YASKAWA

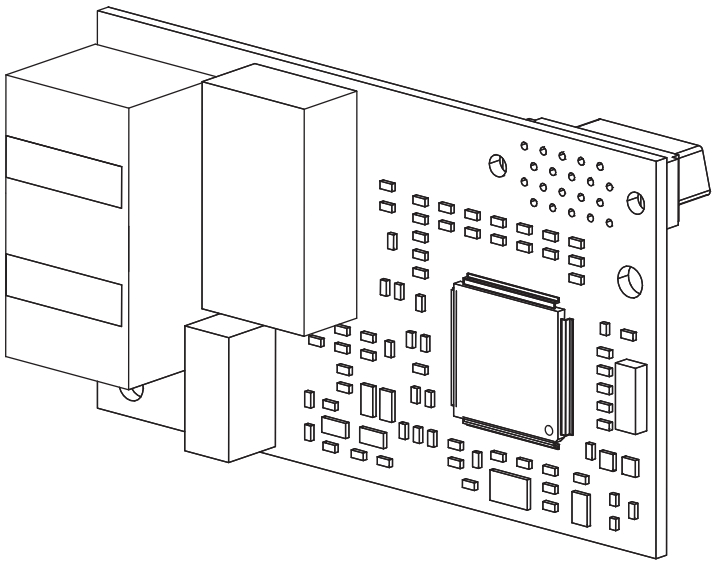
YASKAWA AC Drive Option

PROFINET

Technical 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.



MANUAL NO. SIEP C730600 89D

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 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 (This book)	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 Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.

Drive

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

◆ Terms

Note:	Indicates supplemental information that is not related to safety messages.
Option:	YASKAWA AC Drive Option SI-EP3 PROFINET
Drive:	• YASKAWA AC Drive 1000-Series (A1000, U1000, U1000L, Z1000U) • YASKAWA AC Drive GA500 • YASKAWA AC Drive GA700 • YASKAWA AC Drive GA800
Keypad:	• LCD Operator for YASKAWA AC Drive 1000-Series • LED Operator for YASKAWA AC Drive 1000-Series • LCD Keypad for YASKAWA AC Drive GA500, GA700, and GA800 • LED Keypad for YASKAWA AC Drive GA500, GA700, and GA800
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 a 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 injury.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions
• The diagrams in this 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 Yaskawa or a Yaskawa representative and provide the manual number shown on the front cover to order new copies of the manual.

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will cause death or serious injury.

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

⚠ WARNING

Electrical Shock Hazard

Do not modify the drive or option circuitry.

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

NOTICE

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

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

2 Overview

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.

◆ Compatible Products

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

Table 1 Compatible Products

Product Series	Model(s)	Software Version <1>
A1000	CIMR-A□2A□□□□	≥1020
	CIMR-A□4A0002 to 4A0675	
	CIMR-A□4A0930 and 4A1200	≥3015
	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□□□□	
GA500 <2>	CIPR-GA50□□□□□	≥ 1010
GA700 <2>	CIPR-GA70□□□□□	≥1010
GA800 <2>	CIPR-GA80□□□□□	≥9010

<1> Refer to “PRG” on the drive nameplate for the software version number.
<2> Before you install the option on a YASKAWA AC Drive GA500, GA700 or GA800, make sure that the option software version is PRG: 4400 or later.

Note: **1.** 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 2*** for details.

2. For Yaskawa customers in the North or South America region:
If your product is not listed in ***Table 1***, refer to the web page below to confirm this manual is correct for your product. The web page provides a list of option manuals by product, and a direct link to download a PDF.

Scan QR code

Or refer to: *http://www.yaskawa.com/optionlookup*

◆ Install the Option on a GA500 Drive

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

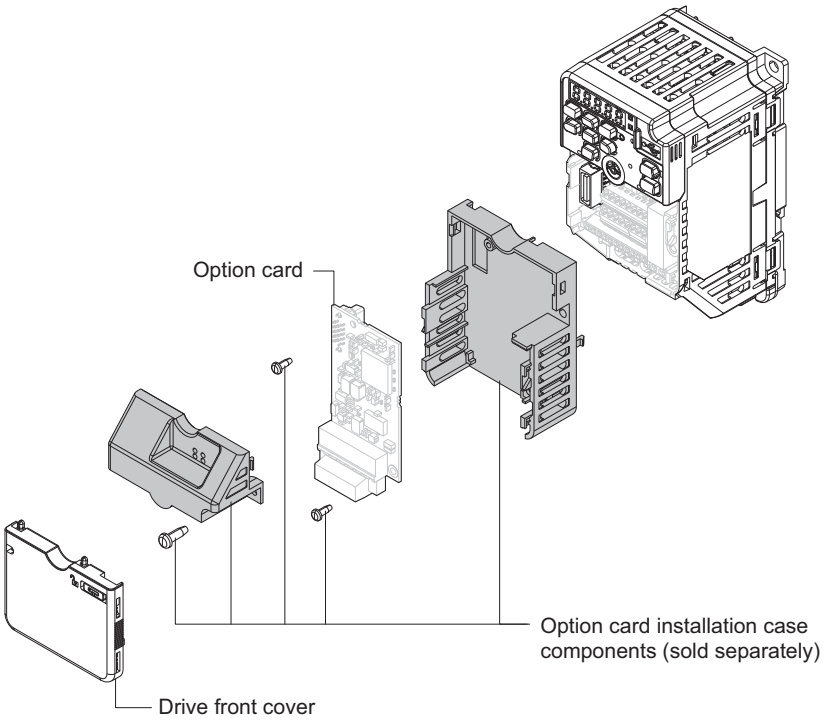


Figure 1 Option Card Installation Case

3 Receiving

After receiving the option package:

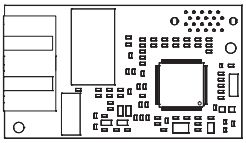
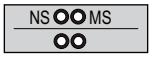
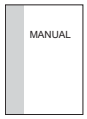
1. Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if the option or other parts appear damaged.

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

2. Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to ***Figure 2*** on page ***10*** for details. Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Contents

Table 2 Option Package Contents

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

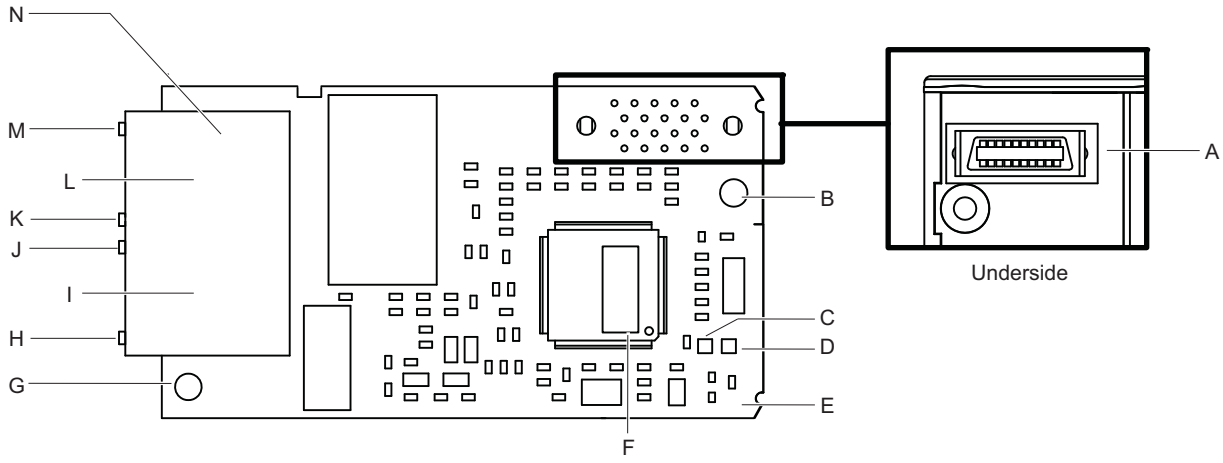
<1> GA700 and GA800 drives do not use the ground wire.
<2> GA700 and GA800 drives use two screws only.

◆ Installation Tools

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

4 Option Components

◆ PROFINET 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

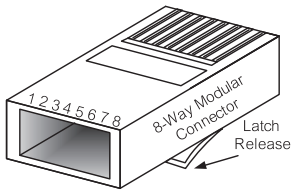
<1> *Refer to Option LED Display on page 11* for details on the LEDs.
<2> Connect the provided ground wire during installation. Installation on GA700 and GA800 drives does not require the ground wire.

Figure 2 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

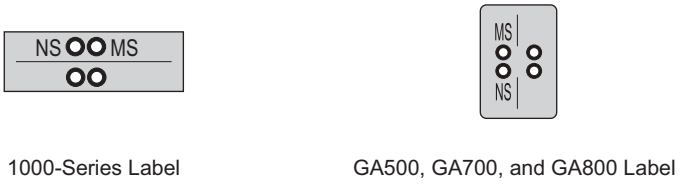
The option has six LEDs:

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



1000-Series Label GA500, GA700, and GA800 Label

Figure 3 Option LED Labels

The operational states of the option LEDs after the power-up diagnostic LED sequence is completed are described in *Table 4*. 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)	Invalid Station Name programmed	Invalid Station name programmed into device. It must be rewritten with a valid name from PLC software or webpage.
	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.
	Red	Flashing (3)	IP address settings bad	Use the operator or Drive Wizard to check and change F7 parameters, then cycle power. You can also set the PLC to assign the IP address, which will auto-clear the fault.
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.

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.

NOTICE

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.

◆ Procedures for Installing and Wiring Options on a Drive

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

Refer to *Table 6* to check the procedures to install and wire the option on a drive.

Table 6 Procedures for Installing and Wiring Options on a Drive

Product Series	Procedures for Installing and Wiring Options on a Drive	Page
A1000	Procedure A	*15*
U1000	Procedure A	*15*
U1000L	Procedure A	*15*
Z1000U	Procedure A	*15*
GA500	*<1> <2>*	–
GA700	Procedure B	*20*
GA800	Procedure B	*20*

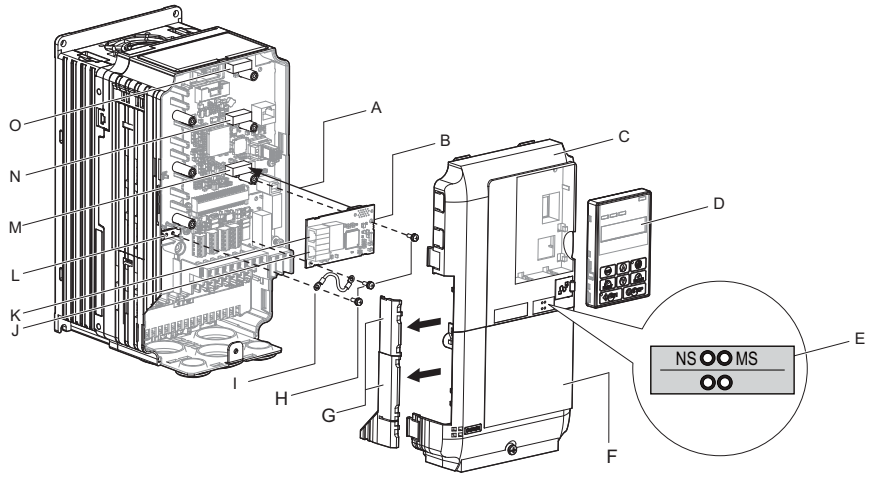
<1> Use the option card installation case manual to install the option on GA500 drives.
<2> Before you install the option on a YASKAWA AC Drive GA500, make sure that the option software version is PRG: 4400 or later.

