YASKAWA

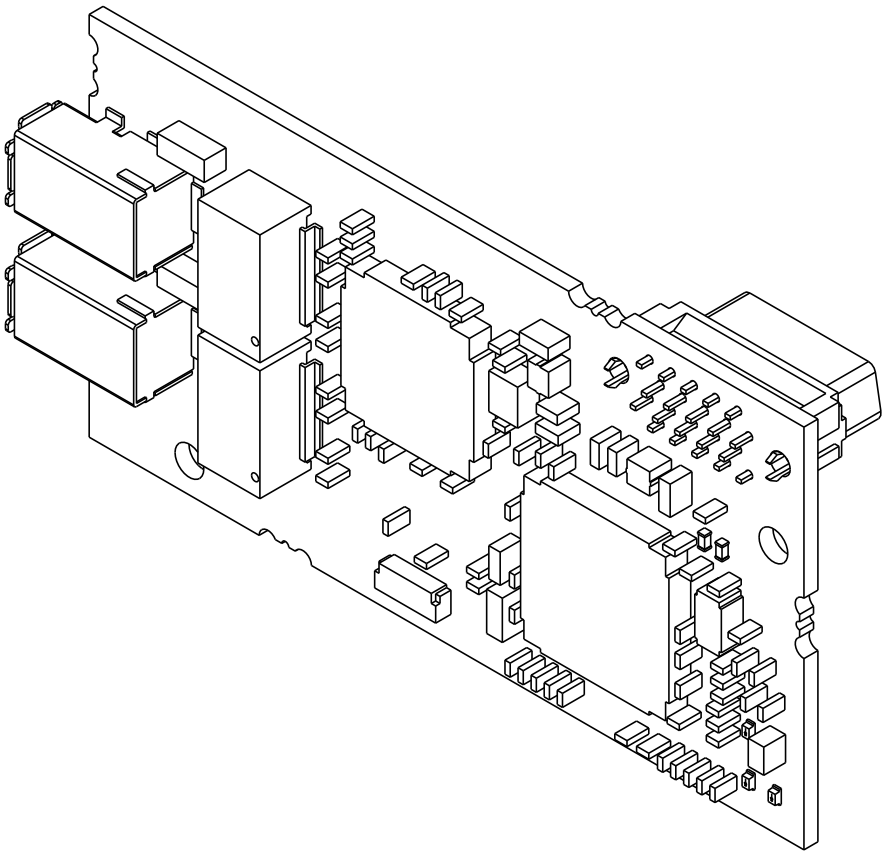
YASKAWA AC Drive Option

MECHATROLINK-III

Technical Manual

Model SI-ET3

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



MANUAL NO. SIEP C730600 88F

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1 Preface and Safety

YASKAWA Electric supplies component parts for use in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer or end user.

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

◆ Applicable Documentation

The following manuals are available for the option:

Document	Description
YASKAWA AC Drive Option MECHATROLINK-III Installation Manual Manual No: TOBP C730600 88	This guide is packaged together with the product and contains information necessary to install the option and set related drive parameters.
YASKAWA AC Drive Option SI-ET3 MECHATROLINK-III Technical Manual Manual No:SIEP C730600 88 (This book)	The technical manual contains detailed information about the option. Access the following sites to obtain the technical manual: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.
YASKAWA AC Drive Manuals	Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The most recent versions of these manuals are available for download on our documentation websites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.

◆ Glossary

Phrase	Definition
Option	YASKAWA AC Drive Option MECHATROLINK-III
Keypad	• LCD Operator for YASKAWA AC Drive 1000-Series • LED Operator for YASKAWA AC Drive 1000-Series • LCD Keypad for YASKAWA AC Drive GA500, GA700, GA800, CR700, and CH700 • LED Keypad for YASKAWA AC Drive GA500, GA700, GA800, CR700, and CH700
Drive	• YASKAWA AC Drive 1000-Series (A1000, U1000, Z1000U) • YASKAWA AC Drive GA500 • YASKAWA AC Drive GA700 • YASKAWA AC Drive GA800 • YASKAWA AC Drive CR700 • YASKAWA AC Drive CH700
Hex. (Example: 900 (Hex.))	Indicates a unit for hexadecimal number format.

◆ Registered Trademarks

- MECHATROLINK-III is a trademark of the MECHATROLINK Members Association (MMA).
- All trademarks are the property of their respective owners.

◆ Supplemental Safety Information

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

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

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

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

⚠ CAUTION *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 body or circuitry of drive or option. Failure to obey can cause damage to the drive and will void warranty. Yaskawa is not responsible for modifications of the product made by the user.*

NOTICE *Do not use steam or other disinfectants to fumigate wood for packaging the drive. 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 option provides a communications connection between the drive and a MECHATROLINK-III network. The option connects the drive to a MECHATROLINK-III network and facilitates the exchange of data.

Install the option/MIII option on a drive to perform the following functions from a MECHATROLINK-III master device:

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

◆ Compatible Products

You can use the option with these products:

Table 2.1 Product Series

Drive	Model (s)	Software Version *1
A1000	CIMR-Ax2Axxxx	≥1020
	CIMR-Ax4A0002 - 4A0675	
	CIMR-Ax4A0930, 4A1200	≥3015
U1000	CIMR-UxxAxxxx	≥1010
	CIMR-UxxExxxx	
	CIMR-UxxPxxxx	
	CIMR-UxxWxxxx	
Z1000U	CIMR-ZxxAxxxx	≥6110
	CIMR-ZxxExxxx	
	CIMR-ZxxPxxxx	
	CIMR-ZxxWxxxx	

Drive	Model (s)	Software Version *1
GA500 *2	CIPR-GA50xxxxx	≥1010
GA700 *2	CIPR-GA70xxxxx	≥1010
GA800 *2	CIPR-GA80xxxxx	≥9010
CR700 *2	CIPR-CR70xxxxx	≥1012
CH700 *2	CIPR-CH70xxxxx	≥1012

*1 Refer to “PRG” on the drive nameplate for the software version number.
*2 Before you install the option on a YASKAWA AC Drive GA500, GA700, GA800, CR700, or CH700, make sure that the option software version is PRG: 6202 or later.

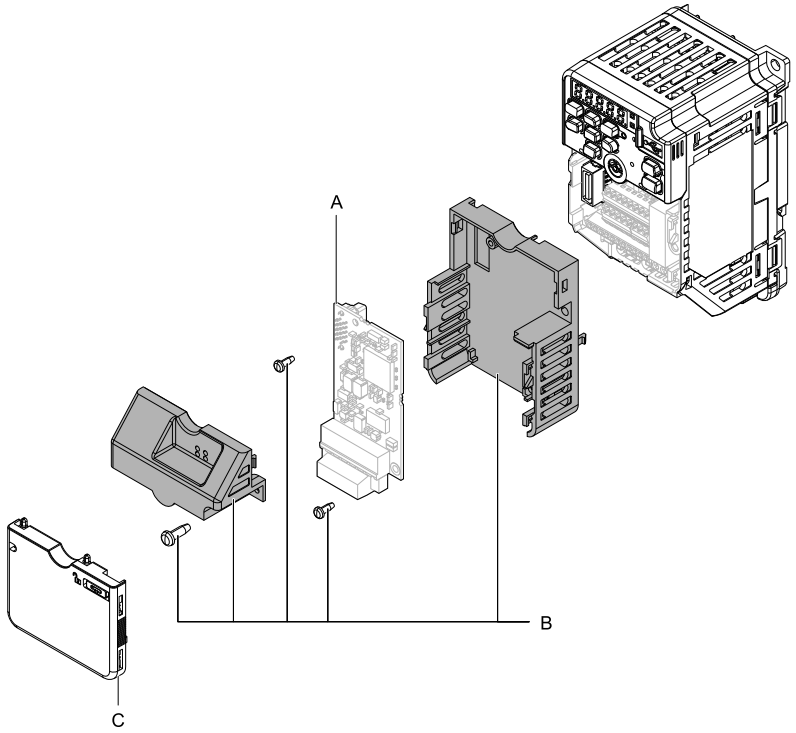
Note:

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.

◆ 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-GA500. This kit is sold separately.

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



A - Option
B - Option card mounting kit components (sold separately)
C - Drive front cover

Figure 2.1 Option Card Mounting Kit

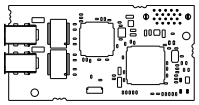
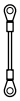
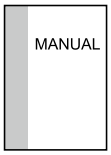
3 Receiving

After receiving the option package:

- Make sure that the option is not damaged and no parts are missing.
  Contact your sales outlet if the option or other parts appear damaged. Contact your sales outlet if there is damage to the option or other parts.
- Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to Figure 4.1 for more information.
- Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Components

Table 3.1 Option Package Contents

Description:	Option	Ground Wire *1	Screws (M3)	LED labels		Installation Manual
				1000-Series	GA500, GA700, GA800, CR700, and CH700	
-						
Quantity:	1	1	3 *2	1	1	1

*1 GA700, GA800, CR700, and CH700 drives do not use the ground wire.
*2 GA700, GA800, CR700, and CH700 drives use two screws only.

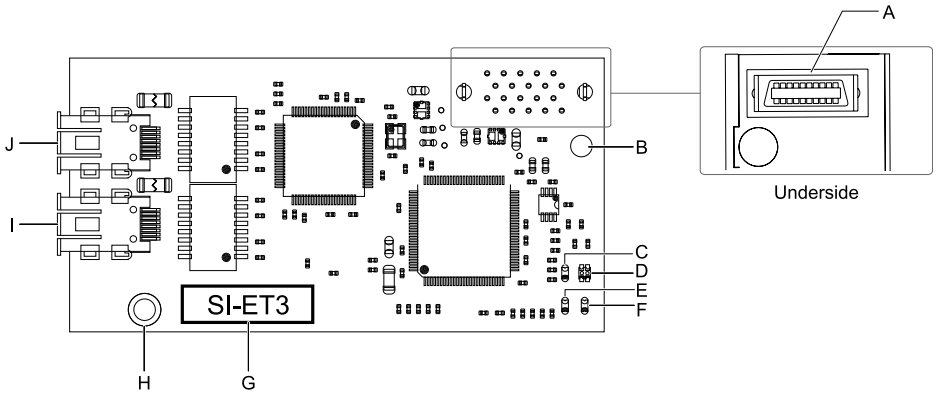
◆ Installation Tools

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

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

4 Drive Components with Option

◆ MECHATROLINK-III Option



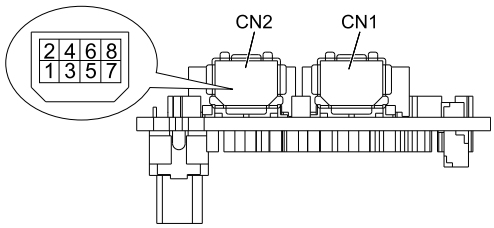
A - Connector (CN5)
B - Installation hole
C - LED (CON) *1
D - LED (R/E) *1
E - LED (LK2) *1
F - LED (LK1) *1
G - Model
H - Ground terminal (FE) (installation hole) *2
I - Communication connector CN1
J - Communication connector CN2

Figure 4.1 SI-EN3 Option Components

*1 Refer to *MECHATROLINK-II Option LED Display on page 10* for more information about the LEDs.
*2 Connect the provided ground wire during installation. The ground wire is not necessary for installation on GA700, GA800, CR700, and CH700 drives.

◆ Connector

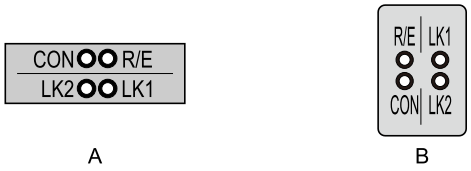
Table 4.1 Communication Connector

MECHATROLINK-III Connector	Pin No.	Signal Name	I/O	Function
	1	TXD_P	I/O	Send data (+): OUT
	2	TXD_N	I/O	Send data (-): OUT
	3	RXD_P	I/O	Receive data (+): IN
	4	(NC)	-	-
	5	(NC)	-	-
	6	RXD_N	I/O	Receive data (-): IN
	7	(NC)	-	-
	8	(NC)	-	-
	Shell	SLD	-	Shield

◆ MECHATROLINK-II Option LED Display

Option has four LEDs that identify the option card or communication status.

■ Defining Option LED States



A B

A - 1000-Series Label

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

Figure 4.2 Option LED Labels

Table 4.2 MECHATROLINK-II Operation LED Status

Name	State	Operating Status	Description
R/E	Lit in green	Power supply on	• SI-ET3 has been successfully powered up • An internal, self-diagnostic check completed in the SI-ET3
	Lit in red	Error	• Error/alarm occurred • Command error occurred (parameter error, phase error, combination error)
	Flashing in red	SI-ET3 error	Error found during the SI-ET3 self-diagnostic check
	Unlit	Power supply off	• The drive has no power • SI-ET3 is not properly connected to the drive, or SI-ET3 has no power • An internal, self-diagnostic error occurred in the SI-ET3
CON	Lit in green	Connection established	Established connection
	Unlit	Connection unestablished	Connection with master device is not established
LK1	Lit in green	Connector CN1 connected	Connector CN1 is connected to other stations
	Unlit	Connector CN1 disconnected	Connector CN1 is not connected to other stations (cable not connected, cable disconnected, other stations not powered up)
LK2	Lit in green	Connector CN2 connected	Connector CN2 is connected to other stations
	Unlit	Connector CN2 disconnected	Connector CN2 is not connected to other stations (cable not connected, cable disconnected, other stations not powered up)

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 equipment 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 serous 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 *Observe correct electrostatic discharge (ESD) procedures when touching the option. Failure to obey can cause ESD damage to the option 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 for Installing and Wiring Options on a Drive

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

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

Product Series	Procedures for Installing and Wiring Options on a Drive	Page
A1000	Procedure A	11
U1000	Procedure A	11
Z1000U	Procedure A	11
GA500	*1 *2	-
GA700	Procedure B	15
GA800	Procedure B	15
CR700	Procedure B	15
CH700	Procedure B	15

*1 To install the option on GA500 drives, use the option card mounting kit manual.

