YASKAWA

YASKAWA AC Drive Option

PROFINET

Installation Manual

Type: SI-EP3

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

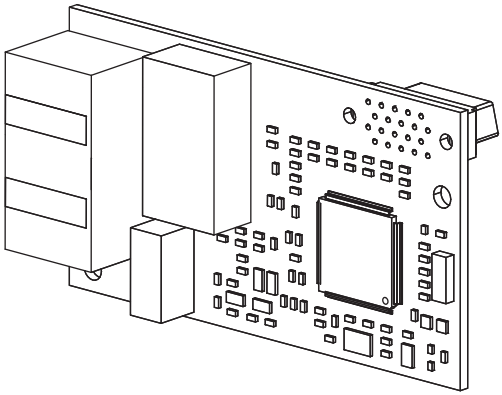
安川インバータ オプション

PROFINET通信

取扱説明書

形　式 SI-EP3

製品を安全にお使い頂くために，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。



MANUAL NO. TOBP C730600 89A

Table of Contents

1 Preface and Safety

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

◆ Applicable Documentation

The following manuals are available for the option:

Option

YASKAWA AC Drive Option SI-EP3 PROFINET Installation Manual Manual No: TOBP C730600 89 (This book)	This guide is packaged together with the product and contains information necessary to install the option and set related drive parameters.
YASKAWA AC Drive Option SI-EP3 PROFINET Technical Manual Manual No: SIEP C730600 89	The technical manual contains detailed information about the option pertaining to communication protocols, and supported features and messaging. 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 For questions, contact your local Yaskawa sales office or the nearest Yaskawa representative.

Drive

YASKAWA AC Drive 1000-Series Quick Start Guide	Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The most recent versions of these manuals are available for download on our documentation websites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals.
YASKAWA AC Drive 1000-Series Technical Manual	
YASKAWA AC Drive GA700 Quick Start Guide/Initial Steps	
YASKAWA AC Drive GA700 Technical Manual	

◆ Terms

Note:	Indicates supplemental information that is not related to safety messages.
Option:	YASKAWA AC Drive Option SI-EP3 PROFINET
Drive:	• YASKAWA A1000-Series Drive • YASKAWA U1000-Series Drive • YASKAWA U1000L-Series Drive • YASKAWA Z1000U-Series Drive • YASKAWA AC Drive GA700 • YASKAWA AC Drive 1000-Series (A1000, U1000, U1000L, Z1000U)
Digital Operator:	• LCD Operator for YASKAWA AC Drive 1000-Series • LED Operator for YASKAWA AC Drive 1000-Series • LCD Keypad for YASKAWA AC Drive GA700 • LED Keypad for YASKAWA AC Drive GA700
V/f:	V/f Control
CLV:	Closed Loop Vector Control
OLV/PM:	Open Loop Vector Control for PM
AOLV/PM:	Advanced Open Loop Vector Control for PM
CLV/PM:	Closed Loop Vector Control for PM
H:	Indicates an engineering unit for hexadecimal number format.

◆ Registered Trademarks

- PROFINET is a registered trademark of PROFIBUS and PROFINET International (PI).
- Trademarks are the property of their respective owners.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option. Install the option according to this manual and local codes.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will cause death or serious injurty.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions
• The diagrams in this book may include options and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. Use the option 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 a Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cove to order new copies of the manual.

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will cause death or serious injury.

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

⚠ WARNING

Electrical Shock Hazard

Do not attempt to modify or alter the drive or drive circuitry in any way not explained in this manual.

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

NOTICE

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

Failure to comply could damage electrical components in the option.

2 Product Overview

◆ About This Product

This option provides a communications connection between the drive and a PROFINET network. The option connects the drive to a PROFINET network and facilitates the exchange of data.

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

PROFINET 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. PROFINET is a simple, networking solution that reduces the cost and time to wire and install factory automation devices, while providing interchangeability of like components from multiple vendors.

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

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

SI-EP3 is PROFINET Conformance Class A certified.

◆ Applicable Models

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

Table 1 Applicable Models

Drive Series	Model Number	Software Version <1>
A1000	CIMR-A□2A□□□□	≥1010
	CIMR-A□4A0002 to 4A0675	
	CIMR-A□4A0930 and 4A1200	≥3014
	CIMR-A□5A□□□□	≥5040 ≥1010
U1000	CIMR-U□□A□□□□	≥1010
	CIMR-U□□E□□□□	
	CIMR-U□□P□□□□	
	CIMR-U□□W□□□□	
U1000L	CIMR-U□□L□□□□	≥6210
	CIMR-U□□F□□□□	
	CIMR-U□□R□□□□	
	CIMR-U□□S□□□□	
Z1000U	CIMR-Z□□A□□□□	≥6110
	CIMR-Z□□E□□□□	
	CIMR-Z□□P□□□□	
	CIMR-Z□□W□□□□	
GA700 <2>	CIPR-GA70□2□□□	≥1010
	CIPR-GA70□4□□□	

<1> Refer to “PRG” on the drive nameplate for the software version number.
<2> Check the option software version is PRG: 6202 and later when installing the option to the YASKAWA AC Drive GA700.

Note: Refer to the option package labeling in the field designated “PRG” (four digit number)” or the option labeling in the field to identify the option software version. Refer to *Figure 1* for details.

3 Receiving

After receiving the option package:

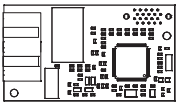
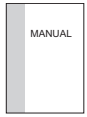
1. Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if the option or other parts appear damaged.

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

2. Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to ***Figure 1*** on page ***12*** for details. Contact the distributor where the option was purchased or the Yaskawa sales office immediately about any problems with the option.

◆ Option Package Contents

Table 2 Option Package Contents

Description:	Option	Ground Wire <1>	Screws (M3)	LED Label for YASKAWA AC Drive 1000-Series	LED Label for YASKAWA AC Drive GA700	Installation Manual
–						
Quantity:	1	1	3 <2>	1	1	1

<1> GA700 drives do not use the ground wire.
<2> GA700 drives use two screws only.

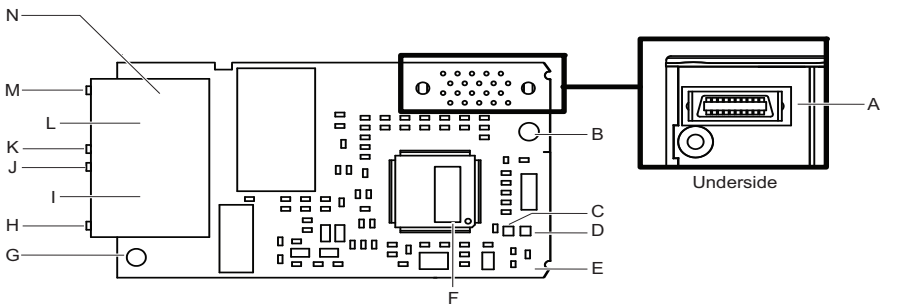
◆ Installation Tools

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

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

4 Option Components

◆ SI-EP3 Option



A – Option connector
B – Installation hole
C – LED (NS) *<1>*
D – LED (MS) *<1>*
E – PROFINET PCB
F – Software number label
G – Ground terminal (FE) and installation hole *<2>*
H – Port 1 LED (10/100) *<1>*
I – Port 1
J – Port 1 LED (LINK/ACT) *<1>*
K – Port 2 LED (10/100) *<1>*
L – Port 2
M – Port 2 LED (LINK/ACT) *<1>*
N – PROFINET cable connection

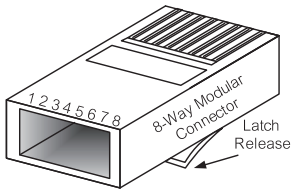
<1> *Refer to Option LED Display on page 13* for details on the LEDs.
<2> Connect the provided ground wire during installation. Installation on GA700 drives does not require the ground wire.

Figure 1 PROFINET Option Components

◆ Communication Modular Connector CN1 Port 1/Port 2

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 point for a customer supplied male Ethernet network communication cable.

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

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

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

◆ Option LED Display

The option has six LEDs:

Bi-color Status LEDs:

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

Ethernet LEDs (2 each):

- Network speed-10/100 yellow
- Link status and network activity-Link/Act green

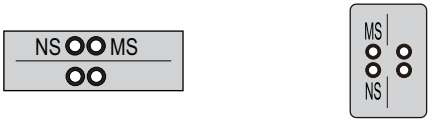


Figure 2 Option LED Labels

The operational states of the option LEDs after the power-up diagnostic LED sequence is completed are described in *Table 4*. The states with a number in parenthesis are the number of pulses of 250 ms on, 250 ms off cycles, followed by 500 ms off, then repeating the cycle. Wait at least 2 seconds for the power-up diagnostic process to complete before verifying LED states.

