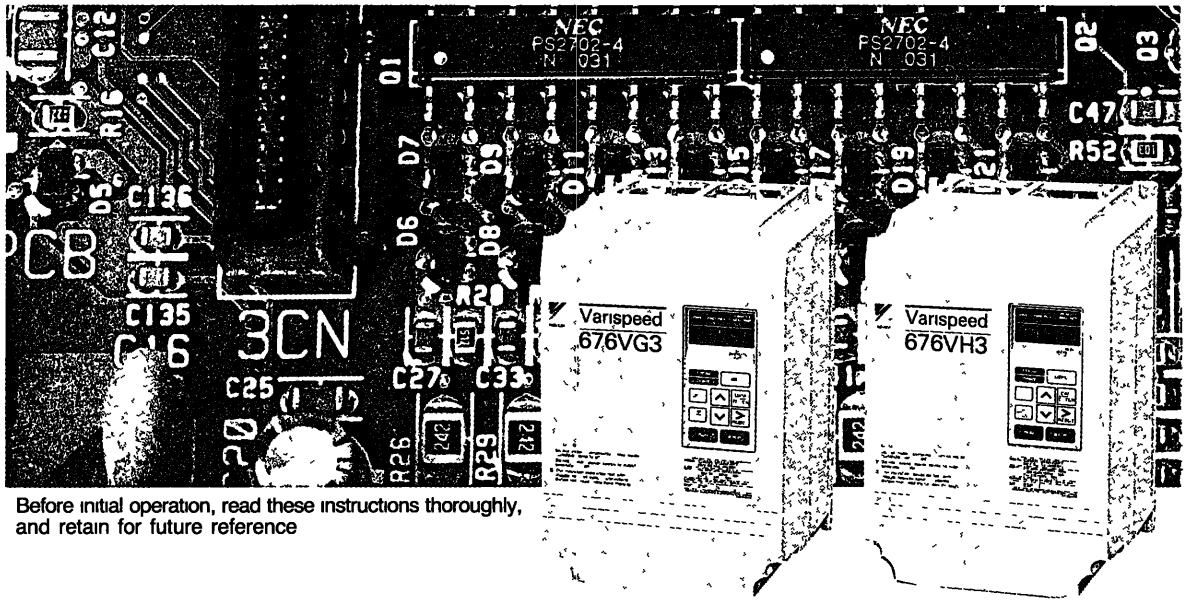
Varispeed-676VG3/VH3 DRIVE
INSTRUCTIONS

MULTI-PURPOSE VECTOR-CONTROLLED INVERTER

MODEL CIMR-VG□□, -VH□□
200 to 230V 0.5 to 100HP (0.4 to 75kW) 1 to 100kVA
380 to 460V 0.5 to 400HP (0.4 to 300kW) 1 to 400kVA



Before initial operation, read these instructions thoroughly, and retain for future reference

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CONTENTS

CONTENTS (Cont'd)

INTRODUCTION

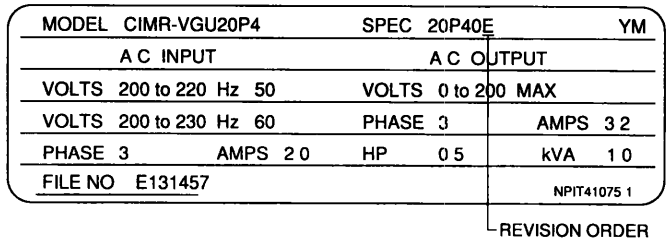
The Varispeed-676VG3/VH3 (VS-676VG3/VH3) is an inverter that drives squirrel-cage induction motors by vector control. This inverter employs IGBT's as main circuit elements to provide low-noise, flexible, variable speed operation with high-performance speed and torque control.

Read this instruction manual thoroughly before installing and operating the inverter. This instruction manual will also be necessary for maintenance and troubleshooting.

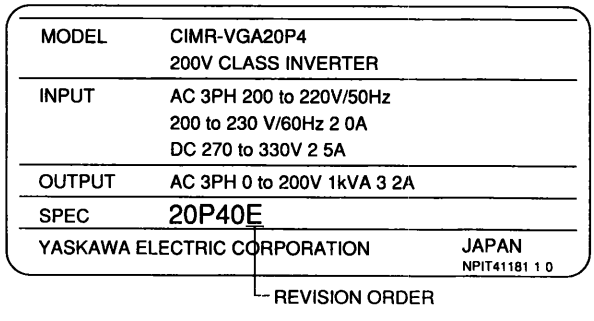
NOTE

In this manual, information in shaded areas ☐ apply only to inverters with revision "E" and after

MODEL CIMR-VGU



MODEL CIMR-VGA



Documents related to the VS-676VG3/VH3

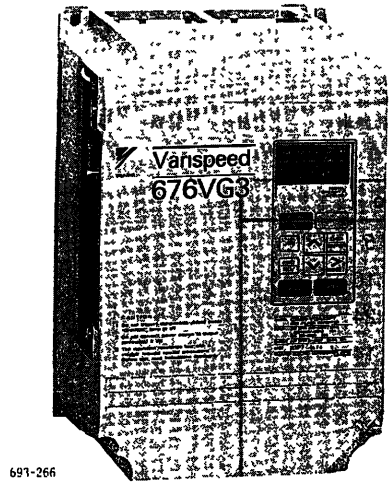
Document	No
BRAKING RESISTOR UNIT, BRAKING UNIT	TOE-C736-50 5
DIGITAL REFERENCE CARD MODEL DI-16H	TOE-C736-30 16
DIGITAL OUTPUT CARD MODEL DO-08	TOE-C736-30 24
ANALOG REFERENCE CARD MODEL AI-14B	TOE-C736-30 14
ANALOG MONITOR CARD MODEL AO-08	TOE-C736-30 21
ANALOG MONITOR CARD MODEL AO-12	TOE-C736-30 22
VS-676VG3/VH3 SUPPORT TOOL INSTRUCTION MANUAL	EZZ 005865

WARNING

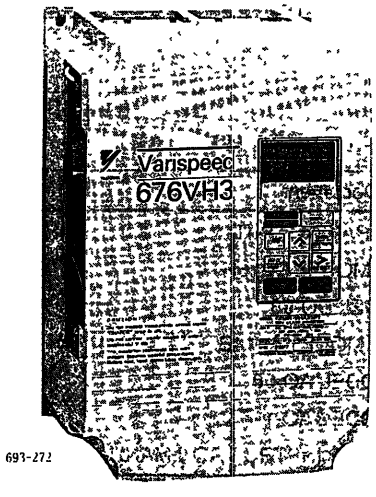
1) After turning OFF the main circuit power supply, do not touch circuit components until the DC bus capacitor "CHARGE" LED has extinguished which signifies that harmful voltage no longer exists within the inverter.
2) Do not connect or disconnect wires or connectors while power is applied to the inverter.
3) Do not check signals during operation.
4) Be sure to properly ground inverter using ground terminal G (E).
5) Never connect main circuit output terminals T1 (U), T2 (V), T3(W) to the AC main circuit power supply. Inverter damage may occur.

