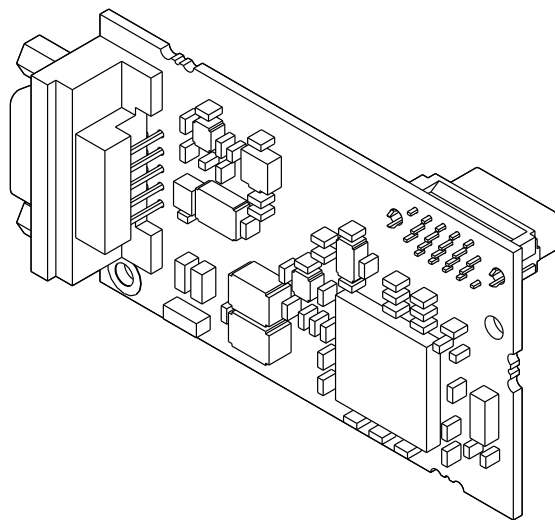


YASKAWA AC Drive Option

# CANopen Technical Manual

Model SI-S3

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



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# Table of Contents

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1. Preface and Safety . . . . .	6
Applicable Documentation . . . . .	6
Glossary . . . . .	6
Registered Trademarks . . . . .	6
Supplemental Safety Information . . . . .	6
Section Safety . . . . .	7
2. Overview . . . . .	7
Compatible Products . . . . .	7
Install the Option on a GA500 Drive . . . . .	8
3. Receiving . . . . .	8
Option Package Contents . . . . .	9
Installation Tools . . . . .	9
4. Option Components . . . . .	10
Option . . . . .	10
Communication Connector . . . . .	10
Option LED States . . . . .	10
Option LED Status Definitions . . . . .	10
5. Installation Procedure . . . . .	11
Section Safety . . . . .	11
Procedures to Install and Wire Options on a Drive . . . . .	12
Procedure A . . . . .	12
Procedure B . . . . .	16
Procedure C . . . . .	19
Communication Cable Specifications . . . . .	26
Option Connection Diagram . . . . .	26
Termination Resistor Connection . . . . .	26
EDS Files . . . . .	26
6. Related Drive Parameters . . . . .	26
7. Bit Rate and Node ID Setup . . . . .	28
Bit Rate Setup . . . . .	28
Setting the Bit Rate Manually . . . . .	28
Using Automatic Bit Rate Detection . . . . .	29
Node ID Setup . . . . .	29
8. Object Dictionary . . . . .	29

Object Dictionary Overview .....	29
Communication Profile Objects (DS 301) .....	29
Manufacturer Specific Profile Objects (DS 301) .....	30
Drives and Motion Profile Objects (DSP 402) .....	31
Communication Profile Objects (DS 301) .....	31
1000 (Hex.) - Device Type .....	31
1001 (Hex.) - Error Register .....	32
1003 (Hex.) - Pre-defined Error Field .....	32
1005 (Hex.) - COB-ID SYNC Message .....	33
1008 (Hex.) - Manufacturer Device Name .....	33
1009 (Hex.) - Manufacturer Hardware Version .....	33
100A (Hex.) - Manufacturer Software Version .....	34
100C (Hex.) - Guard Time .....	34
100D (Hex.) - Life Time Factor .....	34
100E (Hex.) - Node Guarding Identifier .....	34
1010 (Hex.) - Store Parameters .....	34
1011 (Hex.) - Restore Default Parameters .....	34
1014 (Hex.) - COB-ID Emergency Object .....	34
1016 (Hex.) - Consumer Heartbeat Time .....	34
1017 (Hex.) - Producer Heartbeat Time .....	34
1018 (Hex.) - Identity Object .....	35
Manufacturer Specific Profile Objects (DS 301) .....	35
2000 (Hex.) - Operation Command .....	35
2010 (Hex.) - Frequency Reference .....	35
2020 (Hex.) - Torque Reference/Torque Limit .....	36
2030 (Hex.) - Torque Compensation .....	36
2040 (Hex.) - MEMOBUS/Modbus Read Request .....	36
2050 (Hex.) - MEMOBUS/Modbus Write Request .....	36
2060 (Hex.) - MEMOBUS/Modbus Unlimited ENTER Command .....	37
2070 (Hex.) - MEMOBUS/Modbus Limited ENTER Command .....	37
2080 (Hex.) to 3100 (Hex.) - Freely Configurable Input Objects .....	37
2100 (Hex.)/2101 (Hex.) - Drive Status .....	37
2110 (Hex.)/2111 (Hex.) - Output Frequency .....	38
2120 (Hex.)/2121 (Hex.) - Output Current .....	39
2130 (Hex.)/2131 (Hex.) - Output Torque Reference .....	39
2140 (Hex.) - MEMOBUS/Modbus Read Response .....	39
2150 (Hex.) - MEMOBUS/Modbus Write Response .....	39
2155 (Hex.) - PDO Parameter Write Response .....	40
2160 (Hex.) - MEMOBUS/Modbus Unlimited Enter Command Response .....	40
2180 (Hex.) to 21F0 (Hex.) - Freely Configurable Output Objects .....	40
2200 (Hex.)/2201 (Hex.) - Motor Speed .....	41
Drives and Motion Profile Objects (DSP 402) .....	41
6040 (Hex.) - Controlword .....	42
6041 (Hex.) - Statusword .....	42
6042 (Hex.) - vl Target Velocity .....	42
6043 (Hex.) - vl Velocity Demand .....	42
6044 (Hex.) - vl Control Effort .....	42
6046 (Hex.) - vl Velocity Min Max Amount .....	42
6048 (Hex.) - vl Velocity Acceleration .....	42
6049 (Hex.) - vl Velocity Deceleration .....	42
604A (Hex.) - vl Velocity Quick Stop .....	43
604C (Hex.) - vl Dimension Factor .....	43
604D (Hex.) - vl Pole Number .....	43
6061 (Hex.) - Modes of Operation Display .....	43
60FD (Hex.) - Digital Inputs .....	43
60FE (Hex.) - Digital Outputs .....	43
9. Configuring Manufacturer Specific Objects .....	44
Selectable Object Content .....	44

Selecting the Object Content . . . . .	44
Limitations Affecting Object Content Selection . . . . .	44
<b>10. Process Data Objects (PDO) . . . . .</b>	<b>45</b>
PDOs and Default PDO Setup . . . . .	45
Receive PDOs (RxPDO) . . . . .	45
Transmit PDOs (TxPDO) . . . . .	46
Receive PDO Configuration and Mapping . . . . .	46
PDO Configuration . . . . .	46
PDO Mapping . . . . .	46
Transmit PDO Configuration and Mapping . . . . .	47
PDO Configuration . . . . .	47
PDO Mapping . . . . .	47
Transmission Type FE (Hex.) for Transmit PDOs . . . . .	47
Change of State Filter . . . . .	47
<b>11. Drive Parameter, Monitor and Control Register Access . . . . .</b>	<b>48</b>
Drive Parameter and Monitor Access by MEMOBUS/Modbus Read/Write Commands . . . . .	49
Reading a Drive Register, Parameter or Monitor . . . . .	49
Writing to a Parameter or Drive Control Register . . . . .	49
Accessing Drive Parameters and Monitors that are Mapped to Objects . . . . .	49
Accessing Drive Parameters, Monitors and Control Registers Using SDOs . . . . .	49
Accessing Drive Parameters, Monitors and Control Registers Using PDOs . . . . .	49
Initializing the Drive . . . . .	50
<b>12. Troubleshooting . . . . .</b>	<b>51</b>
Option Error Codes . . . . .	51
Drive-Side Error Codes . . . . .	51
Faults . . . . .	51
Minor Faults and Alarms . . . . .	52
SDO Abort Codes . . . . .	52
<b>13. European Standards . . . . .</b>	<b>53</b>
EMC Directive Compliance . . . . .	53
Option Installation . . . . .	53
<b>14. Specifications . . . . .</b>	<b>54</b>
Specifications . . . . .	54
<b>15. Disposal . . . . .</b>	<b>55</b>
Disposal Instructions . . . . .	55
WEEE Directive . . . . .	55
<b>Revision History . . . . .</b>	<b>56</b>

# 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

These manuals are available for the option:

Document	Description
YASKAWA AC Drive Option CANopen Installation Manual	Read this manual first. The manual provides information about wiring, settings, functions, and troubleshooting. The manual is packaged together with the product.
YASKAWA AC Drive Option CANopen Technical Manual Manual No.: SIEP C730600 85 (This book)	The technical manual contains detailed information about the option. Access the following sites to obtain the technical manual: U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a> Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a> Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a> Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.
YASKAWA AC Drive Manuals	Refer to the drive manual to connect with the option. Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The manuals also include important information about parameter settings and tuning the drive. The Quick Start Guides are packaged with the drive. The most recent versions of these manuals are available for download on our documentation websites: U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a> Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a> Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a> Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.

## ◆ Glossary

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

## ◆ Registered Trademarks

- CANopen is a registered trademark of the CAN in Automation (CiA).
- Trademarks are the property of their respective owners.

## ◆ Supplemental Safety Information

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

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

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

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

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

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

## ■ Section Safety

### General Precautions

- The diagrams in this section may include options and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option should be used according to the instructions described in this manual.
- The diagrams in this manual are provided as examples only and may not pertain to all products covered by this manual.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- Contact Yaskawa or a Yaskawa representative and provide the manual number shown on the front cover to order new copies of the manual.

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

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

**NOTICE** *Damage to Equipment.* Do not use steam or other disinfectants to fumigate wood for packaging the drive. Use alternative methods, for example heat treatment, before you package the components. Gas from wood packaging fumigated with halogen disinfectants, for example fluorine, chlorine, bromine, iodine or DOP gas (phthalic acid ester), can cause damage to the drive.

## 2 Overview

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

Install the option/CANopen option on a drive to do these functions from a CANopen master device:

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

The option supports these communication profiles:

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

## ◆ Compatible Products

You can use the option with these products:

**Table 2.1 Compatible Products**

Product Series	Model(s)	Software Version <sup>*1</sup>
A1000	CIMR-Ax2Axxxx	≥ 1020
	CIMR-Ax4A0002 - 4A0675	
	CIMR-Ax4A0930, 4A1200	≥ 3015
U1000	CIMR-UxxAxxxx	≥ 1010
	CIMR-UxxExxxx	
	CIMR-UxxPxxxx	
	CIMR-UxxWxxxx	
U1000L	CIMR-UxxLxxxx	≥ 6210
	CIMR-UxxFxxxx	
	CIMR-UxxRxxxx	
	CIMR-UxxSxxxx	

Product Series	Model(s)	Software Version <sup>*1</sup>
Z1000U	CIMR-ZxxAxxxx	≥ 6110
	CIMR-ZxxExxxx	
	CIMR-ZxxPxxxx	
	CIMR-ZxxWxxxx	
GA500	CIPR-GA50xxxxx	≥ 1010
GA700	CIPR-GA70xxxxx	≥ 1010
GA800	CIPR-GA80xxxxx	≥ 9010
FP605	CIPR-FP65xxxxx	≥ 1010

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

**Note:**

- Refer to the option package labeling in the field designated "PRG (four digit number)" or the option labeling in the field to identify the option software version.
- For Yaskawa customers in the North or South America region:  
If your product is not listed in Table 2.1, refer to the web page below to confirm this manual is correct for your product. The web page provides a list of option manuals by product, and a direct link to download a PDF of the manual.

**Scan QR code Or refer to:**

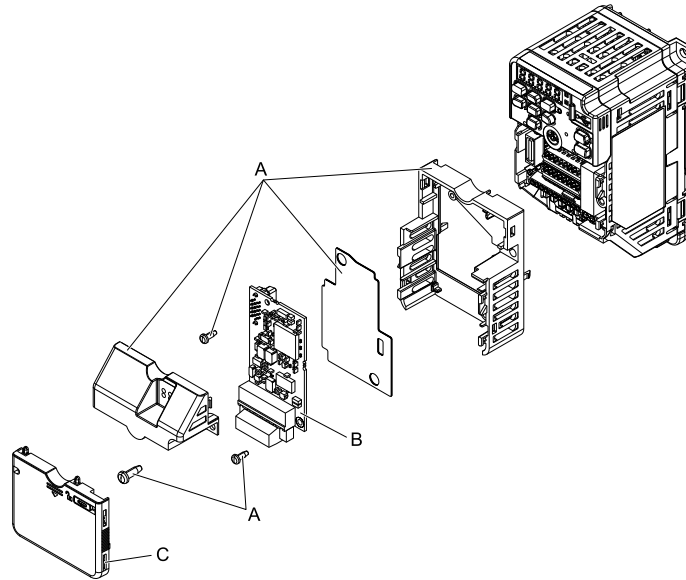
<http://www.yaskawa.com/optionlookup>



### ◆ Install the Option on a GA500 Drive

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

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



**A - Option card mounting kit components (sold separately)**  
**B - Option**

**C - Drive front cover**

Figure 2.1 Option Card Mounting Kit (JOHB-GA50)

## 3 Receiving

After receiving the option package:

- Make sure that the option is not damaged and no parts are missing.



The Yaskawa warranty does not include damage from shipping. Contact your sales outlet if the option or other parts appear damaged.

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

- Make sure that the model number on the option nameplate and the model number on the purchase order are the same. Refer to *Option on page 10* for more information.
- Contact the distributor where you purchased the option or contact Yaskawa or a Yaskawa representative about any problems with the option.

## ◆ Option Package Contents

**Table 3.1 Contents of Package**

Option Contents		Quantity
Option		1
Ground Wire <sup>*1</sup>		1
Screws (M3)		3 <sup>*2</sup>
LED Labels	1000-Series	1
	GA500, GA700, GA800	1
Installation Manual		1

\*1 GA700 and GA800 drives do not use the ground wire.

\*2 Only two screws are necessary to install the option on GA700, GA800, and FP605 drives.

### Note:

The LED label for FP605 drives is packaged with the FP605 drive.

UNP00694-1 LED indicator labels for optional network communication cards. If required, install on the front cover of drive over the LED indicators.		
<b>RUN</b>	<b>COMM</b>	<b>OPTION</b> SI-P3
<b>ERR</b>	<b>BF</b>	
<b>RUN</b>	—	SI-S3
<b>ERR</b>	—	
<b>MS</b>	—	SI-N3
<b>NS</b>	—	

## ◆ Installation Tools

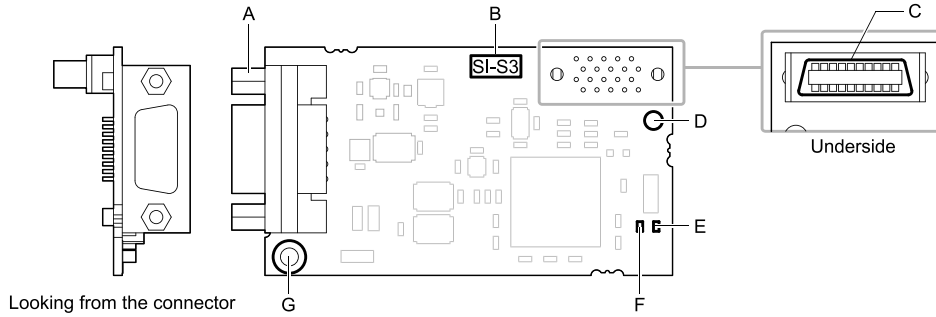
You can use these tools to install the option to the drive:

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

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

# 4 Option Components

## ◆ Option



- A - Communication cable connector (9 pin D-sub)
- B - Option model number
- C - Connector (CN5)
- D - Installation hole
- E - LED (RUN) \*1
- F - LED (ERR) \*1
- G - Ground terminal (FE) and installation hole \*2

Figure 4.1 Option

\*1 Refer to *Option LED States on page 10* for more information about the LEDs.

\*2 Connect the included ground wire during installation. The ground wire is not necessary for installations on GA700 and GA800 drives.

## ◆ Communication Connector

The CANopen Option is connected to the network using a 9-pin D-sub connector. The pin assignment is explained in the table below.

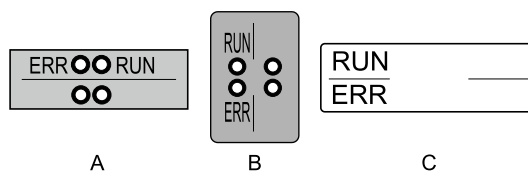
Table 4.1 Communication connector (9-pin D-sub)

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

## ◆ Option LED States

Option has two LEDs that identify the option or communication status.

