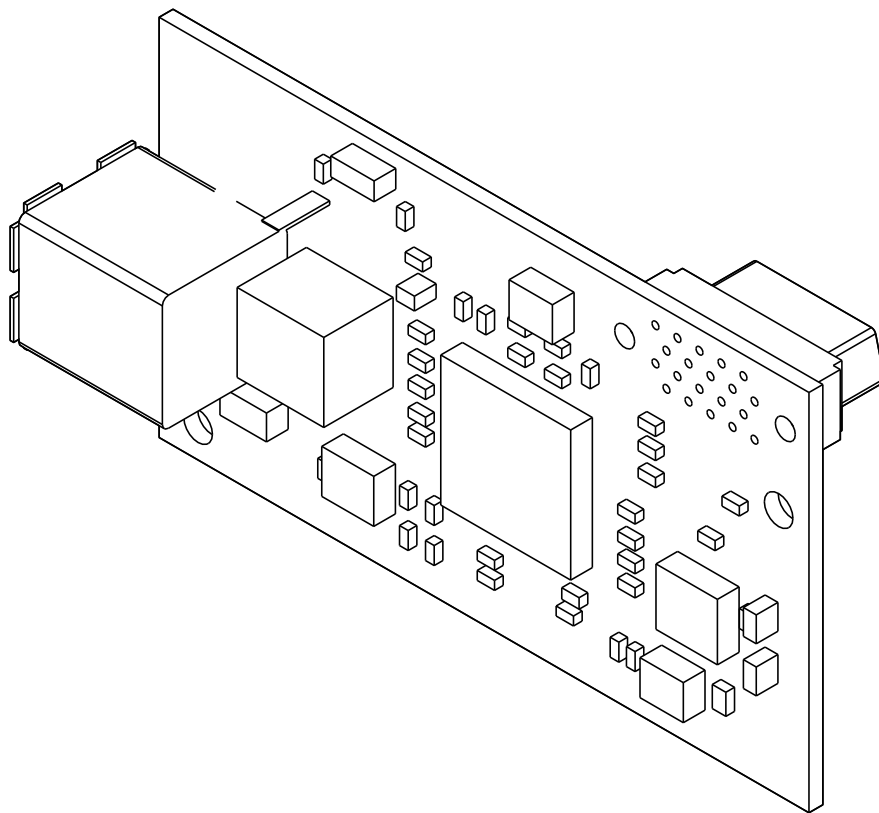# YASKAWA

YASKAWA AC Drive Option

MECHATROLINK-II
Technical Manual

Model   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.

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Table of Contents

1　Preface and Safety

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

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

◆ Applicable Documentation

The following manuals are available for the option:

Document	Description
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.
YASKAWA AC Drive Manual	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-II
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-I/MECHATROLINK-II is a registered trademark of the MECHATROLINK Members Association (MMA).
• Other company names and product names in this document are trademarks or registered trademarks of the respective companies.

◆ **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

MECHATROLINK-II Option (Model: SI-T3) uses the MECHATROLINK protocol to connect a drive to a field network.

Install the option on a drive to use a MECHATROLINK-II master device to do these tasks:

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

◆ **Compatible Products**

You can use the option with the products in the following table:

Table 2.1 Compatible Products

Product Series	Model (s)	Software Version *1
A1000	CIMR-Ax2Axxxx	≥1020
	CIMR-Ax4A0002 - 4A0675	
	CIMR-Ax4A0930, 4A1200	≥3015
	CIMR-Ax5Axxxx	≥5040 ≥1020
U1000 *2	CIMR-UxxAxxxx	≥1010
	CIMR-UxxExxxx	
	CIMR-UxxPxxxx	
	CIMR-UxxWxxxx	
Z1000U *2	CIMR-ZxxAxxxx	≥6110
	CIMR-ZxxExxxx	
	CIMR-ZxxPxxxx	
	CIMR-ZxxWxxxx	

Product Series	Model (s)	Software Version *1
GA500 *3	CIPR-GA50xxxxx	≥1010
GA700 *3	CIPR-GA70xxxxx	≥1010
GA800 *3	CIPR-GA80xxxxx	≥9010
CR700 *3	CIPR-CR70xxxxx	≥1012
CH700 *3	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 U1000 or Z1000U, make sure that the option software version is PRG: 6107 or later.
*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:
• 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.

• For Yaskawa customers in the North or South America region:
If your product is not listed in Table 2.1, refer to the web page below to confirm this manual is correct for your product. The web page provides a list of option manuals by product, and a direct link to download a PDF.
Scan QR code Or refer to: *http://www.yaskawa.com/optionlookup*

◆ Install the Option on a GA500 Drive

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

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

A - Option
B - Option card mounting kit components (sold separately)
C - Drive front cover
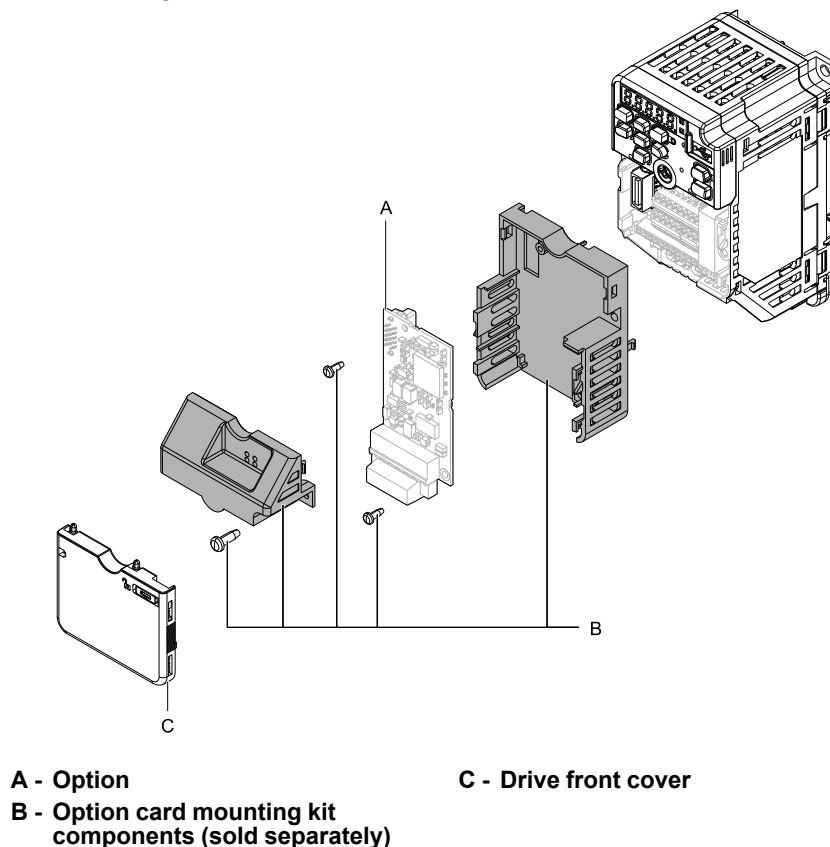
Figure 2.1 Option Card Mounting Kit (JOHB-GA50)

3   Receiving

After receiving the option package:
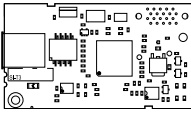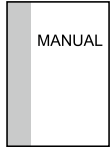
• Make sure that the option is not damaged and no parts are missing.
Contact your sales outlet if the option or other parts appear damaged. Contact your sales outlet if there is damage to the option or other parts.

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

• Make sure that the model number on the option nameplate and the model number on the purchase order are the same. Refer to 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.

