ANALOG REFERENCE CARD
Varispeed SERIES OPTION CARD

CODE NO. 73600-C0020   AI-14B
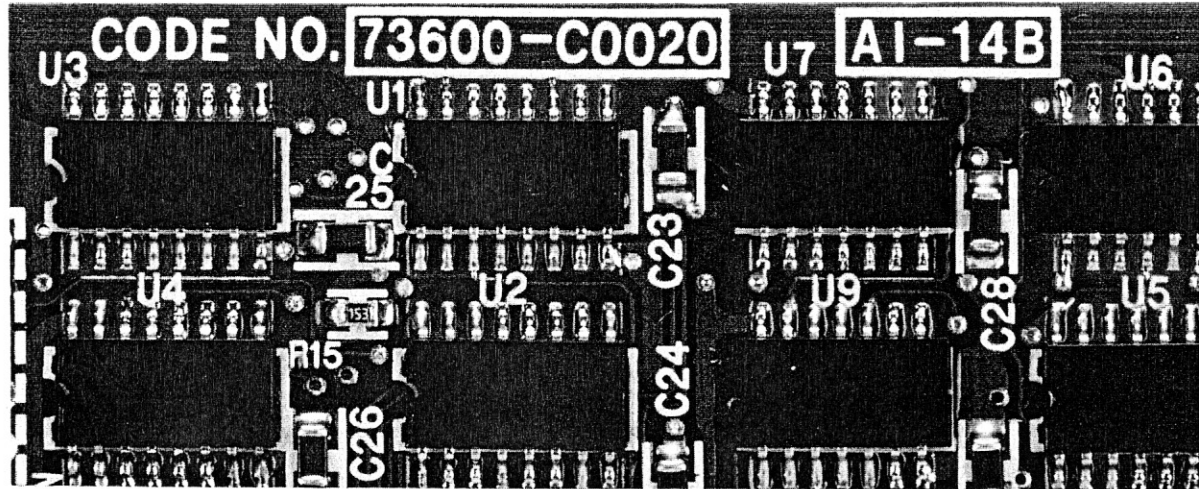
Before initial operation read these instructions thoroughly, and retain for future reference.

YASKAWA

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.

PRECAUTIONS

(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.

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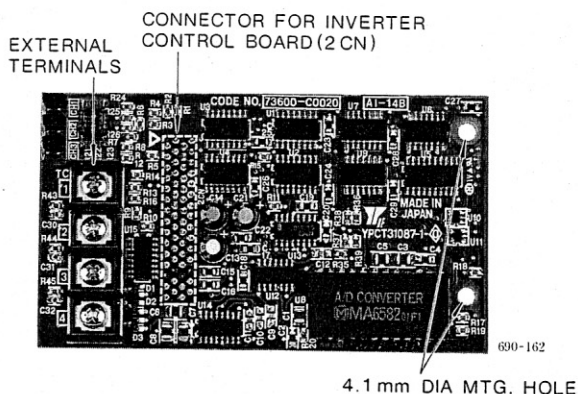
Sn-04 : □□□0 (Set the 1st digit to 0. It is set to 1 at the time of shipment.)

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

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 "SETTING OF ANALOG INPUT SIGNALS" for details.

This option card can be mounted on the following 4 inverter series.

· VS-616G3 series   · VS-616H3 series   · VS-676VG3 series

· VS-676VH3 series

EXTERNAL TERMINALS

CONNECTOR FOR INVERTER CONTROL BOARD (2 CN)

4.1mm DIA MTG. HOLE

Analog Reference Card AI-14B

Name	Code No.	Input System
Analog Reference Card AI-14B	73600-C002X	Input signal level: −10 to +10 VDC (Input impedance: 20 kΩ) 4 to 20 mA (Input impedance: 500 Ω) Input resolution : In case of voltage input—13 bits (1/8192) +sign In case of current input—1/6554 ∗ Voltage input/current input can be selected by each channel (TC1 to TC3).