### ■ Option LED Status Definitions



- A - 1000-Series
- B - GA500, GA700, GA800

C - FP605

Figure 4.2 Option LED Labels

Table 4.2 Option LED States

LED Name	Color	Display	Operating Status
RUN	Green	ON	Option operating
		Blinking	Pre-Operational State
		Single Flash	Stopped
		Flickering <sup>*1</sup>	Automatic bit rate detection in progress (alternately flickering with ERR LED)
ERR	Red	ON	Bus off
		Blinking	Bus initialization failed (parameter setting error)
		Single Flash	Fault has occurred/Receiving CAN error frame (too many error frames)
		Double Flash	Guard/Heartbeat event has occurred
		Flickering <sup>*1</sup>	Automatic bit rate detection in progress (alternately flickering with RUN LED)
		OFF	Online

\*1 Available in option software version 3102 and later. Refer to the option package labeling in the field designated "PRG" (four digit number)" or the option labeling in the field designated "C/N" (S + four digit number)" to identify the option software version.

Figure 4.3 explains the indicator flash rates.

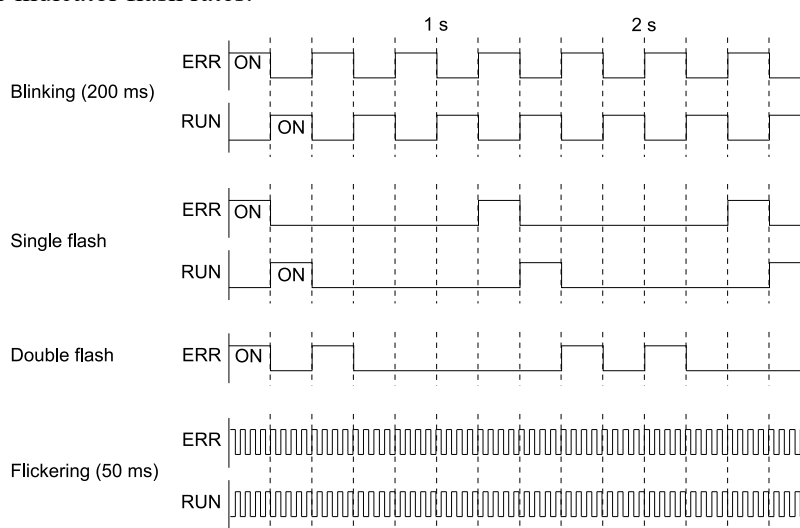


Figure 4.3 LED Flash Rates and Meaning

## 5 Installation Procedure

### ◆ Section Safety

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

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

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

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

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

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

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

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

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

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

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

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

### ◆ Procedures to Install and Wire Options on a Drive

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

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

**Table 5.1 Procedures to Install and Wire Options on a Drive**

Product Series	Procedures to Install and Wire Options on a Drive	Page
A1000	Procedure A	12
U1000	Procedure A	12
U1000L	Procedure A	12
Z1000U	Procedure A	12
GA500	<i>*1</i>	-
GA700	Procedure B	16
GA800	Procedure B	16
FP605	Procedure C	19

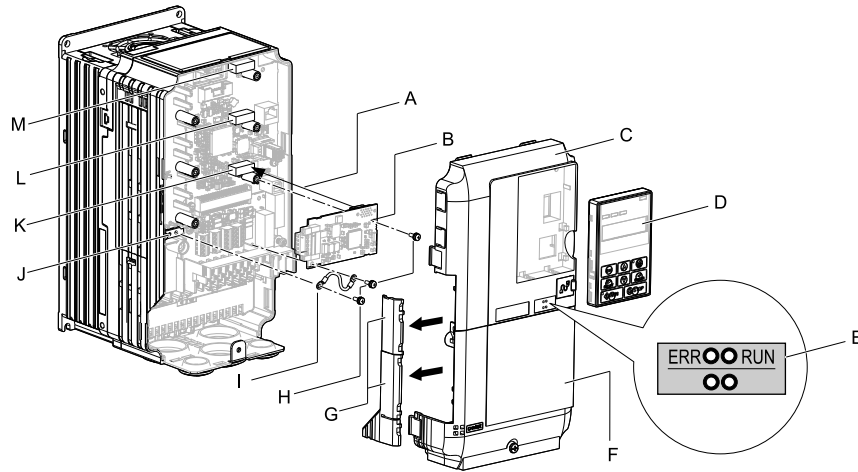
\*1 To install the option on GA500 drives, use the option mounting kit (JOHB-GA50) and manual.

### ■ Procedure A

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

#### Prepare the Drive for the Option

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



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

Figure 5.1 Drive Components with Option

### Install the Option

Use this procedure to install the option.

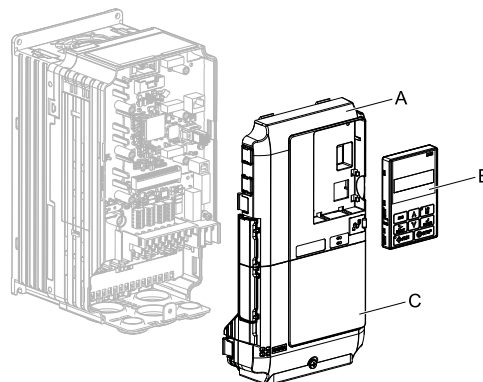
**⚠ DANGER** *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized.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

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

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

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

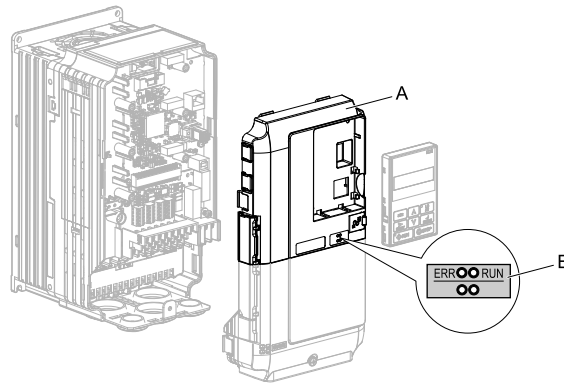
**NOTICE** *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*



- |                              |                                 |
|------------------------------|---------------------------------|
| <b>A - Drive front cover</b> | <b>C - Drive terminal cover</b> |
| <b>B - Keypad</b>            |                                 |

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

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

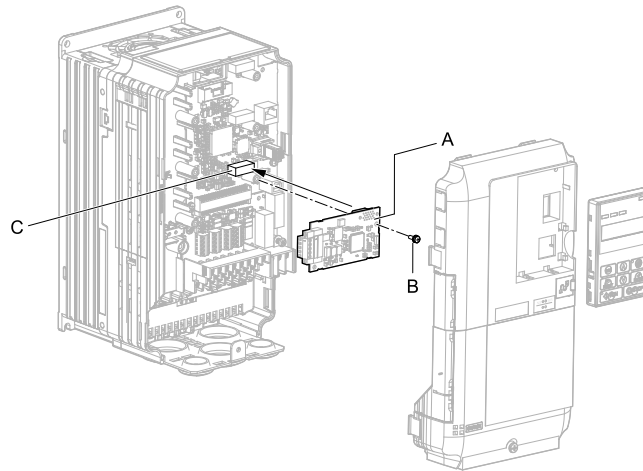


**A - Drive front cover**

**B - LED label**

**Figure 5.3 Put the LED Label on the Drive Front Cover**

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



**A - Option**

**B - Included screw**

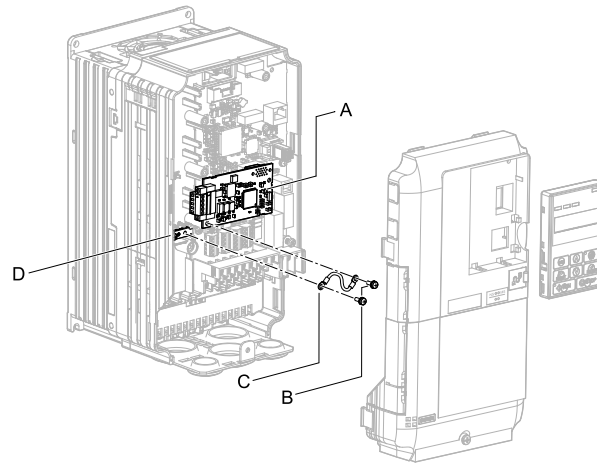
**C - Connector CN5-A**

**Figure 5.4 Install the Option**

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

Tighten the screws to a correct tightening torque:

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



**A - Option**  
**B - Included screws**

**C - Ground wire**  
**D - Drive grounding terminal (FE)**

**Figure 5.5 Connect the Ground Wire**

**Note:**

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

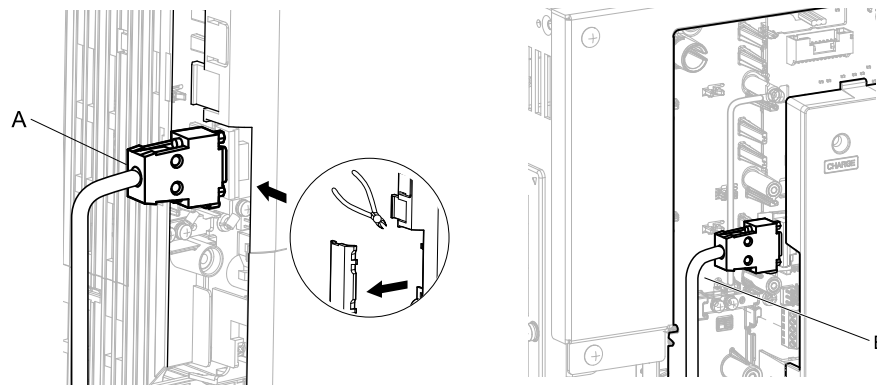
**5. Route the option wiring.**

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

- You can route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in [Figure 5.6-A](#) to create the necessary openings on these models. To prevent damage to the cable from the cut end, treat the cut surface with sandpaper.
  - Route the option wiring inside the enclosure as shown in [Figure 5.6-B](#).
- Refer to the drive manuals for more information.

**Note:**

- Isolate communication cables from main circuit wiring and other electrical and power lines.
- Connect the terminator (model No.: JEPMC-W6022-E) to the option modular connector (CN3) on the end drive of the communication lines.



**A - Route wires through the openings provided on the left side of the front cover. \*1**

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

**Figure 5.6 Wire Routing Examples**

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

- 6. Firmly connect the CANopen communication cable to option communication connector 9-pin D-sub.**  
Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to [Figure 5.22](#)). Refer to [Communication Cable Specifications on page 26](#) for more information.

**Note:**

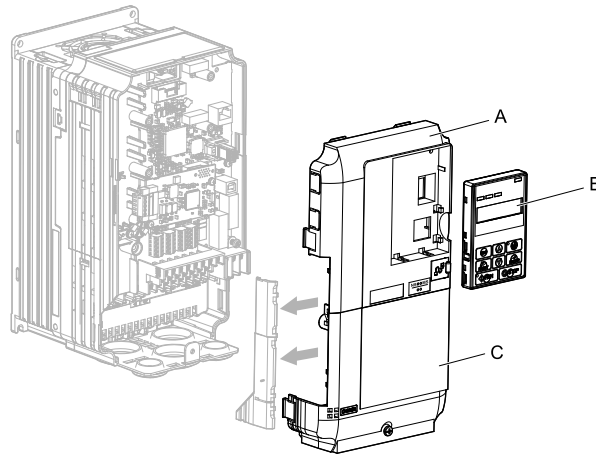
Do not connect or disconnect the communication cable while the drive is energized or while the drive is in operation. Failure to obey can cause a static discharge, which will cause the option to stop working correctly. Cycle power on the drive and option to start using the option again.

7. Reattach the front cover (A), terminal cover (C), and keypad (B).

Refer to the drive manuals for more information.

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

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



A - Drive front cover

B - Keypad

C - Drive terminal cover

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

8. Set drive parameters in [Related Drive Parameters on page 26](#) for correct option performance. Make sure that you set *F6-35 [CANopen Node ID Selection]* to a node address that is unique on the network.

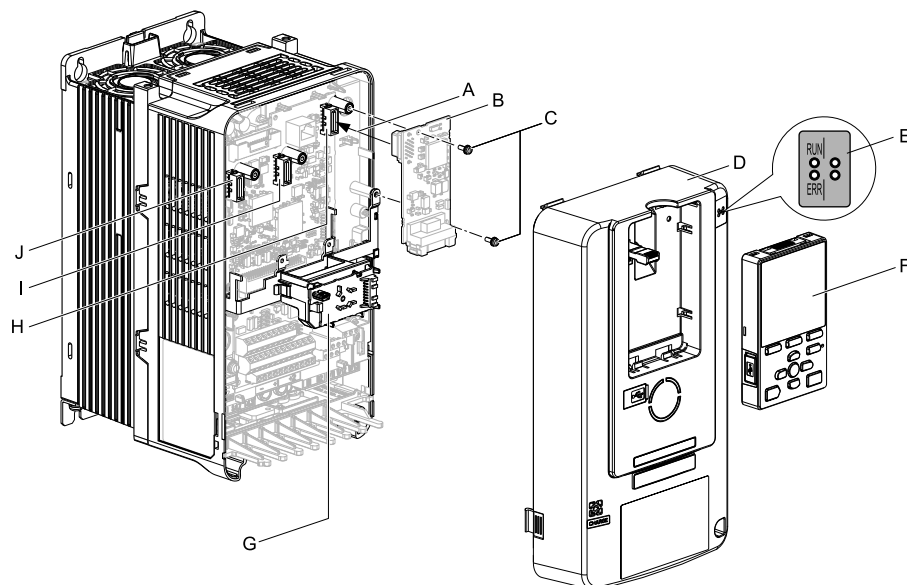
### ■ Procedure B

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

#### Prepare the Drive for the Option

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





- |  |  |
|--|--|
| <p><b>A</b> - Insertion point for CN5 connector<br/> <b>B</b> - Option<br/> <b>C</b> - Included screws<br/> <b>D</b> - Drive front cover<br/> <b>E</b> - LED label</p> | <p><b>F</b> - Keypad<br/> <b>G</b> - LED Status Ring board<br/> <b>H</b> - Connector CN5-A<br/> <b>I</b> - Connector CN5-B (Not available for communication option installation.)<br/> <b>J</b> - Connector CN5-C (Not available for communication option installation.)</p> |
|--|--|

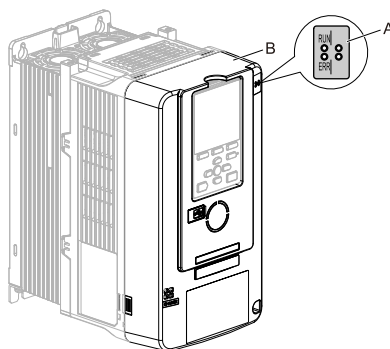
**Figure 5.8 Drive Components with Option**

### Install the Option

Use this procedure to install the option.