◆ Contents and Packaging

Table 3.1 Contents of Package

Description:	Option	Ground Wire *1	Screws (M3)	LED labels		Installation Manual
				1000-Series	**GA500, GA700, GA800, CR700, and CH700**	
-				ERR⭕⭕RUN RX⭕⭕TX	RUN TX ⭕ ⭕ ⭕ ⭕ ERR RX	MANUAL
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-II Option

Looking from the connector

Underside
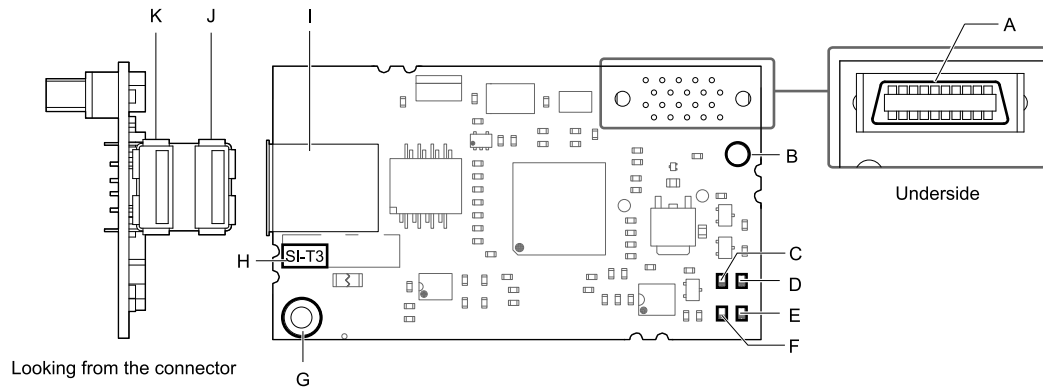
A - Connector (CN101)
B - Installation hole
C - LED (ERR) *1*
D - LED (RUN) *1*
E - LED (TX) *1*
F - LED (RX) *1*

G - Ground terminal (FE) (installation hole) *2*
H - Model
I -   Communication connector CN3
J - Connector B
K - Connector A

Figure 4.1 SI-T3 Option Components

*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.

◆ Communication connector

Table 4.1 Communication Connector

Connector	Connector	Pin No.	Signal Name	I/O	Function
	A	A1	(NC)	-	-
		A2	SRD−	I/O	Send/receive data (−)
		A3	SRD+	I/O	Send/receive data (+)
		A4	(NC)	-	-
		Shell	SLD	-	Shield
	B	B1	(NC)	-	-
		B2	SRD−	I/O	Send/receive data (−)
		B3	SRD+	I/O	Send/receive data (+)
		B4	(NC)	-	-
		Shell	SLD	-	Shield

Note:

Connectors A and B are available for the same functions.

◆ 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

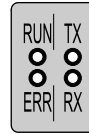| LED	State	Status	Description
RUN	ON	Power supply on	• The SI-T3 has power and is prepared for operation • An internal, self-diagnostic check completed in the SI-T3
	OFF	Power supply off	• The drive has no power • The SI-T3 is not properly connected to the drive, or the SI-T3 has no power • An internal, self-diagnostic check completed in the SI-T3
ERR	ON	Connection Error	• The SI-T3 is not properly connected to the drive • Communication error *1
	Flashing	SI-T3 error	Error found during the SI-T3 self-diagnostic check
	OFF	Normal operation	• The 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 being sent • During reset
RX	ON	Receiving data	Data is being sent (LED may appear to be flashing)
	OFF	Not receiving data	• No data being received • During reset

*1   For more information about the communication error, refer to *Troubleshooting on page 37*.

5   Installation Procedure

◆ Section Safety

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

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

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

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

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

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

NOTICE *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	16
GA800	Procedure B	16
CR700	Procedure B	16
CH700	Procedure B	16

*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: 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

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

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.

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.
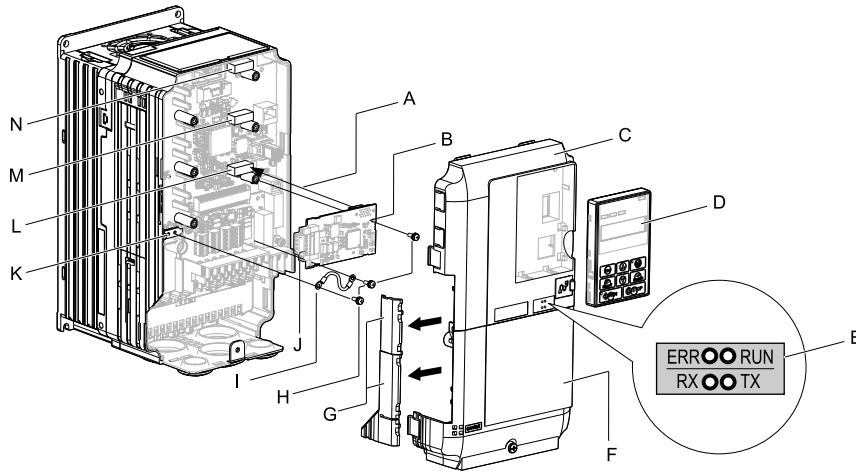
A - **Insertion point for CN101 connector**
B - **Option**
C - **Drive front cover**
D - **Keypad**
E - **LED label**
F - **Drive terminal cover**
G - **Removable tabs for wire routing**

H - **Included screws**
I - **Ground wire**
J - **Option modular connector 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 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 more information about how to remove the keypad and covers.

   NOTICE *Observe correct electrostatic discharge (ESD) procedures when touching the option. Failure to obey can cause ESD damage to the option circuitry.*
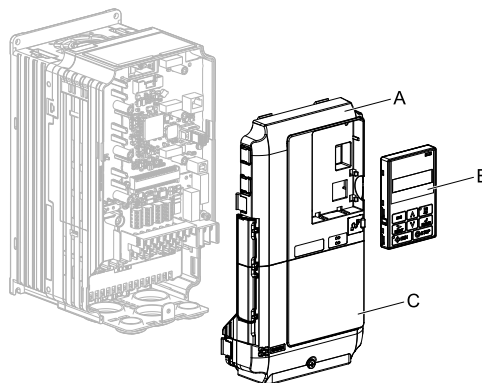
A - **Drive front cover**
B - **Keypad**
C - **Drive terminal cover**

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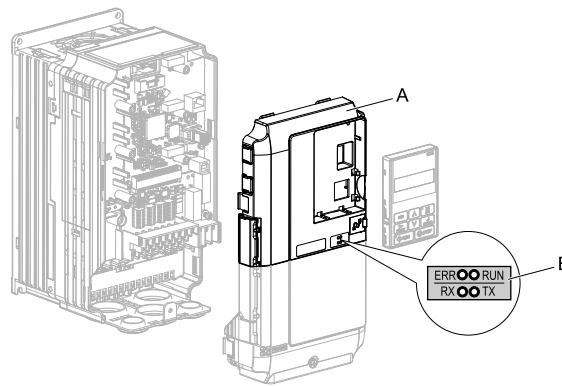
A - Drive front cover   **B - LED label**

Figure 5.3 Put the LED Label on the Drive Front Cover

3. Insert the option card (A) into the CN5-A connector (C) on the drive and use the included screws (B) to put it in place.
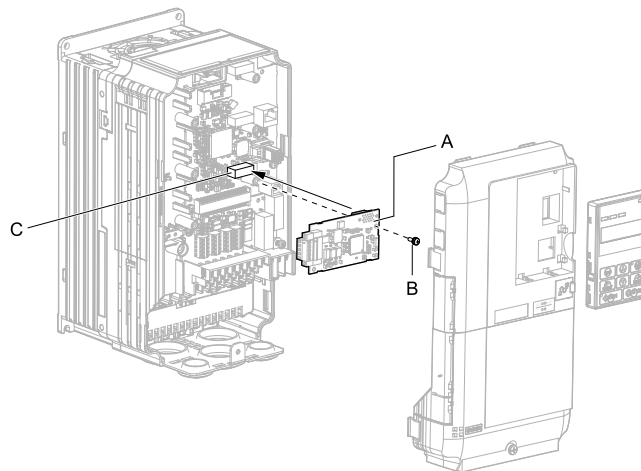
A - Option   **C - Connector CN5-A**
B - Included screws