Table 4 Option LED States

Name	Indication		Operating Status	Description
	Color	Status		
MS (visible through drive cover)	–	OFF	Power supply OFF	Power is not being supplied to the drive.
	Green	ON	Option operating	The option is operating normally and initialization is complete.
	Green	Flashing (1)	Diagnostics	Diagnostic data available.
	Green	Flashing (2)	Configuration tool	Identified by a configuration tool.
	Red	ON	Default MAC or fatal error occurred.	Default MAC address has been programmed or the option has detected an unrecoverable error.
	Red	Flashing (1)	Configuration error (non-fatal)	Configuration error.
	Red	Flashing (2)	No IP (non-fatal)	No IP address assigned.
	Red	Flashing (3)	No station name (non-fatal)	No station name assigned.
	Red	Flashing (4)	Init failure (non-fatal)	Failed to initialize module.
	Green/Red	Flashing	Option self-test	The option is in self-test mode.
NS (visible through drive cover)	–	OFF	Offline or Power supply OFF	–
	Green	ON	Connected	Connection established with I/O controller and in RUN mode.
	Green	Flashing	Connected and stopped	Connection established with I/O controller and in STOP mode.
	Red	ON	BUS fault	Unrecoverable BUS fault.
	Red	Flashing (1)	Lost communication	Host communication is temporarily lost.
	Red	Flashing (2)	Lost link	No link detected to network.
10/100 (visible at RJ45 jack)	Yellow	OFF	10 Mbps is established	–
	Yellow	ON	100 Mbps is established	–
LINK/ACT (visible at RJ45 jack)	Green	OFF	Link is not established	–
	Green	ON	Link is established	–
	Green	Flashing	Link is established and there is network activity	–

■ Power-Up Diagnostics

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

Table 5 Power-Up Diagnostic LED Sequence

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

5 Installation Procedure

◆ Section Safety

⚠ DANGER

Electrical Shock Hazard

Do not inspect, connect, or disconnect any wiring while the drive is energized.

Failure to comply will cause death or serious injury.

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

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.

⚠ WARNING

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

Failure to comply could cause death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

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

NOTICE

Damage to Equipment

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

Failure to comply could cause ESD damage to circuitry.

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

Improper equipment sequencing could damage the drive.

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

Failure to comply could further damage the equipment.

Do not use unshielded wire for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive.

Properly connect all pins and connectors on the option and drive.

Failure to comply could prevent proper operation and damage equipment.

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

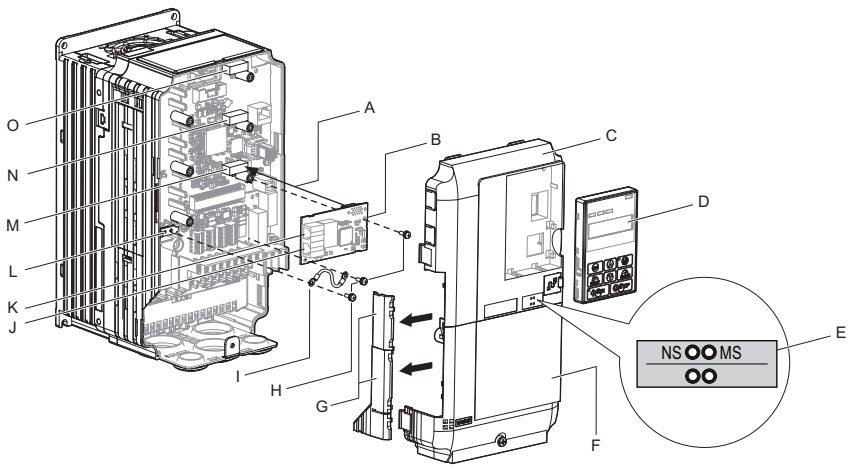
Failure to comply could damage the option.

◆ Installing the Option on a 1000-Series Drive

■ Prepare the Drive for the Option

Before beginning the installation procedure:

1. Wire the drive and make the proper connections to drive terminals according to the manual packaged with the drive.
2. Verify that the drive functions normally.
   Refer to ***Figure 3*** for an exploded view of the drive with the option and related components for reference in the installation procedure.



A – Insertion point for CN5 connector
B – SI-EP3 option
C – Drive front cover
D – Digital operator
E – LED label
F – Drive terminal cover
G – Removable tabs for wire routing
H – Included screws
I – Ground wire
J – Option modular connector CN1 port 1
K – Option modular connector CN1 port 2
L – Drive grounding terminal (FE)
M – Connector CN5-A
N – Connector CN5-B (Not available for communication option installation.)
O – Connector CN5-C (Not available for communication option installation.)

Figure 3 Drive Components with Option

■ Install the Option

Remove the front covers of the drive before installing the option. Refer to the drive instruction manual for directions on removing the front covers. Cover removal varies depending on drive size. This option can be inserted only into the **CN5-A** connector located on the drive control board.

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

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

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

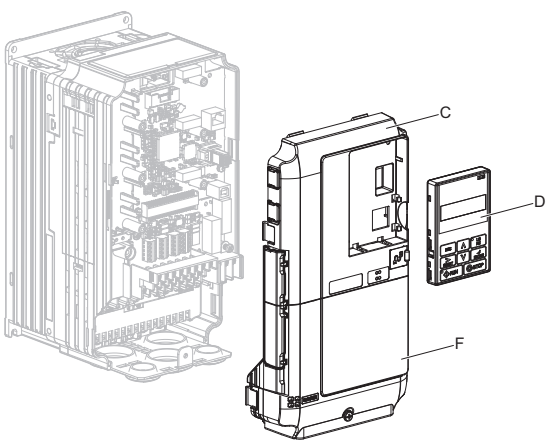


Figure 4 Remove the Digital Operator, Front Cover, and Terminal Cover

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

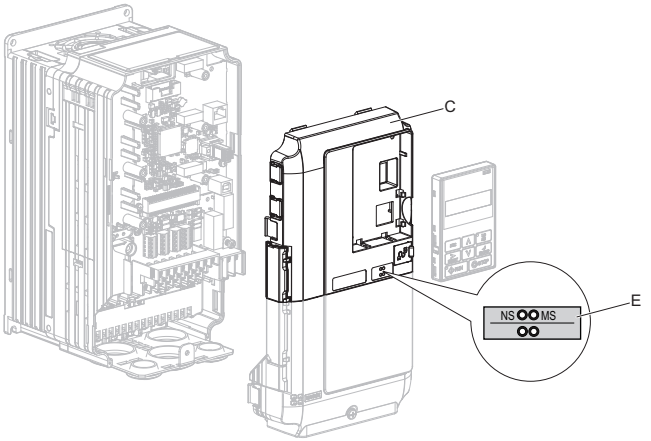


Figure 5 Affix the LED Label

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

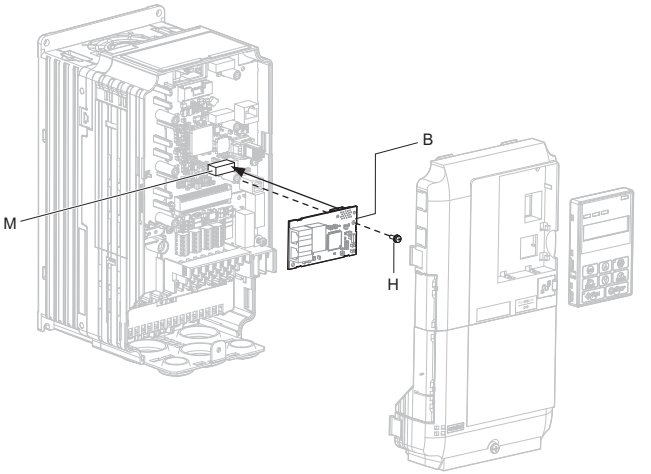


Figure 6 Insert the Option

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

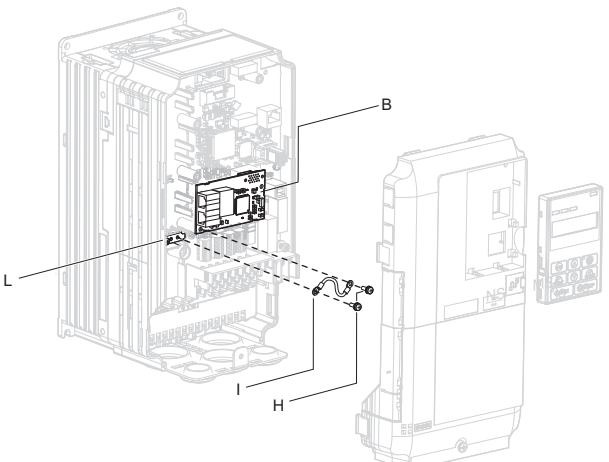
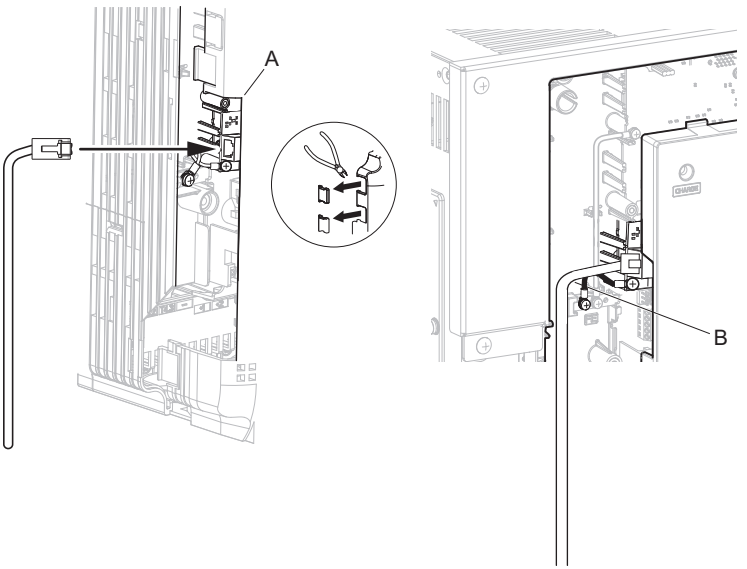


Figure 7 Connect the Ground Wire

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

5. Route the option wiring inside the enclosure as shown in *Figure 8*-B. Take proper precautions so that the front covers will easily fit back onto the drive.
Users may also choose to route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in *Figure 8*-A to create the necessary openings on these models.
Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.

