

Varispeed OPTION CARD
ANALOG INPUT CARD AI-14B
INSTRUCTIONS

MODEL: AI-14B

Upon receipt of the product and prior to initial operation, read these instructions thoroughly and retain them for future reference.



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Preface

This manual is designed to ensure correct and suitable application of AI-14B. Read this manual before attempting to install, operate, maintain, or inspect an AI-14B and keep it in a safe, convenient location for future reference. Before you understand all precautions and safety information before attempting application.

Yaskawa Electric Corporation

General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed, in order to describe the detail with more clarity. Make sure all covers and shields are replaced before operating this product, and operate it in accordance with the instructions in this manual.
- This manual may be modified when necessary because of improvement of the product, modification, or changes in specifications.
- A new version of the manual will be released under a revised manual number when any changes are made.
- Contact your Yaskawa representative or a Yaskawa office listed on the back of this manual to order a new manual if this manual is damaged or lost. Please provide the document number listed on the front cover of this manual when ordering.
- Yaskawa cannot guarantee the quality of any products which have been modified. Yaskawa assumes no responsibility for any injury or damage caused by a modified product.

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.



WARNING

: Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.



CAUTION

: Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.



Failure to heed a precaution classified as a caution can result in serious consequences depending on the situation.

Indicates important information that should be memorized.

Receiving

CAUTION

- Do not use any option card which is damaged or has missing parts.

Failure to observe this caution may result in injury.

Installation and Wiring

WARNING

- Never touch the inside of the Inverter.

Failure to observe this warning may result in electric shock.

- Disconnect all power before mounting or removing the option card or wiring. Then wait at least the specified time (specified on the front cover) after the power supply is disconnected and all LEDs and CHARGE LED are extinguished.

Failure to observe this warning may result in electric shock.

- Do not damage or apply excessive stress to the cables. Do not place heavy objects on the cables or place the cables between other objects.

Failure to observe this warning may result in electric shock, malfunction or damage of the equipment.

CAUTION

- Do not touch the elements of the option card with bare hands.

Failure to observe this caution may result in equipment damage caused by static electricity.

- Insert the connectors firmly.

Failure to observe this caution may result in malfunction or damage of the equipment.

Setting

CAUTION

- Be careful when changing Inverter settings. The Inverter is factory set to suitable settings.

Failure to observe this caution may result in damage of the equipment.

Warranty Information

■ Free Warranty Period and Scope

■ Warranty Period

This product is warranted for twelve months after being delivered to Yaskawa's customer or if applicable eighteen months from the date of shipment from Yaskawa's factory whichever comes first.

■ Scope of Warranty

Inspections

Periodic inspections must be conducted by the customer. However, upon request, Yaskawa or one of Yaskawa's Service Centers can inspect the product for a fee. In this case, if after conferring with the customer, a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, then this fee will be waived and the problem remedied free of charge.

Repairs

If a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, Yaskawa will provide a replacement, repair the defective product, and provide shipping to and from the site free of charge.

However, if the Yaskawa Authorized Service Center determines that the problem with a Yaskawa product is not due to defects in Yaskawa's workmanship or materials, then the customer will be responsible for the cost of any necessary repairs. Some problems that are outside the scope of this warranty are:

- Problems due to improper maintenance or handling, carelessness, or other reasons where the customer is determined to be responsible.
- Problems due to additions or modifications made to a Yaskawa product without Yaskawa's understanding.
- Problems due to the use of a Yaskawa product under conditions that do not meet the recommended specifications.
- Problems caused by natural disaster or fire.
- Or other problems not due to defects in Yaskawa workmanship or materials.

Warranty service is only applicable within Japan.

However, after-sales service is available for customers outside of Japan for a reasonable fee. Contact your local Yaskawa representative for more information.

■ Exceptions

Any inconvenience to the customer or damage to non-Yaskawa products due to Yaskawa's defective products whether within or outside the warranty period are NOT covered by this warranty.

Restrictions

- The Varispeed G7 was not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.
- Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic or electric power, or underwater use must contact their Yaskawa representatives or the nearest Yaskawa sales office beforehand.
- This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.

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The analog reference card AI-14B to be mounted on the control board of the inverter is an on-board type option card for setting high-accuracy, high-resolution analog reference.