Figure 5.4 Insert 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 the screws to 0.5 to 0.6 N•m (4.4 to 5.3 in•lb).
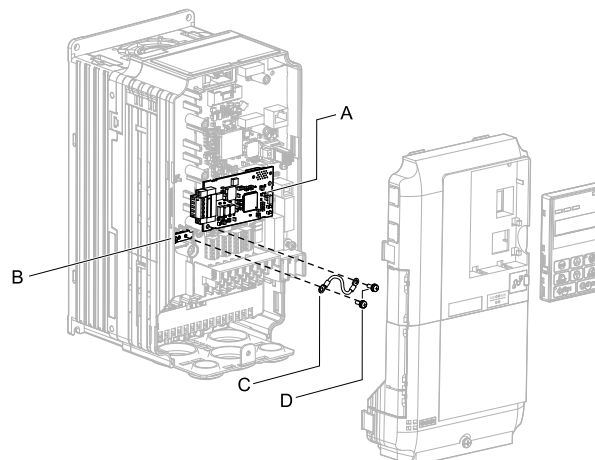
A - Option   **C - Ground wire**
B - Drive grounding terminal (FE) **D - Included screws**

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.
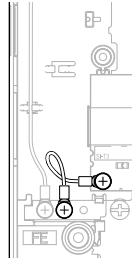
Figure 5.6 Connecting the Ground Terminal

5. Route the option wiring.

   • 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 5.7-A to create the necessary openings on these models.

   • Route the option wiring inside the enclosure as shown in Figure 5.7-B. Make sure 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:
• Isolate communication cables from main circuit wiring and other electrical lines to avoid potential sources of electrical interference.
• Connect the terminator (model No.: JEPMC-W6022-E) to the option modular connector (CN3) on the end drive of the communication lines.
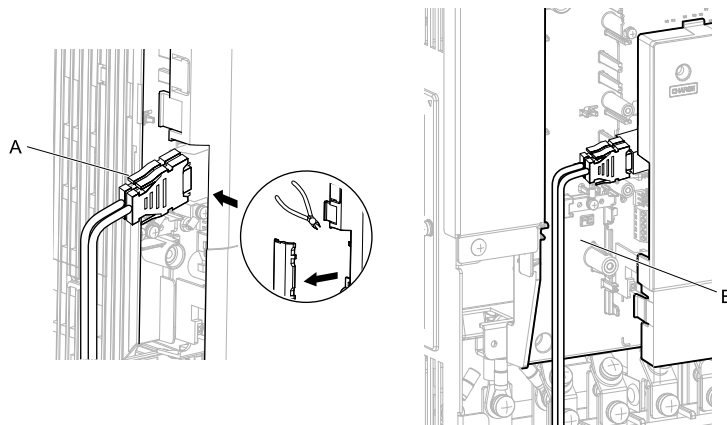
| A - Route wires through the openings provided on the left side of the front cover. *1 | B - Use the open space provided inside the drive to route option wiring. |

Figure 5.7 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-II communication cable to option communication connector CN3.

   Isolate the communications cables from main circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see Figure 5.15). Refer to *MECHATROLINK-II 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 more information about how to reattach the keypad and covers.

   NOTICE   *Do not pinch cables between the front covers and the drive. Failure to comply could cause erroneous operation.*
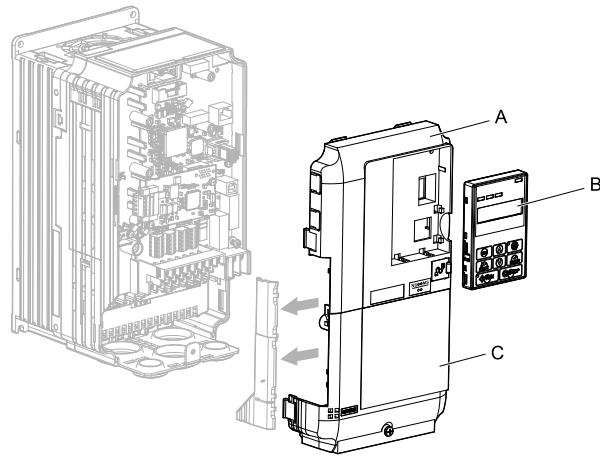
A - Drive front cover   C - Drive terminal cover
B - Keypad

Figure 5.8 Replace the Front Covers and Keypad

8. Set drive parameters in *MECHATROLINK Option Drive Parameters on page 19* 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.

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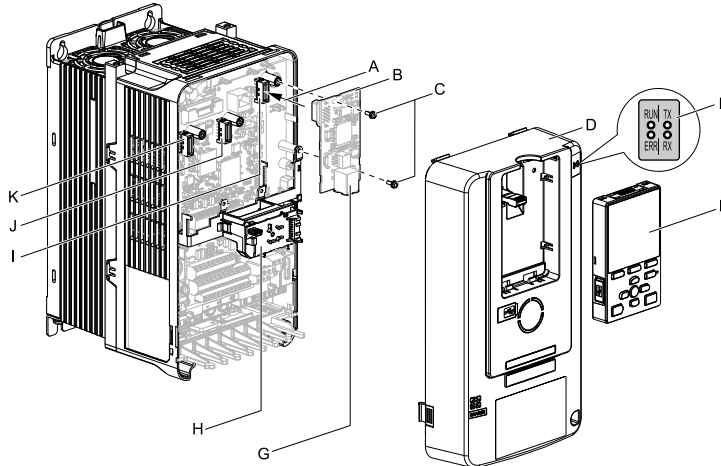
A - Insertion point for CN5 connector
B - Option
C - Included screws
D - Drive front cover
E - LED label
F - Keypad
G - Option modular connector CN3
H - LED Status Ring board
I - Connector CN5-A
J - Connector CN5-B (Not available for communication option installation.)
K - Connector CN5-C (Not available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

Figure 5.9 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).
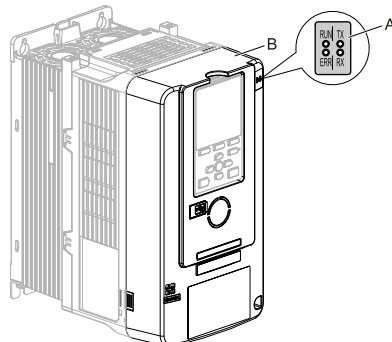
A - LED label   B - Drive front cover

Figure 5.10 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:

Remove the keypad, then move the keypad connector to the holder on the drive, then remove the front cover.
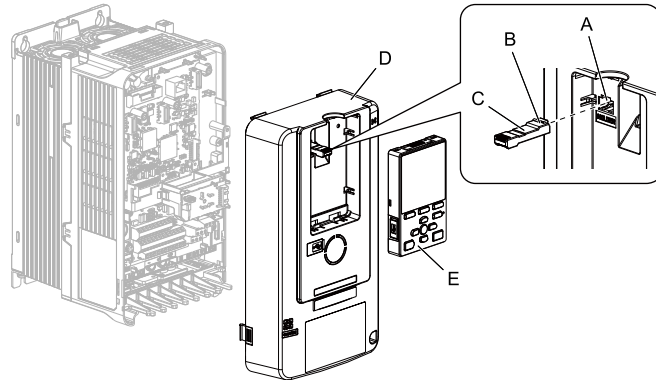
A - **Holder**
B - **Keypad connector tab**
C - **Keypad connector**
D - **Drive front cover**
E - **Keypad**

Figure 5.11 Remove the Front Cover and Keypad

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

Refer to the manual packaged with the drive for information about how to remove the LED Status Ring board.

