

YASKAWA AC Drive Option Modbus TCP/IP Installation Manual

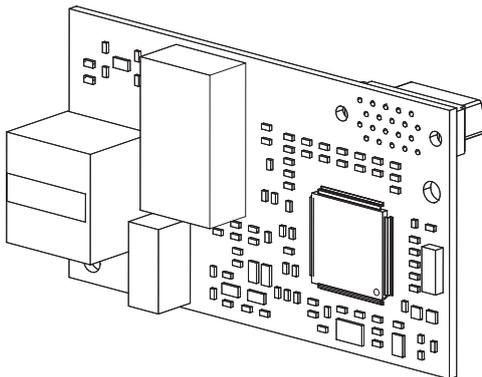
Type: SI-EM3

To correctly use the product, read this manual thoroughly and keep it for easy reference, inspection, and maintenance. Make sure that the end user receives this manual.

安川インバータ オプション Modbus TCP/IP通信 取扱説明書

形 式 SI-EM3

製品を安全にお使いいただくために、本書を必ずお読みください。
また、本書をお手元に保管していただくとともに、最終的に本製品をご使用になるユーザー様のお手元に確実に届けられるよう、お取り計らい願います。



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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

| Document | Description |
|--|---|
| YASKAWA AC Drive Option Modbus TCP/IP Installation Manual (This book) | Read this manual first. The manual provides information about wiring, settings, functions, and troubleshooting. The manual is packaged together with the product. |
| YASKAWA AC Drive Option Modbus TCP/IP Technical Manual Manual No.: SIEP C730600 91 | 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 AC Drive Manuals | Refer to the drive manual to connect with the option. Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The manuals also include important information about parameter settings and tuning the drive. The Quick Start Guides are packaged with the drive. 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. |

◆ Glossary

| Terms | Definition |
|----------------------------|--|
| Option | YASKAWA AC Drive Option SI-EM3 Modbus TCP/IP |
| Keypad | <ul style="list-style-type: none"> • HOA Operator • LCD Operator • LED Operator • HOA Keypad • LCD Keypad • LED Keypad |
| Hex. (Example: 900 (Hex.)) | Identifies a unit for hexadecimal number format. |

◆ Registered Trademarks

- Modbus TCP/IP is a trademark of Modbus-IDA.
- All trademarks are the property of their respective owners.

◆ Supplemental Safety Information

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

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

▲ DANGER This signal word identifies a hazard that will cause serious injury or death if you do not prevent it.

▲ WARNING This signal word identifies a hazard that can cause death or serious injuries if you do not prevent it.

▲ CAUTION This signal word identifies a hazardous situation, which, if not avoided, can cause minor or moderate injury.

NOTICE This signal word identifies a property damage message that is not related to personal injury.

■ Section 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 Do not ignore the safety messages in this manual. If you ignore the safety messages in this manual, it will cause serious injury or death. The manufacturer is not responsible for injuries or damage to equipment.

▲ WARNING *Electrical Shock Hazard.* Do not modify the drive or option circuitry. Failure to obey can cause serious injury or death, or cause damage to the drive or option and will void warranty. Yaskawa is not responsible for modifications of the product made by the user.

NOTICE *Damage to Equipment.* Do not use steam or other disinfectants to fumigate wood for packaging the drive. 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.

2 Overview

This option provides a communications connection between the drive and a Modbus TCP/IP network. The option connects the drive to a Modbus TCP/IP network and facilitates the exchange of data.

Modbus TCP/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. Modbus TCP/IP is a simple, networking solution. Modbus TCP/IP decreases the cost and time to wire and install factory automation devices, and it gives the option to interchange like components from other vendors.

Modbus TCP/IP is an open network standard.

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

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

◆ Compatible Products

You can use the option with these products:

Table 2.1 Compatible Products

| Drive | Model | Software Version */ |
|-------|------------------------|---------------------|
| A1000 | CIMR-Ax2Axxxx | ≥ 1020 |
| | CIMR-Ax4A0002 - 4A0675 | |
| | CIMR-Ax4A0930, 4A1200 | ≥ 3010 |
| | CIMR-Ax5Axxxx | ≥ 5040 ≥ 1020 |
| D1000 | CIMR-Dx2A0005 - 4A0370 | ≥ 2600 |
| | CIMR-Dx4A0630 | ≥ 3014 |
| R1000 | CIMR-Rx2A03P5 - 4A0300 | ≥ 2102 |
| U1000 | CIMR-UxxAxxxx | ≥ 1015 |
| | CIMR-UxxExxxx | |
| | CIMR-UxxPxxxx | |
| | CIMR-UxxWxxxx | |

| Drive | Model | Software Version ^{*1} |
|---------------------|----------------|--------------------------------|
| U1000L | CIMR-UxxLxxxx | ≥ 6210 |
| | CIMR-UxxFxxxx | |
| | CIMR-UxxRxxxx | |
| | CIMR-UxxSxxxx | |
| Z1000 | CIMR-ZxxAxxxx | ≥ 1014 |
| Z1000U | CIMR-ZxxUxxxx | ≥ 6113 |
| | CIMR-ZxxExxxx | |
| | CIMR-ZxxPxxxx | |
| | CIMR-ZxxWxxxx | |
| GA500 ^{*2} | CIPR-GA50xxxxx | ≥ 1010 |
| GA700 ^{*2} | CIPR-GA70xxxxx | ≥ 1010 |
| GA800 ^{*3} | CIPR-GA80xxxxx | ≥ 9010 |
| CR700 ^{*2} | CIPR-CR70xxxxx | ≥ 1012 |
| CH700 ^{*2} | CIPR-CH70xxxxx | ≥ 1012 |
| HV600 ^{*2} | CIPR-HV60xxxxx | ≥ 1011 |
| FP605 ^{*2} | CIPR-FP65xxxxx | ≥ 1010 |

*1 Refer to "PRG" on the drive nameplate for the software version number.

*2 Before you install the option on a GA500, GA700, CR700, CH700, HV600, or FP605 drive, make sure that the option software version is PRG: 8103 or later.

*3 Before you install the option on a GA800 drive, make sure that the option software version is PRG: 8104 or later.

Note:

- Refer to the option package labeling in the field designated "PRG (four digit number)" to identify the option software version.

- For Yaskawa customers in the North or South America regions:

If your product is not listed in Table 2.1, 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 of the manual.

Scan QR code Or refer to:

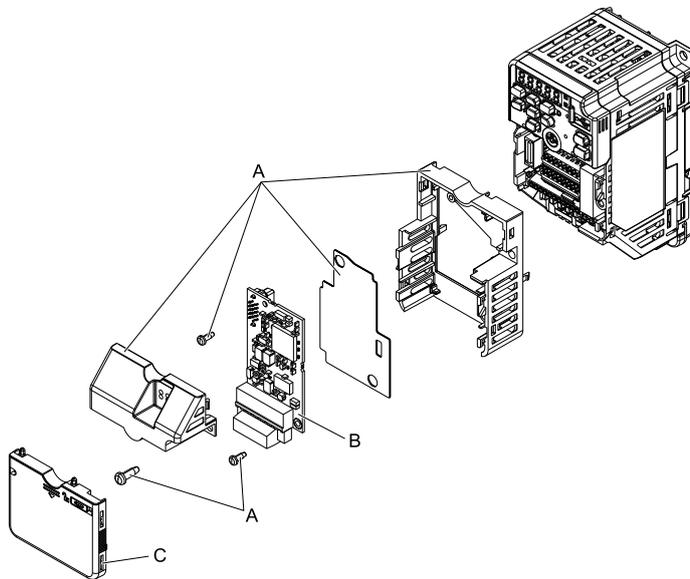
<http://www.yaskawa.com/optionlookup>



◆ Install the Option on a GA500 Drive

An option card mounting kit is necessary to install the option on a GA500 drive. The option card mounting kit model is: JOHB-GA50. This kit is sold separately.

Refer to the option card mounting kit manual for more information about installation.



A - Option card mounting kit components (sold separately)

B - Option

C - Drive front cover

Figure 2.1 Option Card Mounting Kit (JOHB-GA50)

3 Receiving

After receiving the option package:

- Make sure that the option is not damaged and no parts are missing. The Yaskawa warranty does not include damage from shipping. Contact your sales outlet if there is damage to the option or other parts.

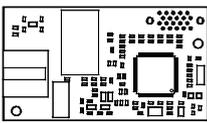
NOTICE

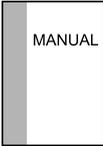
Damage to Equipment. Do not use damaged parts to connect the drive and the option. Failure to comply could damage the drive and option.

- Make sure that the model number on the option nameplate and the model number “SI-EM3” on the purchase order are the same. Refer to Figure 4.1 for more information.
- Contact the distributor where you purchased the option or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Contents

Table 3.1 Contents of Package

| Option Contents | | Quantity |
|-----------------|---|----------|
| Option |  | 1 |
| Ground wire *1 |  | 1 |
| Screws (M3) |  | 3 *2 |

| Option Contents | | | Quantity |
|-----------------|---|---|-----------------|
| LED label | 1000-Series, Z1000U |  | 1 |
| | GA500, GA700, GA800, CR700, and CH700 |  | 1 |
| | Z1000, HV600, and FP605 ^{*3} |  | 1 ^{*4} |
| Manuals |  | 1 | |

*1 GA500, GA700, GA800, CR700, and CH700 drives do not use the ground wire.

*2 GA700, GA800, CR700, CH700, HV600, and FP605 drives use two screws only.

*3 LED label has transparent background and white letters. Please make sure that you use the correct label for Z1000, HV600, or FP605.

*4 Options purchased in Japan do not include LED labels for Z1000, HV600, or FP605.

◆ Installation Tools

You can use these tools to install the option to the drive:

- A Phillips screwdriver or slotted screwdriver (blade depth: 0.4 mm (0.02 in), width: 2.5 mm (0.1 in)) ^{*1}.
- A pair of diagonal cutting pliers.
- A small file or medium-grit sandpaper.

*1 Phillips screw sizes are different for different drive capacities. Prepare different screwdrivers for different screw sizes.

4 Option Components

◆ Option

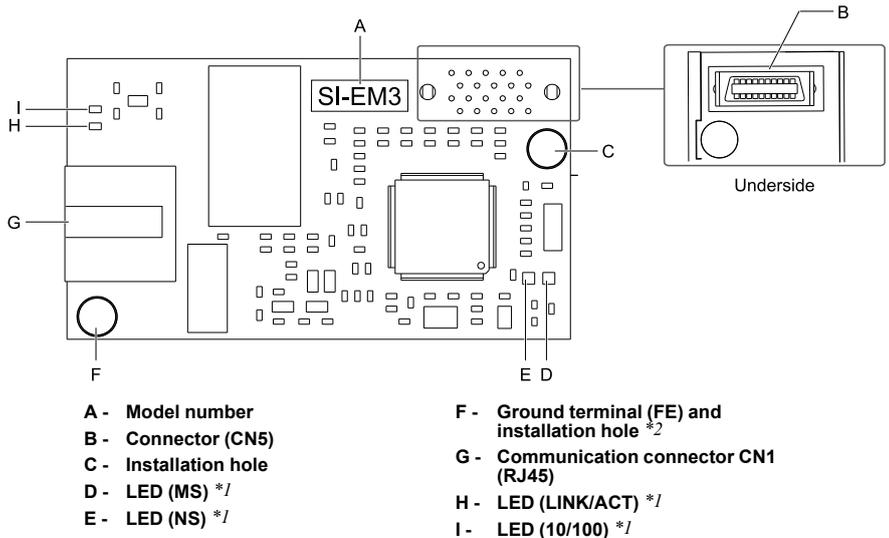


Figure 4.1 Option

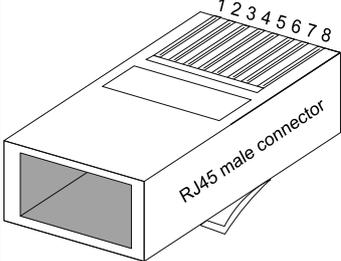
*1 Refer to *Option LED States on page 14* for more information about the LEDs.

*2 Connect the included ground wire during installation. The ground wire is not necessary for installation on GA700, GA800, CR700, and CH700 drives. For GA500, connect the included ground wire to the separately sold communication option case (model: JOHB-GA50).

◆ Communication Connector

The communication modular connector CN1 on the option is a modular dual RJ45 female connector designated port 1 and port 2. Port 1 and port 2 are the connection points for a customer-supplied male Modbus TCP/IP network communication cable.

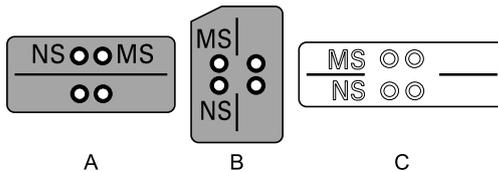
Table 4.1 Male 8-way Ethernet Modular Connector (Customer-Supplied)

| Male 8-way Ethernet 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 |
| | 5 (Pair 1) | Not used |
| | 6 (Pair 3) | Receive data (RXD) - |
| | 7 (Pair 4) | Not used |
| | 8 (Pair 4) | Not used |

◆ **Option LED States**

The option has four LEDs:

- Bi-color Status LEDs:
 - Module status (MS) red/green
 - Network status (NS) red/green
- Ethernet LEDs:
 - Network speed-10/100 green
 - Link status and network activity-Link/Act green



A - 1000-Series, Z1000U

C - Z1000, HV600, and FP605 *1

B - GA500, GA700, GA800, CR700, and CH700

Figure 4.2 Option LED Labels

*1 LED label has transparent background and white letters. Please make sure that you use the correct label for Z1000, HV600, or FP605.