CAUTION

1) All the constants of the inverter have been preset at the factory. Do not change their settings unnecessarily.
2) Do not perform dielectric tests on any part of the inverter. The inverter contains semiconductor devices which are vulnerable to damage from high voltage.
3) The control PC board employs CMOS ICs which can be damaged by static electricity. Do not touch the CMOS IC elements.
4) When the main circuit power supply is from a DC power supply P1-N or B1/P-N, and not from L_1 (R), L_2 (S), L_3 (T), be sure to remove wiring from the main circuit L_1 (R), L_2 (S) to the control circuit ℓ_1 (r), ℓ_2 ($\mathcal{A}$) [or ℓ_1 (r), ℓ_2 400 ($\mathcal{A}$ 400)].



Model CIMR-VG 27P5
200V 7 5kW



Model CIMR-VH 23P7
200V 3 7kW

1. RECEIVING

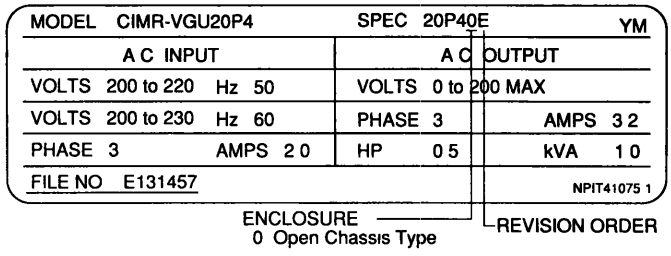
This inverter has been put through demanding tests at the factory before shipment. After unpacking, check the following :

- Verify that the received product matches the purchase order sheet (invoice) and/or packing slip.
- Transit damage.

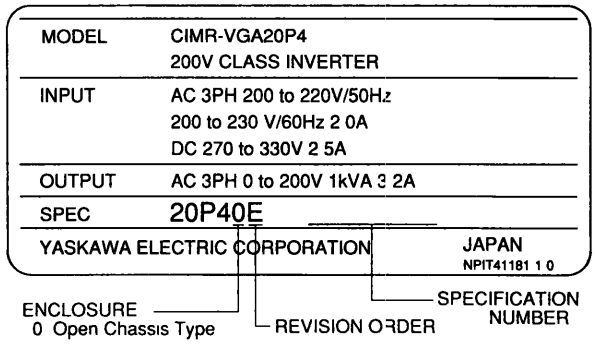
If any part of the inverter is damaged or missing, immediately notify the shipper.

1.1 NAMEPLATE DATA

MODEL CIMR-VGU



MODEL CIMR-VGA



MODEL DESIGNATION

C I M R - V G U 2 0 P 4

Inverter

VG 676VG3 Series
VH 676VH3 Series

Specifications
UL Listed and CSA Certified Components*
U with PG
V without PG

JAPAN use (Non UL/CSA)
A with PG
B without PG
C with PG (for Multi-system)
D without PG (for Multi-system)
J with PG (for Motor Control Centers)
K without PG (for Motor Control Centers)

Voltage
2 200 to 230V
4 380 to 460V

Applicable maximum motor output
0P4 : 0.5HP (0.4kW)
0P7 1HP (0.75kW)
to to
300 400HP (300kW)

"P" indicates a decimal point

* Except for the following components

200V Class CIMR-VGU/V	400V Class CIMR-VGU/V
21P5	40P4
2018	41P5
2L30	45P5
2L37	4018
2L45	4200
2L55	
2L75	

2. INSTALLATION

CAUTION

- Never move, lift or handle the inverter by the front cover.
- Lift the inverter from the bottom.
- Do not drop the inverter.

2.1 LOCATION

The location of the inverter is important in achieving proper performance and normal operating life. The inverter should be installed in an area where the following conditions exist:

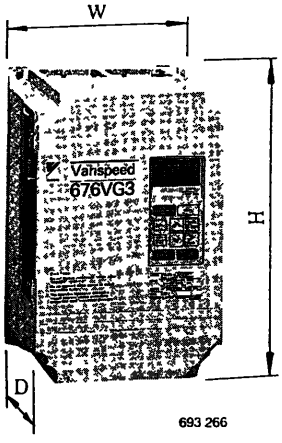
- Protection from rain, wind, and moisture.
- Protection from direct sunlight.
- Protection from corrosive gases and liquids.
- Protection from dust and metallic particles.
- Ambient temperature : +14 to 113℉ (-10 to +45℃)
- A minimal amount of electromagnetic noise (i.e. away from welding machines or power machinery.)
- Free from vibration.

CAUTION

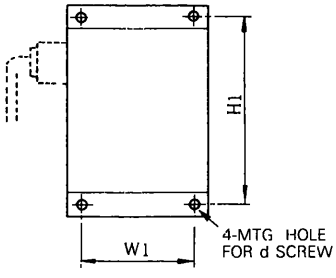
When mounting units in a common enclosure, install a cooling fan or use some other method to keep the air entering the inverter below 113℉ (45℃).

2.2 DIMENSIONS in inches (mm)

■ External Dimensions



■ Mounting Dimensions



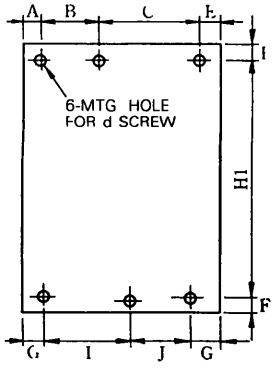


Table 2 1 External and Mounting Dimensions in inches (mm)

