YASKAWA

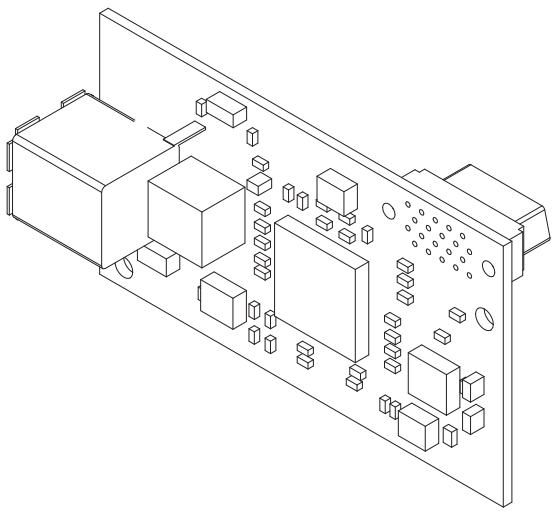
YASKAWA AC Drive Option

MECHATROLINK-II

Technical Manual

Type: SI-T3

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 86E

Table of Contents

1 Preface and Safety

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

◆ Applicable Documentation

The following manuals are available for SI-T3 MECHATROLINK-II Option card:

Option

YASKAWA AC Drive Option MECHATROLINK-II Installation Manual Manual No.: TOBP C730600 86	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 MECHATROLINK-II Technical Manual Manual No.: SIEP C730600 86 (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.

Drive

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

◆ Terms

Note: Indicates supplemental information that is not related to safety messages.

Option: YASKAWA AC Drive Option SI-T3 MECHATROLINK-II

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

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

◆ Registered Trademarks

- MECHATROLINK-I/MECHATROLINK-II is a registered trademark of the MECHATROLINK Members Association (MMA).
- Other company names and product names listed in this manual are registered trademarks of those companies.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option card. The option card 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

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions

- The diagrams in this section may include drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board 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

Heed the safety messages in this manual.

Failure to comply will cause death or serious injury.

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

⚠ WARNING

Electrical Shock Hazard

Do not modify the drive or option circuitry.

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

NOTICE

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

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

2 Overview

MECHATROLINK-II Option (Model: SI-T3) is designed for connecting a drive to a field network using the MECHATROLINK protocol.

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

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

◆ Compatible Products

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

Table 1 Compatible Products

Product Series	Model(s)	Software Version <1>
A1000	CIMR-A□2A□□□□	≥1020
	CIMR-A□4A0002 to 4A0675	
	CIMR-A□4A0930 and 4A1200	≥3015
	CIMR-A□5A□□□□	≥5040 ≥1020
U1000 <2>	CIMR-U□□A□□□□	≥1010
	CIMR-U□□E□□□□	
	CIMR-U□□P□□□□	
	CIMR-U□□W□□□□	
Z1000U <2>	CIMR-Z□□A□□□□	≥6110
	CIMR-Z□□E□□□□	
	CIMR-Z□□P□□□□	
	CIMR-Z□□W□□□□	
GA500 <3>	CIPR-GA50□□□□□	≥1010
GA700 <3>	CIPR-GA70□□□□□	≥1010
GA800 <3>	CIPR-GA80□□□□□	≥ 9010
CR700 <3>	CIPR-CR70□□□□□	≥1012
CH700 <3>	CIPR-CH70□□□□□	≥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 U1000 or Z1000U, make sure that the option software version is PRG: 6107 or later. Refer to "PRG" on the drive nameplate for the software version number.
<3> 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: 6108 or later.

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

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

Scan QR code

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

◆ Install the Option on a GA500 Drive

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

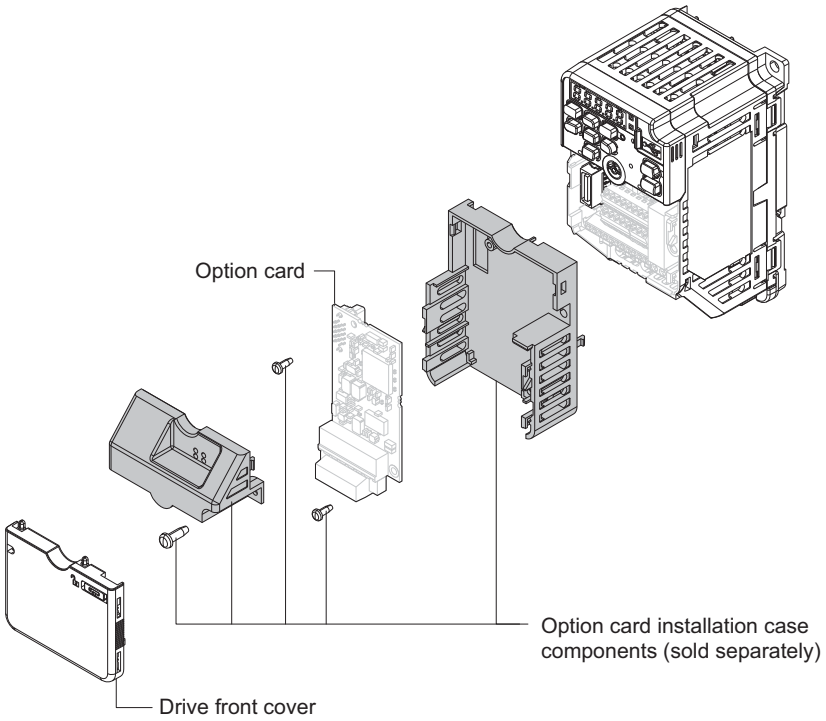


Figure 1 Option Card Installation Case

3 Receiving

After receiving the option package:

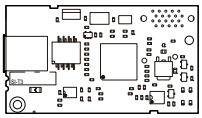
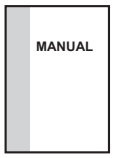
1. Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if the option or other parts appear damaged.

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

2. Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to ***Figure 2*** on page *9* for details. Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Contents and Packaging

Table 2 Contents of Package

Description:	Option Card	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

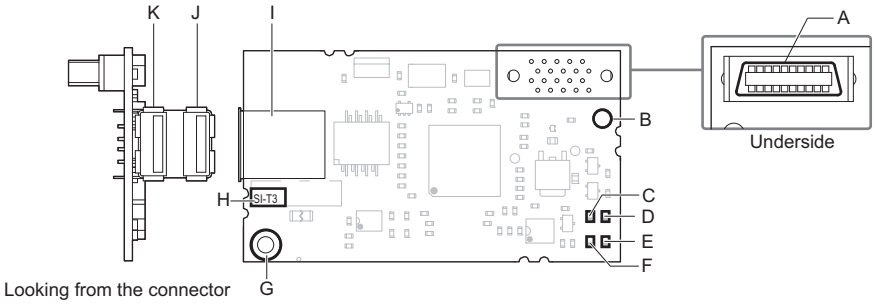
<1> GA700, GA800, CR700, and CH700 drives do not use the ground wire.
<2> GA700, GA800, CR700, and CH700 drives use two screws only.

◆ Installation Tools

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

4 MECHATROLINK-II Option Components

◆ MECHATROLINK-II Option



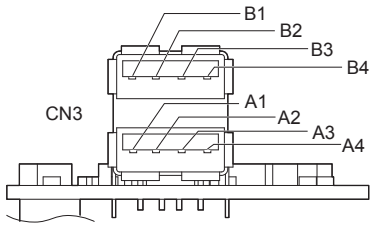
A – Connector (CN101)
B – Installation hole
C – LED (ERR) *<1>*
D – LED (RUN) *<1>*
E – LED (TX) *<1>*
F – LED (RX) *<1>*
G – Ground terminal (FE) (installation hole) *<2>*
H – Option model number
I – Communication cable connector (CN3)
J – Connector B
K – Connector A

<1> *Refer to MECHATROLINK-II Option LED Display on page 10* for details on the LEDs.
<2> Connect the provided ground wire during installation. Installation on GA700, GA800, CR700, and CH700 drives does not require the ground wire.

Figure 2 SI-T3 Option Components

◆ Communication connector

Table 3 Communication connector

MECHATROLINK-II Connector	Connector	Pin No.	Signal Name	I/O	Function
	A	A1	(NC)	–	Not used.
		A2	SRD–	I/O	Send/receive data (–)
		A3	SRD+	I/O	Send/receive data (+)
		A4	(NC)	–	Not used.
		Shell	SLD	–	Shield
	B	B1	(NC)	–	Not used.
		B2	SRD–	I/O	Send/receive data (–)
		B3	SRD+	I/O	Send/receive data (+)
		B4	(NC)	–	Not used.
		Shell	SLD	–	Shield

Note: Both connectors A and B are available for the same functions.

◆ MECHATROLINK-II Option LED Display

The MECHATROLINK-II Option has four LEDs that indicate the option card or communication status.

■ Defining Option LED States

1000-Series Label

GA500, GA700, GA800, CR700, and CH700 Label

Figure 3 Option LED Labels

Table 4 MECHATROLINK-II Operation LED Status

LED	State	Status	Description
RUN	ON	Power supply on	SI-T3 has been successfully powered up
	OFF	No power	• The drive has no power • SI-T3 is not properly connected to the drive, or SI-T3 has no power • An internal, self-diagnostic error occurred in the SI-T3
ERR	ON	Connection error	• SI-T3 is not properly connected to the drive • Communication error <1>
	Flashing	SI-T3 error	Error found during SI-T3's self-diagnostic check
	OFF	Normal operation	• SI-T3 is properly connected to the drive • Communication normal
TX	ON	Sending data	Data is being sent (LED may appear to be flashing)
	OFF	Not sending data	• No data is being sent • During reset
RX	ON	Receiving data	Data is being received (LED may appear to be flashing)
	OFF	Not receiving data	• No data is being received • During reset

<1> For details on the communication error, refer to *Troubleshooting on page 38*.

5 Installation Procedure

◆ Section Safety

⚠ DANGER

Electric Shock Hazard

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

Failure to comply will cause death or serious injury.

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

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.

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

Failure to comply could cause death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

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

NOTICE

Damage to Equipment

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

Failure to comply could cause ESD damage to circuitry.

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

Improper equipment sequencing could damage the drive.

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

Failure to comply could further damage the equipment.

Do not use unshielded wire for control wiring.

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

NOTICE

Properly connect all pins and connectors on the option and drive.
Failure to comply could prevent proper operation and damage equipment.

Confirm that all connections are correct after installing the option and connecting peripheral devices.
Failure to comply could damage the option.

◆ Procedures for Installing and Wiring Options on a Drive

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

Refer to *Table 5* to check the procedures to install and wire the option on a drive.

Table 5 Procedures for Installing and Wiring Options on a Drive

Product Series	Procedures for Installing and Wiring Options on a Drive	Page
A1000	Procedure A	*13*
U1000	Procedure A	*13*
Z1000U	Procedure A	*13*
GA500	*<1> <2>*	–
GA700	Procedure B	*17*
GA800	Procedure B	*17*
CR700	Procedure B	*17*
CH700	Procedure B	*17*

<1> Use the option card installation case manual to install the option on GA500 drives.
<2> Before you install the option to the YASKAWA AC Drive GA500, make sure that the option software version is PRG: 6108 or later.

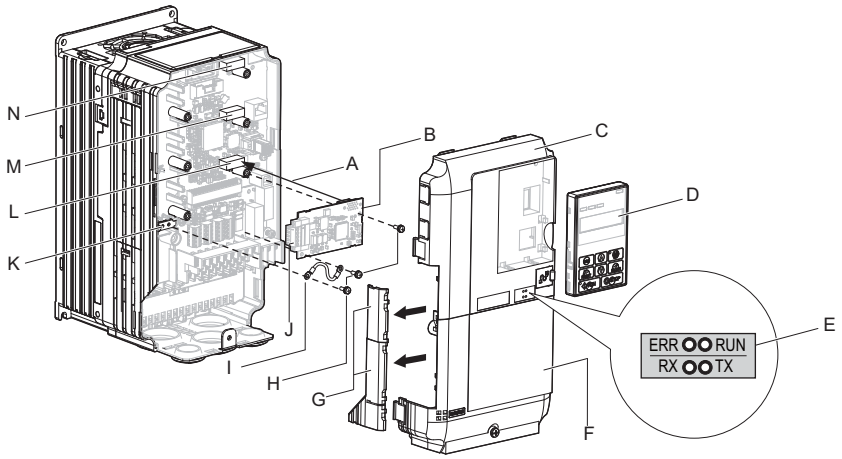
■ Procedure A

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

Prepare the Drive for the Option

Before you install the option on a YASKAWA AC Drive U1000 or Z1000U, make sure that the option software version is PRG: 6107 or later.