Wait 2 seconds minimum for the power-up diagnostic process to complete before you verify the LED states. The Table 4.2 shows the operating status of the option LEDs after the power-up diagnostic LED sequence is complete.

Table 4.2 Option LED States

| LED Name | Indication | | Operating State | Description |
|-----------------|------------|----------|---|--|
| | Color | Display | | |
| MS | - | OFF | Power supply off | There is no power 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 detected a fatal (unrecoverable) error. |
| | Red | Flashing | Non-fatal error occurred | The option detected a non-fatal (recoverable) error. |
| NS | - | OFF | Power supply OFF or Offline | - |
| | Green | ON | Online communications established | The option is online and has established connections. |
| | Green | Flashing | Control connection active | The option is online and has an established and active control connection. |
| | Red | ON | Communications error (fatal) | The option detected a duplicate IP address. |
| 10/100 */ | Green | OFF | 10 Mbps is established | - |
| | Green | ON | 100 Mbps is established | |
| LINK/ ACT */ | Green | OFF | Link is not established | |
| | Green | ON | Link is established | |
| | Green | Flashing | Link is established and there is network activity | |

*1 To verify LED states, you must remove the drive front cover. Do not touch the drive main circuit terminal or circuit boards when you remove the drive front cover.

5 Installation Procedure

◆ Section Safety

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

⚠ WARNING *Electrical Shock Hazard. Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions. Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive. If personnel are not approved, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Do not remove covers or touch circuit boards while the drive is energized. If you touch the internal components of an energized drive, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Do not use damaged wires, put too much force on the wiring, or cause damage to the wire insulation. Damaged wires can cause serious injury or death.*

⚠ WARNING *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

NOTICE *Damage to Equipment. Do not de-energize the drive while the drive is outputting voltage. Incorrect equipment sequencing can cause damage to the drive.*

NOTICE *Do not operate a drive or connected equipment that has damaged or missing parts. You can cause damage to the drive and connected equipment.*

NOTICE *Use Yaskawa connection cables or recommended cables only. Incorrect cables can cause the drive or option to function incorrectly.*

NOTICE *Damage to Equipment. Correctly connect the connectors. Incorrect connections can cause malfunction or damage to the equipment.*

NOTICE *Damage to Equipment. Make sure that all connections are correct after you install the drive and connecting peripheral devices. Incorrect connections can cause damage to the option.*

◆ Procedures to Install and Wire Options on a Drive

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

Refer to the following table to check the procedures to install and wire the option on a drive.

Table 5.1 Procedures to Install and Wire Options on a Drive

| Drive | Procedures to Install and Wire Options on a Drive | Reference Page |
|--------|---|----------------|
| A1000 | Procedure A | 17 |
| D1000 | Procedure A | 17 |
| R1000 | Procedure A | 17 |
| U1000 | Procedure A | 17 |
| U1000L | Procedure A | 17 |
| Z1000U | Procedure A | 17 |
| Z1000 | Procedure B | 23 |
| GA500 | *1 *2 | - |
| GA700 | Procedure C | 29 |
| GA800 | Procedure C | 29 |
| CR700 | Procedure C | 29 |
| CH700 | Procedure C | 29 |
| HV600 | Procedure D | 34 |
| FP605 | Procedure D | 34 |

*1 To install the option on GA500 drives, use the option mounting kit (JOHB-GA50) and manual.

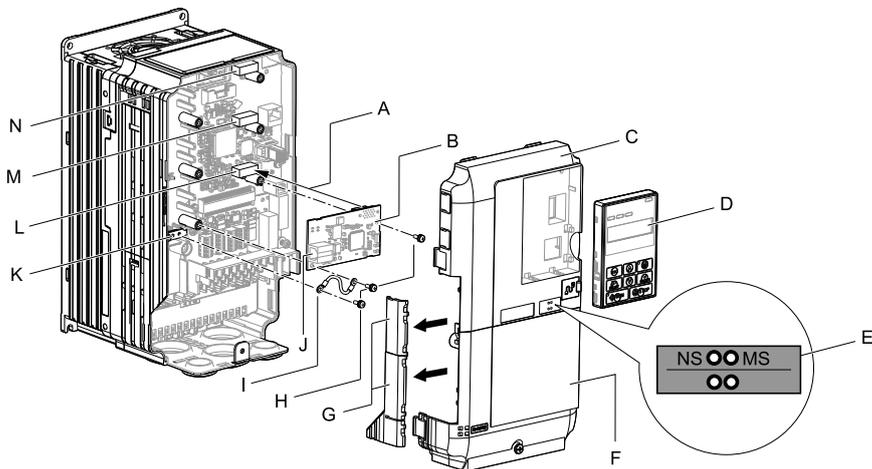
*2 Before you install the option on a GA500 drive, make sure that the option software version is PRG: 8103 or later.

■ Procedure A

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

Prepare the Drive for the Option

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.



- | | |
|--|---|
| A - Insertion point for CN5 connector | H - Included screws |
| B - Option | I - Ground wire |
| C - Drive front cover | J - Option modular connector CN1 |
| D - Keypad | K - Drive grounding terminal (FE) |
| E - LED label | L - Connector CN5-A |
| F - Drive terminal cover | M - Connector CN5-B (Not available for communication option installation.) |
| G - Removable tabs for wire routing | N - Connector CN5-C (Not available for communication option installation.) |

Figure 5.1 Drive Components with Option

Install the Option

Use this procedure to install the option.

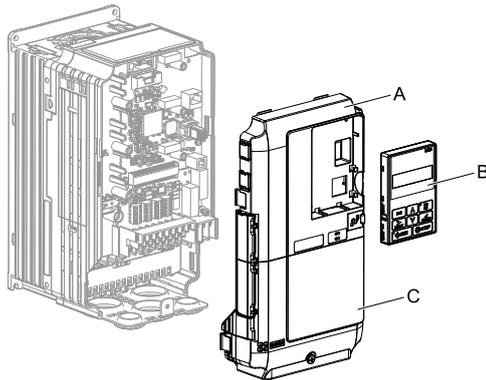
⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

1. Remove the keypad (B), front cover (A), and terminal cover (C).

Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

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

NOTICE *Damage to Equipment.* When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.



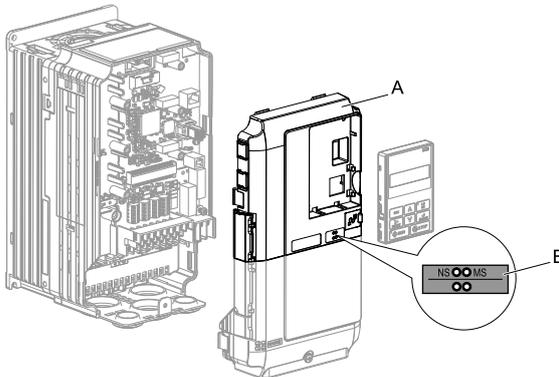
A - Drive front cover

C - Drive terminal cover

B - Keypad

Figure 5.2 Remove the Keypad, Front Cover, and Terminal Cover

- Put the LED label (B) in the correct position on the drive front cover (A).

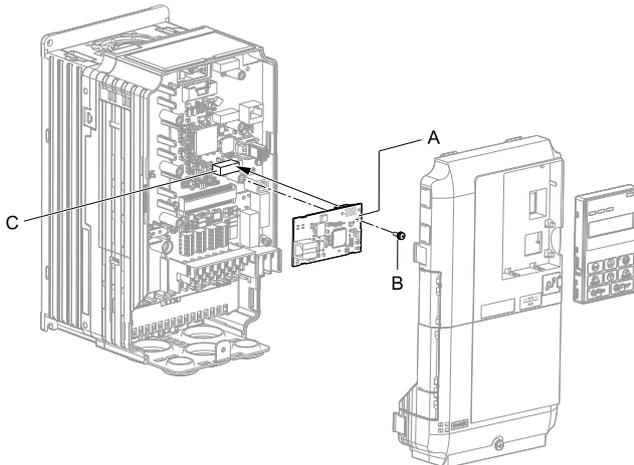


A - Drive front cover

B - LED label

Figure 5.3 Put the LED Label on the Drive Front Cover

3. Install the option (A) into the CN5-A connector (C) on the drive and use one of the included screws (B) to put it in place.



A - Option

B - Included screw

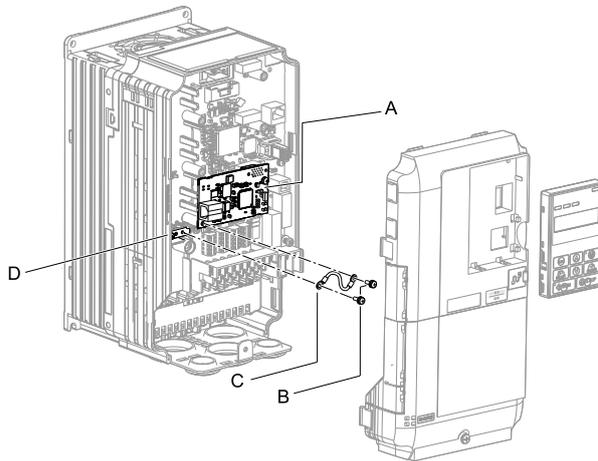
C - Connector CN5-A

Figure 5.4 Install the Option

4. Use one of the remaining included screws (B) to connect one end of the ground wire (C) to the ground terminal (D). Use the last remaining included screw (B) to connect the other end of the ground wire (C) to the remaining ground terminal and installation hole on the option (A).

Tighten the screws to a correct tightening torque:

- 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)



A - Option

B - Included screws

C - Ground wire

D - Drive grounding terminal (FE)

Figure 5.5 Connect the Ground Wire

Note:

The drive has only two ground terminal screw holes. When you connect three options, two options will share one ground terminal.

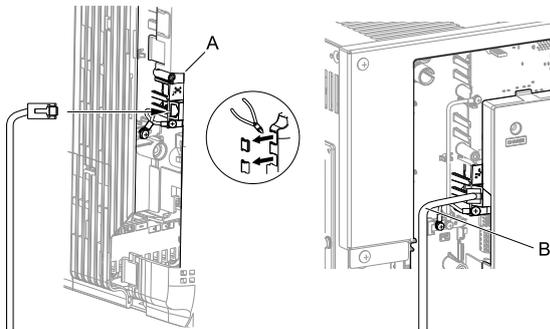
5. Route the option wiring.

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

- You can 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 5.6-A to create the necessary openings on these models. To prevent damage to the cable from the cut end, treat the cut surface with sandpaper.
- Route the option wiring inside the enclosure as shown in Figure 5.6-B. Refer to the drive manuals for more information.

Note:

Isolate communication cables from main circuit wiring and other electrical and power lines.



- 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.**

Figure 5.6 Wire Routing Examples

*1 If there is wiring outside the enclosure, the drive will not meet Enclosed wall-mounted type (IP20/UL Type 1) requirements.

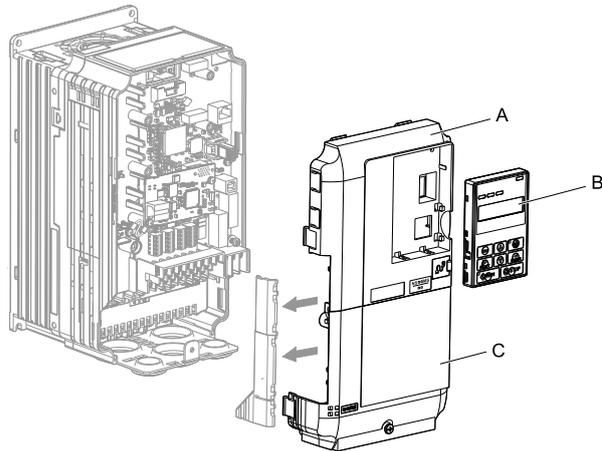
6. Firmly connect the Ethernet communication cable to the option modular connector (CN1).

Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to Figure 5.28). Refer to *Communication Cable Specifications* on page 42 for more information.

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

7. Reattach the front cover (A), terminal cover (C), and keypad (B). Refer to the drive manuals for more information.

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



A - Drive front cover
B - Keypad

C - Drive terminal cover

Figure 5.7 Replace the Front Cover, Terminal Cover, and Keypad

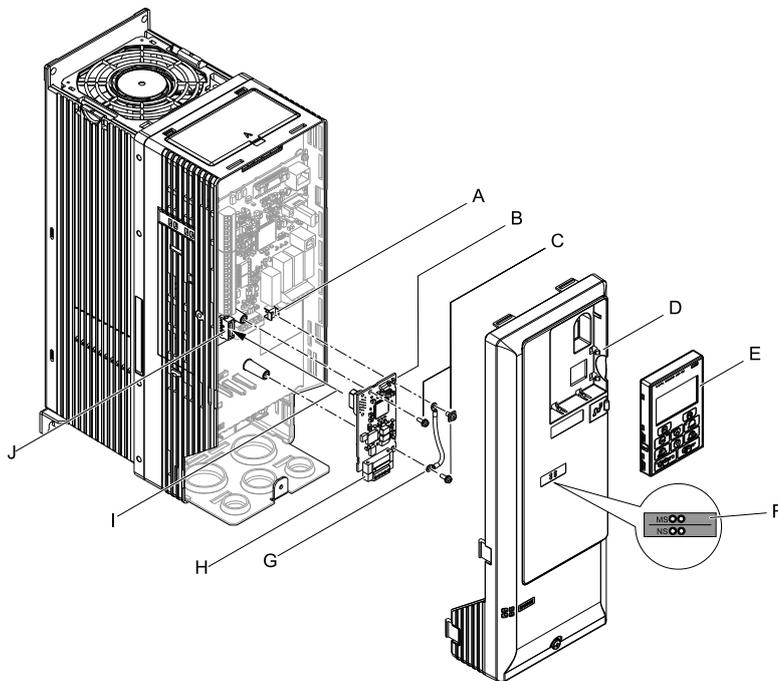
8. Set drive parameters in *Related Drive Parameters* on page 43 for correct option performance.