Voltage Class	Model CIMR-VG -VH	External Dimensions W	H	D	Mtg Dimensions W1	H1	d	Approx Mass lb (kg)
200V Class	20P4, 20P7, 21P5†	8 05 (204 5)	11 97 (304)	7 48 (190)	7 09 (180)	11 22 (285)	M6	11 (5)
	22P2, 23P7	8 05 (204 5)	11 97 (304)	8 86 (225)	7 09 (180)	11 22 (285)	M6	15 (7)
	25P5 27P5	8 05 (204 5)	13 94 (354)	10 04 (255)	7 09 (180)	13 19 (335)	M6	22 (10)
	2011	9 84 (250)	19 69 (500)	10 04 (255)	7 87 (200)	19 09 (485)	M6	46 (21)
	2015	12 80 (325)	21 65 (550)	9 65 (245)	10 83 (275)	21 06 (535)	M6	60 (27)
	2018†, 2022	12 80 (325)	21 65 (550)	10 04 (255)	10 83 (275)	21 06 (535)	M6	70 (32)
	2L30†, 2L37†	16 73 (425)	27 36 (695)	13 78 (350)	12 60 (320)	26 38 (670)	M10	141 (64)
	2037	18 70 (475)	31 50 (800)	11 02 (280)	14 76 (375)	30 71 (780)	M10	130 (59)
	2L45†, 2L55†	18 70 (475)	31 50 (800)	13 78 (350)	14 57 (370)	30 51 (775)	M10	183 (83)
	2055	18 70 (475)	31 50 (800)	11 02 (280)	14 76 (375)	30 71 (780)	M10	143 (65)
	2075	23 62 (600)	50 39 (1280)	17 83 (453)	21 65 (550)	49 02 (1245)	M12	337 (153)
	2L75†	22 64 (575)	36 42 (925)	15 75 (400)	17 52 (445)	35 24 (895)	M12	293 (133)
400V Class	40P4†, 40P7, 41P5†, 42P2	8 05 (204 5)	13 94 (354)	8 66 (220)	7 09 (180)	13 19 (335)	M6	20 (9)
	43P7, 45P5†, 47P5	8 05 (204 5)	13 94 (354)	10 04 (255)	7 09 (180)	13 19 (335)	M6	22 (10)
	4011 4015	9 84 (250)	19 69 (500)	10 04 (255)	7 87 (200)	19 09 (485)	M6	48 (22)
	4018†, 4022	12 80 (325)	21 65 (550)	10 04 (255)	10 43 (265)	21 06 (535)	M6	70 (32)
	4030, 4037, 4045	13 78 (350)	28 54 (725)	11 02 (280)	9 84 (250)	27 76 (705)	M8	99 (45)
	4L45	19 69 (500)	36 42 (925)	11 02 (280)	15 75 (400)	35 43 (900)	M10	165 (75)
	4055 4075	22 64 (575)	36 42 (925)	11 02 (280)	18 70 (475)	35 43 (900)	M10	194 (88)
	4L55, 4L75	17 91 (455)	32 28 (820)	13 78 (350)	13 78 (350)	31 30 (795)	M10	191 (87)
	4110	22 64 (575)	36 42 (925)	12 99 (330)	18 70 (475)	35 43 (900)	M10	229 (104)
	4LA1	22 64 (575)	36 42 (925)	14 76 (375)	17 52 (445)	35 24 (895)	M12	293 (133)
	4160	23 62 (600)	53 54 (1360)	17 83 (453)	21 65 (550)	52 17 (1325)	M12	375 (170)
	4LA6	22 64 (575)	36 42 (925)	15 75 (400)	17 52 (445)	35 24 (895)	M12	324 (147)
	4200*†	25 98 (660)	38 19 (970)	16 30 (414)	23 62 (600)	37 01 (940)	M12	364 (165)

* DC reactor is needed externally, See Fig 2.1

† JAPAN use (Non UL/CSA) only.

Voltage Class	Model CIMR-VG -VH	External Dimensions W	H	D	Mounting Dimensions A	B	C	E	F	G	H1	I	J	d	Approx Mass lb (kg)
400V Class	4220	37 40 (950)	57 09 (1450)	17 12 (435)	1 97 (50)	11 22 (285)	22 24 (565)	1 97 (50)	0 98 (25)	3 94 (100)	55 12 (1400)	17 32 (440)	12 20 (310)	M12	794 (360)
	4300	37 80 (960)	62 99 (1600)	17 91 (455)	2 17 (55)	11 73 (298)	22 64 (575)	1 26 (32)	0 98 (25)	4 13 (105)	61 02 (1550)	17 32 (440)	12 20 (310)	M12	926 (420)

2.2 DIMENSIONS in inches (mm) (Cont'd)

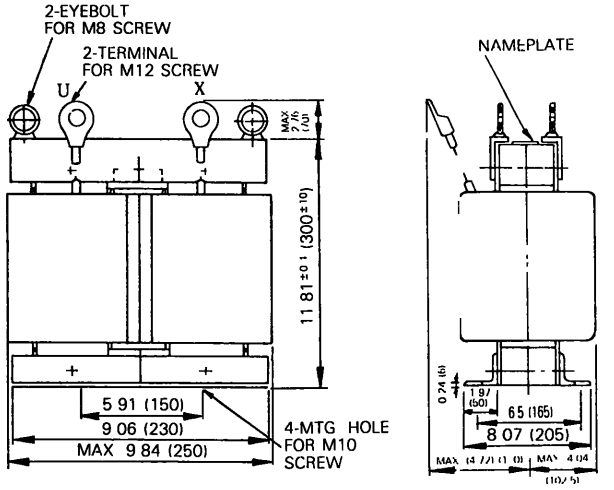
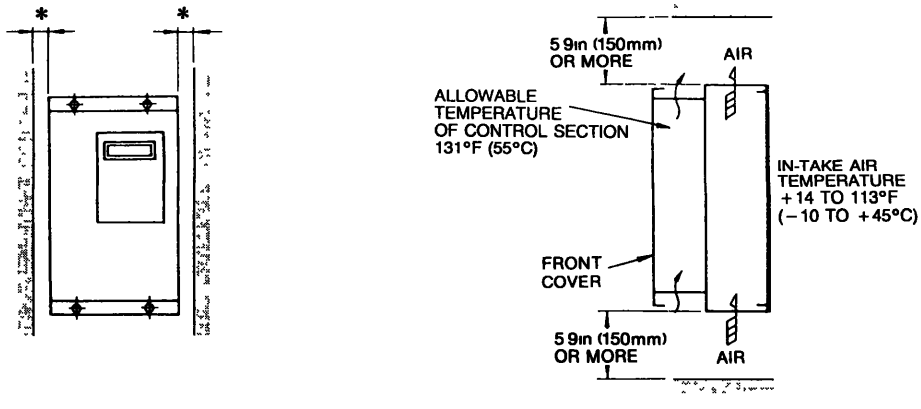


Fig 2 1 DC Reactor for Model CIMR-VG /VH 4200 (Code No X010018)

2.3 INSTALLATION SPACE AND TERMINAL ARRANGEMENT

Install the inverter vertically and allow sufficient space for effective cooling as shown in Fig. 2.2. For the terminal arrangements of the main circuit and the control circuit, see Table 2.2.



