.	
Termination resistor of the MEMOBUS/Modbus communications is not enabled.		Set DIP switch S2 to the ON position to enable the termination resistor on a drive located at the end of a network line.	
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 does 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
Keypad Display		Minor Fault Name	
	EEP	EEPROM Error	
		EEPROM checksum error	
Cause		Possible Solution	Minor Fault (H2-□□ = 10)
EEPROM checksum error		If these errors occur, the object dictionary will be reset to its default values. • After the object dictionary has been changed and object dictionary contents are then changed, execute a Store Parameter command (Index = 1010 (Hex)). • If the object dictionary has not been changed, execute a Restore Parameter command (Index = 1011 (Hex)).	YES

10 European Standards



Figure 20 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This option displays the CE mark based on the EMC guidelines.

EMC Guidelines: 2014/30/EU

Drives used in combination with this option and devices used in combination with the drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. Verify that conditions meet European standards after setting up the device.

◆ EMC Guidelines Compliance

This option is tested according to European standards EN 61800-3:2004/A1:2012 and complies with EMC guidelines. The CE marking is declared based on the harmonized standards.

■ EMC Guidelines Installation Conditions

Verify the following installation conditions to ensure that other devices and machinery used in combination with this option and drives also comply with EMC guidelines:

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 22](#).

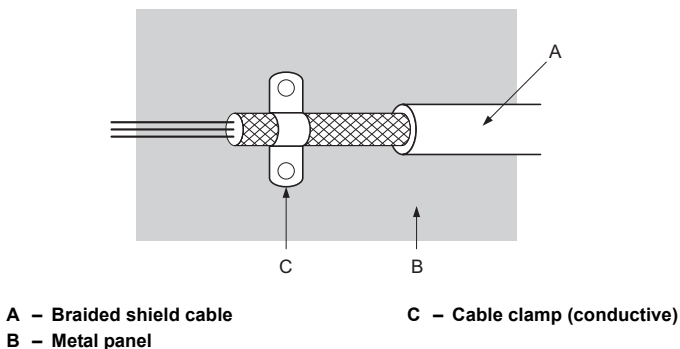


Figure 21 Ground Area

■ **Option Installation for CE Compliance: Models PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□**

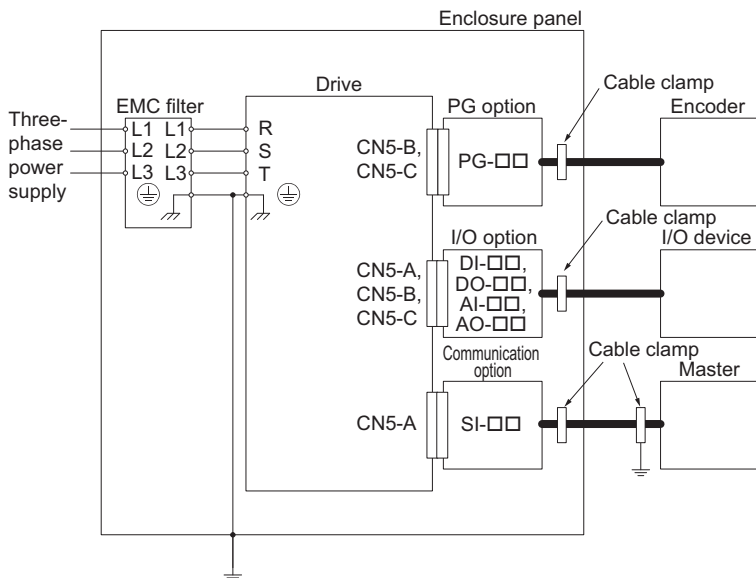


Figure 22 Option Installation for CE Compliance (PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□)

■ Option Installation for CE Compliance with GA500

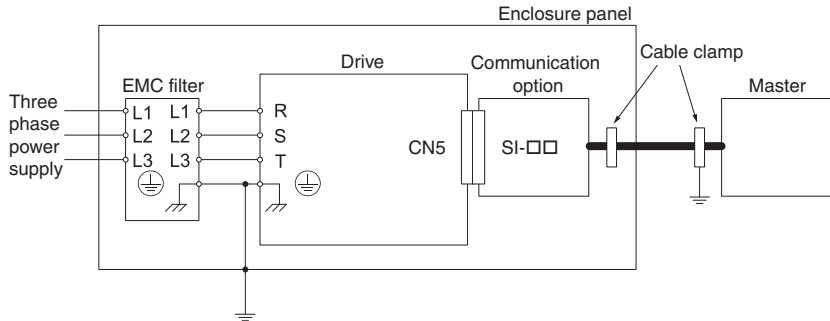


Figure 23 Option Installation for CE Compliance with GA500

11 Specifications

Table 10 Option Card Specifications

Items	Specifications
Model	SI-S3
Communication Profile	DS 301 Ver. 4.02 DSP 402 Ver. 1.1 Velocity Mode
Connector	9 pin D-sub connector (#4/40 UNC thread)
Communications Speed	10 kbps to 1 Mbps
Ambient Temperature	−10 °C to +50 °C
Humidity	up to 95% RH (no condensation)
Storage Temperature	−20 °C to +60 °C (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	up to 1000 m

12 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 24 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.

12 Disposal

◆ Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.

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January 2019	<3>	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Chapter 12	Addition: Disposal
November 2018	<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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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.

Specifications are subject to change without notice for ongoing product modifications and improvements.

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