■ Procedure B

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

Prepare the Drive for the Option

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.



- | | |
|-----------------------------------|---------------------------------------|
| A - Drive grounding terminal (FE) | F - LED label |
| B - Option | G - Ground wire |
| C - Included screws | H - Option modular connector CN1 |
| D - Drive front cover | I - Insertion point for CN5 connector |
| E - Keypad | J - Connector CN5 |

Figure 5.8 Drive Components with Option

Install the Option

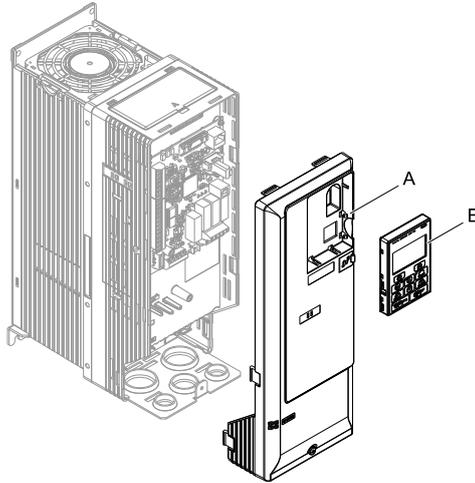
Use this procedure to install the option.

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

1. Remove the keypad (B) and front cover (A).

Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

NOTICE *Damage to Equipment.* When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.

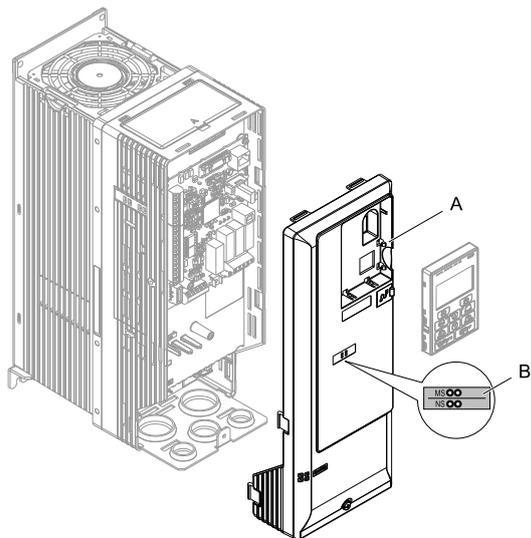


A - Drive front cover

B - Keypad

Figure 5.9 Remove the Front Cover and Keypad

- Put the LED label (B) in the correct position on the drive front cover (A).

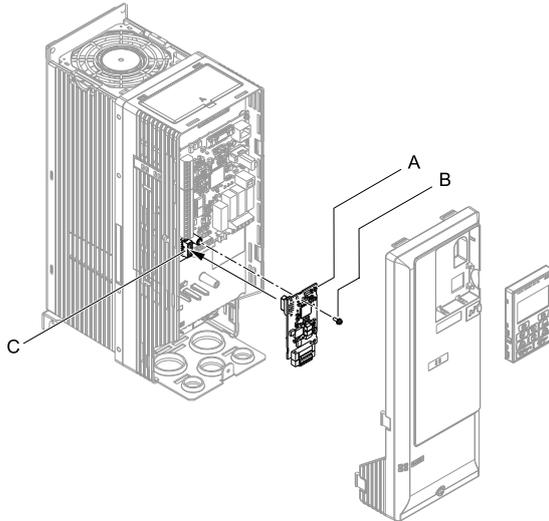


A - Drive front cover

B - LED label

Figure 5.10 Put the LED Label on the Drive Front Cover

3. Install the option (A) into the CN5 connector (C) on the drive and use one of the included screws (B) to put it in place.



A - Option

C - Connector CN5

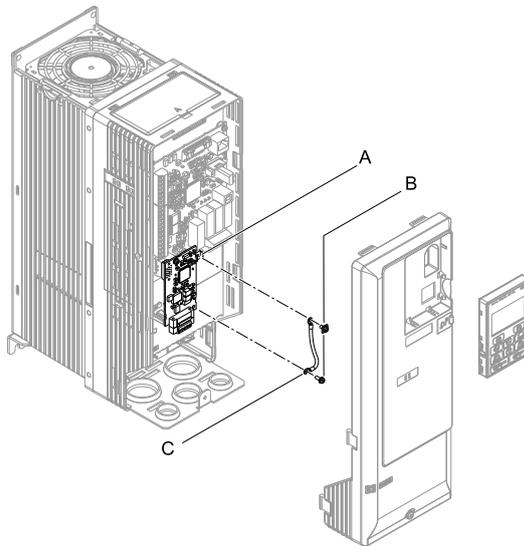
B - Included screw

Figure 5.11 Install the Option

4. Use one of the remaining included screws (B) to connect one end of the ground wire (C) to the ground terminal (A). Use the last remaining included screw (B) to connect the other end of the ground wire (C) to the remaining ground terminal and installation hole on the option (A).

Tighten the screws to a correct tightening torque:

- 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)



A - Drive grounding terminal (FE)

C - Ground wire

B - Included screws

Figure 5.12 Connect the Ground Wire

5. Firmly connect the Ethernet communication cable to the option modular connector (CN1).

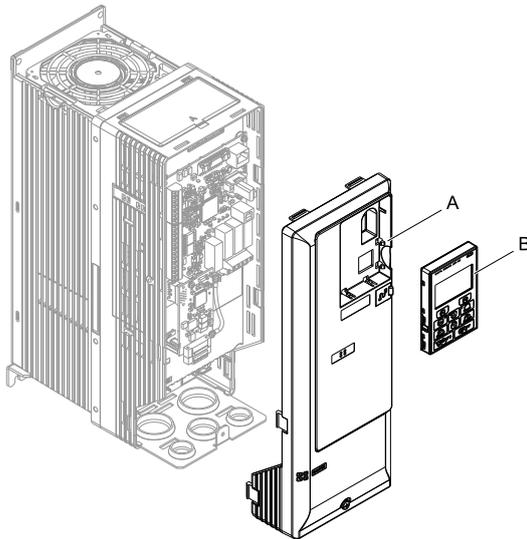
Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to Figure 5.28). Refer to *Communication Cable Specifications* on page 42 for more information.

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

6. Reattach the drive front cover (A) and the keypad (B).

Refer to the drive manuals for more information.

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



A - Drive front cover

B - Keypad

Figure 5.13 Replace the Front Cover and Keypad

7. Set drive parameters in *Related Drive Parameters* on page 43 for correct option performance.

■ Procedure C

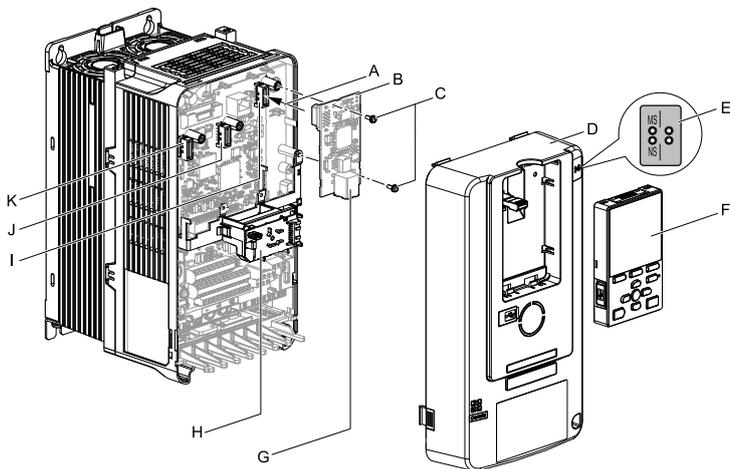
This section shows the procedure to install and wire the option on a GA700, GA800, CR700, or CH700 drive.

Prepare the Drive for the Option

Before you install the option on a YASKAWA AC Drive GA700, CR700, or CH700, make sure that the option software version is PRG: 8103 or later.

Before you install the option on a YASKAWA AC Drive GA800, make sure that the option software version is PRG: 8104 or later.

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.



- A - Insertion point for CN5 connector
- B - Option
- C - Included screws
- D - Drive front cover
- E - LED label
- F - Keypad
- G - Option modular connector CN1
- H - LED Status Ring board
- I - Connector CN5-A
- J - Connector CN5-B (Not available for communication option installation.)
- K - Connector CN5-C (Not available for communication option installation.)

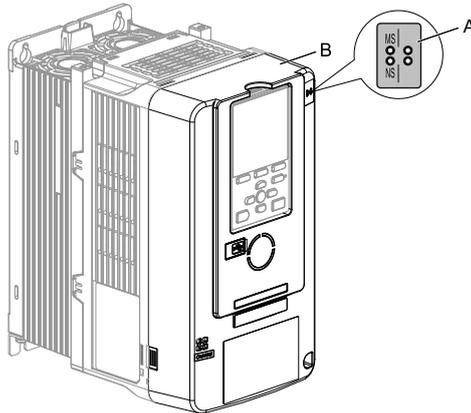
Figure 5.14 Drive Components with Option

Install the Option

Use this procedure to install the option.

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

1. Put the LED label (A) in the correct position on the drive front cover (B).



A - LED label

B - Drive front cover

Figure 5.15 Put the LED Label on the Drive Front Cover

2. Remove the keypad (E) and front cover (D).

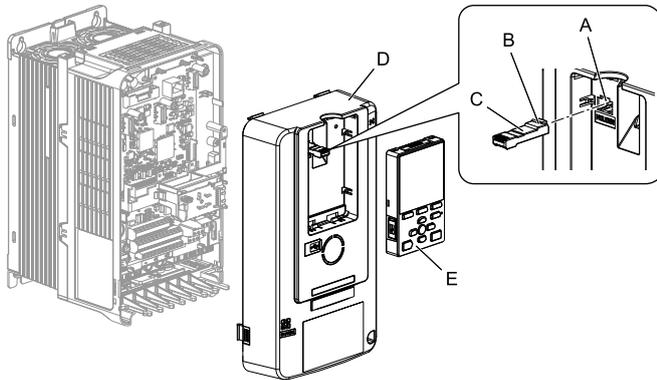
Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

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

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

Note:

Remove the keypad, then move the keypad connector to the holder on the drive, then remove the front cover.

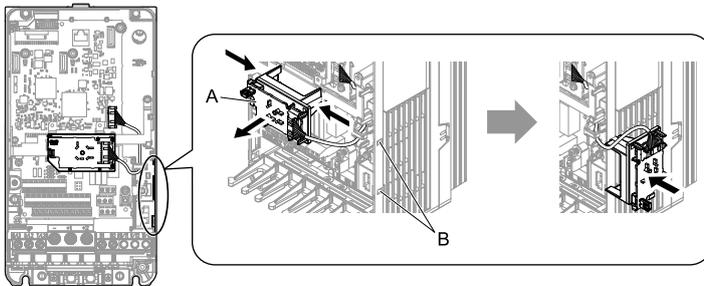


- A - Holder
- B - Keypad connector tab
- C - Keypad connector
- D - Drive front cover
- E - Keypad

Figure 5.16 Remove the Front Cover and Keypad

3. Carefully remove the LED Status Ring board (A) and put it in the temporary placement holes (B) on the right side of the drive. Refer to the drive manuals for more information.

NOTICE Do not remove the LED Status Ring board cable connector. If you disconnect the LED Status Ring board, it can cause incorrect operation and damage to the drive.



Drive front view

- A - LED Status Ring board
- B - Temporary placement holes

Figure 5.17 Remove the LED Status Ring Board

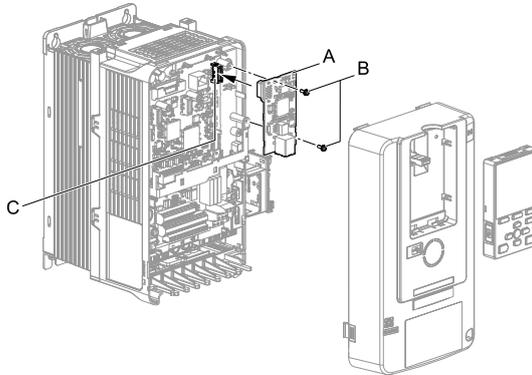
4. Install the option (A) into the CN5-A connector (C) on the drive and use the included screws (B) to put it in place.

Tighten the screws to a correct tightening torque:

- 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

1. A ground wire is not necessary. Do not use the ground wire.
2. Only two screws are necessary to install the option on GA700, GA800, CR700, and CH700 drives.
3. Three screws and one ground wire are packaged with option.