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

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



**A** - LED label

**B** - Drive front cover

**Figure 5.9 Put the LED Label on the Drive Front Cover**

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

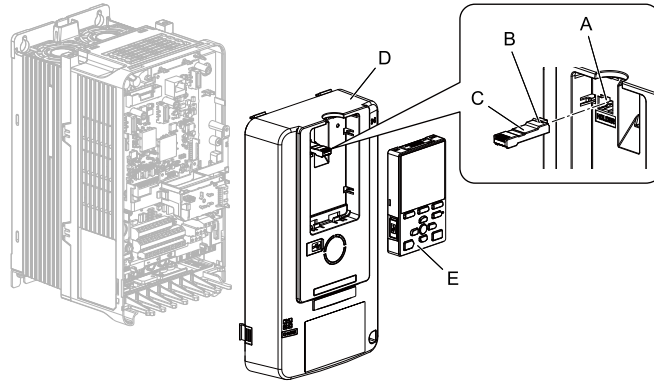
Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

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

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

#### Note:

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

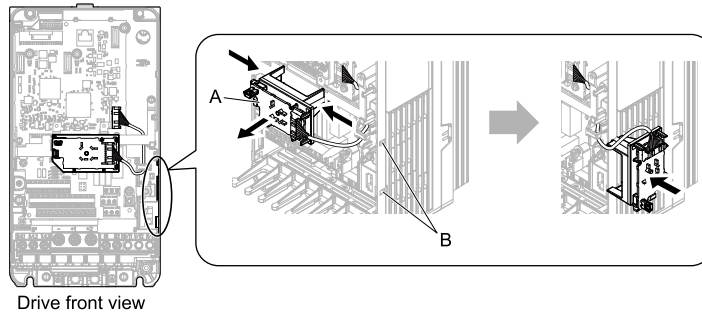


- A - Holder
- B - Keypad connector tab
- C - Keypad connector
- D - Drive front cover
- E - Keypad

**Figure 5.10 Remove the Front Cover and Keypad**

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

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



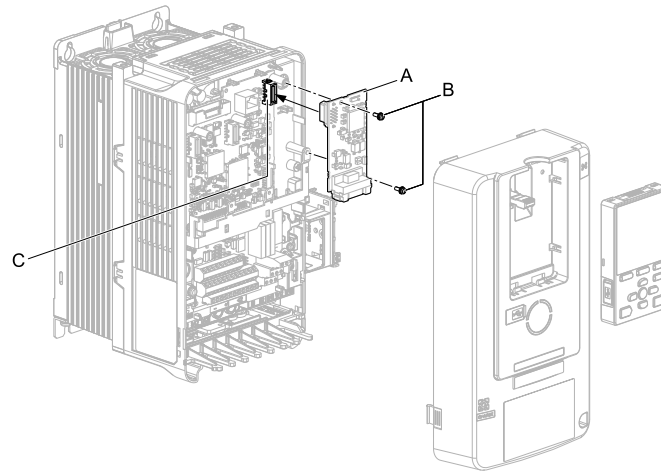
- A - LED Status Ring board
- B - Temporary placement holes

**Figure 5.11 Remove the LED Status Ring Board**

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

**Note:**

1. A ground wire is not necessary. Do not use the ground wire.
2. Only two screws are necessary to install the option on GA700 and GA800 drives.



A - Option  
B - Included screws

C - Connector CN5-A

**Figure 5.12 Install the Option**

- Firmly connect the CANopen communication cable to option communication connector 9-pin D-sub. Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to [Figure 5.22](#)). Refer to [Communication Cable Specifications on page 26](#) for more information.

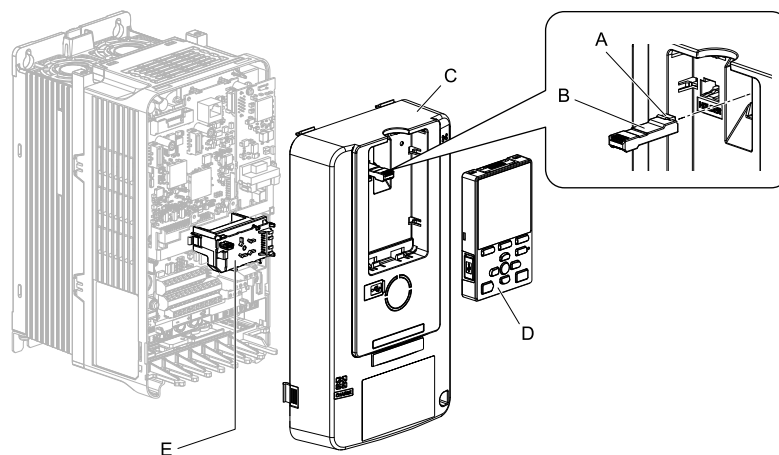
**NOTICE** *Damage to Equipment.* When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.

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

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

**Note:**

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



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

D - Keypad  
E - LED Status Ring board

**Figure 5.13 Install the LED Status Ring board, Front Cover, and Keypad**

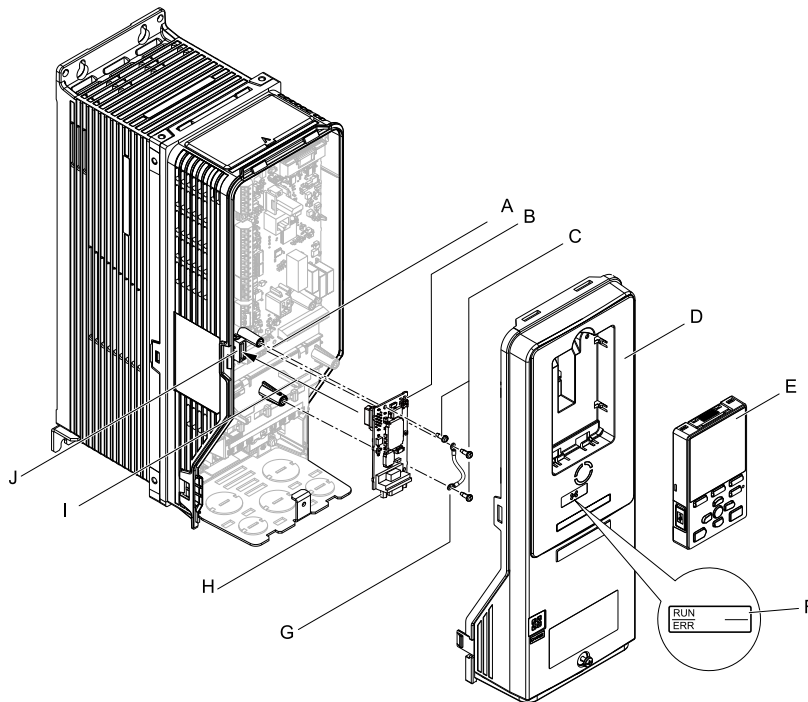
- Set drive parameters in [Related Drive Parameters on page 26](#) for correct option performance. Make sure that you set F6-35 [CANopen Node ID Selection] to a node address that is unique on the network.

## ■ Procedure C

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

### Prepare the Drive for the Option

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



A - Drive grounding terminal (FE)

B - Option

C - Included screws

D - Drive front cover

E - Keypad

F - LED label

G - Ground wire

H - Option connector CN4 (9-pin D-sub female connector)

I - Insertion point for connector CN5-A

J - Connector CN5-A

Figure 5.14 Drive Components with Option

### Install the Option

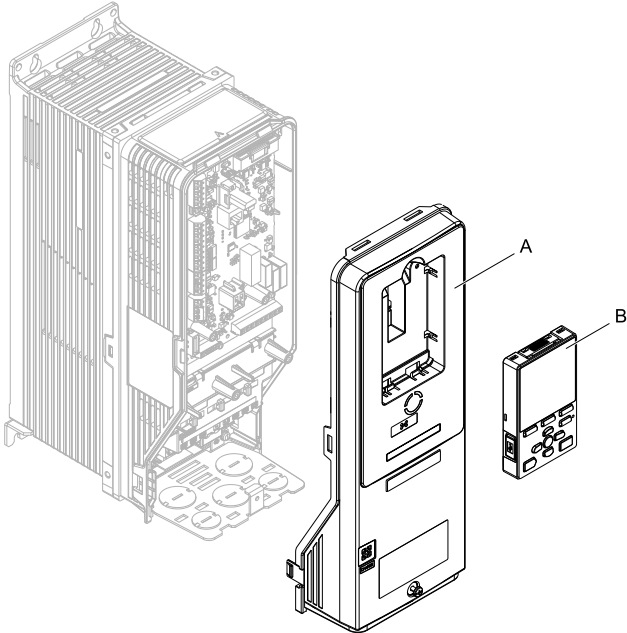
Use this procedure to install the option.

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

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

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

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

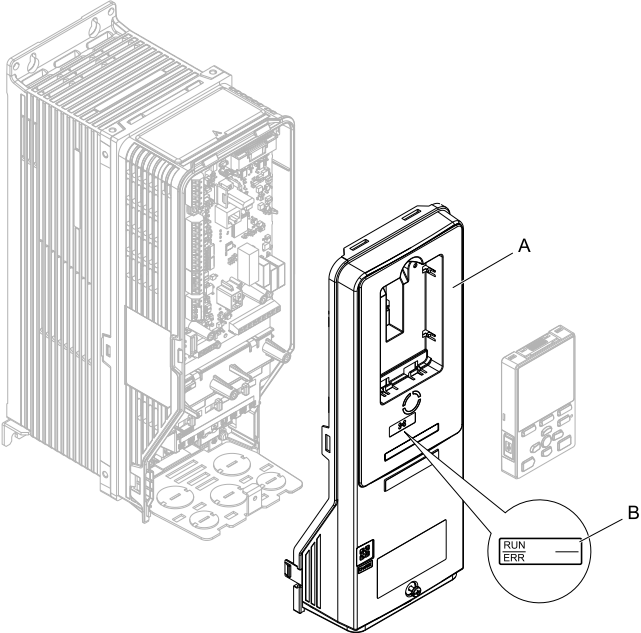


A - Drive front cover

B - Keypad

Figure 5.15 Remove the Front Cover and Keypad

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

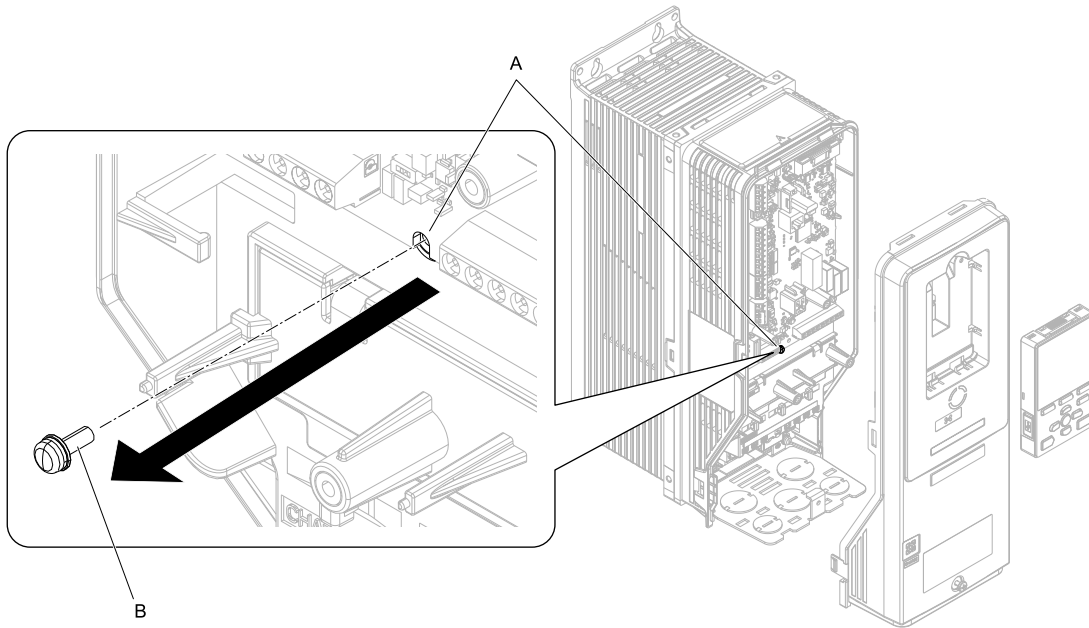


A - Drive front cover

B - LED label

Figure 5.16 Put the LED Label on the Drive Front Cover

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



**A - Drive grounding terminal (FE)**

**B - Included screw**

**Figure 5.17 Remove the Screw from the Drive Grounding Terminal**

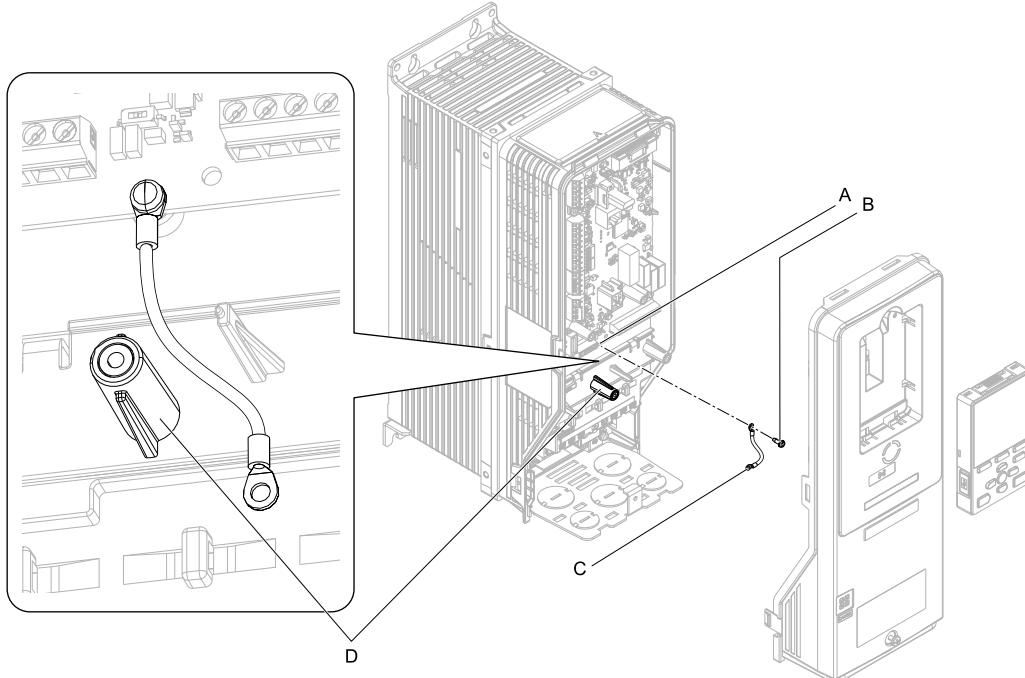
- Use the screw (B) installed in the FE ground terminal of the drive (A) to connect one end of the included ground wire (C) to the ground terminal on the drive.

Tighten the screw to a correct tightening torque:

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

**Note:**

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



**A - Drive grounding terminal (FE)**

**B - Included screw**

**C - Ground wire**

**D - Stud**

**Figure 5.18 Connect the Ground Wire**

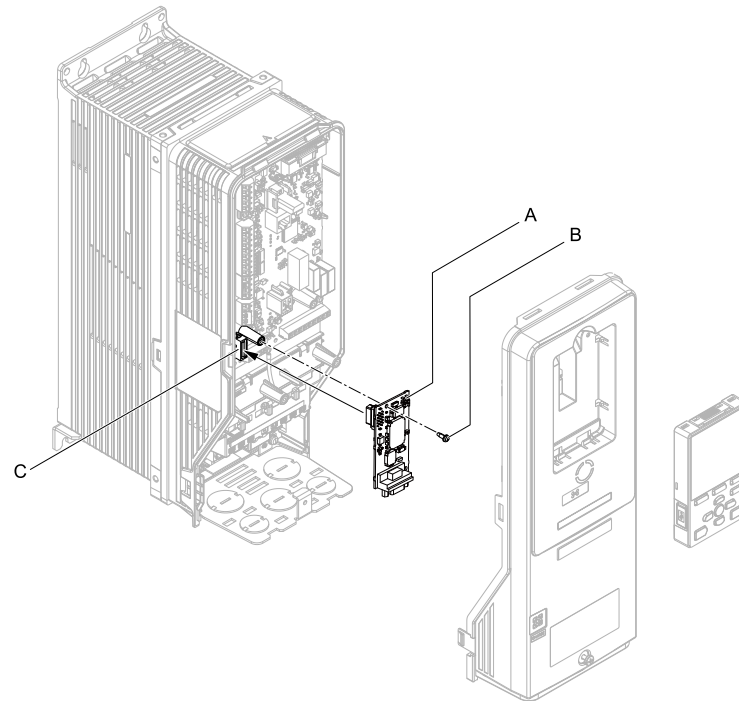
- Install the option (A) into the CN5-A connector (C) on the drive and use one of the included screws (B) to put it in place.

Tighten the screw to a correct tightening torque:

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

**Note:**

1. Only two screws are necessary to install the option on an FP605 drive.
2. The option package contains three screws and one ground wire.