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



A – Insertion point for CN101 connector
B – SI-T3 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 CN3
K – Drive grounding terminal (FE)
L – Connector CN5-A
M – Connector CN5-B
(Not available for communication option installation.)
N – Connector CN5-C
(Not available for communication option installation.)

Figure 4 Drive Components with Option

Install the Option

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

Note: Refer to the instruction manual of a specific drive for information on removing and installing the keypads and the covers.

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

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

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

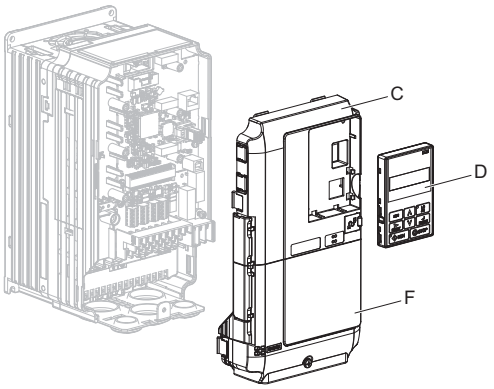


Figure 5 Remove the Keypad, Front Cover, and Terminal Cover

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

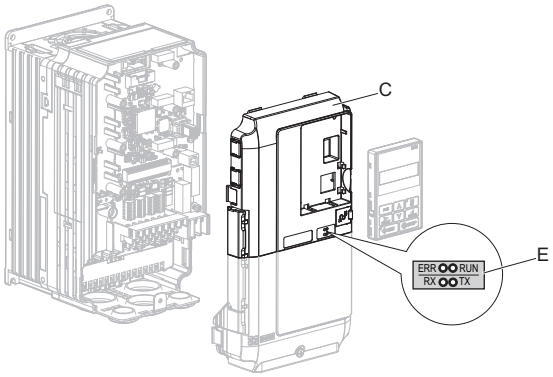


Figure 6 Affix the LED Label

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

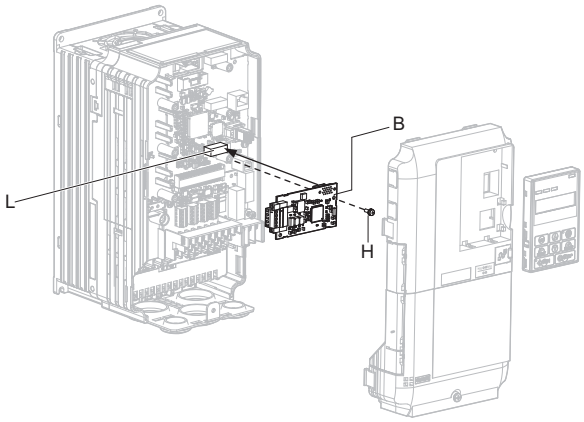


Figure 7 Insert the Option

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

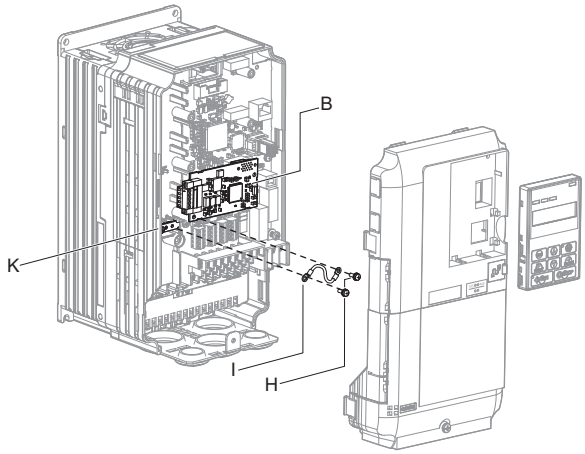


Figure 8 Connect the Ground Wire

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

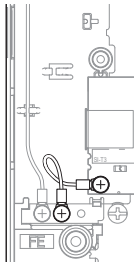


Figure 9 Connecting the Ground Terminal

5. Route the option wiring inside the enclosure as shown in ***Figure 10***-B. Take proper precautions so that the front covers will easily fit back onto the drive.
   Users may also choose to route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in ***Figure 10***-A to create the necessary openings on these models.
   Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.

Note: 1. Separate communication cables from main circuit wiring and other electrical lines to avoid potential sources of electrical interference.
2. Connect the terminator (model No.: JEPMC-W6022-E) to the option modular connector (CN3) on the end drive of the communication lines.

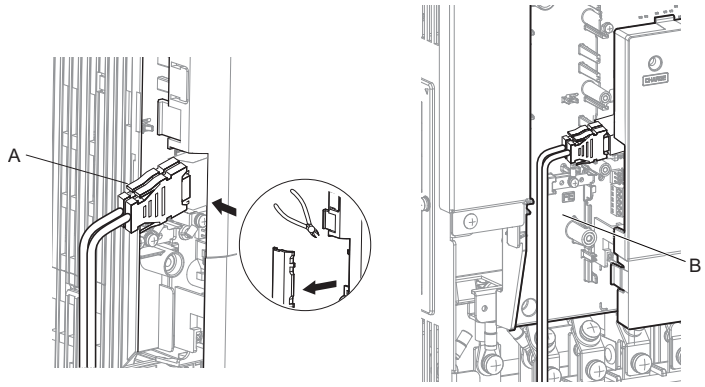


Figure 10 Wire Routing Examples

6. Firmly connect the MECHATROLINK-II communication cable to option communication connector CN3.
   Install MECHATROLINK-II communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see ***Figure 18***). Refer to ***MECHATROLINK-II Communications Cables on page 20*** for details.

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

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

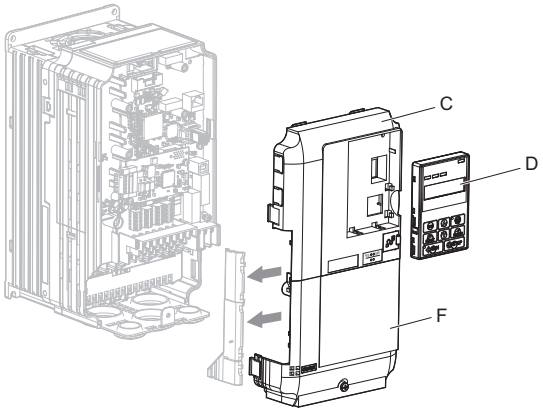


Figure 11 Replace the Front Covers and Keypad

8. Set drive parameters in ***Table 6*** for correct option performance.

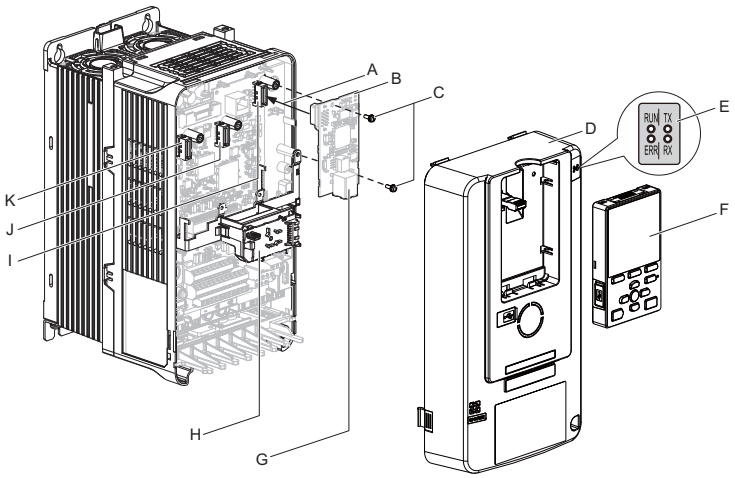
■ Procedure B

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 GA700, GA800, CR700, or CH700, make sure that the option software version is PRG: 6108 or later.

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
   Refer to ***Figure 12*** for an exploded view of the drive with the option and related components for reference in the installation procedure.



A – Insertion point for CN5 connector
B – SI-T3 option
C – Included screws
D – Drive front cover
E – LED label
F – Keypad
G – Option modular connector CN3
H – LED Status Ring board
I – Connector CN5-A
J – Connector CN5-B (Not available for communication option installation.)
K – Connector CN5-C (Not available for communication option installation.)

Figure 12 Drive Components with Option

Install the Option

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

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

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

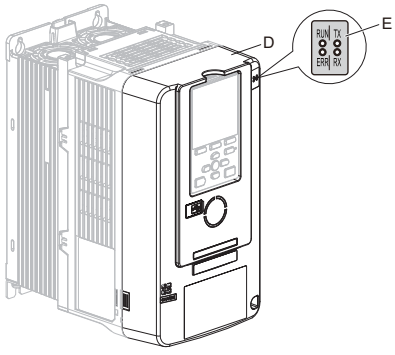


Figure 13 Affix the LED Label

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

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

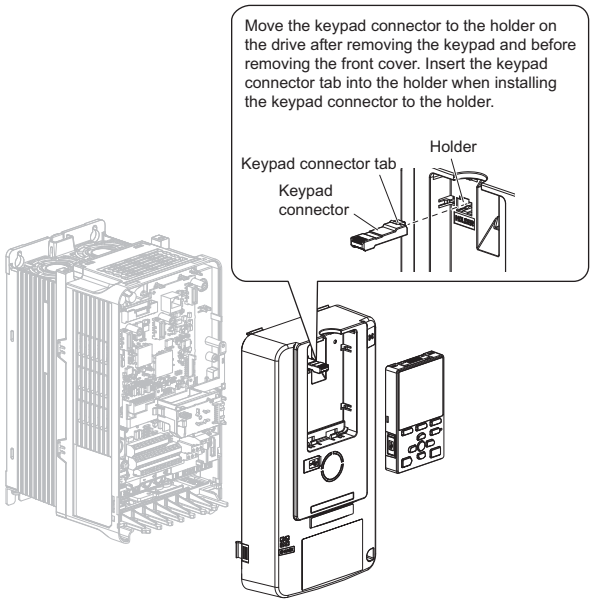


Figure 14 Remove the Front Cover and Keypad

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

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

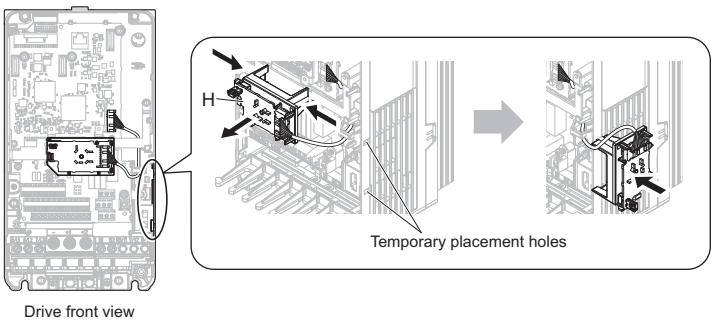


Figure 15 Remove the LED Status Ring Board

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

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

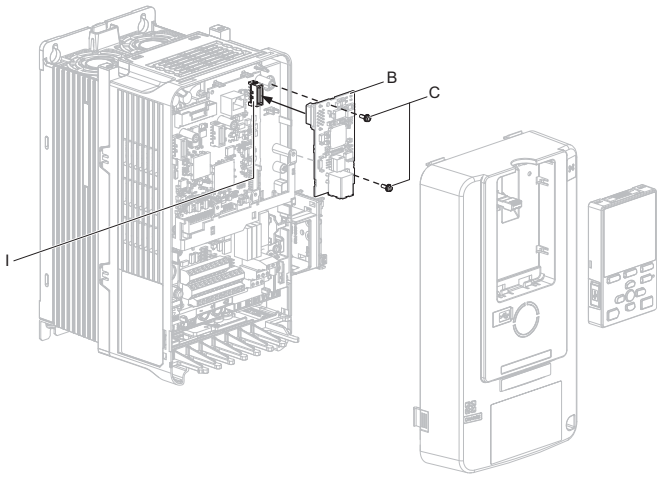


Figure 16 Insert the Option Card

5. Firmly connect MECHATROLINK-II communications cable to option communication connector CN3. Install MECHATROLINK-II communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see ***Figure 18***). Refer to ***MECHATROLINK-II Communications Cables on page 20*** for details.