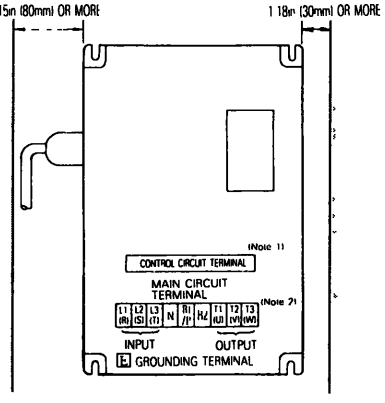
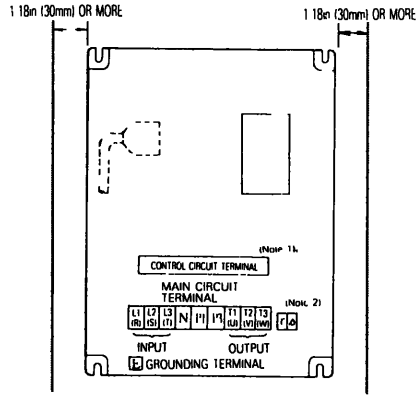
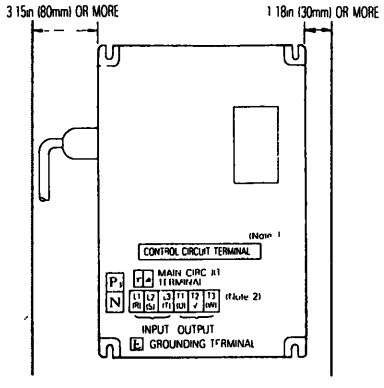
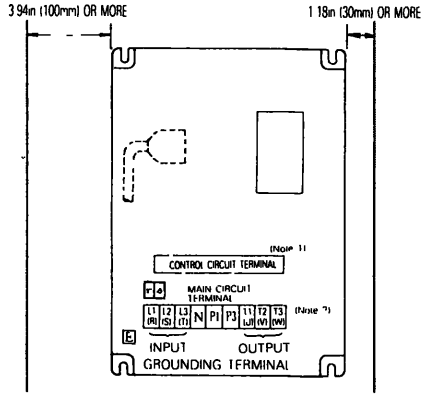
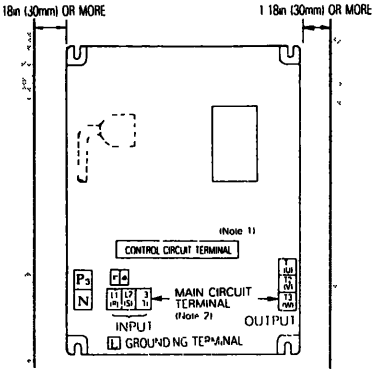
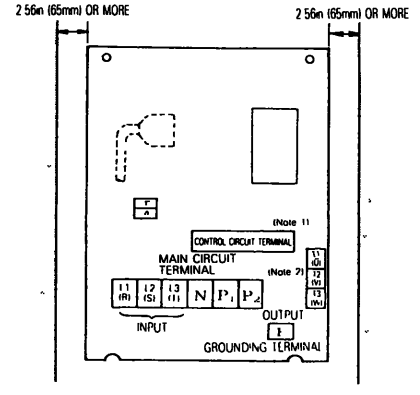
* This dimension varies according to inverter model Refer to Table 2 2

(a) Horizontal Space (b) Vertical Space (Common)

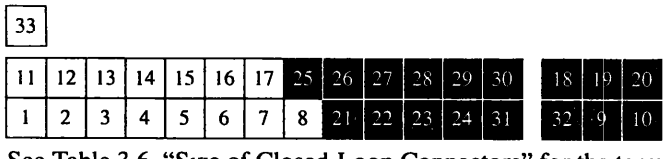
Fig.2.2 Inverter Mounting Clearance Requirements

Table 2 2 Installation Space and Terminal Arrangement

200V Class

Model	CIMR-VG 20P4 to -VG 27P5 -VH 20P4 to -VH 27P5	CIMR-VG 2011 to -VG 2022 -VH 2011 to -VH 2022
Terminal Arrangement		
Model	CIMR-VG 2L30 to -VG 2L55 -VH 2L30 to -VH 2L55	CIMR-VG 2037 to -VG 2055 -VH 2037 to -VH 2055
Terminal Arrangement		
Model	CIMR-VG 2L75 -VH 2L75	CIMR-VG 2075 -VH 2075
Terminal Arrangement		

Notes 1 Control circuit terminal arrangement (common to all models)



2 See Table 3.6 "Size of Closed-Loop Connectors" for the terminal size

Table 2.2 Mounting Space and Terminal Arrangement (Cont'd)

400V Class

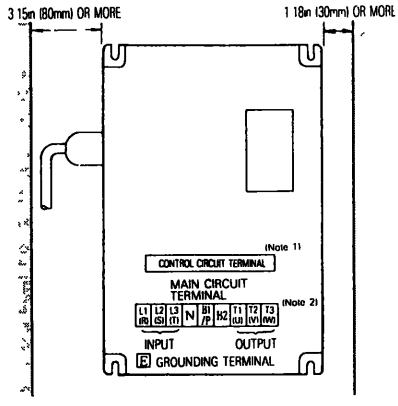
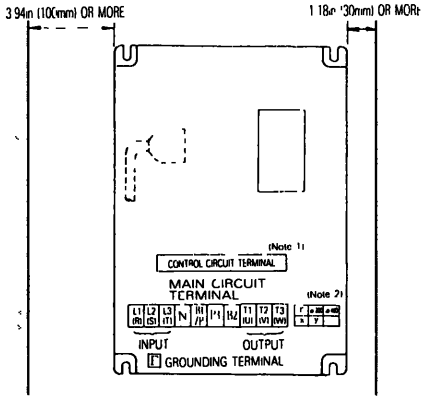
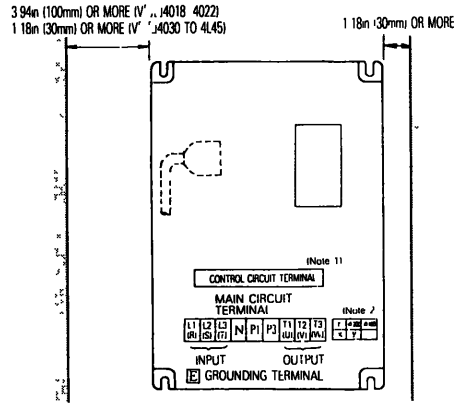
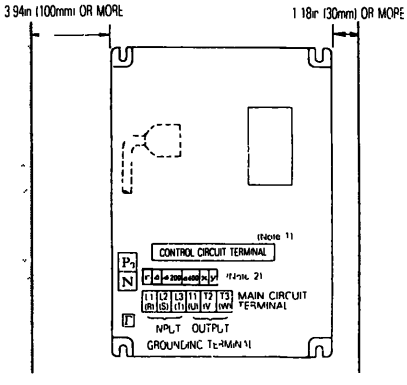
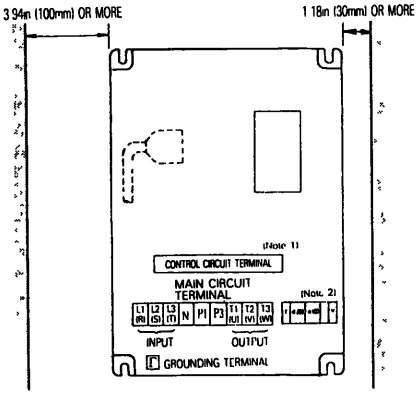
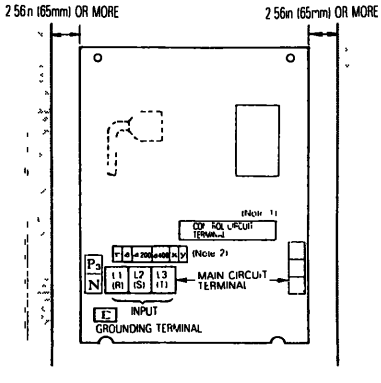
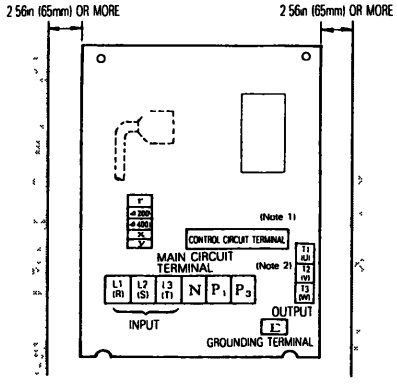
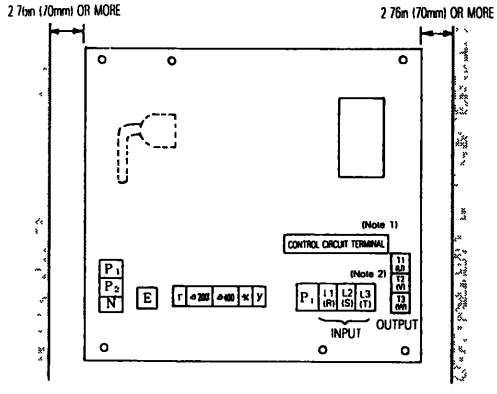
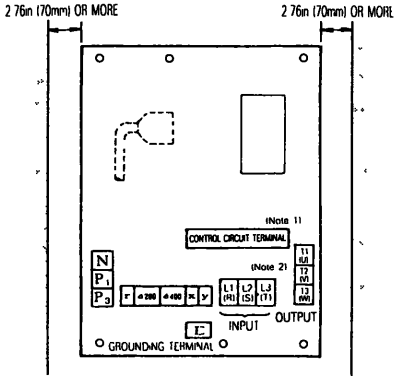
Model	CIMR-VG 40P4 to VG 47P5 -VH 40P4 to VH 47P5	CIMR-VG 4011, -VG 4015 -VH 4011, -VH 4015
Terminal Arrangement		
Model	**CIMR-VG 4018 to -VG 4L45 -VH 4018 to -VH 4L45**	**CIMR-VG 4L55/4L75 -VH 4L55/4L75**
Terminal Arrangement		
Model	**CIMR-VG 4055 TO -VG 4110 -VH 4055 TO -VH 4110**	**CIMR-VG 4LA1/4LA6 -VH 4LA1/4LA6**
Terminal Arrangement		

