

## YASKAWA AC Drive Option DeviceNet Installation Manual

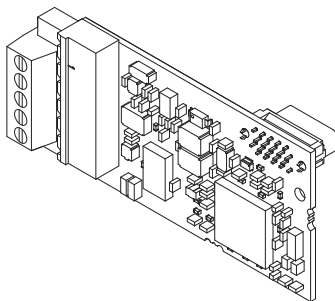
Type: SI-N3

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

## 安川インバータ オプション DeviceNet 通信 取扱説明書

形 式 SI-N3

製品を安全にお使いいただくために、本書を必ずお読みください。  
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# 1 Preface and Safety

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

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

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### ◆ Applicable Documentation

The following manuals are available for the option:

#### DeviceNet SI-N3 Option

|                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>YASKAWA AC Drive Option<br/>DeviceNet Installation Manual<br/>Manual No: TOBP C730600 84<br/>(this book)</b> | This guide is packaged together with the product and contains information necessary to install the option and set related drive parameters.                                                                                                                                                                                                                                                                             |
| <b>YASKAWA AC Drive Option<br/>DeviceNet Technical Manual<br/>Manual No: SIEP C730600 84</b>                    | The technical manual contains detailed information about the option. Access the following sites to obtain the technical manual:<br>U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a><br>Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a><br>Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a><br>Other areas: Contact a Yaskawa representative. |

## Drive

|                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>YASKAWA AC Drive<br/>1000-Series Quick Start Guide</b>         | <p>Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information.</p> <p>The most recent versions of these manuals are available for download on our documentation websites:</p> <p>U.S.: <a href="http://www.yaskawa.com">http://www.yaskawa.com</a><br/>Europe: <a href="http://www.yaskawa.eu.com">http://www.yaskawa.eu.com</a><br/>Japan: <a href="http://www.e-mechatronics.com">http://www.e-mechatronics.com</a></p> <p>Other areas: Check the back cover of these manuals.</p> |
| <b>YASKAWA AC Drive<br/>1000-Series Technical Manual</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>YASKAWA AC Drive GA700<br/>Quick Start Guide/Initial Steps</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>YASKAWA AC Drive GA700<br/>Technical Manual</b>                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## ◆ Terms and Abbreviations

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Note:</b>             | Indicates supplemental information that is not related to safety messages.                                                                                                                                                                                                                                                                                                                                                               |
| <b>Option:</b>           | YASKAWA AC Drive DeviceNet Option SI-N3                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Drive:</b>            | <ul style="list-style-type: none"><li>• YASKAWA A1000-Series Drive</li><li>• YASKAWA E1000-Series Drive</li><li>• YASKAWA H1000-Series Drive</li><li>• YASKAWA L1000A-Series Drive</li><li>• YASKAWA U1000-Series Drive</li><li>• YASKAWA Z1000-Series Drive</li><li>• YASKAWA Z1000U-Series Drive</li><li>• YASKAWA AC Drive GA700</li><li>• YASKAWA AC Drive 1000-Series (A1000, E1000, H1000, L1000A, U1000, Z1000, Z1000U)</li></ul> |
| <b>Digital Operator:</b> | <ul style="list-style-type: none"><li>• LCD Operator for YASKAWA AC Drive 1000-Series</li><li>• LED Operator for YASKAWA AC Drive 1000-Series</li><li>• LCD Keypad for YASKAWA AC Drive GA700</li><li>• LED Keypad for YASKAWA AC Drive GA700</li></ul>                                                                                                                                                                                  |
| <b>CLV:</b>              | Closed Loop Vector Control                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>AOLV/PM:</b>          | Advanced Open Loop Vector Control for PM                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>CLV/PM:</b>           | Closed Loop Vector Control for PM                                                                                                                                                                                                                                                                                                                                                                                                        |

## ◆ Registered Trademarks

- DeviceNet is a trademark of the ODVA.
- Trademarks are the property of their respective owners.

## 1 Preface and Safety

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### ◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option. Install the option according to this manual and local codes.

The following conventions indicate safety messages in this manual. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.

#### **DANGER**

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

#### **WARNING**

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

#### **CAUTION**

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

#### **NOTICE**

Indicates an equipment damage message.

## ■ General Safety

### General Precautions

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

### DANGER

**Heed the safety messages in this manual.**

Failure to comply will cause death or serious injury.

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

### WARNING

#### Electrical Shock Hazard

**Do not attempt to modify or alter the drive or drive circuitry in any way not explained in this manual.**

Failure to comply could cause death or serious injury and will void warranty. Yaskawa is not responsible for any modification of the product made by the user. Do not modify this product.

### NOTICE

**Do not expose the drive or the option to halogen group disinfectants. Do not pack the drive or the option in fumigated or sterilized wooden materials. Do not sterilize the entire package after packing the product.**

Failure to comply could damage electrical components in the option.

## 2 Product Overview

### ◆ About This Product

The SI-N3 Option provides a communications connection between the drive and an ODVA DeviceNet network. The SI-N3 Option connects the drive to a DeviceNet network and facilitates the exchange of data.

DeviceNet is a communications link that connects industrial devices (e.g., limit switches, photoelectric switches, valve manifolds, motor starters, smart motor controllers, operator interfaces, and variable frequency drives) and control devices (e.g., programmable controllers and computers) to a network. DeviceNet is a simple networking solution that reduces the cost and time to wire and install factory automation devices while providing interchangeability of similar components from multiple vendors.

Install the option/DeviceNet option on a drive to perform the following functions from a DeviceNet master device:

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



Figure 1 DeviceNet Approved

### ◆ Applicable Models

The option can be used with the models in [Table 1](#).

Table 1 Applicable Models

| Drive Series | Model Number |
|--------------|--------------|
| A1000        | All models   |
| E1000        | All models   |
| H1000        | All models   |
| L1000A       | All models   |
| U1000        | All models   |
| Z1000        | All models   |
| Z1000U       | All models   |
| GA700 <I>    | All models   |

<1> Check the option software version is PRG: 1114 and later when installing the option to the YASKAWA AC Drive GA700.

**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.

### 3 Receiving

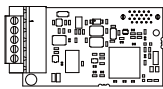
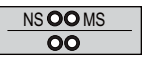
After receiving the option package:

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

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

2. Confirm that the model number on the option nameplate and the model listed in the purchase order are the same. Refer to [Figure 2](#) on page 11 for details. Contact the distributor where the option was purchased or the Yaskawa sales office immediately about any problems with the option.

### ◆ Option Package Contents

| Description: | Option                                                                            | Ground Wire <1>                                                                   | Screws (M3)                                                                       | LED Label for YASKAWA AC Drive 1000-Series                                        | LED Label for YASKAWA AC Drive GA700                                              | Installation Manual                                                               |
|--------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| —            |  |  |  |  |  |  |
| Quantity:    | 1                                                                                 | 1                                                                                 | 3 <2>                                                                             | 1                                                                                 | 1                                                                                 | 1                                                                                 |

<1> GA700 drives do not use the ground wire.

<2> GA700 drives use two screws only.

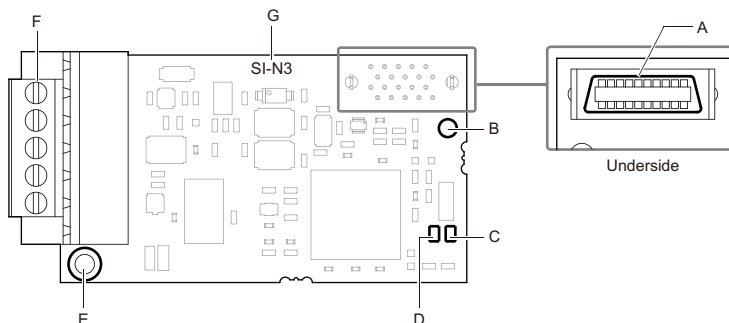
### ◆ Installation Tools

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

**Note:** This manual does not list tools required to prepare option cables for wiring.

## 4 Option Components

### ◆ DeviceNet Option



**A – Connector (CN5)**

**B – Installation hole**

**C – LED (MS) <2>**

**D – LED (NS) <1>**

**E – Ground terminal (FE) and installation hole <2>**

**F – Terminal block CN1**

**G – Option model number**

<1> Refer to [Option LED Display on page 12](#) for details on the LEDs.

<2> Connect the provided ground wire during installation. Installation on GA700 drives does not require the ground wire.

**Figure 2 DeviceNet Option Components**

### ◆ Terminal Block CN1

The communication terminal is a pluggable terminal block that serves as the connection point of the DeviceNet network communication cable to the option.

**Table 2 Terminal Descriptions**

| Terminal | Pin | Color | Signal | Description                          |
|----------|-----|-------|--------|--------------------------------------|
|          | 1   | Black | V-     | Network common                       |
|          | 2   | Blue  | CAN_L  | CAN data Low                         |
|          | 3   | —     | Shield | Cable shield                         |
|          | 4   | White | CAN_H  | CAN data High                        |
|          | 5   | Red   | V+     | Communications network power DC +24V |

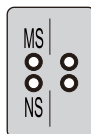
## 4 Option Components

### ◆ Option LED Display

The option has two bicolor, red/green LEDs: one for Module Status (MS) and one for Network Status (NS).



1000-Series Label



GA700 Label

**Figure 3 Option LED Labels**

The operational states of the LEDs after completion of the DeviceNet power-up diagnostic LED sequence are described in [Table 4](#). Wait at least 2 seconds for the power-up diagnostic process to complete before verifying the states of the LEDs.