A - Option

C - Connector CN5-A

B - Included screws

Figure 5.18 Install the Option

5. Firmly connect the Ethernet communication cable to the option modular connector (CN1).

Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to Figure 5.28). Refer to *Communication Cable Specifications on page 42* for more information.

NOTICE

Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.

Note:

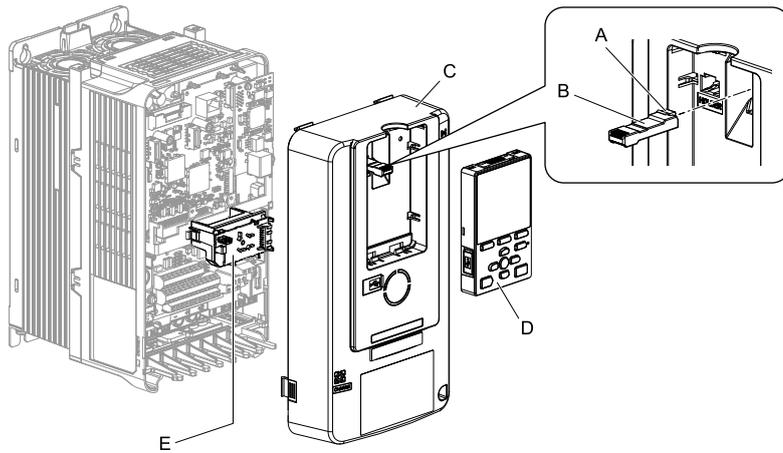
Maximum transmission distance is 100 m (328 ft). Minimum wiring distance between stations is 0.2 m (7.9 in).

6. Reattach the LED Status Ring board (E), front cover (C), and keypad (D). Refer to the drive manuals for more information.

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.

Note:

- Replace the keypad connector then install the keypad.
- Put the keypad connector tab into the holder when you install the keypad connector to the holder.



A - Keypad connector tab
 B - Keypad connector
 C - Drive front cover

D - Keypad
 E - LED Status Ring board

Figure 5.19 Install the LED Status Ring board, Front Cover, and Keypad

7. Set drive parameters in *Related Drive Parameters* on page 43 for correct option performance.

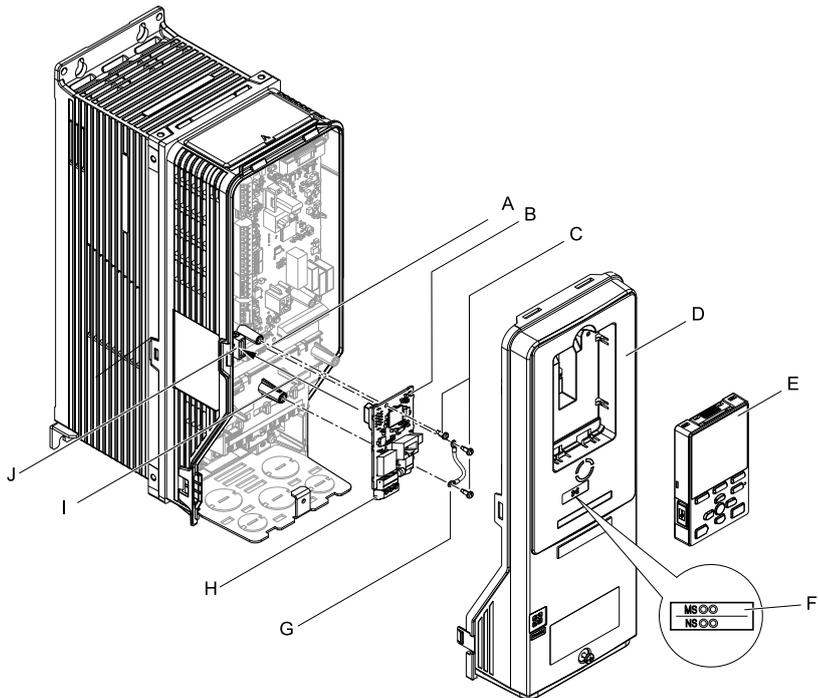
■ Procedure D

This section shows the procedure to install and wire the option on an HV600 or FP605 drive.

Prepare the Drive for the Option

Before you install the option on an HV600 or FP605 drive, make sure that the option software version is PRG: 8103 or later.

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.



- | | |
|--|---|
| A - Drive grounding terminal (FE) | F - LED label |
| B - Option | G - Ground wire |
| C - Included screws | H - Option modular connector CN1 |
| D - Drive front cover | I - Insertion point for connector (HV600: CN5, FP605: CN5-A) |
| E - Keypad | J - Connector (HV600: CN5, FP605: CN5-A) |

Figure 5.20 Drive Components with Option

Install the Option

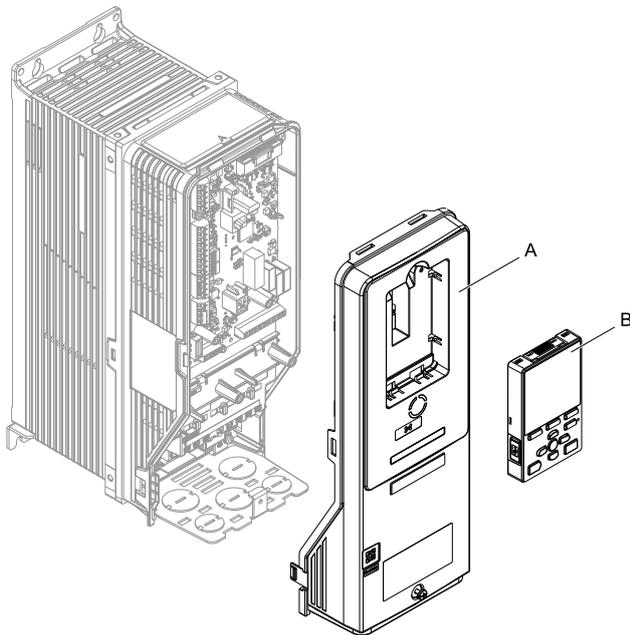
Use this procedure to install the option.

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

1. Remove the keypad (B) and front cover (A).

Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*



A - Drive front cover

B - Keypad

Figure 5.21 Remove the Front Cover and Keypad

- Put the LED label (B) in the correct position on the drive front cover (A).

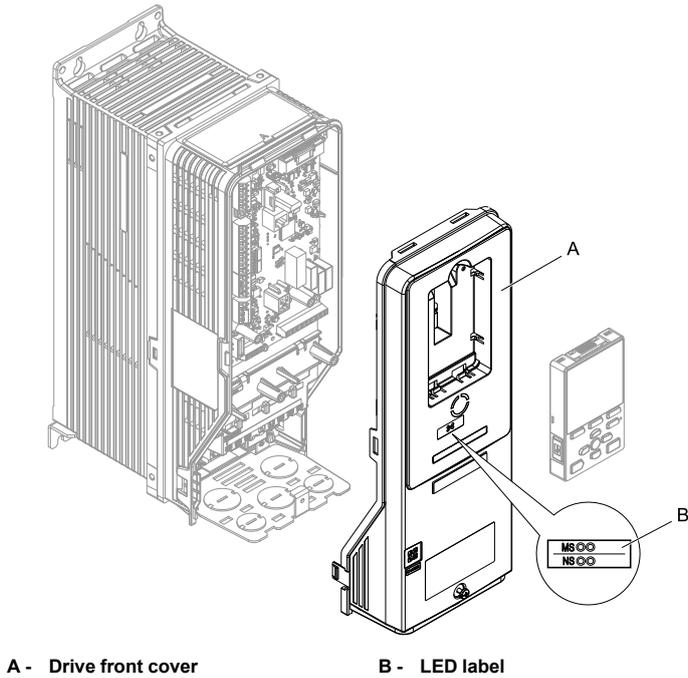
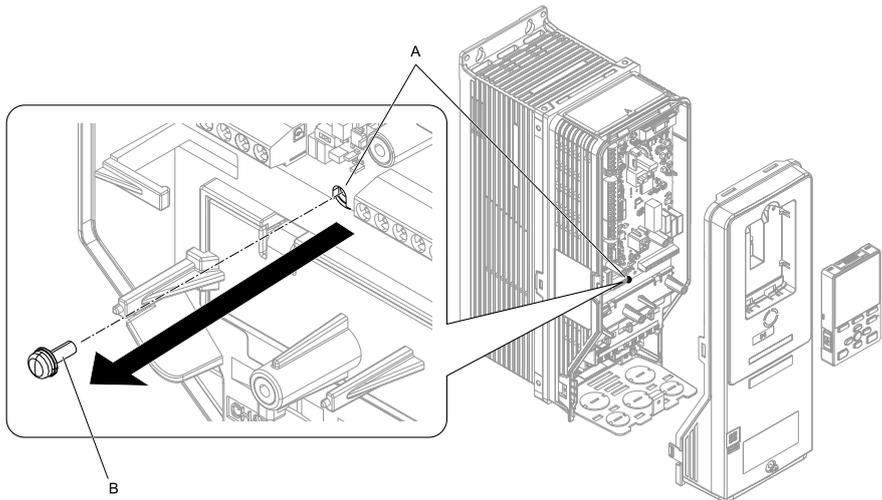


Figure 5.22 Put the LED Label on the Drive Front Cover

3. Remove the screw (B) installed in the drive grounding terminal (A).



A - Drive grounding terminal (FE)

B - Included screw

Figure 5.23 Remove the Screw from the Drive Grounding Terminal

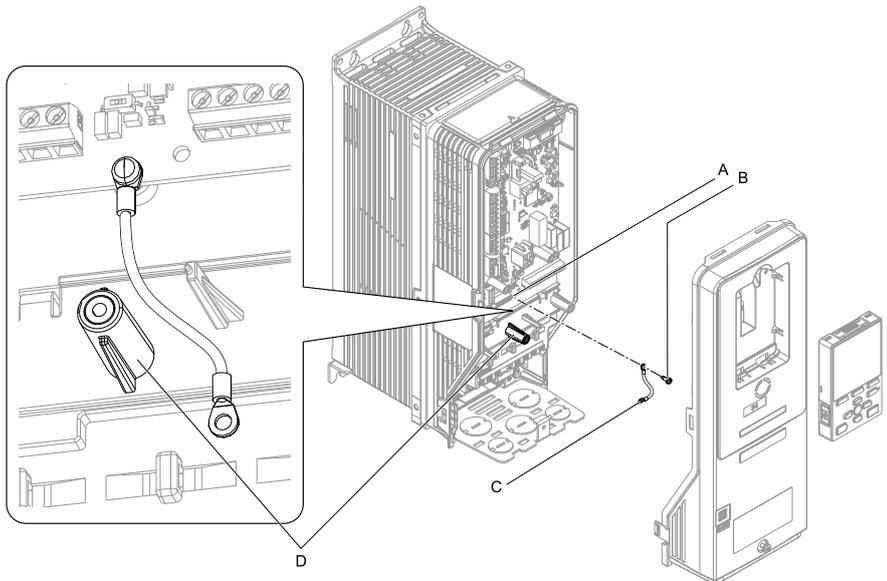
4. Use the screw (B) installed in the FE ground terminal of the drive (A) to connect one end of the included ground wire (C) to the ground terminal on the drive.

Tighten the screw to a correct tightening torque:

- 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

Route ground wire on the right side of the stud (D).



A - Drive grounding terminal (FE)
B - Included screw

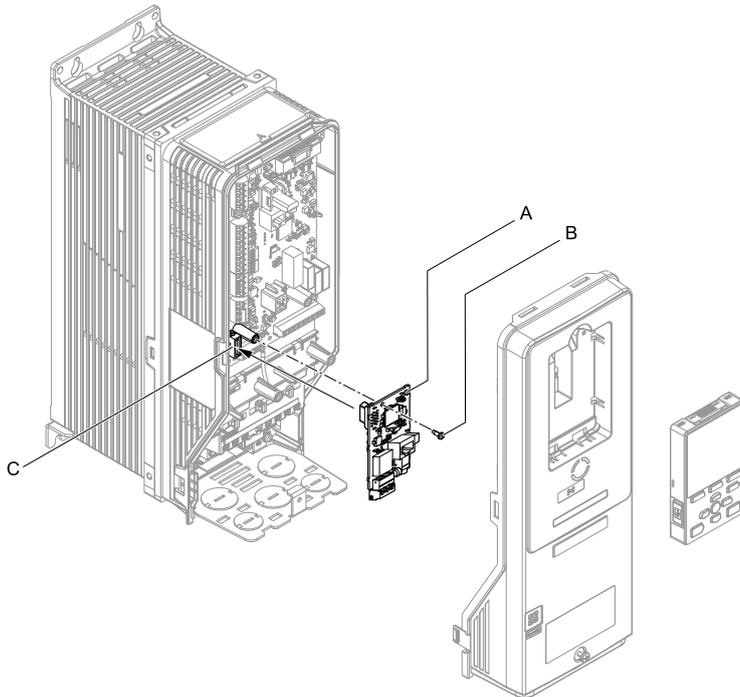
C - Ground wire
D - Stud

Figure 5.24 Connect the Ground Wire

5. Install the option (A) into the connector (C) (HV600: CN5, FP605: CN5-A) on the drive and use the included screw (B) to put it in place.
 Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

1. Only two screws are necessary to install the option on HV600 and FP605 drives.



A - Option

B - Included screw

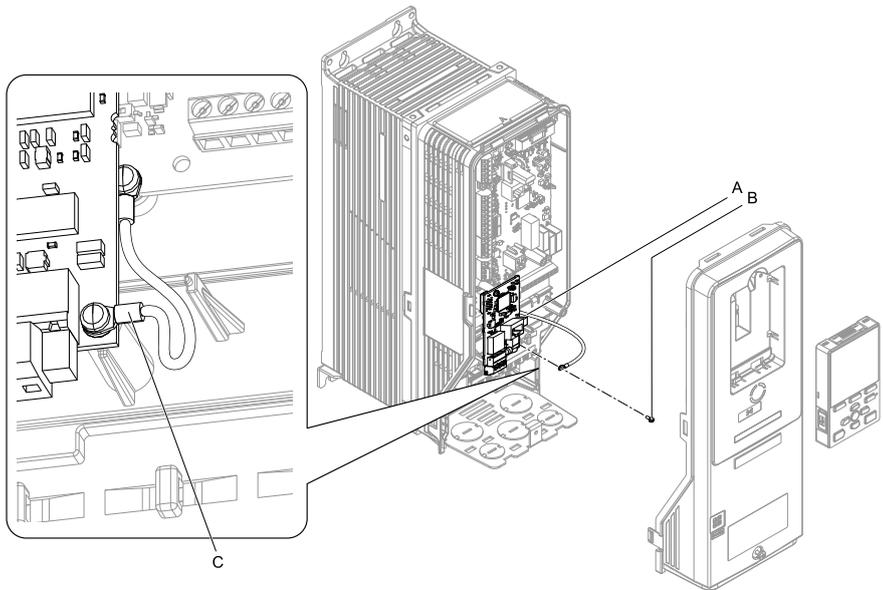
C - Connector CN5

Figure 5.25 Install the Option

6. Use one of the remaining included screws (B) to connect the ground wire (A) to the ground terminal and installation hole on the option.
Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

Refer to Figure 5.26 for instructions about crimp terminal orientation (C) and wire routing.