■ Procedure A

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

Prepare the Drive for the Option

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



A – Insertion point for CN5 connector
B – SI-EP3 option
C – Drive front cover
D – Keypad
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 4 Drive Components with Option

Install the Option

Remove the front covers of the drive before you install the option.
Refer to the drive manual for information about how to remove the front covers. Different drive sizes have different cover removal procedures.
You can only install this option into the **CN5-A** connector on the drive control board.

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

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

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

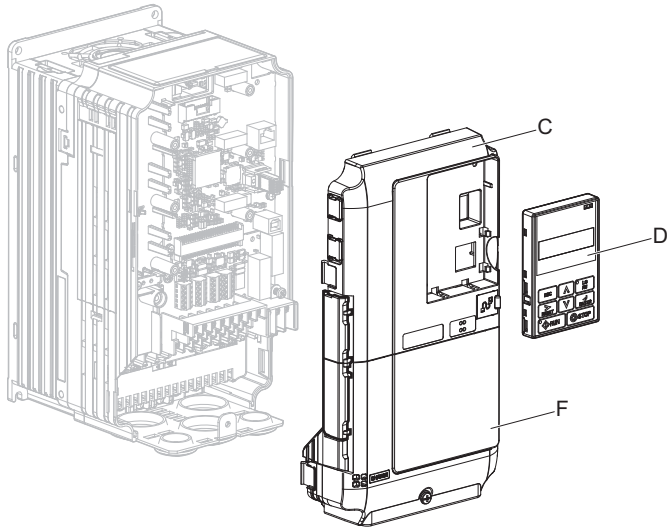


Figure 5 Remove the Keypad, Front Cover, and Terminal Cover

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

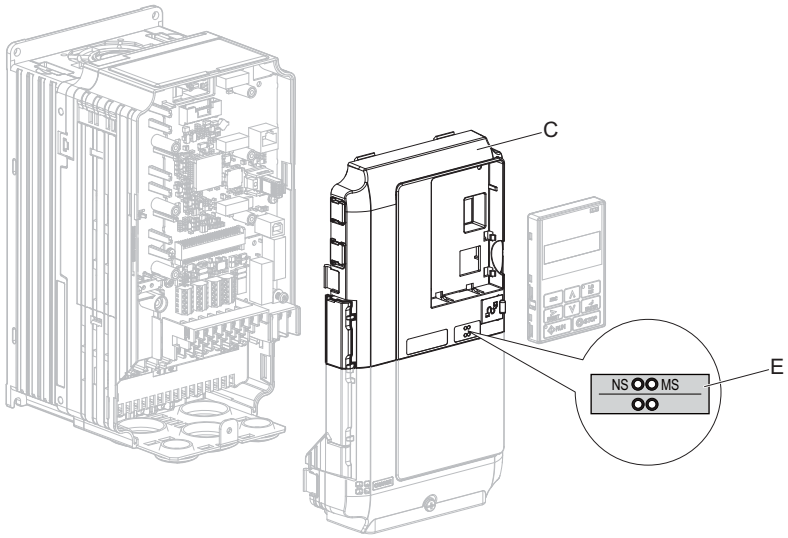


Figure 6 Affix the LED Label

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

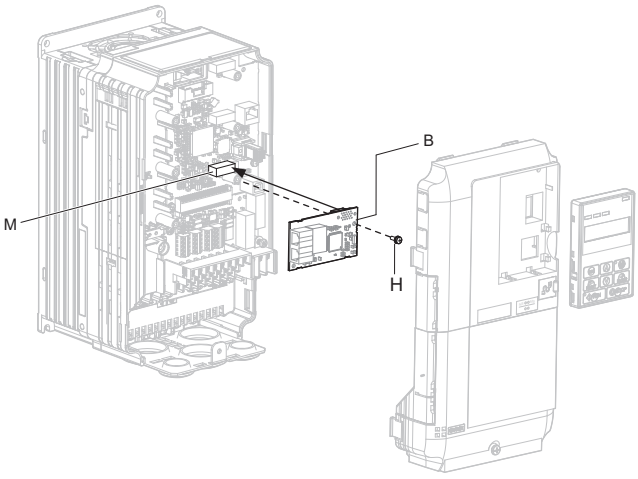


Figure 7 Insert the Option

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·lb).

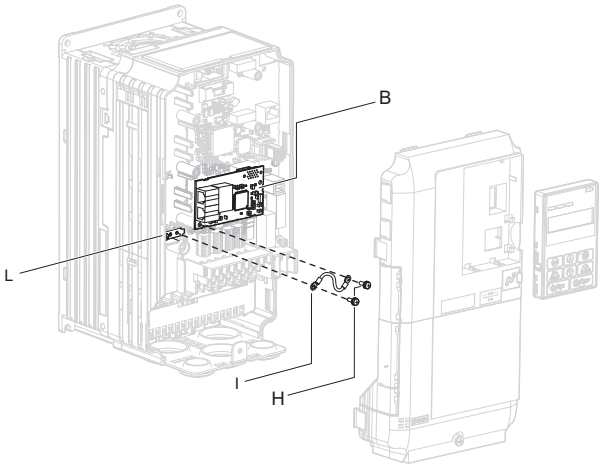
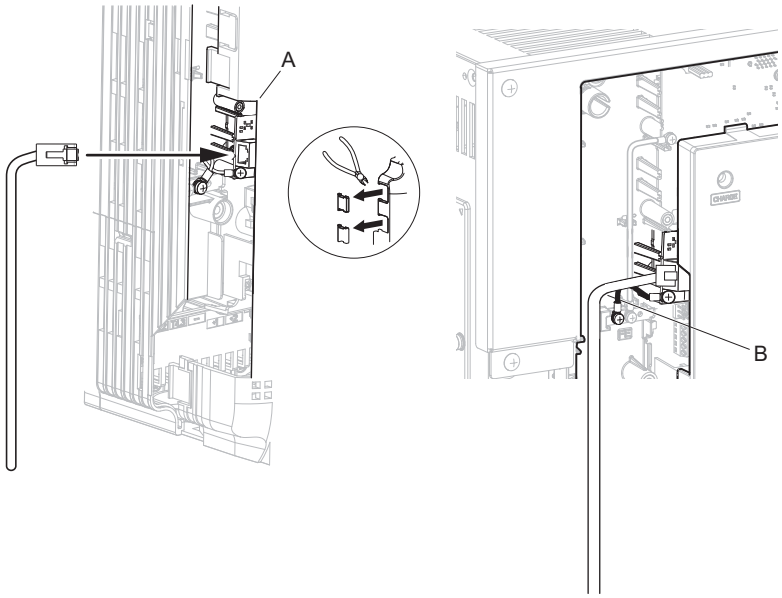


Figure 8 Connect the Ground Wire

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

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



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

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

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

Figure 9 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 17***). Refer to ***Communication Cable Specifications on page 23*** for details.

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. Reattach the drive front covers (C, F) and the keypad (D).

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

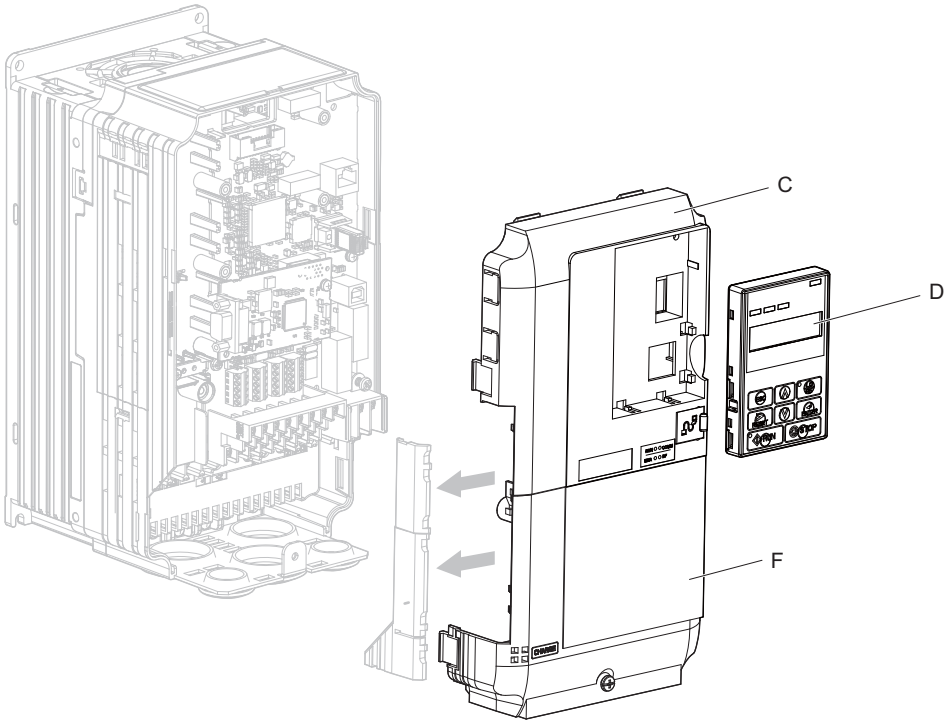


Figure 10 Replace the Front Covers and Keypad

9. Set drive parameters in ***Table 7*** for correct option performance. Be sure to set parameter F6-30 to a node address unique to the network.

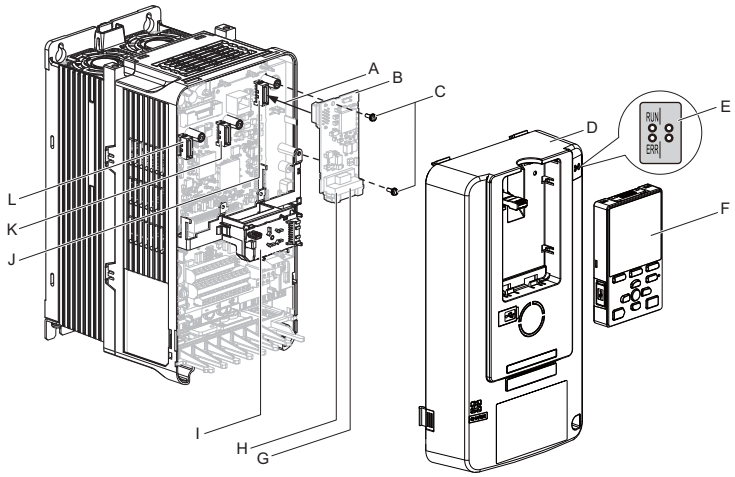
■ Procedure B

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

Prepare the Drive for the Option

Before you install the option on a YASKAWA AC Drive GA700 or GA800, make sure that the option software version is PRG: 4400 or later.

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
   Refer to ***Figure 11*** 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 11 Drive Components with Option

Install the Option

Remove the front cover of the drive before you install the option.
Refer to the drive manual for information about how to remove the front cover. Different drive sizes have different cover removal procedures.
You can only install this option into the **CN5-A** connector on the drive control board.