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 (H).
Use the open space provided inside the LED Status Ring board to route option wiring.

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

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

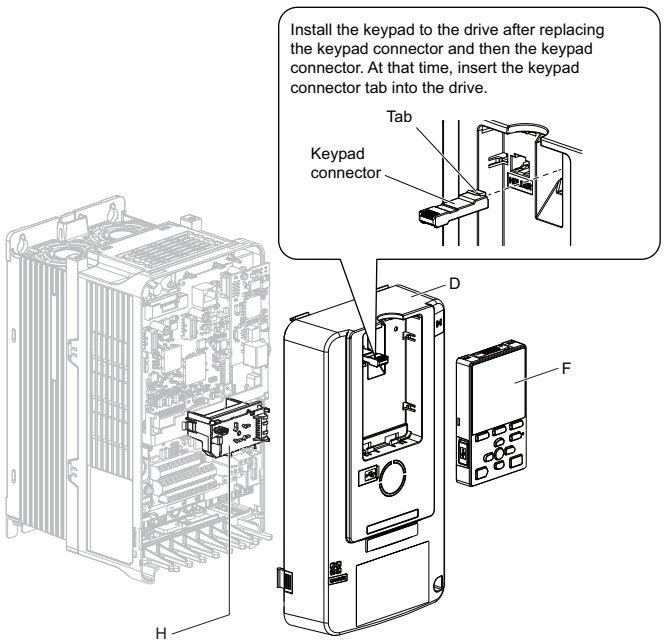


Figure 17 Replace the Front Cover and Keypad

8. Set drive parameters in ***Table 6*** for correct option performance.

◆ MECHATROLINK-II Communications Cables

Connect the MECHATROLINK-II communications cable to option communication connector CN3. Use only the following MECHATROLINK-II dedicated communications cable.

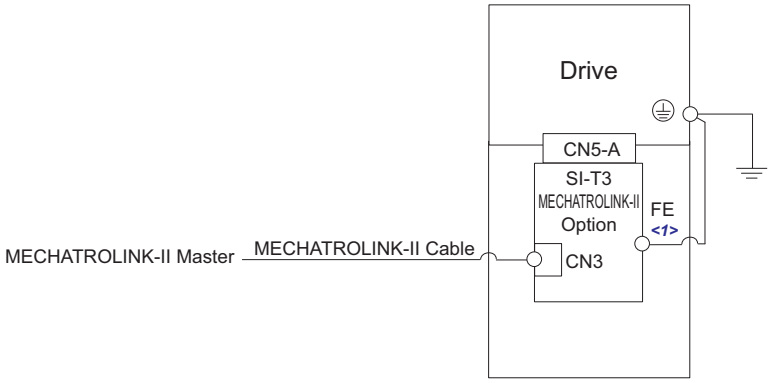
Recommended communication cable: JEPMC-W6002-□□-E <1>
JEPMC-W6003-□□-E (with a core) <1>

<1> □□ is the length (m).

Connect the terminator (model No.: JEPMC-W6022-E) on the end of the communication lines.

Note: Maximum transmission distance is 50 m (1969.0 in). Minimum wiring distance between stations is 0.5 m (19.7 in).

■ Option Connection Diagram



<1> Connect the provided ground wire for installations on 1000-series drives and GA500 drives. The ground wire is not necessary for installation on GA700, GA800, CR700, or CH700 drives.

Figure 18 Option Connection Diagram

6 MECHATROLINK Option Drive Parameters

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

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

Table 6 Parameter Settings

No. (Hex.)	Name	Description	Values
b1-01 (0180) *<1>*	Reference 1 Source	Selects the input method for frequency reference. 0: Keypad 1: Analog Input 2: Memobus/Modbus Communications 3: Option PCB 4: Pulse Train Input	Default: 1 Range: 0 to 4
b1-02 (0181) *<1>*	Run Command 1 Source	Selects the input method for the Run command. 0: Keypad 1: Digital Input 2: Memobus/Modbus Communications 3: Option PCB	Default: 1 Range: 0 to 3
F6-01 (03A2)	Communication Error Selection	Selects drive response when a bUS error is detected during communications with the option. 0: Ramp to stop. 1: Coast to stop. 2: Fast Stop (Use C1-09) 3: Alarm only. *<2>* 4: Alarm - Run at d1-04 *<2>* *<3>* 5: Alarm - Ramp to Stop *<3>*	Default: 1 Range: 0 to 5 *<4>*
F6-02 (03A3)	Comm External Fault (EF0) Detect	Selects the condition for external fault detection (EF0). 0: Always detected. 1: Detection during run only.	Default: 0 Range: 0, 1
F6-03 (03A4)	Comm External Fault (EF0) Select	Selects drive response for external fault input (EF0) detection during option communications. 0: Ramp to stop. 1: Coast to stop. 2: Fast Stop (Use C1-09) 3: Alarm only. *<2>*	Default: 1 Range: 0 to 3
F6-06 (03A7) *<5>*	Torque Reference/Limit by Comm	Enabling this parameter allows d5-01 to determine whether the value is read as the Torque Limit value (d5-01 = 0) or the Torque Reference value (d5-01 = 1). 0: Disabled 1: Enabled *<6>*	Default: 0 Range: 0, 1
F6-07 (03A8)	MultiStep Ref Priority Select	0: MultiStep References Disabled 1: MultiStep References Enabled	Default: 0 *<7>* Range: 0, 1
F6-08 (036A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters F6-☐☐ and F7-☐☐ are set back to original default values when the drive is initialized using parameter A1-03. 0: No Reset - Parameters retained 1: Reset - Back to factory default Note: The setting value is not changed even when F6-08 is set to 1 and the drive is initialized using A1-03.	Default: 0 Range: 0, 1
F6-20 (036B) *<8>* *<9>*	MECHATROLINK Station Address	Sets the station number.	Default:21H Min.: 20H Max.: 3FH
F6-21 (036C) *<8>*	MECHATROLINK Frame Size	Selects the frame size. 0: 32-byte 1: 17-byte	Default: 0 Range: 0, 1
F6-22 (036D) *<8>*	MECHATROLINK Link Speed	Selects the link speed. 0: 10 Mbps 1: 4 Mbps	Default: 0 Range: 0, 1
F6-23 (036E) *<8>* *<10>*	MECHATROLINK Monitor Select (E)	Set MEMOBUS/Modbus register to monitor SEL_MON of INV_CTL and INV_I/O.	Default: 0H Min.: 0H Max.: FFFFH

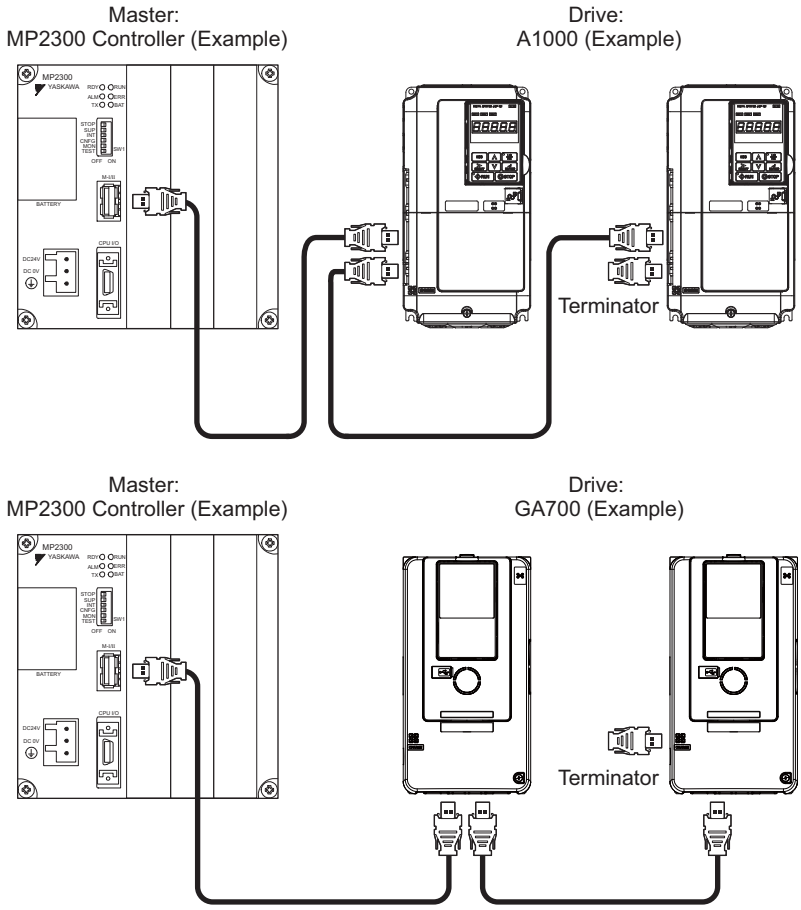
No. (Hex.)	Name	Description	Values
F6-24 (036F) <8> <11>	MECHATROLINK Monitor Select (F)	Set MEMOBUS/Modbus register to monitor SEL_MON of INV_CTL and INV_I/O.	Default: 0H Min.: 0H Max.: FFFFH
F6-25 (03C9)	MECHATROLINK Watchdog Error Select	0: Ramp to Stop 1: Coast to Stop 2: Fast Stop (Use C1-09) 3: Alarm Only <2>	Default: 1 Range: 0 to 3
F6-26 (03CA)	MECHATROLINK bUS Errors Detected	Sets the number bUS alarms necessary to trigger a bUS fault. When the number of option communication alarm bUS exceeds the value set to F6-26, the drive detects option communication fault bUS.	Default: 2 Min.: 2 Max.: 10

<1> Set b1-02 = 3 to start and stop the drive with the MECHATROLINK-II master device using serial communications. Set b1-01 = 3 to control the frequency reference of the drive via the master device.
<2> Setting this parameter to 3 or 4 will cause the drive to continue operation after detecting a fault. Take proper measures such as installing an emergency stop switch when using settings 3 or 4.
<3> Refer to the drive manual to know if settings 4 and 5 are available. Settings 4 and 5 are available in A1000 software versions PRG: 1021 and later.
<4> The setting range for 1000-Series drives is different for different software versions. Refer to the instruction manual of a specific drive for more information.
<5> Control method availability of this parameter depends on product series.
·1000-Series Drives: Parameter is available in CLV, AOLV/PM, and CLV/PM.
In AOLV/PM, this value is read as the Torque Limit.
· GA500 Drive: Parameter is available in OLV, AOLV/PM, and EZOLV.
This value is read as the Torque Limit.
· GA700, GA800 Drives: Parameter is available in OLV, CLV, AOLV, AOLV/PM, CLV/PM, and EZOLV.
In OLV and EZOLV, this value is read as the Torque Limit.
· CR700, CH700 Drives: Parameter is available in OLV, CLV, and AOLV.
This value is read as the Torque Limit.
<6> The setting specifies that network communications provide the torque reference or torque limit. The motor may not rotate if the PLC does not supply a torque reference or torque limit.
<7> Default setting is 1 for GA500.
<8> Cycle power for setting changes to take effect.
<9> 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.
<10> 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 0EH 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 details on settable registers.
<11> 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 0FH 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 details on settable registers.

7 Transmission Interface

◆ MECHATROLINK-II Cyclic Transmissions

As a MECHATROLINK-II station, the SI-T3 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.



◆ Basic Format of Data Transfer

The basic format for transferring data is as follows.

The size of the header for a data link layer is fixed at two bytes.

By setting, either 17 bytes (17-byte data transmission) or 32 bytes (32-byte data transmission) can be selected as the data size for the data link layer. If 32-byte data transmission is selected, only the first 29 bytes <1> are used as application data.