**A - Option**  
**B - Included screw**

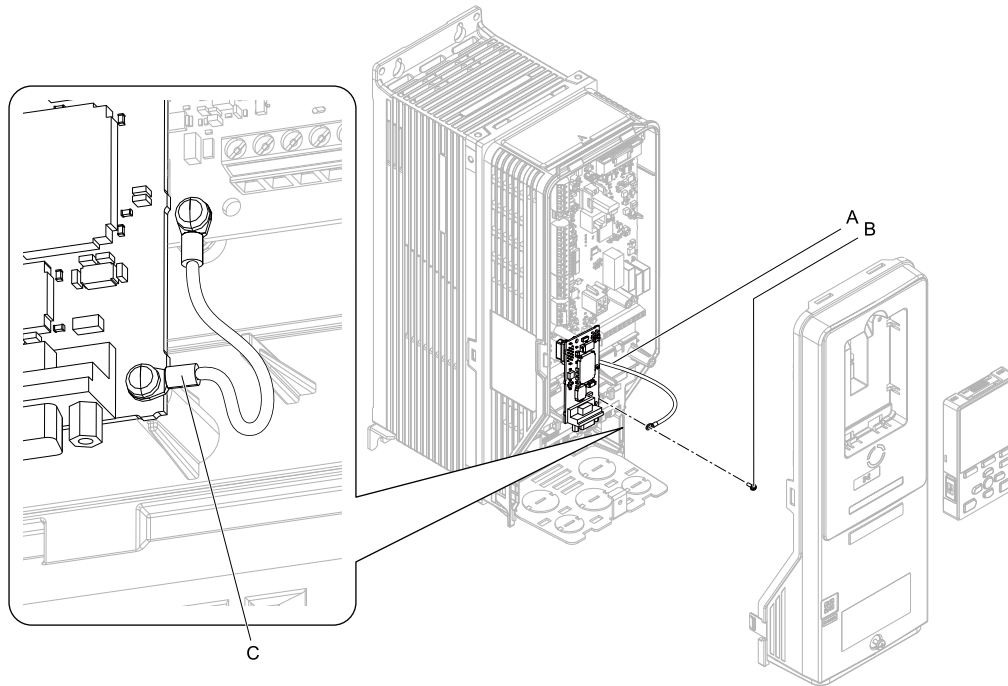
**C - Connector CN5**

**Figure 5.19 Install the Option**

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

**Note:**

Refer to [Figure 5.20](#) for instructions about crimp terminal orientation (C) and wire routing.



**A - Ground wire**  
**B - Included screw**

**C - Crimp terminal**

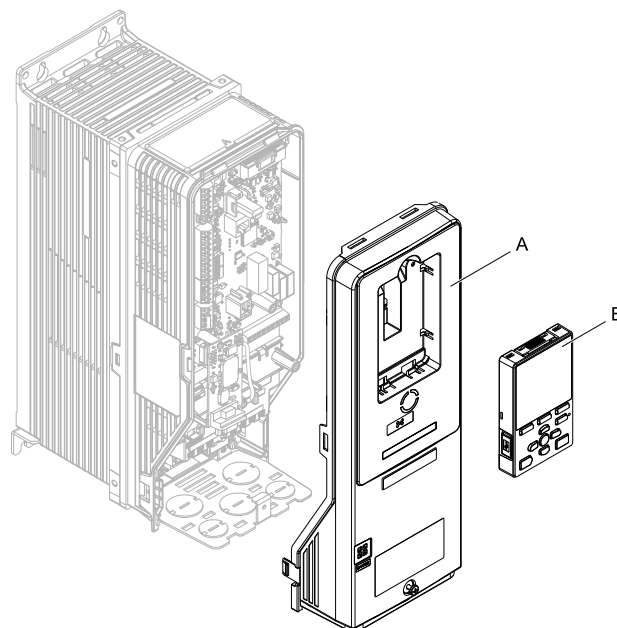
**Figure 5.20 Connect the Ground Wire**

7. Firmly connect the PROFIBUS-DP communication cable to the option 9-pin D-sub connector (CN4). Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. (Refer to [Figure 5.22](#)). Refer to [Communication Cable Specifications on page 26](#) for more information.

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

8. Reattach the drive front cover (A) and the keypad (B). Refer to the drive manuals for more information.

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



**A - Drive front cover**

**B - Keypad**

**Figure 5.21 Replace the Front Cover and Keypad**



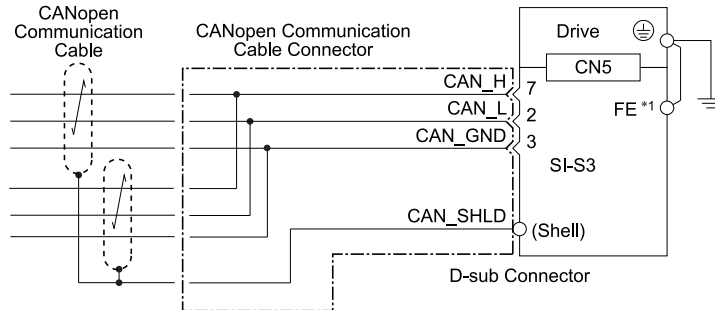
9. Set drive parameters in [Related Drive Parameters on page 26](#) for correct option performance.  
Make sure that you set *F6-35 [CANopen Node ID Selection]* to a node address that is unique on the network.

## ◆ Communication Cable Specifications

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

## ◆ Option Connection Diagram

You must connect the option to the network using a 9-pin D-sub connector wired as shown in Figure 5.22.

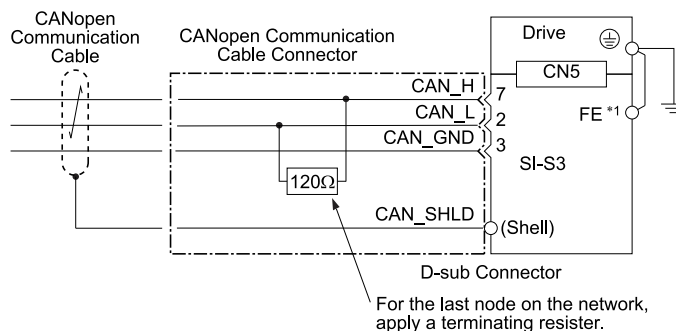


**Figure 5.22 Option Connection Diagram**

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

## ◆ Termination Resistor Connection

Both ends of a CANopen network have to be terminated with a 120 Ω resistor. As the option has no built-in termination resistor, make sure to apply a termination resistor as shown in Figure 5.23 if the CANopen Option is the last node in the network.



**Figure 5.23 Termination Resistor Connection**

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

## ◆ EDS Files

For easy network implementation of drives equipped with a CANopen Option, an EDS file can be obtained from: U.S.: <http://www.yaskawa.com> Europe: <http://www.yaskawa.eu.com> Japan: <http://www.e-mechatronics.com> Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative. You can download drive manuals from the Yaskawa product and technical information website shown on the back cover of this manual.

## 6 Related Drive Parameters

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

### Note:

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

No. (Hex.)	Name	Description	Default (Range)
b1-01 (0180)	Frequency Reference Selection 1	Selects the input method for frequency reference. 0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input <b>Note:</b> • Set <i>b1-02 = 3</i> [Run Command Selection 1 = Option PCB] to use the master device and serial communications to start and stop the drive. Set <i>b1-01 = 3</i> to use the master device to control the frequency reference of the drive. • The default setting is different for different drives. Refer to the instruction manual of your specific drive for more information.	1 (0 - 4)
b1-02 (0181)	Run Command Selection 1	Selects the input method for the Run command. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB <b>Note:</b> Set <i>b1-02 = 3</i> to start and stop the drive with the master device using serial communications. Set <i>b1-01 = 3</i> [Frequency Reference Selection 1 = Option PCB] to use the master device to control the frequency reference of the drive.	1 (0 - 3)
E2-04 (0311)	Motor Pole Count	Set the number of motor poles described on the motor nameplate. <b>Note:</b> • Relevant for DSP402. –1000-Series: 2 - 48 –GA500, GA700, GA800, FP605: 2 - 120 • E2-04 is necessary to set up when the Drive Profile DSP 402 objects are used.	4 (2 - 48)
F6-01 (03A2)	Communication Error Selection	Selects drive response when the drive detects a <i>bUS</i> [Option Communication Error] error during communications with the option. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Alarm - Run at d1-04 5 : Alarm - Ramp Stop <b>Note:</b> • When you set this parameter to 3 or 4, the drive will continue operation after it detects a fault. Separately prepare safety protection equipment and systems, for example fast-stop switches. • 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 or later. • The setting range for 1000-Series drives is different for different software versions. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.	1 (0 - 5)
F6-02 (03A3)	Comm External Fault (EF0) Detect	Selects the conditions at which <i>EF0</i> [Option Card External Fault] is detected. 0 : Always Detected 1 : Detected during RUN Only	0 (0, 1)
F6-03 (03A4)	Comm External Fault (EF0) Select	Selects the operation of the drive when <i>EF0</i> [Option Card External Fault] is detected. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only <b>Note:</b> When you set this parameter to 3, the drive will continue operation after it detects a fault. Separately prepare safety protection equipment and systems, for example fast stop switches.	1 (0 - 3)
F6-06 (03A7)	Torque Reference/Limit by Comm	Sets the function that enables and disables the torque reference and torque limit received from the communication option. 0 : Disabled 1 : Enabled <b>Note:</b> • Control method availability of this parameter is different for different product series. –1000-Series Parameter is available in <i>A1-02 = 3, 6, 7</i> [Control Method Selection = Closed Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector]. When you enable this parameter, <i>d5-01</i> [Torque Control Selection] sets the drive to read the value as the Torque Limit value or the Torque Reference value. <i>d5-01 = 0</i> [Torque Control Selection = Speed Control]: Torque Limit <i>d5-01 = 1</i> [Torque Control Selection = Torque Control]: Torque Reference In <i>A1-02 = 6</i> , this value is read as the Torque Limit. –GA500 Parameter is available in <i>A1-02 = 2, 6, 8</i> [Control Method Selection = Open Loop Vector, PM Advanced Open Loop Vector, EZ Vector Control]. The drive reads this value as the Torque Limit. –GA700, GA800 Parameter is available in <i>A1-02 = 2, 3, 4, 6, 7, 8</i> [Control Method Selection = Open Loop Vector, Closed Loop Vector, Advanced Open Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector, EZ Vector Control].	0 (0, 1)

## 7 Bit Rate and Node ID Setup

No. (Hex.)	Name	Description	Default (Range)
		<p>When you enable this parameter, <i>d5-01 [Torque Control Selection]</i> sets the drive to read the value as the Torque Limit value or the Torque Reference value.</p> <p><i>d5-01 = 0 [Torque Control Selection = Speed Control]:</i> Torque Limit</p> <p><i>d5-01 = 1 [Torque Control Selection = Torque Control]:</i> Torque Reference</p> <p>In <i>A1-02 = 2, 8</i>, these values are read as the Torque Limit.</p> <p>–FP605 Torque Limit is enabled when <i>A1-02 = 8 [Control Method Selection = EZ Vector Control]</i>.</p> <p>• If the PLC does not supply a torque reference or torque limit when <i>F6-06 = 1 [Torque Reference/Limit by Comm = Enabled]</i>, the motor cannot rotate.</p>	
F6-07 (03A8)	Multi-Step Ref @ NetRef/ComRef	<p>0 : Disable Multi-Step References</p> <p>1 : Enable Multi-Step References</p> <p><b>Note:</b> Default setting of <i>F6-07</i> is 1 for GA500.</p>	0 (0, 1)
F6-08 (036A)	Comm Parameter Reset @Initialize	<p>Selects whether communication-related parameters <i>F6-xx</i> and <i>F7-xx</i> are set back to original default values when you use parameter <i>A1-03 [Initialize Parameters]</i> to initialize the drive.</p> <p>0 : No Reset - Parameters Retained</p> <p>1 : Reset - Back to Factory Default</p> <p><b>Note:</b> When you set <i>F6-08</i> to 1 and you then use <i>A1-03</i> to initialize the drive, the drive will not change this setting value.</p>	0 (0, 1)
F6-35 (03D0)	CANopen Node ID Selection	<p>Sets the node address for CANopen communication. Restart the drive after you change the parameter setting.</p> <p><b>Note:</b> Be sure to set an address that is different than all other node addresses. Do not set this parameter to 0. Incorrect parameter settings will cause <i>AEr [Station Address Setting Error]</i> errors and the L.ERR LED on the option will come on.</p>	0 (0 - 126)
F6-36 (03D1)	CANopen Communication Speed	<p>Sets the CANopen communications speed. Restart the drive after you change the parameter setting.</p> <p>0 : Auto-detection</p> <p>1 : 10 kbps</p> <p>2 : 20 kbps</p> <p>3 : 50 kbps</p> <p>4 : 125 kbps</p> <p>5 : 250 kbps</p> <p>6 : 500 kbps</p> <p>7 : 800 kbps</p> <p>8 : 1 Mbps</p>	6 0 (0 - 8)
o1-03 (0502)	Frequency Display Unit Selection	<p>Sets the display units for the frequency reference and output frequency.</p> <p>0 : 0.01 Hz</p> <p>1 : 0.01% (100% = E1-04)</p> <p>2 : Revolutions Per Minute (RPM)</p> <p>3 : User units (Set with o1-10, o1-11)</p>	Determined by A1-02 (0 - 3)

## 7 Bit Rate and Node ID Setup

### ◆ Bit Rate Setup

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

### ■ Setting the Bit Rate Manually

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

Table 7.1 Bit Rate Setting

No.	Name	Description	Default
F6-36	CANopen Communication Speed	<p>0: Auto-detection <sup>*1</sup></p> <p>1: 10 kbps</p> <p>2: 20 kbps</p> <p>3: 50 kbps</p> <p>4: 125 kbps</p> <p>5: 250 kbps</p> <p>6: 500 kbps</p> <p>7: 800 kbps</p> <p>8: 1 Mbps</p>	6

\*1 Available in option software version 3102 and later.  
Disabled in option software versions up to 3101.

## ■ Using Automatic Bit Rate Detection

### Note:

Available in option software version 3102 and later.

Set  $F6-36 = 0$  [*CANopen Communication Speed = Auto-detection*] to enable automatic bit rate detection and cycle the drive power supply. When set to automatic bit rate detection, after power up the option will listen to messages on the bus and adjust its bit rate setting automatically.

When the bit rate is found the option will enter pre-operational status and transmit a boot up message containing the drive's node ID. The option will not send any messages until the bit rate is detected.

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

### Note:

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

## ◆ Node ID Setup

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

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

### Note:

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

# 8 Object Dictionary

## ◆ Object Dictionary Overview

The Object Dictionary consists of three sections:

- Communication Profile Objects
- Manufacturer Specific Profile Objects
- Drive and Motion Profile Objects

The tables below provide an overview of the communication objects available in the SI-S3 option.

### ■ Communication Profile Objects (DS 301)

Refer to *Communication Profile Objects (DS 301) on page 31* for further details on Communication Profile Objects.

Index (Hex.)	Name
1000	Device Type
1001	Error Register
1003	Pre-defined Error Field
1005	COB-ID SYNC Message
1008	Manufacturer Device Name
1009	Manufacturer Hardware Version
100A	Manufacturer Software Version
100C	Guard Time
100D	Life Time Factor
100E	Node Guarding Identifier
1010	Store Parameters

Index (Hex.)	Name
1011	Restore Default Parameters
1014	COB-ID Emergency Object
1016	Consumer Heartbeat Time
1017	Producer Heartbeat Time
1018	Identity Object

■ **Manufacturer Specific Profile Objects (DS 301)**

Refer to *Manufacturer Specific Profile Objects (DS 301) on page 35* for further details on Manufacturer Specific Profile Objects.

Index (Hex.)	Name	
Input	2000	Operation Command
	2010	Speed Command
	2020	Torque Reference/Torque Limit
	2030	Torque Compensation
	2040	MEMOBUS/Modbus Read Command
	2050	MEMOBUS/Modbus Write Command
	2060	MEMOBUS/Modbus Unlimited Enter Command
	2070	MEMOBUS/Modbus Limited Enter Command <sup>*1</sup>
	2080 <sup>*2</sup>	Selectable (default: none)
	2090 <sup>*2</sup>	Selectable (default: none)
	20A0 <sup>*2</sup>	Selectable (default: none)
	20B0 <sup>*2</sup>	Selectable (default: none)
	20C0 <sup>*2</sup>	Selectable (default: none)
	3000 <sup>*2</sup>	Selectable (default: none)
	3100 <sup>*2</sup>	Selectable (default: none)
Output	2100	Drive Status
	2101 <sup>*2</sup>	Drive Status (Change of State filter support)
	2110	Output Frequency
	2111 <sup>*2</sup>	Output Frequency (Change of State filter support)
	2120	Output Current
	2121 <sup>*2</sup>	Output Current (Change of State filter support)
	2130	Torque Reference
	2131 <sup>*2</sup>	Output Torque (Change of State filter support)
	2140	MEMOBUS/Modbus Read Command Response
	2150	MEMOBUS/Modbus Write Command Response
	2155 <sup>*2</sup>	PDO Parameter Write Response
	2160	MEMOBUS/Modbus not limited enter command response
	2180 <sup>*2</sup>	Selectable (default: Input terminal status)
	2190 <sup>*2</sup>	Selectable (default: Analog input 1 monitor)
	21A0 <sup>*2</sup>	Selectable (default: none)
	21B0 <sup>*2</sup>	Selectable (default: none)
	21C0 <sup>*2</sup>	Selectable (default: none)
	21D0 <sup>*2</sup>	Selectable (default: none)
	21E0 <sup>*2</sup>	Selectable (default: none)
	21F0 <sup>*2</sup>	Selectable (default: none)
2200	Motor Speed <sup>*3</sup>	

Index (Hex.)	Name
2201 *2	Motor Speed (Change of State filter support) *3

- \*1 The maximum number of times data can be written to the EEPROM used for the drive is 100,000 times. Do not use this write command frequently.
- \*2 Available in option software version 3102 and later.
- \*3 Units for motor speed are determined by *o1-03*. If the control mode for the drive is set to PM Open Loop Vector Control (*A1-02 = 5*), or if V/f control with simple PG feedback is disabled (*H6-01≠3*) in V/f Control (*A1-02 = 0*), the motor speed will be 0.