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

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

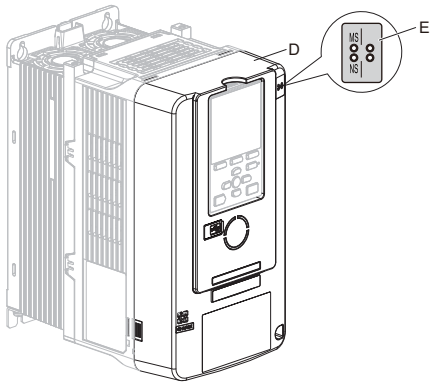


Figure 12 Affix the LED Label

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.*

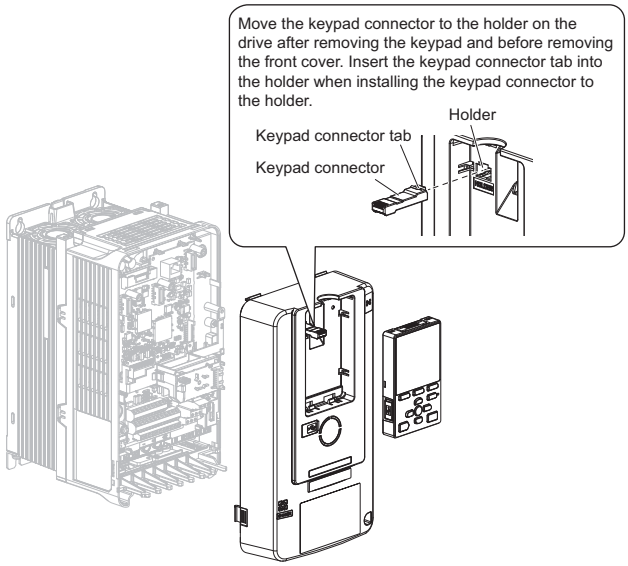


Figure 13 Remove the Front Cover and Keypad

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.*

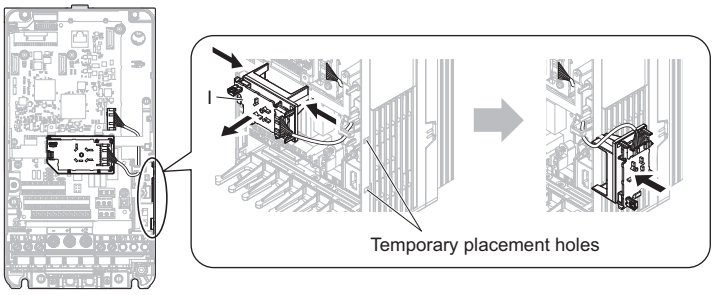


Figure 14 Remove the LED Status Ring Board

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·lb).

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

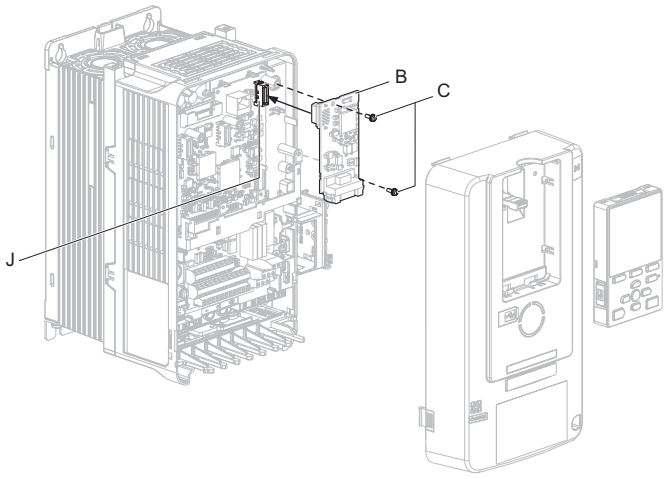


Figure 15 Insert the Option Card

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 17***). Refer to ***Communication Cable Specifications on page 23*** for details.

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

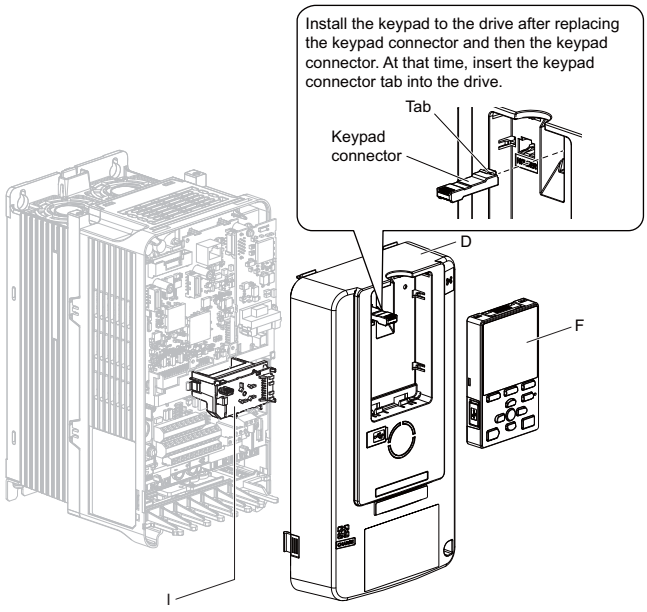


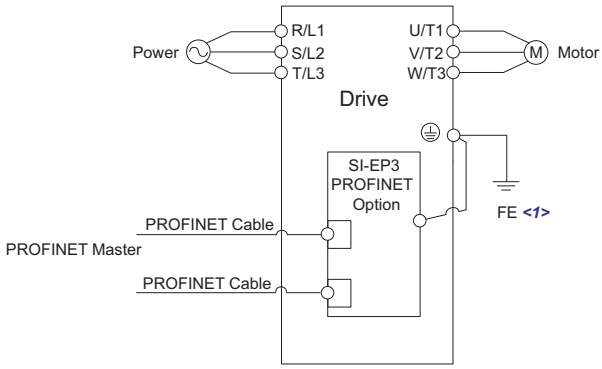
Figure 16 Replace the Front Cover and Keypad

9. Set drive parameters in ***Table 7*** for correct 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 for installations on 1000-series drives and GA500 drives. The ground wire is not necessary for installation on GA700 or GA800 drives.

Figure 17 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.

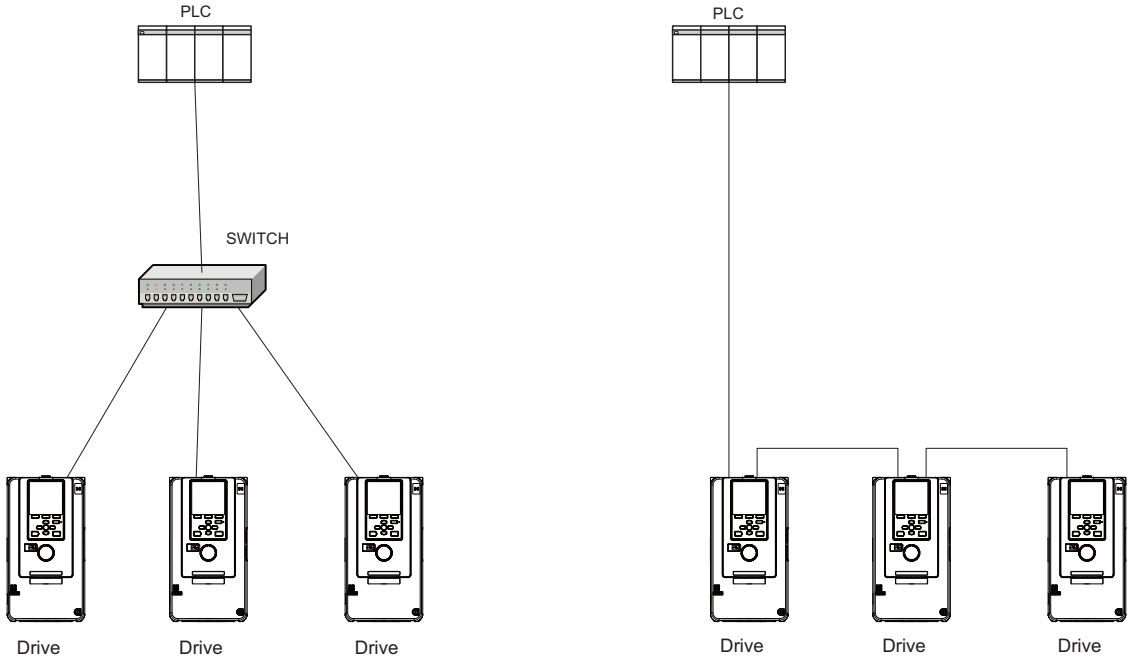


Figure 18 Topology Options

◆ GSD Files

To facilitate network implementation, obtain a GSD file from one of the following websites depending on your region:
U.S.: http://www.yaskawa.com
Europe: http://www.yaskawa.eu.com
Japan: http://www.e-mechatronics.com
Other areas: Check the back cover of these manuals.
For questions, contact Yaskawa or a Yaskawa representative.

6 Related Drive Parameters

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

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

Table 7 Related Parameter Settings

No. (Hex.)	Name	Description	Values
b1-01 (0180) <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 (0181) <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 (03A2)	Communication Error Selection	Selects drive response when a bUS error is detected during communications with the option. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2> 4: Alarm - Run at d1-04 <2> <3> 5: Alarm - Ramp to Stop <3>	Default: 1 Range: 0 to 5 <4>
F6-02 (03A3)	Comm External Fault (EF0) Detect	Selects the condition for external fault detection (EF0). 0: Always detected 1: Detection during run only	Default: 0 Range: 0, 1
F6-03 (03A4)	Comm External Fault (EF0) Select	Selects drive response for external fault input (EF0) detection during option communications. 0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2>	Default: 1 Range: 0 to 3
F6-06 (03A7) <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 (03A8)	MultiStep Ref Priority Select	0: MultiStep References Disabled 1: MultiStep References Enabled	Default: 0 <7> Range: 0, 1
F6-08 (036A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters F6-☐☐ and F7-☐☐ are set back to original default values when the drive is initialized using parameter A1-03. 0: No Reset - Parameters retained 1: Reset - Back to factory default Note: The setting value is not changed even when F6-08 is set to 1 and the drive is initialized using A1-03.	Default: 0 Range: 0, 1
F6-14 (03BB)	Bus Error Auto Reset	Sets the automatic reset function for bUS [Option Communication Errors]. 0: Disabled 1: Enabled	Default: 0 Range: 0, 1
F6-15 (0B5B) <8>	Comm. Option Parameters Reload	Selects whether F6-☐☐/F7-☐☐ communication-related parameters changed are enabled. 0: Reload at Next Power Cycle 1: Reload Now 2: Cancel Reload Request Note: F6-15 is reset to 0 after setting 1 or 2.	Default: 0 Range: 0 to 2

