



YASKAWA

YASKAWA AC Drive-Option Card

Digital Input Installation Manual

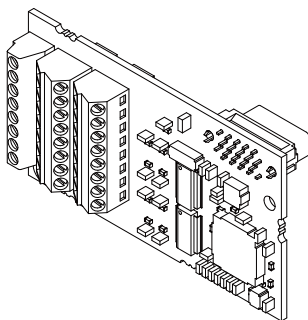
Type DI-A3

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 オプションカード デジタル入力 取扱説明書

形式 DI-A3

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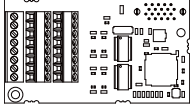
1 Preface

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer 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 systems or equipment designed to incorporate a product 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 Yaskawa 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.

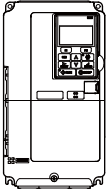
◆ Applicable Documentation

This instruction manual has been written for the items listed below. Use this option card for its intended purpose only.

Option Card

	<p>YASKAWA AC Drive-Option Card Digital Input DI-A3 Installation Manual (this book) Document No. TOBP C730600 39</p> <p>Read this manual first. It contains information required to install the option card and set up related drive parameters.</p>
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Drive

	<p>Refer to the manual of the drive this option card is being used with. The manual for the drive covers basic installation, wiring, operation procedures, functions, troubleshooting, and maintenance information. It also includes important information on parameter settings and how to tune the drive. To obtain instruction manuals for Yaskawa products access these sites: Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative.</p>
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◆ Registered Trademarks

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◆ Supplemental Safety Information

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

The option unit must be installed according to this manual and local codes.

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Indicates an equipment damage message.

1 Preface

■ General Safety

General Precautions

- The diagrams in this section may include option units and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- 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.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

DANGER

Heed the safety messages in this manual.

Failure to comply will result in 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.

NOTICE

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the option unit

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

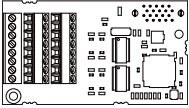
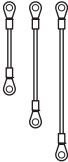

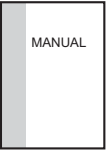
2 Product Overview

◆ Regarding this Product

Using this option card the drive's frequency reference can be set using binary coded digital inputs.

◆ Checking Package Contents

Table 1 Items Included with this Option Card

Package Contents	Option Card	Lead Lines (for grounding)	Screws (M3)	Manual (this book)
—				
Number of Items	1	3	3	1

- Inspect the Option Card for damage. If the Option Card appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the model number printed on the Name plate of the Option Card. (see [Figure 1](#))
- If you have received the wrong model or the Option Card does not function properly, contact your supplier.

◆ Tools Required for Installation

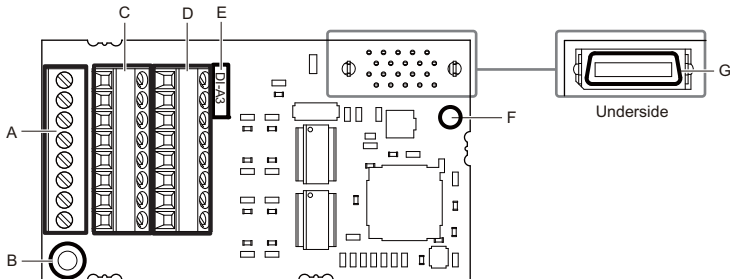
A Phillips screwdriver PH1 (#1) is needed to install this option card.

Additionally a straight-edge screwdriver (blade depth: 0.4 mm, width: 2.5 mm) will be needed to wire the terminal block.

Note: Other tools are required for preparing cables.

3 Option Card Components

◆ Option Card



- A – Terminal block TB1
- B – Ground terminal (installation hole)
- C – Terminal block TB2
- D – Terminal block TB3
- E – Model number
- F – Installation hole
- G – Connector (CN-5)

Figure 1 Option Card

◆ Terminal Block

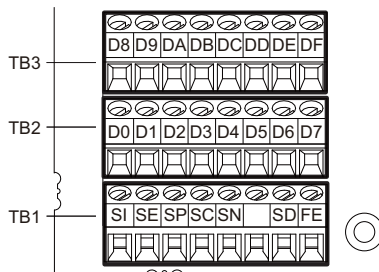


Figure 2 Terminal Block

4 Electrical Installation

◆ Safety Messages

DANGER

Electric Shock Hazard

Power to the drive must be shut off when installing this option card. Even though the power has been shut off, voltage still remains in the drive's DC bus. Wait before removing the front cover once the drive has been turned off. The CHARGE light on the drive will go out after voltage in the DC bus drops below 50 V, at which point it is safe to remove the front cover. Due to the risk of electric shock, be sure that all LEDs have gone out and that the DC bus voltage has reached a safe level prior to performing any work on the drive.

