

YASKAWA AC Drive Option

Digital Input Installation Manual

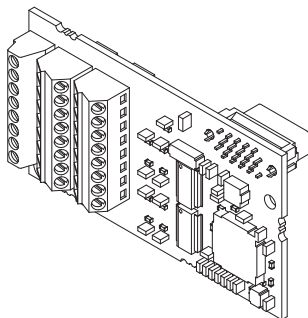
Type DI-A3

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 デジタル入力 取扱説明書

形式 DI-A3

製品を安全にお使いいただくために、この取扱説明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.

◆ Applicable Documentation

The following manuals are available for the option:

Digital Input DI-A3 Option

YASKAWA AC Drive Option Digital Input DI-A3 Installation Manual Manual No: TOBP C730600 80 (This book)	This guide is packaged together with the product and contains information necessary to install the option and set related drive parameters.
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Yaskawa Drive

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

Note:	Indicates supplemental information that is not related to safety messages
Option:	YASKAWA AC Drive Option Digital Input
Drive:	• YASKAWA AC Drive 1000-Series (A1000, L1000A, U1000, U1000L) • YASKAWA AC Drive GA700 • YASKAWA AC Drive GA800 • YASKAWA AC Drive CR700 • YASKAWA AC Drive CH700 • YASKAWA AC Drive LA700 • YASKAWA AC Drive FP605
Keypad:	• LCD Operator for YASKAWA AC Drive 1000-Series • LED Operator for YASKAWA AC Drive 1000-Series • LCD Keypad for YASKAWA AC Drive GA700, GA800, CR700, CH700, LA700, and FP605 • LED Keypad for YASKAWA AC Drive GA700, GA800, CR700, CH700, LA700, and FP605

◆ Registered Trademarks

Trademarks are the property of their respective owners.

◆ 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.

1 Preface and Safety

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 Yaskawa or a Yaskawa representative and provide the manual number shown on the front cover to order new copies of the manual.

DANGER

Heed the safety messages in this manual.

Failure to comply will cause death or serious injury.

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



WARNING

Electrical Shock Hazard

Do not 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 modify the drive or option circuitry.

Failure to comply could result in damage to the drive or option and will void warranty. Yaskawa is not responsible for any modification of the product made by the user.

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 Overview

The Digital Input Option DI-A3 allows the user to set the drive frequency/speed reference using binary coded digital inputs.

The option has the following features:

- Binary 16-bit, 4-digit BCD input
- Binary 12-bit, 3-digit BCD input
- Binary 8-bit, 2-digit BCD input

The input signal is +24 Vdc 8mA isolated input.

◆ Compatible Products

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

Table 1 Compatible Products

Product Series	Model(s)
A1000	All models
L1000A	All models
U1000	All models
U1000L	All models
GA700	All models
GA800	All models
CR700	All models
CH700	All models
LA700	All models
FP605	All models

- Note:**
1. Set the following settings before setting the speed reference using the option card.
A1000, U1000, GA700, GA800, CR700, CH700, LA700, FP605: Set b1-01 or b1-15 to 3.
L1000A, U1000L: Set b1-01 to 3.
 2. For Yaskawa customers in the North or South America region:
If your product is not listed in [Table 1](#), refer to the web page below to confirm this manual is correct for your product. The web page provides a list of option manuals by product, and a direct link to download a PDF.

Scan QR code



Or refer to: <http://www.yaskawa.com/optionlookup>

3 Receiving

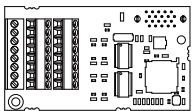
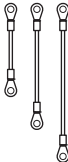
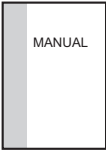
After receiving the option package:

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 1](#) on page 11 for details. Contact the distributor where the option was purchased or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Contents

Description:	Option	Ground Wires <1>	Screws (M3)	Installation Manual
-				
Quantity:	1	3	3 <2>	1

<1> GA700, GA800, CR700, CH700, and LA700 drives do not use the ground wire.

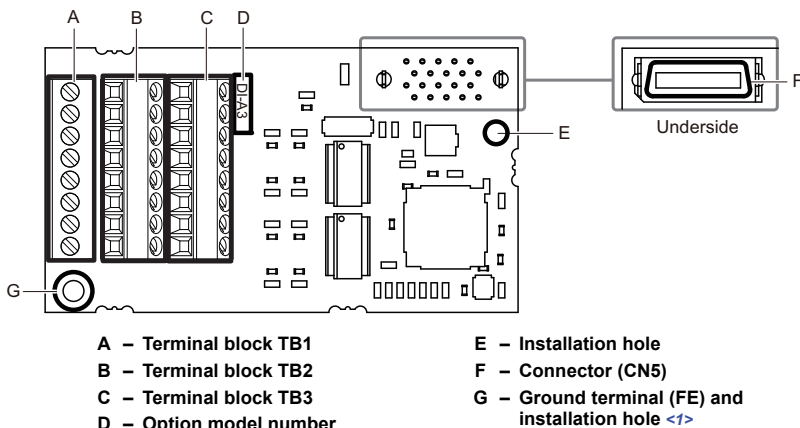
<2> GA700, GA800, CR700, CH700, LA700, and FP605 drives use two screws only.

◆ Installation Tools

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

4 Option Components

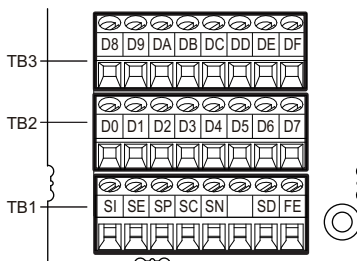
◆ Digital Input Option



<1> Connect the provided ground wire during installation. Installation on GA700, GA800, CR700, CH700, and LA700 drives does not require the ground wire.

Figure 1 Digital Input DI-A3 Option Components

◆ Terminal Blocks TB1, TB2, and TB3



Refer to [Table 5](#) on page [40](#) for details on TB1, TB2, and TB3 terminal functions and signal levels.

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

◆ Option Installation and Wiring Procedures

Procedures for installing and wiring options differ depending on the product.

Refer to [Table 4](#) to check the procedures for installing and wiring options on a drive.

Table 2 Option Installation and Wiring Procedures

Product Series	Option Installation and Wiring Procedures	Page
A1000	Procedure A	15
L1000A	Procedure A	15
U1000	Procedure A	15
U1000L	Procedure A	15
GA700	Procedure B	22
GA800	Procedure B	22
CR700	Procedure B	22
CH700	Procedure B	22
LA700	Procedure B	22
FP605	Procedure C	29

■ Procedure A

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

Prepare the Drive for the Option

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

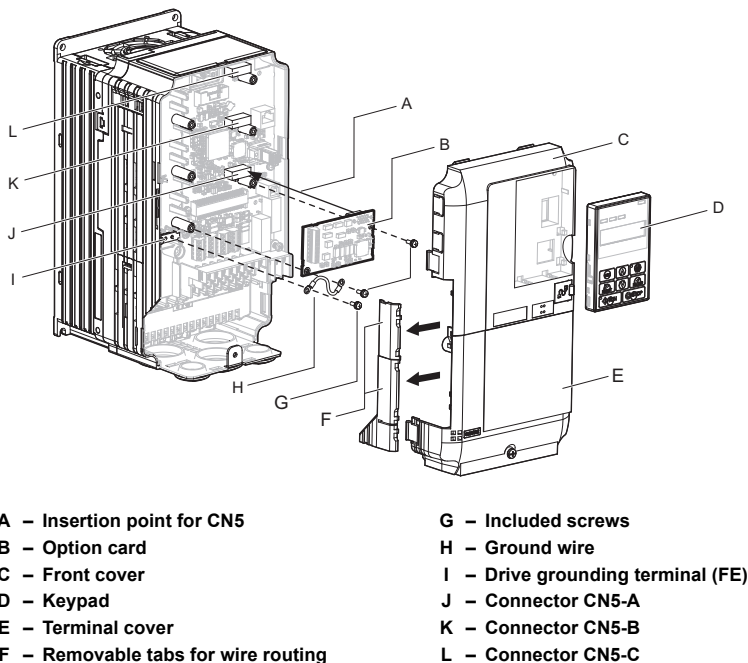


Figure 2 Drive Components with Option

5 Installation Procedure

Install the Option

Refer to the instructions below to install the option.