No. (Hex.)	Name	Description	Values
F7-01 (03E5) *<9> <10> <11>*	IP Address 1	Sets the static/fixed IP address. Parameter F7-01 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-02 (03E6) *<9> <10> <11>*	IP Address 2	Sets the static/fixed IP address. Parameter F7-02 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-03 (03E7) *<9> <10> <11>*	IP Address 3	Sets the static/fixed IP address. Parameter F7-03 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-04 (03E8) *<9> <10> <11>*	IP Address 4	Sets the static/fixed IP address. Parameter F7-04 sets the fourth most significant octet.	Default: 20 Min: 0 Max: 255
F7-05 (03E9) *<11>*	Subnet Mask 1	Sets the static/fixed Subnet Mask. Parameter F7-05 sets the most significant octet.	Default: 255 Min: 0 Max: 255
F7-06 (03EA) *<11>*	Subnet Mask 2	Sets the static/fixed Subnet Mask. Parameter F7-06 sets the second most significant octet.	Default: 255 Min: 0 Max: 255
F7-07 (03EB) *<11>*	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 (03EC) *<11>*	Subnet Mask 4	Sets the static/fixed Subnet Mask. Parameter F7-08 sets the fourth most significant octet.	Default: 0 Min: 0 Max: 255
F7-09 (03ED) *<11>*	Gateway Address 1	Sets the static/fixed Gateway address. Parameter F7-09 sets the most significant octet.	Default: 192 Min: 0 Max: 255
F7-10 (03EE) *<11>*	Gateway Address 2	Sets the static/fixed Gateway address. Parameter F7-10 sets the second most significant octet.	Default: 168 Min: 0 Max: 255
F7-11 (03EF) *<11>*	Gateway Address 3	Sets the static/fixed Gateway address. Parameter F7-11 sets the third most significant octet.	Default: 1 Min: 0 Max: 255
F7-12 (03F0) *<11>*	Gateway Address 4	Sets the static/fixed Gateway address. Parameter F7-12 sets the fourth most significant octet.	Default: 1 Min: 0 Max: 255
F7-13 (03F1) *<11>*	Address Mode at Startup	Selects how the option address is set. 0: Static *<10>* 2: DCP	Default: 2 Range: 0, 2
F7-14 (03F2)	Duplex Mode Selection	Selects duplex mode setting. 0: Half/Half 1: Auto/Auto 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 (03F3) *<12>*	Communication Speed Selection	Sets the communication speed. 10: 10/10 Mbps 100: 100/100 Mbps 101: 10/100 Mbps 102: 100/10 Mbps	Default: 10 Range: 10 to 102
F7-23 (03FB) *<13>*	Dynamic Output Assembly Parameter 1	Sets configurable output 1.	Default: 0H Min.: 0H Max.: FFFFH

No. (Hex.)	Name	Description	Values
F7-24 (03FC) <13>	Dynamic Output Assembly Parameter 2	Sets configurable output 2.	Default: 0H Min.: 0H Max.: FFFFH
F7-25 (03FD) <13>	Dynamic Output Assembly Parameter 3	Sets configurable output 3.	Default: 0H Min.: 0H Max.: FFFFH
F7-26 (03FE) <13>	Dynamic Output Assembly Parameter 4	Sets configurable output 4.	Default: 0H Min.: 0H Max.: FFFFH
F7-27 (03FF) <13>	Dynamic Output Assembly Parameter 5	Sets configurable output 5.	Default: 0H Min.: 0H Max.: FFFFH
F7-33 (0375) <13>	Dynamic Input Assembly Parameter 1	Sets configurable input 1.	Default: 0H Min.: 0H Max.: FFFFH
F7-34 (0376) <13>	Dynamic Input Assembly Parameter 2	Sets configurable input 2.	Default: 0H Min.: 0H Max.: FFFFH
F7-35 (0377) <13>	Dynamic Input Assembly Parameter 3	Sets configurable input 3.	Default: 0H Min.: 0H Max.: FFFFH
F7-36 (0378) <13>	Dynamic Input Assembly Parameter 4	Sets configurable input 4.	Default: 0H Min.: 0H Max.: FFFFH
F7-37 (0379) <13>	Dynamic Input Assembly Parameter 5	Sets configurable input 5.	Default: 0H Min.: 0H Max.: FFFFH
H5-11 (043C)	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: 0 <14> 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 or 4 will cause the drive to continue operation after detecting a fault. Take proper measures such as installing an emergency stop switch when using settings 3 or 4.
<3> Refer to the drive manual to know if settings 4 and 5 are available. Settings 4 and 5 are available in A1000 software versions PRG: 1021 and later.
<4> The setting range for 1000-Series drives is different for different software versions. Refer to the instruction manual of a specific drive for more information.
<5> Control method availability of this parameter depends on product series.
• 1000-Series Drives: Parameter is available in CLV, AOLV/PM, and CLV/PM.
In AOLV/PM, this value is read as the Torque Limit.
• GA500 Drive: Parameter is available in OLV, AOLV/PM, and EZOLV.
This value is read as the Torque Limit.
• GA700, GA800 Drives: Parameter is available in OLV, CLV, AOLV, AOLV/PM, CLV/PM, and EZOLV.
In OLV and EZOLV, this value is read as the Torque Limit.
<6> The setting specifies that network communications provide the torque reference or torque limit. The motor may not rotate if the PLC does not supply a torque reference or torque limit.
<7> Default setting is 1 for GA500.
<8> Not available on 1000-series drives.
<9> Cycle power for setting changes to take effect. Set F6-15 to 1 (Enable), to have settings take effect immediately on non-1000 series drives.
<10> Set F7-01 to F7-04 when F7-13 is set to 0. All IP Addresses (F7-01 to F7-04) must be unique.
<11> Set F7-01 to F7-12 when F7-13 is set to 0.
<12> Set F7-15 when F7-14 is not set to 1.
<13> 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.
<14> The default setting is different for different product series. Refer to the instruction manual of a specific drive for more information.

Table 8 Option Monitors

No.	Name	Description	Range
U6-80 to U6-83	OPT IP ADR1 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
U6-97	OPT SPARE 4	Displays option software version.	–
U6-98	First Fault	Displays first option fault. Refer to ***Option Fault Monitors U6-98 and U6-99 on page 55*** for details.	–
U6-99	Current Fault	Displays current option fault. Refer to ***Option Fault Monitors U6-98 and U6-99 on page 55*** 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 9***. and ***Table 10***. respectively. The drive states are presented in the PROFIdrive State Machine (***Figure 19***.).

■ 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 9 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 10 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	SPEED_ERROR	1	WITHIN TOLERANCE.
		0	OUT OF TOLERANCE.
9	REMOTE	1	Drive control location: REMOTE.
		0	Drive control location: LOCAL.
10	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).
11 to 15	–	–	Reserved

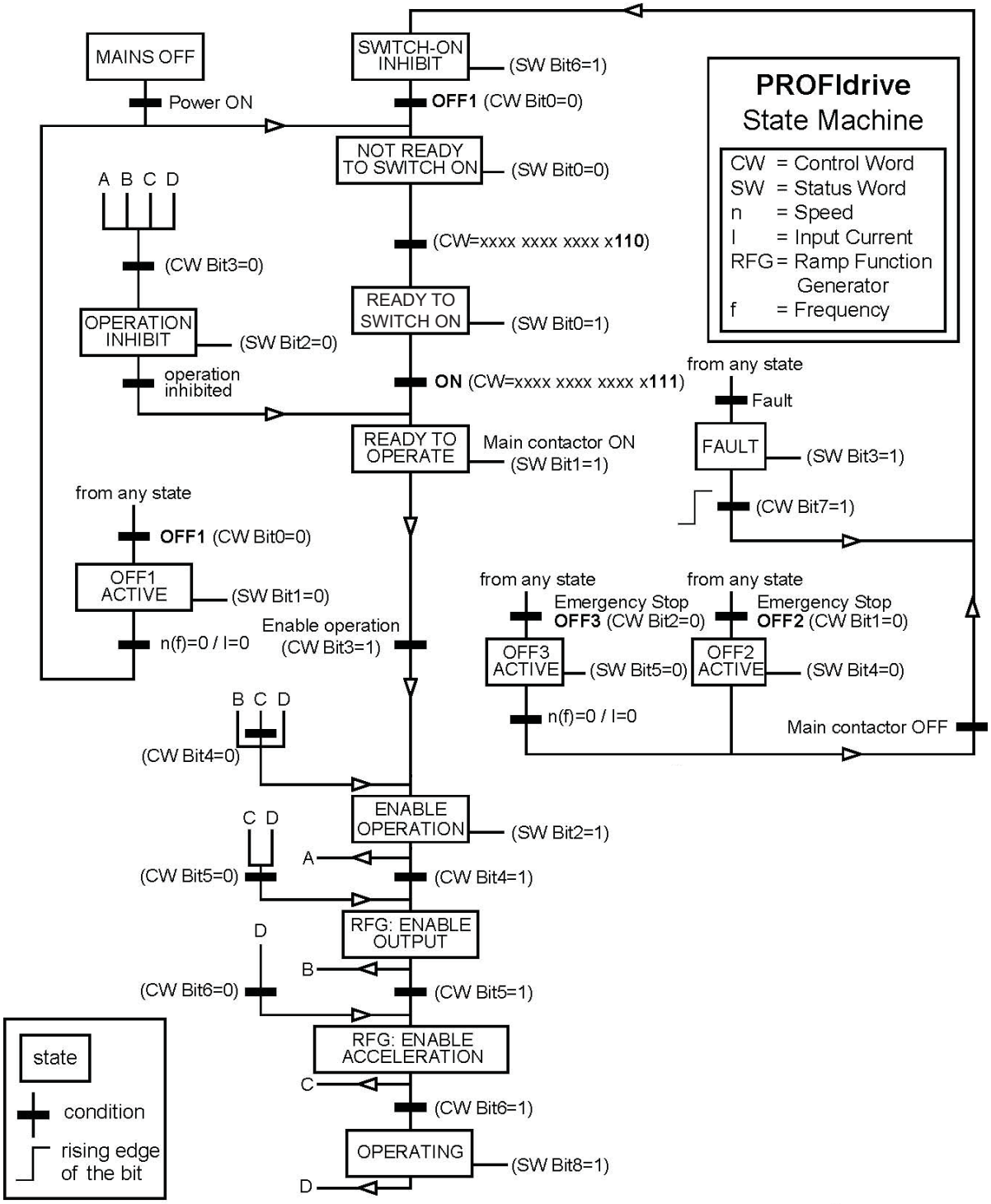


Figure 19 PROFIdrive State Machine

◆ 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 11*.

■ 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 11 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	DI1	4	At Speed
5	DI2	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 <1>	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

<1> Bit 11 is not used for GA500.

8 Communication

This section describes the PROFINET IO messaging used in communication with the drive.

For detailed information on PROFINET IO communication, refer to PROFINET specification Application Layer protocol for decentralized periphery and distributed automation v2.0 available at www.profibus.com.

◆ Introduction to PROFINET IO

PROFINET IO is a fieldbus protocol that enables communication between programmable controllers and distributed field devices in Ethernet network. The protocol classifies devices into IO controllers, IO supervisors and IO devices, which have a specific collection of services.

PROFINET IO uses three different communication channels to exchange data. The standard UDP/IP and TCP/IP channel is used for parameterization and configuration of devices and for acyclic operations. The Real Time (RT) channel is used for cyclic data transfer and alarms. The third channel, Isochronous Real Time (IRT) channel, is used e.g. in motion control applications (not implemented in SI-EP3).

PROFINET IO devices are structured in slots and sub-slots, which can contain modules and sub-modules correspondingly. Devices can have almost any number of slots and sub-slots and they can be virtual or real. Device specific data is represented in slot 0, module and sub-module specific data in subsequent slots and sub-slots.

One of the benefits of PROFINET IO is the diagnostics and alarm mechanism. Every module and sub-module provide alarm data to the IO controller using the cyclic channel. Diagnostic data can be read non-cyclically from the device by using record data.