Table 2 2 Mounting Space and Terminal Arrangement (Cont'd)

400V Class

Model	CIMR-VG 4160 -VH 4160	CIMR-VG 4200 -VH 4200
Terminal Arrangement		

Model	CIMR-VG 4220, VG 4300 -VH 4220, VH 4300
Terminal Arrangement	

3 WIRING

3.1 CAUTIONS

External interconnection wiring should be performed using the following procedures:

After completion, be sure to check that connections are correct. Never use a control circuit buzzer check.

(1) Control Circuit

(a) Control circuit leads (terminals 1 to 32, 33) must be separated from main circuit leads [Terminals L1 (R), L2 (S), L3 (T), B1/⊕ (B1/P), B2, T1 (U), T2 (V), T3 (W), ⊖(N)] and other power cables to prevent erroneous operation caused by noise interference.

(b) Control circuit contact output leads 9, 10, 18, 19, and 20 must be separated from leads 1 to 8, 11 to 17, 21 to 32, and 33.

(c) Use twisted shielded or twisted-pair shielded cable for the control circuit leads. Connect the shield sheath to the inverter terminal 12 (G) as shown in Fig. 3.1

Wiring distance should be less than 164 ft (50 m).

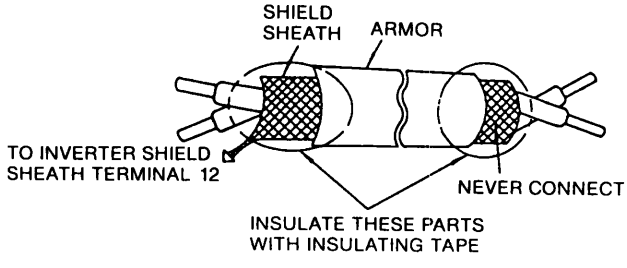


Fig 3 1 Shielded Wire Termination

(2) Main Circuit Input/Output

(a) Phase rotation of the input terminals L_1 (R), L_2 (S), L_3 (T) has no effect on the direction of motor rotation.

(b) Never connect the AC main circuit power supply to output terminals T_1 (U), T_2 (V), T_3 (W). Inverter damage may occur.

(c) Be sure to match the inverter output terminals T_1 (U), T_2 (V), T_3 (W) and the motor terminals T_1 (U), T_2 (V), T_3 (W) respectively. If not matched, the motor may run inadvertantly. For changing the motor rotation direction, refer to Section 5, "OPERATION". When a forward run command is given, the motor will turn in the counterclockwise direction (CCW) when viewed from the load side.

(d) Never connect power factor correction capacitors or LC, RC noise filters to the inverter's output side.

(3) Grounding

Ground the casing of the inverter using ground terminal G (E).

(a) Ground resistance should be 100Ω or less.

(b) Never ground the inverter in common with welding machines, motors, and other large-current electrical equipment. Run the ground lead in a separate conduit from leads of large-current electrical equipment.

(c) Use ground leads which comply with AWG standards using the shortest length possible.

(d) When multiple inverters are used, ground them as shown in Fig. 3.2 (a), taking care not to form ground loops as shown in Fig. 3.2 (b). Also be careful not to form ground loops between the inverter and the motor, as shown in Fig. 3.3 (b).

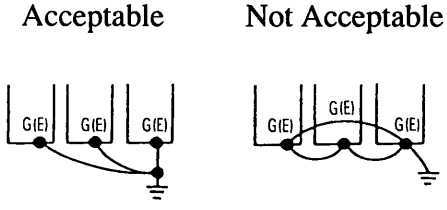


Fig 3 2 Grounding Multiple Inverter Units

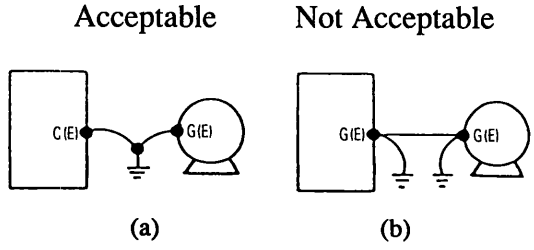


Fig 3.3 Grounding the Inverter and the Motor

3.2 INTERCONNECTION AND TERMINAL FUNCTIONS

Interconnection is to be accomplished as shown on pages 16 through 21.

With the digital operator, the motor can be operated just by connecting the main circuit leads and the PG cable.

(List of Wiring Example for Each Inverter Type)

Model	CIMR-VG /VH	Wiring Example on Page
200 to 230V	20P4 to 27P5	Wiring Example (1) page 16
	2011 to 2075, 2L30 to 2L75	Wiring Example (2) page 17
380 to 460V	40P4 to 47P5	Wiring Example (3) page 18
	4011 to 4015	Wiring Example (4) page 19
	4022 to 4300, 4L55 to 4LA6	Wiring Example (5) page 20
	4200	Wiring Example (6) page 21

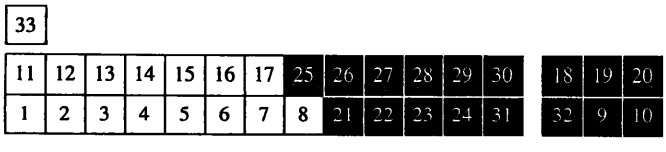
IMPORTANT

Use UL listed and CSA certified closed-loop (ring) connectors sized for the wire gauge used.
Connectors are to be installed using the correct crimp tool specified by the connector manufacturer.