When setting references by the use of the digital reference card, select system constant Sn-04 (operation signal selection 1) so that the external terminal input (frequency reference input) of the inverter is the main speed frequency (speed) reference. Further, select system constant Sn-08 (operation signal selection 5) so that the optional frequency (speed) reference becomes effective.

•VS-616G3/H3 series, VS-676VG3/VH3 series

Sn-04 : □□□□0 (Set the 1st digit to 0. It is set to 1 at the time of shipment.)

Sn-08 : □□□□0 (Set the 1st digit to 0. It is set to 0 at the time of shipment.)

•VS-616G5 series

b1-01:3 (Factory setting = 1)

•VarispeedG7/F7 series

b1-01:1 (Factory setting = 1)

The gain of analog input signals of the analog reference card AI-14B can be adjusted by setting the program constants of the inverter. See 4 *Setting of Analog Input Signals* for details.

This option card can be mounted on the following 7 inverter series.

•VS-616G3 series (Software No.:NSG610010~NSG610013 is not available.)

•VS-616H3 series

•VS-676VG3 series

•VS-676VH3 series

•VS-616G5 series

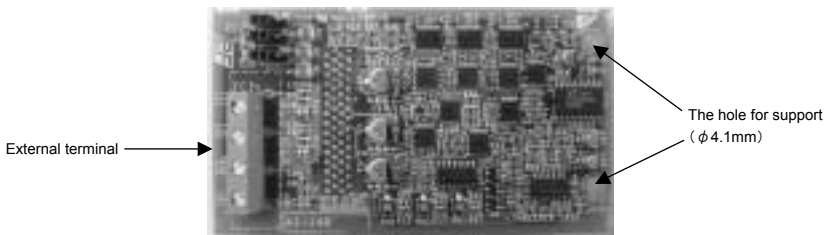
•Varispeed G7 series

•Varispeed F7 series (SPEC E : software No.103X)

("X" means software revision)

And the gain for the analog input signal of AI-14B is able to adjust by setting the parameter in the drive. Please see the instruction manual of drive.

Name	Code No.	Input System
Analog Reference Card AI-14B	73600-C002X	Input signal level: -10 to +10 VDC (Input impedance: 20kΩ) 4 to 20mA (Input impedance: 500Ω) Input resolution: In case of voltage input -13bits (1/8192) + sign In case of current input -1/65534 * Voltage input/current input can be selected by each channel (TC1-1 to TC1-3).



NOTE

- (1) Before using the analog reference card AI-14B, be sure to read this instruction and the instruction manual of the inverter on which this card is mounted.
- (2) Before performing connections to the connector of the analog reference card AI-14B and the external terminals, disconnect the main power supply to the inverter and make sure that the inverter CHARGE signal lamp is OFF.
- (3) When ordering the analog reference card AI-14B, specify the name and code number.

1. Mounting Procedure on the Inverter

- (1) Disconnect the main power supply, remove the inverter face plate, and make sure that CHARGE signal lamp is OFF.
- (2) Mount the connector 2CN of the analog reference card AI-14B to the connector 2CN (No. of pins :60) on the control board of the inverter. When mounting, fit the support holes $\text{\textcircled{A}}$ (2 places) of AI-14B onto the option card supports on the control board until they click to fix the card AI-14B firmly.
- (3) After mounting the analog reference card AI-14B, make connections with peripheral equipment. After completing connections, replace the inverter faceplate.