Properties and services of a PROFINET IO device are described in a GSD file that is written in General Station Description Markup Language (GSDML). GSD file describes the device specific modules and the method of assigning modules and sub-modules to predefined slots and sub-slots.

◆ PROFINET IO in SI-EP3

The decision to use either the PROFIdrive control and status words or the Yaskawa-specific control and status words is done in a hardware configuration tool (customer supplied). The default value is the Yaskawa-specific format.

SI-EP3 uses slots 0 and 1. Slot 0 does not have any sub-slots and the attached DAP module represents the device. Other functional modules and sub-modules described in the GSD file can be assigned to slot 1 and its sub-slots.

- Slot 0 = Device access point (DAP)
- Slot 1, sub-slot 1 = Standard telegram 1, Standard telegram 1 + 5 configurable inputs, outputs, Forty byte IO with 5 configurable input, outputs

The services provided by the SI-EP3 option can be defined using the F7-□□ parameters in the drive or by using a configuration tool. To define the service using the F7-□□ parameters, set the parameter to a value other than 0.
If all F7-□□ parameters are set to 0, the value from the configuration tool will be used.

The SI-EP3 option provides the following services:

- Cyclic messaging in PROFIdrive or Yaskawa-specific mode
- Acyclic parameter access mechanism
- Identification & Maintenance functions (I&M0)
- PROFIdrive parameters
- Diagnostic and alarm mechanism
- Fault buffer mechanism

■ Yaskawa SI-EP3 PROFINET I/O Modules

Std Tgm 1

Table 12 Std Tgm 1 Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB

Table 13 Std Tgm 1 Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB

Std Tgm 1 + 5 PZD

Table 14 Std Tgm 1 + 5 PZD Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB
4	Configurable Output 1 MSB
5	Configurable Output 1 LSB
6	Configurable Output 2 MSB
7	Configurable Output 2 LSB
8	Configurable Output 3 MSB
9	Configurable Output 3 LSB
10	Configurable Output 4 MSB
11	Configurable Output 4 LSB
12	Configurable Output 5 MSB
13	Configurable Output 5 LSB

Table 15 Std Tgm 1 + 5 PZD Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB
4	Configurable Input 1 MSB
5	Configurable Input 1 LSB
6	Configurable Input 2 MSB
7	Configurable Input 2 LSB
8	Configurable Input 3 MSB
9	Configurable Input 3 LSB
10	Configurable Input 4 MSB
11	Configurable Input 4 LSB
12	Configurable Input 5 MSB
13	Configurable Input 5 LSB

Forty Byte IO

Table 16 Forty Byte IO Consume

Bytes	Description
0	Control Word MSB
1	Control Word LSB
2	Frequency Reference MSB
3	Frequency Reference LSB
4	Torque Reference MSB
5	Torque Reference LSB
6	Torque Compensation MSB
7	Torque Compensation LSB
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Analog Output 1 MSB
13	Analog Output 1 LSB
14	Analog Output 2 MSB
15	Analog Output 2 LSB
16	Digital Outputs MSB
17	Digital Outputs LSB
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Configurable Output 1 MSB
31	Configurable Output 1 LSB
32	Configurable Output 2 MSB
33	Configurable Output 2 LSB
34	Configurable Output 3 MSB
35	Configurable Output 3 LSB
36	Configurable Output 4 MSB
37	Configurable Output 4 LSB
38	Configurable Output 5 MSB
39	Configurable Output 5 LSB

Table 17 Forty Byte IO Produce

Bytes	Description
0	Status Word MSB
1	Status Word LSB
2	Output Frequency MSB
3	Output Frequency LSB
4	Torque Reference MSB
5	Torque Reference LSB
6	PG Count Value MSB
7	PG Count Value LSB
8	Motor Speed MSB
9	Motor Speed LSB
10	Frequency Reference Monitor MSB
11	Frequency Reference Monitor LSB
12	Output Current MSB
13	Output Current LSB
14	Analog Input 1 MSB
15	Analog Input 1 LSB
16	DC Bus Voltage MSB
17	DC Bus Voltage LSB
18	Fault Code MSB
19	Fault Code LSB
20	Alarm Code MSB
21	Alarm Code LSB
22	Output Power MSB
23	Output Power LSB
24	Analog Input 2 MSB
25	Analog Input 2 LSB
26	Digital Inputs MSB
27	Digital Inputs LSB
28	Analog Input 3 MSB
29	Analog Input 3 LSB
30	Configurable Input 1 MSB
31	Configurable Input 1 LSB
32	Configurable Input 2 MSB
33	Configurable Input 2 LSB
34	Configurable Input 3 MSB
35	Configurable Input 3 LSB
36	Configurable Input 4 MSB
37	Configurable Input 4 LSB
38	Configurable Input 5 MSB
39	Configurable Input 5 LSB

■ Cyclic Messaging

SI-EP3 supports cycle times of 8 to 512 ms.

■ Yaskawa Acyclic Parameter Access Mechanism

All drive parameters can be read and written under address 0x8000 by performing a read or write with the index value of the corresponding parameter address in the drive. Refer to the drive Technical Manual for a list of these parameter addresses.

■ PROFIdrive Acyclic Parameter Access Mechanism

A PROFIdrive acyclic parameter access mechanism can be used to access PROFIdrive parameters and drive parameters using an index of 0xB02E and the structure in ***Figure 20*** for write and read requests.

Requests and responses between the IO device and the IO controller or the IO supervisor are transferred with the Record Data Objects.

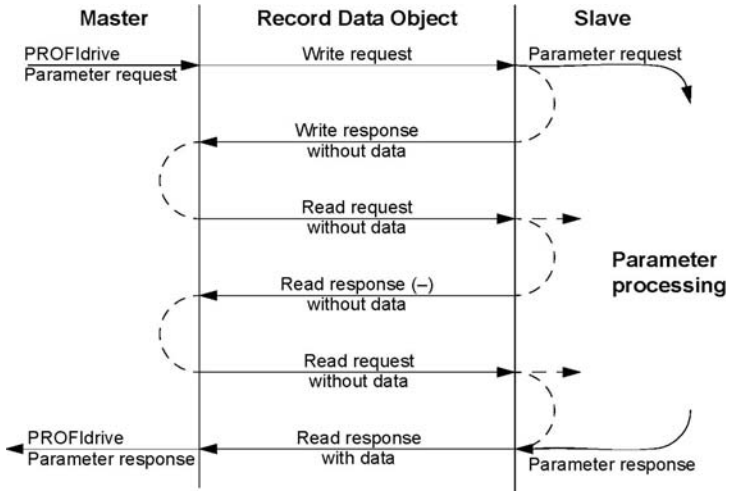


Figure 20 PROFIdrive Acyclic Parameter Access Mechanism Structure

A write request is first sent containing the parameter request.

If the write request is valid, the SI-EP3 acknowledges it with request accepted. The master then sends a read request. If the SI-EP3 is still busy performing the internal parameter request, it will return a negative response with the error code "0xB5" (State conflict). In this case, the master repeats the read request until the SI-EP3 has the PROFIdrive response data ready.

If the write request is invalid, a negative response is returned with an error code.

Base Mode Parameter Access - Local

The DO-ID field in the Record Data Object request header is not evaluated by the parameter manager. Parameters can be read through any slot in the configuration.

Table 18 Response Error Codes

Byte	Value and Meaning
ErrorCode	0xDF (Error Write)
	0xDE (Error Read)
ErrorDecode	0x80 (PNIORW) ErrorCode1 decoded according to *Table 19*. ErrorCode2 is 0.
	0x81 (PNIO) ErrorCode1 and ErrorCode2 decoded according to *Table 19*.
ErrorCode1	Error class and error code (Refer to *Table 19*).
ErrorCode2	Not described

Table 19 ErrorCode1 with PNIORW Decoding

Error class	Meaning	Error Code
0 to 9	(Reserved)	–
10 (0x0A)	Application	0 = Read error
		1 = Write error
		2 = Module failure
		3 to 7 = Reserved
		8 = Version conflict
		9 = Feature not supported
		10 to 15 = User-specific
11 (0x0B)	Access	0 = Invalid index
		1 = Write length error
		2 = Invalid slot
		3 = Type conflict
		4 = Invalid area
		5 = State conflict
		6 = Access denied
		7 = Invalid range
		8 = Invalid parameter
		9 = Invalid type
		10 to 15 = User-specific
12 (0x0C)	Resource	0 = Read constraint conflict
		1 = Write constraint conflict
		2 = Resource busy
		3 = Resource unavailable
		4 to 7 = Reserved
		8 to 15 = User-specific
13 to 15	User-specific	–

Read block is used in read requests and responses. Write block is used in write requests and responses. The request consists of unique identifiers for the connection, addressing information and length of the record data. The response also contains two additional fields for transferring information.

Table 20 Structure of the Read and Write Blocks

Field(s)	Description	Range	Type
Service	Request or Response service.	Request (0x00) Response (0x80)	UI8
Operation	Read or Write operation.	Write (0x08) Read (0x09)	UI8
Block length	Length of the block.	0 to 0xFFFF	UI16
ARUUID	Identifier - time low - time mid - time high and version - clock - node	–	UI32 UI16 UI16 Octet[2] Octet[6]
API	Application Process Identifier	Device Access Point (0x0000) PROFIdrive (0x3A00)	UI32
Slot	Slot of the Module Access Point (MAP/PAP)	0x01	UI16
Sub-slot	Sub-slot of the Module Access Point (MAP/PAP)	0x01	UI16
Padding	2 bytes		
Index	Index of the Record Data Object	0x0001 to 0x7FFF 0xB02E	UI16
Data length	Length of the data block	0 to 0xFFFFFFFF	UI32
Additional value 1 (response only)	Field for transferring additional data	–	UI16
Additional value 2 (response only)	Field for transferring additional data	–	UI16
Padding	24 bytes for request, 20 bytes for response.		
Data block	Used only with write request and read response.		

Data block contains PROFIdrive specific request or response header.

Table 21 PROFIdrive Request Header

Field(s)	Description	Range	Byte/ Word
Request Reference	Unique identification set by the master. Changed for each new request.	1 to 255	Byte
Request ID	Request type for the issued block.	Request Parameter (0x01) Change Parameter (0x02)	Byte
DO-ID	To be set to 0x01.	0 to 255	Byte
No. of Parameters	Number of parameters that are present in the request.	1	Byte
Attribute	Type of object being accessed.	Value (0x10)	Byte
No. of Elements	Number of array elements accessed or length of string accessed. Set to 0 if non-array parameters are used.	0, 1 to 234	Byte
Parameter Index (group)	Address of the PROFIdrive parameter that is being accessed. Also “1” is allowed by SI-EP3 to access drive parameters. Drive parameter group when accessing drive parameters.	1 to 65535	Word
Subindex (parameter)	Addresses the first array element of the parameter. Drive parameter number when accessing drive parameters.	0 to 65535	Word
Format <1>	Refer to ***Table 23*** for details.	–	Byte
Number of Values <1>	Number of values following.	1	Byte
Values <1>	The values of the request. In case of odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value	See Format Field

<1> Only when Request ID is 0x02 (Change Parameter). The Format, Number of Values, and Value Fields are repeated for other parameters.