**Table 3 Option LED States**

| Name | Display   |          | Operating Status         | Description                                                   |
|------|-----------|----------|--------------------------|---------------------------------------------------------------|
|      | Color     | Status   |                          |                                                               |
| MS   | —         | OFF      | Power supply OFF         | Power is not being supplied to the drive.                     |
|      | Green     | ON       | Option operating         | The option is operating normally.                             |
|      | Green     | Flashing | Option initializing      | There is an incorrect baud rate setting or there is a MAC ID. |
|      | Red       | ON       | Fatal error occurred     | A fatal (irrecoverable) error occurred in the option.         |
|      | Red       | Flashing | Non-fatal error occurred | A non-fatal (recoverable) error occurred.                     |
|      | Green/Red | Flashing | Device self-test         | Device in self-test mode.                                     |

| Name | Display   |          | Operating Status                      | Description                                                                                                                                                                                                                                                                                                  |
|------|-----------|----------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | Color     | Status   |                                       |                                                                                                                                                                                                                                                                                                              |
| NS   | –         | OFF      | Offline or Power supply OFF           | –                                                                                                                                                                                                                                                                                                            |
|      | Green     | ON       | Online communications established     | Device is on-line and has connections in the established state.                                                                                                                                                                                                                                              |
|      | Green     | Flashing | Online communications not established | Device is on-line but has no connections in the established state.<br>Duplicate MAC ID test has been passed and is on-line but has no open connections to other nodes.                                                                                                                                       |
|      | Red       | ON       | Communications error                  | An error occurred disabling DeviceNet communications.<br><ul style="list-style-type: none"> <li>• MAC ID duplication</li> <li>• Bus off detected</li> </ul>                                                                                                                                                  |
|      | Red       | Flashing | Communications time-out               | A communications time-out occurred with the master.                                                                                                                                                                                                                                                          |
|      | Green/Red | Flashing | Communication faulted                 | Specific communication faulted device.<br><ul style="list-style-type: none"> <li>• The device has detected a network access error and is in the communications faulted state.</li> <li>• The device has then received and accepted an Identify communication fault request-long protocol message.</li> </ul> |

### ■ Power-Up Diagnostics

An LED test is performed each time the drive is powered up. The initial boot sequence may take several seconds. The option is successfully initialized when the LEDs complete the diagnostic LED sequence. The LEDs then assume operational conditions shown in [Table 3](#).

**Table 4 Power-Up Diagnostic LED Sequence**

| Sequence | Module Status (MS) | Network Status (NS) | Time (ms) |
|----------|--------------------|---------------------|-----------|
| 1        | Green              | OFF                 | 250       |
| 2        | Red                | OFF                 | 250       |
| 3        | Green              | Green               | 250       |
| 4        | Green              | Red                 | 250       |
| 5        | Green              | OFF                 | -         |

# 5 Installation Procedure

### ◆ Section Safety

#### DANGER

##### Electrical Shock Hazard

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

Failure to comply will cause death or serious injury.

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

#### WARNING

##### Electrical Shock Hazard

**Do not operate equipment with covers removed.**

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.

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

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

Failure to comply could cause death or serious injury.



### WARNING

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

Failure to comply could cause death or serious injury.

#### Fire Hazard

**Tighten all terminal screws to the specified tightening torque.**

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

### NOTICE

#### Damage to Equipment

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

Failure to comply could cause ESD damage to circuitry.

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

Improper equipment sequencing could damage the drive.

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

Failure to comply could further damage the equipment.

**Do not use unshielded wire for control wiring.**

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

**Properly connect all pins and connectors on the option and drive.**

Failure to comply could prevent proper operation and damage equipment.

**Confirm that all connections are correct after installing the option and connecting peripheral devices.**

Failure to comply could damage the option.

## 5 Installation Procedure

### ◆ Installing the Option on a 1000-Series Drive

#### ■ Prepare the Drive for the Option

Before beginning the installation procedure:

1. Wire the drive and make the proper connections to drive terminals according to the manual packaged with the drive.
2. Verify that the drive functions normally.  
Refer to [Figure 4](#) for an exploded view of the drive with the option and related components for reference in the installation procedure.

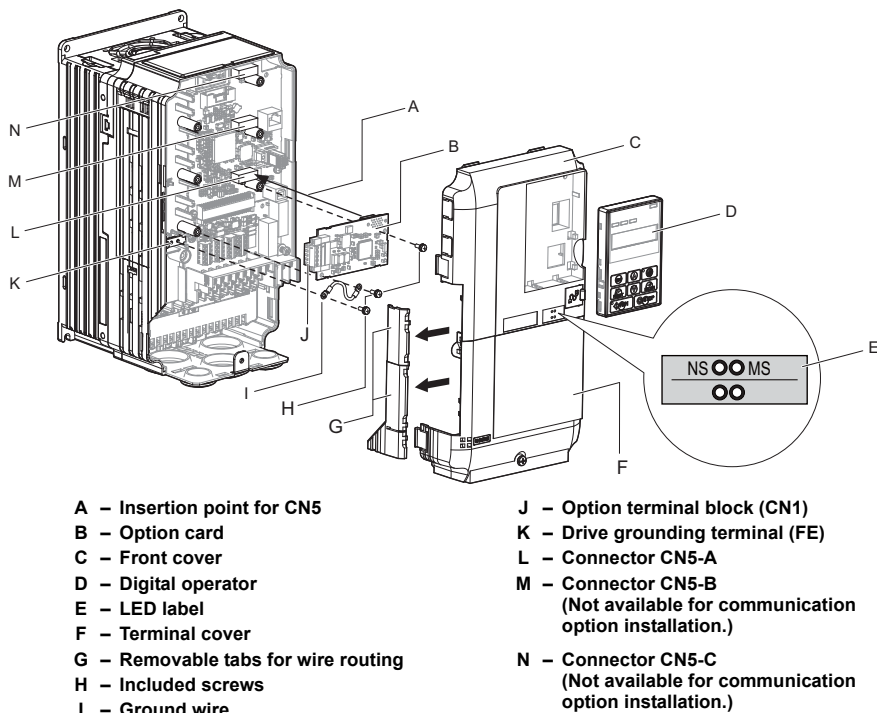


Figure 4 Drive Components with Option

### ■ Install the Option

Refer to the instructions below to install the option.

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

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

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

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

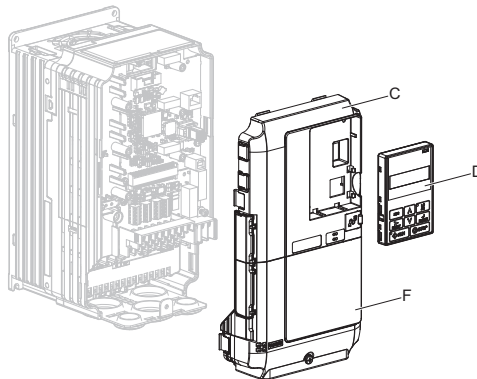


Figure 5 Remove the Digital Operator, Front Cover, and Terminal Cover

## 5 Installation Procedure

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

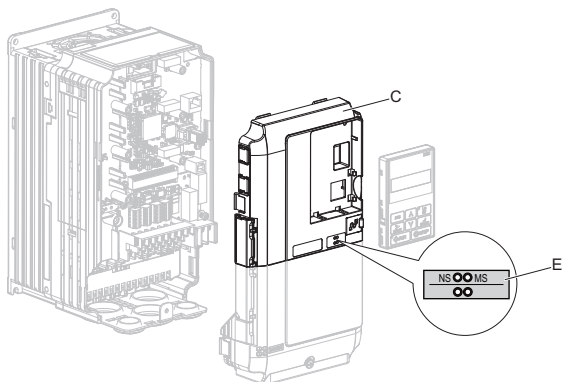


Figure 6 Affix the LED Label

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

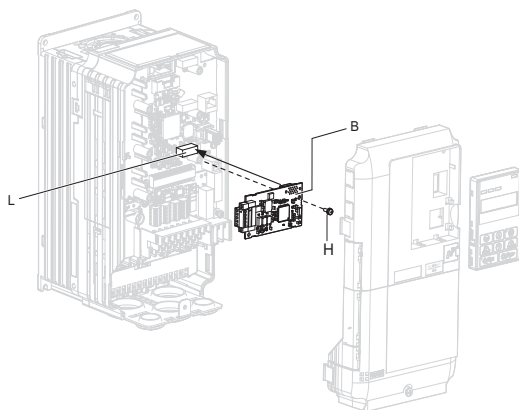
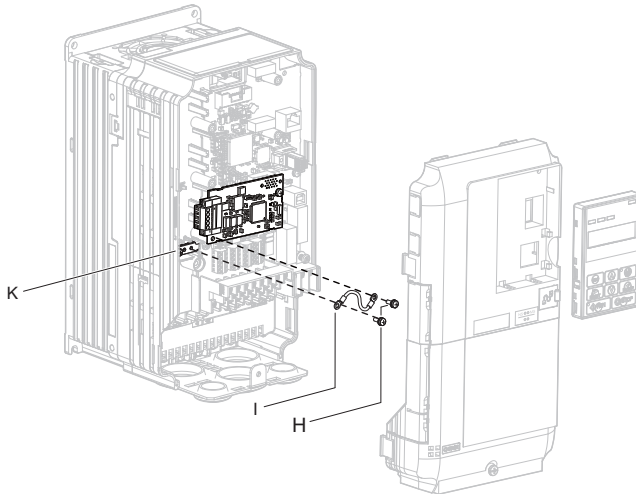