## ■ Drives and Motion Profile Objects (DSP 402)

The drive supports the Drive and Motion Profile DSP 402 Velocity Mode. Before using the Velocity Mode objects the following parameters have to be set up in the drive. If these settings are not done properly, the Velocity Mode objects cannot be used or deliver wrong data.

- Motor Pole Count
  - *E2-04*
  - *E4-04 for motor 2*
  - *E5-04 for PM motor*
  - *E9-08 in EZ Open Loop Vector Control \*1*
- The frequency reference and output frequency display unit has to be set to  $\text{min}^{-1}$  by setting parameter *o1-03 = 2* [*Frequency Display Unit Selection = Revolutions Per Minute (RPM)*].

\*1 EZ Open Loop Vector Control is only available in GA500, GA700, GA800 and FP605 drives.

Refer to [Drives and Motion Profile Objects \(DSP 402\) on page 41](#) for further details on Drives and Motion Profile Objects.

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

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

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

## ◆ Communication Profile Objects (DS 301)

### ■ 1000 (Hex.) - Device Type

This object describes the type of device and its functionality. It is composed of a first 16 bit field that describes the device profile used and a second 16 bit field that gives additional information regarding optional functionality.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1000	-	Device Type	Read Only	Not possible	Unsigned 32

### ■ 1001 (Hex.) - Error Register

This register shows the fault status of the device. If any errors occur in the device, bit 0 (generic error) is set to one.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1001	-	Error register	Read Only	Possible	Unsigned 8

### ■ 1003 (Hex.) - Pre-defined Error Field

The subindex of this object shows the errors that occurred in the device.

Subindex 0 contains the number of errors. Subindexes 1 to FF contain a rolling list of error codes where subindex 1 always contains the last error that occurred. For Error Codes, please refer to [Table 8.1](#).

To reset the error field, write 0 to subindex 0.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1003	0	Number of errors	Read/Write	Not possible	Unsigned 8
	1	Standard error field <i>*1</i>	Read Only		Unsigned 32

\*1 For details of the error codes, refer to [Table 8.1](#).

**Table 8.1 Option Error Codes**

Error Code (Hex.)	Object Name	Drive Display
2220	Overcurrent	oC
2221	Drive Overload	oL2
2310	Motor Overload	oL1
2311	Overtorque Detection 1	oL3
2312	Overtorque Detection 2	oL4
2330	Ground Fault	GF
3130	Input Phase Loss	PF
3210	Overvoltage	ov
3220	DC Bus Undervoltage	Uv1
3221	Soft Charge Answerback Fault	Uv3
3300	Output Phase Loss	LF
4210	Heatsink Overheat	oH1
4280	Heatsink Overheat	oH
4310	Motor Overheat Fault (PTC Input)	oH4
4410	Braking Resistor Overheat	rH
5200	Control Power Undervoltage	Uv2
5300	Keypad Connection Fault	oPr
5420	Dynamic Braking Transistor Fault	rr
5441	External Fault (Terminal S3)	EF3
5442	External Fault (Terminal S4)	EF4
5443	External Fault (Terminal S5)	EF5
5444	External Fault (Terminal S6)	EF6
5445	External Fault (Terminal S7)	EF7
5446	External Fault (Terminal S8)	EF8
5481	Option Card External Fault	EF0
5530	EEPROM Write Error	Err
6000	Other faults	-
6301	Error during object content selection	-
7180	Overspeed (control mode using PG)	oS
7305	Encoder (PG) Feedback Loss (control mode using PG)	PGo



Error Code (Hex.)	Object Name	Drive Display
8313	Zero Servo Fault	SvE
8321	Speed Deviation (control mode using PG)	dEv
FF01	Motor Overheat (PTC Input)	oH3
FF02	PID Feedback Loss	FbL
FF03	Undertorque Detection 1	UL3
FF04	Undertorque Detection 2	UL4
FF05	High Slip Braking Overload	oL7
FF06	Control Fault	CF
FF07	Option Communication Error	bUS
FF08	Modbus Communication Error	CE
FF0D	External Fault (Terminal S1)	EF1
FF0E	External Fault (Terminal S2)	EF2
FF32	Z Pulse Fault (Closed Loop Vector Control for Permanent Magnet Motors)	dv1
FF33	Z Pulse Noise Fault Detection (Closed Loop Vector Control for Permanent Magnet Motors)	dv2
FF34	Inversion Detection (Closed Loop Vector Control for Permanent Magnet Motors)	dv3
FF35	Inversion Prevention Detect (Closed Loop Vector Control for Permanent Magnet Motors)	dv4
FF36	Output Current Imbalance	LF2
FF37	Motor Step-Out Detected 2	STo
FF38	Encoder (PG) Feedback Loss	PGo
FF3B	Speed Search Retries Exceeded	SEr
FF41	PID Feedback Loss	FbH
FF44	Mechanical Weakening Detection 1	oL5
FF45	Mechanical Weakening Detection 2	UL5
FF46	Current Offset Fault	CoF
FF47	PLC Fault 1	PE1
FF49	DriveWorksEZ Fault	dWFL
FF4E	Braking Resistor Fault	RF
FF4F	Braking Transistor Overload Fault	boL
FF52	Node Setup Error	nSE

### ■ 1005 (Hex.) - COB-ID SYNC Message

This object defines the COB-ID of the synchronization object (SYNC), and whether the device generates the SYNC message.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1005	-	COB-ID SYNC message	Read/Write	Not possible	Unsigned 32

### ■ 1008 (Hex.) - Manufacturer Device Name

This object contains the manufacturer device name.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1008	-	Manufacturer device name	Read Only	Not possible	Visible string

### ■ 1009 (Hex.) - Manufacturer Hardware Version

This object contains the manufacturer hardware version.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1009	-	Manufacturer hardware version	Read Only	Not possible	Visible string

### ■ 100A (Hex.) - Manufacturer Software Version

This object contains the manufacturer software version.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
100A	-	Manufacturer software version	Read Only	Not possible	Visible string

### ■ 100C (Hex.) - Guard Time

This object contains the guard time.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
100C	-	Guard time	Read/Write	Not possible	Unsigned 16	1 ms

### ■ 100D (Hex.) - Life Time Factor

This object contains the life time factor. Multiplied with the guard time, it sets the time within the option expects a node guarding message. If the node guarding message is not received an error will be generated.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
100D	-	Life time factor	Read/Write	Not possible	Unsigned 8

### ■ 100E (Hex.) - Node Guarding Identifier

This object defines the identifier for the node guarding.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
100E	-	Node guarding identifier	Read Only	Not possible	Unsigned 32

### ■ 1010 (Hex.) - Store Parameters

By writing "save" (s = 73 (Hex.), a = 61 (Hex.), v = 76 (Hex.), e = 65 (Hex.)) to this object, the option settings are saved in the non-volatile memory. The option will operate using these settings when a Reset Node or Reset Communications command is performed, or when the power supply is cycled.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1010	1	Store Parameters	Read/Write	Not possible	Unsigned 32

### ■ 1011 (Hex.) - Restore Default Parameters

Use this object to restore parameters to their defaults. Writing "load" (l = 6C (Hex.), o = 6F (Hex.), a = 61 (Hex.), d = 64 (Hex.)) to subindex 1 will restore the option default settings.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1011	1	Restore Default Parameters	Read/Write	Not possible	Unsigned 32

### ■ 1014 (Hex.) - COB-ID Emergency Object

This object defines the COB-ID of the emergency object.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1014	-	COB-ID Emergency Object	Read Only	Not possible	Unsigned 32

### ■ 1016 (Hex.) - Consumer Heartbeat Time

This object defines the Consumer heartbeat time. It must be set to a higher value than the producer heartbeat time set in the master. When set to 0, consumer heartbeat is disabled.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
1016	1	Consumer Heartbeat Time	Read/Write	Not possible	Unsigned 32	1 ms

### ■ 1017 (Hex.) - Producer Heartbeat Time

This object determines the cycle time the option uses to produce a heartbeat signal. When set to 0, the option does not produce a heartbeat signal.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
1017	-	Producer Heartbeat Time	Read/Write	Not possible	Unsigned 16	1 ms

### ■ 1018 (Hex.) - Identity Object

This object contains general information about the drive.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
1018	1	Identity Object	Read Only	Not possible	Unsigned 32

## ◆ Manufacturer Specific Profile Objects (DS 301)

The CANopen (SI-S3) option offers the manufacturer-specific objects listed below. These objects are specific to Yaskawa products and therefore not available on other CANopen products.

The manufacturer-specific object list consists of objects that have predefined, non-changeable content and objects that are freely configurable. The content of freely configurable objects can be determined by linking these objects to drive parameters, monitors or MEMOBUS/Modbus. Refer to [Selectable Object Content on page 44](#) for more information.

Input objects are processed in a cycle of 2 ms.

Output objects are, depending on the object, updated in a cycle of either 2 ms or 8 ms. The update cycle cannot be changed.

Some of the output objects support a *Change of State* filter that can be used to reduce the bus traffic when quickly-changing values such as the output current and motor speed are mapped to TxPDOs with *Change of State* (transmission type: FE (Hex.)) enabled. Refer to [Change of State Filter on page 47](#) and [Transmission Type FE \(Hex.\) for Transmit PDOs on page 47](#) for more information.

#### Note:

Freely configurable object content and the object *Change of State* filter function are available in option software version 3102 and later.

### ■ 2000 (Hex.) - Operation Command

This object is used to start and stop the drive, to control the multi-function digital input terminals, and to trigger and reset faults.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2000	0	Operation Command	Read/Write	Possible	2 byte

Bit No. (Hex.)	Content	Description
0	Forward Run	1: Forward Run 0: Stop (Enabled when b1-02 = 3)
1	Reverse Run	1: Reverse Run 0: Stop (Enabled when b1-02 = 3)
2	Terminal S3 Function	Multi-Function Input: H1-03
3	Terminals S4 Function	Multi-Function Input: H1-04
4	Terminal S5 Function	Multi-Function Input: H1-05
5	Terminal S6 Function	Multi-Function Input: H1-06
6	Terminal S7 Function	Multi-Function Input: H1-07
7	Terminal S8 Function	Multi-Function Input: H1-08
8	External Fault (Option Card External Fault)	1: Option Card External Fault (EF0)
9	Fault Reset	1: Fault Reset
A - F	Not used	-

### ■ 2010 (Hex.) - Frequency Reference

Sets the frequency reference. The unit of this value depends on the setting of *o1-03*.

Enabling this parameter allows *d5-01 [Torque Control Selection]* to determine whether the value is read as the Frequency Reference value or the Speed Limit value.

*d5-01 = 0 [Torque Control Selection = Speed Control]:* Frequency Reference

*d5-01 = 1 [Torque Control Selection = Torque Control]: Speed Limit*

**Note:**

Torque control function availability of this parameter is different for different product series and control modes. Refer to the drive manuals for more information.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2010	0	Frequency Reference	Read/Write	Possible	2 byte

### ■ 2020 (Hex.) - Torque Reference/Torque Limit

This object sets the torque reference or the torque limit in units of 0.1%. (Closed Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector)

Only usable when *F6-06 = 1 [Torque Reference/Limit by Comm = Enabled]*.

Enabling this parameter allows *d5-01 [Torque Control Selection]* to determine whether the value is read as the Torque Limit value or the Torque Reference value.

*d5-01 = 0 [Torque Control Selection = Speed Control]: Torque Limit*

*d5-01 = 1 [Torque Control Selection = Torque Control]: Torque Reference*

**Note:**

Torque control/limit function availability of this parameter is different for different product series and control modes. Refer to the drive manuals for more information.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2020	0	Torque Reference/Torque Limit	Read/Write	Possible	2 byte

### ■ 2030 (Hex.) - Torque Compensation

This object sets the torque compensation in units of 0.1%. (Closed Loop Vector, Advanced Open Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector)

Only usable when *F6-06 = 1 [Torque Reference/Limit by Comm = Enabled]*.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2030	0	Torque Compensation	Read/Write	Possible	2 byte

### ■ 2040 (Hex.) - MEMOBUS/Modbus Read Request

This object contains the data of the drive MEMOBUS/Modbus register specified in object 2140 (Hex.).

You must write the address of the MEMOBUS/Modbus in bytes 3 and 4 of Subindex 1, and set bytes 1 and 2 to 0. The PLC reads the drive output frequency at register at 2040 (Hex.). After sending a MEMOBUS/Modbus Read Request to the drive, you can read the MEMOBUS/Modbus register content from object 2140 (Hex.).

For more information about MEMOBUS/Modbus addresses and data, refer to the Technical Manual for your drive.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2040	0	Number of entries	Read Only	Possible	1 byte
	1	MEMOBUS/Modbus Read Command	Read/Write		2 + 2 byte 0000 (Hex.) + MEMOBUS/Modbus Address

### ■ 2050 (Hex.) - MEMOBUS/Modbus Write Request

Using this object, drive MEMOBUS/Modbus registers can be written. The data must be written in byte 1 and 2 of Subindex 1, and the MEMOBUS/Modbus address must be written in bytes 3 and 4. After sending a MEMOBUS/Modbus Write Request to the drive, the response can be read from object 2050 (Hex.).

For more information about MEMOBUS/Modbus addresses and data, refer to the Technical Manual for your drive.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2050	0	Number of entries	Read Only	Possible	1 byte
	1	MEMOBUS/Modbus Write request	Read/Write		2 + 2 byte MEMOBUS/Modbus Data + Address

### ■ 2060 (Hex.) - MEMOBUS/Modbus Unlimited ENTER Command

An ENTER command must be used to activate drive parameters changed via MEMOBUS/Modbus Write Commands. The unlimited ENTER command activates parameters in the drive RAM only. If more than one parameter has been changed, it is enough to send only one ENTER command after the last parameter change. Doing so will activate all changed parameters.

This ENTER command can be used without limitations.

To execute this type of ENTER command, "save" (73 (Hex.) + 61 (Hex.) + 76 (Hex.) + 65 (Hex.)) must be written in object 2060 (Hex.), subindex 0.

If the drive power is cycled, parameter changes are lost.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2060	0	Unlimited ENTER command	Read/Write	Possible	4 byte

### ■ 2070 (Hex.) - MEMOBUS/Modbus Limited ENTER Command

According to the setting of *H5-11*, use the ENTER command to enable the parameters changed by the MEMOBUS/Modbus write command.

The limited ENTER command activates parameters in the drive RAM and saves them to the EEPROM. When power supply loss occurs or the power supply is cycled, the drive will operate using the saved parameters. If more than one parameter has been changed, it is enough to send only one ENTER command after the last parameter change. Doing so will activate all changed parameters.

This type of ENTER command can be applied approximately 100,000 times.

To execute this type of ENTER command, "save" (73 (Hex.) + 61 (Hex.) + 76 (Hex.) + 65 (Hex.)) must be written in object 2070 (Hex.), subindex 0.

The saved data is not cleared after the power turns OFF.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2070	0	Limited enter command	Read/Write	Possible	4 byte

### ■ 2080 (Hex.) to 3100 (Hex.) - Freely Configurable Input Objects

The content of these objects can be freely selected by linking them to drive MEMOBUS/Modbus registers.

Refer to [Selecting the Object Content on page 44](#) for more information.