NOTE

(1) ◎ are main circuit terminals, and ○ are control circuit terminals.

(2) The connection of control circuit terminals ① to ㉜, ㉝ do not follow the terminal numbering order. See the following figure for correct wiring (printed on the PC board).



(3)  represents shielded leads, and  represents twisted pair shielded leads.

(4) Do not use control circuit terminals ⑬ and ⑭ at the same time.
(In the case of simultaneous input, the two signals will be added in the inverter.)

(5) The output current capacity of control circuit terminal ⑮ (+15V) or ㉝ (-15V) is 20mA.

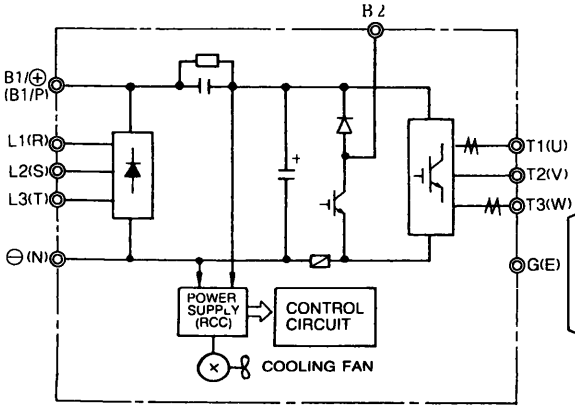
(6) The multi-function analog outputs are exclusive outputs for a speed meter, Ammeter, etc.
[Use the optional analog monitor card AO-12 for control systems.]

(7) For interconnection of the PG and the inverter, refer to Par.3.2 "CONNECTION BETWEEN THE PULSE GENERATOR (PG) AND INVERTER."

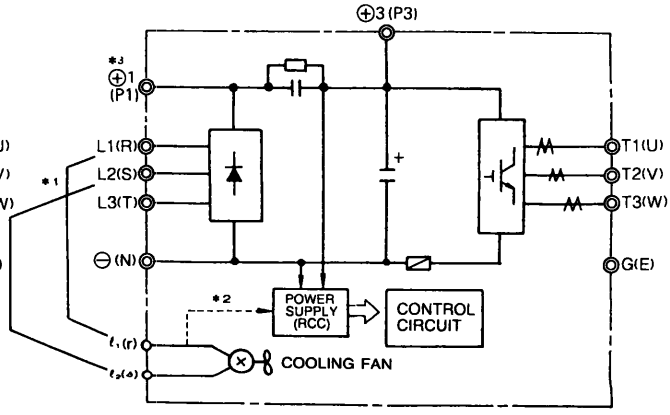
MAIN CIRCUIT TERMINALS

Voltage Class / Model CIMR- VG VH / Terminal Symbol	200 to 230V			380 to 460V				
	20P4 to 27P5	2011 to 2075	2L30 to 2L75	40P7 to 47P5	4011, 4015	4022 to 4300	4L55 to 4LA6	4200
L1 (R)	Main circuit input power supply			Main circuit input power supply				
L2 (S)								
L3 (T)								
T1 (U)	Inverter output			Inverter output				
T2 (V)								
T3 (W)								
B1/⊕B1/P)	• For braking resistor unit B1/⊕(B1/P-B2) • DC input B1/⊕-⊖(B1/P-N)	——		• For braking resistor unit B1/⊕(B1/P-B2) • DC line input B1/⊕-⊖(B1/P-N)	• For braking unit B1/⊕(B1/P-B2) • DC line input B1/⊕-⊖(B1/P-N)	——		
B2								
⊖(N)		• For braking unit ⊕1-⊖(P1-N) • DC line input ⊕1-⊖(P1-N)	• For braking unit ⊕3-⊖(P3-N)			• For braking unit ⊕1-⊖(P1-N) • DC line input ⊕1-⊖(P1-N)	• For braking unit ⊕3-⊖(P3-N)	• For braking unit ⊕2-⊖(P2-N) • For DC reactor ⊕1-⊕2 (P1-P2)
⊕3 (P3)			——			——	——	——
⊕1 (P1)								
⊕2 (P2)								
ℓ2 (⊿)	——	• Cooling fan power supply (Control power supply for 2037 or more)		——	• Cooling fan power supply (Control power supply for 4055 or more) ℓ1 - ℓ2200 (r-200) 200 to 230V input ℓ1 - ℓ2400 (r-400) 380 to 460V input			
ℓ1 (r)								
ℓ3 200 (⊿200)								
ℓ2 400 (⊿400)		——						
x					For external power supply (230VAC 10VA)	For external power supply (230VAC 10VA)		
y								
G (E)	Ground terminal (100Ω or less)			Ground terminal (100Ω or less)				

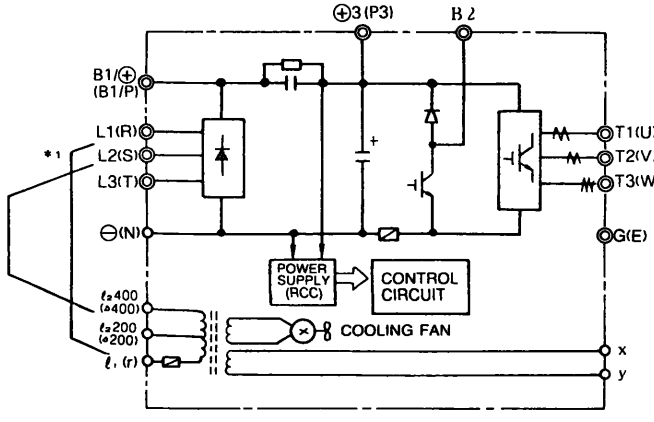
CIMR-V 20P4 to 27P5 (200V 1 to 10kVA)
CIMR-V 40P7 to 47P5 (400V 1.6 to 10kVA)



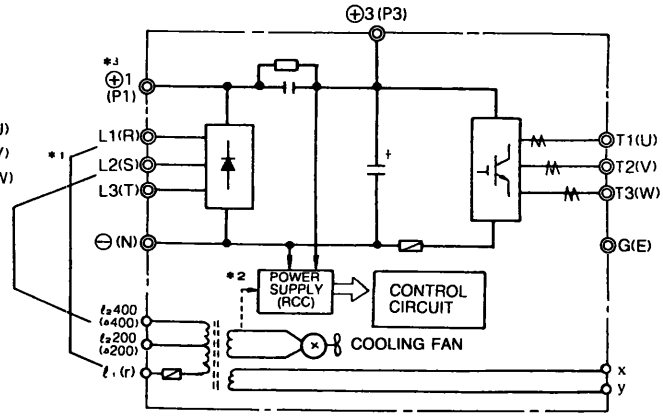
CIMR-V 2011 to 2075 (200V 15 to 100kVA)
CIMR-V 2L30 to 2L75 (200V 40 to kVA)