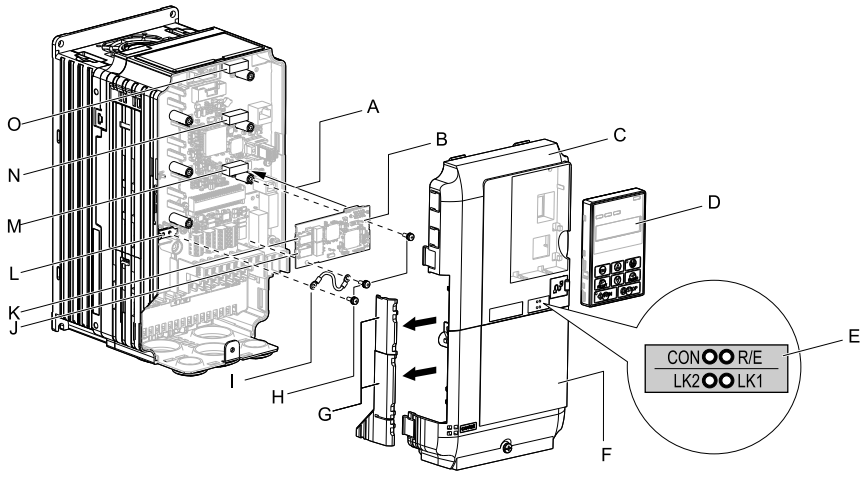
*2 Before you install the option on a YASKAWA AC Drive GA500, make sure that the option software version is PRG: 6202 or later.

■ Procedure A

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

Prepare the Drive for the Option

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



A - Insertion point for CN5 connector
B - Option
C - Drive front cover
D - Keypad
E - LED label
F - Drive terminal cover
G - Removable tabs for wire routing
H - Included screws
I - Ground wire
J - Option modular connector CN1
K - Option modular connector CN2
L - Drive grounding terminal (FE)
M - Connector CN5-A
N - Connector CN5-B (Not available for communication option installation.)
O - Connector CN5-C (Not available for communication option installation.)

Figure 5.1 Drive Components with Option

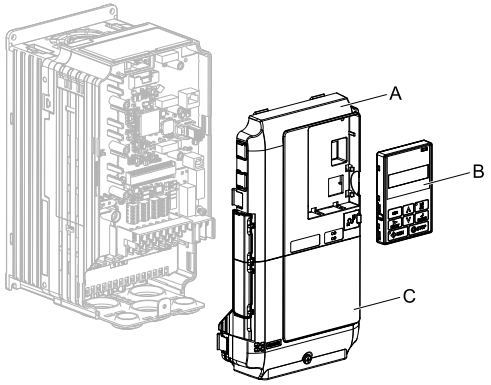
Install the Option

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

DANGER *Electrical Shock Hazard. Do not 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. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the keypad (B) and front covers (A, C).
   Refer to the manual packaged with the drive for instructions on how to remove the cover.

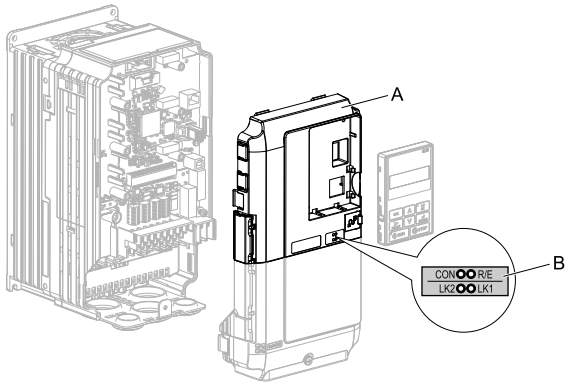
   NOTICE *Observe correct electrostatic discharge (ESD) procedures when touching the option. Failure to obey can cause ESD damage to the option circuitry.*



A - Drive front cover
B - Keypad
C - Drive terminal cover

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

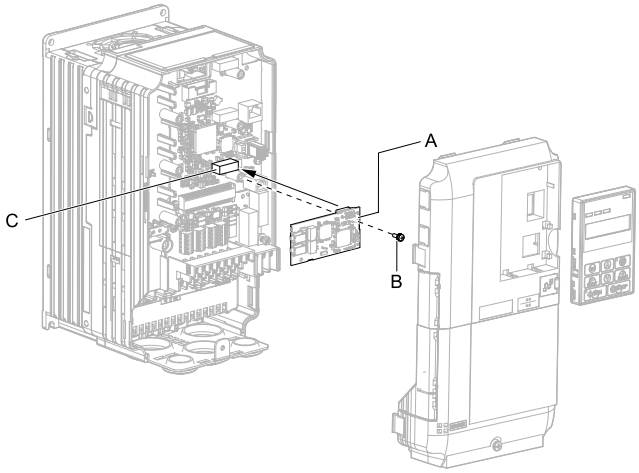
2. Put the LED label (B) in the appropriate position on the drive front cover (A).



A - Drive front cover **B - LED label**

Figure 5.3 Put the LED Label on the Drive Front Cover

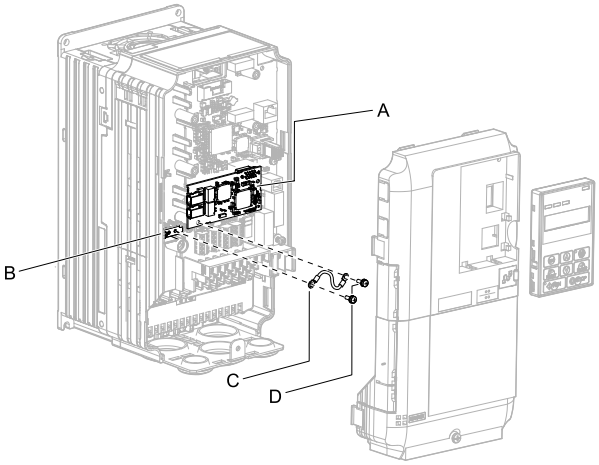
3. Insert the option (A) into the CN5-A connector (C) on the drive and use the included screws (B) to put it in place. Tighten the screw to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).



A - Option **C - Connector CN5-A**
B - Included screws

Figure 5.4 Install the Option

4. Connect one end of the ground wire (C) to the ground terminal (B) using one of the remaining provided screws (D). Connect the other end of the ground wire (C) to the remaining ground terminal and installation hole on the option (A) using the last remaining provided screw (D).
   - Tighten both screws to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).



A - Option **C - Ground wire**
B - Drive grounding terminal (FE) **D - Included screws**

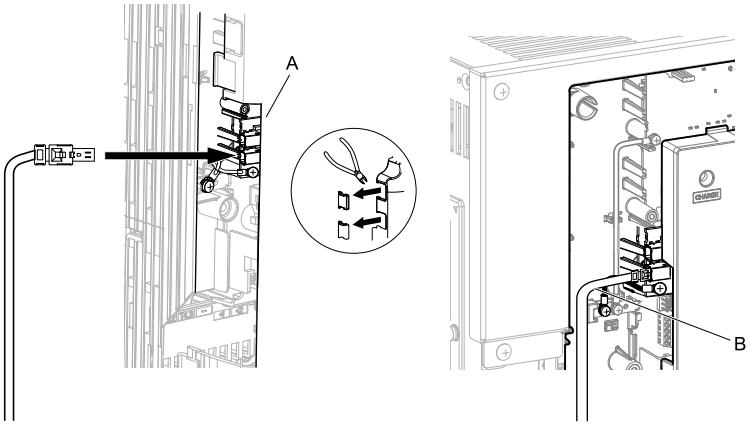
Figure 5.5 Connect the Ground Wire

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

5. Select the proper MECHATROLINK-III dedicated communication cable according to Table 5.1.
   - 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.
   - Route the option wiring inside the enclosure as shown in Figure 5.6-B. Take proper precautions so that the front covers will easily fit back onto the drive.

   Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.

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



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

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

Figure 5.6 Wire Routing Examples

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

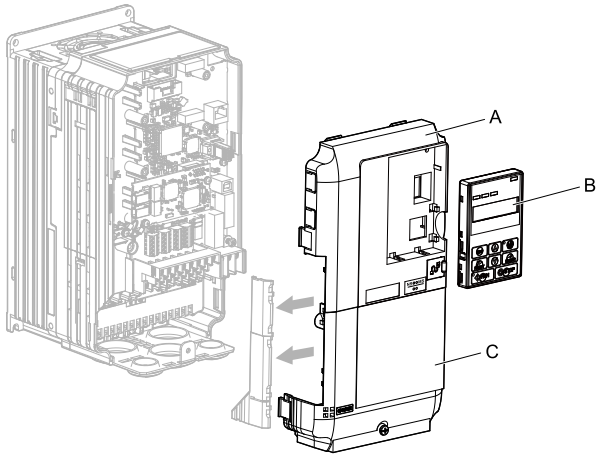
6. Firmly connect the MECHATROLINK-III communication cable to option communication connector CN1 or CN2.

   Install MECHATROLINK-III communications cables separately from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see Figure 5.14). Refer to *MECHATROLINK-III Communications Cables on page 18* for more information.

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

   Refer to the manual packaged with the drive for instructions on how to reattach the cover.

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



A - Drive front cover

B - Keypad

C - Drive terminal cover

Figure 5.7 Replace the Front Covers and Keypad

8. Set drive parameters in *Related Drive Parameters on page 20* for correct option performance.

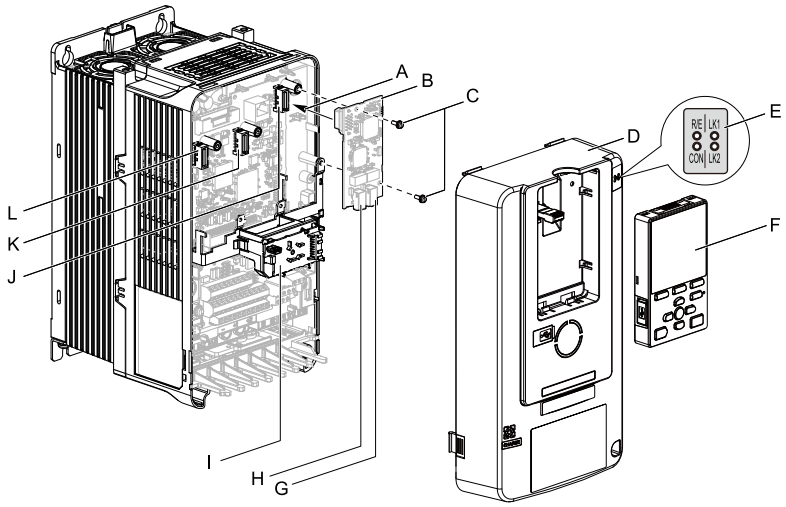
■ Procedure B

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

Prepare the Drive for the Option

Before you install the option on a YASKAWA AC Drive GA500, GA700, GA800, CR700, or CH700, make sure that the option software version is PRG: 6202 or later.

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



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

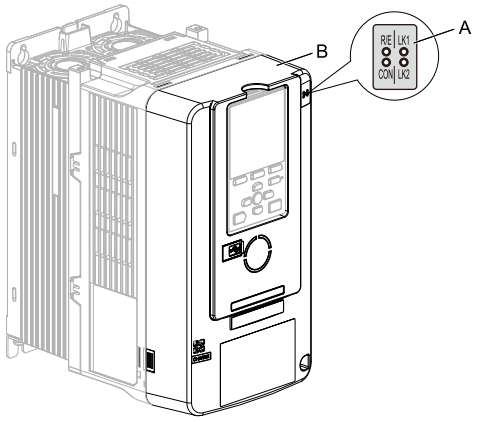
Figure 5.8 Drive Components with Option

Install the Option

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

⚠ DANGER *Electrical Shock Hazard. Do not 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).