Figure 7 Insert the Option Card

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



**Figure 8 Connect the Ground Wire**

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

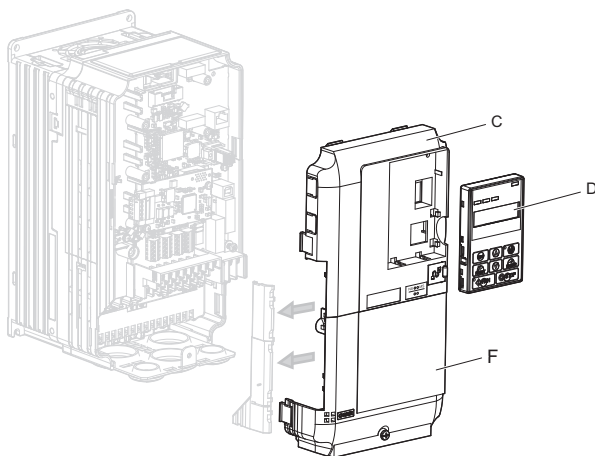
5. Firmly connect the DeviceNet communication cable to option terminal block (CN1). Install DeviceNet communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 16](#)). Refer to [Communication Cable Topology on page 27](#) for details.

## 5 Installation Procedure

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6. Replace and secure the front covers of the drive (C, F) and replace the digital operator (D).

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



**Figure 9 Replace the Front Covers and Digital Operator**

7. Set drive parameters in [Table 6](#) for proper option performance.

### ◆ Installing the Option on a GA700 Drive

#### ■ Prepare the Drive for the Option

Before beginning the installation procedure:

1. Wire the drive and make the proper connections to drive terminals according to the manual packaged with the drive.
2. Verify that the drive functions normally.  
Refer to [Figure 10](#) for an exploded view of the drive with the option and related components for reference in the installation procedure.

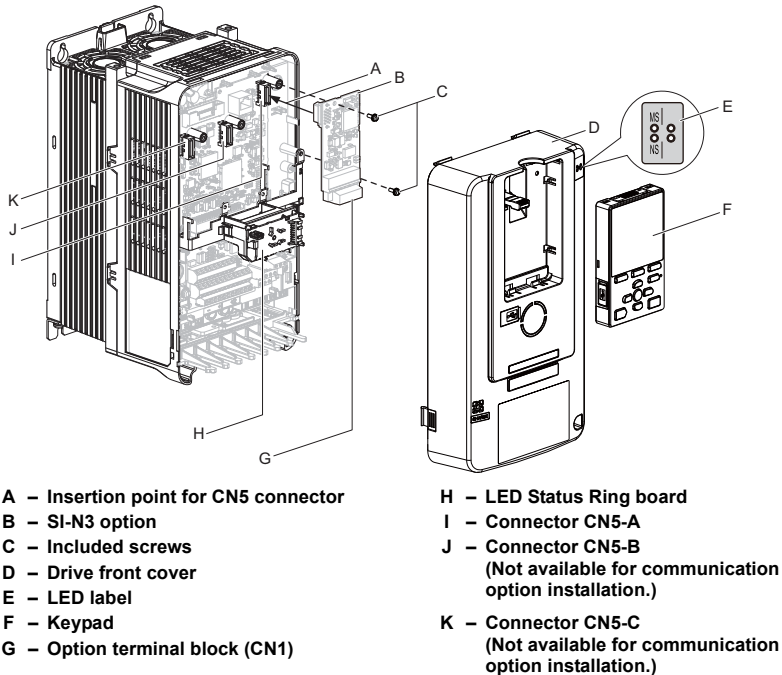


Figure 10 Drive Components with Option

## 5 Installation Procedure

### ■ Install the Option

Remove the front cover of the drive before installing the option. Refer to the drive instruction manual for directions on removing the front cover. Cover removal varies depending on drive size. This option can be inserted only into the **CN5-A** connector located on the drive control board.

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

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

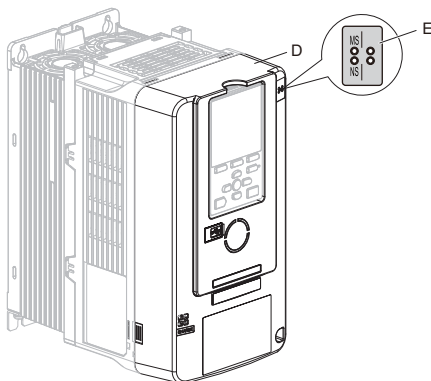
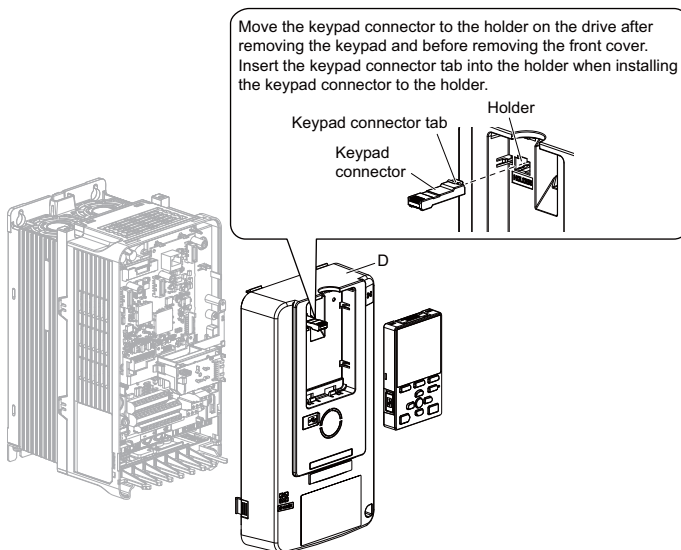


Figure 11 Affix the LED Label

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

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

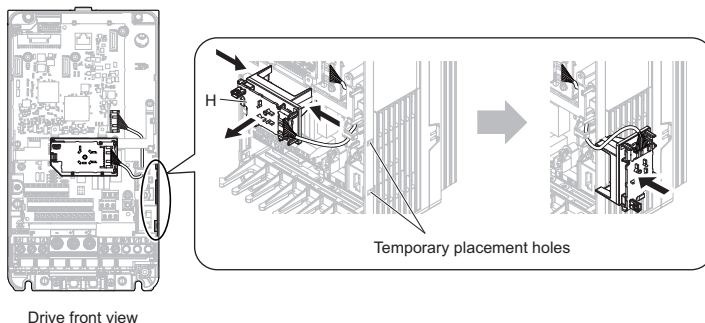


**Figure 12 Remove the Front Cover and Keypad**

## 5 Installation Procedure

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

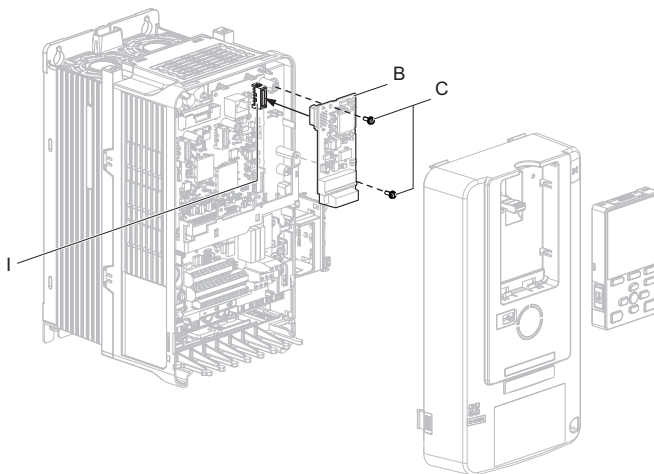
**NOTICE:** Do not remove the LED Status Ring board cable connector. Failure to comply could cause erroneous operation and damage the drive.



**Figure 13 Remove the LED Status Ring Board**

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

**Note:** Installing the option card on a GA700 drive requires only two screws and does not require a ground wire. The option package ships with three screws and a ground wire for installation on other drive series. Do not use the ground wire or the extra screw.



**Figure 14** Insert the Option Card

5. Firmly connect the DeviceNet communication cable to option terminal block(CN1). Install DeviceNet communications cables apart from main-circuit wiring and other electrical and power lines. Ensure the cable end is firmly connected (see [Figure 16](#)). Refer to [Communication Cable Topology on page 27](#) for details.

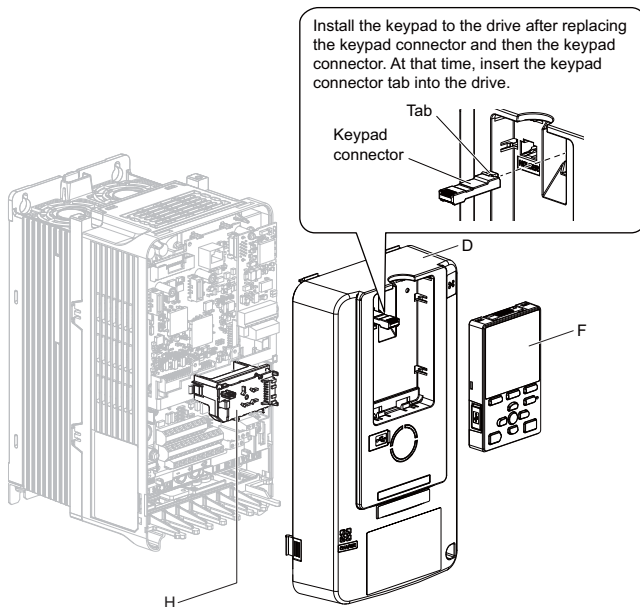
**Note:** Maximum transmission distance is 100 m (328 ft.). Minimum wiring distance between stations is 0.2 m (7.9 in).