Table 22 PROFIdrive Response Header

Field(s)	Description	Range
Response Reference	Mirrored from the request.	1 to 255
Response ID	Response from the slave. In the event that requested services fail, a "not acknowledged" (NAK) response will be indicated.	Request Param OK (0x01) Request Param NAK (0x81) Change Param OK (0x02) Change Param NAK (0x82)
DO-ID	To be set to 1.	0 to 255
No. of Parameters	Number of parameters that are present in the response.	1 to 37
Format <1>	Refer to ***Table 23*** for details.	–
Number of Values <1>	Number of values following.	0 to 234
Values <1>	The values of the request. When there is an odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value

<1> Only when Request ID is 0x01 (Request Parameter OK). The Format, Number of Values, and Value Fields are repeated for other parameters.

Table 23 Data Types for Format Field

Code	Type
0x00	(Reserved)
0x01 to 0x36	Standard data types
0x37 to 0x3F	(Reserved)
0x40	Zero
0x41	Byte
0x42	Word
0x43	Double word
0x44	Error
0x45 to 0xFF	(Reserved)

Table 24 PROFIdrive Parameter Request Error Codes

Error #	Meaning	Used at
0x00	Impermissible parameter number	Access to unavailable parameter.
0x01	Parameter value cannot be changed	Change access to a parameter value that cannot be changed.
0x02	Low or high limit exceeded	Change access with value outside the limits.
0x03	Invalid subindex	Access to unavailable subindex.
0x04	No array	Access with subindex to non-indexed parameter.
0x05	Incorrect data type	Change access with value that does not match the data type of the parameter.
0x06	Setting not permitted (can only be reset)	Change access with value unequal to 0 when this is not permitted.
0x07	Description element cannot be changed	Change access to a description element that cannot be changed.
0x09	No description data available	Access to unavailable description (parameter value is available).
0x0B	No operation priority	Change access rights without rights to change parameters.
0x0F	No text array available	Access to text array that is not available (parameter value is available).
0x11	Request cannot be executed because of operating mode	Access is temporarily not possible for reasons outside scope of these instructions.
0x14	Value impermissible	Change access with a value that is within limits but is not permissible for other long-term reasons (parameter with defined single values).
0x15	Response too long	The length of the current response exceeds the maximum transmittable length.
0x16	Parameter address impermissible	Illegal value or value that is not supported for the attribute, number of elements, parameter number or sub-index, or a combination.
0x17	Illegal format	Write request: Illegal format or format of parameter data that is not supported.
0x18	Number of values inconsistent	Write request: Number of values of parameter data does not match number of elements at the parameter address.
0x19	DO nonexistent	Request to DO, which does not exist.
0x65 to 0xFF	Manufacturer-specific	–
0x65	Vendor-specific error	Vendor-specific error.
0x66	Request not supported	Request not supported.
0x67	Communication error	Request cannot be completed because of communication error.
0x6F	Time-out error	Request aborted due to time-out.

Error #	Meaning	Used at
0x78	PZD map failure	Parameter cannot be mapped to PZD (size mismatch or non-existent).
0x79	PZD memory failure	Parameter cannot be mapped to PZD (out of memory).
0x7A	Multiple PZD map	Parameter cannot be mapped to PZD (multiple PZD write).
0x8C	Set torque mode error	Cannot change mode to TORQUE (frequency is used).
0x90	Illegal Request ID	The request ID of the response is illegal.

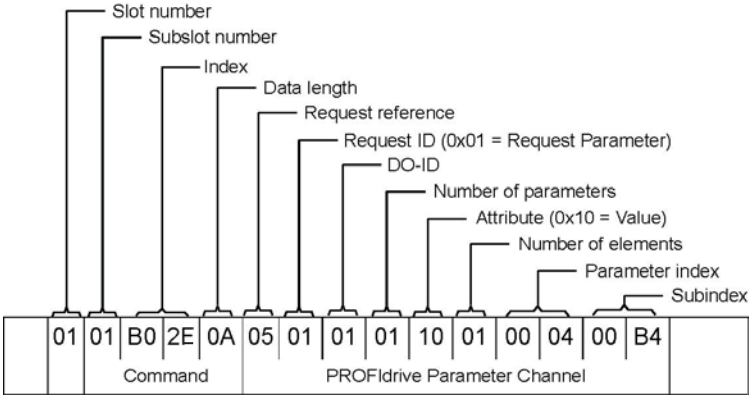
Parameter Data Transfer Examples

The following example shows how parameter data is transferred using the acyclic parameter access mechanism's READ and WRITE.

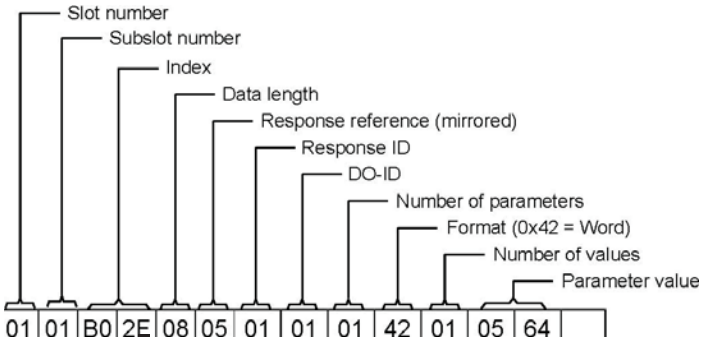
Example 1: Reading a drive parameter

To read a Yaskawa Drive parameter, use the PNU of 1 and the actual address of the parameter in the SubIndex.

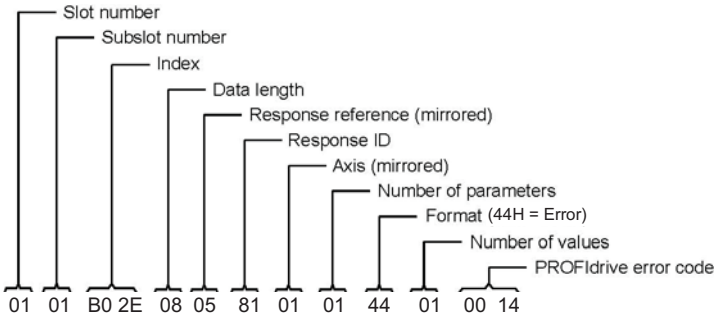
Write Request (Read Parameter Value)



Positive Read Response to Read Request



Negative Response to PROFIdrive Read Request



PROFIdrive Profile-Specific Parameters

PROFIdrive parameters contain data of the drive in standard form. The table below describes the supported PROFIdrive parameters.

Parameter	R/W	Data type	Description
922	R	Unsigned16	Telegram selection
944	R	Unsigned16	Fault message counter
947	R	Array [5] Unsigned16	Fault number. (coded according to DRIVECOM profile) Subindex Contents, see parameter 945.
964	R	Array [6] Unsigned16	Device identification Subindex Contents 0 Manufacturer 1 Device type 2 Version 3 Firmware date (year) 4 Firmware date (day/month) 5 Number of Drive Objects (DO)
965	R	Octet String2	Profile number of this device. 0328h = Profile 3, Version 40
967	R	Unsigned16	Control word (CW)
968	R	Unsigned16	Status word (SW)
972	R/W	Unsigned16	Software reset Value Description 0 No action 1 Power-cycle PROFINET IO module The parameter must do a zero-to-one transition and the motor must be stopped.
977	R/W	Unsigned16	Stores parameters to non-volatile memory Value Description 0 No action 1 Stores parameters The parameter must do a zero-to-one transition and the motor must be stopped.
61000	R	VisibleString24	Name of station
61001	R	Unsigned32	IP of station
61002	R	Array [6] Unsigned8	MAC of station
61003	R	Unsigned32	Default gateway of station
61004	R	Unsigned32	Subnet mask of station

Fault Buffer Mechanism

PROFIdrive profile has a mechanism that can store five fault situations to PROFIdrive parameters. Fault and diagnostic data, like fault number and fault code can be accessed simultaneously with only one subindex. The mechanism consists of two PROFIdrive parameters:

- PNU944: Fault message counter
- PNU947: Fault numbers according to value in U2-01

◆ Option High Priority Alarm Codes

These codes are transmitted as Manufacturer Specific Diagnostic high priority alarms that can be seen in the PLC configuration software. These high priority codes are the same codes that appear in the drive manual, except with an offset of 0x1000.

Table 25 PROFINET Option High Priority Alarm Codes

Drive Alarm Code (Hex) <1>	Description	Corrective Action
1000	None	–
1001	DC Bus Fuse Open (PUF)	Output Transistor Failure. Replace the drive
1002	DC Bus Undervolt (Uv1)	Input power fluctuation too large
1003	CTL PS Undervolt (Uv2)	Cycle drive power and replace drive if fault continues
1004	MC Answerback (Uv3)	Cycle drive power and replace drive if fault continues
1005	Short Circuit (SC)	• Check drive wiring • Cycle drive power and replace drive if fault continues.
1006	Ground Fault (GF)	Check for motor and/or cable damage
1007	Over Current (oC)	Check motor, motor load and accel/decel rates
1008	DC Bus Overvolt (oV)	• Check incoming voltage • Check deceleration time
1009	Heatsink Overtemp (oH)	• Check ambient temperature • Check drive cooling fan
100A	Heatsink Max Temp (oH1)	Check drive cooling fan
100B	Motor Overload (oL1)	• Check the load, accel/decel and cycle times • Check motor rated current (E2-01)
100C	Inv Overload (oL2)	• Check the load, accel/decel and cycle times • Check drive rating
100D	Overtorque Det 1 (oL3)	• Check L6-02 and L6-03 settings • Check system mechanics
100E	Overtorque Det 2 (oL4)	• Check L6-05 and L6-06 settings • Check system mechanics
100F	DynBrk Transistor (rr)	Cycle drive power and replace drive if fault continues
1010	DynBrk Resistor (rH)	Check load, operating speed and deceleration time
1011	External Fault 3 (EF3)	• Multifunction digital input set to external fault • Circuit at terminal is closed
1012	External Fault 4 (EF4)	
1013	External Fault 5 (EF5)	
1014	External Fault 6 (EF6)	
1015	External Fault 7 (EF7)	
1016	External Fault 8 (EF8)	–
1017	Heatsink Fan (FAn)	Check drive cooling fan
1018	Overspeed Det (oS)	• Check reference and reference gain • Check F1-08 and F1-09 settings
1019	Speed Deviation (dEV)	• Check load, accel/decel times and system mechanics • Check F1-10 and F1-11 settings
101A	PGo Open (PGo)	Check PG card connections
101B	Input Phase Loss (PF)	Excessive input voltage fluctuation
101C	Output Phase Loss (LF)	• Check for broken wire/loose terminals • Check motor rating
101D	None	–
101E	Keypad Disconnected (oPr)	Reconnect the keypad
101F	EEPROM R/W Error (Err)	Cycle drive power and replace drive if fault continues
1020	None	–
1021	Comm Error (bUS)	• Check network cable connections. • Check 24 Vdc power supply voltage
1022		Check option installation and connections.
1023		Cycle drive power and replace option or drive if fault continues.
1024		

Drive Alarm Code (Hex) <1>	Description	Corrective Action
1025	Out of Control (CF)	• Check motor parameters • Auto-tune
1027	External Fault 0 (EF0)	• Check PLC program • Check MI switch setting • Check option LEDs for fault indication

<1> Drive error code is stored in MEMOBUS/Modbus address 0080 Hex.