<1> The first 30 bytes are used only when the INV_I/O sub-command is used.

	Command data		Response data	
+00H	Station address	+00H	Station address	Header of data link layer
+01H	Control code	+01H	Control code	
+02H	Command code	+02H	Response code	Data link layer data and application layer
+03H	–	+03H	Alarm	
+04H	Data	+04H	Status	
		+06H	Data	
+11H	WDT	+11H	EWDT	
+12H		+12H		

Figure 19 Basic format of data transfer (17-byte data transmission)

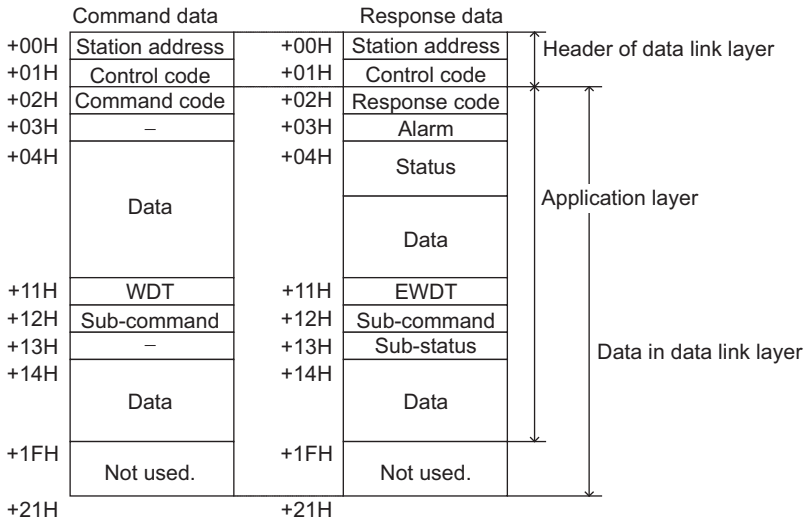


Figure 20 Basic format of data transfer (32-byte data transmission)

◆ Communication Phases

The SI-T3 option changes status after receiving a command code or fault from the master as shown in ***Figure 21***.

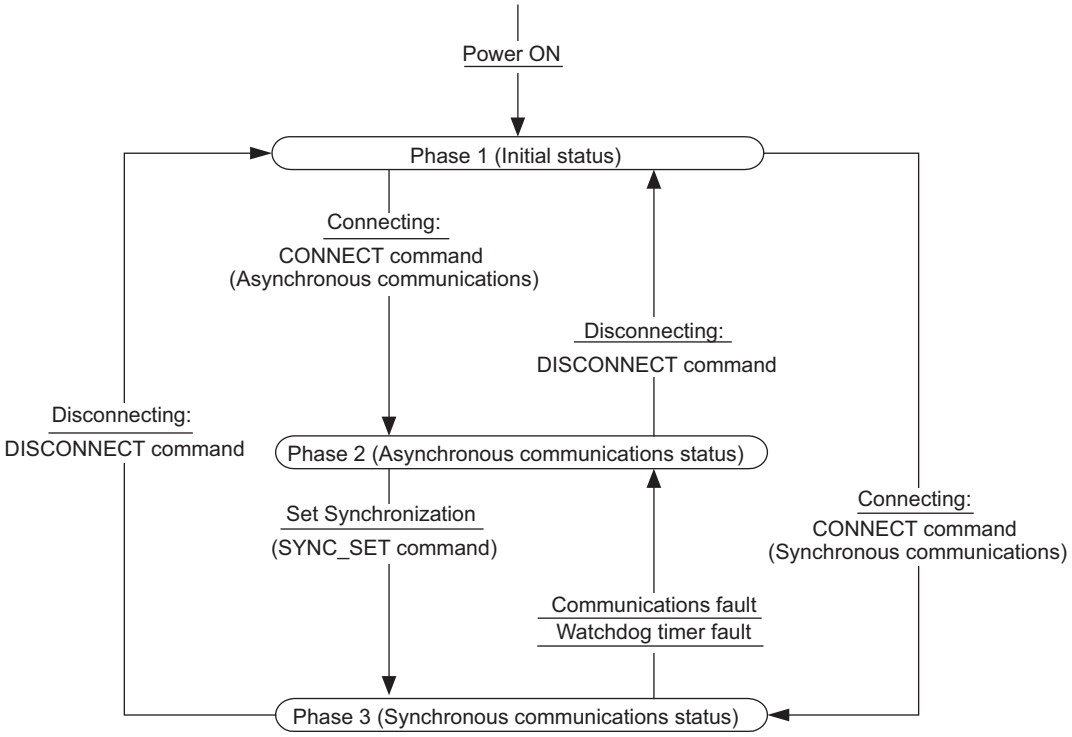


Figure 21 Communication Phases

■ 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-T3 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.
The communication phases determine the available commands. Refer to *Table 7* and *Table 8* for details.

◆ Application Layer Specifications

The data format for the application layer conforms to the MECHATROLINK-II link command specifications.

The SI-T3 option uses the main commands and sub-commands in *Table 7* and *Table 8*.

Table 7 Main Commands

Code	Name	Function
00H	NOP	No Operation
01H	PRM_RD	Read Parameter
02H	PRM_WR	Write Parameter
03H	ID_RD	Read ID Number
04H	CONFIG	RAM Write and EEPROM Write
05H	ALM_RD	Read Alarm and Warning
06H	ALM_CLR	Clear Alarm and Warning
0DH	SYNC_SET	Start Synchronous Communications
0EH	CONNECT	Connect
0FH	DISCONNECT	Disconnect
40H	INV_CTL	Drive Operation Control

Table 8 Sub-commands

Code	Name	Function
00H	NOP	No Operation
01H	PRM_RD	Read Parameter
02H	PRM_WR	Write Parameter
05H	ALM_RD	Read Alarm and Warning
41H	INV_I/O	Drive I/O Control

Set F6-21 = 0 to select 32-byte data transmission prior to using sub-commands.
The request for the main command is processed if a conflict occurs between a request for a main command and a request for a sub-command.
The command being processed is given priority if either a main command or a sub-command is already 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-II Commands on page 26* for details on command formats.

Table 9 shows the combinations of main commands and sub-commands.

Table 9 Main Command and Sub-Commands

Code	Main Command	Sub-command				
		NOP (00H)	PRM_RD (01H)	PRM_WR (02H)	ALM_RD (05H)	INV_I/O (41H)
00H	NOP	OK	OK	OK	OK	OK
01H	PRM_RD	OK	NG (A.95)	NG (A.95)	OK	OK
02H	PRM_WR	OK	NG (A.95)	NG (A.95)	OK	OK
03H	ID_RD	OK	OK	OK	OK	OK
04H	CONFIG	OK	NG (A.95)	NG (A.95)	NG (A.95)	NG (A.95)
05H	ALM_RD	OK	NG (A.95)	NG (A.95)	NG (A.95)	NG (A.95)
06H	ALM_CLR	OK	NG (A.95)	NG (A.95)	NG (A.95)	NG (A.95)
0DH	SYNC_SET	OK	OK	OK	OK	OK
0EH	CONNECT	OK	NG (A.95)	NG (A.95)	NG (A.95)	NG (A.95)
0FH	DISCONNECT	OK	NG (A.95)	NG (A.95)	NG (A.95)	NG (A.95)
40H	INV_CTL	OK	OK	OK	OK	OK

Note: Command warning (A.95) will result if a main command and sub-command conflict with one another. For details on the alarm, refer to *Other Faults on page 39*.

8 MECHATROLINK-II Commands

◆ Main Commands

■ NOP: 00H (No Operation)

Byte	Command	Response
1	NOP	NOP
2	0	ALARM
3, 4		STATUS
5 to 15		0
16	WDT	RWDT

Only the ALARM and STATUS fields of the response data can be monitored. This command can be used in all phases.

■ PRM_RD: 01H (Read Parameter)

Byte	Command	Response
1	PRM_RD	PRM_RD
2	0	ALARM
3, 4		STATUS
5, 6	NO	NO
7	SIZE	SIZE
8 to 15	0	PARAMETER
16	WDT	RWDT

The PRM_RD command is used to read the Drive internal parameters. For offline parameters, it reads the most recently updated setting values. This command can be used in all phases.

In the following cases, a warning (STATUS (WARNG) = 1) is generated and the command is ignored. If a warning is generated, the values that are read are undefined.

- If a register number (NO) fault occurs: Data setting warning (A.94)
- If SIZE is an odd number or is not between 2 and 8: Data setting warning (A.94)

The register number (NO) is the same as the register number that is set and referenced in MEMOBUS/Modbus transfers. Set the lower byte (LSB) before setting the upper byte (MSB). The SI-T3 stores the data read for PARAMETER from lower byte (LSB) to upper byte (MSB). Refer to drive technical manual for detail.

For SIZE, set the number of bytes to be read as an even numbers. Eight bytes can be specified.

The values for the number (NO) and the size (SIZE) in the response data are copies of the values in the command data.

Example when reading C1-01 (200H):

Table 10 Example when reading C1-01 (200H)

Byte	Command	Response
5	00	00
6	02	02
7	02	02
8	00	Lower byte of C1-01
9	00	Upper byte of C1-01

■ PRM_WR: 02H (Write Parameter)

Byte	Command	Response
1	PRM_WR	PRM_WR
2	0	ALARM
3, 4		STATUS
5, 6	NO	NO
7	SIZE	SIZE
8 to 15	DATA	DATA
16	WDT	RWDT

The PRM_WR command is used to write the drive internal parameters.
To save the setting value in the drive EEPROM, set the CONFIG_MOD in the CONFIG command to 1. For details, refer to the section describing the CONFIG command.

In the following cases, a warning is generated and the command is ignored.

- If a register number (NO) fault occurs: Data setting warning (A.94)
- If SIZE is an odd number or is not between 2 and 8: Data setting warning (A.94)
- Data upper/lower limit fault: Data setting warning (A.94)
- While using the keypad to change settings: Command warning (A.95)
- If not in phase 2 or 3: Command warning (A.95)
- During an undervoltage fault: Command warning (A.95)

The register number (NO) is the same as the register number that is set and referenced in MEMOBUS/Modbus transfers. Set the lower byte (LSB) before setting the upper byte (MSB). Refer to Drive Technical Manual for detail.
Set the values for DATA from lower byte (LSB) to upper byte (MSB). For SIZE, set the number of bytes to be written as an even number. Eight bytes can be specified.

The values for the NO, SIZE, and DATA in the response are copies of values in the command.

Example when writing in C1-01 (200H):

Table 11 Example when writing in C1-01 (200H)

Byte	Command	Response
5	00	00
6	02	02
7	02	02
8	Setting value (Lower byte)	Setting value (Lower byte)
9	Setting value (Upper byte)	Setting value (Upper byte)

■ ID_RD: 03H (Read ID Number)

Byte	Command	Response
1	ID_RD	ID_RD
2	0	ALARM
3, 4		STATUS
5	DEVICE_CODE	DEVICE_CODE
6	OFFSET	OFFSET
7	SIZE	SIZE
8 to 15	0	ID
16	WDT	RWDT

The ID_RD command reads the product information as ID data to read the ID of a device.
The following table shows the applicable DEVICE_CODE.

Because of ID area limitations, no more than eight bytes can be read, so use the OFFSET and SIZE to specify the range. The leading ID data that corresponds to the specified OFFSET and returned is shown in the *Table 12*, *Table 13*, and *Table 14*.
Up to eight bytes can be used for SIZE. This command can be used in all phases.

Table 12 Vender Code (DEVICE_CODE = 0FH)

			ID content <1>														
Vender ID	OFFSET	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
	ASCII	0	8	1	0	0	0	0	0	00							
Vender Name	OFFSET	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
	ASCII	Y	A	S	K	A	W	A		E	L	E	C	T	R	I	C
	OFFSET	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
	ASCII		C	O	R	P	O	R	A	T	I	O	N	00			

<1> Vender IDs and vender names are expressed in ASCII, and end in 00H.