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

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

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

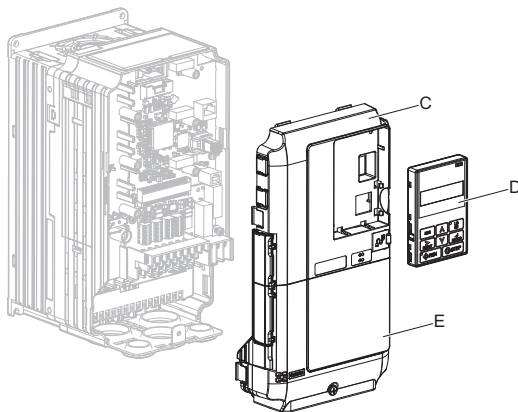


Figure 3 Remove the Keypad, Front Cover, and Terminal Cover

2. Insert the option card (B) into the CN5-A (J), CN5-B (K), or CN5-C (L) connector on the drive and fasten it into place using one of the included screws (G). Tighten both screws to 0.5 to 0.6 N·m (4.4 to 5.3 in·lb).

Note: Install the option to ports CN5-B and CN5-C on the drive for monitoring purposes only. Input levels will be displayed in monitor U1-17. The option will not set the frequency reference when connected to ports CN5-B or CN5-C.

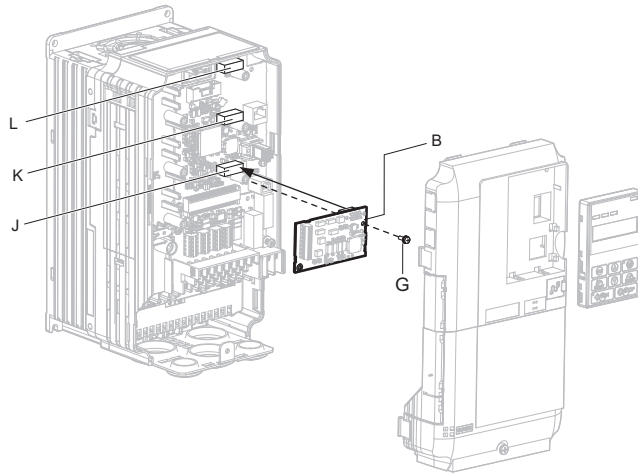


Figure 4 Insert the Option Card

5 Installation Procedure

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

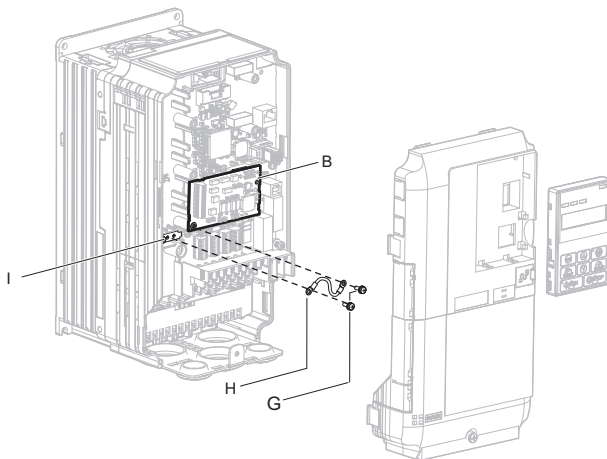


Figure 5 Connect the Ground Wire

- Note:**
1. The option package includes three ground wires. Use the longest wire to connect the option to CN5-C. Use the next longest wire to connect the option to CN5-B. Use the shortest wire to connect the option to CN5-A. Refer to [Option Package Contents on page 10](#) for more information.
 2. The drive has only two ground terminal screw holes (I). Two ground wires should share the same ground terminal when connecting three options.

4. Prepare and connect the wire ends as shown in [Figure 6](#) and [Figure 7](#). Refer to [Wire Gauges and Tightening Torques on page 39](#) to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! Fire Hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specified tightening torque may cause erroneous operation, damage the terminal block, or cause a fire.

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

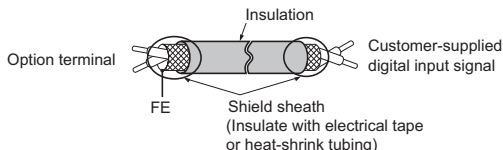


Figure 6 Prepare Ends of Shielded Cable

5. Wire the customer-supplied digital input signal to the terminal blocks on the option according to [Figure 7](#). Refer to [Figure 26](#) for the DI-A3 Option connection diagram. Refer to [Table 5](#) for a detailed description of the option terminal functions.

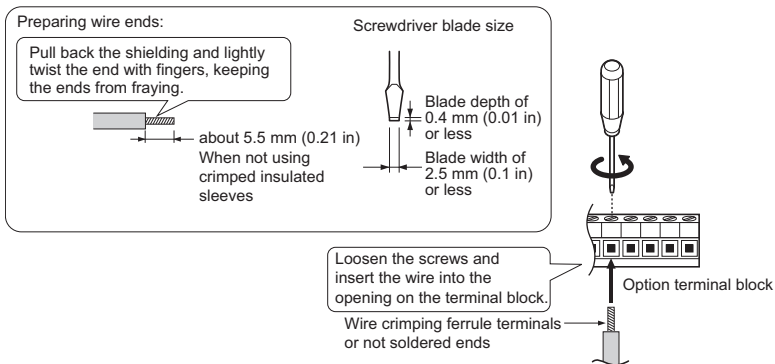


Figure 7 Connect Cable Wiring

6. Set the option for SINK mode or SOURCE mode depending on the application. Refer to [SINK Mode and SOURCE Mode on page 38](#) for details of each mode.

5 Installation Procedure

7. Route the option wiring inside the enclosure as shown in **Figure 8-B**. Take proper precautions so that the front covers will easily fit back onto the drive. Users may also choose to route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in **Figure 8-A** to create the necessary openings on these models. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information.

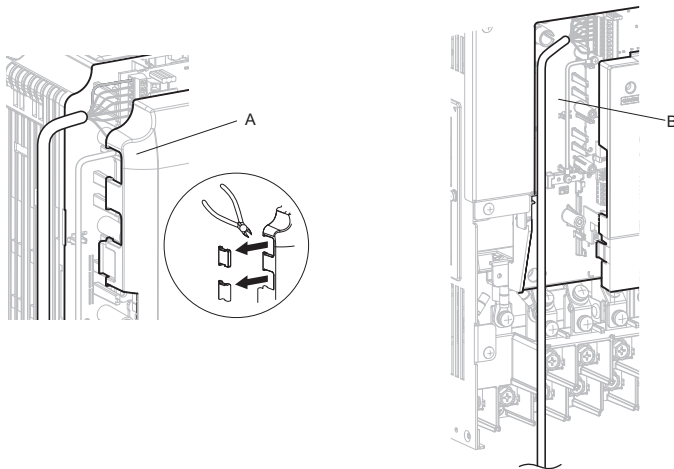


Figure 8 Wire Routing Examples

8. Reattach the drive front covers (C, E) and the keypad (D).

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

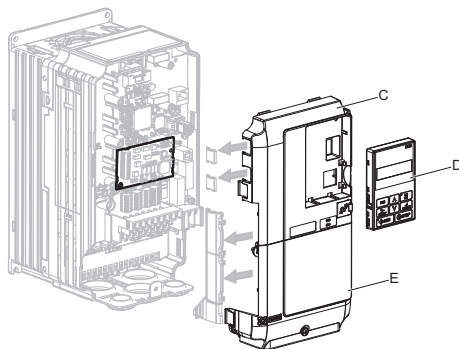


Figure 9 Replace the Front Covers and Keypad

9. Set drive parameters in [Table 6](#) for correct option performance.

5 Installation Procedure

■ Procedure B

This section shows the procedure to install and wire the option on a GA700, GA800, CR700, CH700, or LA700 drive.