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

Drive front view
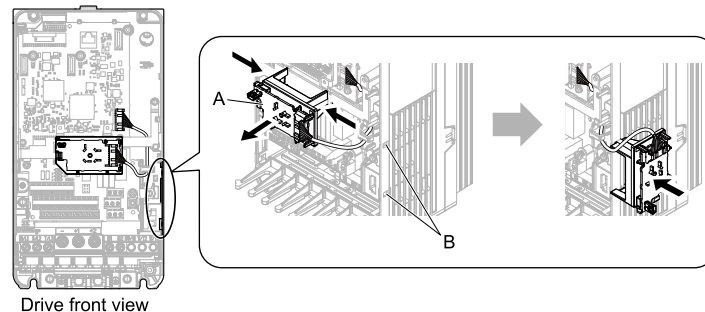
A - **LED Status Ring board**
B - **Temporary placement holes**

Figure 5.12 Remove the LED Status Ring Board

4. Insert the option card (A) into the CN5-A connector (C) on the drive and use the included screws (B) to put it in place.

   • Tighten the screws to 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.
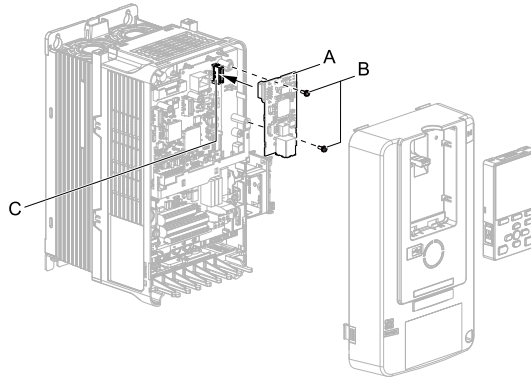
A - Option
B - Included screws

C - Connector CN5-A

Figure 5.13 Insert the Option

5. Firmly connect the MECHATROLINK-II communication cable to option communication connector CN3.

Isolate the communications cables from main circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see Figure 5.15). Refer to *MECHATROLINK-II 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 about 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.
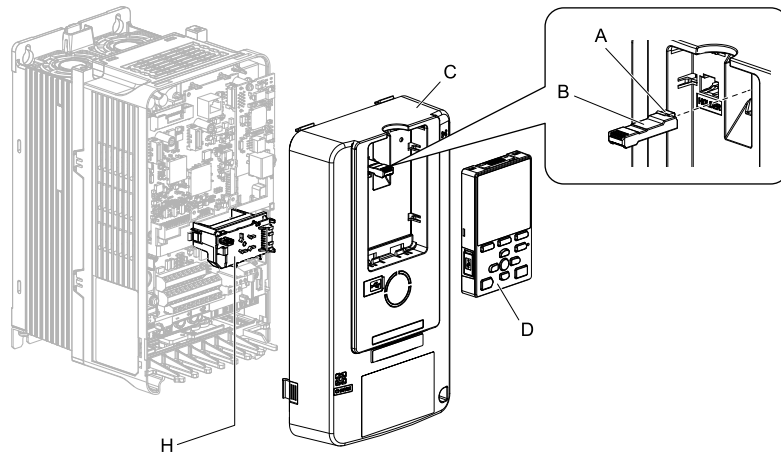
A - Keypad connector tab
B - Keypad connector
C - Drive front cover

D - Keypad
E - LED Status Ring board

Figure 5.14 Replace the Front Cover and Keypad

7. Set drive parameters in *MECHATROLINK Option Drive Parameters on page 19* for correct option performance.

◆ MECHATROLINK-II Communications Cables

Connect the MECHATROLINK-II communication cable to option communication connector CN3.

Use only these MECHATROLINK-II dedicated communications cables:

Recommended communication cables	• JEPMC-W6002-xx-E *1 • JEPMC-W6003-xx-E (with a core) *1

*1   xx 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 (164 ft). Minimum wiring distance between stations is 0.5 m (19.75 in).

■ Option Connection Diagram
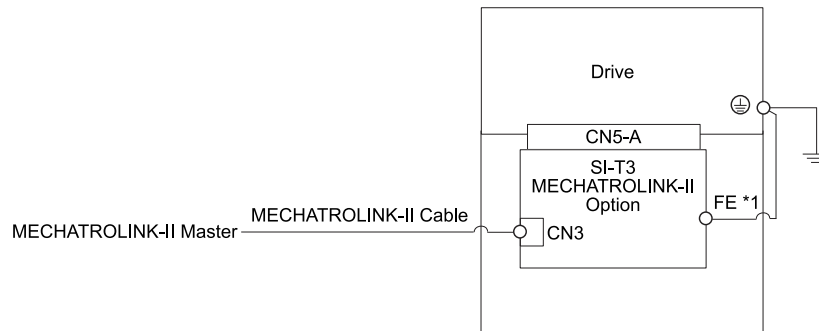
Figure 5.15 Option Connection Diagram

*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.

6   MECHATROLINK Option 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 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.	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)

No. (Hex.)	Name	Description	Default (Range)
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)
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 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.) (20 - 3F (Hex.))
F6-21 (036C)	MECHATROLINK Frame Size	0 : 32-byte 1 : 17-byte **Note:** Cycle power for setting changes to take effect.	0 (0, 1)
F6-22 (036D)	MECHATROLINK Link Speed	Sets the communications speed for MECHATROLINK-II. 0 : 10 Mbps 1 : 4 Mbps **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 - FFFF (Hex.))

No. (Hex.)	Name	Description	Default (Range)
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-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.
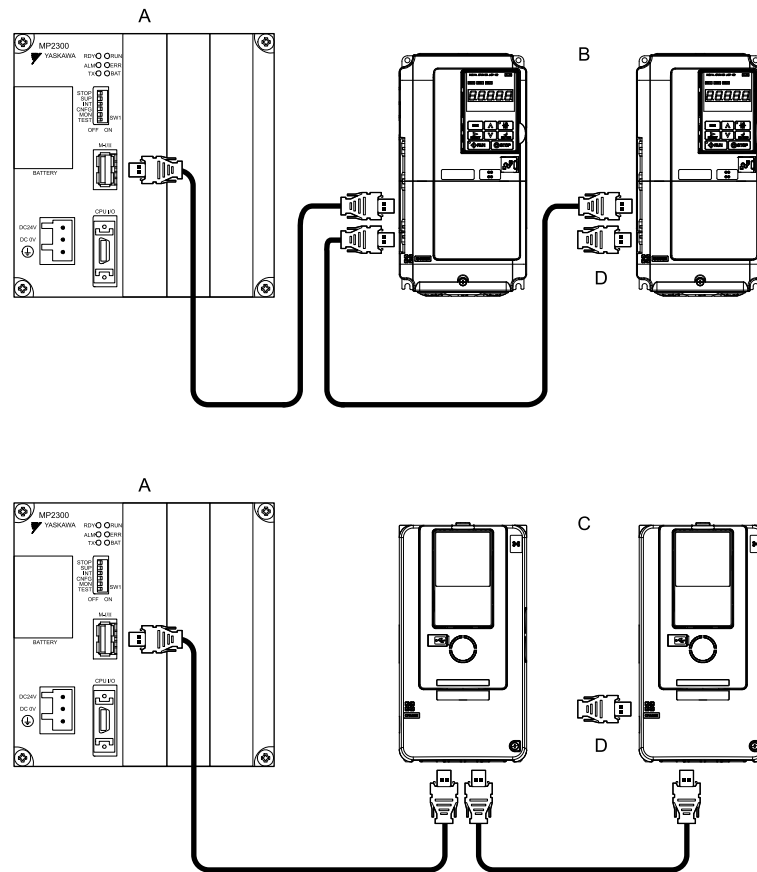
A - Master: MP2300 Controller (Example)
B - Drive: A1000 (Example)
C - Drive: GA700 (Example)
D - Terminator