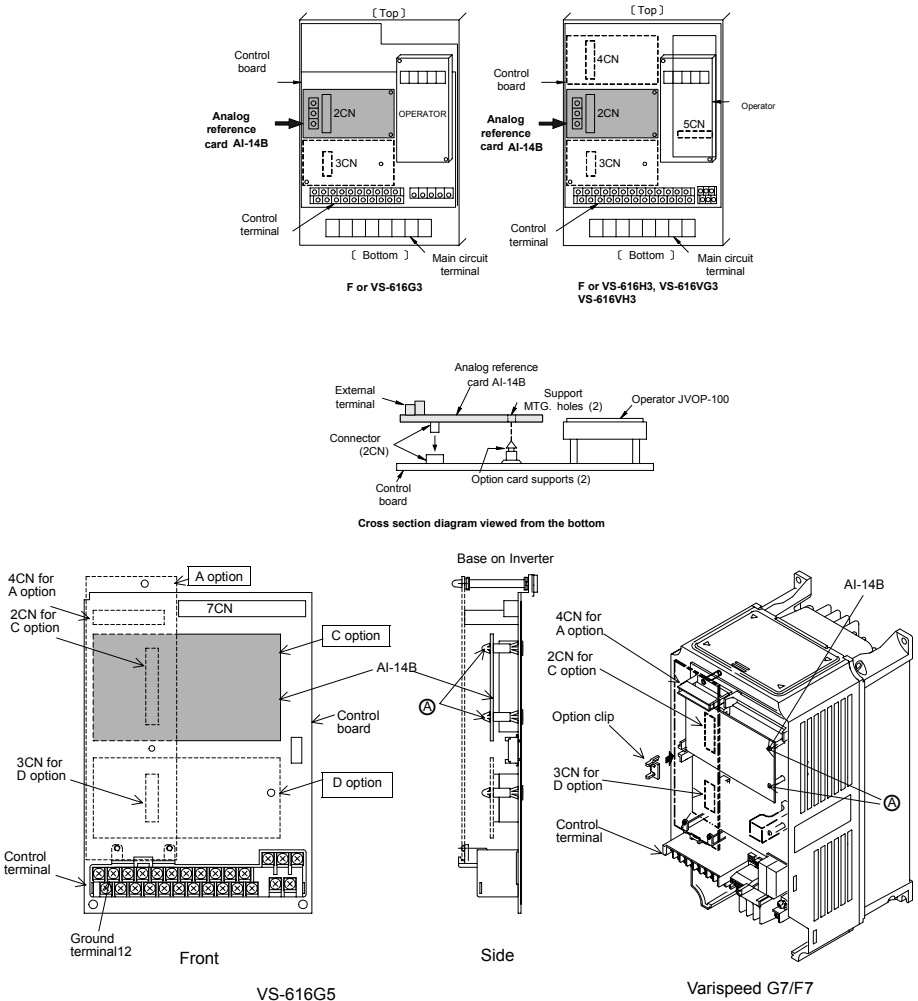


Fig.1 Mounting Procedure on the Inverter

2. Interconnections

Fig. 2 shows the connections between the inverter, the analog reference card AI-14B, and peripheral equipment.

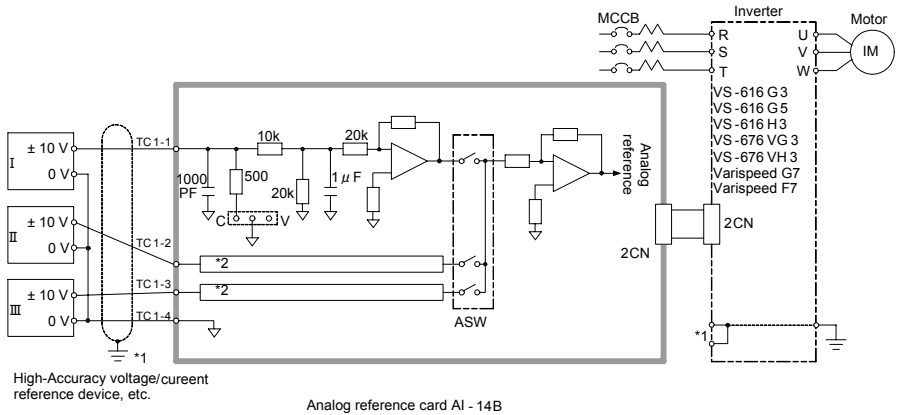


Fig. 2 Interconnections

- *1 Connect the shielded lead to the control terminal (12) or (32) of the inverter control board.
(G3/G5 series → Terminal(12) H3/VG3/VH3 series → Terminal(12)or(32) G7/F7 series →(E)).
- *2 TC1-2 and TC1-3 have the same input circuit as TC1-1

Information for Wiring

- (1) The wiring for the control signals (terminals TC1-1 to TC1-4) of the analog reference card AI-14B should be separated from main circuit wiring and other power lines.
- (2) Use the shielded lead for control signal wiring and terminate the cable end as shown in Fig. 3 (to prevent malfunction due to noise). Wiring length should be 10 m or less.
- (3) If any of control signal input terminals TC1-1 to TC1-3 are not used, be sure to connect them to 0 V terminal (TC1-4).