A - Ground wire
B - Included screw

C - Crimp terminal

Figure 5.26 Connect the Ground Wire

7. Firmly connect the Ethernet communication cable to the option modular connector (CN1).

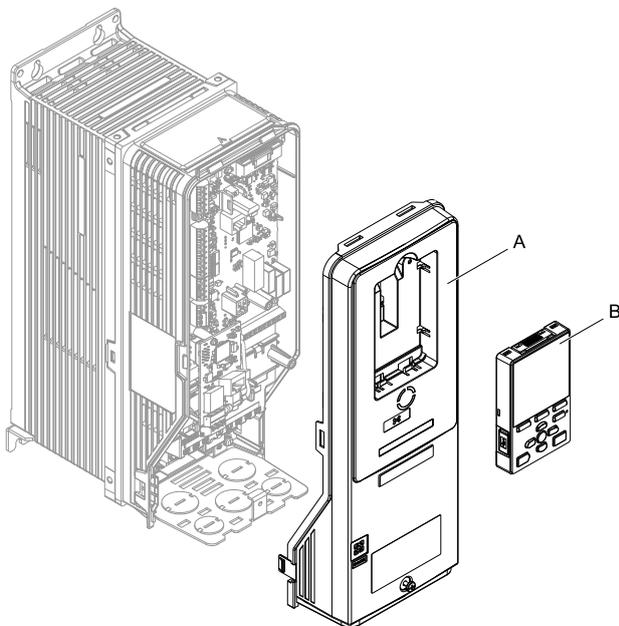
Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to Figure 5.28). Refer to *Communication Cable Specifications* on page 42 for more information.

NOTICE *Damage to Equipment.* When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.

8. Reattach the drive front cover (A) and the keypad (B).

Refer to the drive manuals for more information.

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



A - Drive front cover

B - Keypad

Figure 5.27 Replace the Front Cover and Keypad

9. Set drive parameters in *Related Drive Parameters* on page 43 for correct option performance.

◆ Communication Cable Specifications

Yaskawa recommends using shielded Cat5e cable. The Yaskawa warranty does not cover other cable types.

◆ Option Connection Diagram

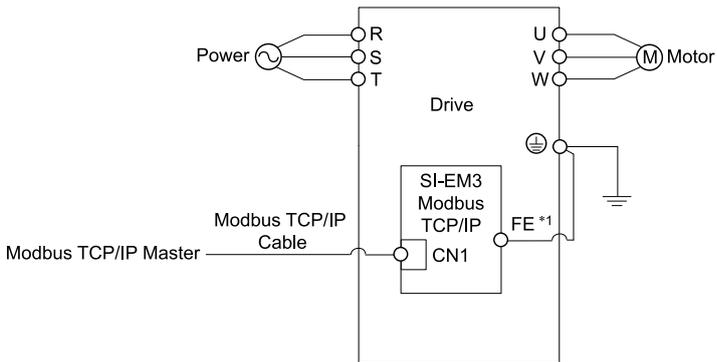


Figure 5.28 Option Connection Diagram

- *1 Connect the specified ground wire for installations on 1000-series, GA500, HV600, and FP605 drives. The ground wire is not necessary for installation on GA700, GA800, CR700, or CH700 drives.

6 Related Drive Parameters

These parameters set the drive for operation with the option. Make sure that the parameter settings in this table are correct before you start network communications.

Note:

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

6 Related Drive Parameters

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|---------------------------------|---|-----------------|
| b1-01 (0180) | Frequency Reference Selection 1 | <p>Selects the input method for frequency reference.</p> <p>0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input</p> <p>Note:</p> <ul style="list-style-type: none"> Set $b1-02 = 3$ [Run Command Selection 1 = Option PCB] to use the master device and serial communications to start and stop the drive. Set $b1-01 = 3$ to use the master device to control the frequency reference of the drive. The default setting is different for different drives. Refer to the instruction manual of your specific drive for more information. | 1 (0 - 4) |
| b1-02 (0181) | Run Command Selection 1 | <p>Selects the input method for the Run command.</p> <p>0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB 7 : AUTO Command + Term Run 8 : AUTO Command + Serial Run 9 : AUTO Command + Option Run</p> <p>Note:</p> <ul style="list-style-type: none"> Set $b1-02 = 3$ to start and stop the drive with the master device using serial communications. Set $b1-01 = 3$ [Frequency Reference Selection 1 = Option PCB] to use the master device to control the frequency reference of the drive. Settings 7 to 9 are available in HV600 software versions PRG: 1011 and later. | 1 (0 - 9) |
| F6-01 (03A2) | Communication Error Selection | <p>Selects drive response when the drive detects a <i>bUS</i> [Option Communication Error] error during communications with the option.</p> <p>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 Stop</p> <p>Note:</p> <ul style="list-style-type: none"> When you set this parameter to 3 or 4, the drive will continue operation after it detects a fault. Separately prepare safety protection equipment and systems, for example fast-stop switches. | 1 (0 - 5) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|----------------------------------|---|--------------------|
| | | <ul style="list-style-type: none"> • Refer to the drive manual to know if settings 4 and 5 are available. • The setting range for 1000-Series drives is different for different software versions. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information. • Changes to this parameter take effect immediately. It is not necessary to cycle power on the drive. | |
| F6-02 (03A3) | Comm External Fault (EF0) Detect | Selects the conditions at which <i>EF0 [Option Card External Fault]</i> is detected. 0 : Always Detected 1 : Detected during RUN Only | 0 (0, 1) |
| F6-03 (03A4) | Comm External Fault (EF0) Select | Selects the operation of the drive when <i>EF0 [Option Card External Fault]</i> is detected. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only Note: When you set this parameter to 3, the drive will continue operation after it detects a fault. Separately prepare safety protection equipment and systems, for example fast stop switches. | 1 (0 - 3) |
| F6-06 (03A7) | Torque Reference/Limit by Comm | Sets the function that enables and disables the torque reference and torque limit received from the communication option. 0 : Disable 1 : Enabled Note: <ul style="list-style-type: none"> • Control method availability of this parameter is different for different product series. <ul style="list-style-type: none"> –1000-Series Parameter is available in <i>A1-02 = 3, 6, 7 [Control Method Selection = Closed Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector]</i>. When you enable this parameter, <i>d5-01 [Torque Control Selection]</i> sets the drive to read the value as the Torque Limit value or the Torque Reference value. <i>d5-01 = 0 [Speed Control]</i>: Torque Limit <i>d5-01 = 1 [Torque Control]</i>: Torque Reference When <i>A1-02 = 6 [Control Method Selection = PM Advanced Open Loop Vector]</i>, this value is read as the Torque Limit. –GA500 Parameter is available in <i>A1-02 = 2, 6, 8 [Control Method Selection = Open Loop Vector, PM Advanced Open Loop Vector, EZ Vector Control]</i>. The drive reads this value as the Torque Limit. –GA700, GA800 | 0 (0, 1) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|---------------------------------------|---|--------------------|
| | | <p>Parameter is available in <i>A1-02 = 2, 3, 4, 6, 7, 8</i> [<i>Control Method Selection = Open Loop Vector, Closed Loop Vector, Advanced Open Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector, EZ Vector Control</i>].</p> <p>When you enable this parameter, <i>d5-01</i> [<i>Torque Control Selection</i>] sets the drive to read the value as the Torque Limit value or the Torque Reference value.</p> <p><i>d5-01 = 0</i> [<i>Speed Control</i>]: Torque Limit</p> <p><i>d5-01 = 1</i> [<i>Torque Control</i>]: Torque Reference</p> <p>When <i>A1-02 = 2, 8</i> [<i>Control Method Selection = Open Loop Vector, EZ Vector Control</i>], this value is read as the Torque Limit.</p> <p>–CR700, CH700</p> <p>When <i>A1-02 = 2, 3, 4</i> [<i>Control Method Selection = Open Loop Vector, Closed Loop Vector, Advanced Open Loop Vector</i>], this value is read as the Torque Limit.</p> <p>–HV600, FP605</p> <p>Torque Limit is enabled when <i>A1-02 = 8</i> [<i>Control Method Selection = EZ Vector Control</i>].</p> <ul style="list-style-type: none"> • If the PLC does not supply a torque reference or torque limit when <i>F6-06 = 1</i> [<i>Torque Reference/Limit by Comm = Enabled</i>], the motor cannot rotate. | |
| F6-07 (03A8) | Multi-Step Ref @ NetRef/ ComRef | <p>0 : Disable Multi-Step References</p> <p>1 : Enable Multi-Step References</p> <p>Note:</p> <p>Default setting of <i>F6-07</i> is 1 for GA500.</p> | 0 (0, 1) |
| F6-08 (036A) | Comm Parameter Reset @Initialize | <p>Selects whether communication-related parameters <i>F6-xx</i> and <i>F7-xx</i> are set back to original default values when you use parameter <i>A1-03</i> [<i>Initialize Parameters</i>] to initialize the drive.</p> <p>0 : No Reset - Parameters Retained</p> <p>1 : Reset - Back to Factory Default</p> <p>Note:</p> <p>When you set <i>F6-08</i> to 1 and you then use <i>A1-03</i> to initialize the drive, the drive will not change this setting value.</p> | 0 (0, 1) |
| F6-14 (03BB) | Bus Error Auto Reset | <p>Enables and disables the automatic reset of a <i>bUS</i> [<i>Option Communication Error</i>] fault.</p> <p>0 : Disabled</p> <p>1 : Enabled</p> <p>Note:</p> <ul style="list-style-type: none"> • This parameter is not available in all 1000-series drives. • Changes to this parameter take effect immediately. It is not necessary to cycle power on the drive. | 0 (0, 1) |
| F6-15 (0B5B) | Comm. Option Parameters Reload | <p>Sets how the drive will enable the <i>F6-xx/F7-xx</i> communication-related parameters that you changed.</p> <p>0 : Reload at Next Power Cycle</p> | 0 (0 - 2) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|---------------|---|--------------------|
| | | 1 : Reload Now 2 : Cancel Reload Request Note: <ul style="list-style-type: none"> • F6-15 is reset to 0 after setting 1 or 2. • Not available on 1000-series drives. | |
| F7-01 (03E5) | IP Address 1 | Sets the static/fixed IP address. Sets the most significant octet. Note: <ul style="list-style-type: none"> • This parameter is only effective when F7-13 = 0 [Address Mode at Startup = Static]. • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set F6-15 = 1 [Comm. Option Parameters Reload = Reload Now]. | 192 (0 - 255) |
| F7-02 (03E6) | IP Address 2 | Sets the static/fixed IP address. Sets the second most significant octet. Note: <ul style="list-style-type: none"> • This parameter is only effective when F7-13 = 0 [Address Mode at Startup = Static]. • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set F6-15 = 1 [Comm. Option Parameters Reload = Reload Now]. | 168 (0 - 255) |
| F7-03 (03E7) | IP Address 3 | Sets the static/fixed IP address. Sets the third most significant octet. Note: <ul style="list-style-type: none"> • This parameter is only effective when F7-13 = 0 [Address Mode at Startup = Static]. • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set F6-15 = 1 [Comm. Option Parameters Reload = Reload Now]. | 1 (0 - 255) |
| F7-04 (03E8) | IP Address 4 | Sets the static/fixed IP address. Sets the fourth most significant octet. Note: <ul style="list-style-type: none"> • This parameter is only effective when F7-13 = 0 [Address Mode at Startup = Static]. • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set F6-15 = 1 [Comm. Option Parameters Reload = Reload Now]. | 20 (0 - 255) |
| F7-05 (03E9) | Subnet Mask 1 | Sets the static/fixed Subnet Mask. Sets the most significant octet. | 255 (0 - 255) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|-------------------|---|--------------------|
| | | <p>Note:</p> <ul style="list-style-type: none"> This parameter is only effective when $F7-13 = 0$ [Address Mode at Startup = Static]. All IP Addresses must be unique. You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set $F6-15 = 1$ [Comm. Option Parameters Reload = Reload Now]. | |
| F7-06 (03EA) | Subnet Mask 2 | <p>Sets the static/fixed Subnet Mask. Sets the second most significant octet.</p> <p>Note:</p> <ul style="list-style-type: none"> This parameter is only effective when $F7-13 = 0$ [Address Mode at Startup = Static]. All IP Addresses must be unique. You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set $F6-15 = 1$ [Comm. Option Parameters Reload = Reload Now]. | 255 (0 - 255) |
| F7-07 (03EB) | Subnet Mask 3 | <p>Sets the static/fixed Subnet Mask. Sets the third most significant octet.</p> <p>Note:</p> <ul style="list-style-type: none"> This parameter is only effective when $F7-13 = 0$ [Address Mode at Startup = Static]. All IP Addresses must be unique. You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set $F6-15 = 1$ [Comm. Option Parameters Reload = Reload Now]. | 255 (0 - 255) |
| F7-08 (03EC) | Subnet Mask 4 | <p>Sets the static/fixed Subnet Mask. Parameter F7-08 sets the fourth most significant octet.</p> <p>Note:</p> <ul style="list-style-type: none"> This parameter is only effective when $F7-13 = 0$ [Address Mode at Startup = Static]. All IP Addresses must be unique. You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set $F6-15 = 1$ [Comm. Option Parameters Reload = Reload Now]. | 0 (0 - 255) |
| F7-09 (03ED) | Gateway Address 1 | <p>Sets the static/fixed Gateway address. Sets the most significant octet.</p> <p>Note:</p> <ul style="list-style-type: none"> This parameter is only effective when $F7-13 = 0$ [Address Mode at Startup = Static]. All IP Addresses must be unique. You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set $F6-$ | 192 (0 - 255) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|--------------------------|---|--------------------|
| | | <i>15 = 1 [Comm. Option Parameters Reload = Reload Now].</i> | |
| F7-10 (03EE) | Gateway Address 2 | Sets the static/fixed Gateway address. Sets the second most significant octet. Note: • This parameter is only effective when <i>F7-13 = 0 [Address Mode at Startup = Static].</i> • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set <i>F6-15 = 1 [Comm. Option Parameters Reload = Reload Now].</i> | 168 (0 - 255) |
| F7-11 (03EF) | Gateway Address 3 | Sets the static/fixed Gateway address. Sets the third most significant octet. Note: • This parameter is only effective when <i>F7-13 = 0 [Address Mode at Startup = Static].</i> • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set <i>F6-15 = 1 [Comm. Option Parameters Reload = Reload Now].</i> | 1 (0 - 255) |
| F7-12 (03F0) | Gateway Address 4 | Sets the static/fixed Gateway address. Parameter F7-12 sets the fourth most significant octet. Note: • This parameter is only effective when <i>F7-13 = 0 [Address Mode at Startup = Static].</i> • All IP Addresses must be unique. • You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set <i>F6-15 = 1 [Comm. Option Parameters Reload = Reload Now].</i> | 1 (0 - 255) |
| F7-13 (03F1) | Address Startup Mode | Selects how the option address is set. 0 : Static (Use F7-01 to F7-12 to set.) 1 : BOOTP (Use network address.) 2 : DHCP (Use network address.) Note: You must cycle power to the drive for the changes to take effect. For non-1000 series drives, you can set <i>F6-15 = 1 [Comm. Option Parameters Reload = Reload Now].</i> | 2 (0 - 2) |
| F7-14 (03F2) | Duplex Mode Selection | Selects duplex mode setting. 0 : Half/Half 1 : Auto/Auto 2 : Full/Full 3 : Half/Auto | 1 (0 - 8) |