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



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

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

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

Figure 8 Wire Routing Examples

6. Firmly connect the PROFINET Cat 5e communication cable to the option modular connector CN1 port 1 or port 2.
   Install PROFINET communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see *Figure 16*). Refer to *Communication Cable Specifications on page 30* for details of installing.

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

7. Use the second option modular connector CN1 port to daisy chain a series of drives where applicable.
8. Replace and secure the front covers of the drive (C, F) and replace the digital operator (D).

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

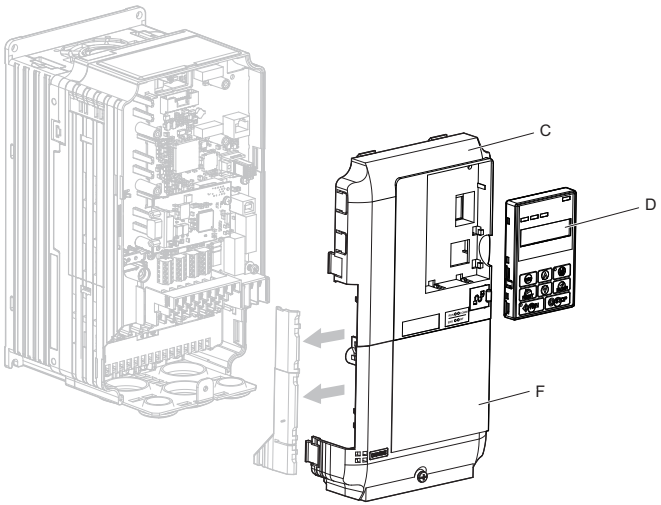


Figure 9 Replace the Front Covers and Digital Operator

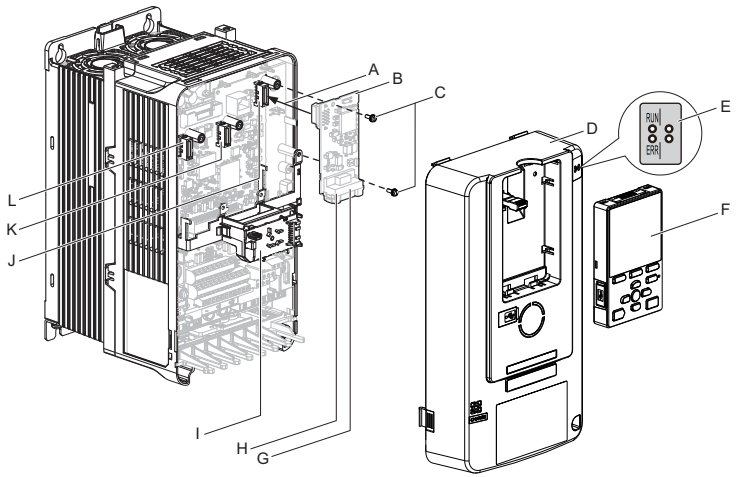
9. Set drive parameters in *Table 6* for proper option performance. Be sure to set parameter F6-30 to a node address unique to the network.

◆ Installing the Option on a GA700 Drive

■ Prepare the Drive for the Option

Before beginning the installation procedure:

1. Wire the drive and make the proper connections to drive terminals according to the manual packaged with the drive.
2. Verify that the drive functions normally.
   Refer to ***Figure 10*** for an exploded view of the drive with the option and related components for reference in the installation procedure.



A – Insertion point for CN5 connector
B – SI-EP3 option
C – Included screws
D – Drive front cover
E – LED label
F – Keypad
G – Option modular connector CN1 port 1
H – Option modular connector CN2 port 2
I – LED Status Ring board
J – Connector CN5-A
K – Connector CN5-B (Not available for communication option installation.)
L – Connector CN5-C (Not available for communication option installation.)

Figure 10 Drive Components with Option

■ Install the Option

Remove the front cover of the drive before installing the option. Refer to the drive instruction manual for directions on removing the front cover. Cover removal varies depending on drive size. This option can be inserted only into the **CN5-A** connector located on the drive control board.

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

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

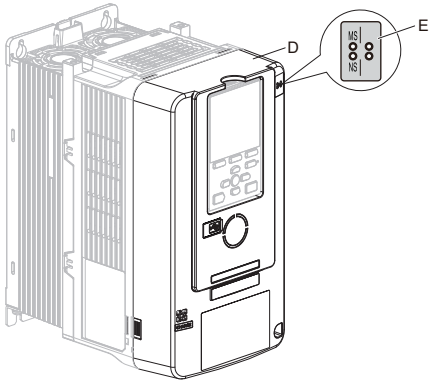


Figure 11 Affix the LED Label

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

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

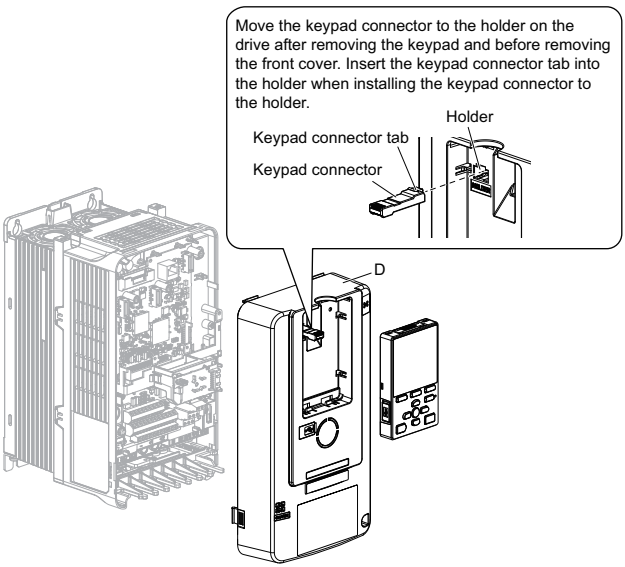


Figure 12 Remove the Front Cover and Keypad

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

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

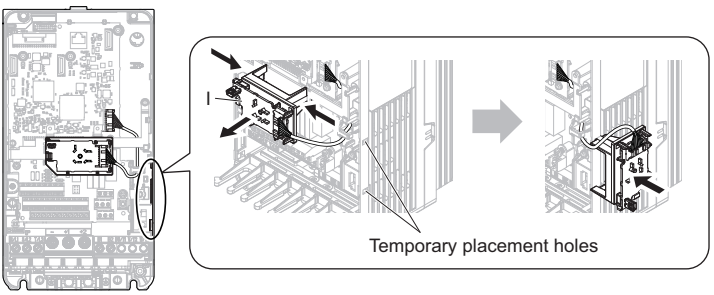


Figure 13 Remove the LED Status Ring Board

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

Note: Installing the option card on a GA700 drive requires only two screws and does not require a ground wire. The option package ships with three screws and a ground wire for installation on other drive series. Do not use the ground wire or the extra screw.

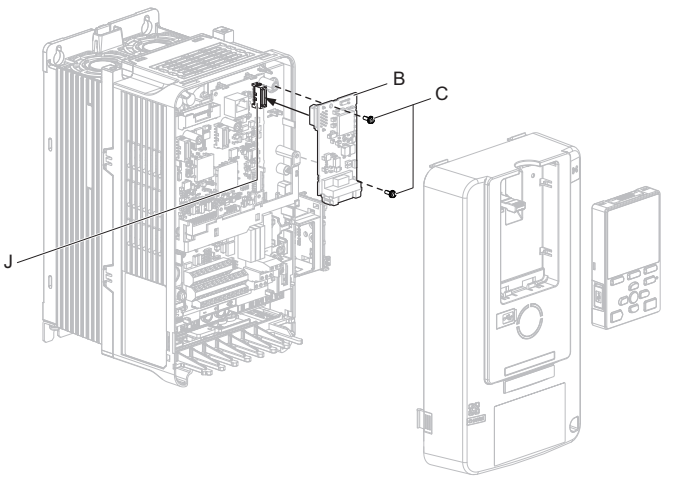


Figure 14 Insert the Option Card

5. Firmly connect the PROFINET Cat 5e communication cable to the option modular connector CN1 port 1 or port 2. Install PROFINET communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see ***Figure 16***). Refer to ***Communication Cable Specifications on page 30*** for details of installing.