◆ Option Low Priority Alarm Codes

These codes are transmitted as Manufacturer Specific Diagnostic low priority alarms that can be seen in the PLC configuration software. These low priority codes are the same codes that appear in the drive manual, except with an offset of 0x400.

Table 26 PROFINET Option Low Priority Alarm Codes

Drive Alarm Code (Hex) <1>	Description	Drive Alarm Code (Hex) <1>	Description
0401	Undervoltage (Uv)	0420	MEMOBUS/Modbus Test Mode Fault (SE)
0402	Overvoltage (ov)	0422	Motor Overheat (oH3)
0403	Heatsink Overheat (oH)	0427	PID Feedback Loss (FbL)
0404	Drive Overheat (oH2)	0428	PID Feedback Loss (FbH)
0405	Overtorque 1 (oL3)	042A	Drive Disabled (dnE)
0406	Overtorque 2 (oL4)	042B	PG Disconnected (PGo)
0407	Rum Command Input Error (EF)	0431	Option Watchdog Error (E5)
0408	Drive Baseblock (bb)	0432	Option Station Address Setting Error (AEr)
0409	External Fault 3, input terminal S3 (EF3)	0433	Option Comm. Cycle Setting Error (CyC)
040A	External Fault 3, input terminal S4 (EF4)	0434	High Current Alarm (HCA)
040B	External Fault 3, input terminal S5 (EF5)	0435	Cooling Fan Maintenance Time (LT-1)
040C	External Fault 3, input terminal S6 (EF6)	0436	Capacitor Maintenance Time (LT-2)
040D	External Fault 3, input terminal S7 (EF7)	0438	Option EEPROM Error (EEP)
040E	External Fault 3, input terminal S8 (EF8)	0439	External Fault (input terminal S1) (EF1)
040F	Cooling Fan Error (FAn)	043A	External Fault (input terminal S2) (EF2)
0410	Overspeed (oS)	043B	Safe Disable Input (HbbF)
0411	Excessive Speed Deviation (dEv)	043C	Safe Disable Input (Hbb)
0412	PG Disconnected (PGo)	043D	Mechanical Weakening Detection 1 (oL5)
0414	MEMOBUS/Modbus Comm. Error (CE)	043E	Mechanical Weakening Detection 2 (UL5)
0415	Option Communication Error (bUS)	043F	PLC Alarm (PA1)
0416	Serial Comm. Transmission Error (CALL)	0440	PLC Alarm (PA2)
0417	Motor Overload (oL1)	0441	Output Voltage Detection Fault (voF)
0418	Drive Overload (oL2)	0442	IGBT Maintenance Time (90%) (TrPC)
041A	Option Card External Fault (EF0)	0443	Soft Charge Bypass Relay Maintenance Time (LT-3)
041B	Motor Switch Command Input during Run (rUn)	0444	IGBT Maintenance Time (50%) (LT-4)
041D	Serial Comm. Transmission Error (CALL)	0445	Braking Transistor Overload (boL)
041E	Undertorque Detection 1 (UL3)	0448	Motor Overheat (NTC Input) (oH5)
041F	Undertorque Detection 2 (UL4)	0449	DriveWorksEZ Alarm (dWAL)

<1> Drive error code is stored in MEMOBUS/Modbus address 0080 Hex.

◆ Identification and Maintenance Functions (I&M)

The purpose of the I&M functions is to provide support for the customer during commissioning, parametrization and repair of the module. SI-EP3 supports I&M function 0, which can be accessed using the Record data object's read request.

Function	Record Data Index
I&M0	0xAFF0

Structure of the I&M functions is described in the following tables.

Table 27 I&M0 Device Identification (Read-Only)

Content	Size	Description
Header	10 bytes	–
Vendor ID	2 bytes	PROFINET Vendor ID of Yaskawa, which is 0x019F
Order ID	20 bytes	Order number of the SI-EP3 adapter kit (SI-EP3)
Serial number	16 bytes	Serial number of the adapter
Hardware revision	2 bytes	Hardware revision of the SI-EP3 adapter
Software revision	4 bytes	Revision of the software
Revision counter	2 bytes	Revision number
Profile ID	2 bytes	PROFIdrive (0x3A00)
Profile specific type	2 bytes	No profile specific type (0x0000)
I&M version	2 bytes	Version is 1.1 (0x0101)
Supported I&M functions	2 bytes	I&M0 is supported (0x0001)

◆ Diagnostic and Alarms

SI-EP3 has mechanisms for sending alarms and saving diagnostics data to fault buffer. Alarm will be triggered if the host or drive has faults in communication or operation. There are three types of faults:

Fault	API/Slot/Sub-slot	Channel Error Type
Drive Fault	0x3A00 / 1 / 1	A fault declared in drive

◆ Alarm Mechanism

When a fault or alarm situation occurs in the drive, the SI-EP3 adapter will send an alarm notification, which the master station must acknowledge. Refer to *Table 28* for details.

Table 28 Alarm Notification

Attribute	Description
BlockHeader	–
AlarmType	PROFINET specific alarm type
API	0x3A00 (PROFIdrive profile)
SlotNumber	Slot number of the Drive Object (DO)
SubslotNumber	Sub-slot number of the sub-slot to which the diagnosis object is related
ModuleIdentNumber	Module Ident number of the DO
SubmoduleIdentNumber	0xFFFF
AlarmSpecifier	Diagnosis type
UserStructureIdentifier	0x8000 (Channel Diagnosis Data)
ChannelNumber	0
ChannelProperties	0x0800 Diagnosis Appears 0x1000 Diagnosis Disappears
ChannelErrorType	Error code of drive fault or drive alarm

9 Web Interface

The web server interface to the drive option through port 80 allows management of diagnostic information through a standard web browser. The available pages include:

- Home Page
- PROFINET Page
- Network Page
- Chart Page
- Email Alerts Page
- Parameter Access Page
- Settings Page

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 keypad to access Option Monitors U6-80 to U6-83. Refer to ***Table 8*** for details.

◆ 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 card.

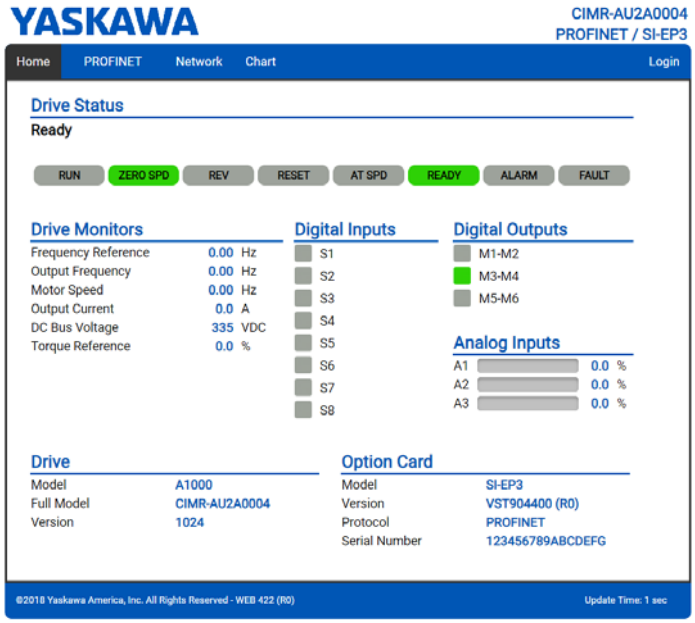


Figure 21 Home Page View

Note: The initial password is yaskawa. To change the password, open the Settings Page.

◆ PROFINET Page

The PROFINET page shows basic information about the protocol. The station name of the option card can be modified here, if the option is not actively connected to a PLC.

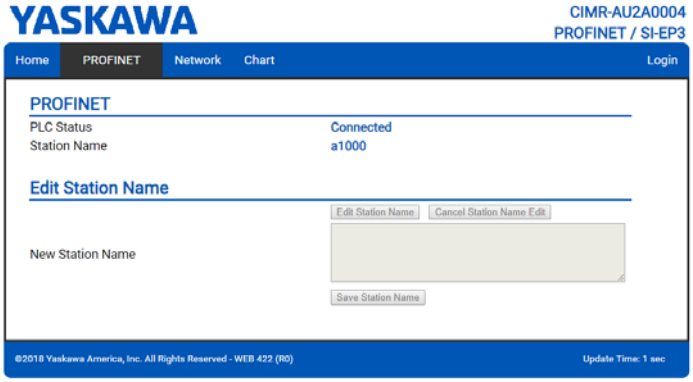


Figure 22 PROFINET Page View

◆ Network Page

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

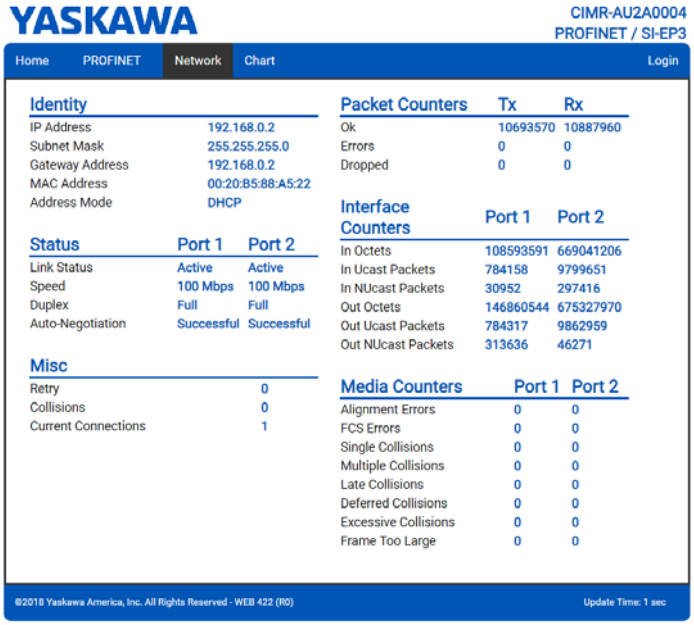


Figure 23 Network Page View

Table 29 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).
IP Address	IP Address of the option card.
Subnet Mask	Subnet Mask of the option card.
Gateway Address	The Gateway IP Address that the option card will use.
MAC Address	MAC Address of the option card.
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.
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.

◆ Chart Page

The Chart page can be used to monitor one signal from a predefined list.

List:

- Frequency Reference
- Output Frequency
- Output Current
- Motor Speed
- Torque Reference
- DC Bus Voltage
- Terminal Analog Input 1
- Terminal Analog Input 2
- Terminal Analog Input 3

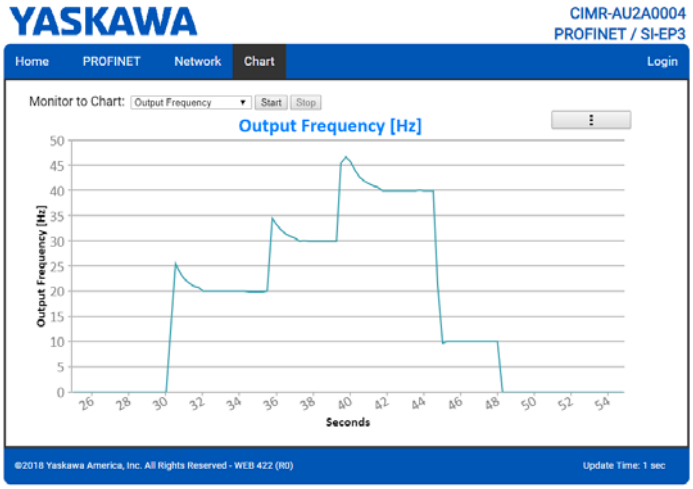


Figure 24 Chart Page View

◆ Email Alerts Page

The Email Alerts page 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.