• When using YASKAWA AC Drive 1000-Series

Table 13 DEVICE_CODE

	DEVICE_CODE	ID content <1>															
	OFFSET	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
Drive Model	00H	C	I	M	R		<8>	<2>	<3>	<4>	0 <5>	0 <5>	0 <5>	6 <5>			
Software Version	02H			S	1 <6>	2 <6>	3 <6>	4 <6>		S	5 <7>	6 <7>	7 <7>	8 <7>			

<1> The codes are expressed in ASCII, and end in 00H.
<2> The portions showing the region are represented by spaces.
<3> Indicates the voltage class. 2: Three Phase 200 V, 4: Three Phase 400 V, 5: Three Phase 575 V
<4> The portions showing the structure are represented by spaces.
<5> Four digits indicating any customized specifications.
<6> Indicates the SI-T3 software version.
<7> Indicates the Drive software version.
<8> Indicates the Product series name. Refer to the Model Number section of the drive Technical Manual for details.

• When using YASKAWA AC Drive GA500, GA700, GA800, CR700, and CH700

Table 14 DEVICE_CODE

	DEVICE_CODE	ID content <1>															
	OFFSET	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
Drive Model	00H	C	I	P	R		<2>	<2>	<2>	<2>	A <3>	4 <4>	0 <5>	0 <5>	4 <5>		
Software Version	02H			S	1 <6>	2 <6>	3 <6>	4 <6>		S	5 <7>	6 <7>	7 <7>	8 <7>			

<1> The codes are expressed in ASCII, and end in 00H.
<2> Indicates the Product series name. Refer to the Model Number section of the drive Technical Manual for details.
<3> Indicates the region of the drive.
<4> Indicates the input power supply voltage.
- B: Single Phase 200 V
- 2: Three Phase 200 V
- 4: Three Phase 400 V
- 5: Three Phase 575 V

<5> Indicates the rated output current.
<6> Indicates the SI-T3 software version.
<7> Indicates the Drive software version.

■ CONFIG: 04H (RAM Write and EEPROM Write)

Byte	Command	Response
1	CONFIG	CONFIG
2	0	ALARM
3, 4		STATUS
5	CONFIG_MOD	CONFIG_MOD
6 to 15	0	0
16	WDT	RWDT

The CONFIG command is used to enable the data for which parameters have been written.

Error codes such as matching of parameters cannot be checked by the responses to this command. They must be checked with the STATUS field's oPE fault bit. This command can be used in phases 2 and 3.

In the following cases, a warning is generated and the command is ignored.

- If CONFIG_MOD is not a set value: Data setting warning (A.94)
- If not in phase 2 or 3: Command warning (A.95)

The following values can be assigned to CONFIG_MOD.

Table 15 CONFIG_MOD

CONFIG_MOD	Description
0	Write RAM The setting value is not saved in EEPROM.
1	The setting value is saved in EEPROM. Note: With the drives, the maximum number of writes to non-volatile memory is 100,000, so do not use the CONFIG command too frequently. If changing several parameters, carry out the CONFIG command only after all the parameters have been changed.

■ ALM_RD: 05H (Read Alarm and Warning)

Byte	Command	Response
1	ALM_RD	ALM_RD
2	0	ALARM
3, 4		STATUS
5	ALM_RD_MOD	ALM_RD_MOD
6 to 15	0	ALM_DATA
16	WDT	RWDT

Table 16 ALM_RD_MOD

Byte	ALM_RD_MOD = 0	ALM_RD_MOD = 1	ALM_RD_MOD = 2
5	00H	01H	02H
6	U2-01	U3-01	Alarm Index
7	U2-02	U3-02	Lower byte of U3-(Alarm Index + 1)
8		U3-03	Upper byte of U3-(Alarm Index + 1)
9		U3-04	
10		U3-05	
11		U3-06	
12		U3-07	
13		U3-08	
14		U3-09	
15		U3-10	

The ALM_RD command is used to read the following information about the status of faults and alarms.

- Present fault and alarm status list
- Fault history (Alarms are not saved in the history.)
- Details of faults

In the following case, a warning is generated and the command is ignored.

- If ALM_RD_MOD is other than a set value: Data setting warning (A.94)

The fault history is saved in EEPROM and is kept even when the control power is interrupted.

- If ALM_RD_MOD is set to 0: Fault code (1 byte) is entered to byte 6 of ALM_DATA, and byte 7 becomes the value of the previous fault.
- If ALM_RD_MOD is set to 1: Fault code is entered in order of detection from ALM_DATA byte 6 so that byte 6 is the most recent fault.
- When ALM_RD_MOD is set to 2: Fault code detected by the value set by the Alarm Index +1 is entered to bytes 7 and 8.

During normal operation (i.e., when no fault has occurred), the value is 00H.

Table 17 ALM_DATA

ALM_RD_MOD	ALM_DATA	Max. Processing Time	Parameter No.
0	Present fault (byte 6), past fault (byte 7)	0.1 s	U2-01 and U2-02
1	Fault history trace 10 max. (byte 6 to 15)	0.1 s	U3-01 to U3-10
2	Fault history (Alarms are not retained in the history.) (bytes 7 and 8)	0.1 s	U3-01 to U3-10

■ ALM_CLR: 06H (Clear Alarm and Warning)

Byte	Command	Response
1	ALM_CLR	ALM_CLR
2	0	ALARM
3, 4		STATUS
5	ALM_CLR_MOD	ALM_CLR_MOD
6 to 15	0	0
16	WDT	RWDT

The ALM_CLR command is used to clear the alarm and warning status.

This command changes the status of the 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.

In the following cases, a warning is generated and the command is ignored.

- If ALM_CLR_MOD is other than a set value: Data setting warning (A.94)
- If not in phase 2 or 3: Command warning (A.95)

Table 18 ALM_CLR_MOD

ALM_CLR_MOD	Description
0	Clears the status of present faults and alarms.

Note: Drive faults and alarms cannot be reset while the Drive RUN command is ON.

■ SYNC_SET: 0DH (Start Synchronous Communications)

Byte	Command	Response
1	SYNC_SET	SYNC_SET
2	0	ALARM
3, 4		STATUS
5 to 15		0
16	WDT	RWDT

The SYNC_SET command is used to request the start of synchronous communications. After this command is issued, synchronous communications are carried out. If communications become asynchronous due to any fault such as a communications fault, this command can be used to restore synchronous communications.

In the following case, a warning is generated and the command is ignored.

- If not in phase 2 or 3: Command warning (A.95)

■ CONNECT: 0EH (Connect)

Byte	Command	Response
1	CONNECT	CONNECT
2	0	ALARM
3, 4		STATUS
5	VER	VER
6	COM_MOD	COM_MOD
7	COM_TIM	COM_TIM
8 to 15	0	0
16	WDT	RWDT

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

If a transfer fault is detected after moving to phase 2 or phase 3, notification is given of the fault. In phase 1, no notification is given even if a transfer fault is detected. Set VER (version) to 21H (Ver. 2.1) for MECHATROLINK-II, and to 10H (Ver. 1.0) for MECHATROLINK-I.

The communications mode is set by the COM_MOD. For details on the settings, refer to the following description.

MECHATROLINK-II (VER: 21H)

COM_MOD

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
SUBCMD	0	0	0	DTMOD		SYNCMOD	0

SUBCMD	Sub-command setting	0	Sub-command not used
		1	Sub-command used
DTMOD	Communication Mode	00	Single data transfer mode
SYNCMOD	Transmission Synchronization	0	Move to phase 2
		1	Move to phase 3

Note: If Bit6, Bit5, Bit4, or Bit0 is set to 1, a warning will be generated (Data setting warning: A.94).

COM_TIM

Set the factor of the transmission cycle to COM_TIM (communications time) so that the setting range satisfies the following formulas.

When the transmission cycle is equal to the communications time (COM_TIM = 1):

- 32-byte data transmission
  1 [ms] ≤ transmission cycle [ms] ≤ 8 [ms]
  If the transmission cycle is set to a fractional value, a warning (Data setting warning: A.94) is generated.
- 17-byte data transmission
  0.5 [ms] ≤ transmission cycle [ms] ≤ 8 [ms]
  If the transmission cycle is not set to a multiple of 0.5 ms, such as 0.75, a warning (Data setting warning: A.94) is generated.

When the transmission cycle is not equal to the communications time (COM_TIM ≠ 1):

A warning (Data setting warning: A.94) is generated.

MECHATROLINK-I (VER: 10H)

COM_MOD

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	DTMOD		SYNCMOD	EXMOD

DTMOD	Communication Mode	00	Single data transfer mode
SYNCMOD	Transmission Synchronization	0	Move to phase 2 (Asynchronous communications status)
		1	Move to phase 3 (Synchronous communications status)
EXMOD	Request to establish expanded/ standard connection	0	Standard connection
		1	Expanded connection Even if SYNCMOD = 1 (synchronous comm.), SYNCMOD will be set to 0 for asynchronous data transmission.

In the following cases, a warning is generated and the command is ignored. Commands are also ignored in phase 2 (with no alarm).

- If COM_MOD is set out of range: Data setting warning (A.94)
- If SUBCMD is set to 1 in 17-byte data transmission: Data setting warning (A.94)
- If SUBCMD is set to 1 for Ver. 1.0 (VER: 10H): Data setting warning (A.94)
- If Bit6, Bit5, Bit4, Bit3, or Bit0 is set to 1: Data setting warning (A.94)

COM_TIM

In MECHATROLINK-I, COM_TIM = 2 the units for COM_TIM were 1 = 1 ms and transmission cycles were fixed at 2 ms.

If COM_TIM ≠ 2: Data setting warning (A.94)

■ DISCONNECT: 0FH (Disconnect)

Byte	Command	Response
1	DISCONNECT	DISCONNECT
2	0	ALARM
3, 4		STATUS
5 to 15		
16	WDT	RWDT

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

After moving to phase 1, no check for transmission faults is executed. This command can be used in phases 2 and 3.

If this command is received while in phase 2 or 3, the data for the control command to the Drive is cleared to 0, and a fault reset command is carried out for the Drive.

■ INV_CTL: 40H (Drive Operation Control)

Byte	Command	Response
1	INV_CTL	INV_CTL
2	0	ALARM
3, 4	Operation signals	STATUS
5, 6	Speed reference	Output frequency
7, 8	Torque reference	Output current
9	SEL REF1/2	SEL REF1/2
10	SEL MON1/2	SEL MON1/2
11, 12	Reference selected by SEL REF1	Monitor selected by SEL MON1
13, 14	Reference selected by SEL REF2	Monitor selected by SEL MON2
15	0	0
16	WDT	RWDT

The INV_CTL command is used to set the drive operation signals, speed references, and so on.

These bytes do not need to be set every scan. The settings are saved in the drive until the next data is received or until the power is turned OFF. For details on operation signals, refer to ***Table 19***.

The speed reference and the output frequency drives can be selected with o1-03.

Table 19 Operation Signals

Bit	Name	Description	Remarks
0	Forward run	0: Stop 1: Forward run	
1	Reverse run	0: Stop 1: Reverse run	
2	Multi-function terminal input 3	Terminal S3 input function 0: Terminal S3 function OFF 1: Terminal S3 function ON	H1-03 (Default = 24: External fault (EF3)) *<1>*
3	Multi-function terminal input 4	Terminal S4 input function 0: Terminal S4 function OFF 1: Terminal S4 function ON	H1-04 (Default = 14: Fault reset) *<1>*
4	Multi-function terminal input 5	Terminal S5 input function 0: Terminal S5 function OFF 1: Terminal S5 function ON	H1-05 (Default = 3: Multi-step speed reference 1) *<1>*
5	Multi-function terminal input 6	Terminal S6 input function 0: Terminal S6 function OFF 1: Terminal S6 function ON	H1-06 (Default = 4: Multi-step speed reference 2) *<1>*
6	Multi-function terminal input 7	Terminal S7 input function 0: Terminal S7 function OFF 1: Terminal S7 function ON	H1-07 (Default = 6: Jog command) *<1>*
7	Multi-function terminal input 8	Terminal S8 input function 0: Terminal S8 function OFF 1: Terminal S8 function ON	H1-08 (Default = 7: External bb command) *<1>*
8	External fault (EF0)	1: External fault (EF0)	
9	Fault reset *<2> <3>*	1: Fault reset	
A	Multi-function terminal input 9	Terminal S9 input function 0: Terminal S9 function OFF 1: Terminal S9 function ON	H1-09 *<1>*
B	Multi-function terminal input 10	Terminal S10 input function 0: Terminal S10 function OFF 1: Terminal S10 function ON	H1-10 *<1>*
C, D	Reserved		
E	Fault history trace clear	1: Fault history trace clear	
F	External BB command	1: External bb command ON	

<1> Refer to the instruction manual of a specific drive for the availability of this parameter and the default setting.
<2> Check that the faults has been successfully reset by confirming that the STATUS (RESET) bit has turned OFF.
<3> Errors are not reported while the fault reset signal is ON.