## 5 Installation Procedure

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

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

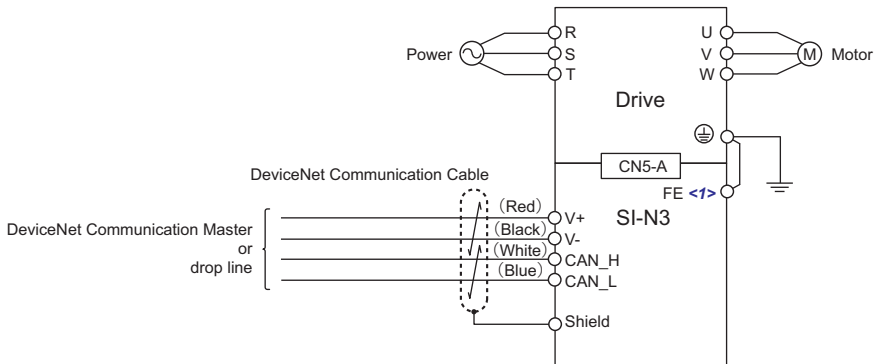
7. Replace and secure the front cover of the drive (D) including the keypad (F).



**Figure 15 Replace the Front Cover and Keypad**

8. Set drive parameters in [Table 6](#) for proper option performance.

### ◆ Option Connection Diagram



**Figure 16 Option Connection Diagram**

<1> Connect the provided ground wire during installation on 1000-series drives.  
Installation on GA700 drives does not require the ground wire.

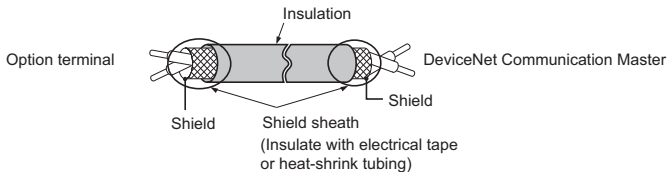
### ◆ Communication Cable Topology

Refer to the ODVA website ([www.odva.org](http://www.odva.org)) for more information on network cabling.

Refer to **Trunk Line and Drop Line Lengths on page 43** for details on selecting trunk line and drop line lengths.

Route the option wiring according to the following procedures.

1. Prepare the communication cables as shown in **Figure 17**.



**Figure 17 Prepare Ends of Shielded Cable**

2. Connect the communication cables to the terminal block as shown in **Figure 18**.  
When attaching the CN1 connector plug on the terminal block to the socket, make sure the screws on the left and right sides of the plug are tightened with a tightening torque of 0.5 to 0.6 (N·m) or 4.4 to 5.43 (inch-lbs).

## 5 Installation Procedure

3. Take particular caution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals. Trim any frayed wires.

**WARNING! Fire Hazard.** Tighten all terminal screws to the specified tightening torque. Loose or overtightened connections could cause erroneous operation and damage to the terminal block or start a fire and cause death or serious injury.

**NOTICE:** Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not come into contact with other wiring. Insufficient insulation may cause a short circuit that can damage the option or the drive.

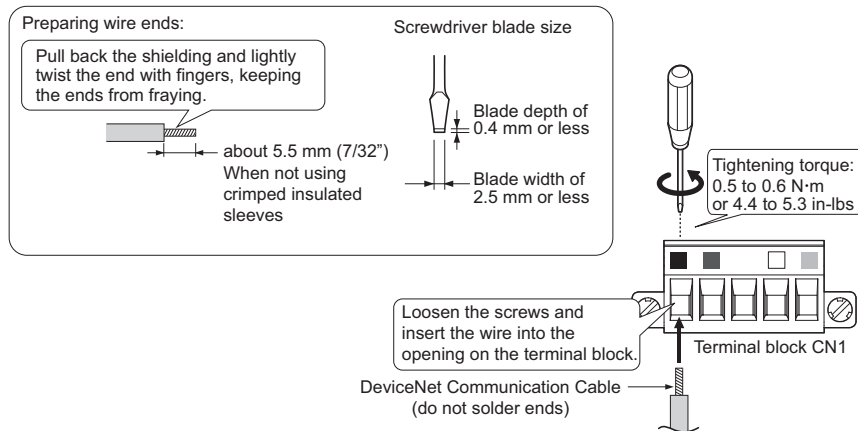


Figure 18 Connect Cable Wiring

### ◆ Termination Resistor Connection

Refer to the ODVA website ([www.odva.org](http://www.odva.org)) for more information on network cabling.

Only connect network termination resistors ( $121\ \Omega$ ,  $\pm 1\%$ ,  $1/4\ \text{W}$ ) to nodes of the two ends of trunk line. Refer to ODVA specifications for more details on DeviceNet termination.

### ◆ Option MAC ID

#### ■ Parameter F6-50, MAC ID Setting 0 to 64

The option MAC ID is set with drive parameter F6-50. MAC ID settings between 0 to 63 are considered valid MAC IDs; setting 64 indicates a network-settable MAC ID.

The option reads the MAC ID value from F6-50 upon power-up and upon a network reset.

### ◆ Option Baud Rate

The option supports standard baud rates of 125 kbps, 250 kbps, and 500 kbps.

**Table 5 Parameter F6-51 Baud Rate Setting**

| Description               | Value |
|---------------------------|-------|
| 125 kbps                  | 0     |
| 250 kbps                  | 1     |
| 500 kbps                  | 2     |
| Programmable from Network | 3     |
| Auto Detect               | 4     |

#### ■ Auto Baud Rate Sensing (F6-51 = 4)

Setting parameter F6-51 to 4 enables automatic baud rate detection and allows the option to automatically determine the baud rate of the DeviceNet network.

**Note:** Auto baud rate sensing is valid only when there is more than one node physically on the DeviceNet network segment. If the auto baud rate sensing fails to detect the baud rate, the drive digital operator will display “bUS” and the option LEDs will be OFF (NS) and solid green (MS).

### ◆ EDS Files

To facilitate network implementation, obtain an EDS file from one of the following websites depending on your region:

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

Europe: <http://www.yaskawa.eu.com>

Japan: <http://www.e-mechatronics.com>

Other areas: contact a Yaskawa representative.

# 6 Related Parameters

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

**Table 6 Related Parameters**

| No.<br>(Addr.<br>Hex) | Name                             | Description                                                                                                                                                                                                                                      | Values                          |
|-----------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| b1-01<br>(180)<br><I> | Reference 1 Source               | Selects the input method for frequency reference.<br>0: Keypad<br>1: Analog Input<br>2: Memobus/Modbus Communications<br>3: Option PCB<br>4: Pulse Train Input                                                                                   | Default: 1<br>Range: 0 to 4     |
| b1-02<br>(181)<br><I> | Run Command 1 Source             | Selects the input method for the Run command.<br>0: Keypad<br>1: Digital Input<br>2: Memobus/Modbus Communications<br>3: Option PCB                                                                                                              | Default: 1<br>Range: 0 to 3     |
| d5-01<br>(29A)        | Torque Control Selection         | 0: Speed Control<br>1: Torque Control                                                                                                                                                                                                            | Default: 0<br>Range: 0, 1       |
| F6-01<br>(3A2)        | Communications Error Selection   | Selects drive response when a bUS error is detected during communications with the option.<br>0: Ramp to Stop<br>1: Coast to Stop<br>2: Fast Stop (Use C1-09)<br>3: Alarm Only <I><br>4: Alarm-Run at d1-04 <I> <I><br>5: Alarm-Ramp to Stop <I> | Default: 1<br>Range: 0 to 5 <I> |
| F6-02<br>(3A3)        | Comm External Fault (EF0) Detect | Selects the condition for external fault detection (EF0).<br>0: Always detected<br>1: Detection during run only                                                                                                                                  | Default: 0<br>Range: 0, 1       |
| F6-03<br>(3A4)        | Comm External Fault (EF0) Select | Selects drive response for external fault input (EF0) detection during option communications.<br>0: Ramp to Stop<br>1: Coast to Stop<br>2: Fast Stop (Use C1-09)<br>3: Alarm Only <I>                                                            | Default: 1<br>Range: 0 to 3     |
| F6-06<br>(3A7)<br><I> | Torque Reference/Limit by Comm   | Enabling this parameter allows d5-01 to determine whether the value is read as the Torque Limit value (d5-01 = 0) or the Torque Reference value (d5-01 = 1).<br>0: Disabled<br>1: Enabled <I>                                                    | Default: 0<br>Range: 0, 1       |