◆ Basic Format of Data Transfer

This is the basic format for transferring data:

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.
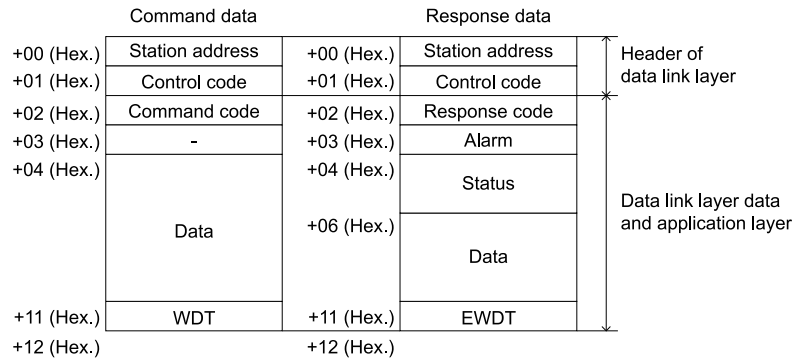
Figure 7.1 Basic Format of Data Transfer (17-Byte Data Transmission)
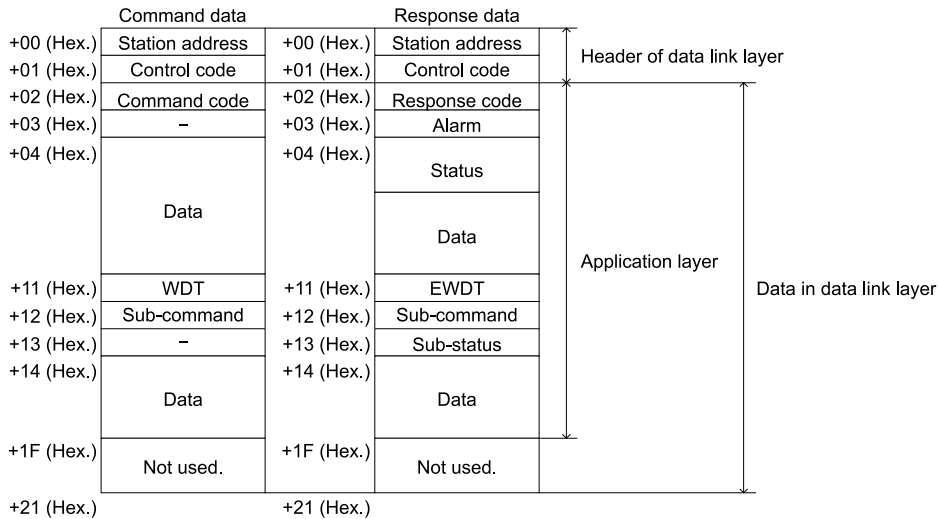
Figure 7.2 Basic Format of Data Transfer (32-Byte Data Transmission)

◆ **Communication Phases**

The SI-T3 option changes status after it receives a command code or fault from the master as shown in the figure. The communication phases determine the available commands. Refer to Table 7.1 and Table 7.2 for more information.
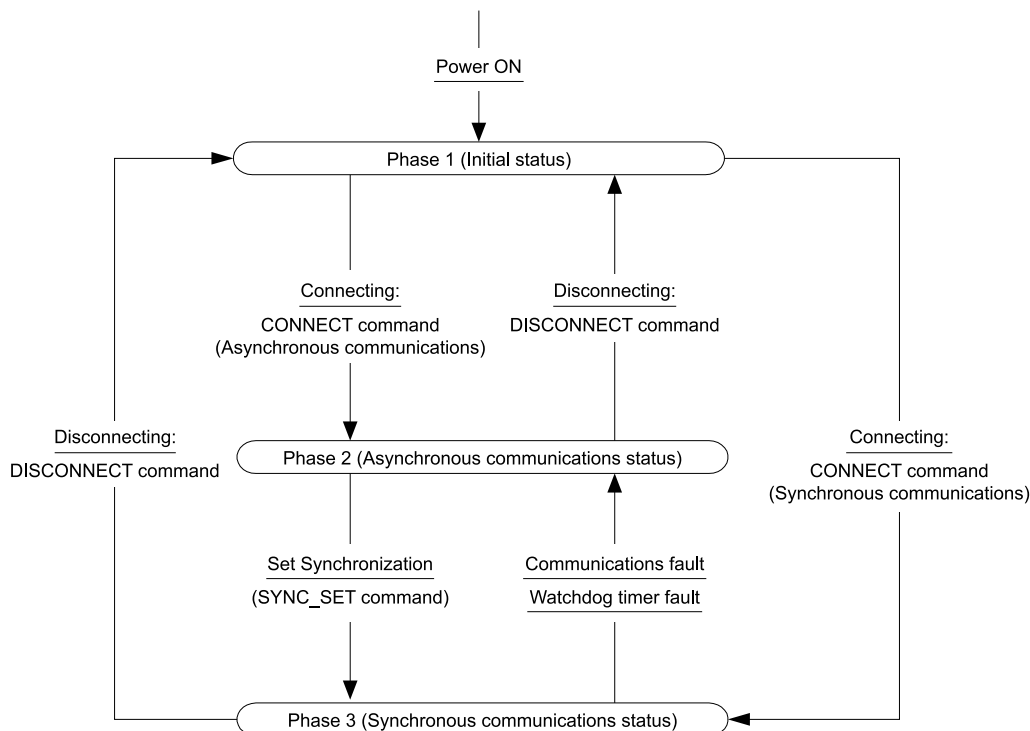
Figure 7.3 Communication Phases

■ Phase 1: Initial status after power ON

Operation proceeds with a default transmission cycle of 2 ms. 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

You can use all SI-T3 commands. 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. If the drive receives the DISCONNECT command, the phase moves to phase 1.

■ 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.

◆ Application Layer Specifications

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

The SI-T3 option uses the main commands and sub-commands in the following tables.

Table 7.1 Main Command

Code (Hex.)	Name	Function
00	NOP	No Operation
01	PRM_RD	Read Parameter
02	PRM_WR	Write Parameter
03	ID_RD	Read ID Number
04	CONFIG	RAM Write and EEPROM Write
05	ALM_RD	Read Alarm and Warning

Code (Hex.)	Name	Function
06	ALM_CLR	Clear Alarm or Warning
0D	SYNC_SET	Start Synchronous Communications
0E	CONNECT	Connect
0F	DISCONNECT	Disconnect
40	INV_CTL	Drive Operation Control

Table 7.2 Sub-Command

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

Set *F6-21 = 0* to select 32-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. If there is a conflict between an INV_CTL main command and an INV_I/O sub-command, the drive gives priority to the sub-command.

Refer to *MECHATROLINK-II Commands on page 25* for more information about command formats. Table 7.3 shows the combinations of main commands and sub-commands.

Table 7.3 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 (41 (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	-	-	-	-
40	INV_CTL	OK	OK	OK	OK	OK

Note:

If there is a conflict between a main command and a sub-command, it will cause a command warning (A.95).

For more information about the alarm, refer to *Other Faults on page 38*.

8 MECHATROLINK-II Commands

◆ Main Commands

■ NOP: 00 (Hex.) (No Operation)

Byte	Command	Response
1	NOP	NOP
2		ALARM
3, 4	0	STATUS
5 - 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: 01 (Hex.) (Read Parameter)

Byte	Command	Response
1	PRM_RD	PRM_RD
2		ALARM
3, 4	0	STATUS
5, 6	NO	NO
7	SIZE	SIZE
8 - 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 you set the upper byte (MSB). The SI-T3 stores the data read for PARAMETER from lower byte (LSB) to upper byte (MSB). Refer to the drive technical manual for more information.