WARNING

Electrical Shock Hazard

Do not allow unqualified personnel to perform work on the drive. Failure to comply could result in death or serious injury. Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives and Option Cards.

NOTICE

Damage to Equipment

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

Failure to comply may result in ESD damage to circuitry.

Never shut the power off while the drive is outputting voltage.

Failure to comply may cause the application to operate incorrectly or damage the drive.

Do not operate damaged equipment.

Failure to comply may cause further damage to the equipment.

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

Properly connect all pins and connectors.

Failure to comply may prevent proper operation and possibly damage equipment.

◆ Installing the Option Card

Insert the option card in the CN5-A connectors located on the drive's control board. See the drive manual for directions on removing the front cover.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the operator and front cover.
2. Insert the CN5 connector on the option card into the matching CN5 connector on the drive, then fasten it into place using one of the screws included with the option card.

Connect one of the lead lines using one of the screws to the ground terminal.

Note: There are only two screw holes on the drive for ground terminals. If three option cards are connected, two of the lead lines will need to share the same ground terminal.

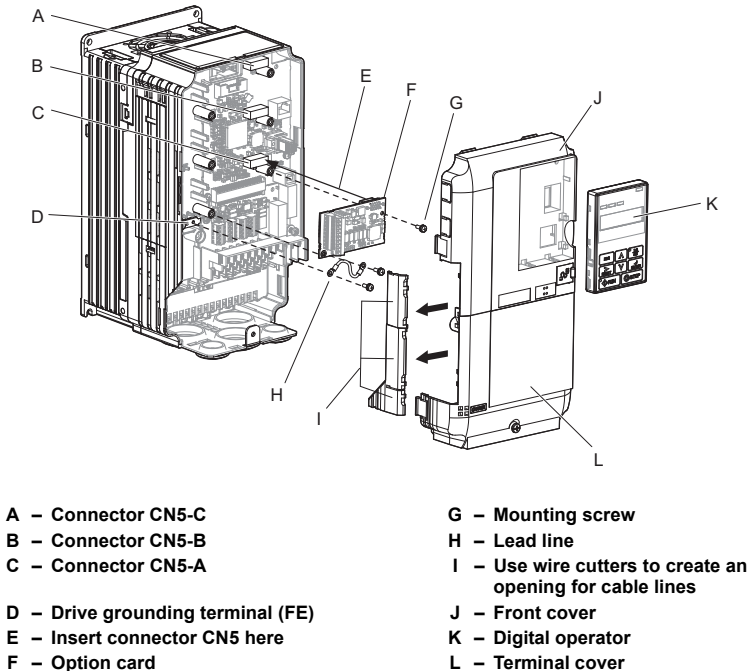


Figure 3 Installing the Option Card

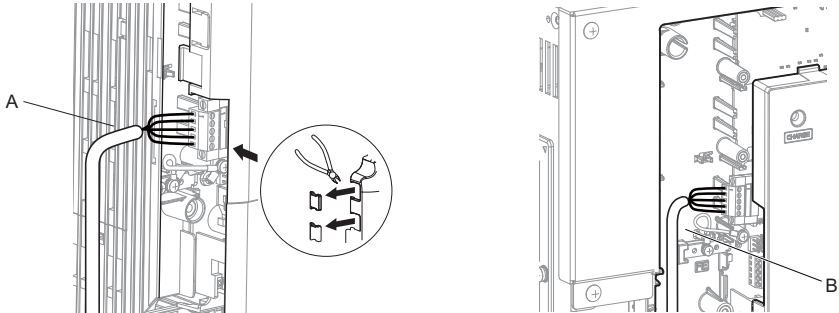
4 Electrical Installation

3. Wire the option card to the terminal block on the option card.

For wiring instructions, see [Connection Diagram on page 13](#).

In the drives CIMR-A□2A0004 to 0040, 4A0002 to 0023 the cable might need to be routed through the top cover to the outside. In this case cut out the perforated openings at the left side of the drive top cover. Make sure no sharp edges that can damage the cable remain.