| No.<br>(Addr.<br>Hex)     | Name                                     | Description                                                                                                                                                                                                                                                                                                                                              | Values                             |
|---------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| F6-07<br>(3A8)            | MultiStep Ref Priority Select            | 0: MultiStep References Disabled<br>1: MultiStep References Enabled                                                                                                                                                                                                                                                                                      | Default: 0<br>Range: 0, 1          |
| F6-08<br>(36A)            | Comm Parameter Reset @Initialize         | Selects whether communication-related parameters F6-□□ and F7-□□ are set back to original default values when the drive is initialized using parameter A1-03.<br>0: No Reset - Parameters retained<br>1: Reset - Back to factory default<br>Note: The setting value is not changed even when F6-08 is set to 1 and the drive is initialized using A1-03. | Default: 0<br>Range: 0, 1          |
| F6-15<br>(B5B)            | Comm. Option Parameter Upgrade Selection | Selects whether F6-□□/F7-□□ communication-related parameters changed are enabled.<br>0: Enabled by Cycling the Power<br>1: Enabled F6-□□/F7-□□<br>2: Disabled F6-□□/F7-□□<br>Note: F6-15 is reset to 0 after setting to 1 or 2.                                                                                                                          | Default: 0<br>Range: 0 to 2        |
| F6-50<br>(3C1)<br><7> <9> | DN MAC Address                           | Selects the drive MAC address<br><b>Note:</b> Used in the DeviceNet Object                                                                                                                                                                                                                                                                               | Default: <10><br>Min: 0<br>Max: 64 |
| F6-51<br>(3C2)<br><9>     | DN Baud Rate                             | DeviceNet communication speed<br>0: 125 kbps<br>1: 250 kbps<br>2: 500 kbps<br>3: Adjustable from network<br>4: Detect automatically<br><b>Note:</b> Used in the DeviceNet Object                                                                                                                                                                         | Default: <12><br>Range: 0 to 4     |
| F6-52<br>(3C3)<br><8>     | DeviceNet PCA Setting                    | I/O Polled Consuming Assembly data instance<br><b>Note:</b> Used in the Connection Object                                                                                                                                                                                                                                                                | Default: 21<br>Min: 0<br>Max: 255  |
| F6-53<br>(3C4)<br><8>     | DeviceNet PPA Setting                    | I/O Polled Producing Assembly data instance<br><b>Note:</b> Used in the Connection Object                                                                                                                                                                                                                                                                | Default: 71<br>Min: 0<br>Max: 255  |
| F6-54<br>(3C5)<br><9>     | DN Idle Flt Det                          | Determines whether the drive triggers an EF0 fault when no data is received from the master.<br>0: Enabled<br>1: Disabled, no fault detection<br>2: Vendor Specific<br>3: Run Fwd<br>4: Run Rev                                                                                                                                                          | Default: 0<br>Range: 0 to 4 <4>    |
| F6-55<br>(3C6)            | DN BAUD RATE MEM                         | Displays the baud rate currently being used for network communications. F6-55 is used only as a monitor.<br>0: 125 kbps<br>1: 250 kbps<br>2: 500 kbps<br><b>Note:</b> Used in the DeviceNet Object                                                                                                                                                       | Default: 0<br>Range: 0 to 2        |

## 6 Related Parameters

| No.<br>(Addr.<br>Hex)  | Name                                       | Description                                                                                                                                | Values                                        |
|------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| F6-56<br>(3D7)         | DeviceNet Speed Scaling                    | Sets the scaling factor for the Speed Monitor in the DeviceNet Object Class 2A hex<br><b>Note:</b> Used in the AC/DC Drive Object          | Default: 0<br>Min: -15<br>Max: 15             |
| F6-57<br>(3D8)         | DeviceNet Current Scaling                  | Sets the scaling factor for the Output Current Monitor in the DeviceNet Object Class 2A hex<br><b>Note:</b> Used in the AC/DC Drive Object | Default: 0<br>Min: -15<br>Max: 15             |
| F6-58<br>(3D9)         | DeviceNet Torque Scaling                   | Sets the scaling factor for the Torque Monitor in the DeviceNet Object Class 2A hex<br><b>Note:</b> Used in the AC/DC Drive Object         | Default: 0<br>Min: -15<br>Max: 15             |
| F6-59<br>(3DA)         | DeviceNet Power Scaling                    | Sets the scaling factor for the Power Monitor in the DeviceNet Object Class 2A hex<br><b>Note:</b> Used in the AC/DC Drive Object          | Default: 0<br>Min: -15<br>Max: 15             |
| F6-60<br>(3DB)         | DeviceNet Voltage Scaling                  | Sets the scaling factor for the Voltage Monitor in the DeviceNet Object Class 2A<br><b>Note:</b> Used in the AC/DC Drive Object            | Default: 0<br>Min: -15<br>Max: 15             |
| F6-61<br>(3DC)         | DeviceNet Time Scaling                     | Sets the scaling factor for the Time Monitor in the DeviceNet Object Class 2A hex<br><b>Note:</b> Used in the AC/DC Drive Object           | Default: 0<br>Min: -15<br>Max: 15             |
| F6-62<br>(3DD)         | DeviceNet Heartbeat Interval               | Sets the heartbeat interval. A setting of 0 disables the heartbeat function.<br><b>Note:</b> Used in the Identity Object                   | Default: 0<br>Min: 0<br>Max: 10               |
| F6-63<br>(3DE)         | DeviceNet Network MAC ID                   | Displays the MAC ID assigned to the drive. F6-63 is used only as a monitor.<br><b>Note:</b> Used in the DeviceNet Object                   | Default: <11><br>Min: 0<br>Max: 63            |
| F6-64<br>(3DF)<br><13> | Dynamic Out Assembly 109 Param1 (DOA109 1) | The data in configurable output 1 is written to the MEMOBUS/Modbus address defined by this parameter.                                      | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-65<br>(3E0)<br><13> | Dynamic Out Assembly 109 Param2 (DOA109 2) | The data in configurable output 2 is written to the MEMOBUS/Modbus address defined by this parameter.                                      | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-66<br>(3E1)<br><13> | Dynamic Out Assembly 109 Param3 (DOA109 3) | The data in configurable output 3 is written to the MEMOBUS/Modbus address defined by this parameter.                                      | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-67<br>(3E2)<br><13> | Dynamic Out Assembly 109 Param4 (DOA109 4) | The data in configurable output 4 is written to the MEMOBUS/Modbus address defined by this parameter.                                      | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-68<br>(3E3)<br><13> | Dynamic In Assembly 159 Param 1 (DIA159 1) | The data in configurable input 1 is read from the MEMOBUS/Modbus address defined by this parameter.                                        | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-69<br>(3E4)<br><13> | Dynamic In Assembly 159 Param 2 (DIA159 2) | The data in configurable input 2 is read from the MEMOBUS/Modbus address defined by this parameter.                                        | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |

| No.<br>(Addr.<br>Hex)  | Name                                          | Description                                                                                                                                                                                                                                                   | Values                                        |
|------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| F6-70<br>(3E5)<br><I3> | Dynamic In Assembly<br>159 Param 3 (DIA159 3) | The data in configurable input 3 is read from the MEMOBUS/Modbus address defined by this parameter.                                                                                                                                                           | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| F6-71<br>(3E6)<br><I3> | Dynamic In Assembly<br>159 Param 4 (DIA159 4) | The data in configurable input 4 is read from the MEMOBUS/Modbus address defined by this parameter.                                                                                                                                                           | Default: 0x0000<br>Min: 0x0000<br>Max: 0xFFFF |
| U6-98<br>(7F8)         | First Fault                                   | Displays previous faulted status.<br>0: No fault<br>1: Option failure<br>2: PLC in idle state<br>3: Force fault<br>1000: Network power loss<br>1001: Connection timeout<br>1002: Duplicate MAC ID<br>1003: Bus-off<br><b>Note:</b> Used in option faults      | —                                             |
| U6-99<br>(7F9)         | Current Fault                                 | Displays the most recent fault status.<br>0: No fault<br>1: Option failure<br>2: PLC in idle state<br>3: Force fault<br>1000: Network power loss<br>1001: Connection timeout<br>1002: Duplicate MAC ID<br>1003: Bus-off<br><b>Note:</b> Used in option faults | —                                             |

- <1> To start and stop the drive with the DeviceNet master device using serial communications, set b1-02 to 3 or set the Net Control bit in the assemblies or Control Supervisor Object. To control the frequency reference of the drive via the master device, set b1-01 to 3 or set the Net Reference bit in the assemblies or AC/DC object.
- <2> Setting this parameter to 3 will cause the drive to continue operation after detecting a fault. Take proper measures such as installing an emergency stop switch when using setting 3.
- <3> Refer to the instruction manual of a specific drive to determine if settings 4 and 5 are available in the drive.
- <4> Settings 4 and 5 are not available on 1000-Series drives.
- <5> Control method availability of this parameter depends on drive 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.
  - GA700 Drives: Parameter is available in CLV, AOLV, AOLV/PM, and CLV/PM.
- <6> The setting specifies that network communications provide the torque reference or torque limit. The motor could rotate if the PLC does not supply a torque reference or torque limit.
- <7> All MAC addresses must be unique.
- <8> Setting unavailable values will initialize Polled Consuming Assembly (PCA) and Polled Producing Assembly (PPA).
- <9> Cycle power for setting changes to take effect.