For SIZE, set the number of bytes to be read as an even numbers. You can specify eight bytes.

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 (200 (Hex.))

Table 8.1 Example when reading C1-01 (200 (Hex.))

Byte	Command (Hex.)	Response (Hex.)
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: 02 (Hex.) (Write Parameter)

Byte	Command	Response
1	PRM_WR	PRM_WR
2	0	ALARM
3, 4		STATUS
5, 6	NO	NO
7	SIZE	SIZE
8 - 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 case, 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 the drive technical manual for more information.

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. You can specify eight bytes.

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

Example when writing in C1-01 (200 (Hex.))

Table 8.2 Example when writing in C1-01 (200 (Hex.))

Byte	Command (Hex.)	Response (Hex.)
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: 03 (Hex.) (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 - 15	0	ID
16	WDT	RWDT

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

Table 8.3, Table 8.4, and Table 8.5 show 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 8.3, Table 8.4, and Table 8.5.

Up to eight bytes can be used for SIZE. This command can be used in all phases.

Table 8.3 Vendor Code (DEVICE_CODE = 0F (Hex.))

		ID content *1															
Vendor 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	-	-	-	-	-	-	-
Vendor 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   Vendor IDs and vendor names are expressed in ASCII, and end in 00 (Hex.).

When using YASKAWA AC Drive 1000-Series

Table 8.4 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	0000	C	I	M	R	-	*8	*2	*3	*4	0 *5	0 *5	0 *5	6 *5	-	-	-
Software Version	0002	-	-	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 00 (Hex.).
*2   The portions showing the region are represented by spaces.
*3   Identifies 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   Identifies the SI-T3 software version.
*7   Identifies the Drive software version.
*8   Identifies the Product series name. Refer to the Model Number section of the drive Technical Manual for more information.

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

Table 8.5 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	0000	C	I	P	R	-	*2	*2	*2	*2	A *3	4 *4	0 *5	0 *5	4 *6	-	-
Software Version	0002	-	-	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 00 (Hex.).
*2   Identifies the Product series name. Refer to the Model Number section of the drive Technical Manual for more information.
*3   The figures in this section show the different schematics of the drive main circuit.
*4   Indicates the input power supply voltage.
   • B: Single Phase 200 V
   • 2: Three Phase 200 V
   • 4: Three Phase 400 V
*5   Identifies the rated output current.
*6   Identifies the SI-T3 software version.
*7   Identifies the Drive software version.

■ CONFIG: 04 (Hex.) (RAM Write and EEPROM Write)

Byte	Command	Response
1	CONFIG	CONFIG
2		ALARM
3, 4	0	STATUS
5	CONFIG_MOD	CONFIG_MOD

Byte	Command	Response
6 - 15	0	0
16	WDT	RWDT

The CONFIG command enables 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 oPE fault bit of the status field. The command can be used in communication phases 2 and 3.

In the following case, 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 8.6 CONFIG_MOD

CONFIG_MOD	Description
0	Write RAM The setting value is not stored in EEPROM.
1	The setting value is saved in EEPROM. The maximum number of writes to non-volatile drive memory is 100,000. 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: 05 (Hex.) (Read Alarm and Warning)

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

Table 8.7 ALM_RD_MOD

Byte	ALM_RD_MOD = 0	ALM_RD_MOD = 1	ALM_RD_MOD = 2
5	00 (Hex.)	01 (Hex.)	02 (Hex.)
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 retained 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 (1 byte) is entered to byte 6 of ALM_DATA, and byte 7 becomes the value of the previous 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 00 (Hex.).

Table 8.8 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, U2-02
1	Fault history trace 10 max. (byte 6 to 15)	0.1 s	U3-01 - U3-10
2	Fault history (Alarms are not retained in the history.) (bytes 7 and 8)	0.1 s	U3-01 - U3-10

■ ALM_CLR: 06 (Hex.) (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 - 15	0	0
16	WDT	RWDT

The ALM_CLR command clears the alarm or warning state after the cause has been removed.

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.

In the following case, 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 8.9 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 (Hex.) (Start Synchronous Communications)

Byte	Command	Response
1	SYNC_SET	SYNC_SET
2	0	ALARM
3, 4		STATUS
5 - 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.

Only the ALARM and STATUS fields of the response data can be monitored.

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: 0E (Hex.) (Connect)

Byte	Command	Response
1	CONNECT	CONNECT
2		ALARM
3, 4	0	STATUS
5	VER	VER
6	COM_MOD	COM_MOD
7	COM_TIM	COM_TIM
8 - 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 21 (Hex.) (Ver. 2.1) for MECHATROLINK-II, and to 10 (Hex.) (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: 21 (Hex.))

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: 10 (Hex.))

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)

		0	Standard connection
EXMOD	Request to establish expanded/ standard connection	1	Expanded connection Even if SYNCMOD = 1 (synchronous comm.), SYNCMOD will be set to 0 for asynchronous data transmission.

In the following case, 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: 0F (Hex.) (Disconnect)

Byte	Command	Response
1	DISCONNECT	DISCONNECT
2		ALARM
3, 4	0	STATUS
5 - 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. The command can be used in communication 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: 40 (Hex.) (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 others. 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 8.10.

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

Table 8.10 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	*H1-03 (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 base block reference	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 Make sure 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.

The following tables show the selection ranges for SEL REF1/2 (3/4, 5/6) and SEL MON1/2 (3/4, 5/6).

Table 8.11 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	Enabled when *H4-01 = 000*
3	Analog output terminal 2 output	Enabled 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 (Enabled when $H2\text{-}01 = F$) Terminal P1-PC (Enable when $H2\text{-}02 = F$) *1* Terminal P2-PC (Enable when $H2\text{-}03 = F$) *2* • YASKAWA AC Drive GA500 Drive terminal output Terminal MA/MB-MC (Enabled when $H2\text{-}01 = F$) Terminal P1-C1 (Enabled when $H2\text{-}02 = F$) Terminal P2-C2 (Enabled when $H2\text{-}03 = F$) • YASKAWA AC Drive GA700, GA800, CR700, and CH700 Multi-function digital output 1 (Enable when $H2\text{-}01 = F$) Multi-function digital output 2 (Enable when $H2\text{-}02 = F$) *1* Multi-function digital output 3 (Enable when $H2\text{-}03 = F$) *2* Multi-function digital output 4 (Enable when $H2\text{-}04 = F$) *3* Multi-function digital output 5 (Enable when $H2\text{-}05 = F$) *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 - F	Not used	-

*1   Terminals are different for different drive models.

- YASKAWA AC Drive 1000-Series
  CIMR-xAx, CIMR-xTx, CIMR-xKx, CIMR-xBx, CIMR-xDx: P1-PC
  CIMR-xUx, CIMR-xCx: M3-M4
- YASKAWA AC Drive GA700, GA800
  CIPR-GAxAx, CIPR-GAxTx, CIPR-GAxUx, CIPR-GAxCx, CIPR-GAxBx, CIPR-GAxKx, CIPR-GAxDx: M3-M4
- YASKAWA AC Drive CR700, CH700
  CIPR-CR70Ax, CIPR-CR70Tx, CIPR-CH70Bx: M3-M4

*2   Terminals are different for different drive models.