Prepare the Drive for the Option

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
Refer to [Figure 10](#) for an exploded view of the drive with the option and related components for reference in the installation procedure.

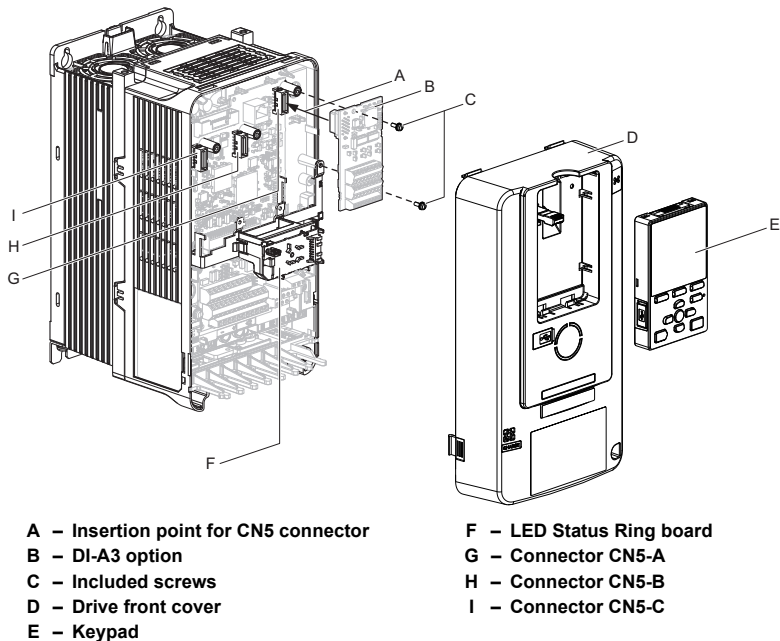


Figure 10 Drive Components with Option

Install the Option

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, confirm all charge indicator LEDs extinguish, then remove the front cover (D) including the keypad (E). Refer to the manual packaged with the drive for details on cover removal.

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

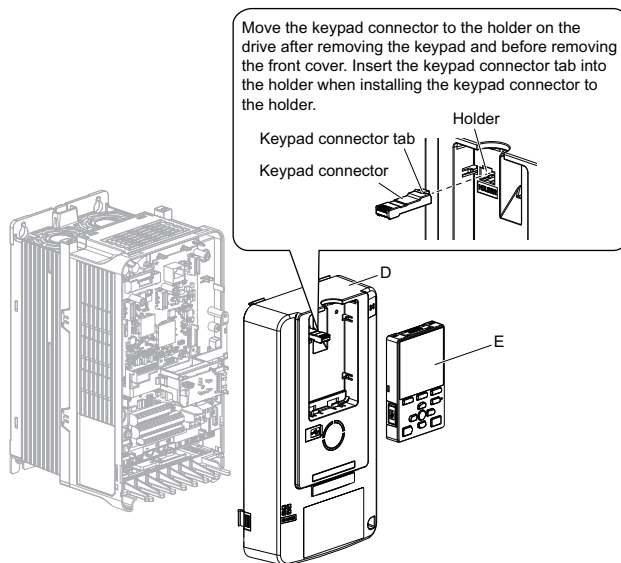


Figure 11 Remove the Front Cover Including Keypad

5 Installation Procedure

2. Carefully remove the LED Status Ring board (F) 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.

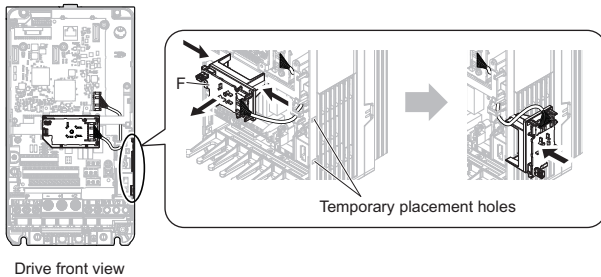


Figure 12 Remove the LED Status Ring Board

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

Note:

1. Installing the option card on GA700, GA800, CR700, CH700, and LA700 drives requires only two screws and does not require a ground wire. The option package ships with three screws and ground wires for installation on other product series. Do not use the ground wire or the extra screw.
2. Install the option to ports CN5-B and CN5-C on the drive for monitoring purposes only. Input levels will be displayed in monitor U1-17. The option will not set the frequency reference or multi-function digital inputs when connected to ports CN5-B or CN5-C.

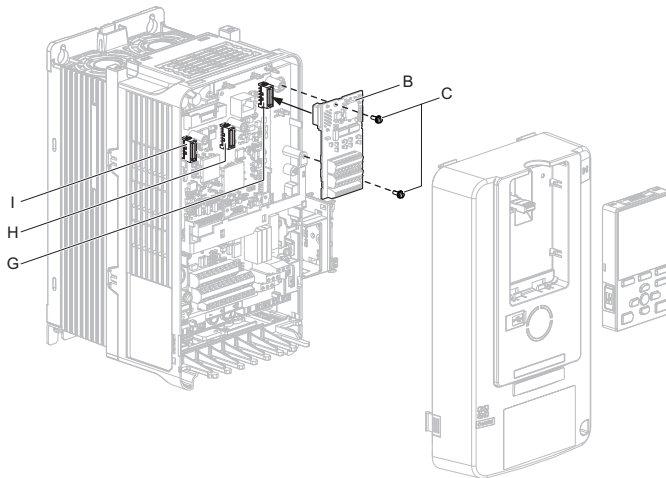


Figure 13 Insert the Option Card

4. Prepare the wire ends as shown in [Figure 14](#).

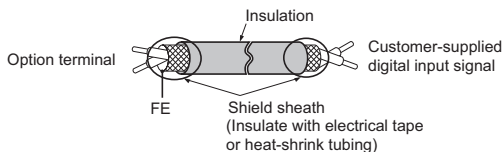


Figure 14 Prepare Ends of Shielded Cable

5 Installation Procedure

5. Wire the customer-supplied digital input signal to the terminal blocks on the option according to [Figure 15](#). Refer to [Figure 26](#) for the DI-A3 Option connection diagram. Refer to [Table 5](#) for a detailed description of the option terminal functions.