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.

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.

Table 20 and ***Table 21*** show the selection ranges for SEL REF1/2 (3/4, 5/6) and SEL MON1/2 (3/4, 5/6).

Table 20 SEL REF1/2 (3/4, 5/6) Selection Range

Bit	Item	Remarks
0	Nothing selected	
1	Torque Compensation	Drive: 0.1%
2	Analog output terminal 1 output	Enable when H4-01=000
3	Analog output terminal 2 output	Enable when H4-04=000

Bit	Item	Remarks
4	• YASKAWA AC Drive 1000-Series Drive terminal output Bit0: Terminal M1-M2 Bit1: Terminal P1-PC <1> Bit2: Terminal P2-PC <2> • YASKAWA AC Drive GA500 Drive terminal output Bit0: Terminal MA/MB-MC Bit1: Terminal P1-C1 Bit2: Terminal P2-C2 • YASKAWA AC Drive GA700, GA800, CR700, and CH700 Drive terminal output Bit0: Multi-function digital output 1 (M1-M2) Bit1: Multi-function digital output 2 <1> Bit2: Multi-function digital output 3 <2> Bit3: Multi-function digital output 4 <3> Bit4: Multi-function digital output 5 <4>	• YASKAWA AC Drive 1000-Series Terminal M1-M2 (Enable when H2-01 = F) Terminal P1-PC (Enable when H2-02 = F) <1> Terminal P2-PC (Enable when H2-03 = F) <2> • YASKAWA AC Drive GA500 Drive terminal output Terminal MA/MB-MC (Enable when H2-01 = F) Terminal P1-C1 (Enable when H2-02 = F) Terminal P2-C2 (Enable when H2-03 = F) • YASKAWA AC Drive GA700, GA800, CR700, and CH700 Multi-function digital output 1 (Enable when H2-01 = F) Multi-function digital output 2 (Enable when H2-02 = F) <1> Multi-function digital output 3 (Enable when H2-03 = F) <2> Multi-function digital output 4 (Enable when H2-04 = F) <3> Multi-function digital output 5 (Enable when H2-05 = F) <4>
5	PID target	Drive: 0.01%
6	Pulse train output	Drive: 1 Hz
7	V/f gain	
8	Reserved	
9	Command selection Bit1: PID target value enable	
A to F	Not used.	

<1> Terminals will differ depending on the model of the drive.
· YASKAWA AC Drive 1000-Series
CIMR-□A□, CIMR-□T□, CIMR-□K□, CIMR-□B□, CIMR-□D□: P1-PC
CIMR-□U□, CIMR-□C□: M3-M4
· YASKAWA AC Drive GA700, GA800
CIPR-GA□A□, CIPR-GA□T□, CIPR-GA□U□, CIPR-GA□C□, CIPR-GA□B□, CIPR-GA□K□, CIPR-GA□D□: M3-M4
· YASKAWA AC Drive CR700, CH700
CIPR-CR70A□, CIPR-CR70T□, CIPR-CH70B□: M3-M4
<2> Terminals will differ depending on the model of the drive.
· YASKAWA AC Drive 1000-Series
CIMR-□A□, CIMR-□T□, CIMR-□K□, CIMR-□B□, CIMR-□D□: P2-PC
CIMR-□U□, CIMR-□C□: M5-M6
· YASKAWA AC Drive GA700, GA800
CIPR-GA□A□, CIPR-GA□T□: P1-C1
CIPR-GA□U□, CIPR-GA□C□, CIPR-GA□B□, CIPR-GA□K□, CIPR-GA□D□: M5-M6
· YASKAWA AC Drive CR700, CH700
CIPR-CR70A□, CIPR-CR70T□, CIPR-CH70B□: M5-M6
<3> Available in CIPR-GA70A□, CIPR-GA70T□, CIPR-CR70□, CIPR-CH70□.
· YASKAWA AC Drive GA700
CIPR-GA70A□, CIPR-GA70T□: P2-C2
· YASKAWA AC Drive CR700, CH700
CIPR-CR70A□, CIPR-CR70T□, CIPR-CH70B□: P1-C1
<4> Available in CIPR-CR70□, CIPR-CH70□.
· YASKAWA AC Drive CR700, CH700
CIPR-CR70A□, CIPR-CR70T□, CIPR-CH70B□: P2-C2

Table 21 SEL MON1/2 (3/4, 5/6) Selection Range

MON1/2	Item	Remarks
0	Nothing selected	
1	Motor Speed	Same as U1-05, determined by o1-03
2	Torque reference (Monitor)	Same as U1-09, 0.1%
3	Speed Detection PG 1 Counter	
4	Frequency reference	Same as U1-01, determined by o1-03
5	Analog input terminal A2	Same as U1-14, 0.1%
6	Main circuit current voltage	Same as U1-07, 1V
7	Drive alarm	Refer to *Table 29 Drive Alarm Codes on page 40*.
8	Drive warning	Refer to *Table 30 Drive Minor Fault and Alarm on page 42*.
9	Multi-function output terminal status	Same as U1-11
A	Analog input terminal A3	Same as U1-15, 0.1%
B	Multi-function input terminal S1 to S8	Same as U1-10
C	Analog input terminal A1	Same as U1-13, 0.1%

MON1/2	Item	Remarks
D	Speed Detection PG 2 Counter	
E	Monitor data set in F6-23	
F	Monitor data set in F6-24	

In the following case, a warning is generated and the command is ignored.

• If not in phase 2 or 3: Command warning (A.95)

◆ Sub-commands

Use sub-commands after selecting the 32-byte data transmission (F6-21 = 0).

■ NOP: 00H (No Operation)

Byte	Command	Response
17	NOP	NOP
18	0	SUBSTATUS
19 to 29		0

This is the format of No Operation sub-command.

■ PRM_RD: 01H (Read Parameter)

Byte	Command	Response
17	PRM_RD	PRM_RD
18	0	SUBSTATUS
19, 20	NO	NO
21	SIZE	SIZE
22 to 29	0	PARAMETER

The PRM_RD sub-command is used to read internal Drive parameters. This sub-command functions in the same way as the PRM_RD main command.

In the following cases, a warning is generated and the command is ignored. If a warning is generated, the values that were read are undefined.

- If a register number (NO) fault occurs: Data setting warning (A.94)
- If SIZE is an odd number or is not between 2 and 8: Data setting warning (A.94)
- If a main command is PRM_RD or PRM_WR: Command warning (A.95)

■ PRM_WR: 02H (Write Parameter)

Byte	Command	Response
17	PRM_WR	PRM_WR
18	0	SUBSTATUS
19, 20	NO	NO
21	SIZE	SIZE
22 to 29	PARAMETER	PARAMETER

The PRM_WR sub-command is used to write internal Drive parameters. This sub-command functions in the same way as the PRM_WR main command.

In the following cases, a warning is generated and the command is ignored. If a warning is generated, the values that were read are undefined.

- If a register number (NO) fault occurs: Data setting warning (A.94)
- If SIZE is an odd number or is not between 2 and 8: Data setting warning (A.94)
- Data upper and lower limit fault: Data setting warning (A.94)
- During an undervoltage error: Command warning (A.95)
- While using the keypad to change settings: Command warning (A.95)
- If not in phase 2 or 3: Command warning (A.95)
- If a main command is PRM_RD or PRM_WR: Command warning (A.95)

■ ALM_RD: 05H (Read Alarm and Warning)

Byte	Command	Response
17	ALM_RD	ALM_RD
18	0	SUBSTATUS
19	ALM_RD_MOD	ALM_RD_MOD
20 to 29	0	ALM_DATA

The ALM_RD sub-command is used to read the fault and alarm status. This sub-command functions in the same way as the ALM_RD main command.

In the following case, a warning is generated and the command is ignored.

- If ALM_RD_MOD is not set: Data setting warning (A.94)

■ INV_I/O: 41H (Drive I/O Control)

Byte	Sub-Command	Response
17	INV_I/O	INV_I/O
18	0	SUBSTATUS
19	SEL REF3/4	SEL REF3/4
20	SEL REF5/6	SEL REF5/6
21	SEL MON3/4	SEL MON3/4
22	SEL MON5/6	SEL MON5/6
23, 24	Reference selected by SEL REF3	Monitor selected by SEL MON3
25, 26	Reference selected by SEL REF4	Monitor selected by SEL MON4
27, 28	Reference selected by SEL REF5	Monitor selected by SEL MON5
29, 30	Reference selected by SEL REF6	Monitor selected by SEL MON6

The INV_I/O sub-command is used to select the type of output from the Drive's terminals and refers to the values from the Drive's internal monitors.

These settings do not need to be set every scan. The settings are saved in the Drive until the next data is received or until the power is turned OFF.

The SEL REF3/4 sub-command is used to select the contents of REF3 with bits 0 to 3, and select the contents of REF4 with bits 4 to 7.
The SEL REF5/6 sub-command is used to select the contents of REF5 with bits 0 to 3, and select the contents of REF6 with bits 4 to 7.
Refer to ***Table 20*** for detail on the selection range for SEL REF 3 to 6.

The SEL MON3/4 sub-command is used to select the contents of MON3 with bits 0 to 3, and select the contents of MON4 with bits 4 to 7.
The SEL MON5/6 sub-command is used to select the contents of MON5 with bits 0 to 3, and select the contents of MON6 with bits 4 to 7.
Refer to ***Table 21*** for detail on the selection range for SEL MON 3 to 6.

In the following cases, a warning is generated and the command is ignored.

- If not in phase 2 or 3: Command warning (A.95)

◆ Status

This section describes the STATUS field for main commands and the SUBSTATUS field for sub-commands.

■ STATUS Field

Bit	Name	Description	Value	Setting
0	ALM	Alarm (fault) status	0	No alarm
			1	Alarm (fault)
1	WARNG	Warning status	0	No warning
			1	Warning
2	CMDRDY	Command ready	0	Busy
			1	Ready
3	BB OFF	Baseblock OFF (OFF when output voltage is being output from the drive or during baseblock.)	0	Baseblock ON
			1	Baseblock OFF
4	PON	Main power supply ON (OFF during undervoltage)	0	Main power supply OFF
			1	Main power supply ON
5	RUNX	Running	0	–
			1	Running
6	0SP	Zero speed	0	–
			1	Zero speed
7	REV	Reverse RUN	0	Forward RUN
			1	Reverse RUN
8	RESET	Fault reset signal input	0	–
			1	Fault reset signal input
9	AGREE	Speed agreement	0	–
			1	Speed agreement
A	INV_READY	Drive ready	0	–
			1	Drive ready
B	OPE	oPE fault	0	–
			1	oPE fault
C	UV_R	Recovery after power loss or recovery after momentary power loss	0	Recovery after power loss
			1	Recovery after momentary power loss
D	REMOTE	Local or Remote	0	Local
			1	Remote (Transfer)
E	SEL_M	Motor Selection	0	Motor 1, motor 3
			1	Motor 2
F	0_SERVO	Zero Servo Complete	0	–
			1	Zero Servo complete

Note: With the PRM_RD command, only the settings for the STATUS (CMDRDY) is valid. Other bits are not used.