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length
2080 *1	0	Number of entries	2	Read Only	Not possible	1 byte
	1	Data	-	Read/Write	Possible	4 byte
	2	MEMOBUS/Modbus address of content 1 and 2	FFFF (Hex.)/FFFF (Hex.)	Read/Write *2	Not possible	4 byte
2090 - 20C0, 3000, 3100 *1	0	Number of entries	2	Read Only	Not possible	1 byte
	1	Data	-	Read/Write	Possible	2 byte
	2	MEMOBUS/Modbus address of content	FFFF (Hex.)	Read/Write *2	Not possible	2 byte

\*1 Available in option software version 3102 and later.

\*2 Read / Write access when SI-S3 is in the Pre-Operational state, Read only access if the SI-S3 is in the Operational state or if the drive is running.

Read only access if the option is in the Operational state or if the drive is running.

### ■ 2100 (Hex.)/2101 (Hex.) - Drive Status

These objects can be used to monitor the drive status.

For the value in object 2101 (Hex.), a *Change of State* filter can be set up as explained in [Change of State Filter on page 47](#).

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2100	0	Drive Status *2	-	Read Only	Possible	2 byte	2 ms
2101 *1	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Drive Status *2	-	Read Only	Possible	2 byte	2 ms

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
	2	MEMOBUS/Modbus register address for content MEMOBUS/Modbus address	00FC (Hex.)	Read Only	Not possible	2 byte	-
	3	Filter value	0	Read/Write *3	Not possible	2 byte	-
	4	Filter type	1 (Bitmask)	Read/Write *3	Not possible	2 byte	-

\*1 Available in option software version 3102 and later.

\*2 For details of the drive status, refer to [Table 8.2](#).

\*3 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

**Table 8.2 Drive Status**

Bit No. (Hex.)	Content	Description
0	Running	1: Running 0: Not Running
1	Zero Speed	1: Zero Speed
2	Reverse Running	1: Reverse Running 0: Forward Running
3	During Reset Signal Input	1: During Reset Signal Input
4	Speed Agree	1: During Speed Agree
5	Drive Ready	1: Ready 0: Not Ready
6	Alarm	1: During Alarm
7	Fault	1: During Fault
8	Operation Error [oPE]	1: Operation Error [oPE] Generated
9	Recovery from Momentary Power Loss	1: Recovery from Momentary Power Loss 0: Power Loss Recovery
A	NetCtrl Status	1: NetCtrl
B	Digital Output 1 Status (function set in drive parameter H2-01)	1: ON 0: OFF
C	Digital Output 2 Status (function set in drive parameter H2-02)	1: ON 0: OFF
D	Digital Output 3 Status (function set in drive parameter H2-03)	1: ON 0: OFF
E	Motor 2 Selected	1: Motor 2 Selected
F	Zero Servo Completed	1: Zero Servo Completed

## ■ 2110 (Hex.)/2111 (Hex.) - Output Frequency

This object monitors the drive output frequency. The units used for the monitor value are determined by drive parameter *o1-03*.

For the value in object 2111 (Hex.), a Change of State filter can be set up as explained in [Change of State Filter on page 47](#).

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2110	0	Output Frequency	-	Read Only	Possible	2 byte	2 ms
2111 *1	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Output Frequency	-	Read Only	Possible	2 byte	2 ms
	2	MEMOBUS/Modbus address for output frequency	0041 (Hex.)	Read Only	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write *2	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write *2	Not possible	2 byte	-

\*1 Available in option software version 3102 and later.

\*2 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

## ■ 2120 (Hex.)/2121 (Hex.) - Output Current

This object monitors the drive output current. The current value resolution is the same as drive monitor *UI-03*. For details, refer to the Technical Manual for the drive.

For the value in object 2121 (Hex.), a *Change of State* filter can be set up as explained in [Change of State Filter on page 47](#).

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2120	0	Output Current	-	Read Only	Possible	2 byte	8 ms
2121 *1	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Output Current	-	Read Only	Possible	2 byte	8 ms
	2	MEMOBUS/Modbus address for output current	00FB (Hex.)	Read Only	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write *2	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write *2	Not possible	2 byte	-

\*1 Available in option software version 3102 and later.

\*2 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

## ■ 2130 (Hex.)/2131 (Hex.) - Output Torque Reference

These objects can be used to monitor the output torque reference. (Open Loop Vector, Closed Loop Vector, Advanced Open Loop Vector, PM Advanced Open Loop Vector, PM Closed Loop Vector, EZ Vector Control)

For the value in object 2131 (Hex.), a *Change of State* filter can be set up as explained in [Change of State Filter on page 47](#).

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2130	0	Torque Reference	-	Read Only	Possible	2 byte	8 ms
2131 *1	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Torque Reference	-	Read Only	Possible	2 byte	8 ms
	2	MEMOBUS/Modbus address for output torque	0048 (Hex.)	Read Only	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write *2	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write *2	Not possible	2 byte	-

\*1 Available in option software version 3102 and later.

\*2 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

## ■ 2140 (Hex.) - MEMOBUS/Modbus Read Response

This object contains the data of the drive MEMOBUS/Modbus register specified in object 2040 (Hex.).

Bytes 1 and 2 of subindex 1 will contain the data, and bytes 3 and 4 will contain the MEMOBUS/Modbus Address that was read.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2140	0	Number of entries	Read Only	Possible	1 byte
	1	MEMOBUS/Modbus Read Command Response			2 + 2 byte MEMOBUS/Modbus Data + Address

## ■ 2150 (Hex.) - MEMOBUS/Modbus Write Response

This object contains the response from the drive when writing a drive parameter with a MEMOBUS/Modbus write command (object 2050 (Hex.)). Bytes 1 and 2 of subindex 1 will contain the data that was written, and bytes 3 and 4 will contain the MEMOBUS/Modbus Address that was written to.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2150	0	Number of entries	Read Only	Possible	1 byte

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
	1	MEMOBUS/Modbus Write Command Response			2 + 2 byte MEMOBUS/Modbus Data + Address

### ■ 2155 (Hex.) - PDO Parameter Write Response

**Note:**

Available in option software version 3102 and later.

This object contains the response from the drive when writing a drive parameter directly using a RxPDO.

Byte 1 contains the lower byte and byte 2 contains the higher byte of the message identifier (COB-ID) for the message that contains the parameter write request. Byte 3 contains the number of errors.

This object can only be read if the option is in the Operational state.

Refer to [Transmission Type FE \(Hex.\) for Transmit PDOs on page 47](#) for details on writing parameters using PDOs.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2155	0	PDO Parameter Write Response (COB-ID of the RxPDO and number of errors)	Read Only	Possible	3 byte

### ■ 2160 (Hex.) - MEMOBUS/Modbus Unlimited Enter Command Response

Object 2160 (Hex.) contains the response from the drive when you use object 2060 (Hex.) to write an Enter command.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2160	0	MEMOBUS/Modbus not limited enter command response	Read Only	Possible	4 byte

### ■ 2180 (Hex.) to 21F0 (Hex.) - Freely Configurable Output Objects

**Note:**

Available in option software version 3102 and later.

The content of these objects can be freely selected by linking them to drive MEMOBUS/Modbus registers.

For objects with 2-byte values except 21F0 (Hex.), a *Change of State* filter can be applied. Refer to [Change of State Filter on page 47](#) for more information.

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2180	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Data	Input Terminal Status	Read Only	Possible	2 byte	8 ms
	2	MEMOBUS/Modbus address of content	0049 (Hex.)	Read/Write <i>*I</i>	Not possible	2 byte	-
	3	Filter value	0	Read/Write <i>*I</i>	Not possible	2 byte	-
	4	Filter type	1 (Bitmask)	Read/Write <i>*I</i>	Not possible	2 byte	-
2190	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Data	Analog Input 1 Monitor	Read Only	Possible	2 byte	8 ms
	2	MEMOBUS/Modbus address of content	004E (Hex.)	Read/Write <i>*I</i>	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write <i>*I</i>	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write <i>*I</i>	Not possible	2 byte	-
21A0	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Data	-	Read Only	Possible	2 byte	8 ms
	2	MEMOBUS/Modbus address of content	FFFF (Hex.)	Read/Write <i>*I</i>	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write <i>*I</i>	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write <i>*I</i>	Not possible	2 byte	-
21B0 - 21E0	0	Number of entries	4	Read Only	Not possible	1 byte	-



Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
	1	Data	-	Read Only	Possible	2 byte	2 ms
	2	MEMOBUS/Modbus address of content	FFFF (Hex.)	Read/Write *1	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write *1	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write *1	Not possible	2 byte	-
21F0	0	Number of entries	2	Read Only	Not possible	1 byte	-
	1	byte 1, 2: Value for assignment 1 byte 3, 4: Value for assignment 2	-	Read Only	Possible	4 byte	8 ms
	2	byte 1, 2: MEMOBUS/Modbus address for assignment 1 byte 3, 4: MEMOBUS/Modbus address for assignment 2	FFFF (Hex.)/FFFF (Hex.)	Read/Write *1	Not possible	4 byte	-

\*1 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

## ■ 2200 (Hex.)/2201 (Hex.) - Motor Speed

These objects can be used to monitor the motor speed.

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

For the value in object 2201 (Hex.), a *Change of State* filter can be set up as explained in [Change of State Filter on page 47](#).

Index (Hex.)	Subindex	Content	Default	Access	PDO Mapping	Data Length	Update Cycle
2200	0	Motor Speed	-	Read Only	Possible	2 byte	2 ms
2201 *1	0	Number of entries	4	Read Only	Not possible	1 byte	-
	1	Motor Speed	-	Read Only	Possible	2 byte	2 ms
	2	MEMOBUS/Modbus address for motor speed	0044 (Hex.)	Read Only	Not possible	2 byte	-
	3	Filter value	FFFF (Hex.)	Read/Write *2	Not possible	2 byte	-
	4	Filter type	0 (Analog)	Read/Write *2	Not possible	2 byte	-

\*1 Available in option software version 3102 and later.

\*2 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

## ◆ Drives and Motion Profile Objects (DSP 402)

The drive supports the Drive and Motion Profile DSP 402 Velocity Mode. Before using the Velocity Mode objects the following parameters have to be set up in the drive. If these settings are not done properly, the Velocity Mode objects cannot be used or deliver wrong data.

### • Motor Pole Count

- E2-04 [Motor Pole Count]
- E4-04 [Motor 2 Motor Poles] for motor 2
- E5-04 [PM Motor Pole Count] for PM motor
- E9-08 [Motor Pole Count] in EZ Open Loop Vector Control \*1

### • The frequency reference and output frequency display unit has to be set to min<sup>-1</sup> by setting parameter *o1-03* = 2 [*Frequency Display Unit Selection = Revolutions Per Minute (RPM)*].

\*1 EZ Open Loop Vector Control is only available in YASKAWA AC Drive GA500, GA700, GA800 and FP605.

#### Note:

Drive and Motion Control (DSP 402) cannot be set or referenced unless *o1-03* = 2.

### ■ 6040 (Hex.) - Controlword

This object sets the device to different states.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
6040	0	Controlword	Read/Write	Possible	0...65535

### ■ 6041 (Hex.) - Statusword

This object shows different states of the device.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
6041	0	Statusword	Read Only	Possible	0...65535

### ■ 6042 (Hex.) - vl Target Velocity

This object sets the speed reference and the Run command. It is internally multiplied with the 604C (Hex.) vl dimension factor. Can be set when the status in Controlword 6040 (Hex.) is "Operation Enable".

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6042	0	vl target velocity	Read/Write	Possible	-32768...0 32767	min <sup>-1</sup>

### ■ 6043 (Hex.) - vl Velocity Demand

The vl velocity effort is the output frequency of the drive to the motor.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6043	0	vl velocity demand	Read Only	Possible	-32768...0 32767	min <sup>-1</sup>

### ■ 6044 (Hex.) - vl Control Effort

The vl control effort is the motor speed.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6044	0	vl control effort	Read Only	Possible	-32768...0 32767	min <sup>-1</sup>

### ■ 6046 (Hex.) - vl Velocity Min Max Amount

This object provides two subindexes to set the minimum and maximum speed reference in min<sup>-1</sup>.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6046	1	vl velocity min amount	Read/Write	Possible	0...(2 <sup>32</sup> - 1)	min <sup>-1</sup>
	2	vl velocity max amount				

### ■ 6048 (Hex.) - vl Velocity Acceleration

The quotient of the subindexes delta speed and delta time determines the acceleration time. The object values correspond to the acceleration time setting in the drive. Delta time is always fixed at 1.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6048	1	Delta speed	Read/Write	Possible	0...(2 <sup>32</sup> - 1)	min <sup>-1</sup>
	2	Delta time				

### ■ 6049 (Hex.) - vl Velocity Deceleration

The vl velocity min max amount specifies the deceleration time. The quotient of the subindexes delta speed and delta time determines the deceleration time. The object values correspond to the deceleration time setting in the drive. Delta time is always fixed at 1.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
6049	1	Delta speed	Read/Write	Possible	0...(2 <sup>32</sup> - 1)	min <sup>-1</sup>

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
	2	Delta time			0...65535	sec

### ■ 604A (Hex.) - vI Velocity Quick Stop

The quotient of the subindexes delta speed and delta time determines the quick stop ramp time. The object values correspond to the fast stop time setting in the drive. Delta time is always fixed at 1.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range	Unit
604A	1	Delta speed	Read/Write	Possible	0...(2 <sup>32</sup> - 1)	min <sup>-1</sup>
	2	Delta time			0...65535	sec

### ■ 604C (Hex.) - vI Dimension Factor

The quotient of the subindexes vI dimension factor numerator and vI dimension factor denominator determines the vI dimension factor.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
604C	1	vI dimension factor numerator	Read/Write	Possible	-2 <sup>31</sup> ...(2 <sup>31</sup> - 1)
	2	vI dimension factor denominator			

### ■ 604D (Hex.) - vI Pole Number

The vI pole number sets the number of motor poles and is used to calculate all speed related values in min<sup>-1</sup>. This object sets the number of motor poles and calculates all speed related values in min<sup>-1</sup>. This value aligns with the number of motor poles setting in the drive.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
604D	0	vI pole number	Read/Write	Not possible	2...48

### ■ 6061 (Hex.) - Modes of Operation Display

This object shows the mode of the device. The object supports 2 (Velocity Mode) only.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
6061	0	Modes of operation display	Read Only	Possible	-128...127

### ■ 60FD (Hex.) - Digital Inputs

This object contains the drive digital output status (seen as input to the network). (Input from the network)

The content of this object is equal to drive MEMOBUS/Modbus register 004A (Hex.)/U1-11 (drive output terminal status). It is different for different drive models. For details of the contents of this register refer to the technical manual for the drive.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
60FD	0	Drive digital input status	Read Only	Possible	0...(2 <sup>32</sup> - 1)

Bit No. (Hex.)	Content	Description
0 - F	Not used	-
10 - 1F	Bit 0 to F of drive MEMOBUS/Modbus register 004A (Hex.) (Output terminal status monitor U1-11)	1: ON 0: OFF

### ■ 60FE (Hex.) - Digital Outputs

This object is used to set drive digital inputs (seen as output from the network). (Output to the network)

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Value Range
60FE	1	Drive Digital Input Command	Read/Write	Possible	0...(2 <sup>32</sup> - 1)

Bit No. (Hex.)	Content	Description
0 - 11	Not used	-
12	Terminal S3 Function	Multi-Function Input: H1-03

Bit No. (Hex.)	Content	Description
13	Terminals S4 Function	Multi-Function Input: H1-04
14	Terminal S5 Function	Multi-Function Input: H1-05
15	Terminal S6 Function	Multi-Function Input: H1-06
16	Terminal S7 Function	Multi-Function Input: H1-07
17	Terminal S8 Function	Multi-Function Input: H1-08
18	Option Card External Fault [EF0]	1: Option Card External Fault [EF0]
19	Fault Reset	1: Fault Reset
1A - 1F	Not used	-

## 9 Configuring Manufacturer Specific Objects

This section describes the configuration of manufacturer specific objects that support content selection and *Change of State* filtering.

### Note:

The functions described in this section are available in option software versions 3102 and later.

### ◆ Selectable Object Content

All parameters, monitors and other control registers in the drive are represented by their MEMOBUS/Modbus register. Using the addresses of these registers, the content of some manufacturer-specific objects can be selected. Refer to the drive Technical Manual for details on available MEMOBUS/Modbus registers.