In the drives CIMR-A□2A0056 to 0211, 4A0031 to 0165 the cable can be routed inside the drive.



A – Wires should pass through the access hold provided on the left side of the front cover.
(CIMR-A□2A0004 to 0040, 4A0002 to 0023)

B – Use the open space provided inside the drive to route option card wiring.
(CIMR-A□2A0056 to 0211, 4A0031 to 0165)

Figure 4 Wiring space

4. Place the front cover back onto the drive.

- Note:**
1. Take care when wiring the option card so that the front cover easily fits back onto the drive. Make sure a cable is not caught between the front cover and the drive when putting the cover back on.
 2. The drive will not be used as NEMA Type1 if there is any exposed wiring outside the enclosure.

◆ Connection Diagram

Wire terminals on the option card as illustrated in *Figure 5*.

Refer to *Terminal Functions on page 15* for the different functions that can be assigned to the terminals.

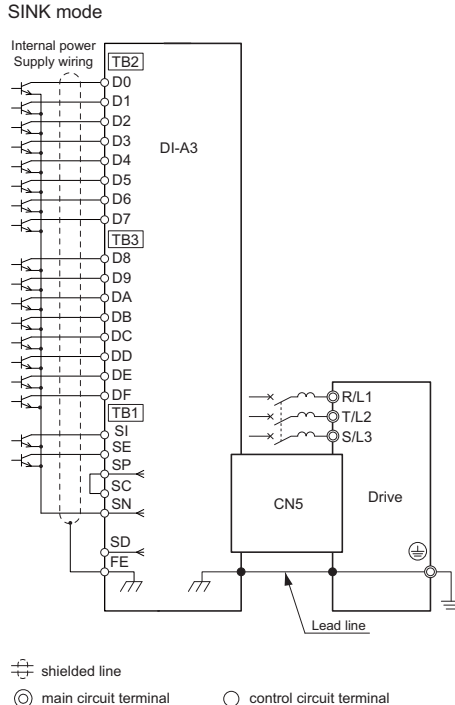


Figure 5 Wiring the Option Card and Drive

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

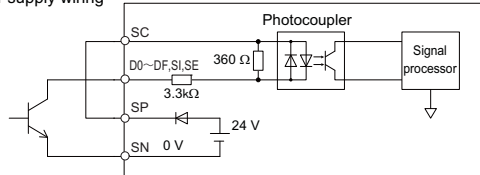
- Use shielded wire for the signal lines.
- Keep wiring under 50 m.
- Make sure that control lines to the option card, main circuit wiring, and power lines are separated from one another.

4 Electrical Installation

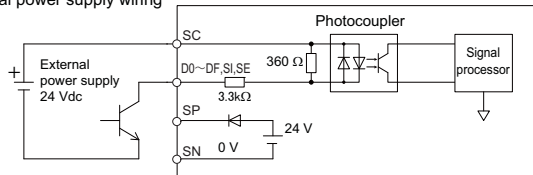
SINK Mode

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

Internal power supply wiring



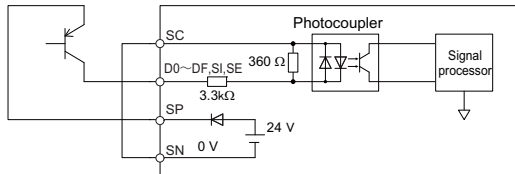
External power supply wiring



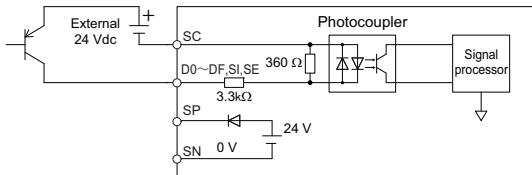
SOURCE Mode

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

Internal power supply wiring



External power supply wiring



◆ Terminal Functions

Table 2 Terminal Function Selection

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 = 2		F3-03 = 0	F3-03 = 1	F3-03 = 2
TB2	D0		1		1		1	1 digit (0 to 9)	2	bit 0	bit 0	bit 0
	D1	1 digit (0 to 9)	2	1 digit (0 to 9)	2	1 digits (0 to 9)	2	2 digits (0 to 9)	4	bit 1	bit 1	bit 1
	D2		4		4		4		8	bit 2	bit 2	bit 2
	D3	8	8	8	8	1	bit 3		bit 3	bit 3		
	D4	2 digits (0 to 15)	1	2 digits (0 to 15)	1	2 digits (0 to 9)	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)	1	3 digits (0 to 9)	1		4 digits (0 to 9)	2	-	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)	1	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> The setting F3-01 = 6 is enabled only when F3-03 = 2. Once enabled, the frequency reference can be set from 0.00 to 399.8 Hz with a BCD signal. Because the signed bit SI is also used, a negative reference cannot be input. The smallest bit of the first digit starts with 2, so that 0.02 Hz is the smallest unit that can be used for the frequency reference setting.