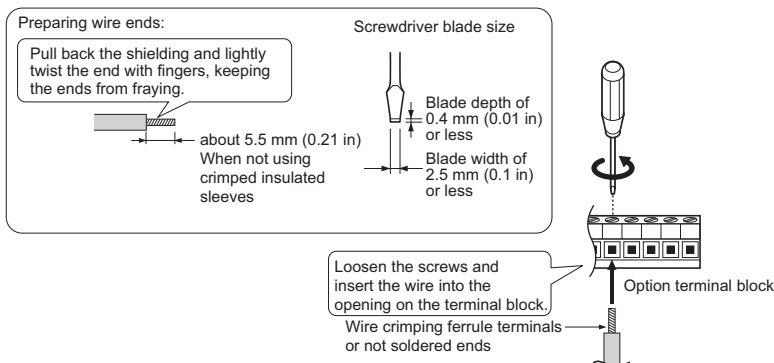


Figure 15 Connect Cable Wiring

6. Set the option for SINK mode or SOURCE mode depending on the application. Refer to [SINK Mode and SOURCE Mode on page 38](#) for details of each mode.

7. Reattach the LED Status Ring board (F) and the front cover of the drive (D) including the keypad (E).

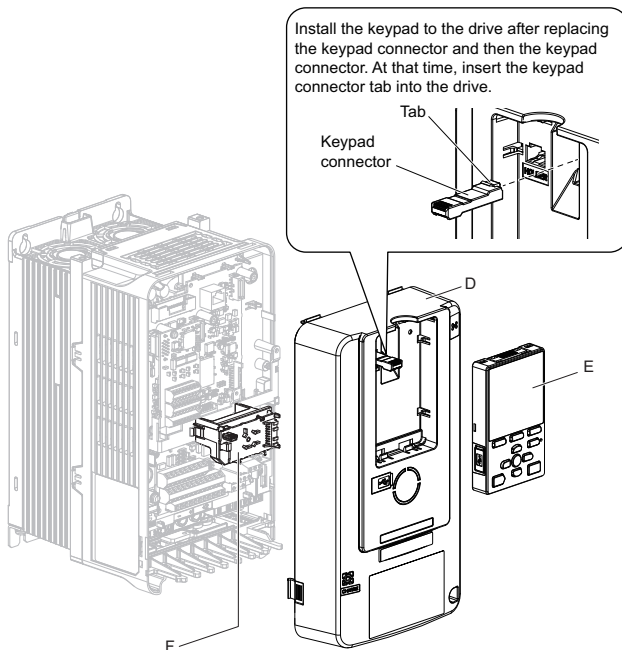


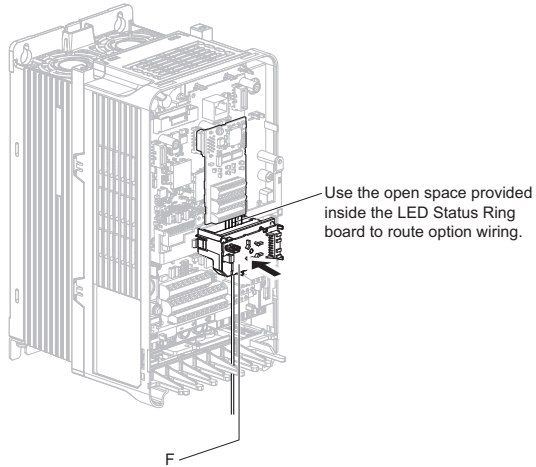
Figure 16 Replace the LED Status Ring Board, Front Cover, and Keypad

5 Installation Procedure

Reattach the LED Status Ring board (F).

Use the open space provided inside the LED Status Ring board to route option wiring when using connector CN5-B.

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.



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

■ Procedure C

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

Prepare the Drive for the Option

1. Correctly wire the drive as specified by the manual packaged with the drive.
2. Make sure that the drive functions correctly.
Refer to [Figure 17](#) for an exploded view of the drive with the option and related components for reference in the installation procedure.

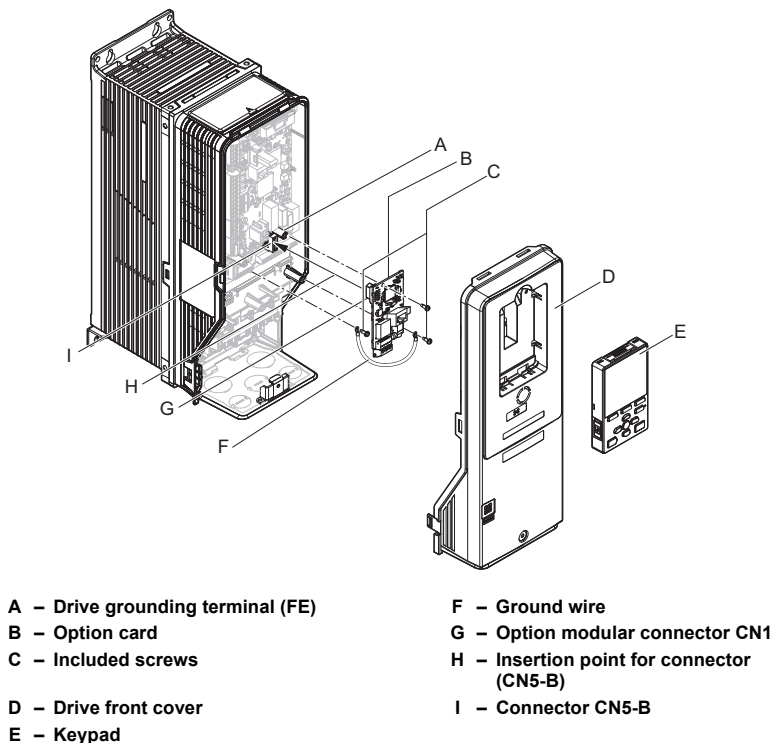


Figure 17 Drive Components with Option

5 Installation Procedure

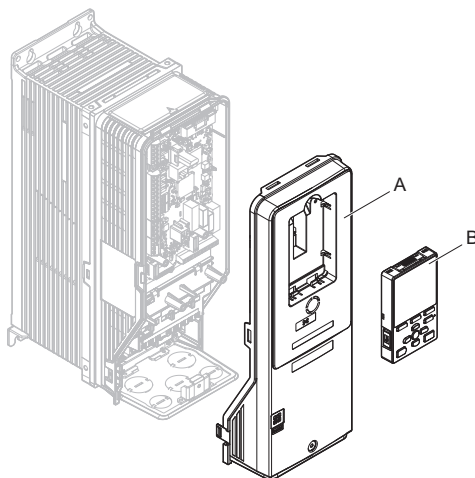
Install the Option

Refer to the instructions below to install the option.

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

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

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

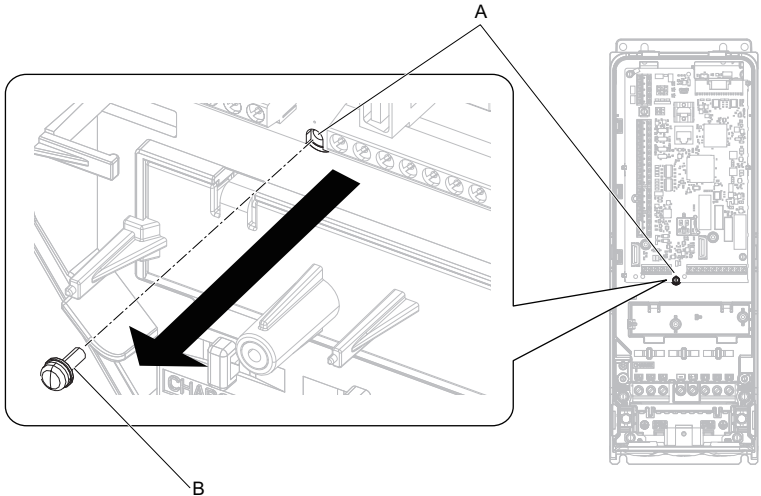


A – Drive front cover

B – Keypad

Figure 18 Remove the Front Cover and Keypad

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



A – Drive grounding terminal (FE)