## 6 Related Parameters

---

### <10> Regional default settings

#### <1000-Series Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIMR-AA□A, CIMR-AB□A, CIMR-AC□A, CIMR-AD□A, CIMR-AT□A)

Setting 64: USA (Drive model code: CIMR-AU□A)

#### <GA700 Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIPR-□A□, CIPR-□B□, CIPR-□C□, CIPR-□D□, CIPR-□T□)

Setting 64: the Americas (Drive model code: CIPR-□U□)

### <11> Regional default settings

#### <1000-Series Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIMR-AA□A, CIMR-AB□A, CIMR-AC□A, CIMR-AD□A, CIMR-AT□A)

Setting 63: USA (Drive model code: CIMR-AU□A)

#### <GA700 Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIPR-□A□, CIPR-□B□, CIPR-□C□, CIPR-□D□, CIPR-□T□)

Setting 63: the Americas (Drive model code: CIPR-□U□)

### <12> Regional default settings

#### <1000-Series Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIMR-AA□A, CIMR-AB□A, CIMR-AC□A, CIMR-AD□A, CIMR-AT□A)

Setting 64: USA (Drive model code: CIMR-AU□A)

#### <GA700 Drives>

Setting 0: Japan, China, Europe, India, and Asia (Drive model code: CIPR-□A□, CIPR-□B□, CIPR-□C□, CIPR-□D□, CIPR-□T□)

Setting 4: the Americas (Drive model code: CIPR-□U□)

### <13> Available in the option software versions PRG: 1111 and later.

## 7 Configuring DeviceNet Messaging

This section provides information on the methods used to control the drive on DeviceNet.

### ◆ Drive Configuration on DeviceNet

#### ■ Polled Configuration

Configure the drive DeviceNet polled connection before receiving commands from a master device. The two parameters that must be configured are:

- F6-52: Polled Consuming Assembly (PCA)

**Note:** Output assembly consumed by the drive.

- F6-53: Polled Producing Assembly (PPA)

**Note:** Input assembly produced by the drive.

The default connection paths for the option are set for Extended Speed Control.

The PCA and PPA parameters can be accessed by two methods:

- A software configuration tool (not supplied), and Yaskawa Electronic Data Sheet (EDS)

**Note:** The PCA and PPA parameters can be accessed from the “DN: Polled Config” parameter group.

- A software configuration tool (not supplied), via a DeviceNet message path, such as Extended Speed Control

**Note:** Use DeviceNet Connection Object to change the PCA or PPA if required by the application. (Class 5, Instance 1, Attributes 14 and 16)

One of each PCA and PPA assembly from the following table must be selected to configure the drive for polled operation.

**Table 7 Supported Polled Assemblies (PCA and PPA)**

| Assy Number (decimal) | Description                                                                              | Type | Bytes | Page               |
|-----------------------|------------------------------------------------------------------------------------------|------|-------|--------------------|
| 20                    | Basic Speed Control Output - 20 (0x14)                                                   | PCA  | 4     | <a href="#">38</a> |
| 21                    | Extended Speed Control Output - 21 (0x15) (Default Setting)                              | PCA  | 4     | <a href="#">38</a> |
| 22                    | Speed and Torque Control Output - 22 (0x16)                                              | PCA  | 6     | —                  |
| 23                    | Extended Speed and Torque Control Output - 23 (0x17)                                     | PCA  | 6     | —                  |
| 70                    | Basic Speed Control Input - 70 (0x46)                                                    | PPA  | 4     | <a href="#">38</a> |
| 71                    | Extended Speed Control Input - 71 (0x47) (Default Setting)                               | PPA  | 4     | <a href="#">38</a> |
| 72                    | Speed and Torque Control Input - 72 (0x48)                                               | PPA  | 6     | —                  |
| 73                    | Extended Speed and Torque Control Input - 73 (0x49)                                      | PPA  | 6     | —                  |
| 100                   | MEMOBUS/Modbus Message Command (Vendor Specific Yaskawa Electric (YE) Assy) - 100 (0x64) | PCA  | 5     | —                  |

## 7 Configuring DeviceNet Messaging

| Assy Number (decimal) | Description                                                                                | Type | Bytes | Page |
|-----------------------|--------------------------------------------------------------------------------------------|------|-------|------|
| 101                   | Standard Control (Vendor Specific Yaskawa Electric (YE) Assy) - 101 (0x65)                 | PCA  | 8     | —    |
| 102                   | Accel/Decel Time (Vendor Specific Yaskawa Electric (YE) Assy) - 102 (0x66)                 | PCA  | 8     | —    |
| 103                   | 3-Wire Control (Vendor Specific Yaskawa Electric (YE) Assy) - 103 (0x67)                   | PCA  | 4     | —    |
| 104                   | 3-Wire Control Status (Vendor Specific Yaskawa Electric (YE) Assy) - 104 (0x68)            | PPA  | 4     | —    |
| 105                   | Enhanced Speed Control, Dynamic (Vendor Specific Yaskawa Electric (YE) Assy) - 105 (0x69)  | PCA  | 8     | —    |
| 106                   | Enhanced Control (Vendor Specific Yaskawa Electric (YE) Assy) - 106 (0x6A)                 | PCA  | 8     | —    |
| 107                   | Standard DI/DO Control (Vendor Specific Yaskawa Electric (YE) Assy) - 107 (0x6B)           | PCA  | 8     | —    |
| 108                   | Enhanced Torque Control, Dynamic (Vendor Specific Yaskawa Electric (YE) Assy) - 108 (0x6C) | PCA  | 8     | —    |
| 109                   | Dynamic Output Assembly (Vendor Specific Yaskawa Electric (YE) Assy) - 109 (0x6D)          | PCA  | 8     | —    |
| 120                   | Speed Command 1 (Vendor Specific Yaskawa Electric (YE) Assy) - 120 (0x78)                  | PCA  | 4     | —    |
| 121                   | Torque Command 1 (Vendor Specific Yaskawa Electric (YE) Assy) - 121 (0x79)                 | PCA  | 4     | —    |
| 122                   | Speed Command 2 (Vendor Specific Yaskawa Electric (YE) Assy) - 122 (0x7A)                  | PCA  | 6     | —    |
| 123                   | Torque Command 2 (Vendor Specific Yaskawa Electric (YE) Assy) - 123 (0x7B)                 | PCA  | 6     | —    |
| 124                   | Speed Dynamic Assy (Vendor Specific Yaskawa Electric (YE) Assy) - 124 (0x7C)               | PCA  | 8     | —    |
| 125                   | Torque Dynamic Assy (Vendor Specific Yaskawa Electric (YE) Assy) - 125 (0x7D)              | PCA  | 8     | —    |
| 126                   | Speed/Torque Assy (Vendor Specific Yaskawa Electric (YE) Assy) - 126 (0x7E)                | PCA  | 8     | —    |
| 130                   | Speed Status (Vendor Specific Yaskawa Electric (YE) Assy) - 130 (0x82)                     | PPA  | 4     | —    |
| 131                   | Current Status (Vendor Specific Yaskawa Electric (YE) Assy) - 131 (0x83)                   | PPA  | 4     | —    |
| 132                   | Current & Speed Status (Vendor Specific Yaskawa Electric (YE) Assy) - 132 (0x84)           | PPA  | 6     | —    |
| 134                   | Speed Status Dynamic Assy (Vendor Specific Yaskawa Electric (YE) Assy) - 134 (0x86)        | PPA  | 8     | —    |
| 135                   | Current Status Dynamic Assy (Vendor Specific Yaskawa Electric (YE) Assy) - 135 (0x87)      | PPA  | 8     | —    |
| 136                   | Torque and Speed Status (Vendor Specific Yaskawa Electric (YE) Assy) - 136 (0x88)          | PPA  | 8     | —    |
| 150                   | MEMOBUS/Modbus Message Reply (Vendor Specific Yaskawa Electric (YE) Assy) - 150 (0x96)     | PPA  | 5     | —    |
| 151                   | Standard Status 1 (Vendor Specific Yaskawa Electric (YE) Assy) - 151 (0x97)                | PPA  | 8     | —    |
| 152                   | Standard Status 2 (Vendor Specific Yaskawa Electric (YE) Assy) - 152 (0x98)                | PPA  | 8     | —    |

## 7 Configuring DeviceNet Messaging

| Assy Number (decimal) | Description                                                                               | Type | Bytes | Page |
|-----------------------|-------------------------------------------------------------------------------------------|------|-------|------|
| 155                   | Enhanced Speed Status, Dynamic (Vendor Specific Yaskawa Electric (YE) Assy) - 155 (0x9B)  | PPA  | 8     | —    |
| 156                   | Enhanced Control Status (Vendor Specific Yaskawa Electric (YE) Assy) - 156 (0x9C)         | PPA  | 8     | —    |
| 157                   | Standard DI/DO Status (Vendor Specific Yaskawa Electric (YE) Assy) - 157 (0x9D)           | PPA  | 8     | —    |
| 158                   | Enhanced Torque Status, Dynamic (Vendor Specific Yaskawa Electric (YE) Assy) - 158 (0x9E) | PPA  | 8     | —    |
| 159<br><2>            | Dynamic Input Assembly (Vendor Specific Yaskawa Electric (YE) Assy) - 159 (0x9F)          | PPA  | 8     | —    |
| 199<br><1>            | Change of State Response (Vendor Specific Yaskawa Electric (YE) Assy) - 199 (0xC7)        | PPA  | 8     | —    |

<1> Available in the option software versions PRG: 1107 and later.

<2> Available in the option software versions PRG: 1111 and later.