- YASKAWA AC Drive 1000-Series
  CIMR-xAx, CIMR-xTx, CIMR-xKx, CIMR-xBx, CIMR-xDx: P2-PC
  CIMR-xUx, CIMR-xCx: M5-M6
- YASKAWA AC Drive GA700, GA800
  CIPR-GAxAx, CIPR-GAxTx: P1-C1
  CIPR-GAxUx, CIPR-GAxCx, CIPR-GAxBx, CIPR-GAxKx, CIPR-GAxDx: M5-M6
- YASKAWA AC Drive CR700, CH700
  CIPR-CR70Ax, CIPR-CR70Tx, CIPR-CH70Bx: M5-M6

*3   Available in CIPR-GA70Ax, CIPR-GA70Tx, CIPR-CR70x, CIPR-CH70x

- YASKAWA AC Drive GA700
  CIPR-GA70Ax, CIPR-GA70Tx: P2-C2
- YASKAWA AC Drive CR700, CH700
  CIPR-CR70Ax, CIPR-CR70Tx, CIPR-CH70Bx: P1-C1

*4   Available in CIPR-CR70x, CIPR-CH70x

- YASKAWA AC Drive CR700, CH700
  CIPR-CR70Ax, CIPR-CR70Tx, CIPR-CH70Bx: P2-C2

Table 8.12 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*, 1 V
7	Drive alarm	Refer to Table 9.8.
8	Drive warning	Refer to Table 9.9.
9	Multi-Function Output Terminal Status	Same as *U1-11*
A	Analog Input Terminal A3	Same as *U1-15*, 0.1%

MON1/2	Item	Remarks
B	Multi-Function Input Terminal S1 - S8	Same as *U1-10*
C	Analog input terminal A1	Same as *U1-13*, 0.1%
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: 00 (Hex.) (No Operation)

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

This is the format of No Operation sub-command.

■ PRM_RD: 01 (Hex.) (Read Parameter)

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

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

In the following case, a warning 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)
• If a main command is PRM_RD or PRM_WR: Command warning (A.95)

■ PRM_WR: 02 (Hex.) (Write Parameter)

Byte	Command	Response
17	PRM_WR	PRM_WR
18	0	SUBSTATUS
19, 20	NO	NO
21	SIZE	SIZE
22 - 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 case, a warning 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)
• Data upper/lower limit fault: Data setting warning (A.94)

- During a *Uv* 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: 05 (Hex.) (Read Alarm and Warning)

Byte	Command	Response
17	ALM_RD	ALM_RD
18	0	SUBSTATUS
19	ALM_RD_MOD	ALM_RD_MOD
20 - 21	0	ALM_DATA

The ALM_RD sub-command is used to read the fault and alarm status. his 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 other than a set value: Data setting warning (A.94)

■ INV_I/O: 41 (Hex.) (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.

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.

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 8.11 for more information on the selection range for SEL REF 3 to 6.

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.

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 8.12 for more information on the selection range for SEL MON 3 to 6.

In the following case, 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 *bb*.)	0	Baseblock ON
			1	Baseblock OFF
4	PON	Main power supply ON (OFF during *Uv*)	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

		Value	Setting
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 9.1 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 9.2 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 38* for detail.

> **Note:**
>
> − : 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 following table shows the response data when consecutive alarms or warnings occurs.

Table 9.3 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 9.4 Reception Failures in Each Phase

Communication Phase	Communications Failure		Transmission Cycle
	First	Second (Consecutive)	Fault
Phase 1	-	-	-
Phase 2	96	E6	E6
Phase 3	96	E6	E6

Table 9.5 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 9.6 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 9.7 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 activates the relevant bit in the STATUS field.

Table 9.8 and Table 9.9 show the alarm codes for SI-T3 notification if a fault is detected in the drive.

Table 9.8 Drive Alarm Codes

ALRM Code (Hex.)	Keypad Display	Description
00	SCF	Safety Circuit Fault **Note:** When using YASKAWA AC Drive 1000-Series, "SCF" (Safety Circuit Fault) will not be displayed.
02	Uv1	DC Bus Undervoltage
03	Uv2	Control Power Undervoltage
04	Uv3	Soft Charge Answerback Fault
06	GF	Ground Fault
07	oC	Overcurrent
08	ov	Overvoltage
09	oH	Heatsink Overheat
0A	oH1	Heatsink Overheat
0B	oL1	Motor Overload

ALRM Code (Hex.)	Keypad Display	Description
0C	oL2	Drive Overload
0D	oL3	Overtorque Detection 1
0E	oL4	Overtorque Detection 2
0F	rr	Dynamic Braking Transistor Fault
10	rH	Braking Resistor Overheat
11	EF3	External Fault (Terminal S3)
12	EF4	External Fault (Terminal S4)
13	EF5	External Fault (Terminal S5)
14	EF6	External Fault (Terminal S6)
15	EF7	External Fault (Terminal S7)
16	EF8	External Fault (Terminal S8)
18	oS	Overspeed
19	dEv	Speed Deviation
1A	PGo	Encoder (PG) Feedback Loss
1B	PF	Input Phase Loss
1C	LF	Output Phase Loss
1D	oH3	Motor Overheat (PTC Input)
1E	oPr	Keypad Connection Fault
1F	Err	EEPROM Write Error
20	oH4	Motor Overheat Fault (PTC Input)
21	CE	Modbus Communication Error
25	CF	Control Fault
26	SvE	Zero Servo Fault
27	EF0	Option Card External Fault
28	FbL	PID Feedback Loss
29	UL3	Undertorque Detection 1
2A	UL4	Undertorque Detection 2
2B	oL7	High Slip Braking Overload
32	dv1	Z Pulse Fault
33	dv2	Z Pulse Noise Fault Detection
34	dv3	Inversion Detection
35	dv4	Inversion Prevention Detection
36	LF2	Output Current Imbalance
37	STo	Motor Step-Out Detected **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	Encoder (PG) Hardware Fault
3B	SEr	Speed Search Retries Exceeded
41	FbH	Excessive PID Feedback
42	EF1	External Fault (Terminal S1)
43	EF2	External Fault (Terminal S2)
44	oL5	Mechanical Weakening Detection 1
45	UL5	Mechanical Weakening Detection 2
46	CoF	Current Offset Fault
49	dWFL	DriveWorksEZ Fault
4A	dWF1	EEPROM Memory DWEZ Data Error
4D	voF	Output Voltage Detection Fault

ALRM Code (Hex.)	Keypad Display	Description
4E	rF	Braking Resistor Fault
4F	boL	BrakingTransistor Overload Fault
52	nSE	Node Setup Error
83	CPF02	A/D Conversion Fault
84	CPF03	Control Board Connection Fault
87	CPF06	EEPROM Memory Data Error
88	CPF07, CPF08	Terminal Board Connection Fault
89		
8C	CPF11 - CPF21	Control Circuit Error
8D		
8E		
8F		
91		
92		
93		
94		
95		
96		
97	CPF22	Hybrid IC Error
98	CPF23	Control Board Connection Error
99	CPF24	Drive Unit Signal Fault
9B	CPF26 - CPF38	Control Circuit Error **Note:** When using YASKAWA AC Drive 1000-Series, *CPF36 - CPF38* (ALRM code: A5 - A7) will not be displayed.
9C		
9D		
9E		
9F		
A0		
A1		
A2		
A3		
A4		
A5		
A6		
A7		
E5	E5	MECHATROLINK Watchdog Timer Error
E6	bUS	Option Communication Error
FA	oFA00 - oFA43	Option Card Error

Table 9.9 Drive Minor Fault and Alarm

ALRM Code (Hex.)	Display	Description
01	Uv	DC Bus Undervoltage
02	ov	Overvoltage
03	oH	Heatsink Overheat
04	oH2	Drive Overheat
05	oL3	Overtorque 1
06	oL4	Overtorque 2
07	EF	FWD/REV Run Command Input Error