B – Included screw

Figure 19 Remove the Screw from the Drive Grounding Terminal

5 Installation Procedure

3. Use the screw (B) installed in the FE ground terminal of the drive (A) to connect one end of the included ground wire (C) to the ground terminal on the drive. Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

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

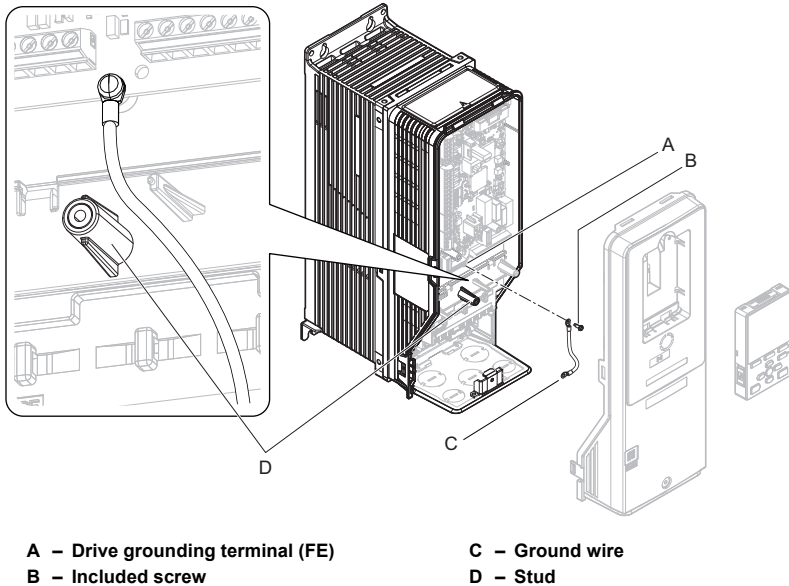


Figure 20 Connect the Ground Wire

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

Note: 1. Only two screws are necessary to install the option on FP605 drive.
2. The option package contains three screws and three ground wires.

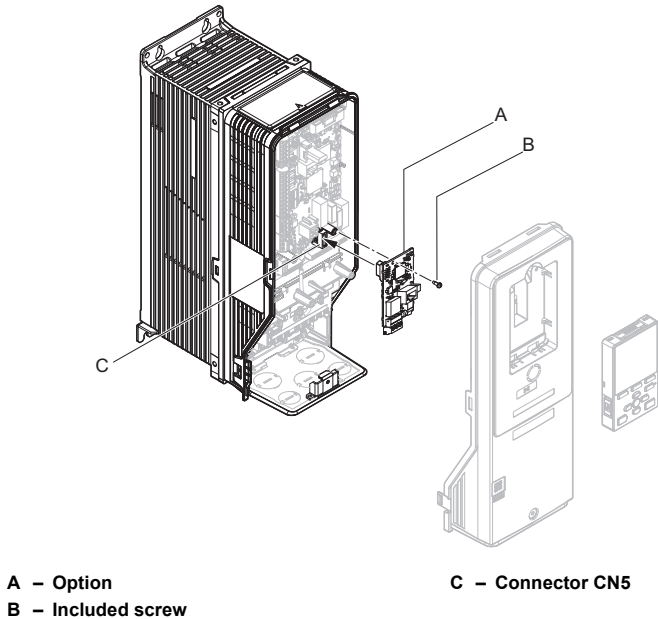


Figure 21 Install the Option

5 Installation Procedure

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

Note: Refer to [Figure 22](#) for instruction about crimp terminal orientation (C) and wire routing.

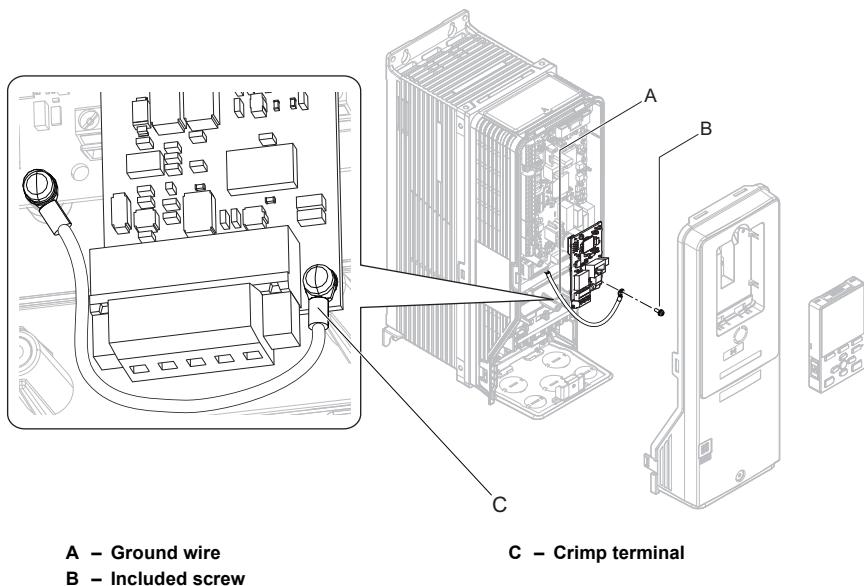


Figure 22 Connect the Ground Wire

6. Prepare and connect the wire ends as shown in [Figure 23](#) and [Figure 24](#). Refer to [Wire Gauges and Tightening Torques on page 39](#) to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! Fire Hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specified tightening torque may cause erroneous operation, damage the terminal block, or cause a fire.

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

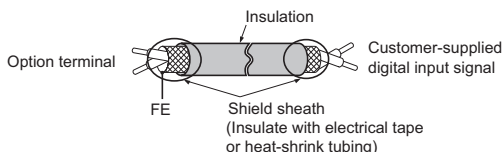


Figure 23 Prepare Ends of Shielded Cable

7. Wire the customer-supplied digital input signal to the terminal blocks on the option according to [Figure 24](#). Refer to [Figure 26](#) for the DI-A3 Option connection diagram. Refer to [Table 5](#) for a detailed description of the option terminal functions.

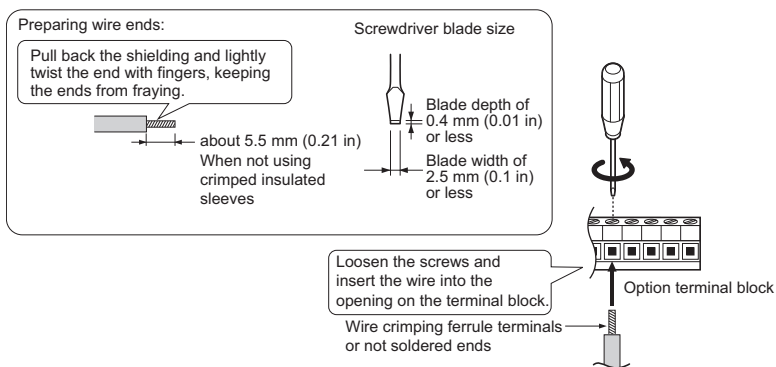


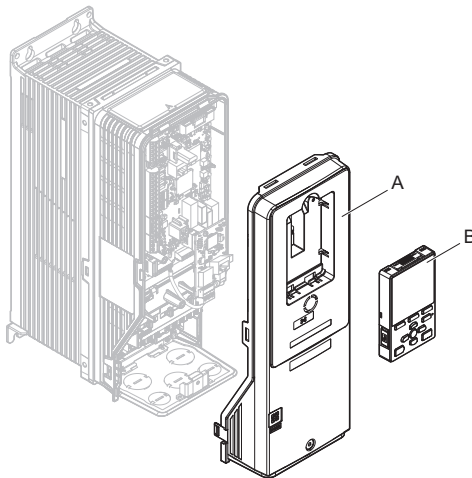
Figure 24 Connect Cable Wiring

8. Set the option for SINK mode or SOURCE mode depending on the application. Refer to [SINK Mode and SOURCE Mode on page 38](#) for details of each mode.