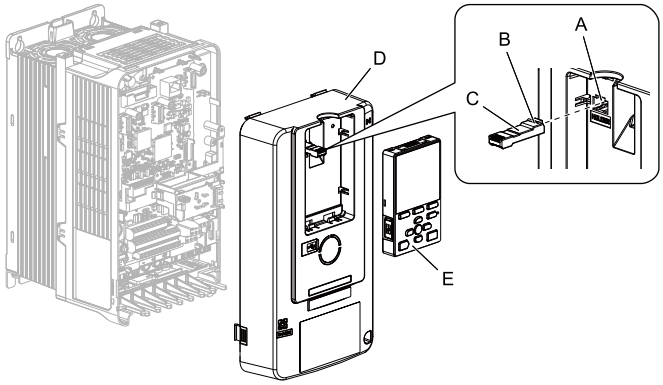
A - LED label **B - Drive front cover**

Figure 5.9 Put the LED Label on the Drive Front Cover

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

   NOTICE *Observe correct electrostatic discharge (ESD) procedures when touching the option. Failure to obey can cause ESD damage to the option circuitry.*

Note:
1. Move the keypad connector to the holder on the drive after removing the keypad and before removing the front cover.
2. Insert the keypad connector tab into the holder when installing the keypad connector to the holder.

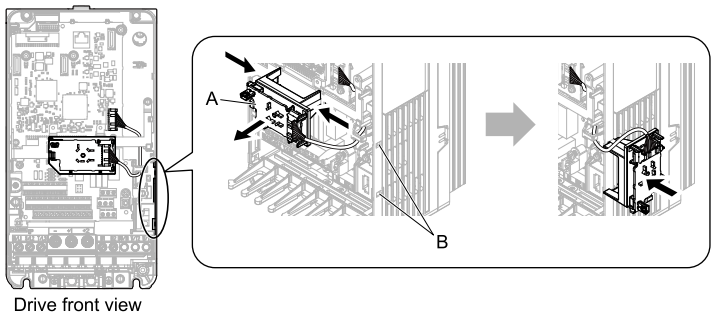


A - Holder **D - Drive front cover**
B - Keypad connector tab **E - Keypad**
C - Keypad connector

Figure 5.10 Remove the Front Cover and Keypad

3. Carefully remove the LED Status Ring board (A) and put it on the right side of the drive using the temporary placement holes (B).
   Refer to the manual packaged with the drive for information on how to remove the LED Status Ring board.

Note:
- Make sure that the LED status ring board is safe after you remove it from the bracket.
- Do not remove the LED Status Ring board cable connector. Failure to comply could cause erroneous operation and damage the drive.



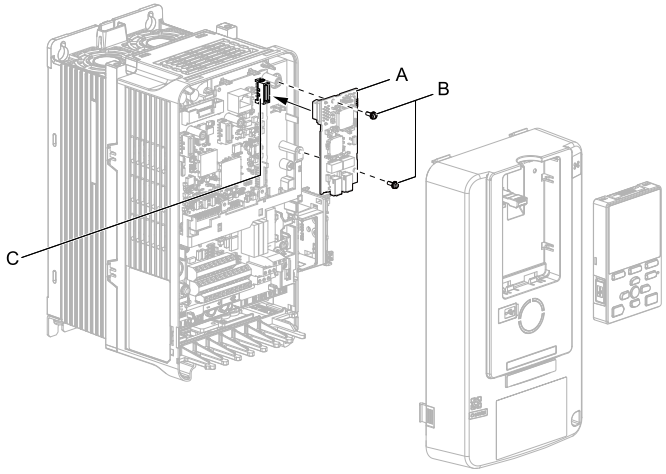
A - LED Status Ring board **B - Temporary placement holes**

Figure 5.11 Remove the LED Status Ring Board

4. Insert the option (A) into the CN5-A connector (C) on the drive and use the included screws (B) to put it in place.
   - Tighten both screws to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).

Note:

1. A ground wire is not necessary. The option package ships with three screws and a ground wire for installation on other product series. Do not use the ground wire or the extra screw.
2. Only two screws are necessary to install the option on GA700, GA800, CR700, and CH700 drives.



A - Option **C - Connector CN5-A**
B - Included screws

Figure 5.12 Install the Option

5. Select the proper MECHATROLINK-III dedicated communication cable according to Table 5.1.

   Firmly connect the MECHATROLINK-III communication cable to option communication connector CN1 or CN2. Isolate the MECHATROLINK-II communications cables from main circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see Figure 5.14). Refer to *MECHATROLINK-III Communications Cables on page 18* for more information.

Note:

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

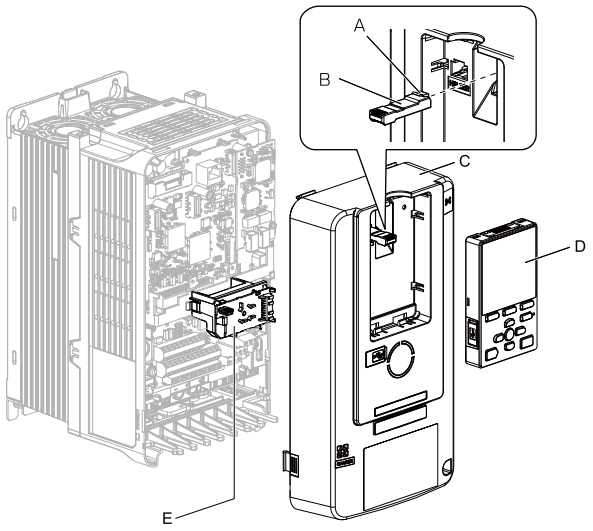
6. Reattach the LED Status Ring board (E). Use the open space provided inside the LED Status Ring board to route option wiring. Reattach the drive front cover (C) and the keypad (D).

   Refer to the manual packaged with the drive for information on how to reattach the LED Status Ring board.

   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.
- At that time, insert the keypad connector tab into the drive.



A - Keypad connector tab
B - Keypad connector
C - Drive front cover
D - Keypad
E - LED Status Ring board

Figure 5.13 Replace the Front Cover and Keypad

7. Set drive parameters in *Related Drive Parameters on page 20* for correct option performance.

◆ MECHATROLINK-III Communications Cables

Connect the MECHATROLINK-III communication cable to option communication connector CN1 or CN2. Use only MECHATROLINK-III dedicated communication cable. Refer to Table 5.1 for more information.

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

■ Option Connection Diagram

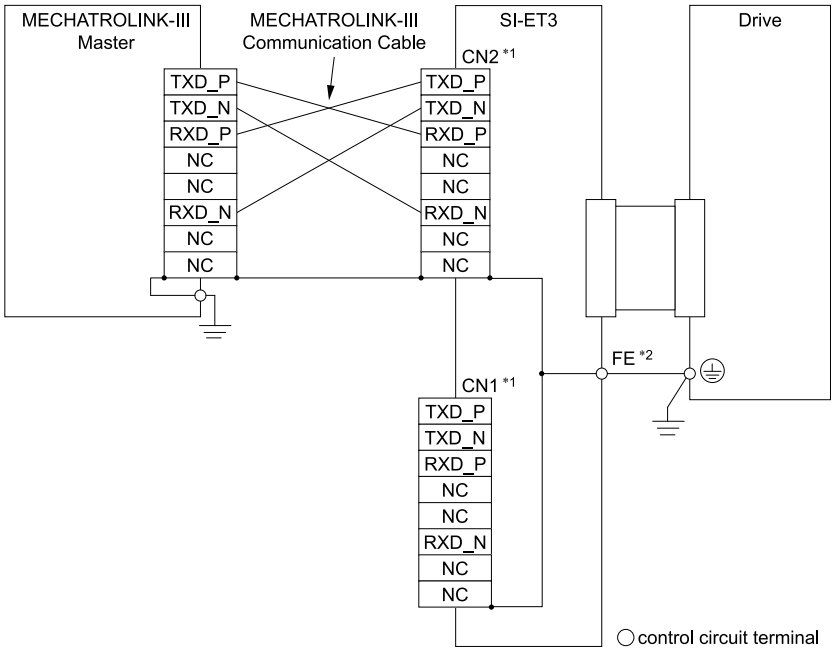
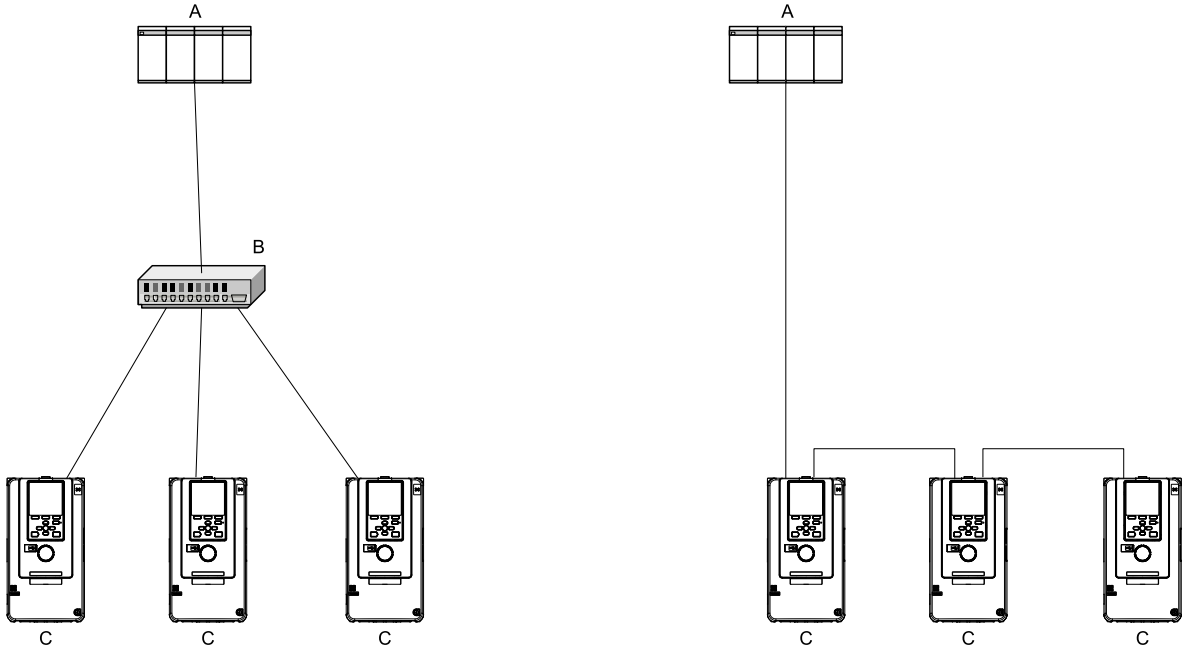


Figure 5.14 Option Connection Diagram

*1 Connect the MECHATROLINK-III cable to connector CN1 or CN2.
*2 Connect the provided ground wire for installations on 1000-series drives and GA500 drives.
The ground wire is not necessary for installation on GA700, GA800, CR700, or CH700 drives.

■ Communication Cable Topology

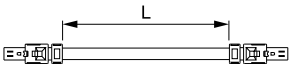
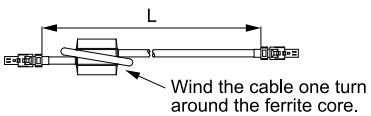
The dual communication cable ports on the option board act as a switch to allow for flexibility in cabling topology. Users may employ a traditional star network topology using a single communication cable port on the option. Users may also choose to employ a ring topology using both communication cable ports on the option and reduce the requirements of MECHATROLINK-III hub module ports.

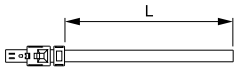


A - PLC
B - MECHATROLINK-III Hub Module
C - Drive

Figure 5.15 Topology Options

Table 5.1 MECHATROLINK-III Communications Cable

Connection Type	Cable Specification	Length (L)	Model
MECHATROLINK-III connection without ferrite core		0.2 m (7.9 in)	JEPMC-W6012-A2-E
		0.5 m (19.7 in)	JEPMC-W6012-A5-E
		1 m (39.4 in)	JEPMC-W6012-01-E
		2 m (78.7 in)	JEPMC-W6012-02-E
		3 m (118.1 in)	JEPMC-W6012-03-E
		4 m (157.5 in)	JEPMC-W6012-04-E
		5 m (196.9 in)	JEPMC-W6012-05-E
		10 m (393.7 in)	JEPMC-W6012-10-E
		20 m (787.4 in)	JEPMC-W6012-20-E
		30 m (1181.1 in)	JEPMC-W6012-30-E
		50 m (1968.5 in)	JEPMC-W6012-50-E
MECHATROLINK-III connection with ferrite core		10 m (393.7 in)	JEPMC-W6013-10-E
		20 m (787.4 in)	JEPMC-W6013-20-E
		30 m (1181.1 in)	JEPMC-W6013-30-E
		50 m (1968.5 in)	JEPMC-W6013-50-E
		75 m (2952.8 in)	JEPMC-W6013-75-E
		100 m (3937.0 in)	JEPMC-W6013-100-E

Connection Type	Cable Specification	Length (L)	Model
MECHATROLINK-III connection with loose wires at one end		0.5 m (19.7 in)	JEPMC-W6014-A5-E
		1 m (39.4 in)	JEPMC-W6014-01-E
		3 m (118.1 in)	JEPMC-W6014-03-E
		5 m (196.9 in)	JEPMC-W6014-05-E
		10 m (393.7 in)	JEPMC-W6014-10-E
		30 m (1181.1 in)	JEPMC-W6014-30-E
		50 m (1968.5 in)	JEPMC-W6014-50-E

6 Related Drive Parameters

The parameters in the following table set the drive for operation with the option. Confirm proper setting of all parameters in the following table before starting network communications.