### ■ Selecting the Object Content

Objects with selectable content have the following structure:

Object Type	Subindex	Content	Access	PDO Mapping	Data Length
2 byte	0	Number of entries	Read Only	Not possible	1 byte
	1	Data	depends on object	Possible	2 byte
	2	MEMOBUS/Modbus address of content	Read/Write *1	Not possible	2 byte
4 byte	0	Number of entries	Read Only	Not possible	1 byte
	1	Data	depends on object	Possible	4 byte
	2	MEMOBUS/Modbus address of content 1 and 2	Read/Write *1	Not possible	4 byte

\*1 Read/Write access when the option is in the Pre-Operational state.

Read only access if the option is in the Operational state or if the drive is running.

To map the content of a specific MEMOBUS/Modbus register of the drive to subindex 1 of an object, the MEMOBUS/ Modbus register address must be written to subindex 2 of the object.

### Examples

- To map the drive output power monitor (U1-08, 0047 (Hex.)) to output object 21A0 (Hex.), write 0047 (Hex.) to subindex 2 of object 21A0 (Hex.).
- To map the reference 1 (d1-01, 0280 (Hex.)) to input object 2090 (Hex.), write 0280 (Hex.) to subindex 2 of object 2090 (Hex.).
- To map the input terminal status (U1-10, 0049 (Hex.)) and output terminal status (U1-11, 004A (Hex.)) to output object 21F0 (Hex.) (4 Byte), write 0049 (Hex.) to the higher and 004A (Hex.) to the lower word of object 2090 (Hex.), subindex 2.

### ■ Limitations Affecting Object Content Selection

The following limitations must be considered when setting the content of an object.

- The object content can only be changed when the option is in the Pre-Operational state and the drive is stopped (Run command not active).
- The option cannot be switched to the Operational state until the content selection process is complete. If the process is incomplete, it will trigger an emergency message (code 6301 (Hex.))

- When object content selection is ongoing, you cannot send a different request or command, including Run, to the drive. If you send a different request or command, it will trigger an error message or an emergency message (code 6301 (Hex.)).
- If the object content mapping is changed from the default setting and a Reset Node command is issued while Run is active, the drive will first be stopped and then will be reset.
- For 4 byte input objects 2080 (Hex.), MEMOBUS/Modbus register numbers below 0100 (Hex.) can be linked in any combination. If MEMOBUS/Modbus register numbers equal to or greater than 0100 (Hex.) are linked to a 4 byte object 2080 (Hex.), the MEMOBUS/Modbus register numbers must be consecutive.

Mapped Register 1 (Hex.)	Mapped Register 2 (Hex.)	PDO Mapping
0007	0009	Possible
0201	0202	Possible
0202	0201	Not possible
0201	0203	Not possible
0202	0202	Not possible
0200	FFFF	Possible
FFFF	0200	Possible

- Register numbers can be non-consecutive for 4 byte output objects (21F0 (Hex.)).
- A MEMOBUS/Modbus register cannot be mapped to two or more objects at the same time.
- MEMOBUS/Modbus registers 0001 (Hex.), 0002 (Hex.), 0004 (Hex.), 0005 (Hex.), and 0014 (Hex.) cannot be linked to any object with selectable content. Any attempt to map one of those registers to such an input object will result in an error message.

## 10 Process Data Objects (PDO)

### ◆ PDOs and Default PDO Setup

The drive supports 15 Receive and 16 Transmit PDOs.

The tables below show the available PDOs, their default settings, and the objects that need to be set when changing the PDO configuration or the PDO mapping:

### ■ Receive PDOs (RxPDO)

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

PDO Number	Receive PDO Parameter		Receive PDO Mapping	
	COB-ID (Hex.)	Index (Hex.)	Mapped Objects (Hex.)	Index (Hex.)
40	Not assigned	1427	Subindex 1: 2040 sub1	1627
41	Not assigned	1428	Subindex 1: 2050 sub1	1628

■ Transmit PDOs (TxPDO)

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

◆ Receive PDO Configuration and Mapping

A receive PDO can be configured using the corresponding 14xx (Hex.) object, and the mapping can be changed in the 16xx (Hex.) object that belongs to the PDO.

■ PDO Configuration

Index (Hex.)	Subindex	Content	Default	Access	Data Length
14xx	0	Largest subindex supported	2	Read Only	1 byte
	1	COB-ID used by the RxPDO	see Receive PDO table above	Read/Write	4 byte
	2	Transmission type	FE (Hex.)	Read/Write	1 byte

■ PDO Mapping

Index (Hex.)	Subindex	Content	Default	Access	Data Length
16xx	0	Number of mapped RxPDOs	see Receive PDO table above	Read/Write	1 byte
	1 - 40	Data length, subindex, and index of the object to be mapped	see Receive PDO table above	Read/Write	4 byte

**Note:**

When changing the PDO mapping, always first set subindex 0 to "0", then set subindex 1 to subindex n. Then activate the mapping by setting subindex 0 to the number of mapped objects n.

## ◆ Transmit PDO Configuration and Mapping

A transmit PDO can be configured by using the corresponding 18xx (Hex.) object, and the mapping can be changed in the 1Axx (Hex.) object that belongs to the PDO.

### ■ PDO Configuration

Index (Hex.)	Subindex	Content	Default	Access	Data Length
18xx	0	Largest subindex supported	5	Read Only	1 byte
	1	COB-ID used by the TxPDO	see transmit PDO table above	Read/Write	4 byte
	2	Transmission type	depends on PDO	Read/Write	1 byte
	3	Inhibit time (Set as a multiple of 100 us)	0	Read/Write	2 byte
	5	Event timer (Set as a multiple of 1 ms)	0	Read/Write	2 byte

### ■ PDO Mapping

Index (Hex.)	Subindex	Content	Default	Access	Data Length
1Axx	0	Number of mapped PDOs	see transmit PDO table above	Read Only	1 byte
	1 - 40	Data length, subindex, and index of the object to be mapped	see transmit PDO table above	Read/Write	4 byte

**Note:**

When changing the PDO mapping, always first set subindex 0 to "0", then set subindex 1 to subindex n. Then activate the mapping by setting subindex 0 to the number of mapped objects n.

### ■ Transmission Type FE (Hex.) for Transmit PDOs

When the transmission type of a TxPDO is set to FE (Hex.), the PDO is automatically transmitted whenever the value in one of the mapped objects changes.

When this transmission type is used for a TxPDO that is mapped to an object with a *Change of State* filter, the filter can be used to reduce the amount of data transferred if the object value changes quickly. Refer to [Change of State Filter on page 47](#) for more information. The filter must be set to a value that is different from FFFF (Hex.). If a large filter value is applied, then it can be helpful to also set an event timer for the PDO (18xx (Hex.), subindex 5). In this way, the PDO is triggered cyclically even if the change in the value of the linked object does not exceed the filter value. In this way, variations within the filter can still be seen without having a large number of messages sent.

**Note:**

When a Change of State filter and an event timer are used simultaneously, the PDO will be triggered by whichever one is received first, the timer event or the Change of State event. If the PDO is triggered by the Change of State event, the event timer will be reset.

### ■ Change of State Filter

**Note:**

This function is available in option software 3102 and later.

Some Output objects of the Manufacturer Specific Profile support a Change of State filter. If such an object is mapped to a TxPDOs with transmission type FE (Hex.) (Change of State), and the filter is set up, a *Change of State* event is triggered (i.e., the PDO is transmitted) only if the change in the object value exceeds the filter value. Such objects have the following structure and can be set up as explained below.

Index (Hex.)	Subindex	Content	Access	PDO Mapping	Data Length
2101, 2111, 2121, 2131, 2180 - 21E0, 2201	0	Number of entries	Read Only	Not possible	1 byte
	1	Object value	Read Only	Possible	2 byte
	2	MEMOBUS/Modbus address of content	Read/Write *1	Not possible	2 byte
	3	Filter value	Read/Write *1	Not possible	2 byte
	4	Filter type	Read/Write *1	Not possible	2 byte

\*1 Read/Write access when the option is in the Pre-Operational state. Read only access if the option is in the Operational state or if the drive is running.

## Subindex 0: Number of entries

Contains the number of subindex.

## Subindex 1: Object value

This subindex contains the value of the object (value of the MEMOBUS/Modbus register specified in the subindex 2).

## Subindex 2: MEMOBUS/Modbus address of content

This subindex contains the address of the drive MEMOBUS/Modbus register that the object is linked to. Setting FFFF (Hex.) to subindex 2 will disable the object (i.e., the value in subindex 1 will be 0).

## Subindex 3: Filter value

Sets the filter value for the Change of State event if the object is mapped to a TxPDO with transmission type FE (Hex.). When the filter value is set to 0000 (Hex.), the *Change of State* event will be triggered whenever the value of the MEMOBUS/Modbus register specified in subindex 2 changes. When the filter is set to FFFF (Hex.), the *Change of State* event will not be triggered.

## Subindex 4: Filter type

This subindex is used to select the filter type. Two filter types are available, an analog filter and a bitmask filter.

If the analog filter is selected (subindex 4 = 0), the value of the MEMOBUS/Modbus register specified in subindex 2 must change by the amount set in subindex 3 before a *Change of State* event is triggered. The filter has no unit. The resolution depends on the value of the MEMOBUS/Modbus register content.

If the bitmask filter is selected (subindex 4 = 1), the *Change of State* event will be triggered whenever the value of the MEMOBUS/Modbus register specified in subindex 2 changes in any bit except the masked bits. The bitmask is set by the filter value of subindex 3. Bits set to "1" are ignored.

## Examples

Object Content (Subindex 2)	Filter Value (Subindex 3)	Filter Type (Subindex 4)	Resolution of Object Value	Object Value Behavior
Output frequency (0041 (Hex.))	A (Hex.)	0 (Analog)	0.01 Hz	Change of State is triggered when the output frequency changes by more than 0.10 Hz.
Output voltage (0054 (Hex.))	32 (Hex.)	0 (Analog)	0.1 V	Change of State is triggered when the output voltage changes by more than 5.0 V.
Drive Status (0020 (Hex.))	0	1 (Bitmask)	-	Change of State is triggered when any bit in the drive status changes.
Drive Status (0020 (Hex.))	03 (Hex.) 0000 0000 0000 0011 (Bin)	1 (Bitmask)	-	Change of State is triggered by any status change except "Running" (bit 0) and "During Zero Speed" (bit 1).
Drive Status (0020 (Hex.))	09 (Hex.) 0000 0000 0000 1001 (Bin)	1 (Bitmask)	-	Change of State is triggered by any status change except "Running" (bit 0) and "During Fault Reset Input" (bit 3).

# 11 Drive Parameter, Monitor and Control Register Access

All drive parameters, monitors, and other control registers are represented by their MEMOBUS/Modbus register. They can be read or written by accessing these registers through the SI-S3 option.

MEMOBUS/Modbus registers can be directly read or written by using the MEMOBUS/Modbus read/write commands. They can also be mapped to the content of a manufacturer-specific object, and then be accessed by reading from or writing to this object. Refer to [Selecting the Object Content on page 44](#) for details on object content selection.

When writing drive parameters, some general precautions concerning the message timing have to be taken into account.

- The drive needs some time to activate changes to parameter values. When changing multiple parameters, be sure to add a wait time between write requests.
- If an Enter command is issued, be sure to add a wait time between the Enter command and the next message.

Refer to the drive technical manual for more information about MEMOBUS/Modbus addresses available in the drive and the wait times required between parameter write requests and Enter commands.



## ◆ Drive Parameter and Monitor Access by MEMOBUS/Modbus Read/Write Commands

### ■ Reading a Drive Register, Parameter or Monitor

Reading a drive parameter, monitor or control register using a MEMOBUS/Modbus read command requires the following steps:

- Write the address of the drive MEMOBUS/Modbus register to be read to subindex 0 of object 2040 (Hex.).
- Read the value of the drive MEMOBUS/Modbus register from the MEMOBUS/Modbus read response in subindex 1 of object 2140 (Hex.).

Objects 2040 (Hex.) and 2140 (Hex.) can both be mapped to PDOs.

### ■ Writing to a Parameter or Drive Control Register

Writing to drive parameters or control registers can be performed by following the steps below:

- Write the value and the MEMOBUS/Modbus address of the drive parameter or control register to subindex 1 of object 2050 (Hex.).
- Read the MEMOBUS/Modbus write response from subindex 1 of object 2150 (Hex.) to verify that the item was written correctly.

If  $H5-11 = 0$  [Comm ENTER Command Mode = ENTER Command Required], a RAM Enter command (object 2060 (Hex.)) must be issued to enable the change of the parameter setting value. To store the parameter change in the non-volatile memory of the drive, a ROM Enter command (object 2070 (Hex.)) must be issued instead. An Enter command can be issued by performing the steps below.

- Write "save" (73 (Hex.) + 61 (Hex.) + 76 (Hex.) + 65 (Hex.)) to subindex 1 of object 2060 (Hex.) for a RAM Enter command, or to subindex 1 of object 2070 (Hex.) for a ROM Enter command.
- When using a RAM Enter command, read the Enter command response from object 2160 (Hex.) to verify whether the Enter command was successful.

**Note:**

When multiple drive parameters are changed, only one Enter command is required after the last parameter value to activate all parameter changes.

Objects 2050/01 (Hex.), 2060 (Hex.), 2070 (Hex.), 2150/01 (Hex.) and 2160 (Hex.) can be mapped to PDOs.

## ◆ Accessing Drive Parameters and Monitors that are Mapped to Objects

**Note:**

The functions described in this section are available in option software 3102 and later.

When drive items like parameters, monitors, or control registers are mapped to manufacturer-specific objects, they can also be read or written directly by using SDO or PDO messages instead of MEMOBUS/Modbus read/write commands.

### ■ Accessing Drive Parameters, Monitors and Control Registers Using SDOs

A drive parameter, monitor or control register can be accessed by using a normal SDO read or write message on the object it is mapped to. The SDO response will contain the write request answer or error information (e.g., if parameter limits were exceeded, if a read/write access violation occurred, etc.).

**Note:**

If  $H5-11 = 0$  [Comm ENTER Command Mode = ENTER Command Required], an Enter command must be issued to allow the parameter change become active in the drive. When multiple drive parameters are changed, only one Enter command is required after the last parameter value to activate all parameter changes.

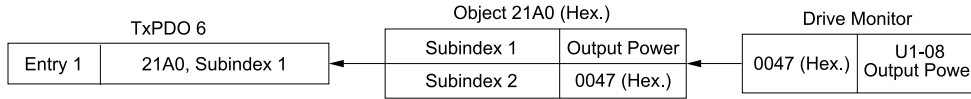
### ■ Accessing Drive Parameters, Monitors and Control Registers Using PDOs

When a drive parameter, monitor, or control register is connected to an object and the object is mapped to a PDO, the connected drive item can be accessed directly by using this PDO.

#### Reading Drive Parameters, Monitors, or Control Registers

In order to read a drive item directly by using a PDO, the object that contains the item must be mapped to a TxPDO. The TxPDO can either be triggered on remote request (RTR) or can be configured to be sent automatically by timer or upon *Change of State* events.

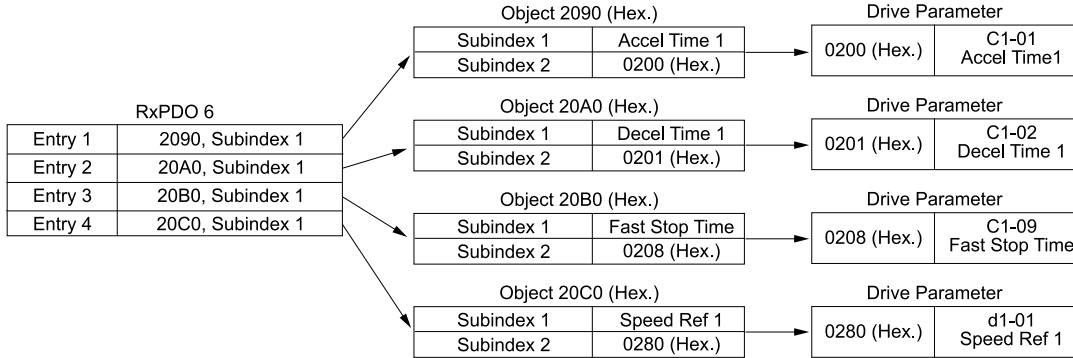
Example: To read the output power monitor *U1-08* via the PDO, the monitor must be mapped to an output object, e.g., 21A0 (Hex.). This object must then be mapped to a PDO, e.g., TxPDO 6.