5 Installation Procedure

9. Reattach the drive front covers (A) and the keypad (B).

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



A – Drive front cover

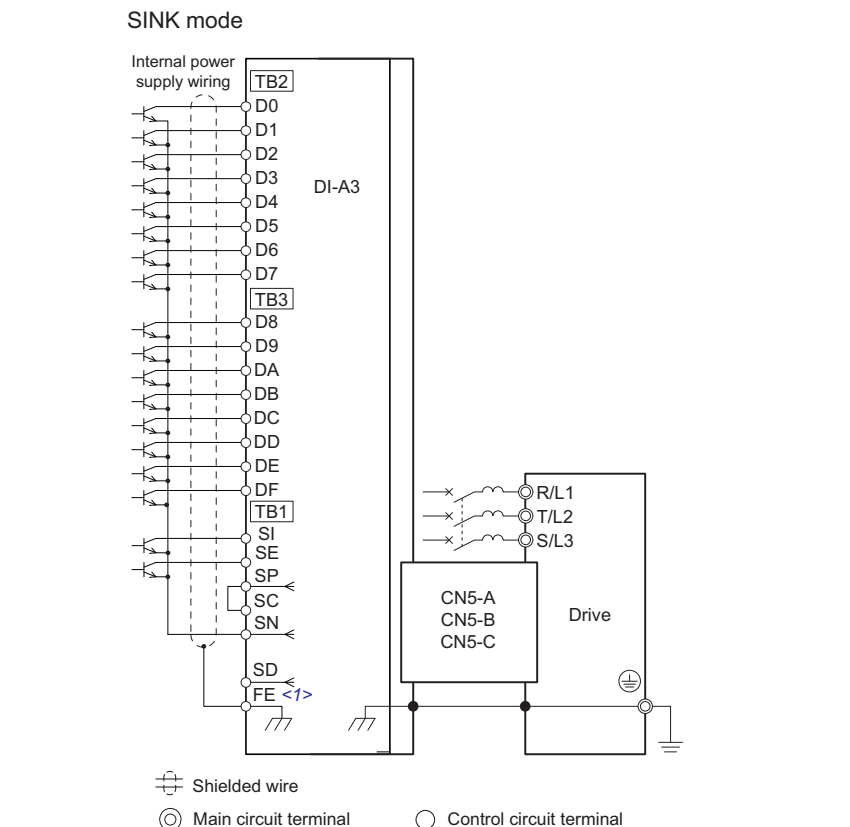
B – Keypad

Figure 25 Replace the Front Covers and Keypad

10. Set the drive parameters in [Table 6](#) for correct option performance.

◆ Option Connection Diagram

Refer to [Table 5](#) on page 40 for a detailed description of the option board terminal functions. To ensure accurate control, use a stable power supply for the voltage reference source.



<1> Connect the provided ground wire for installations on 1000-series and FP605 drives. The ground wire is not necessary for installation on GA700, GA800, CR700, CH700, and LA700 drives.

Figure 26 Option Connection Diagram

◆ SINK Mode and SOURCE Mode

■ SINK Mode

- To use the internal power supply of the drive, connect a wire jumper between terminals SP and SC.
- To use an external power supply, connect the positive lead from the power supply to terminal SC on the option. Do not connect the negative lead to terminal SN on the option.

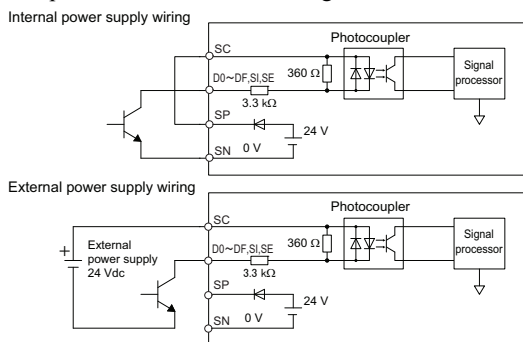


Figure 27 SINK Mode Connection Diagram

■ SOURCE Mode

- To use internal power supply of the drive, short terminals SN and SC.
- To use an external power supply, connect the negative lead from the power supply to terminal SC on the option. Do not connect the positive lead to terminal SP.

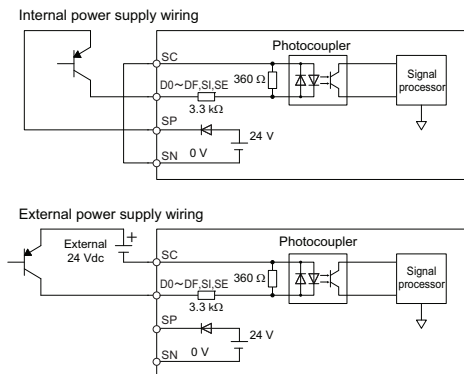


Figure 28 SOURCE Mode Connection Diagram

◆ Wire Gauges, Tightening Torques and Ferrule-Type Terminals

■ Wire Gauges and Tightening Torques

Wire gauge and torque specifications are listed in [Table 3](#).

Table 3 Wire Gauges and Tightening Torques

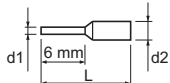
Terminal signal	Screw Size	Tightening Torque N·m (in·lb)	Bare Wire		Ferrule-Type Terminals		Wire Type
			Recommended Gauge mm ²	Applicable Gauges mm ²	Recommended Gauge mm ²	Applicable Gauges mm ²	
D0 to DF SI, SE, SP, SC, SN, SD, FE	M2	0.22 to 0.25 (1.95 to 2.21)	0.75 (18 AWG)	Stranded wire: 0.25 to 1.0 (24 to 17 AWG) Solid wire: 0.25 to 1.5 (24 to 16 AWG)	0.5 (20 AWG)	0.25 to 0.5 (24 to 20 AWG)	Shielded twisted pair, etc.

■ Ferrule-Type Terminals

Yaskawa recommends using CRIMPFOX 6 by Phoenix Contact or equivalent ferrule-type terminals with the specifications listed in [Table 4](#) for wiring to ensure proper connections.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 4 Ferrule-Type Terminal Sizes

Ferrule-Type Terminal	Wire Gauge mm ²	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
	0.25 (24 AWG)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (22 AWG)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (20 AWG)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