6 Related Drive Parameters

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|-------------------------------|--|--------------------|
| | | 4 : Half/Full 5 : Auto/Half 6 : Auto/Full 7 : Full/Half 8 : Full/Auto Note: <ul style="list-style-type: none"> • When you set this parameter to 0, 2, 3, 4, 7, or 8, you must also set F7-15 [Communication Speed Selection]. • The option sets the duplex mode as specified by these F7-14 settings: <ul style="list-style-type: none"> –0: Half/Half, 3: Half/Auto, 4: Half/Full, duplex mode is "Half". –1: Auto/Auto, 5: Auto/Half, 6: Auto/Full, duplex mode is "Auto". –2: Full/Full, 7: Full/Half, 8: Full/Auto, duplex mode is "Full". | |
| F7-15 (03F3) | Communication Speed Selection | Sets the communications speed. 10 : 10/10 Mbps 100 : 100/100 Mbps 101 : 10/100 Mbps 102 : 100/10 Mbps Note: <ul style="list-style-type: none"> • F7-15 is only effective when the port is set to half or full duplex in F7-14 [Duplex Mode Selection]. • The default setting and setting range are different for different product series. <ul style="list-style-type: none"> –1000-Series, GA700, GA800, CR700, CH700 Drives Default value: 10 Range: 10 - 102 –GA500 Default value: 10 Range: 10, 100 –HV600, FP605 Default value: 10 Range: 10, 102 • This option sets the communication speed as specified by these F7-15 settings: <ul style="list-style-type: none"> –10: 10/10 Mbps or 101: 10/100 Mbps, the speed is 10 Mbps. –100: 100/100 Mbps or 102: 100/10 Mbps, the speed is 100 Mbps. | 10 (10 - 102) |

| No. (Hex.) | Name | Description | Default (Range) |
|-----------------|--|--|---------------------------|
| F7-16 (03F4) | Timeout Value | Sets the detection time for a communications timeout. Note: <ul style="list-style-type: none"> • Set this parameter to <i>0.0</i> to disable the connection timeout function. • This parameter is not available in all 1000-series drives. • Changes to this parameter take effect immediately. It is not necessary to cycle power on the drive. | 0.0 s (0.0 s - 30.0 s) |
| H5-11 (043C) | Communications ENTER Function Selection (Function common to communication option) | Sets when an Enter command is necessary to use MEMOBUS/Modbus communications to change parameter values. 0 : Parameter changes are activated when ENTER command is written 1 : Parameter changes are activated immediately. No ENTER command is necessary. | 0 (0, 1) |

Table 6.1 Option Monitor

| No. | Name | Description | Range |
|---------------|-------------------------|--|------------------------------|
| U6-80 - U6-83 | Option IP Address 1 - 4 | Shows the currently available local IP Address. <ul style="list-style-type: none"> • <i>U6-80</i>: First octet • <i>U6-81</i>: Second octet • <i>U6-82</i>: Third octet • <i>U6-83</i>: Forth octet | 0 - 255 |
| U6-84 - U6-87 | Online Subnet 1 - 4 | Shows the currently available subnet mask. <ul style="list-style-type: none"> • <i>U6-84</i>: First octet • <i>U6-85</i>: Second octet • <i>U6-86</i>: Third octet • <i>U6-87</i>: Forth octet | 0 - 255 |
| U6-88 - U6-91 | Online Gateways 1 - 4 | Shows the currently available gateway address. <ul style="list-style-type: none"> • <i>U6-88</i>: First octet • <i>U6-89</i>: Second octet • <i>U6-90</i>: Third octet • <i>U6-91</i>: Forth octet | 0 - 255 |
| U6-92 | Online Speed | Shows link speed currently available. | 10: 10 Mbps 100: 100 Mbps |
| U6-93 | Online Duplex | Shows duplex setting currently available. | 0: Half/Half 1: Full/Full |

| No. | Name | Description | Range |
|-------|---------------|--|-------|
| U6-97 | OPT SPARE 4 | Shows option software version. | - |
| U6-98 | First Fault | Shows first option fault. Refer to page 65 for more information. | - |
| U6-99 | Current Fault | Shows current option fault. Refer to page 65 for more information. | - |

7 Modbus TCP/IP Messaging

◆ Modbus TCP/IP Overview

The Modbus TCP/IP protocol is essentially the Modbus protocol over an Modbus TCP/IP network. A master controller (typically a PLC) sends commands to slave devices, which then perform the specified functions and send a response to the master. The drive using the option has slave functionality.

■ Supported Modbus TCP/IP Commands

Table 7.1 Supported Modbus TCP/IP Commands

| Function Code (Hex.) | Name |
|----------------------|-------------------------------|
| 03 | Read Multiple Registers |
| 06 | Write Single Register |
| 10 | Write Multiple Registers |
| 17 | Read/Write Multiple Registers |

■ Drive Modbus TCP/IP Option Registers

All of the command registers, monitor registers, and parameters documented in the drive Technical Manual are accessible via the option.

■ High Speed Access Drive Modbus TCP/IP Option Registers

Many of the registers required for control have been specially mapped to provide higher speed access to increase network performance. Use these registers for the best response times.

As shown in Table 7.2, all of the drive command registers have been mapped to this high speed access area (Modbus TCP/IP registers 01 (Hex.) to 01F (Hex.)). In addition, the monitors shown in Table 7.3 are mapped for high speed access.

You can read and write command data.

Note:

Set bits that you do not use to 0. Do not write to reserved registers.

Table 7.2 Command Register Data

| Register Number (Hex.) | Description | |
|---------------------------|--|--|
| 0000 | Reserved | |
| 0001 | Operation Commands and Multi-function Inputs | |
| | bit0 | <p><i>H5-12 = 0 [Run Command Method Selection = FWD/Stop, REV/Stop]: FWD/Stop</i> 1: Forward operation in progress 0: Stop</p> <p><i>H5-12 = 1 [Run Command Method Selection = Run/Stop, FWD/REV]: Run/Stop</i> 1: Run 0: Stop</p> |
| | bit1 | <p><i>H5-12 = 0 [Run Command Method Selection = FWD/Stop, REV/Stop]: REV/Stop</i> 1: Reverse Operation 0: Stop</p> <p><i>H5-12 = 1 [Run Command Method Selection = Run/Stop, FWD/REV]: FWD/REV</i> 1: Reverse run 0: Forward run</p> |
| | bit2 | External Fault (EF0 [Option Card External Fault]) |
| | bit3 | Fault Reset |
| | bit4 | Multi-Function Input 1 |
| | bit5 | Multi-Function Input 2 |
| | bit6 | Multi-Function Input 3 |
| | bit7 | Multi-Function Input 4 |
| | bit8 | Multi-Function Input 5 |
| | bit9 | Multi-Function Input 6 |
| | bit A | Multi-Function Input 7 |
| | bit B | Multi-Function Input 8 |
| | bit C - F | Reserved |

| Register Number (Hex.) | Description | |
|------------------------|--|--|
| 0002 | Frequency Reference | Units are determined by parameter <i>o1-03</i> [Frequency Display Unit Selection]. |
| 0003 | Output voltage gain Unit: 0.1% Setting range: 20 (2.0%) - 2000 (200.0%), the default value at energize: 1000 (100.0%) | |
| 0004 | Torque reference/torque limit (0.1% signed) | |
| 0005 | Torque compensation (0.1% signed) | |
| 0006 | PID setpoint (0.01% signed) | |
| 0007 | Multi-Function Analog Output Terminal 1 Setting (10 V / 4000 (Hex.)) | |
| 0008 | Multi-Function Analog Output Terminal 2 Setting (10 V / 4000 (Hex.)) | |
| 0009 | MFDO setting | |
| | bit 0 | Multi-Function Contact Output 1 Terminal M1-M2 (varies by drive model) |
| | bit 1 | Multi-Function Contact Output 2 Terminal M3-M4 (varies by drive model) |
| | bit 2 | Multi-Function Contact Output 3 Terminal M5-M6 (varies by drive model) |
| | bit 3- 5 | Reserved |
| | bit 6 | Enables the function in bit 7 |
| | bit 7 | Fault Relay Output Terminal MA/MB-MC (varies by drive model) |
| bit 8 - F | Reserved | |
| 000A | Pulse train output (Units: 1/1 Hz, setting range: 0 - 32000) | |
| 000B - 000E | Reserved | |
| 000F | Command selection setting | |
| | bit 0 | Reserved |
| | bit 1 | Input for the PID setpoint |
| | bit 2 | Torque reference/torque limit input (enables the setting from MEMOBUS/Modbus) |

| Register Number (Hex.) | Description | |
|------------------------|--|---|
| | bit 3 | Torque compensation input (enables the setting from MEMOBUS/Modbus) |
| | bit 4 - B | Reserved |
| | bit C | Terminal S5 input of broadcast message |
| | bit D | Terminal S6 input of broadcast message |
| | bit E | Terminal S7 input of broadcast message |
| | bit F | Terminal S8 input of broadcast message |
| 0010 - 001A | Reserved | |
| 001B | Analog Monitor Option AO-A3 Analog Output 1 (10 V/4000 (Hex.)) | |
| 001C | Analog Monitor Option AO-A3 Analog Output 2 (10 V/4000 (Hex.)) | |
| 001D | Digital output option DO-A3 output value (binary) | |
| 001E - 001F | Reserved | |