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 (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 face plate.
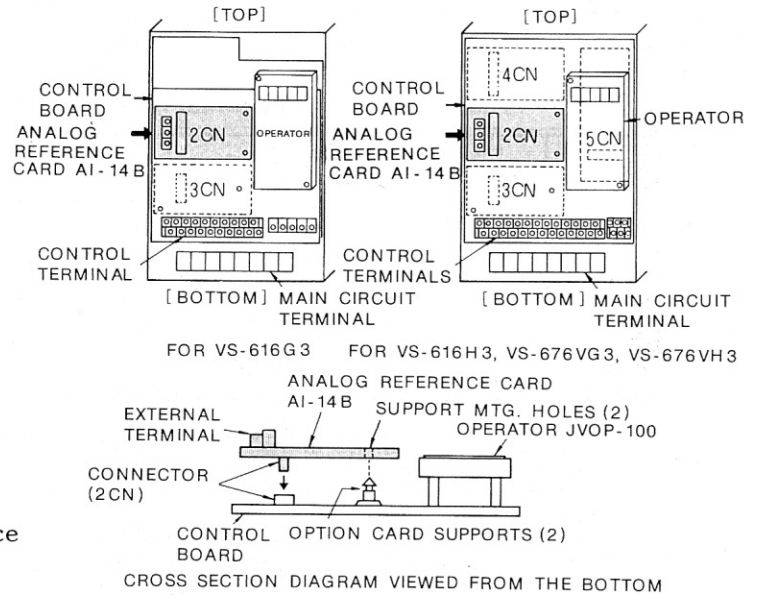
Fig. 1 Mounting of Analog Reference Card AI-14B

INTERCONNECTIONS

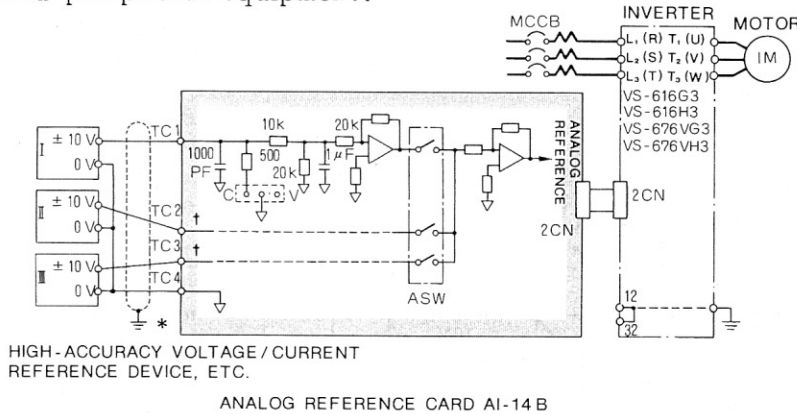Fig. 2 shows the connections between the inverter, the analog reference card AI-14B, and peripheral equipment.

* Connect the shielded lead to the control terminal (12) or (32) of the inverter control board. (Only (12) in G3 series).

† TC2 and TC3 have the same input circuit as TC1.

Fig. 2 Interconnections

PRECAUTIONS

(1) The wiring for the control signals (terminals TC1 to TC4) 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.

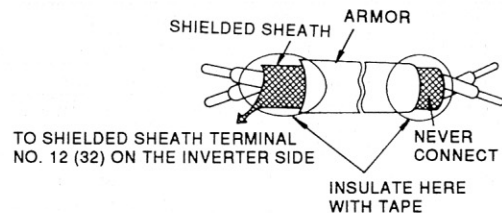(3) If any of control signal input terminals TC1 to TC3 are not used, be sure to connect them to 0 V terminal (TC4).

Fig. 3 Preparation of Shielded Cable Ends

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DESCRIPTION OF EXTERNAL TERMINAL FUNCTIONS

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 Thread Size	Functions	Signal Level		Linearity
TC1	M3	Channel 1 Analog voltage/ current input	Voltage input	Input voltage : 0 to ±10 V/0 to ±100% Input impedance : 20 kΩ Input resolution : 1/8192 (13 bits) + sign	
TC2	M3	Channel 2 Analog voltage/ current input			±0.1%
TC3	M3	Channel 3 Analog voltage/ current input	Current input	Input current : 4 to 20 mA/0 to ±100% Input impedance : 500Ω Input resolution : 1/6554	
TC4	M3	Common terminal	0 V		—

Notes :
1. The analog signal (input voltage/input current) input level of external terminals TC1 to TC3 can be adjusted by the setting of respective inverter program constants. See Section 4.
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.

Channel 1 : Voltage input / current input
Channel 2 : Voltage input / current input
Channel 3 : Voltage input / current input

Voltage Current

Short-circuiting pin
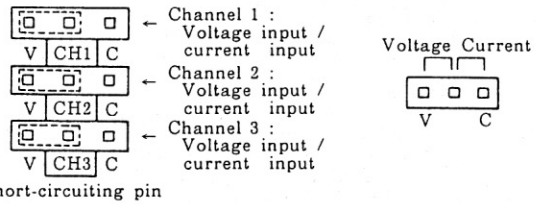
SETTING OF ANALOG INPUT SIGNALS