■ SUBSTATUS Field

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	SUBCMDRDY	SUBWARNG	SUBALM

SUBALM	Sub-command alarm	0	No alarm
		1	Alarm
SUBWARNG	Sub-command warning	0	No warning
		1	Warning
SUBCMDRDY	Sub-command ready (Sub-command can be received.)	0	Busy
		1	Ready

9 Troubleshooting

◆ Fault Detection Processing

Faults can be detected by two methods: Drive fault detection and SI-T3 fault detection.

The SI-T3 is notified of drive faults by the internal interface, and the SI-T3 sends the response data, ALARM or STATUS.

The SI-T3 notifies drive of SI-T3 faults by the internal interface, and the faults are simultaneously sent the response data, ALARM or STATUS.

The following four types of faults can be detected. The subsequent operation varies depending on the type of fault.

Table 22 Fault Type

Fault Type		Location	Description
Alarm	Drive alarm	Drive	Fault that causes damage to the drive or machinery
	Communications alarm	SI-T3	Interference related to MECHATROLINK-II communications
Warning	Drive warning	Drive	Illegal operation or minor fault not posing any immediate danger
	Communications warning	SI-T3	MECHATROLINK-II communications fault warning

Table 23 Fault Type and SI-T3 Processing

Fault Type	SI-T3 Processing					Direction of Communications	Reset
	MECHATROLINK Response			LED (ERR)	Processing		
	ALARM	STATUS					
		WARNG	ALM				
Drive alarm	CODE <1>	–	1	–	No special processing	←	Required
Communications alarm		–	1	ON	Notification to drive	←	Required
Drive warning		1	–	–	No special processing	←	Required
Communications warning		1	–	–	No special processing	None	Not required

<1> Refer to *Drive Fault Notification on page 40* for detail.

Note: The meanings of each symbol are as follows.
– : No change
←: Fault notification from Drive

When consecutive alarms occur, the SI-T3 provides notification of the most recent alarm with a MECHATROLINK response data. If warnings occur simultaneously, notification priority is given to the warning with the lowest warning code. If alarms and warnings are mixed together, the SI-T3 gives notification priority to alarms.

The *Table 24* shows the response data when consecutive alarms or warnings occurs.

Table 24 Response Data for Consecutive Alarms and/or Warnings

Fault Detection		MECHATROLINK-II Response Data Contents		
Previous Value	Most Recent Value	Alarm	STATUS	
			WARNG	ALM
Alarm	Alarm	Most recent alarm code	0	1
Alarm	Warning	Most recent alarm code	1	1
Warning	Alarm	Most recent alarm code	1	1
Warning	Warning	Warning with the smaller warning code	1	0

◆ Alarm Processing

■ SI-T3 Communications Fault Detection

The following tables show the communications faults detected by the SI-T3 and the conditions in which they can be detected.

Table 25 Reception Failures in Each Phase

Communications Phase	Reception Failure		Transmission cycle
	First	Second (Consecutive)	Fault
Phase 1	–	–	–
Phase 2	96	E6	E6
Phase 3	96	E6	E6

Table 26 Alarm Code (MECHATROLINK-II Response ALARM Value)

ALARM	Description	Fault Type
96	MECHATROLINK-II communications fault warning	Communications warning
E5	MECHATROLINK-II WDT Error	Communications alarm
E6	MECHATROLINK-II communications fault	Communications alarm

Table 27 Fault Types

Fault	Description
Communications failure	Transmission LSI detected a data reception failure.
Transmission cycle fault	A timing fault of a synchronous frame in a transmission cycle was detected.
Watchdog timer error	A WDT count fault in a synchronous frame was detected.

■ Other Faults

The following table shows other faults that can be detected by the SI-T3. If a warning occurs, operation will follow the previous command.

Table 28 Other fault detected by SI-T3

ALARM	Description	Fault Type	Operation when Fault Occurs
94	Data setting warning	Communications warning	Received commands are ignored.
95	Command warning	Communications warning	Received commands are ignored.
EC	WDC fault with drive	Communications alarm	Waits for power supply to be reset.
ED	Drive access permission fault (Access not possible 10 consecutive times)	Communications alarm	Waits for power supply to be reset.
EE	Drive monitor timer over (1 s elapsed)	Communications alarm	Waits for power supply to be reset. Received commands are ignored. <1>

<1> If the ERR indicator is not lit or flashing, any commands that are received will be ignored.

■ Drive Fault Notification

If a fault is detected in the drive, SI-T3 stores the alarm or warning code in the MECHATROLINK-II ALARM command and simultaneously turns ON the relevant bit in the STATUS field.

The following tables show the alarm codes for SI-T3 notification if a fault is detected in the drive.

Table 29 Drive Alarm Codes

ALRM Code (Hex)	Display		Description
00	SCF	SCF	Safety Circuit Fault Note: When using YASKAWA AC Drive 1000-Series, “SCF” (Safety Circuit Fault) will not be displayed.
02	Uv1	Uv1	Undervoltage
03	Uv2	Uv2	Control Power Supply Undervoltage
04	Uv3	Uv3	Soft Charge Circuit Fault
06	GF	GF	Ground Fault
07	oC	oC	Overcurrent
08	ov	ov	Overvoltage
09	oH	oH	Heatsink Overheat
0A	oH1	oH1	Heatsink Overheat
0B	oL1	oL1	Motor Overload
0C	oL2	oL2	Drive Overload
0D	oL3	oL3	Overtorque Detection 1
0E	oL4	oL4	Overtorque Detection 2
0F	rr	rr	Dynamic Braking Transistor
10	rH	rH	Dynamic Braking Resistor
11	EF3	EF3	External Fault (input terminal S3)
12	EF4	EF4	External Fault (input terminal S4)
13	EF5	EF5	External Fault (input terminal S5)
14	EF6	EF6	External Fault (input terminal S6)
15	EF7	EF7	External Fault (input terminal S7)
16	EF8	EF8	External Fault (input terminal S8)
18	oS	oS	Overspeed
19	dEv	dEv	Excessive Speed Deviation
1A	PGo	PGo	PG Disconnect
1B	PF	PF	Input Phase Loss
1C	LF	LF	Output Phase Loss
1D	oH3	oH3	Motor Overheat 1 (PTC)
1E	oPr	oPr	Operator Connection Fault
1F	Err	Err	EEPROM Write Error
20	oH4	oH4	Motor Overheat 2 (PTC)
21	CE	CE	MEMOBUS/Modbus Communication Error
25	CF	CF	Control Fault
26	SvE	SvE	Zero-Servo Fault
27	EF0	EF0	Option Card External Fault
28	FbL	FbL	PID Feedback Loss
29	UL3	UL3	Undertorque Detection 1
2A	UL4	UL4	Undertorque Detection 2
2B	oL7	oL7	High Slip Braking oL
32	dv1	dv1	Z Pulse Fall Detection
33	dv2	dv2	Z Pulse Noise Fault Detection

ALRM Code (Hex)	Display		Description
34	dv3	dv3	Inversion Detection
35	dv4	dv4	Inversion Prevention Detection
36	LF2	LF2	Output current imbalance
37	STo	STo	Motor Pull Out or Step Out Detection Note: When using YASKAWA AC Drive GA500, GA700, GA800, CR700, and CH700, “STPo” (Motor Pull Out or Step Out Detection) will be displayed.
38	PGoH	PGoH	PG Hardware Fault (when using PG-X3)
3B	SEr	SEr	Too Many Speed Search Restarts
41	FbH	FbH	Excessive PID Feedback
42	EF1	EF1	External Fault (input terminal S1)
43	EF2	EF2	External Fault (input terminal S2)
44	oL5	oL5	Mechanical Weakening Detection 1
45	UL5	UL5	Mechanical Weakening Detection 2
46	CoF	CoF	Current Offset Fault
49	dWFL	dWFL	DriveWorksEZ Fault
4A	dWF1	dWF1	DriveWorksEZ EEPROM Fault
4D	voF	voF	Output Voltage Detection Fault
4E	rF	rF	Braking Resistor Fault
4F	boL	boL	Braking Transistor Overload Fault
52	nSE	nSE	NodeSetup Fault
83	CPF02	CPF02	A/D Conversion Fault
84	CPF03	CPF03	Control Board Connection Fault
87	CPF06	CPF06	EEPROM Memory Data Fault
88	CPF07, CPF08	CPF07, CPF08	Terminal Board Connection Fault
89			
8C	CPF11 to CPF21	CPF11 to CPF21	Control Circuit Error
8D			
8E			
8F			
91			
92			
93			
94			
95			
96			
97	CPF22	CPF22	Hybrid IC Error
98	CPF23	CPF23	Control Board Connection Error
99	CPF24	CPF24	Drive Unit Signal Fault
9B	CPF26 to CPF38	CPF26 to CPF38	Control Circuit Error Note: When using YASKAWA AC Drive 1000-Series, “CPF36 to CPF38” (ALRM code: A5 to A7) will not be displayed.
9C			
9D			
9E			
9F			
A0			
A1			
A2			
A3			
A4			
A5			
A6			
A7			

ALRM Code (Hex)	Display		Description
E5	E5	E5	MECHATROLINK Watchdog Timer Error
E6	bUS	bUS	Option Communication Error
FA	oFA00 to oFA43	oFA00 to oFA43	Option Card Error

Table 30 Drive Minor Fault and Alarm

ALRM Code (Hex)	Display		Description
01	Uv	Uv	Undervoltage
02	ov	ov	Overvoltage
03	oH	oH	Heatsink Overheat
04	oH2	oH2	Drive Overheat
05	oL3	oL3	Overtorque 1
06	oL4	oL4	Overtorque 2
07	EF	EF	Run Command Input Error
08	bb	bb	Drive Baseblock
09	EF3	EF3	External Fault (input terminal S3)
0A	EF4	EF4	External Fault (input terminal S4)
0B	EF5	EF5	External Fault (input terminal S5)
0C	EF6	EF6	External Fault (input terminal S6)
0D	EF7	EF7	External Fault (input terminal S7)
0E	EF8	EF8	External Fault (input terminal S8)
0F	FAn	FAn	Cooling Fan Error
10	oS	oS	Overspeed
11	dEv	dEv	Excessive Speed Deviation
12	PGo	PGo	PG Disconnect
14	CE	CE	MEMOBUS/Modbus Communication Error
1A	EF0	EF0	Option Card External Fault
1B	rUn	rUn	During Run 2, Motor Switch Command Input
1D	CALL	CALL	Serial Communication Transmission Error
1E	UL3	UL3	Undertorque 1
1F	UL4	UL4	Undertorque 2
20	SE	SE	MEMOBUS/Modbus Communication Test Mode Error
22	oH3	oH3	Motor Overheat (PTC)
27	FbL	FbL	PID Feedback Loss
28	FbH	FbH	Excessive PID Feedback
2A	dnE	dnE	DriveDisabled
2B	PGoH	PGoH	PG Hardware Fault (when using PG-X3)
32	AEr	AEr	Station Address Error
33	CyC	CyC	SI-T3 Transmission Cycle Error
34	HCA	HCA	Current Alarm
35	LT-1	LT-1	Cooling Fan Maintenance Time
36	LT-2	LT-2	Capacitor Maintenance Time
39	EF1	EF1	External Fault (input terminal S1)
3A	EF2	EF2	External Fault (input terminal S2)
3B	HbbF	HbbF	Safe Disable Signal Input Note: SToF (Safe Torque OFF) will be displayed for GA500, GA700, GA800, CR700, and CH700 drives.

ALRM Code (Hex)	Display		Description
3C	Hbb	Hbb	Safe Disable Signal Input Note: STo (Safe Torque OFF) will be displayed for GA500, GA700, GA800, CR700, and CH700 drives.
3D	oL5	oL5	Mechanical Weakening Detection 1
3E	UL5	UL5	Mechanical Weakening Detection 2
41	voF	voF	Output Voltage Detection Fault
42	TrPC	TrPC	IGBT Maintenance Time (90%)
43	LT-3	LT-3	Soft Charge Bypass Relay Maintenance Time
44	LT-4	LT-4	IGBT Maintenance Time (50%)
45	boL	boL	Breaking Transistor Overload Fault
49	dWAL	dWAL	DriveWorksEZ Error
E5	E5	E5	MECHATROLINK Watchdog Timer Error
E6	bUS	bUS	Option Communication Error

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Table 31* 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

Errors bUS (Option Communication Error), E5 (MECHATROLINK Watchdog Timer Error), and EF0 (Option Card External Fault) can appear as an alarm or as a fault. When a fault occurs, the keypad ALM LED remains. When an alarm occurs, the keypad ALM LED flashes.