4 Electrical Installation

◆ Input Timing

In order to activate the reference value set by the digital input as frequency reference the controller has to activate the SET input using the timing illustrated in *Figure 6*. The controller should switch off the SET signal and wait at least 1 ms before the changing digital inputs. After changing the inputs it should wait at least 1 ms before enabling the SET signal. The SET signal should be activated for at least 3 ms.

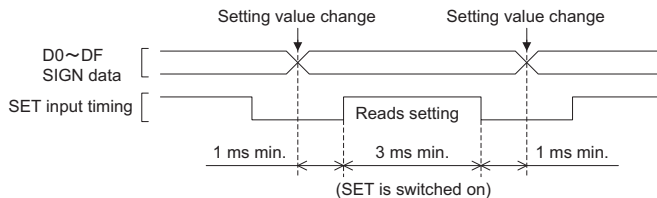


Figure 6 SET Input Timing

◆ Wire Gauges and Tightening Torque

Wire gauge specifications are listed below in [Table 3](#).
Yaskawa recommends using crimp terminals for easy of wiring and to ensure proper connection. Crimp terminal specifications can be found in [Table 4](#).

Table 3 Wire Gauges and Tightening Torque

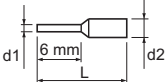
Terminal Signal	Screw Size	Tightening Torque (N·m)	Bare Cable		Wiring Gauges with Crimp Terminals		Wire Type
			Possible Gauges mm ² (AWG)	Recommended Gauges mm ² (AWG)	Possible Gauges mm ² (AWG)	Recommended Gauges mm ² (AWG)	
D0 to DF, SI,SE,SP, SC,SN,FE	M2	0.22 to 0.25	Stranded wire: 0.25 to 1.0 (24 to 17) Single line: 0.25 to 1.5 (24 to 16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	Shielded twisted pair, etc.

■ Crimp Terminals

Yaskawa recommends using CRIMPFOX ZA-3 by Phoenix Contact to crimp the terminal ends.

Note: Wire ends should be properly trimmed so no wire extends out from the crimp terminals.

Table 4 Crimp Terminal Sizes

	Wire Gauge mm ² (AWG)	Model	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
	0.25 (24)	AI 0.25 - 6YE	10.5	0.8	2	Phoenix Contact
	0.34 (22)	AI 0.34 - 6TQ	10.5	0.8	2	
	0.5 (20)	AI 0.5 - 6WH	14	1.1	2.5	

4 Electrical Installation

◆ Wiring Procedure

When wiring the option card, wire ends should be prepared as shown in [Figure 7](#). See [Wire Gauges and Tightening Torque on page 17](#) to make sure the proper tightening torque is applied to each terminal end.

Take particular precautions to ensure that each cable is properly connected, and that wire insulation has not been accidentally inserted into the terminals.

NOTICE: *Insulation or tape may be required to ensure that shielded lines do not come into contact with other wiring. Insufficient insulation may cause a short circuit that can damage the option card and the drive.*

NOTICE: *Follow the tightening torque specifications in this manual for all terminal screws. Failing to do so may keep the drive from functioning properly and could damage the terminal block.*

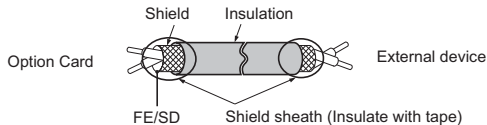


Figure 7 Treating Terminal Ends for Shielded Line

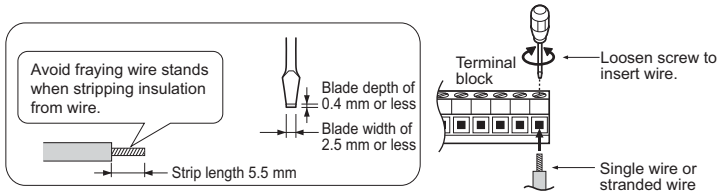


Figure 8 Terminal Block Wiring

5 Related Parameters

The following parameters are used to set up the drive for operation with an option card. Set parameters as needed. Instructions on how to set parameters can be found in the instruction manual for the drive the option card is connected to.