## 7 Configuring DeviceNet Messaging

### ◆ Drive Operation on DeviceNet

#### ■ Polled Assemblies Quick Reference

Refer to the option Technical Manual for details on polled assemblies and other message types.

#### Output Assemblies/Drive Consumes

| Instance                                     | Byte | Bit 7                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2          | Bit 1 | Bit 0   |
|----------------------------------------------|------|-----------------------------|-------|-------|-------|-------|----------------|-------|---------|
| 20<br>DeviceNet<br>Basic<br>Speed<br>Control | 0    | -                           | -     | -     | -     | -     | Fault<br>Reset | -     | Run Fwd |
|                                              | 1    | -                           |       |       |       |       |                |       |         |
|                                              | 2    | Speed Reference (Low Byte)  |       |       |       |       |                |       |         |
|                                              | 3    | Speed Reference (High Byte) |       |       |       |       |                |       |         |

| Instance                                        | Byte | Bit 7                       | Bit 6   | Bit 5    | Bit 4 | Bit 3 | Bit 2          | Bit 1      | Bit 0      |
|-------------------------------------------------|------|-----------------------------|---------|----------|-------|-------|----------------|------------|------------|
| 21<br>DeviceNet<br>Extended<br>Speed<br>Control | 0    | -                           | Net Ref | Net Ctrl | -     | -     | Fault<br>Reset | Run<br>Rev | Run<br>Fwd |
|                                                 | 1    | -                           |         |          |       |       |                |            |            |
|                                                 | 2    | Speed Reference (Low Byte)  |         |          |       |       |                |            |            |
|                                                 | 3    | Speed Reference (High Byte) |         |          |       |       |                |            |            |

#### Input Assemblies/Drive Produces

| Instance                                     | Byte | Bit 7                    | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2              | Bit 1 | Bit 0 |
|----------------------------------------------|------|--------------------------|-------|-------|-------|-------|--------------------|-------|-------|
| 70<br>DeviceNet<br>Basic<br>Speed<br>Control | 0    | -                        | -     | -     | -     | -     | Running 1<br>(FWD) | -     | Fault |
|                                              | 1    | -                        |       |       |       |       |                    |       |       |
|                                              | 2    | Speed Actual (Low Byte)  |       |       |       |       |                    |       |       |
|                                              | 3    | Speed Actual (High Byte) |       |       |       |       |                    |       |       |

| Instance                                        | Byte | Bit 7                    | Bit 6           | Bit 5            | Bit 4 | Bit 3              | Bit 2              | Bit 1   | Bit 0 |
|-------------------------------------------------|------|--------------------------|-----------------|------------------|-------|--------------------|--------------------|---------|-------|
| 71<br>DeviceNet<br>Extended<br>Speed<br>Control | 0    | At Speed                 | Ref from<br>Net | Ctrl from<br>Net | Ready | Running 2<br>(REV) | Running 1<br>(FWD) | Warning | Fault |
|                                                 | 1    | State                    |                 |                  |       |                    |                    |         |       |
|                                                 | 2    | Speed Actual (Low Byte)  |                 |                  |       |                    |                    |         |       |
|                                                 | 3    | Speed Actual (High Byte) |                 |                  |       |                    |                    |         |       |

## 8 Troubleshooting

### ◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. [Table 8](#) lists causes of the errors and possible corrective actions. Refer to the drive Technical Manual for additional error codes that may appear on the drive digital operator.

### ■ Faults

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

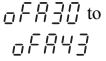
Check the following items first when an error code occurs on the drive:

- Communication cable connections.
- Make sure the option is properly installed to the drive.
- Operation status of the controller program and controller CPU.
- Did a momentary power loss interrupt communications?

**Table 8 Fault Displays, Causes, and Possible Solutions**

| Keypad Display                                             |     | Fault Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| bUS                                                        | bUS | Option Communication Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                            |     | <ul style="list-style-type: none"><li>• After establishing initial communication, the connection was lost.</li><li>• Only detected when the run command frequency reference is assigned to the option (bl-01 = 3 or bl-02 = 3).</li></ul>                                                                                                                                                                                                                                                                                                                                           |
| Cause                                                      |     | Possible Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| No signal was received from the PLC.                       |     | <ul style="list-style-type: none"><li>• Check for faulty wiring.</li><li>• Correct any wiring problems.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 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.        |     | <ul style="list-style-type: none"><li>• Counteract noise in the control circuit, main circuit, and ground wiring.</li><li>• If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil.</li><li>• Use only recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side.</li><li>• Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.</li><li>• Counteract noise in the master controller (PLC).</li></ul> |
| The option is not properly connected to the drive.         |     | Reinstall the option.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 8 Troubleshooting

| Option is damaged                                                                  |                | If there are no problems with the wiring and the error continues to occur, replace the option.                                                                                                                                    |
|------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network power loss                                                                 |                | The power on the DeviceNet network cable is 0.<br>Verify power is available between option terminals V+ (red) and V- (black).                                                                                                     |
| Connection timeout                                                                 |                | <ul style="list-style-type: none"><li>• The option Requested Packet Interval (RPI) timer timed out.</li><li>• The option Expected Packet Rate (EPR) timer timed out.</li><li>• Make sure that EPR time is set properly.</li></ul> |
| Duplicate MAC ID                                                                   |                | The option MAC ID and at least one other node have the same MAC ID.<br>Verify F6-50 is set properly. All MAC IDs must be unique.                                                                                                  |
| Keypad Display                                                                     |                | Fault Name                                                                                                                                                                                                                        |
|   | EF0            | Option Card External Fault                                                                                                                                                                                                        |
|                                                                                    |                | The alarm function for an external device has been triggered.                                                                                                                                                                     |
| Cause                                                                              |                | Possible Solution                                                                                                                                                                                                                 |
| An external fault was received from the PLC.                                       |                | <ol style="list-style-type: none"><li>1. Remove the cause of the external fault.</li><li>2. Reset the external fault input from the PLC.</li></ol>                                                                                |
| Problem with the PLC program                                                       |                | Check the PLC program.                                                                                                                                                                                                            |
| Keypad Display                                                                     |                | Fault Name                                                                                                                                                                                                                        |
|    | oFA00          | Option Card Connection Error (CN5-A)                                                                                                                                                                                              |
|                                                                                    |                | Option is not properly connected.                                                                                                                                                                                                 |
| Cause                                                                              |                | Possible Solution                                                                                                                                                                                                                 |
| The option card installed into port CN5-A is incompatible with the drive.          |                | Connect the option to the correct option port.<br>Note: PG option cards are supported by option ports CN5-B and CN5-C only.                                                                                                       |
| Keypad Display                                                                     |                | Fault Name                                                                                                                                                                                                                        |
|    | oFA01          | Option Card Fault (CN5-A)                                                                                                                                                                                                         |
|                                                                                    |                | Option is not properly connected.                                                                                                                                                                                                 |
| Cause                                                                              |                | Possible Solution                                                                                                                                                                                                                 |
| The option connected to option port CN5-A was changed during run.                  |                | De-energize the drive and plug the option into the drive according to <a href="#">Installation Procedure on page 14</a> .                                                                                                         |
| Keypad Display                                                                     |                | Fault Name                                                                                                                                                                                                                        |
|  | oFA30 to oFA43 | Option Card Connection Error (CN5-A)                                                                                                                                                                                              |
|                                                                                    |                | Communication ID error.                                                                                                                                                                                                           |
| Cause                                                                              |                | Possible Solution                                                                                                                                                                                                                 |
| The option card connection to port CN5-A is faulty.                                |                | <ol style="list-style-type: none"><li>1. Turn off the power.</li><li>2. Check if the option is properly plugged into the option port.</li><li>3. Replace the option if the fault continues to occur.</li></ol>                    |

| Keypad Display                                                                         |       | Fault Name                                                                                                                                                                              |
|----------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | oFb00 | Option Fault (CN5-B)                                                                                                                                                                    |
|                                                                                        |       | Non-compatible option is connected.                                                                                                                                                     |
| Cause                                                                                  |       | Possible Solution                                                                                                                                                                       |
| The option card installed into port CN5-A is incompatible with the drive.              |       | Connect the option to the correct option port.<br>Note: Use connector CN5-B when connecting DO-A3, AO-A3, or two PG options.<br>Use connector CN5-C when connecting only one PG option. |
| Keypad Display                                                                         |       | Fault Name                                                                                                                                                                              |
|       | oFb02 | Option Fault (CN5-B)                                                                                                                                                                    |
|                                                                                        |       | Two identical options are connected at the same time.                                                                                                                                   |
| Cause                                                                                  |       | Possible Solution                                                                                                                                                                       |
| An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C. |       | Connect the option to the correct option port.                                                                                                                                          |
| Keypad Display                                                                         |       | Fault Name                                                                                                                                                                              |
|       | oFC00 | Option Fault (CN5-C)                                                                                                                                                                    |
|                                                                                        |       | Non-compatible option is connected.                                                                                                                                                     |
| Cause                                                                                  |       | Possible Solution                                                                                                                                                                       |
| The option card installed into port CN5-C is incompatible with the drive.              |       | Connect the option to the correct option port.<br>Note: AI-A3, DI-A3, and communication options are not supported by option port CN5-C.                                                 |
| Keypad Display                                                                         |       | Fault Name                                                                                                                                                                              |
|       | oFC02 | Option Fault                                                                                                                                                                            |
|                                                                                        |       | Option Flash write mode.                                                                                                                                                                |
| Cause                                                                                  |       | Possible Solution                                                                                                                                                                       |
| An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C. |       | Connect the option to the correct option port.                                                                                                                                          |