If communication stops while the drive is running, answer the following questions to help remedy the fault:

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

Table 31 Fault Display and Possible Solutions

Keypad Display		Fault Name
bUS	bUS	Option Communication Error
		• After establishing initial communication, the connection was lost. • Only detected when the run command or frequency reference is assigned to the option (b1-01 = 3 or b1-02 = 3).
Cause		**Possible Solution**
No signal was received from the PLC.		• Check for faulty wiring. • Correct any wiring problems.
Faulty communications wiring.		
An existing short circuit or communications disconnection.		Check disconnected cables and short circuits and repair as needed.
A data error occurred due to electric interference.		• Counteract noise in the control circuit, main circuit, and ground wiring. • If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input. • Counteract noise in the master controller (PLC).
The option is not properly connected to the drive.		Reinstall the option.
Option is damaged.		If there are no problems with the wiring and the error continues to occur, replace the option.
Keypad Display		**Fault Name**
E5	E5	MECHATROLINK Watchdog Timer Error
		The watchdog has timed out.
Cause		**Possible Solution**
Data has not been received from the PLC, triggering the watchdog timer.		Check the MECHATROLINK cable connection. Check for wiring and how to counteract noise according to the following manuals by MECHATROLINK Members Association. MECHATROLINK-II Installation Guide, MMATDEP011
Keypad Display		**Fault Name**
EF0	EF0	Option Card External Fault
		The alarm function for an external device has been triggered.
Cause		**Possible Solution**
An external fault was received from the PLC.		1. Remove the cause of the external fault. 2. Reset the external fault input from the PLC.
Problem with the PLC program		Check the PLC program.
Keypad Display		**Fault Name**
oFA00	oFA00	Option Card Connection Error (CN5-A)
		Option is not properly connected.
Cause		**Possible Solution**
The option card installed into port CN5-A is incompatible with the drive.		Connect the option to the correct option port. Note: PG option cards are supported by option ports CN5-B and CN5-C only.

Keypad Display		Fault Name
oFA01	oFA01	Option Card Fault (CN5-A)
		Option is not properly connected.
Cause		**Possible Solution**
The option connected to option port CN5-A was changed during run.		De-energize the drive and plug the option into the drive according to *Installation Procedure on page 11*.
Keypad Display		**Fault Name**
oFA03, oFA04	oFA03, oFA04	Option Card Error (CN5-A)
		Option Card Error (CN5-A)
Cause		**Possible Solutions**
A fault occurred in the option.		1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
Keypad Display		**Fault Name**
oFA30 to oFA43	oFA30 to oFA43	Option Card Connection Error (CN5-A)
		Communication ID error.
Cause		**Possible Solution**
The option card connection to port CN5-A is faulty.		1. Turn off the power. 2. Check if the option is properly plugged into the option port. 3. Replace the option if the fault continues to occur.
Keypad Display		**Fault Name**
oFb00	oFb00	Option Fault (CN5-B)
		Non-compatible option is connected.
Cause		**Possible Solution**
The option card installed into port CN5-A is incompatible with the drive.		Connect the option to the correct option port. Note: Use connector CN5-B when connecting DO-A3, AO-A3, or two PG options. Use connector CN5-C when connecting only one PG option.
Keypad Display		**Fault Name**
oFb02	oFb02	Option Fault (CN5-B)
		Two identical options are connected at the same time.
Cause		**Possible Solution**
An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.		Connect the option to the correct option port.
Keypad Display		**Fault Name**
oFC00	oFC00	Option Fault (CN5-C)
		Non-compatible option is connected.
Cause		**Possible Solution**
The option card installed into port CN5-C is incompatible with the drive.		Connect the option to the correct option port. Note: AI-A3, DI-A3, and communication options are not supported by option port CN5-C.
Keypad Display		**Fault Name**
oFC02	oFC02	Option Fault
		Option Flash write mode.
Cause		**Possible Solution**
An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.		Connect the option to the correct option port.

■ Minor Faults and Alarms

Keypad Display		Minor Fault Name	
AEr	AEr	Station Address Error	
		Option is set to an address outside the allowable setting range.	
Cause		**Possible Solution**	Minor Fault (H2-□□ = 10)
MECHATROLINK-II Option is set to an address outside the allowable setting range.		Set F6-20 to an address within the specified range.	YES
Keypad Display		**Minor Fault Name**	
CALL	CALL	Serial communication transmission error	
		Communication is not established.	
Cause		**Possible Solution**	Minor Fault (H2-□□ = 10)
Communication wiring is faulty.		• Check for wiring errors. • Correct the wiring.	YES
An existing short circuit or communications disconnection		Check disconnected cables and short circuits and repair as needed.	
Programming error on the master side		Check communications at start-up and correct programming errors.	
Communication circuitry is damaged.		• Perform a self-diagnostics check. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or a Yaskawa representative.	
Termination resistor of the MEMOBUS/Modbus communications is not enabled.		Set DIP switch S2 to the ON position to enable the termination resistor on a drive located at the end of a network line.	
Keypad Display		**Minor Fault Name**	
CyPo	CyPo	Cycle Power to Active Parameters	
		Comm. Option Parameter Not Upgraded	
Cause		**Possible Solution**	Minor Fault (H2-□□ = 10)
Although F6-15 = 1 [Comm. Option Parameters Reload = Reload Now], the drive did not update the communication option parameters.		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.	YES

10 European Standards

Figure 22 CE Mark

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

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

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

EMC Guidelines: 2014/30/EU

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

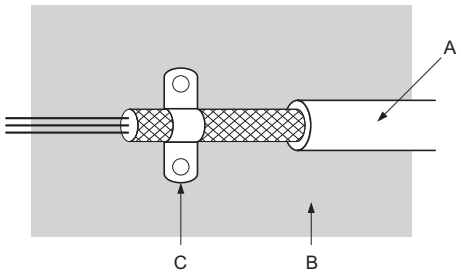
◆ EMC Guidelines Compliance

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

■ EMC Guidelines Installation Conditions

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

1. Use dedicated shield cable for the option and external device (encoder, I/O device, master), or run the wiring through a metal conduit.
2. Keep wiring as short as possible and ground the largest possible surface area of the shield to the metal panel according to *Figure 24*.



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

Figure 23 Ground Area

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

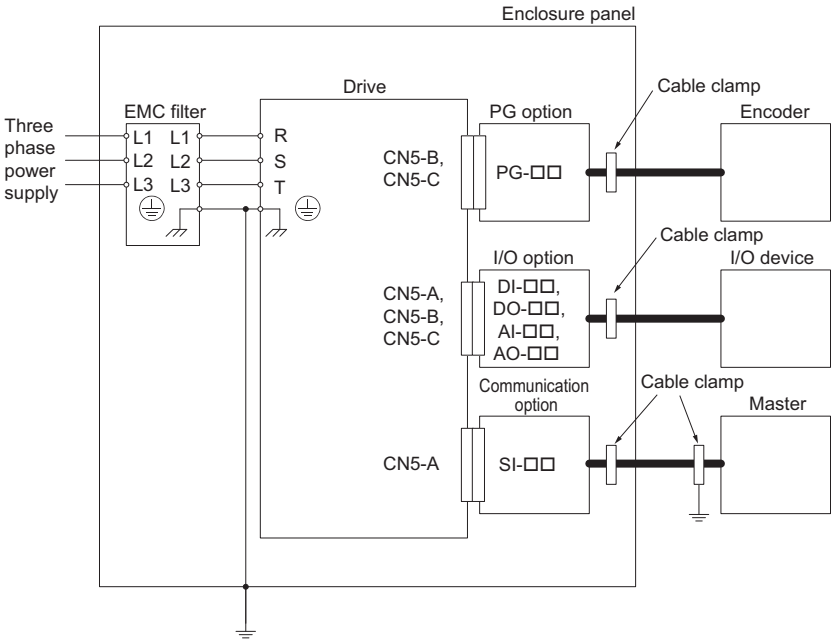


Figure 24 Option Installation for CE Compliance (PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□)

■ Option Installation for CE Compliance with GA500

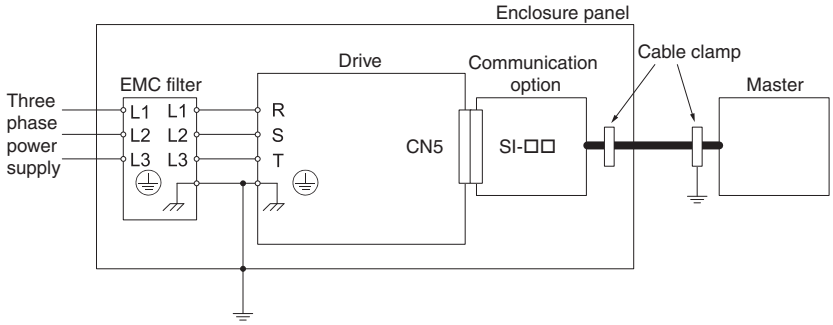


Figure 25 Option Installation for CE Compliance with GA500

11 Specifications

Table 32 Option Specifications

Items	Specifications
Model	SI-T3
Access mode	Start-stop synchronization, master/slave method
Communication Speed	10 Mbps (MECHATROLINK-II), 4 Mbps (MECHATROLINK-I)
Transmission cycle	500 µs to 8 ms <1>
Maximum transmission distance	50 m (1969.0 in) <2>
Minimum wiring distance between stations	0.5 m (19.7 in)
Data length	17-byte data transmission or 32-byte data transmission <3>
Maximum number of stations	30 <2> <4>
Ambient Temperature	–10°C to +50°C (14°F to 122°F)
Humidity	up to 95% RH (no condensation)
Storage Temperature	–20°C to +60°C (–4°F to 140°F) allowed for short-term transport of the product
Area of Use	Indoors and free from: • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	Up to 1000 m (3280 ft)

<1> For MECHATROLINK-I, a cycle is 2 ms.
For MECHATROLINK-II, a cycle is 1 ms to 8 ms for a 32-byte data transmission, and 500 µs to 8 ms for a 17-byte data transmission.
<2> At the maximum transmission distance of 50 m (1969.0 in), the maximum number of stations is 15.
<3> For MECHATROLINK-I, only a 17-byte data transmission can be selected.
<4> The maximum number of connectable stations changes depending on the types and settings of the host controller, baud rate, or communications cycle. For details, refer to the manuals of your controller.
Communications cycle: Integral multiple of transmission cycles (depending on the host controller settings).
Example: If the host controller is an MP2300
・For MECHATROLINK-II (32-byte transmission, 2.0 ms communications cycle): 21 stations max. (21 stations can be set, but then the maximum number of connectable drives will be 16.)
・For MECHATROLINK-II (32-byte transmission, 1.0 ms communications cycle): 9 stations max.
・For MECHATROLINK-II (17-byte transmission, 1.0 ms communications cycle): 15 stations max.
・For MECHATROLINK-I: 14 stations max.

12 Disposal

◆ Disposal Instructions

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

◆ WEEE Directive

Figure 26 WEEE Mark

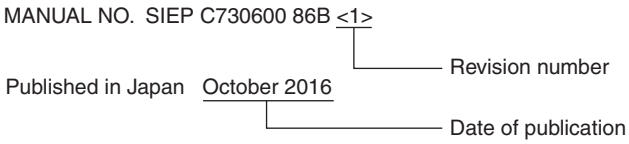
The wheelie bin symbol on this product, its manual, or its packaging identifies that you must recycle it at the end of its product life.

You must discard the product at an applicable collection point for electrical and electronic equipment (EEE).

Do not discard the product with usual waste.

◆ Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.



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		Chapter 12	Addition: Disposal
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		Back cover	Revision: Address
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		Chapter 2	Addition: Note in Table 1
		Back cover	Revision: Address
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YASKAWA AC Drive Option

MECHATROLINK-II

Technical Manual

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