◆ Terminal Functions

Table 5 Option Terminal Functions

Terminal Block	Terminal	BCD, Signed						BCD, Unsigned	Binary, Signed			
		F3-01 = 0 to 5						F3-01 = 6 <1>	F3-01 = 7			
		8-bit		12-bit		16-bit		16-bit	8-bit	12-bit	16-bit	
		F3-03 = 0	F3-03 = 1	F3-03 = 2			F3-03 = 0	F3-03 = 1	F3-03 = 2			
TB2	D0	1 digit (0 to 9)	1	1 digit (0 to 9)	1	1 digit (0 to 9)	1	1 digit (0, 2, 4, 6, 8)	2	bit 0	bit 0	bit 0
	D1		2		2		2	4	bit 1	bit 1	bit 1	
	D2		4		4		4	8	bit 2	bit 2	bit 2	
	D3	2 digits (0 to 15) <2>	8	2 digits (0 to 9)	8	2 digits (0 to 9)	8	2 digits (0 to 9)	1	bit 3	bit 3	bit 3
	D4		1		1		1		2	bit 4	bit 4	bit 4
	D5		2		2		2		4	bit 5	bit 5	bit 5
	D6		4		4		4		8	bit 6	bit 6	bit 6
	D7		8		8		8		1	bit 7	bit 7	bit 7
TB3	D8	–	–	3 digits (0 to 15) <2>	1	3 digits (0 to 9)	1	3 digits (0 to 9)	2	–	bit 8	bit 8
	D9		–		2		2		4	–	bit 9	bit 9
	DA		–		4		4		8	–	bit 10	bit 10
	DB		–		8		8		1	–	bit 11	bit 11
	DC	–	–	–	–	4 digits (0 to 15) <2>	1	4 digits (0 to 9)	2	–	–	bit 12
	DD		–		–		2		4	–	–	bit 13
	DE		–		–		4		8	–	–	bit 14
	DF		–		–		8		1	–	–	bit 15
TB1	SI	Signed 0: Forward 1: Reverse						5 digits (0 to 3)	2	Signed 0: Forward 1: Reverse		
	SE	Set (Read) signal 1: Reads values set to D0 to DF, SI										
	SP	24 V ±5% internal power supply										
	SC	Input signal common										
	SN	Internal power supply common: 0 V										
	SD	Cable shield 2 (open)										
	FE	Shield ground										

<1> Setting parameter F3-01 to 6 is only possible when F3-03 = 2. Once enabled, the frequency reference can be set to any value between 0.00 to 399.98 Hz with a BCD signal. It is not possible to use a negative reference because the signed bit SI is also used. The smallest bit of the first digit starts with 2, so 0.02 Hz is the smallest frequency reference setting drive. Setting parameter F3-03 to any value except 2 will cause an oPE05 error to occur when F3-01 = 6.

<2> The most significant digits can be set from 0 to 15 in BCD and signed input. Other digits can be set from 0 to 9.

◆ Input Timing

The SET (Read) signal can read digital references. To change the setting of the digital reference (DF to D0, SIGN data), input the SET signal at the timing shown in [Figure 29](#).

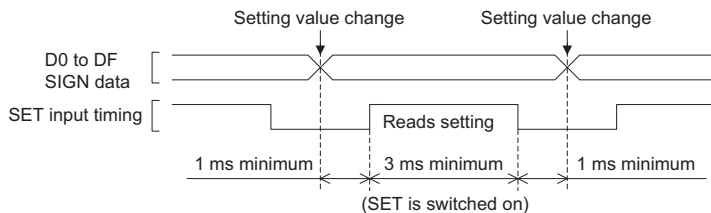


Figure 29 SET Input Timing

6 Related Parameters

The parameters outlined in the following sections are used to set up the drive for operation with the option. Set parameters as needed. Refer to the manual packaged with the drive for details on setting parameters.

◆ Parameter Table

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

Table 6 Related Parameters

No. (Hex.)	Name	Description	Values
b1-01 (180)	Reference 1 Source	Selects the input method for frequency reference. 0: Keypad 1: Analog Input 2: Memobus/Modbus Communications 3: Option PCB 4: Pulse Train Input	Default: 1 Range: 0 to 4 (Set to 3)
F3-01 (390) </>	Digital Input Function Selection	Selects the method to input the option data. 0: BCD, 1% units 1: BCD, 0.1% units 2: BCD, 0.01% units 3: BCD, 1 Hz units 4: BCD, 0.1 Hz units 5: BCD, 0.01 Hz units 6: BCD (5-digit), 0.01 Hz 7: Binary input (F3-03=0: 255/100%; F3-03=1: 4095/100%; F3-03=2: 30000/100%) Keypad display units are determined by parameter o1-03. 8: Multi-function Digital input	Default: 0 </> Range: 0 to 8 </>
F3-03 (3B9)	DI Data Length Selection	0: 8 bit data 1: 12 bit data 2: 16 bit data	Default: 2 Range: 0 to 2
F3-10 to F3-25 (0BE3 to 0BF2) </> Expert </>	Terminals D0 to DF Function Selection	Selects the function for terminals D0 to DF of DI-A3 when F3-01=8. Note: The availability of this function depends on the drive. Refer to the instruction manuals of specific drives for details.	Default: F Range: 1 to 1FF

- <1> Binary input is not possible if o1-03 is set to 2 or 3. The setting of F3-01 will then be disregarded and setting drives will be determined by o1-03. When using YASKAWA AC Drive 1000-Series, the setting range will depend on the software version of the drive. Refer to the drive instruction manual for details.
- <2> Default setting is 8 for GA800 and FP605.
- <3> The setting range is 0 to 7 when using YASKAWA AC Drive 1000-Series.
- <4> Set b1-01 $\neq$ 3 to use as multi-function digital inputs.
- <5> This parameter is available only in Expert mode. Parameters in Expert mode can be displayed or set if A1-01 (Access Level Selection) is set to 3 (Expert Level).

7 Troubleshooting

◆ Drive-Side Error Codes

Table 7 lists the various fault codes related to the option. Refer to the drive Technical Manual for further details on fault codes.

Confirm the following items upon receiving an error notification on the drive keypad:

1. Correct and secure cable connections including ground wiring.
2. Proper option installation.
3. No momentary power loss occurred.

Table 7 Fault Displays, Causes, and Possible Solutions

Keypad Display		Fault Name
	oFA01	Option is not properly connected.
Cause		Possible Solution
The option connected to option port CN5-A was changed during run.		De-energize the drive and plug the option into the drive according to Installation Procedure on page 12 .
Keypad Display		Fault Name
	oFb01	Option Card Fault (CN5-B)
		Option is not properly connected.
Cause		Possible Solution
Option in drive port CN5-B was changed during run.		De-energize the drive and plug the option into the drive according to Installation Procedure on page 12 .
Keypad Display		Fault Name
	oFb02	Option Fault (CN5-B)
		Two identical options are connected at the same time.
Cause		Possible Solution
DI-A3 option connected to CN5-B port while another option was connected to CN5-A port.		Only one of the options: DI-A3, AI-A3, or SI-□□ can be connected to the drive at the same time.
Keypad Display		Fault Name
	oFC01	Option is not properly connected.
		Possible Solution
Option at drive port CN5-C was changed during run.		De-energize the drive and plug the option into the drive according to Installation Procedure on page 12 .

Keypad Display		Fault Name	
	oFC02	Option Fault (CN5-C)	
		Two identical options are connected at the same time.	
Cause		Possible Solution	
DI-A3 option connected to CN5-C port while another option was connected to CN5-A port.		Only one of these options, DI-A3, AI-A3, or SI-□□ can be connected to the drive at the same time.	
Keypad Display		Fault Name	
	oPE05	Run command/frequency reference source selection error.	
Cause		Possible Solution	
Frequency reference is assigned to an option (b1-01 = 3) but an option is not connected.		Reconnect the option to the drive.	
Although the digital card input is set for BCD special for a 5 digit input (F3-01 = 6), the data length is set for 8 bit or 12 bit (F3-03 = 0, 1).		Set the input data for 16 bit (F3-03 = 2).	

◆ Option Compatibility

Users may connect up to 3 options simultaneously depending on the type of option. Refer to [Table 8](#) for details.

- Note:**
1. You can connect two options to an FP605 drive. Connect the communication option to the CN5-B connector.
 2. Compatible communication options are different for different models. Refer to the drive manuals for more information.