Note:

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

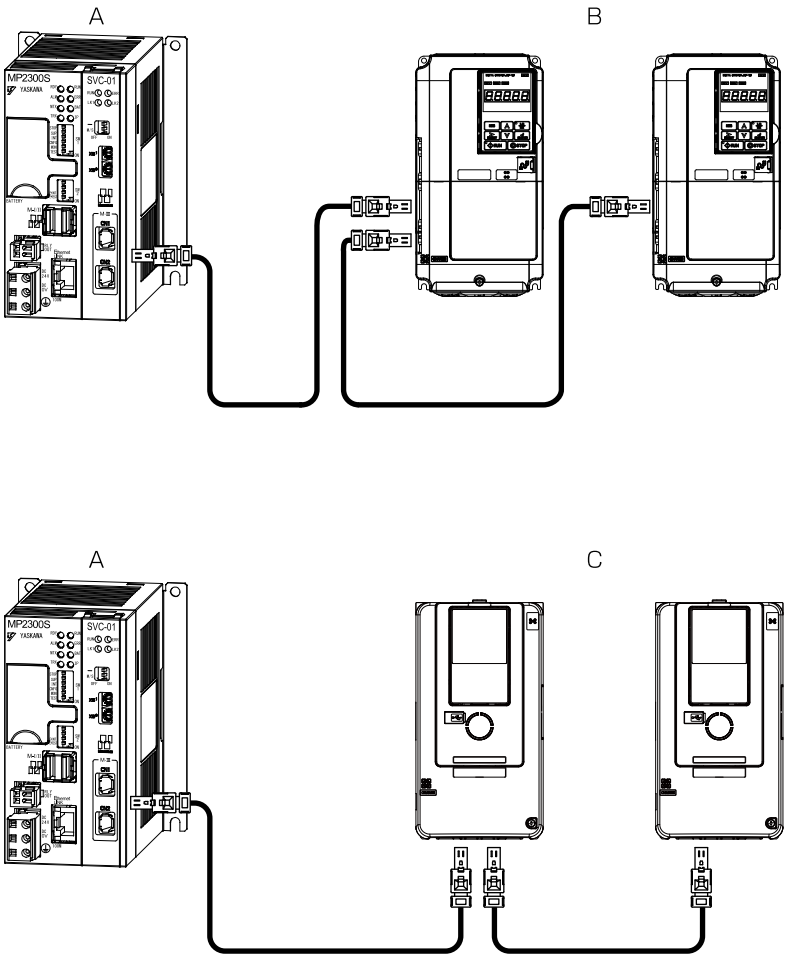
No. (Hex.)	Name	Description	Default (Range)
b1-01 (0180)	Reference 1 Source	Selects the input method for frequency reference. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option 4 : Pulse Train Input **Note:** • Set *b1-02 = 3* to use the master device and serial communications to start and stop the drive. Set *b1-01 = 3* to use the master device to control the frequency reference of the drive. • The default setting is different for different drives. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.	1 (0 - 4)
b1-02 (0181)	Run Command 1 Source	Selects the input method for the Run command. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option **Note:** Set *b1-02 = 3* to start and stop the drive with the master device using serial communications. Set *b1-01 = 3* to use the master device to control the frequency reference of the drive.	1 (0 - 3)
F6-01 (03A2)	Communication Error Selection	Selects drive response when the drive detects a *bUS* 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 to Stop **Note:** • When you set this parameter to *3* or *4*, the drive will continue operation after it detects a fault. If you set this parameter to 3 or 4, make sure that you install an emergency stop switch. • Refer to the drive manual to know if settings *4* and *5* are available. Settings 4 and 5 are available in A1000 software versions PRG: 1021 and later. • 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 condition for external fault detection *[EF0]*. 0 : Always detected 1 : Detection during run only	0 (0, 1)
F6-03 (03A4)	Comm External Fault *[EF0]* Select	Selects drive response when the drive detects an external fault input *[EF0]* during option communications. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only **Note:** When you set this parameter to *3* or *4*, the drive will continue operation after it detects a fault. If you set this parameter to 3 or 4, make sure that you install an emergency stop switch.	1 (0 - 3)

No. (Hex.)	Name	Description	Default (Range)
F6-06 (03A7)	Torque Reference/Limit by Comm	When you enable this parameter, d5-01 determines whether the value is read as the Torque Limit value (d5-01 = 0) or the Torque Reference value (d5-01 = 1). 0 : Disabled 1 : Enabled **Note:** • Control method availability of this parameter is different for different product series. –1000-Series Drives: Parameter is available in CLV, AOLV/PM, and CLV/PM. In AOLV/PM, this value is read as the Torque Limit. In AOLV/PM, this value is read as the Torque Limit. –GA500 Drive: Parameter is available in OLV, AOLV/PM, and EZOLV. This value is read as the Torque Limit. –GA700, GA800 Drives: Parameter is available in OLV, CLV, AOLV, AOLV/PM, CLV/PM, and EZOLV. In OLV and EZOLV, this value is read as the Torque Limit. –CR700, CH700 Drives: Parameter is available in OLV, CLV, and AOLV. This value is read as the Torque Limit. • The setting specifies that network communications provide the torque reference or torque limit. If the PLC does not supply a torque reference or torque limit, the motor cannot rotate.	0 (0, 1)
F6-07 (03A8)	MultiStep Ref Priority Select	0 : MultiStep References Disabled 1 : MultiStep References Enabled **Note:** Default setting is *1* for GA500.	0 (0, 1)
F6-08 (036A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters *F6-xx* and *F7-xx* are set back to original default values when the you use parameter *A1-03* to initialize the drive. 0 : No Reset - Parameters retained 1 : Reset - Back to factory default **Note:** The drive will not change this setting value when you set *F6-08 = 1* and use *A1-03* to initialize the drive.	0 (0, 1)
F6-20 (036B)	MECHATROLINK Station Address	Sets the station number **Note:** • Cycle power for setting changes to take effect. • All station addresses must be unique. If set to 20 or 3F, a Station Address Error *[AEr]* will occur and the ERR light will turn on.	21 (Hex.) (03 - EF (Hex.))
F6-21 (036C)	MECHATROLINK Frame Size	0 : 64-byte 1 : 32-byte **Note:** Cycle power for setting changes to take effect.	0 (0, 1)
F6-23 (036E)	MECHATROLINK Monitor Select (E)	Set MEMOBUS/Modbus register to monitor SEL_MON of INV_CTL and INV_I/O. **Note:** • Cycle power for setting changes to take effect. • Set byte 21, SEL_MON1/2 of INV_CTL, or byte 38, SEL_MON 3/4 and byte 39, SEL_MON 5/6 of INV_I/O to 0E (Hex.) to enable the register set with *F6-23*. Bytes of the response data enable the register content set with *F6-23*. Refer to the manual packaged with the drive for more information about registers that you can set.	0 (Hex.) (0 - FFFF (Hex.))
F6-24 (036F)	MECHATROLINK Monitor Select (F)	Set MEMOBUS/Modbus register to monitor SEL_MON of INV_CTL and INV_I/O. **Note:** • Cycle power for setting changes to take effect. • Set byte 21, SEL_MON1/2 of INV_CTL, or byte 38, SEL_MON 3/4 and byte 39, SEL_MON 5/6 of INV_I/O to 0F (Hex.) to enable the register set with *F6-24*. Bytes of the response data enable the register content set with *F6-24*. Refer to the manual packaged with the drive for more information about registers that you can set.	0 (Hex.) (0 - EF (Hex.))
F6-25 (03C9)	MECHATROLINK Watchdog Error Sel	0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only **Note:** When you set this parameter to *3* or *4*, the drive will continue operation after it detects a fault. If you set this parameter to 3 or 4, make sure that you install an emergency stop switch.	1 (0 - 3)
F6-26 (03CA)	MECHATROLINK *bUS* Errors Detected	When the option detects the *bUS* alarm for the number of times set in *F6-26*, it will detect *Option Communication Error [bUS]*.	2 (2 - 10)

7 Transmission Interface

◆ MECHATROLINK-III Cyclic Transmissions

As a MECHATROLINK-III station, the SI-ET3 option exchanges control data and I/O data with a control device. The option sends response data timed to the reception of command data for the local station address from the master in each transmission cycle to communicate. The command and response data formats follow the specifications for the MECHATROLINK Drive commands.



A - Master: MP2300S Controller (Example)
B - Drive: A1000 (Example)
C - Drive: GA700 (Example)

◆ Command Format of the Standard Profile Common Commands

This section describes the specifications of the standard profile common commands.
Table 7.1 lists the data format and the common commands and responses.
Standard inverter profile commands fix the data length at 32 bytes for main commands and sub-commands.

Table 7.1 Command Format of the Standard Profile Common Commands

–	Byte	Command	Response	Reference
Main Commands	0	CMD	RCMD	• CMD/RCMD Command code specified for individual commands: Refer to page 27. • WDT/RWDT: Watchdog data is usually set automatically. • CMD_CTRL: Refer to page 26. • CMD_STAT: Refer to page 26. • CMD_DATA/RSP_DATA: Specified for individual commands. Refer to page 27.
	1	WDT	RWDT	
	2	CMD_CTRL	CMD_STAT	
	3			
	4	CMD_DATA	RSP_DATA	
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25			
	26			
	27			
	28			
	29			
	30			
	31			
Sub-Commands	32	SUBCMD	RSUBCMD	Do not use sub-commands when *F6-21 = 1 [MECHATROLINK Frame Size = 32-byte]*. • SUBCMD/RSUBCMD: Command code specified for individual commands. Refer to page 42. • SUB_CTRL: Refer to page 42. • SUB_STAT: Refer to page 42. • SUB_CMD_DATA/SUB_RSP_DATA: Specified for individual commands. Refer to page 42.
	33	SUB_CTRL	SUB_STAT	
	34			
	35			
	36	SUB_CMD_DATA	SUB_RSP_DATA	
	37			
	38			
	·			
	·			
	61			
	62			
	63			

◆ Communication Phases

The SI-ET3 option changes status after receiving a command code or fault from the master as shown in the following figure.

The communication phases determine the available commands. Refer to Table 7.4 and Table 7.5 for more information.

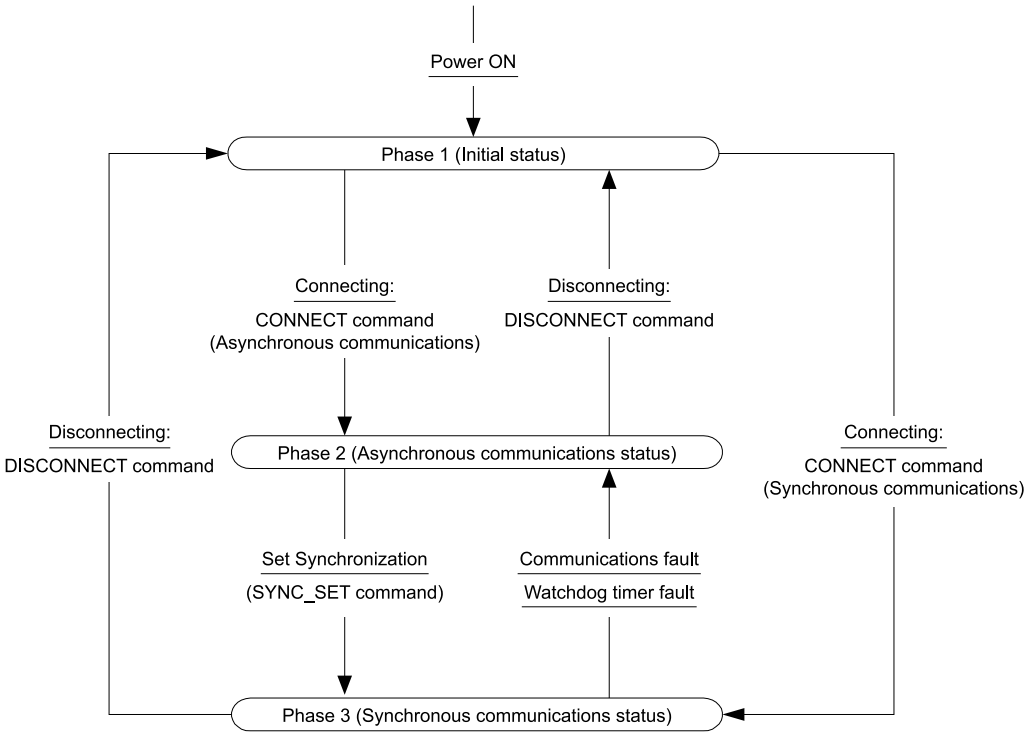


Figure 7.1 Communication Phases

■ Phase 1: Initial status after power ON

Operation proceeds with a default transmission cycle of 2 ms. The transmission cycle is changed to the time indicated in the synchronous frame when a CONNECT command is received from the master. Then the phase moves to phase 2 or phase 3 after a response to the CONNECT command is returned.

Even if a transfer fault is detected in phase 1, no fault notification is provided.

■ Phase 2: Asynchronous communications

All SI-ET3 commands can be used. Phase 2 starts to count the watchdog timer in the communications frame The phase moves to phase 3 when a SYNC_SET command is received, and it moves to phase 1 when a DISCONNECT command is received.