Note:
1. Separate communication cables from main circuit wiring and other electrical lines.
2. Do not connect or disconnect the communication cable while the drive is powered up or while the drive is in operation. Failure to comply may cause a static discharge, which will cause the option card to stop working properly. Cycle power on the drive and option card to reestablish functionality.
3. Maximum transmission distance is 100 m (328 ft.). Minimum wiring distance between stations is 0.2 m (7.9 in).

6. Use the second option modular connector CN1 port to daisy chain a series of drives where applicable.

7. Replace and secure the LED Status Ring board (I).
Use the open space provided inside the LED Status Ring board to route option wiring.

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

8. Replace and secure the front cover of the drive (D) including the keypad (F).

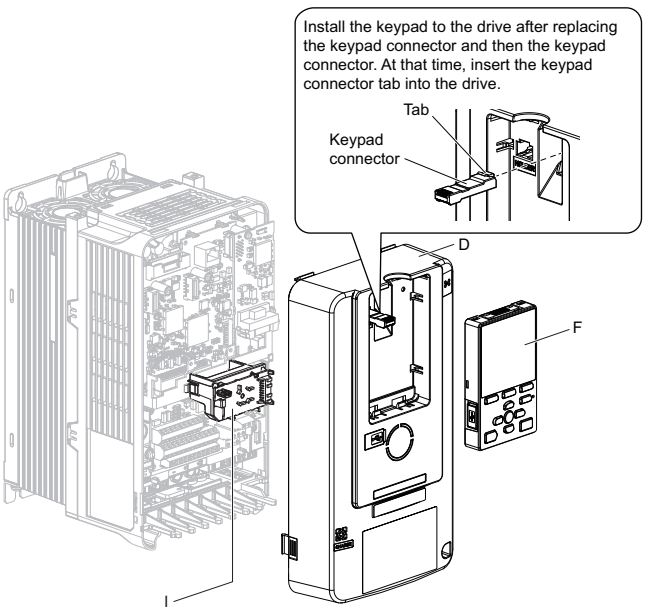


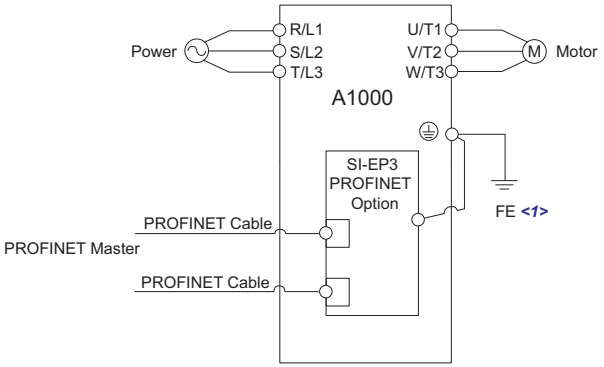
Figure 15 Replace the Front Cover and Keypad

9. Set drive parameters in ***Table 6*** for proper option performance. Be sure to set parameter F6-30 to a node address unique to the network.

◆ Communication Cable Specifications

Use only PROFINET dedicated communication cable; the Yaskawa warranty does not cover other cable types.

■ Option Connection Diagram



<1> Connect the provided ground wire during installation on 1000-series drives. Installation on GA700 drives does not require the ground wire.

Figure 16 Option Connection Diagram

■ Communication Cable Topology

The option modular connector CN1 port 1 and port 2 act as a switch to allow for flexibility in cabling topology. Users may employ a traditional star network topology using a single communication cable port on the option.
Users may also choose to employ a ring topology using both communication modular connector ports on the option and reduce the requirements of PROFINET switch ports.

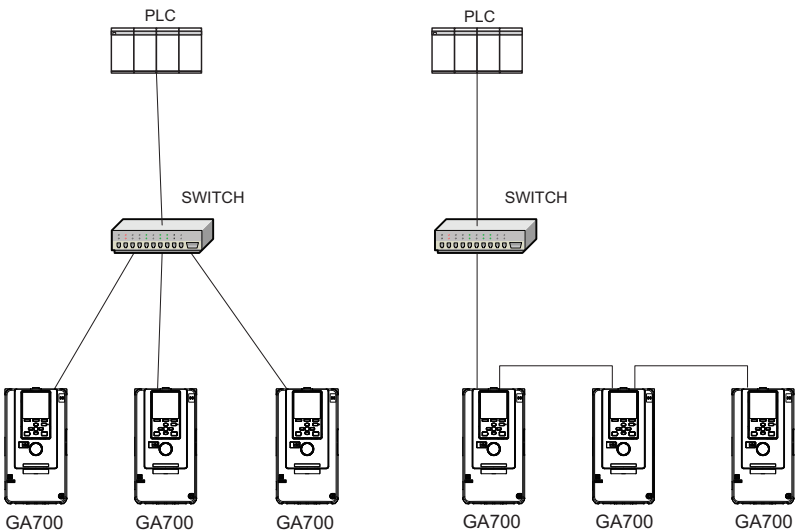


Figure 17 Topology Options

◆ GSD Files

To facilitate network implementation, obtain a GSD file from one of the following websites depending on your region:
US: http://www.yaskawa.com
Europe: http://www.yaskawa.eu.com
Japan: http://e-mechatronics.com
Other areas: Contact your Yaskawa representative

6 Related Drive Parameters

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

Table 6 Related Parameter Settings

No. (Addr. Hex)	Name	Description	Values
b1-01 (180) <1>	Reference 1 Source	Selects the input method for frequency reference. 0: Keypad 1: Analog Input 2: Memobus/Modbus Communications 3: Option PCB 4: Pulse Train Input	Default: 1 Range: 0 to 4 (Set to 3)
b1-02 (181) <1>	Run Command 1 Source	Selects the input method for the Run command. 0: Keypad 1: Digital Input 2: Memobus/Modbus Communications 3: Option PCB	Default: 1 Range: 0 to 3 (Set to 3)
F6-01 (3A2)	Communication Error Selection	Selects drive response when a bUS error is detected during communications with the option. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2> 4: Alarm - Run at d1-04 <2> <3> 5: Alarm - Ramp to Stop <3>	Default: 1 Range: 0 to 5 <4>
F6-02 (3A3)	Comm External Fault (EF0) Detect	Selects the condition for external fault detection (EF0). 0: Always detected 1: Detection during run only	Default: 0 Range: 0, 1
F6-03 (3A4)	Comm External Fault (EF0) Select	Selects drive response for external fault input (EF0) detection during option communications. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2>	Default: 1 Range: 0 to 3
F6-06 (3A7) <5>	Torque Reference/Limit by Comm	Enabling this parameter allows d5-01 to determine whether the value is read as the Torque Limit value (d5-01 = 0) or the Torque Reference value (d5-01 = 1). 0: Disabled 1: Enabled <6>	Default: 0 Range: 0, 1
F6-07 (3A8)	MultiStep Ref Priority Select	0: MultiStep References Disabled 1: MultiStep References Enabled	Default: 0 Range: 0, 1

No. (Addr. Hex)	Name	Description	Values
F6-08 (36A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters F6-☐☐ and F7-☐☐ are set back to original default values when the drive is initialized using parameter A1-03. 0: No Reset - Parameters retained 1: Reset - Back to factory default Note: The setting value is not changed even when F6-08 is set to 1 and the drive is initialized using A1-03.	Default: 0 Range: 0, 1
F6-15 (B5B)	Comm. Option Parameter Upgrade Selection	Selects whether F6-☐☐/F7-☐☐ communication-related parameters changed are enabled. 0: Enabled by Cycling the Power 1: Enabled F6-☐☐/F7-☐☐ 2: Disabled F6-☐☐/F7-☐☐ Note: F6-15 is reset to 0 after setting to 1 or 2.	Default: 0 Range: 0 to 2
F7-01 (3E5) <7> <8> <9>	IP Address 1	Sets the static/fixed IP address. Parameter F7-01 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-02 (3E6) <7> <8> <9>	IP Address 2	Sets the static/fixed IP address. Parameter F7-02 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-03 (3E7) <7> <8> <9>	IP Address 3	Sets the static/fixed IP address. Parameter F7-03 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-04 (3E8) <7> <8> <9>	IP Address 4	Sets the static/fixed IP address. Parameter F7-04 sets the fourth most significant octet.	Default: 20 Min: 0 Max: 255
F7-05 (3E9) <9>	Subnet Mask 1	Sets the static/fixed Subnet Mask. Parameter F7-05 sets the most significant octet.	Default: 255 Min: 0 Max: 255
F7-06 (3EA) <9>	Subnet Mask 2	Sets the static/fixed Subnet Mask. Parameter F7-06 sets the second most significant octet.	Default: 255 Min: 0 Max: 255
F7-07 (3EB) <9>	Subnet Mask 3	Sets the static/fixed Subnet Mask. Parameter F7-07 sets the third most significant octet.	Default: 255 Min: 0 Max: 255
F7-08 (3EC) <9>	Subnet Mask 4	Sets the static/fixed Subnet Mask. Parameter F7-08 sets the fourth most significant octet.	Default: 0 Min: 0 Max: 255