Table 5 Related Parameters

No.	Parameter Name	Description	Setting Range	Default
F3-01 </>	Option Card Input Selection	Selects the method to input the option card data. 0: BCD 1% unit 1: BCD 0.1% unit 2: BCD 0.01% unit 3: BCD 1 Hz unit 4: BCD 0.1Hz unit 5: BCD 0.01Hz unit 6: BCD custom setting (5 digit input), 0.02 Hz units 7: Binary input	0 to 7	0
F3-03	Data Length Selection	0: 8 bit 1: 12 bit 2: 16 bit	0 to 2	2

<1> Binary input is not possible if o1-03 is set to 2 or 3. The setting of F3-01 will be disregarded and setting units will be determined by o1-03.

6 Troubleshooting

◆ Error Codes Displayed on the Drive Operator

The table below lists the various fault codes related to this option card. Further detail on various faults can be found in the instruction manual for the drive.

- Check all cables connected to the option card.
- Make sure the option card is properly installed to the drive.

Table 6 Fault Display

Digital Operator Display		Fault Name
oFA01	oFA01	Option Card Connection Error at CN5-A
Cause		Possible Solution
Option card at port CN5-A was changed during run.		Switch the power off and reconnect the option card.
Digital Operator Display		Fault Name
oFb01	oFb01	Option Card Connection Error at CN5-B
Cause		Possible Solution
Option card at port CN5-B was changed during run.		Switch the power off and reconnect the option card.
Digital Operator Display		Fault Name
oFb02	oFb02	Duplicate Option at Port CN-B
Cause		Possible Solution
Same type of option card connected to ports CN5-A and CN5-B.		Use only compatible option cards. See note </>.
Digital Operator Display		Fault Name
oFC01	oFC01	Option Card Connection Error at CN5-C
Cause		Possible Solution
Option card at port CN5-C was changed during run.		Switch the power off and reconnect the option card.
Digital Operator Display		Fault Name
oFC02	oFC02	Duplicate Option Connected
Cause		Possible Solution
Same type of option card connected to ports CN5-A, CN5-B, and CN5-C.		Use only compatible option cards. See note </>.

Digital Operator Display		Fault Name
oPE05	oPE05	Run Command/Frequency Reference Source Selection Error
Cause		Possible Solutions
Frequency reference is assigned to an option card (b1-01 = 3) but an input option card is not connected to the drive.		Reconnect the input option card to the drive.

<1> Depending the type of option card, only a certain number of cards may be connected at the same time. Refer to table below. More details can be found in the option card section of the drive instruction manual.

Table 7 Option Card Installation

Option Card	Connector	Number of Cards Possible
SI-C3, SI-N3, SI-P3, SI-S3, AI-A3, DI-A3 <2>	CN5-A	1
PG-B3, PG-X3	CN5-B, C	2 <3>
DO-A3, AO-A3	CN5-A, B, C	1

<2> The AI-A3 and DI-A3 option can also be installed to option ports CN5-B and CN5-C, but are then used for monitoring purposes only. Input levels are then displayed in U1-17, U1-21 to U1-23. Here, the option cards cannot be used to set the frequency reference or replace the drive analog input with higher resolution inputs.

<3> If only one PG option card is connected to the drive, use the CN5-C connector. If two PG option cards are connected, use both CN5-B and CN5-C.

7 Specifications & Warranty Information

◆ Specifications

Table 8 Specifications

Model	DI-A3
Digital Input	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
Humidity	95% RH or less with no condensation
Storage Temperature	-20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	1000 m or less

◆ Revision History

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

MANUAL NO. TOBP C730600 39A

Published in Japan July 2008 08-7
└── Date of publication └── Date of original publication

Date of Publication	Rev. No.	Section	Revised Content
July 2008	—	—	First edition

YASKAWA AC Drive-Option Card

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 Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply. Specifications are subject to change without notice for ongoing product modifications and improvements.

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MANUAL NO. TOBP C730600 39A

Published in Japan July 2008 08-7
08-5-3