■ Phase 3: Synchronous communications

Watchdog timer faults in the communications frame are detected. The phase moves to phase 1 if the DISCONNECT command is received. The phase moves to phase 2 if a reception fault or a watchdog timer fault is detected.

Table 7.2 Main Command Communication Phases

Command	Code (Hex.)	Contents	Communication Phases		
			1	2	3
NOP	00	No Operation Command	-	○	○
PRM_RD	01	Read Parameter Command	-	○	○
PRM_WR	02	Write Parameter Command	-	○	○
ID_RD	03	Read ID Number Command	-	○	○
CONFIG	04	Setup Device Command	-	○	○
ALM_RD	05	Read Alarm and Warning Command	-	○	○
ALM_CLR	06	Clear Alarm and Warning Command	-	○	○

Command	Code (Hex.)	Contents	Communication Phases		
			1	2	3
SYNC_SET	0D	Start Synchronous Communication Command	-	○	△
CONNECT	0E	Establish Connection Command	○	△	△
DISCONNECT	0F	Release Connection Command	○	○	○
INV_CTL	50	Inverter Operation Control Command	-	○	○

○: Can be executed, Δ: Ignored, –: Cannot be executed (phase error)

Table 7.3 Sub-Command Communication Phases

Command	Code (Hex.)	Contents	Communication Phases		
			1	2	3
NOP	00	No Operation Command	-	○	○
PRM_RD	01	Read Parameter Command	-	○	○
PRM_WR	02	Write Parameter Command	-	○	○
ALM_RD	05	Read Alarm and Warning Command	-	○	○
INV_IO	51	Inverter I/O Control Command	-	○	○

○: Can be executed, –: Cannot be executed (phase error)

◆ Application Layer Specifications

The data format for the application layer conforms to the MECHATROLINK-III command specifications for standard inverter profile.

The SI-ET3 option uses the main commands and sub-commands in the following tables.

Table 7.4 Main Commands

Code (Hex.)	Name	Function
00	NOP	No Operation Command
01	PRM_RD	Read Parameter Command
02	PRM_WR	Write Parameter Command
03	ID_RD	Read ID Number Command
04	CONFIG	RAM Write and EEPROM Write Command
05	ALM_RD	Read Alarm and Warning Command
06	ALM_CLR	Clear Alarm and Warning Command
0D	SYNC_SET	Start Synchronous Communication Command
0E	CONNECT	Connect Command
0F	DISCONNECT	Release Connection Command
50	INV_CTL	Inverter Operation Control Command

Table 7.5 Sub-Commands

Code (Hex.)	Name	Function
00	NOP	No Operation Command
01	PRM_RD	Read Parameter Command
02	PRM_WR	Write Parameter Command
05	ALM_RD	Read Alarm and Warning Command
51	INV_I/O	Inverter I/O Control Command

Set *F6-21 = 0* to select 64-byte data transmission before you use sub-commands. If there is a conflict between a request for a main command and a request for a sub-command, the drive will process the main command request.

If the drive is currently processing a main command or a sub-command, the drive gives priority to the command being processed. The sub-command is given priority if an INV_CTL main command and an INV_I/O sub-command conflict.

Refer to *MECHATROLINK-III Commands on page 26* for more information about command formats. Table 7.6 shows the combinations of main commands and sub-commands.

Table 7.6 Main Commands and Sub-Commands

Code (Hex.)	Main Command	Sub-Command				
		NOP (00 (Hex.))	PRM_RD (01 (Hex.))	PRM_WR (02 (Hex.))	ALM_RD (05 (Hex.))	INV_I/O (51 (Hex.))
00	NOP	OK	OK	OK	OK	OK
01	PRM_RD	OK	-	-	OK	OK
02	PRM_WR	OK	-	-	OK	OK
03	ID_RD	OK	OK	OK	OK	OK
04	CONFIG	OK	-	-	-	-
05	ALM_RD	OK	-	-	-	-
06	ALM_CLR	OK	-	-	-	-
0D	SYNC_SET	OK	OK	OK	OK	OK
0E	CONNECT	OK	-	-	-	-
0F	DISCONNECT	OK	-	-	-	-
50	INV_CTL	OK	OK	OK	OK	OK

Note:
CMD_ALM = B (Hex.) (sub-command combination error) will result if a main command and sub-command conflict with one another.

8 MECHATROLINK-III Commands

◆ Command Control (CMD_CTRL)

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
CMD_ID		Reserved (0)	Reserved (0)	ALM_CLR	Reserved (0)	Reserved (0)	Reserved (0)

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
Reserved (0)							

Command	Description
CMD_ID	This is not used with standard inverter profile commands.
ALM_CLR	0: Clear alarm/warning disabled 1: Clear alarm/warning triggered The same processing as when ALM_CLR_MODE = 0 for the ALM_CLR command (the current alarm/warning state is cleared) is performed.

◆ Command Status (CMD_STAT)

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
RCMD_ID		Reserved (0)	Reserved (0)	ALM_CLR_CMP	CMDRDY	D_WAR	D_ALM

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
COMM_ALM				CMD_ALM			

Command	Description
RCMD_ID	The slave returns the echo of the CMD_ID as the RCMD_ID.
ALM_CLR_CMP	ALM_CLR_CMP = 1 means that CMD_CTRL.ALM_CLR = 1 has been received and alarm clear processing has been completed.
CMDRDY	0: Other 1: Command reception enabled
D_WAR	0: Normal operation 1: The device is in the warning state.
D_ALM	0: Normal operation 1: The device is in the alarm state.

Command	Description
COMM_ALM	Notifies the communication error state. COMM_ALM is independent of CMD_ALM, D_ALM and D_WAR. COMM_ALM is cleared at the leading edge of CMD_CTRL.ALM_CLR or by the ALM_CLR command. Refer to page 27 for more information.
CMD_ALM	Notifies the command error state. If a normal command is received after the occurrence of a command error, CMD_ALM is automatically cleared. Refer to page 27 for more information.

■ COMM_ALM

Code (Hex.)		Contents
-	0000	Normal
Warning	0001	Frame Check Sequence (FCS) error
	0002	Command data not received
	0003	Synchronous frame not received
Alarm	0008	Frame Check Sequence (FCS) error
	0009	Command data not received
	000A	Synchronous frame not received
	000B	Synchronization interval Error
	000C	WDT error

■ CMD_ALM

Code (Hex.)		Contents
-	0000	Normal
Warning	0001	Invalid data
Alarm	0008	Unsupported command received
	0009	Invalid data
	000A	Command execution condition error
	000B	Sub-command combination error
	000C	Phase Error

9 Main Commands

◆ NOP: 00 (Hex.) (No Operation Command)

The NOP command is used for network control. The current state is returned as a response. This command can be used in all phases.

NOP Command		
Byte	Command	Description
0	NOP (00 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	Reserved (0)	Not used
5		
·		
·		
31		

NOP Response		
Byte	**Response**	**Description**
0	NOP (00 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	Reserved (0)	Not used
5		
·		
·		
31		

◆ PRM_RD: 01 (Hex.) (Read Parameter Command)

The PRM_RD command specifies the parameter number and the data size to read a parameter. The command can be used in communication phases 2 and 3. Refer to the drive manual for more information on MEMOBUS/Modbus register numbers.

PRM_RD Command		
Byte	**Command**	**Description**
0	PRM_RD (01 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	NO	MEMOBUS/Modbus register number (Lower)
5		MEMOBUS/Modbus register number (Upper)
6	SIZE	Data size to read [units: byte] 2, 4, 6, and 8 are available.
7	Reserved (0)	Not used
8		
9		
10		
·		
·		
31		

PRM_RD Response		
Byte	**Response**	**Description**
0	PRM_RD (01 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26. If the SIZE data is invalid or MEMOBUS/Modbus register number does not exist, “9” is set for CMD_ALM.
3		
4	NO	The value (Lower) set in the command.
5		The value (Upper) set in the command.
6	SIZE	The SIZE is the same as the register number set in MEMOBUS/Modbus transfers.
7	Reserved (0)	0 is set.

PRM_RD Response		
Byte	**Response**	**Description**
8	PARAMETER	Sets the data read in the byte set in the command. The option stores the data read for PARAMETER from lower byte (LSB) to upper byte (MSB). 0 is stored when the field is not used. 0 is stored in PARAMETER when command error occurs.
9		
10		
.		
.		
31		

■ Example: Reading C1-01 (200 (Hex.))

Byte	Command (Hex.)	Response (Hex.)
4	00	00
5	02	02
6	02	02
7	00	00
8	00	Value set to *C1-01* (Lower)
9	00	Value set to *C1-01* (Upper)

◆ PRM_WR: 02 (Hex.) (Write Parameter Command)

The PRM_WR command specifies the parameter number, data size, and parameter data to write a parameter. The command can be used in communication phases 2 and 3. The CONFIG command must be sent to set up after the parameters are written. Refer to the drive manual for more information on MEMOBUS/Modbus register numbers.

PRM_WR Response		
Byte	**Command**	**Description**
0	PRM_WR (02 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	NO	MEMOBUS/Modbus register number (Lower)
5		MEMOBUS/Modbus register number (Upper)
6	SIZE	Specify the parameter data size in bytes. 2, 4, 6, and 8 are available.
7	Reserved (0)	Not used
8	PARAMETER	Specify the lower byte (LSB) before the upper byte (MSB) in the size set in the SIZE.
9		
10		
.		
.		
31		

PRM_WR Response		
Byte	**Response**	**Description**
0	PRM_WR (02 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26. If the SIZE data is invalid, “9” is set for CMD_ALM.
3		
4	NO	The value (Lower) set in the command.
5		The value (Upper) set in the command.

PRM_WR Response		
Byte	**Response**	**Description**
6	SIZE	The value set in the command.
7	Reserved (0)	0 is set.
8	PARAMETER	The value set in the command. 0 is stored when the field is not used.
9		
10		
.		
.		
31		

In the following status, an alarm is detected and the command goes into error.

Error	Response
Register Number Error	"9" is set for CMD_ALM.
Bit Count Error	"9" is set for CMD_ALM.
Data Setting Error	"9" is set for CMD_ALM.
Write Mode Error	"9" is set for CMD_ALM.
Writing Error during Under Voltage	"9" is set for CMD_ALM.
Writing Error during Parameter Processing	"9" is set for CMD_ALM.

■ Example: Writing C1-01 (200 (Hex.))

Byte	Command (Hex.)	Response (Hex.)
4	00	00
5	02	02
6	02	02
7	00	00
8	Value set to *C1-01* (Lower)	Value set to *C1-01* (Lower)
9	Value set to *C1-01* (Upper)	Value set to *C1-01* (Upper)

◆ ID_RD: 03 (Hex.) (Read ID Number Command)

The ID_RD command reads the product information as ID data to read the ID of a device.

ID_RD Command		
Byte	**Command**	**Description**
0	ID_RD: 03 (Hex.)	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	ID_CODE	Specifies the ID_CODE. Refer to Table 9.1 for more information.
5	OFFSET	Set the offset in byte.
6	SIZE	Set the size in byte. (Lower)
7		Set the size in byte. (Upper)
8	Reserved (0)	Not used
.		
.		
31		

ID_RD Response		
Byte	**Response**	**Description**
0	ID_RD: 03 (Hex.)	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	ID_CODE	The value set in the command.
5	OFFSET	The value set in the command.
6	SIZE	The value set in the command.
7		
8	ID	ID data is stored. Refer to Table 9.1 for more information.
.		
.		
31		

Table 9.1 ID_CODE

ID_CODE (Hex.)	Description	Size	Description
01	Vendor ID Code	4 byte	0000 (Hex.)
02	Device Code	4 byte	1000-Series Drives: 04000001 (Hex.) GA500, GA700, GA800, CR700, and CH700: 04000002 (Hex.)
03	Device Version	4 byte	Version information of device
04	Device Definition File Version	4 byte	0000 (Hex.)
05	Extended Address Setting	4 byte	0001 (Hex.) (Multi-slave is not available)
10	Profile type 1 (Primary)	4 byte	0020 (Hex.) (Inverter profile)
11	Profile Version 1 (Primary)	4 byte	0100 (Hex.)
12	Profile type 2	4 byte	00FF (Hex.) (Not available)
13	Profile Version 2	4 byte	0000 (Hex.)
14	Profile type 3	4 byte	00FF (Hex.) (Not available)
15	Profile Version 3	4 byte	0000 (Hex.)
16	Minimum transmission cycle	4 byte	25000 (250 µs) [unit: 0.01 µs]
17	Maximum transmission cycle	4 byte	800000 (8 ms) [unit: 0.01 µs]
18	Transmission Cycle Increment (Granularity)	4 byte	03 (Hex.) (Supports 31.25 [µs], 62.5 [µs], 125 [µs], 250 [µs], 500 [µs], 750 [µs], 1 to 64 [ms] (0.5 ms increment))
19	Minimum Value of Communication Cycle	4 byte	25000 (250 µs) [unit: 0.01 µs]
1A	Maximum Value of Communication Cycle	4 byte	3200000 (32 ms) [unit: 0.01 µs]
1B	Number of Transmission Bytes	4 byte	00000014 (Hex.) (64 byte, 32 byte)
1C	Number of Transmission Bytes (Current Setting)	4 byte	The number of transmission bytes for cyclic communication that is currently set for the device. (Cyclic communication/ event driven communication)
1D	Profile Type (Current Selection)	4 byte	The number of transmission bytes for cyclic communication that is currently set for the device. This is the profile selected with the CONNECT command.
20	Supported Communication Mode	4 byte	00000003 (Hex.) (Cyclic communication/event driven communication)
30	List of Supported Main Commands	32 byte	The list of the sub-commands that the device supports.
38	List of Supported Sub-Commands	32 byte	The list of the sub-commands that the device supports.
40	List of Supported Common Parameters	32 byte	0
48	Speed reference unit/Output reference unit	4 byte	0: 0.01 Hz units 1: 0.01% units 2: min^{-1} (r/min) units 3: Units in the product specifications 4 and above: Reserved

ID_CODE (Hex.)	Description	Size	Description
49	Torque Reference Unit	4 byte	0: 0.1% units
4A	Output Current Unit	4 byte	0: 0.1 A units

Access the MECHATROLINK Members Association web site http://www.mechatrolink.org/ for details on the ID_CODE.