CIMR-V 4011, 4015 (400V 15, 20kVA)

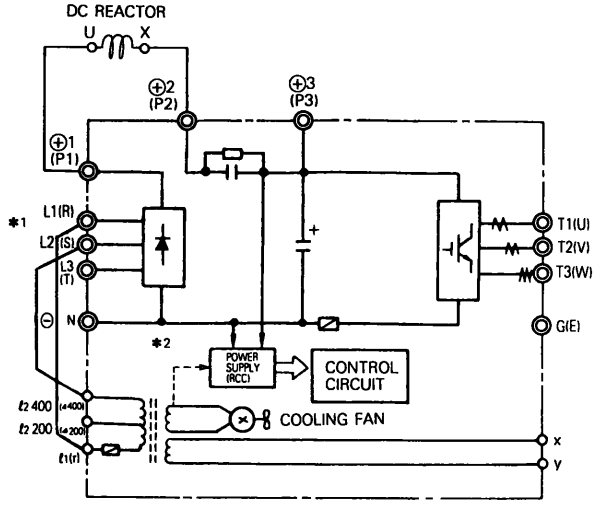


CIMR-V 4022 to 4300 (400V 30 to 400kVA)
CIMR-V 4L55 to 4LA6 (400V 80 to 200kVA)



MAIN CIRCUIT TERMINALS (Cont'd)

CIMR-V 4200 (400V 250kVA)



*1 When a DC power supply is used for the main circuit power supply (between ⊕1 - ⊖ or B1/⊕ - ⊖(B1/P-N)), disconnect the control power supply leads from L1(R) and L2 (S).

*2 For models CIMR-VG 2037/-VH 2037 and larger, and -VG 4055/-VH 4055 and larger, the RCC power supply input is the AC control power source.

*3 The following models are not provided with terminal P1

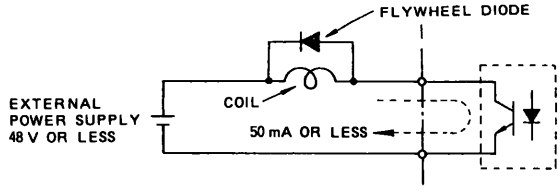
- CIMR-VG 2L30 to 2L75/-VH 2L30 to 2L75
- CIMR-VG 4L55 to 4LA6/-VH 4L55 to 4LA6

CONTROL CIRCUIT TERMINALS

Type	Terminal Symbol	Signal Name	Terminal Function		Remarks
Sequence Input Signal	1	Forward run/stop command	"Closed" forward run, "Open" stop		+24VDC, 8mA Photocoupler insulation
	2	Reverse run/stop command	"Closed" reverse run, "Open" stop		
	3	External fault input	"Closed" fault, "Open" normal		
	4	Fault reset	"Closed" reset		
	5	Main/aux speed selection (Multi-step reference 1)	"Closed" auxiliary speed reference	• Multi-function input • Sn-15 to Sn-18	
	6	Multi-step speed reference 2	"Closed" multi-step setting 2 enabled		
	7	Jog command	"Closed" jog operation		
	8	External base block	"Closed" stop inverter output		
	11	Sequence control input common	—		
Analog Input Signal	15	+15V power supply	Analog reference power supply		+15V (allowable current is max 20mA)
	13	Master speed reference	−10 to +10V/−100 to +100% speed 0 to +10V/100%		−10 to +10V (20kΩ) 0 to +10V (20kΩ)
	14		4 to 20mA/100% speed		4 to 20mA (250Ω)
	16	Multi-function analog input	−10 to +10V/−100 to +100% 0 to 10V/100%	Multi-function analog input (Sn-19)	−10 to +10V (20kΩ) 0 to +10V (20kΩ)
	17	Control common	—		Signal ground
	12	For shielded sheath lead connection	—		Frame ground
	33	−15V power supply	Analog reference power supply		−15V (allowable current is max 20mA)
Sequence Output Signal	9 10	"Running" signal (NO contact)	"Closed" at running	Multi-function output • Sn-20 to Sn-24	Drive contact Contact capacity 250VAC, 1 A or less 30VDC, 1 A or less
	25	Zero-speed detection	"Closed" when below zero-speed level (Cn-01)		Open collector +48V 50mA or less*2
	26	Speed agree detection	"Closed" when it falls within the detection range, (Cn-03) of the preset speed reference		
	28	Ready for operation	"Closed" when it is ready for operation		
	29	Braking resistor overheat	"Closed" when the braking resistor overheats		
	27	Open collector output common	—		—
	18 19 20	Fault output signal common (NO/NC contact)	"Closed" between ⑱ and ⑳ in case of fault "Open" between ⑲ and ⑳ in case of fault		Drive contact Contact capacity 250VAC, 1 A or less 30VDC, 1 A or less
Analog Output Signal	21	Multi-function analog monitor 1 (+)	0 to ±10V/±100% speed	Multi-function analog monitor 1 *1 (bn-17, bn-18)	0 to ±11V Max ±5% 2mA or less
	22	Analog monitor common (−)			
	23	Multi-function analog monitor 2 (+)	5V/inverter rated current	Multi-function analog monitor 2 *1 (bn-26, bn-27)	
	24	Analog monitor 2 common (−)			
	32	For shielded sheath lead connection	—		—
Thermister	30 31	Motor thermister	Motor temperature detection		—
PG Input	CA1	PG power supply (+12V) PG pulse A, B pulse	Inputs PG output pulse		50% duty

*1 Set the Un- item number to be monitored using bn-17 and bn-26 ; bn-18 and bn-27 are monitor output gains and can be set from 0 000 to 10 000