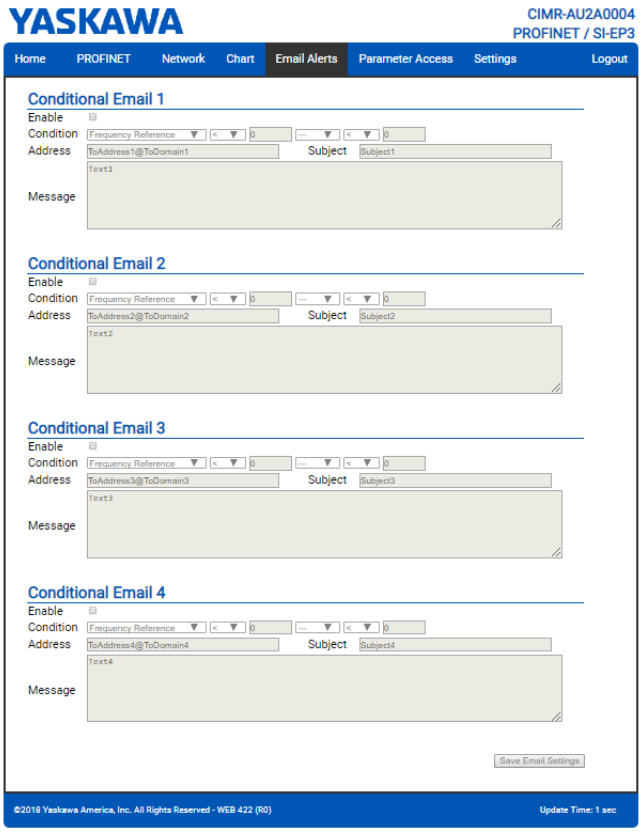


Figure 25 Email Alerts Page View

■ Procedure: Conditional Email Set-up

1. Click the “Enable” check box to enable the alert.
2. 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 “---”.
3. Enter the email address where the alert will be sent.
4. Enter the message that will appear in the email contents.
5. Enter the email subject.

Clicking “Save Email Settings” will save the entered information into the option.

◆ Parameter Access Page

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

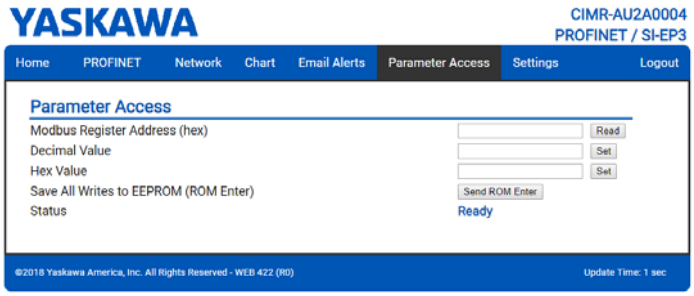


Figure 26 Parameter Access Page View

The MEMOBUS/Modbus address for the drive parameter being accessed must be entered in 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 “Read Successful” or “Write Successful” is displayed when finished.

◆ Settings Page

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

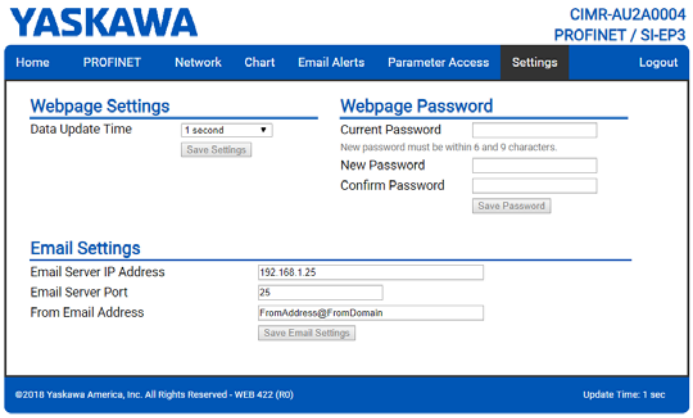


Figure 27 Settings Page View

■ Security Login

Click “Login” and enter a valid password. 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 Settings page. Entering a valid password allows access to the settings in the Settings page, Email Alerts page, and the Parameter Access page.

■ Webpage Password

To change the password, enter the new password in the “New Password:” and “Confirm Password:” text boxes then click “Save password”.

■ Webpage Settings

The values displayed in the various tabs are refreshed at the rate defined in the “Data Update Time” select box. The Data Update Time can be set to 250 ms, 500 ms, 1 second, 2 seconds, or 5 seconds.

■ Email Settings

The “Email Server IP Address” 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 Server Port” text box.

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

Click “Save Email Settings” to save the email settings to the option.

10 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Table 30* lists causes of the errors and possible corrective actions. Refer to the drive Technical Manual for additional error codes that may appear on the drive keypad.

■ Faults

Both bUS (Option Communication Error) and EF0 (Option Card External Fault) can appear as either an alarm or as a fault. When a fault occurs, the keypad ALM LED remains lit. When an alarm occurs, the keypad 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 30 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 13*.

Keypad Display		Fault Name
oFA03, oFA04	oFA03, oFA04	Option Card Error (CN5-A)
		Option Card Error (CN5-A)
Cause		**Possible Solution**
A fault occurred in the option.		1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
Keypad Display		**Fault Name**
oFA30 to oFA43	oFA30 to oFA43	Option Card Connection Error (CN5-A)
		Communication ID error.
Cause		**Possible Solution**
The option card connection to port CN5-A is faulty.		1. Turn off the power. 2. Check if the option is properly plugged into the option port. 3. Replace the option if the fault continues to occur.
Keypad Display		**Fault Name**
oFb00	oFb00	Option Fault (CN5-B)
		Non-compatible option is connected.
Cause		**Possible Solution**
The option card installed into port CN5-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.

■ 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 31*.

Table 31 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.
Bad Station Name Programmed	None	1306	Station Name Programmed is invalid and must be reprogrammed.
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.
Bad IP Configuration	None	1309	Invalid IP/subnet/gateway address programmed into F7-01 to F7-12.

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 32* for details.

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

Table 32 Option Compatibility

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

<1> When connecting two PG option cards, use both CN5-B and CN5-C. When connecting only one PG option card, use the CN5-C connector.
<2> Not available for the application with Motor 2 Selection.
<3> Not available with 1000-Series drive models with a capacities between 450 and 630 kW.
<4> When you use the input status of AI-A3 and DI-A3 as a monitor, you can connect AI-A3 and DI-A3 to CN5-A, CN5-B, or CN5-C.

11 European Standards

Figure 28 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.

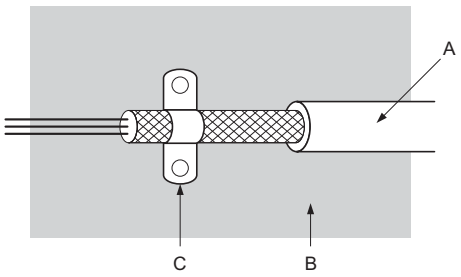
◆ EMC Guidelines Compliance

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 30***.



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

Figure 29 Ground Area

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

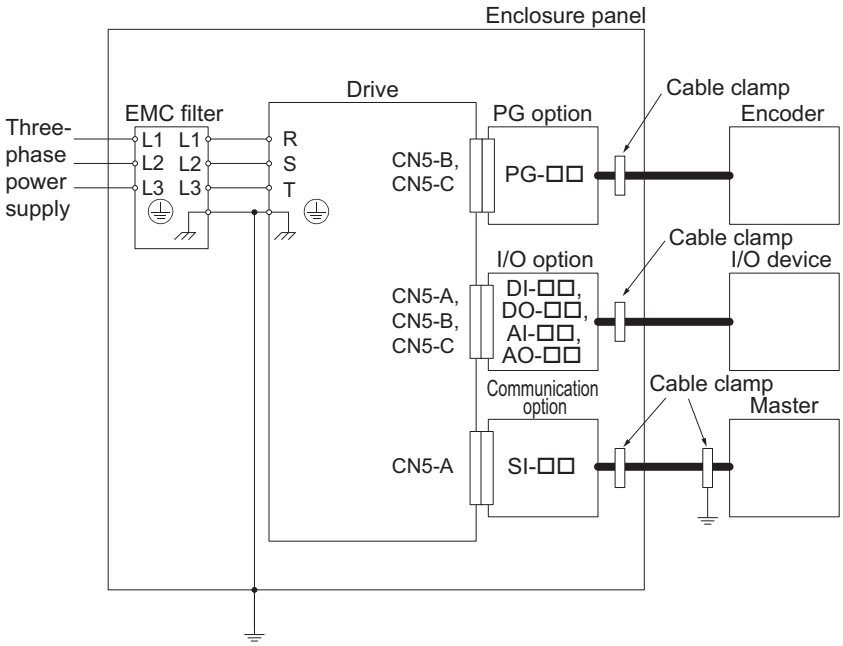


Figure 30 Option Installation for CE Compliance (PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□)

■ Option Installation for CE Compliance with GA500

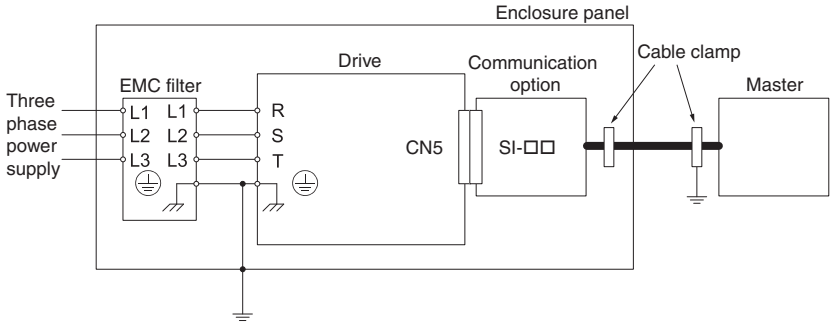


Figure 31 Option Installation for CE Compliance with GA500

12 Specifications

Table 33 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

13 Disposal

◆ Disposal Instructions

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

◆ WEEE Directive

Figure 32 WEEE Mark

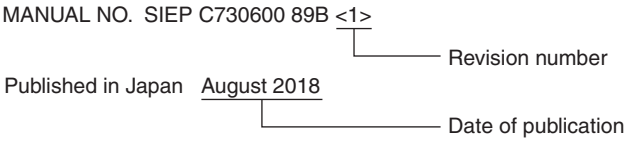
The wheelie bin symbol on this product, its manual, or its packaging identifies that you must recycle it at the end of its product life.

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

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



Date of Publication	Revision Number	Section	Revised Content
March 2019	<3>	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Chapter 13	Addition: Disposal
February 2019	<2>	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Back cover	Revision: Address
August 2018	<1>	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Back cover	Revision: Address
June 2016	–	–	First edition

YASKAWA AC Drive Option
PROFINET
Technical Manual

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MANUAL NO. SIEP C730600 89D <3>

Published in Japan March 2019
18-11-20