◆ CONFIG: 04 (Hex.) (Setup Device Command)

The CONFIG command forces the parameters written using PRM_WR to become effective, and optionally stores the parameters into EEPROM. The command can be used in communication phases 2 and 3.

CONFIG Command		
Byte	**Command**	**Description**
0	CONFIG (04 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	CONFIG_MOD	Specify the type of setup. Refer to Table 9.2 for more information.
5	Reserved (0)	Not used
6		
7		
.		
.		
31		

CONFIG Response		
Byte	**Response**	**Description**
0	CONFIG (04 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	CONFIG_MOD	The value set in the command.
5	Reserved (0)	Not used
6		
7		
.		
.		
31		

Table 9.2 CONFIG_MOD

CONFIG_MOD	Description
0	RAM Write The setting value is not stored in EEPROM.
1	The setting value is stored in EEPROM. **Note:** The EEPROM can only be written to 100,000 times, so it is recommended to limit the number of times writing to the EEPROM. Change all the parameters then issue the CONFIG command.

◆ ALM_RD: 05 (Hex.) (Read Alarm and Warning Command)

The ALM_RD command reads the alarm or warning state. The command can be used in communication phases 2 and 3. The current alarm or warning state is read from ALM_DATA as an alarm or warning code. Refer to the drive manual for details about ALM_DATA.

ALM_RD Command		
Byte	**Command**	**Description**
0	ALM_RD (05 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	ALM_RD_MOD	Specify the alarm or warning state. (Lower)
5		Specify the alarm or warning state. (Lower)
6	ALM_INDEX	Specify the alarm index. The command is enabled when ALM_RD_MODE is 2. (Lower)
7		Specify the alarm index. The command is enabled when ALM_RD_MODE is 2. (Upper)
8	Reserved (0)	Not used
9		
10		
.		
.		
31		

ALM_RD Response		
Byte	**Response**	**Description**
0	ALM_RD (05 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	ALM_RD_MOD	The value set in the command.
5		
6	ALM_INDEX	The value set in the command.
7		
8	ALM_DATA	ALM_DATA specifies an alarm using 2 bytes.
9		
10		
.		
.		
31		

Table 9.3 ALM_RD_MOD

ALM_RD_MOD	Description	
0	Present fault (Byte 6), Fault history (Byte 8 - 11)	*U2-01*, *U2-02*
1	Alarm status list (Byte 8 - 27)	*U3-01 - U3-10*
2	Fault history (Alarms are not retained in the history.) (Byte 8 - 9)	*U2-01*, *U3-01 - U3-10*

Table 9.4 ALM_RD_MOD

Byte	ALM_RD_MOD = 0	ALM_RD_MOD = 1	ALM_RD_MOD = 2
4	00 (Hex.)	01 (Hex.)	02 (Hex.)
5	00 (Hex.)	00 (Hex.)	00 (Hex.)
6	-	-	ALM_INDEX (Lower)
7	-	-	ALM_INDEX (Upper)
8	*U2-01* (Lower)	*U3-01* (Lower)	ALM_INDEX = 0: *U2-01* (Lower) ALM_INDEX ≠ 0: U3-(ALM_INDEX) (Lower)
9	*U2-01* (Upper)	*U3-01* (Upper)	ALM_INDEX = 0: U2-01 (Upper) ALM_INDEX ≠ 0: U3-(ALM_INDEX) (Upper)
10	*U2-02* (Lower)	*U3-02* (Lower)	-
11	*U2-02* (Upper)	*U3-02* (Upper)	-
12	-	*U3-03* (Lower)	-
13	-	*U3-03* (Upper)	-
14	-	*U3-04* (Lower)	-
15	-	*U3-04* (Upper)	-
16	-	*U3-05* (Lower)	-
17	-	*U3-05* (Upper)	-
18	-	*U3-06* (Lower)	-
19	-	*U3-06* (Upper)	-
20	-	*U3-07* (Lower)	-
21	-	*U3-07* (Upper)	-
22	-	*U3-08* (Lower)	-
23	-	*U3-08* (Upper)	-
24	-	*U3-09* (Lower)	-
25	-	*U3-09* (Upper)	-
26	-	*U3-10* (Lower)	-
27	-	*U3-10* (Upper)	-

◆ ALM_CLR: 06 (Hex.) (Clear Alarm and Warning Command)

The ALM_CLR command clears the alarm or warning state after the cause has been removed. The command can be used in communication phases 2 and 3.

This command changes the state of a slave station; it does not remove the cause of a fault. After the cause of the alarm or warning has been removed, this command is then used to clear the status of the alarm or warning.

ALM_CLR Command		
Byte	**Command**	**Description**
0	ALM_CLR (06 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	ALM_CLR_MOD	0: Clears the status of present faults and alarms.
5		
6	Reserved (0)	Not used
7		
·		
·		
31		

ALM_CLR Response		
Byte	**Response**	**Description**
0	ALM_CLR (06 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	ALM_CLR_MOD	The value set in the command.
5		
6	Reserved (0)	Not used
7		
·		
·		
31		

◆ SYNC_SET: 0D (Hex.) (Start Synchronous Communication Command)

The SYNC_SET command starts synchronous communications. The SYNC_SET command starts synchronous communications. This command also restores synchronous if communications become asynchronous due to any fault. The command can be used in communication phases 2 and 3. Completing this command commences watchdog data error detection.

SYNC_SET Command		
Byte	**Command**	**Description**
0	SYNC_SET (0D (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	Reserved (0)	Not used
5		
6		
7		
·		
·		
31		

SYNC_SET Response		
Byte	**Response**	**Description**
0	SYNC_SET (0D (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	Reserved (0)	Not used
5		
6		
7		
·		
·		
31		

◆ CONNECT: 0E (Hex.) (Establish Connection Command)

The CONNECT command establishes a MECHATROLINK connection. The phase moves to communication phase 2 and 3 after the connection is established.

CONNECT Command		
Byte	**Command**	**Description**
0	CONNECT (0E Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	VER	Specify 30 (Hex.).
5	COM_MOD	Specify the Communication Mode (COM_MOD). Refer to Table 9.5 for more information.
6	COM_TIM	1 - 255 Sets multiples of the transmission cycle as the communication cycle.
7	PROFILE_TYPE	Specify PROFILE_TYPE = 20 (Hex.).
8	Reserved (0)	Not used
.		
.		
31		

CONNECT Response		
Byte	**Response**	**Description**
0	CONNECT (0E Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	VER	The value set in the command.
5	COM_MOD	The value set in the command.
6	COM_TIM	The value set in the command.
7	PROFILE_TYPE	The value set in the command.
8	Reserved (0)	Not used
.		
.		
31		

Table 9.5 COM_MOD

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
SUBCMD	0	0	0	DTMODE		SYNCMODE	0

bit	Name	Value	Description
SUBCMD	Sub-command setting	0	Sub-command disabled
		1	Sub-command enabled
DTMODE	Data transfer method	0	Single transmission
SYNCMODE	Synchronization setting	0	Performs asynchronous communication
		1	Performs synchronous communication

◆ DISCONNECT: 0F (Hex.) (Release Connection Command)

The DISCONNECT command releases the connection. The communication phase shifts to communication phase 1 after this command is completed.

DISCONNECT Command		
Byte	**Command**	**Description**
0	DISCONNECT (0F (Hex.))	Command code
1	Reserved (0)	Not used
.		
.		
31		

DISCONNECT Response		
Byte	**Response**	**Description**
0	DISCONNECT (0F (Hex.))	Command code
1	Reserved (0)	Not used
.		
.		
31		

◆ INV_CTL: 50 (Hex.) (Inverter Operation Control Command)

The INV_CTL command is used to set the drive operation signals, speed references, and others. These bytes do not need to be set every scan. Parameter *o1-03* sets the units for speed reference and output frequency.

The command can be used in communication phases 2 and 3.

INV_CTL Response		
Byte	**Response**	**Description**
0	INV_CTL (50 (Hex.))	Command code
1	WDT	Watchdog data
2	CMD_CTRL	Refer to page 26.
3		
4	INVCMD_CTRL	Refer to page 38.
5		
6		
7		
8	INVCMD_IO	Refer to page 39.
9		
10		
11		
12	Speed reference	Speed Reference (Lower)
13		Speed Reference (Upper)
14		Not used (Set to 0.)
15		Not used (Set to 0.)
16	Torque reference	Torque Reference (Lower)
17		Torque Reference (Upper)
18		Not used (Set to 0.)
19		Not used (Set to 0.)
20	SEL_REF1/2	Use the SEL_REF1/2 command to select the contents of REF1 with bits 0 to 3 and to select the contents of REF2 with bits 4 to 7. Refer to Table 9.7 for the selection ranges for SEL_REF1/2.
21	SEL_MON1/2	Use the SEL_MON1/2 command to select the contents of MON1 with bits 0 to 3 and to select the contents of MON2 with bits 4 to 7. Refer to Table 9.8 for the selection ranges for SEL_MON1/2.
22	Reserved (0)	Not used
23		

INV_CTL Response		
Byte	**Response**	**Description**
24	Reference selected with SEL_ REF1	Reference selected with SEL_REF1 (Lower)
25		Reference selected with SEL_REF1 (Upper)
26		Not used (Set to 0.)
27		Not used (Set to 0.)
28	Reference selected with SEL_ REF2	Reference selected with SEL_REF2 (Lower)
29		Reference selected with SEL_REF2 (Upper)
30		Not used (Set to 0.)
31		Not used (Set to 0.)

■ INVCMD_CTRL

Vendor Specific						bit 1	bit 0
bit 7	**bit 6**	**bit 5**	**bit 4**	**bit 3**	**bit 2**		
Not used						Reverse operation	Forward operation

Vendor Specific						bit 9	bit 8
bit 15	**bit 14**	**bit 13**	**bit 12**	**bit 11**	**bit 10**		
Not used			External base block reference	Clear the fault history	External fault (EF0)	Fault reset	Reserved (0)

Vendor Specific							
bit 23	**bit 22**	**bit 21**	**bit 20**	**bit 19**	**bit 18**	**bit 17**	**bit 16**
Not used	1000-Series Drives, GA700, GA800, CR700, and CH700: Multi-Function Input Terminal 3 - 8 GA500: Multi-Function Input Terminal 3 - 7						

bit 31	**bit 30**	**bit 29**	**bit 28**	**bit 27**	**bit 26**	**bit 25**	**bit 24**
Reserved (0)							

Table 9.6 INVCMD_CTRL Bits

Bit	Name	Description
0	Forward operation	0: Stop 1: Forward operation
1	Reverse operation	0: Stop 1: Reverse operation
9	Fault Reset	1: Fault reset
10	External fault (EF0)	1: External fault input (EF0)
11	Clear fault history	1: Clear fault history
12	External base block reference	1: External base block reference ON
16	Multi-function input terminal 3	Multi-function input terminal S3 0: Multi-function input terminal S3 is OFF 1: Multi-function input terminal S3 is ON
17	Multi-function input terminal 4	Multi-function input terminal S4 0: Multi-function input terminal S4 is OFF 1: Multi-function input terminal S4 is ON
18	Multi-function input terminal 5	Multi-function input terminal S5 0: Multi-function input terminal S5 is OFF 1: Multi-function input terminal S5 is ON
19	Multi-function input terminal 6	Multi-function input terminal S6 0: Multi-function input terminal S6 is OFF 1: Multi-function input terminal S6 is ON

Bit	Name	Description
20	Multi-function input terminal 7	Multi-function input terminal S7 0: Multi-function input terminal S7 is OFF 1: Multi-function input terminal S7 is ON
21	Multi-function input terminal 8 *1	Multi-function input terminal S8 0: Multi-function input terminal S8 is OFF 1: Multi-function input terminal S8 is ON

*1 GA500 does not have multi-function digital input 8.