## 8 Troubleshooting

### ■ Minor Faults and Alarms

| Keypad Display                                                            |      | Minor Fault Name                                                                                                                                                                                                                                                                    |                          |
|---------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| CALL                                                                      | CALL | Serial communication transmission error                                                                                                                                                                                                                                             |                          |
|                                                                           |      | Communication is not established.                                                                                                                                                                                                                                                   |                          |
| Cause                                                                     |      | Possible Solution                                                                                                                                                                                                                                                                   | Minor Fault (H2-□□ = 10) |
| Communication wiring is faulty.                                           |      | <ul style="list-style-type: none"><li>• Check for wiring errors.</li><li>• Correct the wiring.</li></ul>                                                                                                                                                                            | YES                      |
| An existing short circuit or communications disconnection                 |      | Check disconnected cables and short circuits and repair as needed.                                                                                                                                                                                                                  |                          |
| Programming error on the master side.                                     |      | Check communications at start-up and correct programming errors.                                                                                                                                                                                                                    |                          |
| Communication circuitry is damaged.                                       |      | <ul style="list-style-type: none"><li>• Perform a self-diagnostics check</li><li>• If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Yaskawa or your nearest sales representative.</li></ul> |                          |
| Termination resistor of the MEMOBUS/Modbus communications is not enabled. |      | Set DIP switch S2 to the ON position to enable the termination resistor on a drive located at the end of a network line.                                                                                                                                                            |                          |
| Keypad Display                                                            |      | Minor Fault Name                                                                                                                                                                                                                                                                    |                          |
| CyPo                                                                      | CyPo | Cycle Power to Active Parameters                                                                                                                                                                                                                                                    |                          |
|                                                                           |      | Comm. Option Parameter Not Upgraded                                                                                                                                                                                                                                                 |                          |
| Cause                                                                     |      | Possible Solution                                                                                                                                                                                                                                                                   | Minor Fault (H2-□□ = 10) |
| Drive is not compatible with the option software version.                 |      | Turn off the power and upgrade the communication option parameters.<br>Note: An alarm is triggered when the option software version is earlier or an incompatible option is installed to the drive.                                                                                 | YES                      |

## 9 Trunk Line and Drop Line Lengths

Refer to [www.odva.org](http://www.odva.org) for more information regarding wiring DeviceNet networks.

### ◆ Trunk Line

The maximum allowable trunk line length depends on the type of cable used and the network baud rate. The total cable length includes the length of the trunk and the sum of all the drop lines.

**Table 9 Trunk Line Cable Length**

| Baud Rate (kbps) | Thick Cable      | Thin Cable      |
|------------------|------------------|-----------------|
| 125              | 500 m (1640 ft.) | 100 m (328 ft.) |
| 250              | 250 m (787 ft.)  | 100 m (328 ft.) |
| 500              | 100 m (328 ft.)  | 100 m (328 ft.) |

To calculate the maximum total length for trunk lines of mixed thick and thin cables, use the following formulas:

- 125 kbps:  $L_{\text{thick}} + (5 \times L_{\text{thin}}) \leq 500 \text{ m (1640 ft.)}$
- 250 kbps:  $L_{\text{thick}} + (2.5 \times L_{\text{thin}}) \leq 250 \text{ m (787 ft.)}$
- 500 kbps:  $L_{\text{thick}} + L_{\text{thin}} \leq 100 \text{ m (328 ft.)}$

### ◆ Drop Line

The drop line is measured from the tap on the trunk line to the transceiver of the DeviceNet node. The total cable length includes the length of the trunk and the sum of all the drop lines.

**Table 10 Drop Line Cable Length**

| Baud Rate (kbps) | Maximum at Each Drop | Maximum Total   |
|------------------|----------------------|-----------------|
| 125              | 6 m (20 ft.)         | 156 m (511 ft.) |
| 250              |                      | 78 m (256 ft.)  |
| 500              |                      | 39 m (128 ft.)  |

# 10 European Standards



Figure 19 CE Mark

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

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

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

### **EMC Guidelines: 2014/30/EU**

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

---

### ◆ **EMC Guidelines Compliance**

This drive 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 also comply with EMC guidelines:

1. Use dedicated shield cable for the option and external device (encoder, I/O device, master), or run the wiring through a metal conduit.
2. Keep wiring as short as possible and ground the largest possible surface area of the shield to the metal panel according to [Figure 21](#).

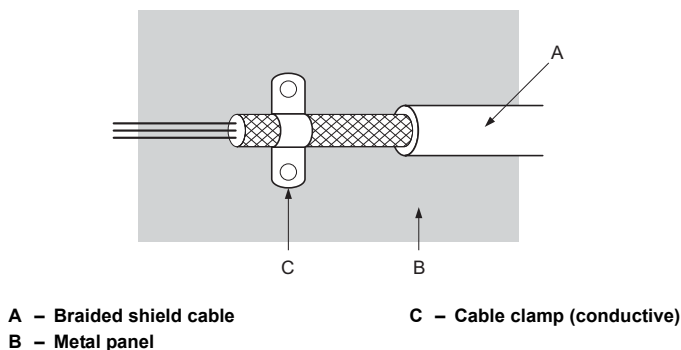


Figure 20 Ground Area

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

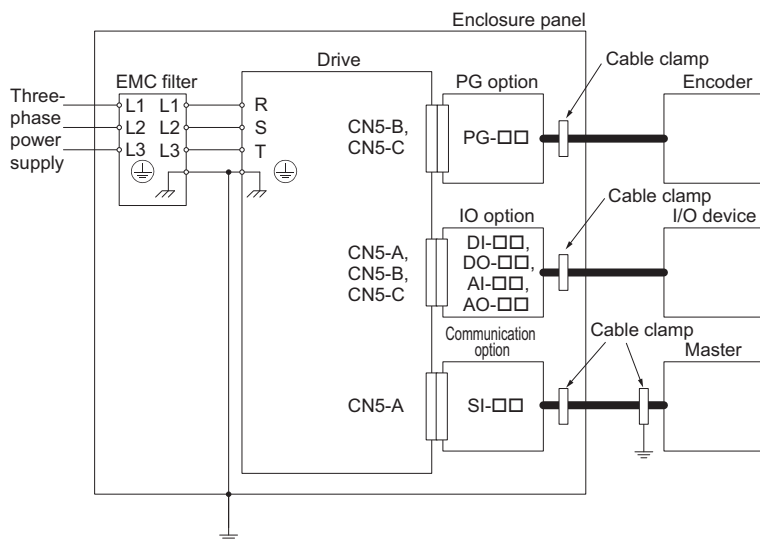


Figure 21 Option Installation for CE Compliance

## 11 Specifications

**Table 11 Option Specifications**

| Items                                 | Specifications                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model</b>                          | SI-N3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>SI-N3 Supported Messages</b>       | <ul style="list-style-type: none"> <li>• Group 2 Server (UCMM capable).</li> <li>• Explicit Messages: Fragmentation is supported. Up to 32 bytes can be input and output.</li> <li>• Polled I/O Messages: Fragmentation is not supported. Up to 8 bytes can be input and output.</li> <li>• Faulted Node Recovery / Offline Connection Set Messages / Automatic Device Replacement (ADR).</li> <li>• Change of State Message (COS). COS can be used as an I/O Input Assembly.</li> </ul> |
| <b>I/O Assembly Instance</b>          | Input: 20 types (4 to 8 bytes)<br>Output: 20 types (4 to 8 bytes)                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>DeviceNet Specification</b>        | Conformance Level 19: Passed                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>DeviceNet Profile</b>              | AC Drive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Input Power</b>                    | Voltage: 11 to 25 Vdc<br>Current: 40 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Connector Type</b>                 | 5-pin open-style screw connector                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Physical Layer Type</b>            | Isolated Physical Layer<br>CAN transceiver + photocoupler                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>MAC ID Setting</b>                 | Programmable from drive keypad or network:<br>MAC ID 0 to 63                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Communications Speed/Baud Rate</b> | Programmable from drive keypad or network: <ul style="list-style-type: none"> <li>• 125/250/500 kbps</li> <li>• Auto Baud Rate</li> <li>• Idle Mode Detect</li> <li>• Heartbeat</li> </ul>                                                                                                                                                                                                                                                                                               |
| <b>Ambient Temperature</b>            | -10 °C to +50 °C (14 °F to 122 °F)                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Humidity</b>                       | 95% RH or lower with no condensation                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Storage Temperature</b>            | -20 °C to +60 °C (-4 °F to 140 °F) allowed for short-term transport of the product                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Area of Use</b>                    | Indoors and free from: <ul style="list-style-type: none"> <li>• Oil mist, corrosive gas, flammable gas, and dust</li> <li>• Radioactive materials or flammable materials, including wood</li> <li>• Harmful gas or fluids</li> <li>• Salt</li> <li>• Direct sunlight</li> <li>• Falling foreign objects</li> </ul>                                                                                                                                                                       |
| <b>Altitude</b>                       | 1000 m (3280 ft.) or lower                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## ◆ Revision History

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

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# YASKAWA AC Drive Option DeviceNet Installation Manual

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# YASKAWA

**YASKAWA ELECTRIC CORPORATION**

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

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