## Writing Parameters

In order to write a drive parameter directly by using a PDO, the object that contains the drive parameter must be mapped to an RxPDO. Writing data using this RxPDO will change the data in the drive immediately without the need for an Enter command. To store the parameter change in the non-volatile memory of the drive, a ROM Enter command must be issued after the last parameter change.

Up to four objects that are connected to drive parameters can be mapped to one PDO. In the example below, RxPDO 6 is used to write drive parameters C1-01, C1-02, C1-09 and d1-01 simultaneously.



If the PDO contains invalid data, then only the valid data will be written to the drive. Using the example above, if the data for C1-01, C1-09 and d1-01 are valid and the data for C1-02 is out of range, then only parameters C1-01, C1-09 and d1-01 will be changed in the drive, and the data for C1-02 will be ignored.

## Write Response

The PDO write response object allows the user to recognize errors that occur when writing parameters as in the example above. The drive stores the COB-ID of the parameter writing PDO and the number of invalid registers in object 2155 (Hex.), subindex 0. The data configuration of object 2155 (Hex.) is shown in the table below.

Index (Hex.)	Subindex	Byte	Content
2155	0	0	Lower byte of the COB-ID of the parameter write RxPDO
		1	Higher byte of the COB-ID of the parameter write RxPDO
		2	Number of invalid registers

When writing parameters directly by using PDOs, object 2155 (Hex.) should always be used in order confirm that the data has been written correctly. Object 2155 (Hex.) should be mapped to a TxPDO with transmission type FE (Hex.) (Change of State), so that each parameter writing PDO is answered automatically and write errors can be easily detected.

### Note:

- Object 2155 (Hex.) will only be refreshed when the option receives parameter write requests via PDOs, or if an object of the Drive Profile that is linked to a drive parameter (e.g. 6048 (Hex.)) is changed using a PDO. Object 2155 (Hex.) will not be refreshed when parameters are changed using SDOs.
- Reading of this object using an SDO will cause an error response message if no parameter write PDO has been sent previously.

## ◆ Initializing the Drive

The drive can be initialized by writing the corresponding initialization code to MEMOBUS/Modbus register 0103 (Hex.) (drive parameter A1-03; refer to the Technical Manual of the drive for details on initialization codes). The initialization is performed only if drive parameter *H5-11* is set to "0" and if an Unlimited Enter Command is sent after setting register 0103 (Hex.).

To initialize a drive via CANopen communications, follow the instructions below:

- Read out the value of drive parameter *H5-11* using a MEMOBUS/Modbus Read Request (object 2040 (Hex.)) on drive register 04C3 (Hex.) (*H5-11*).
- If the content of register 04C3 (Hex.) is "1" then change it to "0" using a MEMOBUS/Modbus Write Request (object 2050 (Hex.)).

3. Set drive parameter A1-03 to the desired initialization mode.  
For example, in order to perform a “2-Wire Initialization”, write “08AC” (Hex.) (2220) to MEMOBUS/Modbus register 0103 (Hex.).
4. Finish the initialization by sending an Unlimited Enter Command (object 2060 (Hex.)).

## 12 Troubleshooting

### ◆ Option Error Codes

Refer to [Table 8.1](#) for more information about option error codes.

### ◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. The table below 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 a fault. When a fault occurs, the digital characters shown on the keypad does not flash but stay lit. The keypad ALM LED also stays lit. When an alarm occurs, the ALM LED flashes.

If communication stops while the drive is running, answer these questions to help fix the problem:

- Is the drive properly connected to the option?
- Is the communication line properly connected to the option? Is it loose?
- Is the PLC program working? Is the controller/PLC CPU stopped?
- Did a momentary power loss interrupt communications?

Code	Name	Causes	Possible Solutions
bUS	Option Communication Error	The drive did not receive a signal from the controller.	<ul style="list-style-type: none"> <li>• Check for wiring errors.</li> <li>• Correct the wiring.</li> </ul>
		The communications cable wiring is incorrect.	
		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	<ul style="list-style-type: none"> <li>• Prevent noise in the control circuit, main circuit, and ground wiring.</li> <li>• If you identify a magnetic contactor as a source of noise, install a surge absorber to the contactor coil.</li> <li>• Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side.</li> <li>• Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.</li> <li>• Counteract noise in the master controller (PLC).</li> </ul>
		Option is damaged	If there are no problems with the wiring and the error continues to occur, replace the option.
		Connection Time-out	<ul style="list-style-type: none"> <li>• The option Requested Packet Interval (RPI) timer timed out</li> <li>• Make sure that RPI time is set properly</li> </ul>
EF0	Option Card External Fault	The option received an external fault from the controller.	<ol style="list-style-type: none"> <li>1. Find the device that caused the external fault and remove the caus.</li> <li>2. Clear the external fault input from the controller.</li> </ol>
		A programming error occurred on the controller side.	Examine the operation of the controller program.
oFA00	Option Not Compatible with Port	The option connected to connector CN5-A is not compatible.	Connect the option to the correct connector. <ul style="list-style-type: none"> <li>• Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.</li> </ul>
oFA01	Option Card Fault (CN5-A)	The option connected to option port CN5-A was changed during run.	<ol style="list-style-type: none"> <li>1. De-energize the drive.</li> <li>2. Connect the option to the correct option port.</li> </ol>
oFA03, oFA04	Option Card Error (CN5-A)	A fault occurred in the option.	<ol style="list-style-type: none"> <li>1. De-energize the drive.</li> <li>2. Make sure that the option is correctly connected to the connector.</li> <li>3. If the problem continues, replace the option.</li> </ol>

Code	Name	Causes	Possible Solutions
oFA30 to oFA43	Option Card Connection Error (CN5-A)	A fault occurred in the option.	<ol style="list-style-type: none"> <li>1. De-energize the drive.</li> <li>2. Make sure that the option is correctly connected to the connector.</li> <li>3. If the problem continues, replace the option.</li> </ol>
oFb00	Option Not Compatible with Port	The option connected to connector CN5-B is not compatible.	Connect the option to the correct connector. <ul style="list-style-type: none"> <li>• Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.</li> </ul>
oFb02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.
oFC00	Option Fault (CN5-B)	The option connected to connector CN5-C is not compatible.	Connect the option to the correct connector. <ul style="list-style-type: none"> <li>• Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.</li> </ul>
oFC02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.
PE1	PLC Fault 1	The object dictionary settings were different from the settings stored in the EEPROM of the SI-S3, and Node Reset (NMT 81 (Hex.) xx (Hex.)) was performed while the drive was running.	<ul style="list-style-type: none"> <li>• Stop the drive before performing Node Reset.</li> <li>• Save the object dictionary settings using Store Parameters (object 1010 (Hex.)) before performing Node Reset.</li> </ul>

■ Minor Faults and Alarms

Code	Name	Causes	Possible Solutions
AEr	Station Address Error	CANopen Option is set to an address outside the allowable setting range.	Set F6-35 to an address within the specified range.
CALL	Serial Comm Transmission Error	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short circuit in the communications cable or the communications cable is not connected.	<ul style="list-style-type: none"> <li>• Repair the short-circuited or disconnected portion of the cable.</li> <li>• Replace the defective communications cable.</li> </ul>
		A programming error occurred on the controller side.	Examine communications at start-up and correct programming errors.
		There is damage to the communications circuitry.	<ul style="list-style-type: none"> <li>• Do a self-diagnostics check.</li> <li>• If the problem continues, replace the control board or the drive. Contact Yaskawa or your nearest sales representative to replace the control board.</li> </ul>
		The termination resistor setting for MEMOBUS/Modbus communications is incorrect.	On the last drive in a MEMOBUS/Modbus network, set DIP switch S2 to the ON position to enable the termination resistor.
CyPo	Cycle Power to Active Parameters	Comm. Option Parameter Not Upgraded	Re-energize the drive to update the communication option parameters. <p><b>Note:</b> If the option software version is not compatible or if you install an incorrect option to the drive, it will trigger an alarm.</p>
EEP	SI - S EEPROM Err	EEPROM checksum error	If these errors occur, the object dictionary is reset to its default values. <ul style="list-style-type: none"> <li>• After the object dictionary changes and object dictionary contents are changed, execute a Store Parameter command (Index = 1010 (Hex.)).</li> <li>• If the object dictionary was not changed, execute a Restore Parameter command (Index = 1011 (Hex.)).</li> </ul>

◆ SDO Abort Codes

SDO abort codes are supported as specified in DS301. Additionally, the abort codes listed below are implemented.

SDO Abort Code	Content
0602 0010 (Hex.)	Consecutive MEMOBUS/Modbus Read/Write/Enter commands are being sent but the wait time between messages is too short.
	A MEMOBUS/Modbus Read or Write Response (2140 (Hex.) and 2150 (Hex.)) was received, but either an incorrect MEMOBUS/Modbus address or no MEMOBUS/Modbus address has been written to object 2040 (Hex.) or 2050 (Hex.) before.
	A MEMOBUS/Modbus write request was sent during DC bus undervoltage.
0602 0022 (Hex.)	Drive Profile DSP 402 was used and a value was written to object 6042 (Hex.) (v1 Target Velocity) while the drive status was not "Operation Enable".
	Object 2155 (Hex.) was received while the SI-S3 option was not in the Operational state.
	A MEMOBUS/Modbus Read or Write command (2040 (Hex.) and 2050 (Hex.)) was performed with an invalid MEMOBUS/Modbus address.

## 13 European Standards



Figure 13.1 CE Mark

The CE mark indicates compliance with European safety and environmental regulations.

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

It is required for engaging in business and commerce in Europe.

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

EMC Directive: 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 European standards. Verify that conditions meet European standards after setting up the device.

### ◆ EMC Directive Compliance

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

### ■ Option Installation

Verify the following installation conditions to make sure that other devices and machinery used with this option and drive also comply with EMC Directive:

1. Use dedicated shielded 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 13.2](#), [Figure 13.3](#), and [Figure 13.4](#).

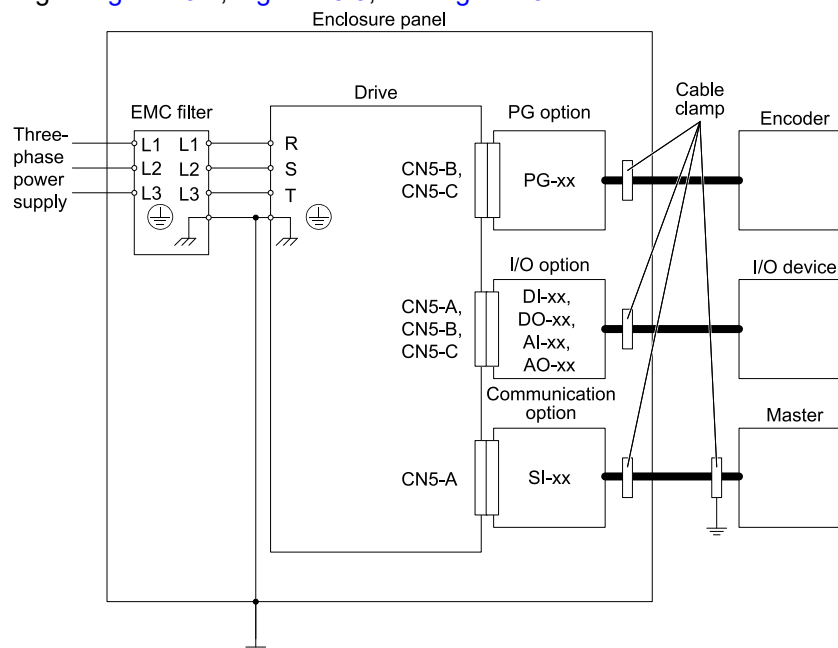


Figure 13.2 Option Installation for CE Compliance: 1000-Series, GA700, GA800

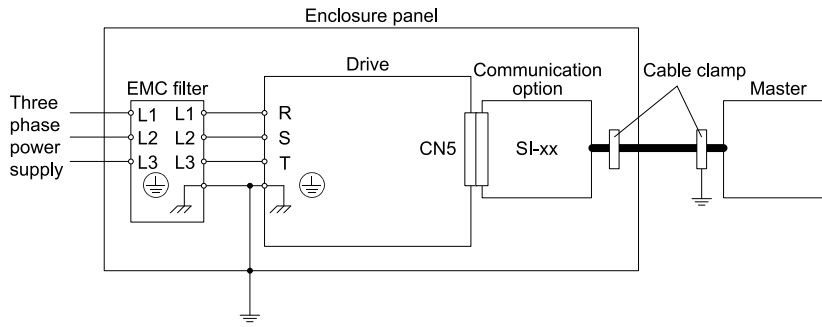


Figure 13.3 Option Installation for CE Compliance: GA500

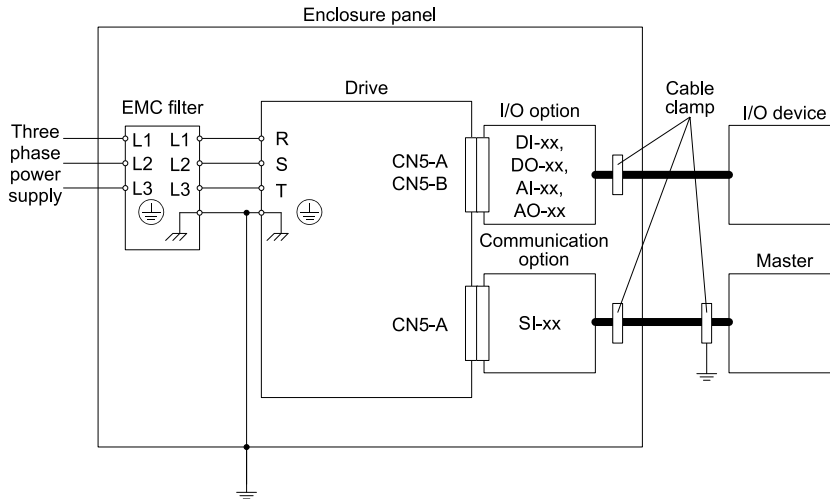
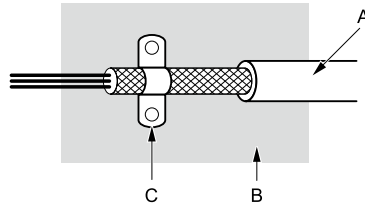


Figure 13.4 Option Installation for CE Compliance: FP605

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



A - Braided shielded cable  
B - Metal panel

C - Cable clamp (conductive)

Figure 13.5 Ground Area

## 14 Specifications

### ◆ Specifications

Table 14.1 Option Specifications

Items	Specifications
Model	SI-S3
Communication Profile	DS 301 Ver. 4.02 DSP 402 Ver. 1.1 Velocity Mode
Connector	9-pin D-sub connector (#4/40 UNC thread)
Communication Speed	10 kbps - 1 Mbps
Ambient Temperature	-10 °C to +50 °C (14 °F to 122 °F)
Humidity	95% RH or lower with no condensation
Storage Temperature	-20 °C to +60 °C (-4 °F to 140 °F) allowed for short-term transport of the product

Items	Specifications
Area of Use	Indoors and free from: <ul style="list-style-type: none"> <li>• Oil mist, corrosive gas, flammable gas, and dust</li> <li>• Radioactive materials or flammable materials, including wood</li> <li>• Harmful gas or fluids</li> <li>• Salt</li> <li>• Direct sunlight</li> <li>• Falling foreign objects</li> </ul>
Altitude	1000 m (3280 ft) or lower

## 15 Disposal

### ◆ Disposal Instructions

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

### ◆ WEEE Directive



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

You must discard the product at an applicable collection point for electrical and electronic equipment (EEE). Do not discard the product with usual waste.

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## Revision History

Date of Publication	Revision Number	Section	Revised Content
October 2022	3	All	Addition: Information on FP605 Revision: Reviewed and corrected entire documentation
February 2019	2	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation
		Chapter 15	Addition: Disposal
December 2018	1	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation
June 2016	-	-	First edition





# YASKAWA AC Drive Option

# CANopen

# Technical Manual

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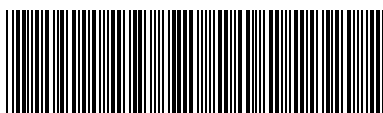
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# YASKAWA

YASKAWA ELECTRIC  
CORPORATION



\*SIEPC73060085\*

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

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

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