■ INVCMD_IO Command

Vendor Specific							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Not used							

Vendor Specific							
bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
Not used							

Vendor Specific							
bit23	bit22	bit21	bit20	bit19	bit18	bit17	bit16
Not used							

bit31	bit30	bit29	bit28	Vendor Specific			
				bit27	bit26	bit25	bit24
Reserved (0)				Not used			

Table 9.7 SEL_REF Reference Data Codes

Selection Code (Hex.)	Monitor Name	Contents
0	Nothing Selected	-
1	Torque Compensation	Unit: 0.1%
2	Analog output terminal 1 output	Enabled when *H4-01 = 000*
3	1000-Series Drives, GA700, GA800, CR700, and CH700: Analog Output Terminal 2 Output GA500: Not used	1000-Series Drives, GA700, GA800, CR700, and CH700: Enabled when *H4-04 = 000* GA500: -
4	Drive terminal output	-
5	PID Setpoint	Unit: 0.01%
6	Pulse Output	Unit: 1 Hz
7	V/f gain	-
8	Not used	-
9	Command selection setting	Bit 1: PID setpoint enabled

Table 9.8 SEL_MON Monitor Data Codes

Selection Code (Hex.)	Monitor Name	Contents
0	Nothing Selected	-
1	Motor Speed	Displayed in *U1-05* and determined by *o1-03*.
2	Torque Reference (Monitor)	Displayed in *U1-09* (0.1%).
3	1000-Series Drives, GA700, GA800, CR700, and CH700: Speed Detection PG1 Counter GA500: Not used	-
4	Frequency Reference	Displayed in *U1-01* and determined by *o1-03*.
5	Analog input Terminal A2	Displayed in *U1-14* (0.1%).
6	DC Bus Voltage	Displayed in *U1-07* (1 V).
7	Inverter Alarm	-
8	Inverter Warning	-

Selection Code (Hex.)	Monitor Name	Contents
9	Multi-Function Output Terminal Status	Displayed in *U1-11*.
A	1000-Series Drives, GA700, GA800, CR700, and CH700: Analog Input Terminal GA500: Not used	1000-Series Drives, GA700, GA800, CR700, and CH700: Displayed in *U1-15* (0.1%). GA500: -
B	1000-Series Drives, GA700, GA800, CR700, and CH700: Multi-Function Input Terminal Status S1 - S8 GA500: Multi-Function Input Terminal Status S1 - S7	Displayed in *U1-10*.
C	Analog input terminal A1	Displayed in *U1-13* (0.1%).
D	1000-Series Drives, GA700, GA800, CR700, and CH700: Speed Detection PG2 Counter GA500: Not used	-
E	Monitor Data Set to *F6-23*	-
F	Monitor Data Set to *F6-24*	-

■ INV_CTL Response

INV_CTL Response		
Byte	**Response**	**Description**
0	INV_CTL (50 (Hex.))	Command code
1	RWDT	Watchdog data
2	CMD_STAT	Refer to page 26.
3		
4	INVCMD_STAT	Refer to page 41.
5		
6		
7		
8	INVCMD_IO	Refer to page 41.
9		
10		
11		
12	Output Frequency	Output Frequency (Lower)
13		Output Frequency (Upper)
14		Not used (Set to 0.)
15		Not used (Set to 0.)
16	Output current	Output current (Lower)
17		Output current (Upper)
18		Not used (Set to 0.)
19		Not used (Set to 0.)
20	SEL_REF1/2	The value set in the command.
21	SEL_MON1/2	The value set in the command.
22	Reserved (0)	Not used (Set to 0.)
23		
24	Monitor data set to SEL_MON1	Monitor data set to SEL_MON1 (Lower)
25		Monitor data set to SEL_MON1 (Upper)
26		Not used (Set to 0.)
27		Not used (Set to 0.)
28	Monitor data set to SEL_MON2	Monitor data set to SEL_MON2 (Lower)
29		Monitor data set to SEL_MON2 (Upper)
30		Not used (Set to 0.)
31		Not used (Set to 0.)

■ INVCMD_STAT

Vendor Specific						bit1	bit0
bit7	bit6	bit5	bit4	bit3	bit2		
oPE Error	Drive Ready	Speed Agree	Zero speed	Main Power Supply ON	Baseblock Released	Reverse Operation	Forward Operation

Vendor Specific						bit9	bit8
bit15	bit14	bit13	bit12	bit11	bit10		
Not used		Zero Servo	Motor 2 Selection	LOCAL/REMOTE	Power Loss Recovery/ Momentary Power Loss Recovery	Fault Reset Signal being Input	Reserved (0)

Vendor Specific							
bit23	bit22	bit21	bit20	bit19	bit18	bit17	bit16
Not used							

bit31	bit30	bit29	bit28	bit27	bit26	bit25	bit24
Reserved (0)						SEL_MON2 Status	SEL_MON1 Status

Table 9.9 INVCMD_STAT Bits

Bit	Name	Description
0	Forward Operation	0: Stop 1: Forward operation in progress
1	Reverse Operation	0: Stop 1: Reverse operation
2	Baseblock Released	0: Baseblock 1: Baseblock released
3	Main Power Supply ON	0: Main power supply OFF 1: Main power supply ON
4	Zero Speed	1: Zero Speed
5	Speed Agree	1: Speed agree
6	Drive Ready	1: Drive ready
7	oPE Error	1: oPE error
9	Fault Reset Signal being Input	1: Fault reset signal being input
10	Power Loss Recovery/Momentary Power Loss Recovery	0: Power loss recovery 1: Momentary power loss recovery
11	LOCAL/REMOTE	0: LOCAL 1: REMOTE
12	Motor 2 Selection	0: Motor 1 1: Motor 2
13	Zero Servo	1: Zero servo
24	SEL_MON1 Status	0: Disabled 1: SEL_MON1 enabled
25	SEL_MON2 Status	0: Disabled 1: SEL_MON2 enabled

■ INVCMD_IO Response

Vendor Specific							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Not used							

Vendor Specific							
bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
Not used							

Vendor Specific							
bit23	bit22	bit21	bit20	bit19	bit18	bit17	bit16
Not used							

bit31	bit30	bit29	bit28	Vendor Specific			
				bit27	bit26	bit25	bit24
Reserved (0)				Not used			

10 Sub-Command

Use sub-commands after selecting the 64-byte data transmission (*F6-21 = 0*).

◆ SUB_CTRL (Sub-Command Control Field)

Table 10.1 SUB_CTRL

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved (0)							

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
Reserved (0)							

bit23	bit22	bit21	bit20	bit19	bit18	bit17	bit16
Reserved (0)							

◆ SUB_STAT (Sub-Command Status)

Table 10.2 SUB_STAT

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Not used				Reserved (0)	SUBCMDRDY	Not used	

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
Reserved (0)				SUBCMD_ALM			

bit 23	bit 22	bit 21	bit 20	bit 19	bit 18	bit 17	bit 16
Reserved (0)				SEL_MON6 Status	SEL_MON5 Status	SEL_MON4 Status	SEL_MON3 Status

Command	Description
SUBCMDRDY	0: Sub-command reception disabled 1: Sub-command reception enabled
SUBCMD_ALM	Notifies the sub-command error state. If a normal sub-command is received after the occurrence of a sub-command error, SUBCMD_ALM is automatically cleared.
SEL_MON3 Status	0: Disabled 1: SEL_MON3 enabled
SEL_MON4 Status	0: Disabled 1: SEL_MON4 enabled
SEL_MON5 Status	0: Disabled 1: SEL_MON5 enabled
SEL_MON6 Status	0: Disabled 1: SEL_MON6 enabled

Table 10.3 SUBCMD_ALM

Code (Hex.)		Description
-	00	Normal
Warning	01	Invalid data

Code (Hex.)		Description
Alarm	08	Unsupported command received
	09	Invalid data
	0A	Command execution condition error
	0B	Sub-command combination error
	0C	Phase Error

◆ NOP: 00 (Hex.) (No Operation Command)

The NOP command is used for network control. The current state is returned as a response. This command can be used in all phases.

NOP Command		
Byte	**Command**	**Description**
32	NOP (00 (Hex.))	Command code
33	SUB_CTRL	Refer to page 42.
34		
35		
36	Reserved (0)	Not used
37		
·		
·		
63		

NOP Response		
Byte	**Response**	**Description**
32	NOP (00 (Hex.))	Command code
33	SUB_STAT	Refer to page 42.
34		
35		
36	Reserved (0)	Not used
37		
·		
·		
63		

◆ PRM_RD: 01 (Hex.) (Read Parameter Command)

The PRM_RD command specifies the parameter number and the data size to read a parameter. The command can be used in communication phases 2 and 3. Refer to the drive manual for details on MEMOBUS/Modbus register numbers.

PRM_RD Command		
Byte	**Command**	**Description**
32	PRM_RD (01 (Hex.))	Command code
33	SUB_CTRL	Refer to page 42.
34		
35		
36	NO	MEMOBUS/Modbus register number (Lower)
37		MEMOBUS/Modbus register number (Upper)
38	SIZE	Data size to read [units: byte] 2, 4, 6, and 8 are available.

PRM_RD Command		
Byte	**Command**	**Description**
39	Reserved (0)	Not used
40		
41		
42		
.		
.		
63		

PRM_RD Response		
Byte	**Response**	**Description**
32	PRM_RD (01 (Hex.))	Command code
33	SUB_STAT	Refer to page 42.
34		
35		
36	NO	The value (Lower) set in the command.
37		The value (Upper) set in the command.
38	SIZE	The value set in the command.
39	Reserved (0)	0 is set.
40	PARAMETER	Sets the data read in the byte set in the command. The option stores the data read for PARAMETER from lower byte (LSB) to upper byte (MSB). 0 is stored when the field is not used. 0 is stored in PARAMETER when command error occurs.
41		
42		
.		
.		
63		

◆ PRM_WR: 02 (Hex.) (Write Parameter Command)

The PRM_WR command specifies the parameter number, data size, and parameter data to write a parameter. The command can be used in communication phases 2 and 3. The CONFIG command must be sent to set up after the parameters are written. Refer to the drive manual for more information on MEMOBUS/Modbus register numbers.

PRM_WR Response		
Byte	**Command**	**Description**
32	PRM_WR (02 (Hex.))	Command code
33	SUB_CTRL	Refer to page 42.
34		
35		
36	NO	MEMOBUS/Modbus register number (Lower)
37		MEMOBUS/Modbus register number (Upper)
38	SIZE	Specify the parameter data size in bytes. 2, 4, 6, and 8 are available.
39	Reserved (0)	Not used
40	PARAMETER	Specify the lower byte (LSB) before the upper byte (MSB) in the size set in the SIZE.
41		
42		
.		
.		
63		

PRM_WR Response		
Byte	**Response**	**Description**
32	PRM_WR (02 (Hex.))	Command code
33	SUB_STAT	Refer to page 42.
34		
35		
36	NO	The value (Lower) set in the command.
37		The value (Upper) set in the command.
38	SIZE	The value set in the command.
39	Reserved (0)	0 is set.
40	PARAMETER	The value set in the command. 0 is stored when the field is not used.
41		
42		
.		
.		
63		

In the following status, an alarm is detected and the command goes into error.

Error	Response
Register Number Error	"9" is set for CMD_ALM.
Bit Count Error	"9" is set for CMD_ALM.
Data Setting Error	"9" is set for CMD_ALM.
Write Mode Error	"9" is set for CMD_ALM.
Writing Error during Under Voltage	"9" is set for CMD_ALM.
Writing Error during Parameter Processing	"9" is set for CMD_ALM.

◆ ALM_RD: 05 (Hex.) (Read Alarm and Warning Command)

The ALM_RD command reads the alarm or warning state. Refer to *ALM_RD: 05 (Hex.) (Read Alarm and Warning Command) on page 33* for more information on ALM_DATA. The command can be used in communication phases 2 and 3. The current alarm or warning state is read from ALM_DATA as an alarm or warning code. Refer to the drive manual for details about ALM_DATA.

ALM_RD Command		
Byte	**Command**	**Description**
32	ALM_RD (05 (Hex.))	Command code
33	SUB_CTRL	Refer to page 42.
34		
35		
36	ALM_RD_MOD	Specify the alarm or warning state. (Lower)
37		Specify the alarm or warning state. (Lower)
38	ALM_INDEX	Specify the alarm index. The command is enabled when ALM_RD_MODE is 2. (Lower)
39		Specify the alarm index. The command is enabled when ALM_RD_MODE is 2. (Upper)
40	Reserved (0)	Not used
41		
42		
.		
.		
63		

ALM_RD Response		
Byte	**Response**	**Description**
32	ALM_RD (05 (Hex.))	Command code
33	SUB_STAT	Refer to page 42.
34		
35		
36	ALM_RD_MOD	The value set in the command.
37		
38	ALM_INDEX	The value set in the command.
39		
40	ALM_DATA	ALM_DATA specifies an alarm using 2 bytes.
41		
42		
.		
.		
63		

◆ INV_I/O: 51 (Hex.) (Inverter I/O Control Command)

The INV_I/O command sets the drive I/O, displays the monitor value, and executes references.