No. (Addr. Hex)	Name	Description	Values
F7-09 (3ED) *<9>*	Gateway Address 1	Sets the static/fixed Gateway address. Parameter F7-09 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-10 (3EE) *<9>*	Gateway Address 2	Sets the static/fixed Gateway address. Parameter F7-10 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-11 (3EF) *<9>*	Gateway Address 3	Sets the static/fixed Gateway address. Parameter F7-11 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-12 (3E0) *<9>*	Gateway Address 4	Sets the static/fixed Gateway address. Parameter F7-12 sets the fourth most significant octet.	Default: 1 Min: 0 Max: 255
F7-13 (3F1) *<9>*	Address Mode at Startup	Selects how the option address is set. 0: Static *<8>* 2: DCP	Default: 2 Range: 0, 2
F7-14 (3F2)	Duplex Mode Selection	Selects duplex mode setting. 0: Auto/Auto 1: Half/Half 2: Full/Full 3: Half/Auto 4: Half/Full 5: Auto/Half 6: Auto/Full 7: Full/Half 8: Full/Auto	Default: 1 Range: 0 to 8
F7-15 (3F3) *<10>*	Communication Speed Selection	Sets the communication speed. 10: 10 Mbps 100: 100 Mbps 101: 10/10 Mbps 102: 100/100 Mbps	Default: 10 Range: 10 to 102
F7-23 (3FB) *<11>*	Dynamic Output Assembly Parameter 1	Sets configurable output 1.	Default: 0H Min.: 0H Max.: FFFFH
F7-24 (3FC) *<11>*	Dynamic Output Assembly Parameter 2	Sets configurable output 2.	Default: 0H Min.: 0H Max.: FFFFH
F7-25 (3FD) *<11>*	Dynamic Output Assembly Parameter 3	Sets configurable output 3.	Default: 0H Min.: 0H Max.: FFFFH

No. (Addr. Hex)	Name	Description	Values
F7-26 (3FE) <1>	Dynamic Output Assembly Parameter 4	Sets configurable output 4.	Default: 0H Min.: 0H Max.: FFFFH
F7-27 (3FF) <1>	Dynamic Output Assembly Parameter 5	Sets configurable output 5.	Default: 0H Min.: 0H Max.: FFFFH
F7-33 (405) <1>	Dynamic Input Assembly Parameter 1	Sets configurable input 1.	Default: 0H Min.: 0H Max.: FFFFH
F7-34 (406) <1>	Dynamic Input Assembly Parameter 2	Sets configurable input 2.	Default: 0H Min.: 0H Max.: FFFFH
F7-35 (407) <1>	Dynamic Input Assembly Parameter 3	Sets configurable input 3.	Default: 0H Min.: 0H Max.: FFFFH
F7-36 (408) <1>	Dynamic Input Assembly Parameter 4	Sets configurable input 4.	Default: 0H Min.: 0H Max.: FFFFH
F7-37 (409) <1>	Dynamic Input Assembly Parameter 5	Sets configurable input 5.	Default: 0H Min.: 0H Max.: FFFFH
H5-11 (43C)	Communications ENTER Function Selection	Selects whether an Enter command is necessary to change parameter values via MEMOBUS/Modbus communications. 0: Parameter changes are activated when ENTER command is written 1: Parameter changes are activated immediately without use of ENTER command	Default: 1 Range: 0, 1

<1> Set b1-02 = 3 to start and stop the drive with the PROFINET master device using serial communications.
Set b1-01 = 3 to control the frequency reference of the drive via the master device.

<2> Setting this parameter to 3 will cause the drive to continue operation after detecting a fault. Take proper measures such as installing an emergency stop switch when using setting 3.
<3> Available for software versions PRG: 1021 and later when using A1000. Refer to the instruction manual of a specific drive to determine if settings 4 and 5 are available in the drive.
<4> Settings 4 and 5 are not available on 1000-Series drives.
<5> Control method availability of this parameter depends on drive series.
• 1000-Series Drives: Parameter is available in CLV, AOLV/PM, and CLV/PM.
In AOLV/PM, this value is read as the Torque Limit.
• GA700 Drives: Parameter is available in CLV, AOLV, AOLV/PM, and CLV/PM.
<6> The setting specifies that network communications provide the torque reference or torque limit. The motor could rotate if the PLC does not supply a torque reference or torque limit.
<7> Cycle power for setting changes to take effect.
<8> Set F7-01 to F7-04 when F7-13 is set to 0. All IP Addresses (F7-01 to F7-04) must be unique.
<9> Set F7-01 to F7-12 when F7-13 is set to 0.
<10> Set F7-15 when F7-14 is set to 0 or 2.
<11> If a value other than 0 is assigned to parameters F7-23 to F7-27 and F7-33 to F7-37 by the drive, that value will take precedent over a value set by the configuration software. If the value in the drive is 0 (default), the value from the configuration software is used.

Table 7 Option Monitors

No.	Name	Description	Range
U6-80 to U6-83	OPT IP ADR 1 to 4	Displays IP Address currently available; • U6 -80: First octet • U6 -81: Second octet • U6 -82: Third octet • U6 -83: Forth octet	0 to 255
U6-84 to U6-87	Online Subnet 1 to 4	Displays subnet currently available; • U6 -84: First octet • U6 -85: Second octet • U6 -86: Third octet • U6 -87: Forth octet	0 to 255
U6-88 to U6-91	Online Gateway	Displays gateway currently available; • U6 -88: First octet • U6 -89: Second octet • U6 -90: Third octet • U6 -91: Forth octet	0 to 255
U6-92	Online Speed	Displays CN1 Port 1 link speed currently available.	10, 100
U6-93	Online Duplex	Displays CN1 Port 1 duplex setting currently available.	0: Half, 1: Full
U6-94	Online Speed	Displays CN1 Port 2 link speed currently available.	10, 100
U6-95	Online Duplex	Displays CN1 Port 2 duplex setting currently available.	0: Half, 1: Full
U6-98	First Fault	Displays first option fault. Refer to *Option Fault Monitors U6-98 and U6-99 on page 58* for details.	-
U6-99	Current Fault	Displays current option fault. Refer to *Option Fault Monitors U6-98 and U6-99 on page 58* for details.	-

7 PROFINET Messaging

◆ PROFINET Overview

This section describes the communication profile used between the PROFINET I/O network and the option.

The option supports the PROFIdrive profile. Users can select between the control and status words according to the PROFIdrive profile or use the Yaskawa-specific control and status words.

◆ PROFIdrive Communication Profile

■ The Control Word and the Status Word

The contents of the Control Word and the Status Word are detailed in *Table 8*. and *Table 9*. respectively. The drive states are presented in the PROFIdrive State Machine (Refer to the option Technical Manual.).

■ Frequency Reference

The Frequency reference is a 16-bit word containing a sign bit and a 15-bit integer. A negative reference (indicating reverse direction of rotation) is formed by calculating the two's complement from the corresponding positive reference. The reference value is the desired output frequency.

■ Output Frequency

Output Frequency is a 16-bit word containing the current output frequency (U1-02) of the drive.

Table 8 Control Word for PROFIdrive Communication Profile

Bit	Name	Value	Proceed to STATE/Description
0	ON	1	Proceed to READY TO OPERATE.
	OFF1	0	Emergency OFF. Proceed to OFF1 ACTIVE; proceed further to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active.
1	OFF2	1	Continue operation (OFF2 inactive).
		0	Emergency OFF. Proceed to OFF2 ACTIVE; proceed further to SWITCH ON INHIBIT.
2	OFF3	1	Continue operation (OFF3 inactive).
		0	Emergency stop. Proceed to OFF3 ACTIVE; proceed further to SWITCH-ON INHIBIT.
3	OPERATION_ ENABLE	1	Proceed to ENABLE OPERATION.
		0	Inhibit operation. Proceed to OPERATION INHIBIT.
4	RAMP_OUT_ ZERO	1	Normal operation. Proceed to RAMP FUNCTION GENERATOR: ENABLE OUTPUT.
		0	Stop according to selected stop type.
5	RAMP_HOLD	1	Normal operation.
		0	Proceed to RAMP FUNCTION GENERATOR: ENABLE ACCELERATOR. Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_ ZERO	1	Normal operation. Proceed to OPERATING. Note: This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters.
		0	Force Ramp Function Generator input to zero.
7	RESET	0 -> 1	Fault reset if an active fault exists. Proceed to SWITCH ON INHIBIT.
		0	(Continue normal operation)
8	INCHING_1	-	Inching 1. (Not supported)
9	INCHING_2	-	Inching 2. (Not supported)
10	REMOTE_CMD	1	Network control enabled.
		0	Network control disabled.
11 to 15	-	-	Reserved

Table 9 Status Word for the PROFIdrive Communication Profile

Bit	Name	Value	STATE/Description
0	RDY_ON	1	READY TO SWITCH ON.
		0	NOT READY TO SWITCH ON.
1	RDY_RUN	1	READY TO OPERATE.
		0	OFF1 ACTIVE.
2	RDY_REF	1	ENABLE OPERATION.
		0	DISABLE OPERATION.
3	TRIPPED	1	FAULT.
		0	No fault.
4	OFF_2_STA	1	OFF2 inactive.
		0	OFF2 ACTIVE.
5	OFF_3_STA	1	OFF3 inactive.
		0	OFF3 ACTIVE.
6	SWC_ON_INHIB	1	SWITCH-ON INHIBIT ACTIVE.
		0	SWITCH-ON INHIBIT NOT ACTIVE.
7	ALARM	1	Warning/Alarm.
		0	No Warning/Alarm.
8	AT_SETPOINT	1	OPERATING. Actual value equals reference value (i.e., is within tolerance limits).
		0	Actual value differs from reference value (i.e., is outside tolerance limits).
9	REMOTE	1	Drive control location: REMOTE.
		0	Drive control location: LOCAL.
10	ABOVE_LIMIT	-	Not supported.
11 to 15	-	-	Reserved

◆ Yaskawa Vendor-Specific Control and Status Words

■ The Control Word and the Status Word

The contents of the Control Word and the Status Word are detailed in *Table 10*.