Table 8 Option Compatibility

Option Card	Connector	Number of Cards Possible
PG-B3 <1>, PG-X3 <1>	CN5-B, C	2 <2>
PG-RT3 <1> <3> <4>, PG-F3 <1> <3> <4>	CN5-C	1
DO-A3, AO-A3	CN5-A, B, C	1
SI-C3, SI-N3, SI-P3, SI-S3, SI-T3, SI-ET3, SI-ES3, SI-B3, SI-M3, SI-W3 <4>, SI-EM3 <4>, SI-EM3D <4>, SI-EN3 <4>, SI-EN3D <4>, SI-EP3, JOHB-SMP3, AI-A3 <5>, DI-A3 <5>	CN5-A	1

<1> Not available with FP605.

<2> When connecting two PG option cards, use both CN5-B and CN5-C. When connecting only one PG option card, use the CN5-C connector.

<3> Not available for the application with Motor 2 Selection.

<4> Not available with 1000-Series products with a capacities between 450 and 630 kW.

7 Troubleshooting

<5> When you use the input status of AI-A3 and DI-A3 as a monitor, you can connect AI-A3 and DI-A3 to CN5-A, CN5-B, and CN5-C.

◆ Preventing Electrical Signal Interference

Take the following steps to prevent erroneous operation caused by electrical signal interference:

- Use shielded wire for the signal lines.
- Limit the length of wiring under 50 m (164 ft).
- Separate the control wiring to the option, main circuit wiring, and power lines.

8 European Standards



Figure 30 CE Mark

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

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

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

This option displays the CE mark based on the EMC Directive: 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 Directive Compliance

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

■ EMC Directive Installation Conditions

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

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 31](#) and [Figure 32](#).

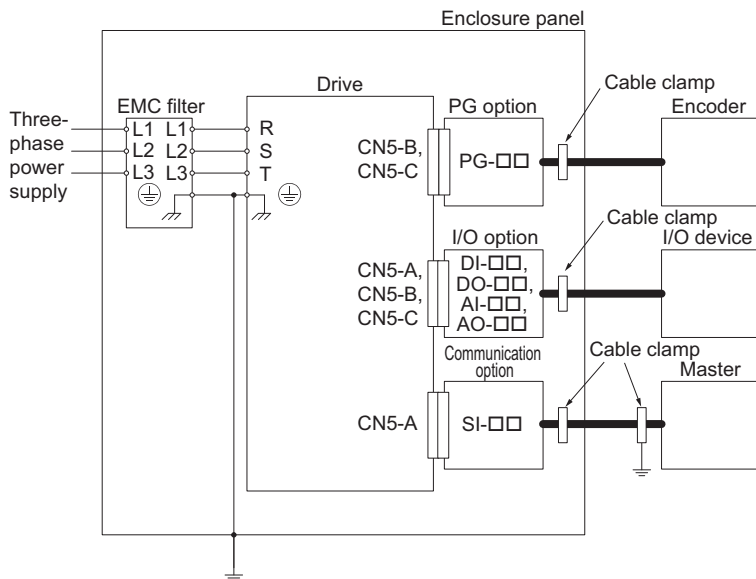


Figure 31 Option Installation for CE Compliance: 1000-Series, GA700, GA800, CR700, CH700, LA700

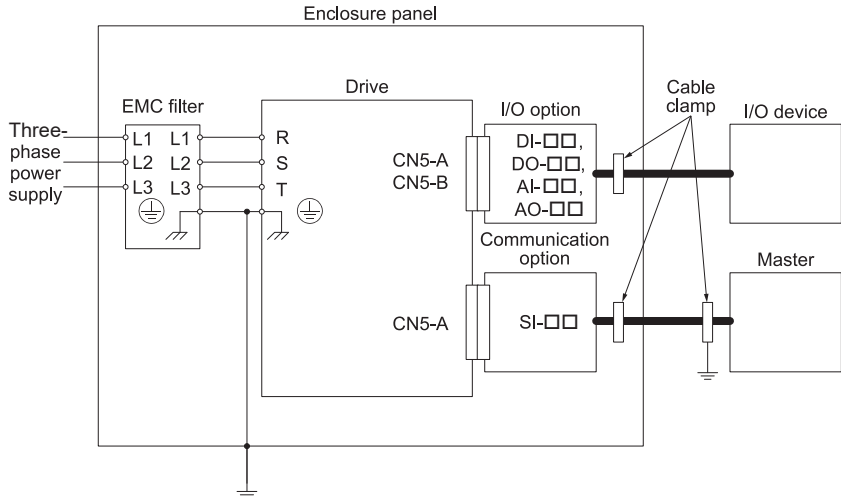


Figure 32 Option Installation for CE Compliance: FP605

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

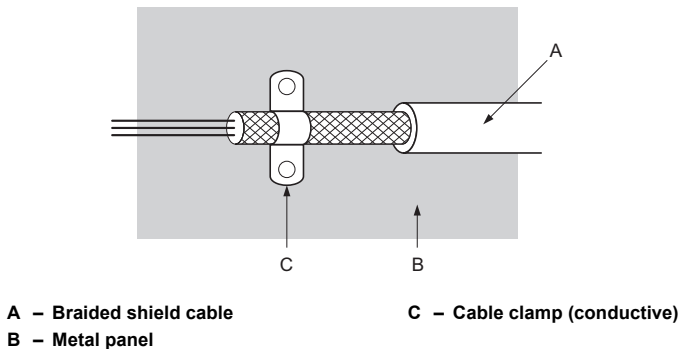


Figure 33 Ground Area

9 United Kingdom Conformity Assessed Marking



Figure 34 UKCA Mark

The UKCA mark indicates compliance with United Kingdom safety and environmental regulations.

It is required for engaging in business and commerce in the United Kingdom.

United Kingdom standards include the Supply of Machinery (Safety) Regulations (Machinery) for machine manufacturers, the Electrical Equipment (Safety) Regulations (Low voltage) for electronics manufacturers, and the Electromagnetic Compatibility Regulations (EMC) for controlling noise.

This product displays the UKCA mark in accordance with the EMC.

Table 9 Designated Standards

Statutory Instruments	Designated Standards
Electromagnetic Compatibility Regulations S.I. 2016 No. 1091	EN 61800-3 </>
Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations S.I. 2012 No. 3032	EN IEC 63000 </>

</> Refer to the "UK Declaration of Conformity" for the year of the Designated Standards.

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

10 Specifications

Table 10 Option Specifications

Item	Description
Model	DI-A3
Input Terminals	18 terminals (including SET and SIGN signals)
Input Signal Type (Parameter Settings)	Binary 16-bit, 4-digit BCD Binary 12-bit, 3-digit BCD Binary 8-bit, 2-digit BCD
Input Signal	SINK, SOURCE, external power supply Photocoupler input: 24 Vdc, 8 mA
Ambient Temperature	-10°C to +50°C (14°F to 122°F)
Humidity	95% RH or lower with no condensation
Storage Temperature	-20°C to +60°C (-4°F to +140°F) allowed for short-term transport of the product
Area of use	Indoors and free from: • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	1000 m (3280 ft) or lower

11 Disposal

◆ Disposal Instructions

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

◆ WEEE Directive



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

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

◆ Revision History

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

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			Chapter 9	Addition: United Kingdom Conformity Assessed Marking
			Back cover	Revision: Address
February 2022	<6>	0	All	Addition: Information on FP605 Revision: Reviewed and corrected entire documentation.
July 2020	<5>	0	Back cover	Revision: Address
October 2018	<4>	0	All	Addition: Information on GA800 Revision: Reviewed and corrected entire documentation.
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YASKAWA AC Drive Option

Digital Input

Installation Manual

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Act. 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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