NOTE

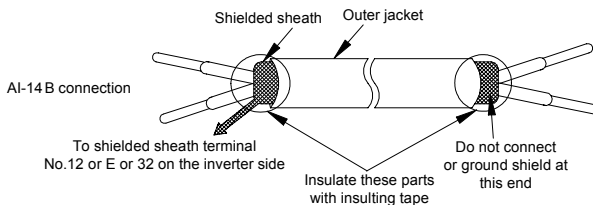


Fig. 3 Preparing The End of Shielded Wire

3. External Terminal

3.1 Function

The analog reference card AI-14B has external terminals (4 pins) to be connected with peripheral equipment. Table 1 shows terminal functions.

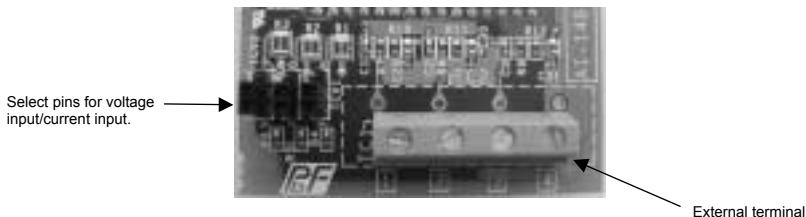


Table 1 External Terminal Functions of Analog Reference Card AI-14B

External Terminal	Terminal No.	Functions	Signal Level	Linearity
TC1	1	Channel 1 Analog voltage/ current input	Voltage input Input voltage: 0 to $\pm 10V/0$ to $\pm 100\%$ Input impedance: $20k\Omega$ Input resolution: $1/8192$ (13 bits) + sign	$\pm 0.1\%$
	2	Channel 2 Analog voltage/ current input		
	3	Channel 3 Analog voltage/ current input	Current input Input current: 4 to $20mA/0$ to $+100\%$ Input impedance: 500Ω Input resolution: $1/6554$	
	4	Common terminal	0V	

Notes:

- 1 The analog signal (input voltage/input current) input level of external terminals TC1-1 to TC1-3 can be adjusted by the setting of respective inverter program constants. See 4 *Setting of Analog Input Signals*.
- 2 Voltage input/current input can be selected by the short-circuiting pin of respective channels: V-side voltage input, C-side current input. Voltage input is selected for each channel at the time of shipment.

3.2 Wiring

Wire the shielded cable to the terminal block according to the following procedure.

- 1) Loosen the terminal screw with the regular screw driver.
- 2) Strip the top of the cable as shown in Fig.4 and insert it into the bottom of the terminal block.
- 3) Tighten the terminal screw so that the cable cannot be removed.
(Applicable size of the core cable: 26 to 16AWG tightening torque: 0.22 to $0.25[N\cdot m]$)

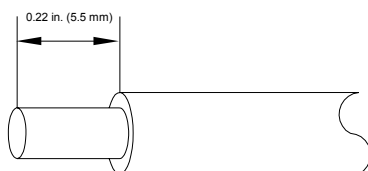
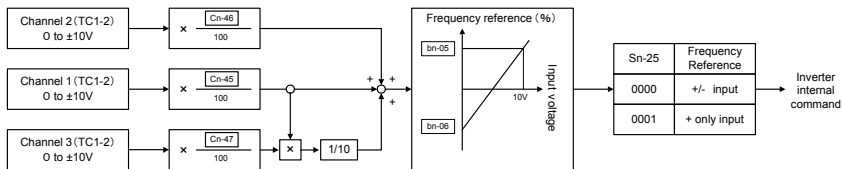


Fig. 4 Length of the sheath strip

4. Setting of Analog Input Signals

(1)VS-616G3 and VS-616H3

The analog signals entered from channel 1 (TC1-1), channel 2 (TC1-2), and channel 3 (TC1-3) are added internally. For VS-616H3, the analog signal level entered can be adjusted by the setting of program constants.