Table 7.3 Drive Registers

| No. (Modbus Register) | Drive Registers | Register Name | Bit | Description |
|-----------------------|-----------------|----------------------|-----|--|
| 2000 | 4B | Drive Status (U1-12) | 0 | 1: During Run |
| | | | 1 | 1: During zero speed |
| | | | 2 | 1: During reverse |
| | | | 3 | 1: During reset signal input |
| | | | 4 | 1: During Speed Agree |
| | | | 5 | 1: Drive operation ready |
| | | | 6 | 1: Alarm |
| | | | 7 | 1: Fault |
| | | | 8 | 1: During Operation Error (oPExx) |
| | | | 9 | 1: Momentary power loss recovery 0: Power loss recovery |
| | | | A | 1: Motor 2 Selection |
| | | | B | Reserved |

| No. (Modbus Register) | Drive Registers | Register Name | Bit | Description |
|-----------------------|------------------------------|---|-----|---|
| | | | C | Reserved |
| | | | D | Reserved |
| | | | E | ComRef status/ NetRef status |
| | | | F | ComCtrl status/ NetCtrl status |
| 2001 | 44 | Motor Speed Monitor (U1-05) | | |
| 2002 | 48 | Torque Reference Monitor (U1-09) | | |
| 2003 | F0 | PG Count Channel 1 | | |
| 2004 | 40 | Frequency Reference Monitor (U1-01) | | |
| 2005 | 41 | Output Frequency Monitor (U1-02) | | |
| 2006 | 26 | Output Current (U1-03) (units: 0.1 A) | | |
| 2007 | 4F | Terminal A2 Input Level Monitor (U1-14) | | |
| 2008 | 46 | DC Bus Voltage Monitor (U1-07) | | |
| 2009 | C0 | Error Signal 1 | 0 | Reserved |
| | | | 1 | Undervoltage (Uv1) |
| | | | 2 | Control Power Supply Undervoltage (Uv2) |
| | | | 3 | Soft Charge Circuit Fault (Uv3) |
| | | | 4 | Short Circuit/IGBT Failure (SC) |
| | | | 5 | Ground Fault (GF) |
| | | | 6 | Overcurrent (oC) |
| | | | 7 | Overvoltage (ov) |
| | | | 8 | Heatsink Overheat (oH) |
| | | | 9 | Heatsink Overheat (oH1) |
| | | | A | Motor Overload (oL1) |
| | | | B | Drive Overload (oL2) |
| | | | C | Overtorque Detection 1 (oL3) |
| D | Overtorque Detection 2 (oL4) | | | |

| No. (Modbus Register) | Drive Registers | Register Name | Bit | Description |
|-----------------------|-----------------|----------------|-----|---|
| | | | E | Dynamic Braking Transistor Fault (rr) |
| | | | F | Braking Resister Overheat (rH) |
| 200A | C1 | Error Signal 2 | 0 | External Fault 3, input terminal S3 (EF3) |
| | | | 1 | External Fault 4, input terminal S4 (EF4) |
| | | | 2 | External Fault 5, input terminal S5 (EF5) |
| | | | 3 | External Fault 6, input terminal S6 (EF6) |
| | | | 4 | External Fault 7, input terminal S7 (EF7) |
| | | | 5 | External Fault 8, input terminal S8 (EF8) |
| | | | 6 | Cooling fan Error (FAn) |
| | | | 7 | Overspeed (oS) |
| | | | 8 | Excessive Speed Deviation (dEv) |
| | | | 9 | PG Disconnected (PGo) |
| | | | A | Input Phase Loss (PF) |
| | | | B | Output Phase Loss (LF) |
| | | | C | Motor Overheat (PTC input) (oH3) |
| | | | D | Digital Operator Connection Fault (oPr) |
| | | | E | EEPROM Write Error (Err) |
| | | | F | Motor Overheat Fault (PTC input) (oH4) |
| 200B | C2 | Error Signal 3 | 0 | MEMOBUS/Modbus Communication Error (CE) |
| | | | 1 | Option Communication Error (bUS) |
| | | | 2 | Reserved |
| | | | 3 | Reserved |
| | | | 4 | Control Fault (CF) |
| | | | 5 | Zero Servo Fault (SvE) |
| | | | 6 | Option External Fault (EF0) |
| | | | 7 | PID Feedback Loss (FbL) |

| No. (Modbus Register) | Drive Registers | Register Name | Bit | Description |
|-----------------------|-----------------|---|-----|----------------------------------|
| | | | 8 | Undertorque Detection 1 (UL3) |
| | | | 9 | Undertorque Detection 2 (UL4) |
| | | | A | High Slip Braking Overload (oL7) |
| | | | B | Reserved |
| | | | C | Reserved |
| | | | D | Reserved |
| | | | E | Reserved |
| | | | F | Hardware Fault (includes oFx) |
| 200C | 4E | Terminal A1 Input Level Monitor (U1-13) | | |
| 200D | 49 | Digital Input Terminal Status (U1-10) | | |
| 200E | 50 | Terminal A3 Input Level Monitor (U1-15) | | |
| 200F | F1 | PG Count Channel 2 | | |
| 2010 | 4D | Drive Software Number (Flash) (U1-25) | | |

■ Types of Enter Commands

The drive supports the two Enter commands shown in Table 7.4.

An Enter command is enabled by writing 0 to register number 0900 (Hex.) or 0910 (Hex.).

These registers can be written to only.

An error will occur if the user attempts to read from these registers.

Table 7.4 Types of Enter Commands

| Register Number (Hex.) | Description |
|------------------------|--|
| 0900 | When you write parameter data to the EEPROM, you will enable the data on the RAM at the same time. Parameter changes remain even if the power supply is cycled. |
| 0910 | This updates the data on the RAM, but does not write data to the EEPROM. Parameter changes are lost when the drive is shut off. |

Note:

- You can write the EEPROM to the drive a maximum of 100,000 times. Do not frequently execute the Enter command (0900 (Hex.)) that is written to EEPROM. When the command data or broadcast message is transmitted to the drive, the Enter command is not necessary.
- Parameter data cannot be written to EEPROM during undervoltage, even using 0900 (Hex.).
- If undervoltage occurs when a making several parameter changes issued with a single ENTER command, the writing process may be aborted before all of the new changes have been written. Because all of the data has not yet been written, the EEPROM data error *CPF06* will be displayed the next time power to the drive is cycled. To prevent *CPF06*, wait approximately 5 seconds after issuing the ENTER command before shutting off drive power.

■ Enter Command Function Differences Depending on the Setting of H5-11

Table 7.5 Enter Command Function Differences Depending on the Setting of H5-11

| H5-11 Settings | H5-11 = 0 | H5-11 = 1 |
|--|--|--|
| Time when the parameter settings are enabled | When the drive receives the Enter command from the master | When you change the parameter settings |
| Upper and lower limit check | Checks the upper and lower limits and considers the related parameter settings. | Checks the upper and lower limit of the changed parameter only. |
| Default setting of related parameters | Not affected. The settings of related parameters remain unchanged. They must be changed manually, if needed. | Automatically changes the default settings for the related parameters. |
| Fault detection when you set more than one parameter | Accepts and responds as usual to correct setting data if the data contains parameter setting errors. The drive discards the disabled setting data, but will not return an error message. | Error occurs if only one setting is invalid. All data sent are discarded. The drive discards the data that was sent. |

8 Web Interface

The option contains a series of web pages that allow for viewing of status and diagnostic information through a standard web browser. The embedded web pages include:

- Home Page
- Modbus-TCP Page
- Network Page

◆ Home Page

The Home page shows the status of the drive and the I/O. It also shows identifying information about the drive and the option.

YASKAWA CIMR-AU2A0004
Modbus-TCP / SI-EM3

Home Modbus-TCP Network

Drive Status

Ready

RUN ZERO SPD REV RESET AT SPD **READY** ALARM FAULT

| Drive Monitors | | Digital Inputs | | Digital Outputs | |
|---------------------|---------|-----------------------------|---|-----------------|--|
| Frequency Reference | 0.00 Hz | <input type="checkbox"/> S1 | <input type="checkbox"/> M1-M2 | | |
| Output Frequency | 0.00 Hz | <input type="checkbox"/> S2 | <input checked="" type="checkbox"/> M3-M4 | | |
| Output Current | 0.0 A | <input type="checkbox"/> S3 | <input type="checkbox"/> M5-M6 | | |
| DC Bus Voltage | 336 VDC | <input type="checkbox"/> S4 | | | |
| Torque Reference | 0.0 % | <input type="checkbox"/> S5 | | | |
| | | <input type="checkbox"/> S6 | | | |
| | | <input type="checkbox"/> S7 | | | |
| | | <input type="checkbox"/> S8 | | | |

Analog Inputs

| | | |
|----|----------------------------------|-------|
| A1 | <input type="text" value="0.0"/> | 0.0 % |
| A2 | <input type="text" value="0.0"/> | 0.0 % |
| A3 | <input type="text" value="0.0"/> | 0.0 % |

| Drive | | Option Card | |
|------------|---------------|-------------|----------------|
| Model | A1000 | Model | SI-EM3 |
| Full Model | CIMR-AU2A0004 | Version | VST908104 (R0) |
| Version | 1024 | Protocol | Modbus-TCP |

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Figure 8.1 Home Page View

◆ Modbus-TCP Page

The Modbus-TCP page shows basic information about the protocol.

YASKAWA CIMR-AU2A0004
Modbus-TCP / SI-EM3

Home Modbus-TCP Network

Modbus-TCP

| | |
|----------------------------|-----|
| Current Connections | 0 |
| Connection Delta Time (ms) | N/A |

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Figure 8.2 Modbus-TCP Page View

Table 8.1 Modbus-TCP Page Explanations

| Protocol Monitor | Explanation |
|-------------------------------|---|
| Current Connections | Current number of open connections. |
| Control Connection Delta Time | The time between the last two writes to the Control register, MEMOBUS/Modbus address 0001 (Hex.). |

◆ Network Page

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

CIMR-AU2A0004
Modbus-TCP / SI-EM3



| Identity | | Packet Counters | | Tx | Rx |
|---------------------|-------------------|----------------------|--|----------|-------|
| IP Address | 192.168.1.23 | Ok | | 76325 | 95615 |
| Subnet Mask | 255.255.255.0 | Errors | | 0 | 0 |
| Gateway Address | 192.168.1.1 | Dropped | | 0 | 0 |
| MAC Address | 00:20:B5:88:56:F7 | | | | |
| Address Mode | Static | | | | |
| Status | | Interface Counters | | | |
| Link Status | Active | In Octets | | 13222832 | |
| Speed | 100 Mbps | In Ucast Packets | | 94923 | |
| Duplex | Full | In NUcast Packets | | 3631 | |
| Auto-Negotiation | Successful | Out Octets | | 10827669 | |
| | | Out Ucast Packets | | 76216 | |
| | | Out NUcast Packets | | 47 | |
| Misc | | Media Counters | | | |
| Retry | 0 | Alignment Errors | | 0 | |
| Collisions | 0 | FCS Errors | | 0 | |
| Current Connections | 0 | Single Collisions | | 0 | |
| | | Multiple Collisions | | 0 | |
| | | Late Collisions | | 0 | |
| | | Deferred Collisions | | 0 | |
| | | Excessive Collisions | | 0 | |
| | | Frame Too Large | | 0 | |

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Update Time: 1 sec

Figure 8.3 Network Page View

| Network Monitor | Description |
|---------------------|---|
| Msg Tx OK | Cumulative number of messages transmitted successfully from the option. |
| Msg Rx OK | Cumulative number of messages received successfully to the option. |
| Current Connections | Current number of open connections. |

| Network Monitor | Description |
|---------------------|--|
| 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 (half duplex only) reported by the MAC/PHY (Media Access Control/Physical Connection). |
| Msg Tx Errors | Cumulative number of transmit underruns and transmit stops reported by the MAC/PHY. |
| Msg Rx Errors | Cumulative number of receive overruns, receive stops, and receive error frames reported by the MAC/PHY. |
| Tx Retry | Cumulative number of transmits in which the 1st attempt was delayed due to busy medium reported by the MAC/PHY. |
| IP Address | IP Address of the option. |
| Subnet Mask | Subnet Mask of the option. |
| Gateway Address | The Gateway IP Address that the option will use. |
| MAC Address | MAC Address of the option. |
| Address Mode | Either static IP address or DHCP. |
| Link Status | Active if the cable is plugged in, or inactive if no cable. |
| Speed | Connection speed, either 10 Mbps or 100 Mbps. |
| Duplex | Display either Full or Half. |
| Auto-Negotiation | If auto-negotiation is enabled, this will show the status of the negotiation. |
| In Octets | Cumulative number of incoming octets. |
| In Ucast Packets | Cumulative number of unicast packets received. |
| In NUcast Packets | Cumulative number of non-unicast packets received. |
| Out Octets | Cumulative number of outgoing octets. |
| Out Ucast Packets | Cumulative number of unicast packets sent. |
| Out NUcast Packets | Cumulative number of non-unicast packets sent. |
| Alignment Errors | Cumulative number of errors for uneven packets lengths. |
| FCS Errors | Cumulative number of frame check sequence errors. |
| Single Collisions | Cumulative number of single collisions. |
| Multiple Collisions | Cumulative number of multiple collisions. |

| Network Monitor | Description |
|----------------------|---|
| Late Collisions | Cumulative number of late collisions. |
| Deferred Collisions | Cumulative number of deferred collisions. |
| Excessive Collisions | Cumulative number of excessive collisions. |
| Frame Too Large | Cumulative number of frames that exceed the maximum frame size. |

Note:

Cumulative counters are reset when the power supply is cycled.