■ Frequency Reference

Frequency Reference is a 16-bit word containing the desired output frequency.

■ Output Frequency

Output Frequency is a 16-bit word containing the current output frequency of the drive.

Table 10 Yaskawa-Specific Control Word and Status Word

Yaskawa-Specific Control Word		Yaskawa-Specific Status Word	
Bit	**Description**	**Bit**	**Description**
0	Run bit	0	Running
1	Reverse run bit	1	Zero Speed
2	EF0	2	Reverse Operation
3	Fault Reset	3	Reset Signal Input Active
4	ComFref	4	At Speed
5	ComCtrl	5	Ready
6	DI3	6	Alarm
7	DI4	7	Fault
8	DI5	8	oPE Fault
9	DI6	9	Uv Return
10	DI7	10	2nd Motor
11	DI8	11	ZSV
12	Not Used	12	Not Used
13	Not Used	13	Not Used
14	Not Used	14	Net Reference
15	Not Used	15	Net Control

8 Web Interface

The web server interface to the drive option through port 80 allows management of diagnostic information through a standard web browser. The web page is a Java applet that creates a tabbed web page. The available tabs include:

- Main Tab
- Drive Status Tab
- Network Tab
- Doc links Tab
- Email Alerts Tab
- Parameter Access Tab <1>
- Configuration Tab <1>
- Custom Tab

<1> PCs must have Java SE 6 Update 14 or later installed to view the web pages. PCs without Java will display web pages with limited features.

Access the web server interface by typing the IP address of the SI-EP3 option in a web browser address.

Example: "http://192.168.1.20"

The SI-EP3 IP Address is available using drive digital operator to access Option Monitors U6-80 to U6-83. Refer to ***Table 7*** for details.

◆ Main Tab

The Main tab shows basic option information such as IP address, MAC address, and firmware version.

Figure 18 Main Tab View

Note: The initial password is yaskawa. To change the password, open the Configuration Tab.

◆ Drive Status Tab

The Drive Status tab shows basic I/O information and drive state information.

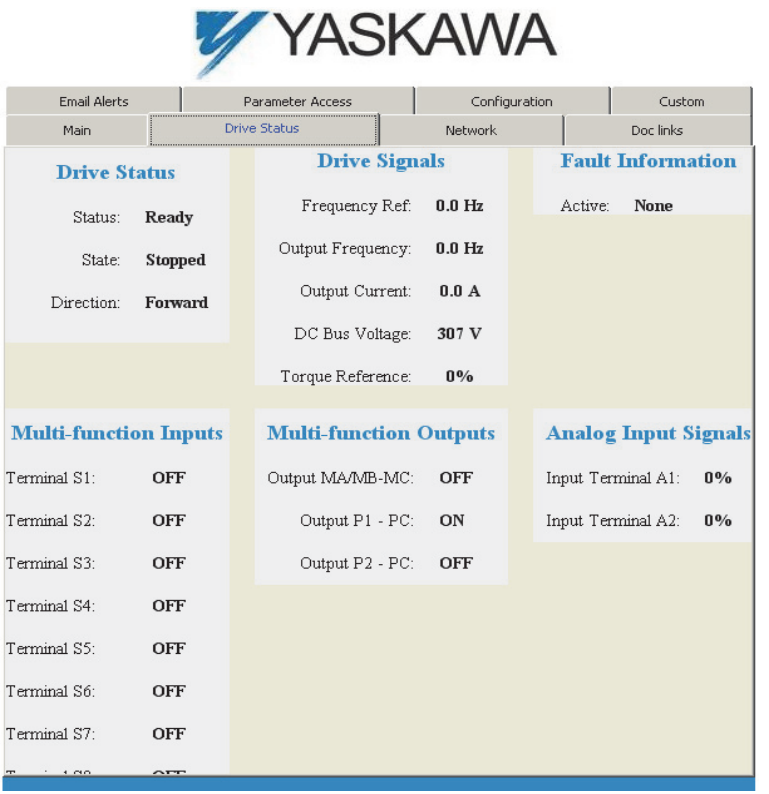


Figure 19 Drive Status Tab View

◆ Network Tab

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

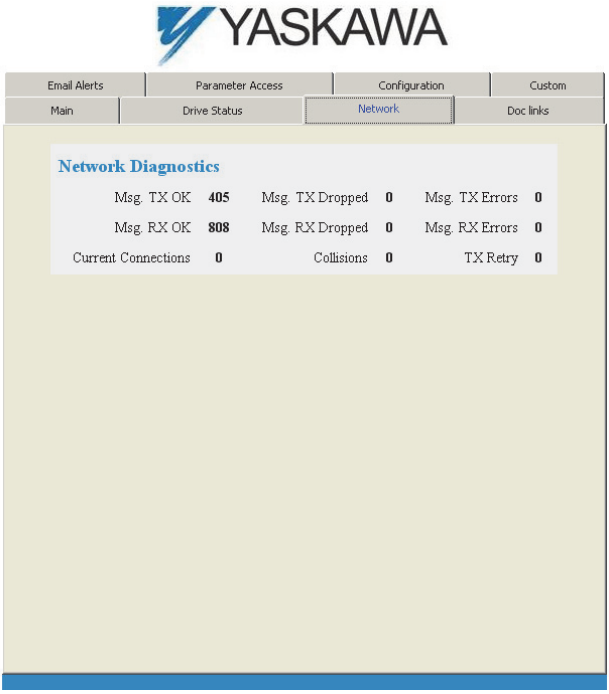


Figure 20 Network Tab View

Table 11 Network Monitor Descriptions

Network Monitor	Explanation
Msg Tx OK	Cumulative number of messages transmit successfully from SI-EP3.
Msg Rx OK	Cumulative number of messages received successfully to SI-EP3.
Current Connections	Current number of open connections.
Msg Tx Dropped	Cumulative number of messages dropped due to output network buffer being full and unable to hold the new message.
Msg Rx Dropped	Cumulative number of messages dropped due to input network buffer being full and unable to hold the new message.
Collisions	Cumulative number of collisions (half duplex only) reported by the MAC/PHY (Media Access Control/Physical Layer).
Msg Tx Errors	Cumulative number of transmit errors reported by the MAC/PHY (Media Access Control/Physical Layer).
Msg Rx Errors	Cumulative number of receive errors reported by the MAC/PHY (Media Access Control/Physical Layer).
Tx Retry	Cumulative number of retransmits due to busy medium reported by the MAC/PHY (Media Access Control/Physical Layer).

Note: Cumulative counters are reset when the power supply is cycled.

◆ Doc Links Tab

The Doc links tab contains links to the option documentation on the Yaskawa website.