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

The analog signals entered from channel 1 (TC1), channel 2 (TC2), and channel 3 (TC3) are added internally. For VS-616H3, the analog signal level entered can be adjusted by the setting of program constants.
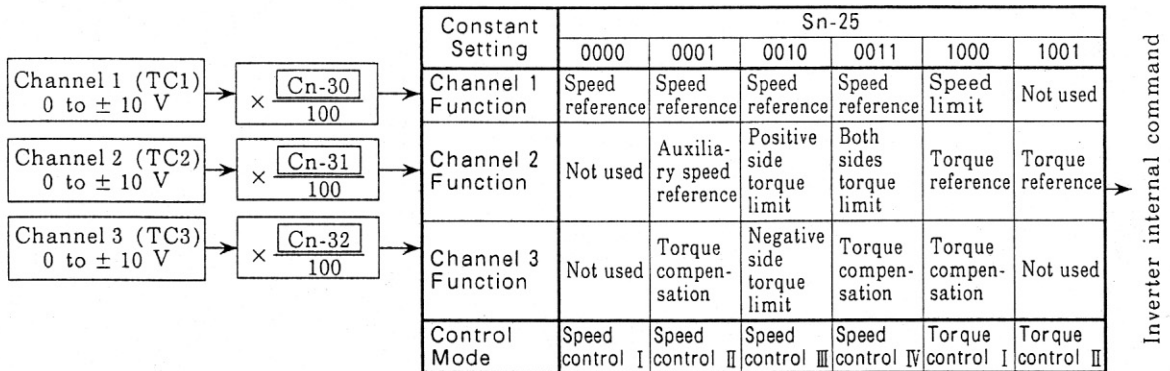

⟨AI-14B⟩   ⟨INVERTER⟩
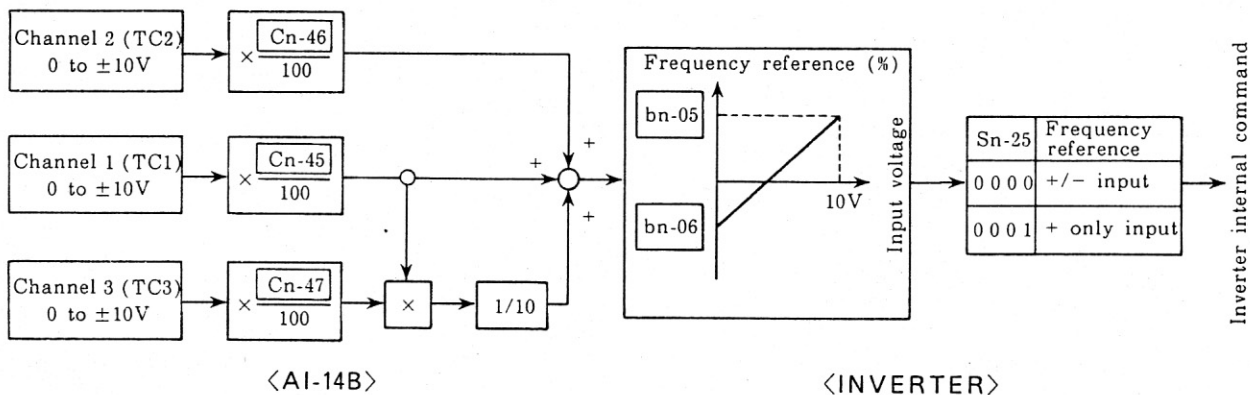
* Setting Range of Constants

Program Constant No.	Description	VS-616G3			VS-616H3		
		Setting Range	Unit	at Factory Shipment	Setting Range	Unit	at 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.

$$bn\text{-}05 : \frac{60\,Hz}{59\,Hz} = 1.01695 = 101.7\ (\%)$$

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

The function of signals entering from channel 1 (TC1), channel 2 (TC2), and channel 3 (TC3) can be selected by the setting of the program constant Sn-25. Analog signal levels can be adjusted, respectively.

Constant Setting	Sn-25					
	0000	0001	0010	0011	1000	1001
Channel 1 Function	Speed reference	Speed reference	Speed reference	Speed reference	Speed limit	Not used
Channel 2 Function	Not used	Auxiliary speed reference	Positive side torque limit	Both sides torque limit	Torque reference	Torque reference
Channel 3 Function	Not used	Torque compensation	Negative side torque limit	Torque compensation	Torque compensation	Not used
Control Mode	Speed control I	Speed control II	Speed control III	Speed control IV	Torque control I	Torque control II

(Channel 1 (TC1) 0 to ± 10 V × Cn-30/100, Channel 2 (TC2) 0 to ± 10 V × Cn-31/100, Channel 3 (TC3) 0 to ± 10 V × Cn-32/100 → Inverter internal command)

∗ Setting Range of Constants

Program Constant No.	Description	Setting Range	Unit	at 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

——— 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.