9 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Fault on page 63* 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.

■ Fault

Both *bUS [Option Communication Error]* and *EF0 [Option Card External Fault]* can appear as a fault. When a fault occurs, the keypad ALM LED stays lit. When an alarm occurs, the ALM LED flashes.

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

- Did you correctly connect the Modbus TCP/IP™ communication line to the option?
- Is the communication line properly connected to the option? Is it loose?
- Is the PLC program working? Is the controller/PLC CPU stopped?
- Did a momentary power loss interrupt communications?

| Code | Name | Causes | Possible Solutions |
|------|----------------------------|---|---|
| bUS | Option Communication Error | The drive did not receive a signal from the controller. | <ul style="list-style-type: none"> • Check for wiring errors. • Correct the wiring. |
| | | The communications cable wiring is incorrect. | |
| | | An existing short circuit or communications disconnection | Check disconnected cables and short circuits and repair as needed |

| Code | Name | Causes | Possible Solutions |
|--------------|---------------------------------|---|---|
| | | A data error occurred due to electric interference | <ul style="list-style-type: none"> Prevent noise in the control circuit, main circuit, and ground wiring. If you identify a magnetic contactor 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. Decrease the effects of electrical interference from the controller. |
| | | Option is damaged | If there are no problems with the wiring and the error continues to occur, replace the option. |
| | | Connection Time-out | Check if the CPU of the controller is not stopped. |
| | | Duplicate IP Address found on network | Change to a different IP address. If <i>F7-13 = 0 [Address Mode at Startup = Static]</i> , change parameters <i>F7-01 to F7-04 [IP Address 1 to 4]</i> . |
| EF0 | Option Card External Fault | The option received an external fault from the controller. | <ol style="list-style-type: none"> Find the device that caused the external fault and remove the cause. Clear the external fault input from the controller. |
| | | A programming error occurred on the controller side. | Examine the operation of the controller program. |
| oFA00 | Option Not Compatible with Port | The option connected to connector CN5-A is not compatible. | <p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> Use connector CN5-A when you connect the option. To use other options, refer to those option manuals. |
| oFA01 | Option Card Fault (CN5-A) | The option connected to option port CN5-A was changed during run. | <ol style="list-style-type: none"> De-energize the drive. Connect the option to the correct option port. |
| oFA03, oFA04 | Option Card Error (CN5-A) | A fault occurred in the option. | <ol style="list-style-type: none"> De-energize the drive. Make sure that the option is correctly connected to the connector. If the problem continues, replace the option. |

| Code | Name | Causes | Possible Solutions |
|----------------|--------------------------------------|--|--|
| oFA30 to oFA43 | Option Card Connection Error (CN5-A) | A fault occurred in the option. | <ol style="list-style-type: none"> 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. |
| oFb00 | Option Not Compatible with Port | The option connected to connector CN5-B is not compatible. | <p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. To use other options, refer to those option manuals. |
| oFb02 | Option Fault | 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. |
| oFC00 | Option Fault (CN5-B) | The option connected to connector CN5-C is not compatible. | <p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. To use other options, refer to those option manuals. |
| oFC02 | Option Fault | 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. |

■ Minor Faults and Alarms

| Code | Name | Causes | Possible Solutions |
|------|----------------------------------|-------------------------------------|--|
| CyPo | Cycle Power to Active Parameters | Comm. Option Parameter Not Upgraded | Re-energize the drive to update the communication option parameters. |

◆ 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 9.1.

Table 9.1 Option Fault Monitor Descriptions

| Status | Fault Declared | Status Value (<i>U6-98/ U6-99</i>) | Description |
|----------------------|----------------|--------------------------------------|---|
| No faults | - | 0 | No faults |
| Fatal error occurred | EF0 | 3 | Network sent a message to force this node to the fault state. |
| Network Link Down | bUS | 1104 | No network link to option. |

| Status | Fault Declared | Status Value (U6-98/ U6-99) | Description |
|----------------------|----------------|--------------------------------|--|
| Connection Time-out | bUS | 1101 | The control connection timer is more than the setting value of F7-16. |
| Duplicate IP Address | bUS | 1102 | This node and at least one other node have the same IP Address. |
| Default MAC Address | - | 1103 | MAC Address programmed into the option is not factory default setting. Note: Contact Yaskawa or your nearest sales representative for more information. |

Two drive monitor parameters, *U6-98 [First Fault]* and *U6-99 [Current Fault]* 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.

◆ Option Compatibility

You can connect a maximum of 3 options at the same time depending on the type of option.

Note:

- You can only connect one option to the GA500 and HV600 drives. Connect the option to the CN5 connector.
- You can connect two options to an FP605 drive. Connect the communication option to the CN5-A connector.
- Compatible communication options are different for different models. Refer to the drive manuals for more information.

Table 9.2 Option Compatibility

| Option | Connector | Number of Options Possible |
|---------------------------------|-----------|----------------------------|
| PG-B3 *1, PG-X3 *1 | CN5-B, C | 2 *2 |
| PG-RT3 *1 *3 *4, PG-F3 *1 *3 *4 | CN5-C | 1 |

| Option | Connector | Number of Options Possible |
|--|-----------------|----------------------------|
| DO-A3 *5, AO-A3 *5 | CN5-A, B, and C | 1 |
| SI-C3, SI-N3, SI-P3, SI-S3, SI-T3, SI-ET3, SI-ES3, SI-B3, SI-M3, SI-W3 *4, SI-EM3 *4, SI-EM3D *4, SI-EN3 *4, SI-EN3D *4, SI-EP3, JOHB-SMP3, AI-A3 *5 *6, DI-A3 *5 *6 | CN5-A | 1 |

*1 Not available for GA500, HV600, or FP605 drives.

*2 To connect two PG options, use the CN5-C and CN5-B connectors. To connect only one PG option, use the CN5-C connector.

*3 If you use the motor switching function, you cannot use this option.

*4 Not available for 1000-Series drive models with capacities between 450 and 630 kW (650 to 1000 HP).

*5 Not available for GA500 or HV600 drives.

*6 To use AI-A3 and DI-A3 input statuses as monitors, connect the options to CN5-A, CN5-B, or CN5-C.

10 Option Installation

Verify the following installation conditions to make sure that other devices and machinery used with this option and drive 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 10.1 and Figure 10.2.

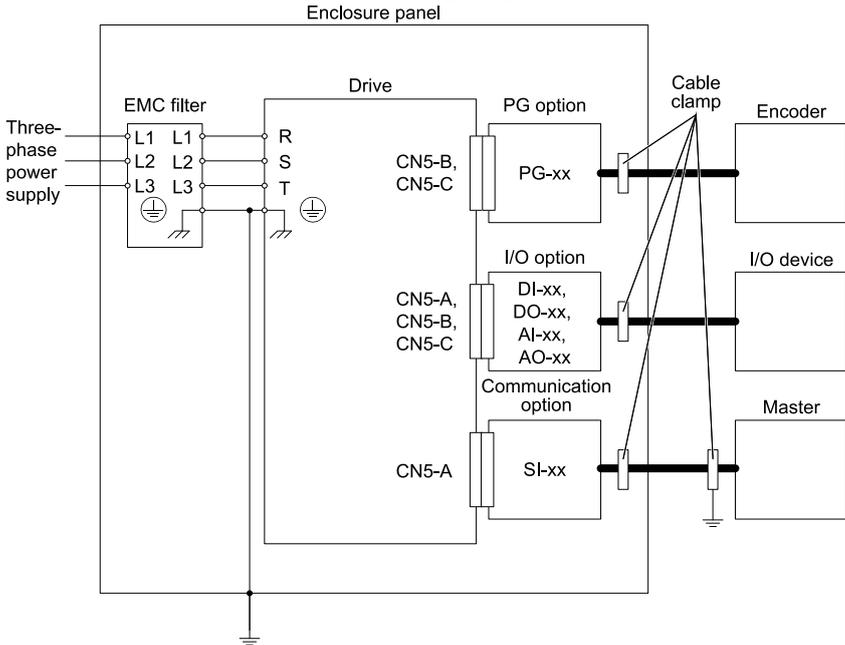


Figure 10.1 Option Installation for CE Compliance: 1000-Series, GA700, GA800, CR700, CH700

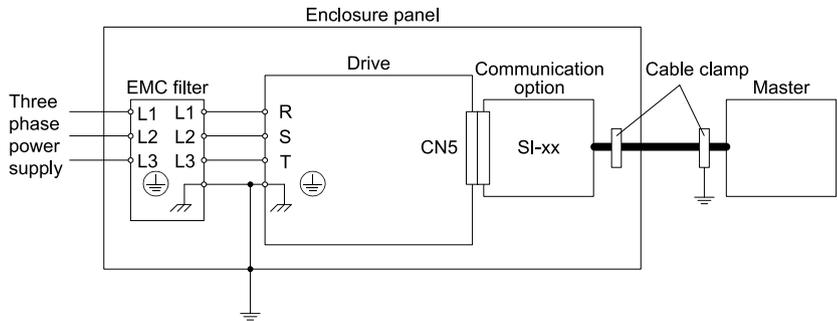


Figure 10.2 Option Installation for CE Compliance: GA500, HV600

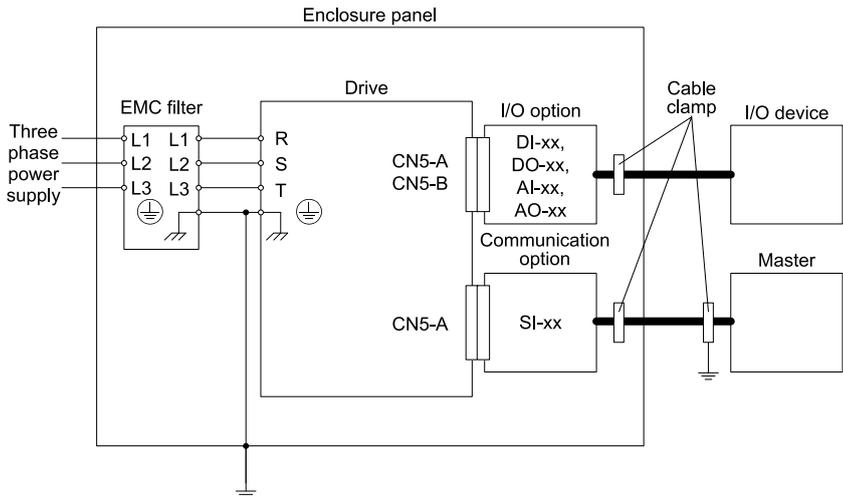
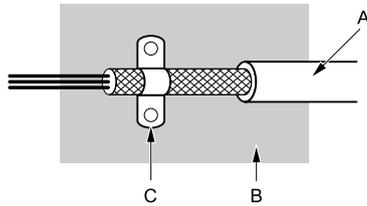


Figure 10.3 Option Installation for CE Compliance: FP605

3. Ground the largest possible surface area of the shield to the metal panel. Yaskawa recommends using cable clamps.



A - Braided shield cable
 B - Metal panel

C - Cable clamp (conductive)

Figure 10.4 Ground Area

11 Specifications

◆ Specifications

Table 11.1 Option Specifications

| Items | Specifications |
|------------------------------|---|
| Model | SI-EM3 |
| Supported Messages | <ul style="list-style-type: none"> • Read Multiple Registers (03 (Hex.)) • Write Single Register (06 (Hex.)) • Write Multiple Registers (10 (Hex.)) • Read and Write Registers (17 (Hex.)) Commands that support multiple registers have a maximum Read and Write size of 16 registers. |
| Modbus TCP/IP Specifications | Modbus-IDA Passed |
| Recommended Connector Type | Shielded Cat5e cable |
| Physical Layer Type | Ethernet Isolated Physical Layer |
| 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 | <ul style="list-style-type: none"> • Modbus TCP/IP: 10 • Web page connections: 2 |
| Duplex Mode | <ul style="list-style-type: none"> • Half/Half • Auto-negotiate • Full/Full |
| Address Startup Mode | <ul style="list-style-type: none"> • Static • BOOTP |

| Items | Specifications |
|---------------------|--|
| | <ul style="list-style-type: none"> DHCP |
| Ambient Temperature | -10°C - +50°C (14°F - 122°F) |
| Humidity | Up to 95% RH (no condensation) |
| Storage Temperature | -20°C - +60°C (-4°F - 140°F) allowed for short-term transport of the product |
| Area of Use | Indoors and free from: <ul style="list-style-type: none"> 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 (3280 ft) |

12 Disposal

◆ Disposal Instructions

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

◆ WEEE Directive



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.

Revision History

| Date of Publication | Revision Number | Section | Revised Content |
|----------------------------|------------------------|----------------|---|
| October 2021 | 1 | All | Addition: Information on FP605 Revision: Reviewed and corrected entire documentation |
| July 2020 | - | - | First Edition This manual is created based on TOBP C730600 91D<3>-0. |

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YASKAWA AC Drive Option Modbus TCP/IP Installation Manual

安川インバータ オプション

Modbus TCP/IP通信 取扱説明書

Any inquiries related to the product can be directed to the address listed at the end of each section in the related language.

この製品に関するお問い合わせ先については、各言語の最終ページをご覧ください。

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