INV_IO Command		
Byte	**Command**	**Description**
32	INV_IO (51 (Hex.))	Command code
33	SUB_CTRL	Refer to page 42.
34		
35		
36	SEL_REF 3/4	Use the SEL_REF3/4 command to select the contents of REF3 with bits 0 to 3 and to select the contents of REF4 with bits 4 to 7. Refer to Table 9.7 for the selection ranges for SEL REF3/4 and SEL MON3/4.
37	SEL_REF 5/6	Use the SEL REF5/6 command to select the contents of REF5 with bits 0 to 3 and to select the contents of REF6 with bits 4 to 7. Refer to Table 9.7 for the selection ranges for SEL REF5/6 and SEL MON5/6.
38	SEL_MON 3/4	Use the SEL MON3/4 command to select the contents of MON3 with bits 0 to 3 and to select the contents of MON4 with bits 4 to 7. Refer to Table 9.8 for the selection ranges for SEL REF3/4 and SEL MON3/4.
39	SEL_MON 5/6	Use the SEL MON5/6 command to select the contents of MON5 with bits 0 to 3 and to select the contents of MON6 with bits 4 to 7. Refer to Table 9.8 for the selection ranges for SEL REF5/6 and SEL MON5/6.
40	Reference selected with SEL_ REF3	Reference selected with SEL_REF3 (Lower)
41		Reference selected with SEL_REF3 (Upper)
42		Not used (Ignored if a value is set.)
43		Not used (Ignored if a value is set.)
44	Reference selected with SEL_ REF4	Reference selected with SEL_REF4 (Lower)
45		Reference selected with SEL_REF4 (Upper)
46		Not used (Set to 0.)
47		Not used (Set to 0.)
48	Reference selected with SEL_ REF5	Reference selected with SEL_REF5 (Lower)
49		Reference selected with SEL_REF5 (Upper)
50		Not used (Set to 0.)
51		Not used (Set to 0.)

INV_IO Command		
Byte	**Command**	**Description**
52	Reference selected with SEL_ REF6	Reference selected with SEL_REF6 (Lower)
53		Reference selected with SEL_REF6 (Upper)
54		Not used (Set to 0.)
55		Not used (Set to 0.)
56	Reserved (0)	Not used
.		
.		
63		

INV_IO Response		
Byte	**Response**	**Description**
32	INV_IO (51 (Hex.))	Command code
33	SUB_STAT	Refer to page 42.
34		
35		
36	SEL_REF 3/4	The value set in the command.
37	SEL_REF 5/6	The value set in the command.
38	SEL_MON 3/4	The value set in the command.
39	SEL_MON 5/6	The value set in the command.
40	Monitor data set to SEL_MON3	Monitor data set to SEL_MON3 (Lower)
41		Monitor data set to SEL_MON3 (Upper)
42		Not used (Set to 0.)
43		Not used (Set to 0.)
44	Monitor data set to SEL_MON4	Monitor data set to SEL_MON4 (Lower)
45		Monitor data set to SEL_MON4 (Upper)
46		Not used (Set to 0.)
47		Not used (Set to 0.)
48	Monitor data set to SEL_MON5	Monitor data set to SEL_MON5 (Lower)
49		Monitor data set to SEL_MON5 (Upper)
50		Not used (Set to 0.)
51		Not used (Set to 0.)
52	Monitor data set to SEL_MON6	Monitor data set to SEL_MON6 (Lower)
53		Monitor data set to SEL_MON6 (Upper)
54		Not used (Set to 0.)
55		Not used (Set to 0.)
56	Reserved (0)	Not used
.		
.		
63		

11 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Faults on page 48* 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

bUS [Option Communication Error], *E5 [MECHATROLINK Watchdog Timer Error]*, and *EF0 [Option Card External Fault from the option]* can appear as an alarm or as a fault. When a fault occurs, the keypad ALM LED remains lit. When an alarm occurs, the ALM LED flashes.

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

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

Code	Name	Causes	Possible Solutions
bUS	Option Communication Error	The drive did not receive a signal from the controller.	• Check for wiring errors. • Correct the wiring.
		Faulty communications wiring	
		An existing short circuit or communications disconnection	Check disconnected cables and short circuits and repair as needed
		A data error occurred due to electric interference	• Prevent noise in the control circuit, main circuit, and ground wiring. • If you identify a magnetic contactor as a source of noise, install a surge absorber to the contactor coil. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input. • Counteract noise in the master controller (PLC).
		Option is damaged	If there are no problems with the wiring and the error continues to occur, replace the option.
		Connection Time-out	• The option Requested Packet Interval (RPI) timer timed out • Make sure that RPI time is set properly
		Duplicate Station Address	Check if the option shares Station Address with at least one other node. Check the setting values of *F6-20 [MECHATROLINK Station Address]*.
E5	MECHATROLINK Watchdog Timer Error	The drive detected a watchdog circuit exception while it received data from the controller.	Check the MECHATROLINK cable connection. Check for wiring and how to counteract noise according to the following manuals by MECHATROLINK Members Association. • MECHATROLINK-III Installation Guide, MMATDEP018A
EF0	Option Card External Fault	An external fault was received from the PLC.	1. Remove the cause of the external fault 2. Reset the external fault input from the PLC
		A programming error occurred on the controller side.	Check the PLC program.
		PLC is in the Idle Mode.	1. Set the PLC to the Run Mode. 2. Set the parameter F6-54 = 0 (Enabled) to ignore errors while the PLC is in the Idle Mode.
oFA00	Option Card Connection Error (CN5-A)	The option card installed into port CN5-A is not compatible with the drive.	Connect the option to the correct option port. • Note: Use connector CN5-B when connecting DO-A3, AO-A3, or two PG options. Use connector CN5-C when connecting only one PG option. To use other options, refer to those option manuals.
oFA01	Option Card Fault (CN5-A)	The option connected to option port CN5-A was changed during run.	1. De-energize the drive. 2. Connect the option to the correct option port.
oFA03, oFA04	Option Card Error (CN5-A)	A fault occurred in the option.	1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
oFA30 to oFA43	Option Card Connection Error (CN5-A)	A fault occurred in the option.	1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
oFb00	Option Not Compatible with Port	The option card installed into port CN5-B is not compatible with the drive.	Connect the option to the correct option port. • Use connector CN5-B when you connect DO-A3, AO-A3, or two PG options. Use connector CN5-C when you connect only one PG option. To use other options, refer to those option manuals.
oFb02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.

Code	Name	Causes	Possible Solutions
oFC00	Option Fault (CN5-B)	The option card installed into port CN5-C is not compatible with the drive.	Connect the option to the correct option port. • Note: Use connector CN5-B when connecting DO-A3, AO-A3, or two PG options. Use connector CN5-C when connecting only one PG option. To use other options, refer to those option manuals.
oFC02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.

■ Minor Faults and Alarms

Code	Name	Causes	Possible Solutions
CALL	Serial communication transmission error	The communications cable wiring is incorrect.	• Check for wiring errors. • Correct the wiring.
		An existing short circuit or communications disconnection	Check disconnected cables and short circuits and repair as needed.
		Programming error on the master side	Check communications at start-up and correct programming errors.
		Communication circuitry is damaged.	• Perform a self-diagnostics check • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative.
CyC	MECHATROLINK Communications Cycle Setting Error	The upper controller is using a communication cycle beyond the allowable setting range for the MECHATROLINK option.	Set the communication cycle for the upper controller within the allowable setting range for the MECHATROLINK option.
CyPo	Cycle Power to Active Parameters	Comm. Option Parameter Not Upgraded	Re-energize the drive to update the communication option parameters. **Note:** If the option software version is not compatible or if you install an incorrect option to the drive, it will trigger an alarm.

◆ Option Compatibility

Users may connect up to 3 options simultaneously depending on the type of option.

Note:

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

Table 11.1 Option Compatibility

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

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

12 European Standards

Figure 12.1 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 guidelines for controlling noise.

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

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

EMC Guidelines: 2014/30/EU

Drives used in combination with this option and devices used in combination with the drive must also be CE certified and display the CE mark.

When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. Verify that conditions meet European standards after setting up the device.

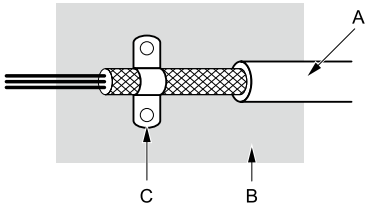
◆ EMC Guidelines Compliance

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

■ EMC Guidelines Installation Conditions

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

1. Use dedicated shield cable for the option and external device (encoder, I/O device, master), or run the wiring through a metal conduit.
2. Keep wiring as short as possible and ground the largest possible surface area of the shield to the metal panel as specified by Figure 12.3 and Figure 12.4.
3. Ground the largest possible surface area of the shield to the metal panel.



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

Figure 12.2 Ground Area

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

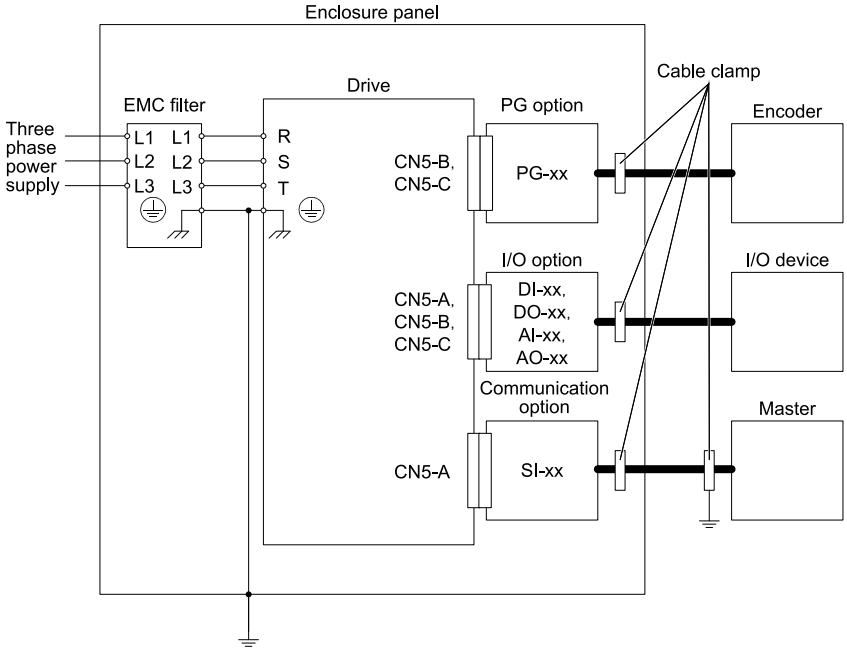


Figure 12.3 Option Installation for CE Compliance: 1000-Series, GA700, GA800, CR700, CH700

■ Option Installation for CE Compliance with GA500

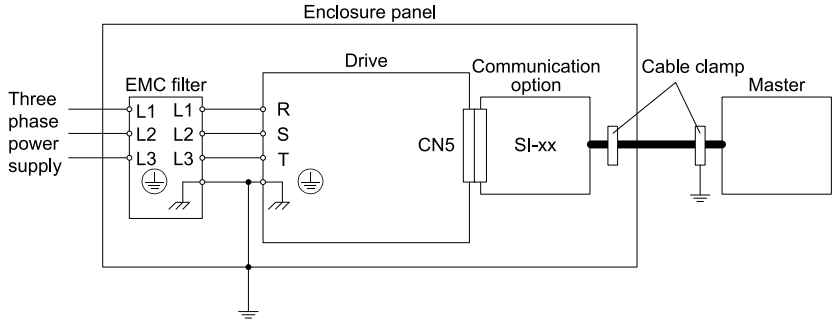


Figure 12.4 Option Installation for CE Compliance with GA500

13 Specifications

◆ Specifications

Table 13.1 Option Specifications

Item	Specification
Model	SI-ET3
Access mode	MECHATROLINK-III
Communication speed	100 Mbps
Minimum transmission cycle	250 µs
Maximum transmission cycle	8 ms
Transmission cycle granularity	03 (Hex.)
Minimum wiring distance between stations	0.2 m (7.9 in)
Maximum wiring distance between stations	100 m (328 ft)
Data length	32-byte data transmission or 64-byte data transmission
Event driven communication	Valid
Profile	Compliant with standard inverter profile
Maximum number of stations	62 *1
Ambient temperature	-10°C to +50°C (14°F to 122°F)
Humidity	95% RH or lower with no condensation
Storage temperature	-20°C - +60°C (-4°F to 140°F) allowed for short-term transport of the product
Area of use	Indoors and free from: • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	1000 m (3281 ft) or lower

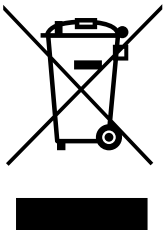
*1 The maximum number of connectable stations changes depending on the types and settings of the host controller, baud rate, and communications cycle. Refer to the host controller manual for details.

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

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

Revision History

Date of Publication	Revision Number	Section	Revised Content
September 2019	5	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation
March 2019	4	All	Revision: Reviewed and corrected entire documentation Addition: Applicable product series
		Chapter 14	Addition: Disposal
January 2019	3	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation
October 2017	2	All	Revision: Reviewed and corrected entire documentation Addition: Applicable product series
October 2016	1	All	Revision: Reviewed and corrected entire documentation Revision: Applicable product series
June 2016	-	-	First edition

YASKAWA AC Drive Option

MECHATROLINK-III

Technical Manual

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

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

Contact Yaskawa or your nearest sales representative for more information about the contents of this manual.

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