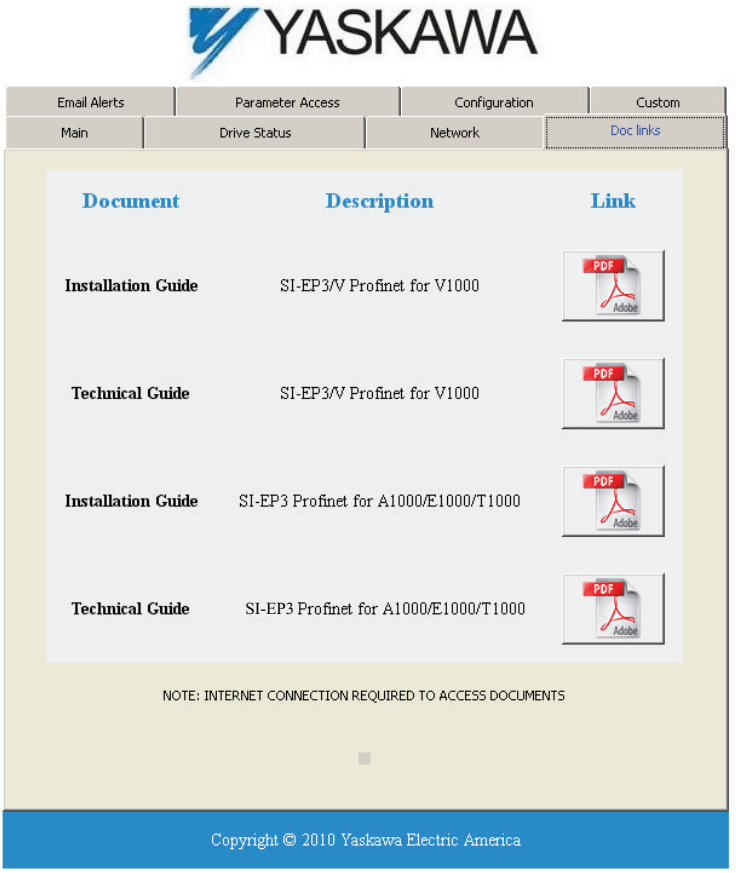


Figure 21 Doc Links Tab View

◆ Email Alerts Tab

The Email Alerts tab allows the user to configure four Email Fault/Alarm conditions. When the condition is true, one email will be sent to the provided email address. Another email will not be sent until the condition becomes false and then true again. A 30-second timer prevents emails from being sent when conditions reoccur immediately after being removed. The timer helps limit the amount of emails sent regarding the same intermittent condition and helps to reduce network traffic by reducing emails about reoccurring errors.

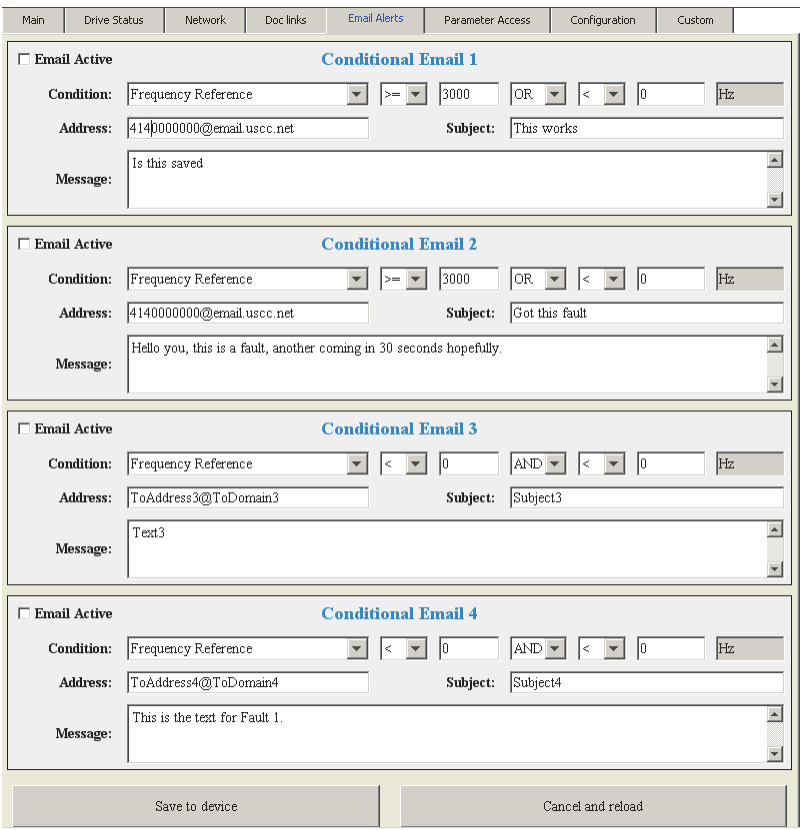


Figure 22 Email Alerts Tab View

■ Procedure: Conditional Email Set-up

1. Define the condition that will trigger the email by selecting a monitor parameter, a comparator, and a value. Set the conditions to send alerts from the “Condition” drop-down selection. If choosing only one condition and no OR or AND are needed, set the “OR/AND” drop-down selection to “NotUsed”.
2. Enter the email address where the alert will be sent.
3. Enter the message that will appear in the email contents.
4. Enter the email subject.
5. Click the “Email Active” check box to enable the alert.

Clicking “Save to device” will save the entered information into the option.

Clicking “Cancel and reload” will cancel any pending edits and display the most recently saved settings from the option board.

◆ Parameter Access Tab

The Parameter Access tab allows the user to read and write parameters from the drive. Write access is restricted until a valid password is entered.

Figure 23 Parameter Access Tab View

The MEMOBUS/Modbus address for the drive parameter being accessed must be entered in hexadecimal. The number must begin with “0x” to signify hexadecimal.

Clicking “Read” will load and display the current value of the given MEMOBUS/Modbus Address. Clicking “Set” will save the given value to the given MEMOBUS/Modbus address.

After a “Read” or “Set” command is given, Status will display “Waiting” while the action is being carried out, then “Complete” is displayed when finished.

◆ Configuration Tab

The Configuration tab sets web page behavior parameters. Access is restricted unless a valid password is entered.

Figure 24 Configuration Tab View

■ Security Login

Enter a valid password and click “Log in”. The button text will change to “Log out” and the status will change to “Logged in”.

Note: The default security password is “**yaskawa**”.

This password can be changed in the “Change Password” section of the tab. Entering a valid password allows access to the settings in the Configuration tab, Email Alerts tab, and the Parameter Access tab.

■ Change Password

To change the password, enter the new password in the “New Password:” and “Confirm Password:” text boxes then click “Change password”. The Status display will change to “Idle” then “Changing Password” then “Password Changed”. If the passwords in the two text boxes do not match, the Status will display “Passwords don’t match”.

■ Option Card

The values displayed in the various tabs are refreshed at the rate defined in the “Applet Refresh Rate (ms)” text box. Enter values in the range of 1000 ms to 65.535 seconds.

Parameter Security can be enabled or disabled by clicking one of the radio buttons. When “Disabled” is selected, no password is necessary and all functions in the web pages will be available. When “Enabled” is selected, a valid password must be entered to edit email settings and to write parameters.

■ Email Settings

The “Email Server IP” text box must contain the IP address of the email server. The subnet address is configured in drive parameters F7-05 through F7-08. The configured email alerts will use the server at this address when sending emails.

Enter the email server port in the “Email Port” text box.

The value in the “From’ Email Address” text box identifies the origin of the email alerts to the recipient.

Click “Submit Email Parameters” to save the email settings to the option.

Click “Save Configuration Parameters to Flash” to save the entered values from this tab into non-volatile memory. These values will then be remembered after cycling power.

■ General Settings

Click “Save Option Card Parameters” to save the Applet Refresh Rate and the Parameter Security settings to the option.

◆ Custom Tab

The Custom tab displays a selection of quick setting parameters.

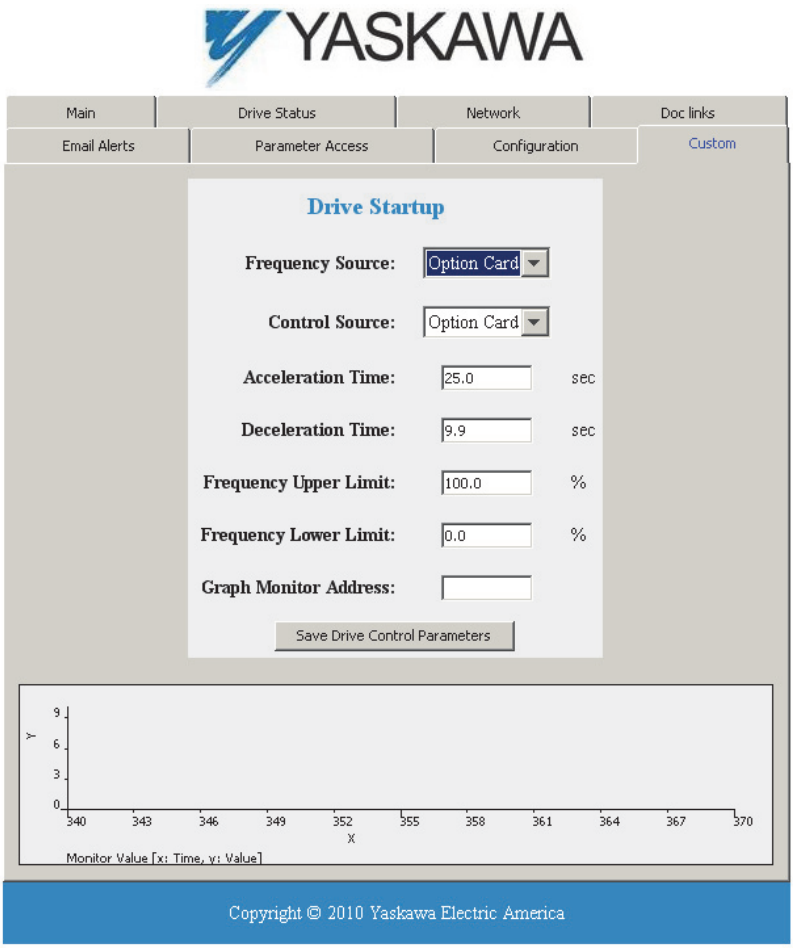


Figure 25 Custom Tab View

9 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Table 12* 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 digital operator.