ALRM Code (Hex.)	Display	Description
08	bb	Baseblock
09	EF3	External Fault (Terminal S3)
0A	EF4	External Fault (Terminal S4)
0B	EF5	External Fault (Terminal S5)
0C	EF6	External Fault (Terminal S6)
0D	EF7	External Fault (Terminal S7)
0E	EF8	External Fault (Terminal S8)
0F	FAn	Internal Fan Fault
10	oS	Overspeed
11	dEv	Speed Deviation
12	PGo	Encoder (PG) Feedback Loss
14	CE	Modbus Communication Error
1A	EF0	Option Card External Fault
1B	rUn	Motor Switch during Run
1D	CALL	Serial communication transmission error
1E	UL3	Undertorque Detection 1
1F	UL4	Undertorque Detection 2
20	SE	Modbus Test Mode Error
22	oH3	Motor Overheat (PTC Input)
27	FbL	PID Feedback Loss
28	FbH	Excessive PID Feedback
2A	dnE	Drive Disabled
2B	PGoH	Encoder (PG) Hardware Fault
32	AEr	Station Address Setting Error
33	CyC	MECHATROLINK CommCycleSettingErr
34	HCA	High Current Alarm
35	LT-1	Cooling Fan Maintenance Time
36	LT-2	Capacitor Maintenance Time
39	EF1	External Fault (Terminal S1)
3A	EF2	External Fault (Terminal S2)
3B	HbbF	Safe Disable Signal Input **Note:** *SToF [Safe Torque OFF]* will be displayed for GA500, GA700, GA800, CR700, and CH700 drives.
3C	Hbb	Safe Disable Signal Input **Note:** *STo [Safe Torque OFF]* will be displayed for GA500, GA700, GA800, CR700, and CH700 drives.
3D	oL5	Mechanical Weakening Detection 1
3E	UL5	Mechanical Weakening Detection 2
41	voF	Output Voltage Detection Fault
42	TrPC	IGBT Maintenance Time (90%)
43	LT-3	SoftChargeBypassRelay MainteTime
44	LT-4	IGBT Maintenance Time (50%)
45	boL	Braking Transistor Overload
49	dWAL	DriveWorksEZ Fault
E5	E5	MECHATROLINK Watchdog Timer Error
E6	bUS	Option Communication Error

◆ Drive-Side Error Codes

Drive-side error codes are shown on the drive keypad. These tables list causes of the errors and possible solutions:
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 stays lit. When an alarm occurs, the ALM LED flashes.

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

• Did you correctly install the option?
• Did you correctly connect the communication line to the option? Is it loose?
• Is the PLC program working? Is the controller/PLC CPU stopped?
• Did a momentary power loss interrupt communications?

Code	Name	Causes	Possible Solutions
bUS	Option Communication Error	The drive did not receive a signal from the controller.	• 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-II Installation Guide, MMATDEP011
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.

Code	Name	Causes	Possible Solutions
oFb02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.
oFC00	Option Fault (CN5-B)	The option 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
AEr	Station Address Setting Error	The node address for the option card is not in the permitted setting range.	Set *F6-20* correctly.
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.
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 9.10 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.

10   European Standards

Figure 10.1 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 10.2 and Figure 10.3.
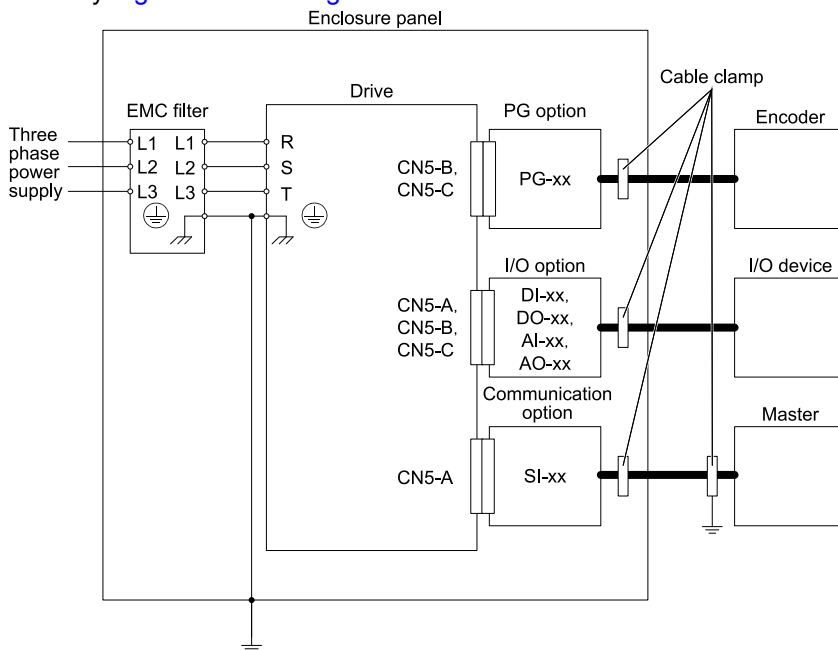
Figure 10.2 Option Installation for CE Compliance: 1000-Series, GA700, GA800, CR700, CH700
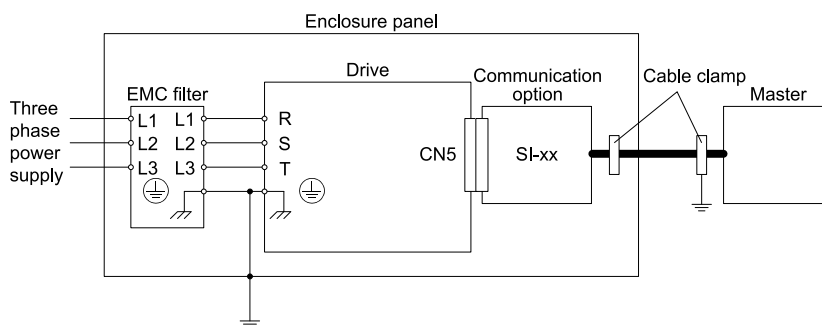
Figure 10.3 Option Installation for CE Compliance with GA500

3. Ground the largest possible surface area of the shield to the metal panel.
   Use cable clamps if possible.
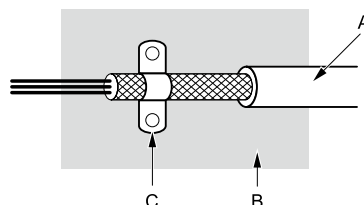
A - Braided shield cable　　　　**C - Cable clamp (conductive)**
B - Metal panel

Figure 10.4 Ground Area

11　Specifications

◆ Specifications

Table 11.1 Option Specifications

Items	Specifications
Specifications	SI-T3
Access mode	Start-stop synchronization, master/slave method
Communication speed	10 Mbps (MECHATROLINK-II), 4 Mbps (MECHATROLINK-I)
Transmission Cycle	500 µs - 8 ms *1
Maximum transmission distance	50 m (164 ft) *2
Minimum wiring distance between stations	0.5 m (19.75 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 - +60°C (-4°F to 140°F) allowed for short-term transport of the product
Area of use	Indoors in an area that does not have: • Oil mist, corrosive gas, flammable gas, or 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 stations that you can connect is different for different host controller types, and baud rate and communications cycle settings.

　　Communications cycle: Integral multiple of transmission cycles (depending on the host controller settings).

　　For details, refer to the manuals of your controller.

　　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 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.
February 2019	4	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Chapter 12	Addition: Disposal
December 2018	3	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
October 2017	2	All	Addition: Applicable product series Revision: Reviewed and corrected entire documentation.
		Chapter 2	Addition: Note in Table 1
October 2016	1	All	Addition: Applicable product series
June 2016	-	-	First Edition

YASKAWA AC Drive Option
MECHATROLINK-II
Technical Manual

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