*Setting Range of Constants

Program Constant No.	Description	VS-616G3			VS-616H3		
		Setting Range	Unit	Factory Shipment	Setting Range	Unit	Factory Shipment
bn-05	Frequency reference gain	0.0 to 1000.0	0.1%	100.0	0.0 to 1000.0	0.1%	100.0
bn-06	Frequency reference bias	-100 to 100	1%	0	-100.0 to 100.0	0.1%	0.0
Cn-45	Input gain of AI-14B channel 1	Fixed 100%			0.0 to 1000.0	0.1%	100.0
Cn-46	Input gain of AI-14B channel 2	Fixed 10%			0.0 to 1000.0	0.1%	10.0
Cn-47	Input gain of AI-14B channel 3	Fixed 10%			0.0 to 1000.0	0.1%	10.0

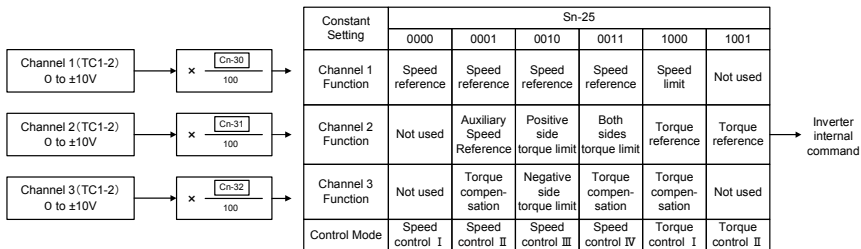
*Setting Example

When 10 V is entered to channel 1 of VS-616G3 (if the set frequency shows only 59 Hz, adjust bn-05 as follows to obtain the set frequency of 60 Hz $bn-05:60(\text{Hz})/59(\text{Hz})=1.01695=101.7(\%)$)

(2)VS-676VG3 and VS-676VH3

The function of signals entering from channel 1 (TC1-1), channel 2 (TC1-2), and channel3 (TC1-3) can be selected by the setting of the program constant Sn-25.

Analog signal levels can be adjusted, respectively.

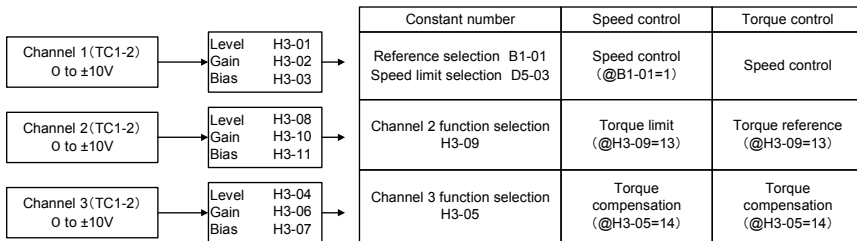


* Setting Range of Constants

Program Constant No.	Description	Setting Range	Unit	Factory Shipment
Cn-30	Input gain of AI-14B channel 1	0.0 to 1000.0	0.1%	100.0
Cn-31	Input gain of AI-14B channel 2	0.0 to 1000.0	0.1%	100.0
Cn-32	Input gain of AI-14B channel 3	0.0 to 1000.0	0.1%	100.0

(3)VS-616G5, VarispeedG7/F7

The function of signals entering from channel 1 (TC1-1), channel 2 (TC1-2), and channel3 (TC1-3) can be selected by the setting of the following parameter. Analog signal levels can be adjusted, respectively.



*Parameter setting range

Parameter No.	Description	Setting range	Factory setting
H3-01,H3-08, H3-04	Select the input level of each Channel	0:0~+10V 1:-10~+10V	H3-01, H3-04=0 H3-08=2
H3-02,H3-10, H3-06	The gain setting of each Channel	0.0~1000.0(%) (100%/10V)	100.0
H3-03,H3-11, H3-07	The bias setting of each Channel	-100.0~+100.0(%) (100%/10V)	0.0

NOTE

Notes on the Accuracy of Analog References

Analog references are converted into digital references with a resolution of 1/8192.

In addition to the observation of wiring instructions, the accuracy of the voltage source used for analog references comes into question.

To increase control accuracy, use a high-accuracy, stabilized power supply.

Revision History

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

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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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