■ Faults

Both bUS (Option Communication Error) and EF0 (Option Card External Fault) can appear as either an alarm or as a fault. When a fault occurs, the digital operator ALM LED remains lit. When an alarm occurs, the digital operator ALM LED flashes.

Check the following items first when an error code occurs on the drive:

- Communication cable connections
- Make sure the option is properly installed to the drive
- Operation status of the controller program and controller CPU
- Did a momentary power loss interrupt communications?

Table 12 Fault Displays, Causes, and Possible Solutions

Keypad Display		Fault Name
bUS	bUS	Option Communication Error
		• After establishing initial communication, the connection was lost. • Only detected when the run command frequency reference is assigned to the option (bl-01 = 3 or bl-02 = 3).
Cause		**Possible Solution**
No signal was received from the PLC.		• Check for faulty wiring. • Correct any wiring problems.
Faulty communications wiring		
An existing short circuit or communications disconnection		Check disconnected cables and short circuits and repair as needed.
A data error occurred due to electric interference.		• Counteract noise in the control circuit, main circuit, and ground wiring. • If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input. • Counteract noise in the master controller (PLC).
The option is not properly connected to the drive.		Reinstall the option.
Option is damaged.		If there are no problems with the wiring and the error continues to occur, replace the option.

Keypad Display		Fault Name
EF0	EF0	Option Card External Fault
		The alarm function for an external device has been triggered.
Cause		**Possible Solution**
An external fault was received from the PLC.		1. Remove the cause of the external fault. 2. Reset the external fault input from the PLC.
Problem with the PLC program.		Check the PLC program.
Keypad Display		**Fault Name**
oFA00	oFA00	Option Card Connection Error (CN5-A)
		Option is not properly connected.
Cause		**Possible Solution**
The option card installed into port CN5-A is incompatible with the drive.		Connect the option to the correct option port. Note: PG option cards are supported by option ports CN5-B and CN5-C only.
Keypad Display		**Fault Name**
oFA01	oFA01	Option Card Fault (CN5-A)
		Option is not properly connected.
Cause		**Possible Solution**
The option connected to option port CN5-A was changed during run.		De-energize the drive and plug the option into the drive according to *Installation Procedure on page 16*.
Keypad Display		**Fault Name**
oFA03	oFA03	Option fault (CN5-A)
		Option self-diagnostics error
Cause		**Possible Solution**
The option card connection to port CN5-A is faulty.		1. Turn off the power. 2. Check if the option is properly plugged into the option port. 3. Replace the option if the fault continues to occur.
Keypad Display		**Fault Name**
oFA04	oFA04	Option fault (CN5-A)
		Option flash write mode
Cause		**Possible Solution**
The option card connection to port CN5-A is faulty.		1. Turn off the power. 2. Check if the option is properly plugged into the option port. 3. Replace the option if the fault continues to occur.

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

■ Minor Faults and Alarms

Keypad Display		Minor Fault Name	
CALL	CALL	Serial communication transmission error	
		Communication is not established.	
Cause		**Possible Solution**	**Minor Fault (H2-☐☐ = 10)**
Communication wiring is faulty.		• Check for wiring errors. • Correct the wiring.	YES
An existing short circuit or communications disconnection		Check disconnected cables and short circuits and repair as needed.	
Programming error on the master side.		Check communications at start-up and correct programming errors.	
Communication circuitry is damaged.		• Perform a self-diagnostics check • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or your nearest sales representative.	
Termination resistor of the MEMOBUS/Modbus communications is not enabled.		Set DIP switch S2 to the ON position to enable the termination resistor on a drive located at the end of a network line.	
Keypad Display		**Minor Fault Name**	
CyPo	CyPo	Cycle Power to Active Parameters	
		Comm. Option Parameter Not Upgraded	
Cause		**Possible Solution**	**Minor Fault (H2-☐☐ = 10)**
Drive is not compatible with the option software version.		Turn off the power and upgrade the communication option parameters. Note: An alarm is triggered when the option software version is earlier or an incompatible option is installed to the drive.	YES

■ Option Fault Monitors U6-98 and U6-99

The option can declare error/warning conditions via drive monitor parameters on the drive digital operator as shown in *Table 13*.

Table 13 Option Fault Monitor Descriptions

Fault Condition	Fault Declared	Status Value (U6-98/U6-99)	Description
No Fault	N/A	0	No faults.
Force Fault	EF0	3	Network sent a message to force this node to the fault state.
Network Link Down	bUS	1300	No network link to option board.
Network Failure	bUS	1301	Connection with PLC Timeout.
Default MAC Address	None	1303	Factory default MAC Address programmed into the option. Return for reprogramming.
No IP Address	None	1304	No IP Address has been programmed into the option.
No Station Name	None	1305	No Station Name has been programmed into the option.
Config Error	None	1306	Configuration error on power-up.
Init. Failure	None	1307	Initialize error on power-up.
Permanent Communication Loss	bUS	1308	Fatal error in MAC/PHY hardware, requires power cycle to recover.

Two drive monitor parameters, U6-98 and U6-99 assist 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 SI-EP3 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

Users may connect up to 3 options simultaneously depending on the type of option. Refer to *Table 14* for details.

Table 14 Option Compatibility

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

<1> When connecting two PG option cards, use both CN5-B and CN5-C. When connecting only one PG option card, use the CN5-C connector.
<2> Not available for the application with Motor 2 Selection.
<3> Not available with 1000-Series drive models with a capacities between 450 and 630 kW.

10 European Standards

Figure 26 CE Mark

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

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

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

EMC Guidelines: 2014/30/EU

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

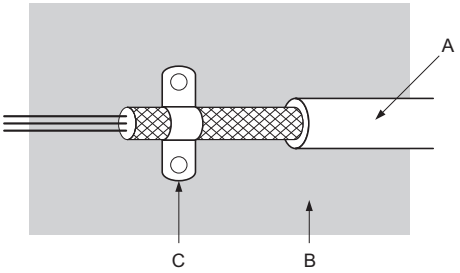
◆ EMC Guidelines Compliance

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

■ EMC Guidelines Installation Conditions

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

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



A – Braided shield cable
B – Metal panel
C – Cable clamp (conductive)

Figure 27 Ground Area

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

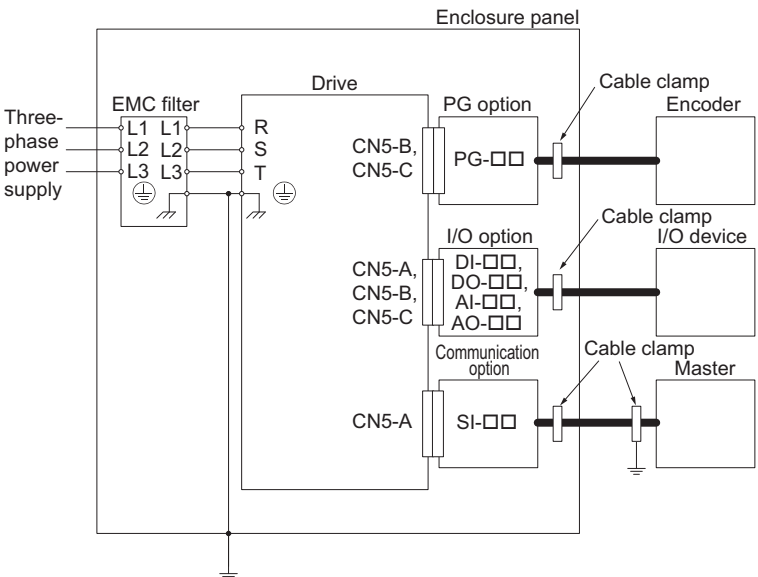


Figure 28 Option Installation for CE Compliance

11 Specifications

Table 15 Option Specifications

Items	Specifications
Model	SI-EP3
Option Conformance	Passed PROFINET Conformance Class A
Connector Type	Dual RJ45 8-pin Shielded Twisted Pair Cat 5e cable
Physical Layer Type	Isolated Physical Layer TCP Protocol Transformer Isolated
IP Address Setting	Programmable from drive keypad or network
Communication Speed	Programmable from drive keypad or network: 10/100 Mbps, auto-negotiate.
Number of Connections	1 PLC connection, 1 supervisor connection, 2 web page connections
Duplex Mode	Half-forced, Auto-negotiate, Full-forced
Address Startup Mode	Static, DCP
Ambient Temperature	-10°C to +50°C (14°F to 122°F)
Humidity	Up to 95% RH (no condensation)
Storage Temperature	-20°C to +60°C (-4 °F to 140°F) (allowed for short-term transport of the product)
Area of Use	Indoors and free from: • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	1000 m (3280 ft.) or lower
PROFINET Functions	PROFINET IO with PROFIdrive profile Configurable I/O in cyclic messages Drive diagnostic alarms I&M0

◆ Revision History

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YASKAWA AC Drive Option

PROFINET

Installation Manual

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