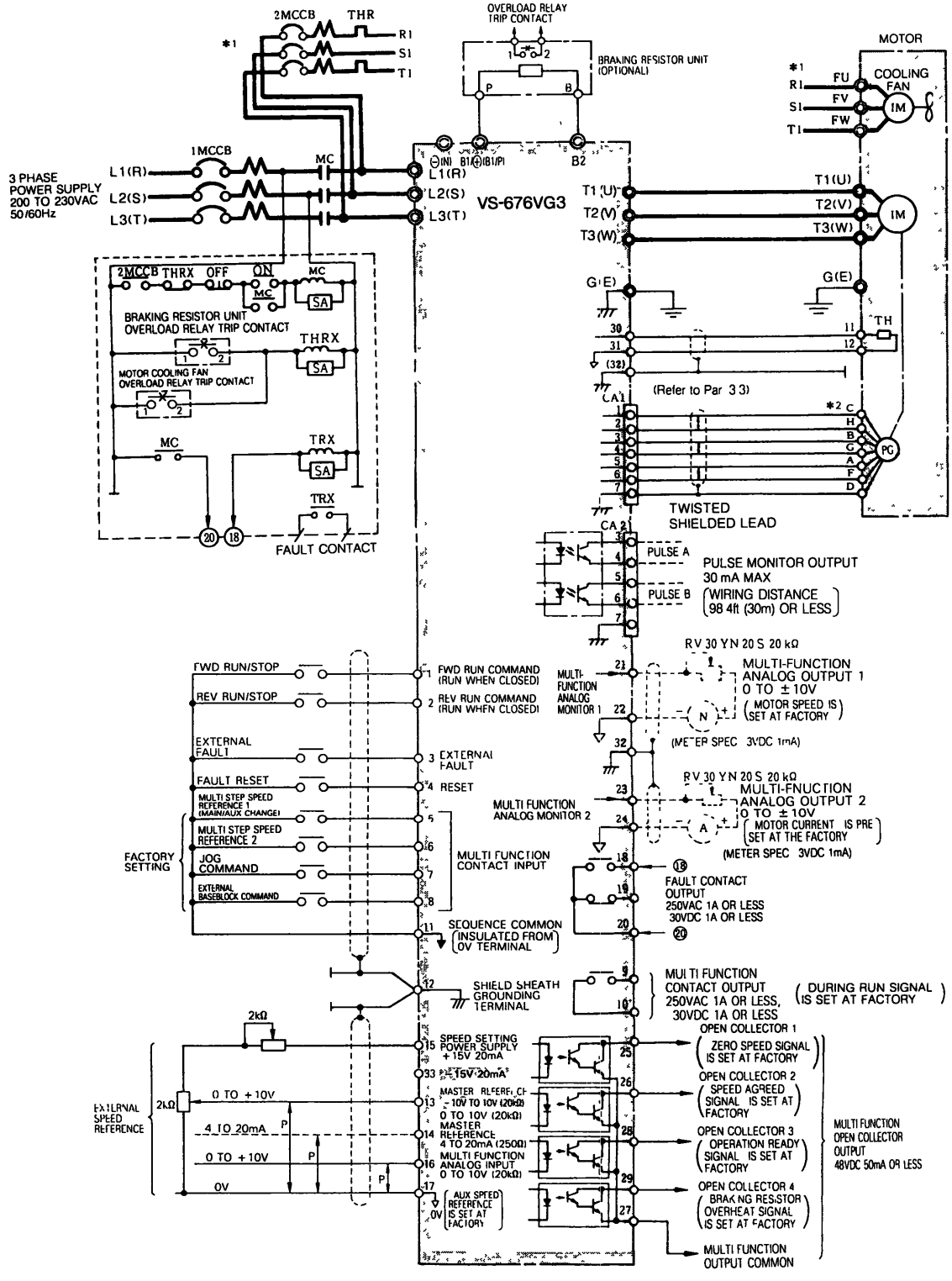
*2 When an inductive load such as a relay coil is driven, insert a free-wheel diode as shown in the following figure



Flywheel diode rating should be of rated circuit voltage/current value or over.

3.2 INTERCONNECTION AND TERMINAL FUNCTIONS (Cont'd)

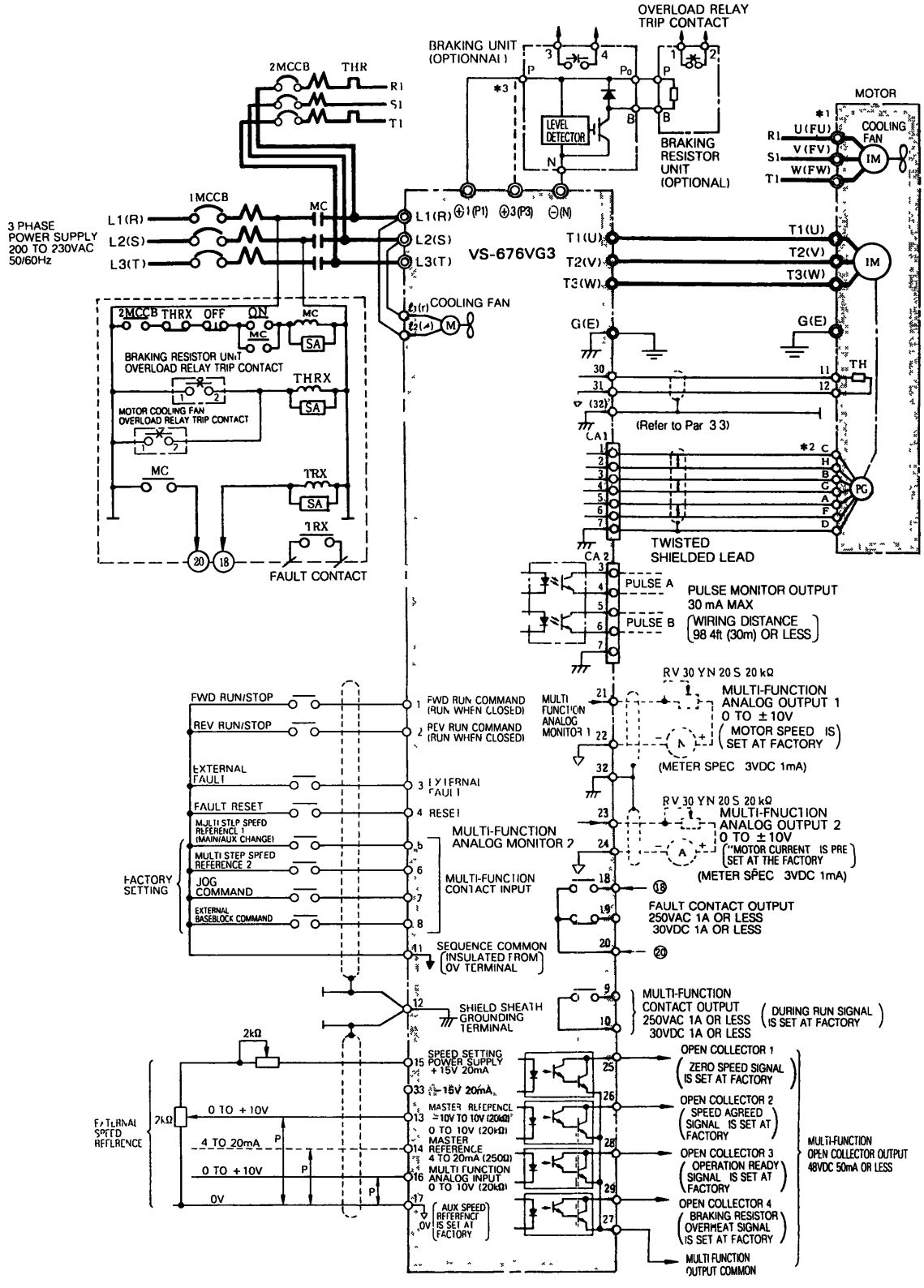
(1) Example of Models CIMR-V 20P4 to -V 27P5 Wiring
[200 to 230V, 0.5 to 10HP (0.4 to 7.5kW) motors are applicable]



*1 Not required for natural air-cooled type motor.
*2 Not required for motor without PG

(2) Example of Models CIMR-V 2011 to -V 2075, CIMR-V . 2L30 to -V . . 2L75 Wiring

[200 to 230V, 15 to 100HP (11 to 75kW) motors are applicable]



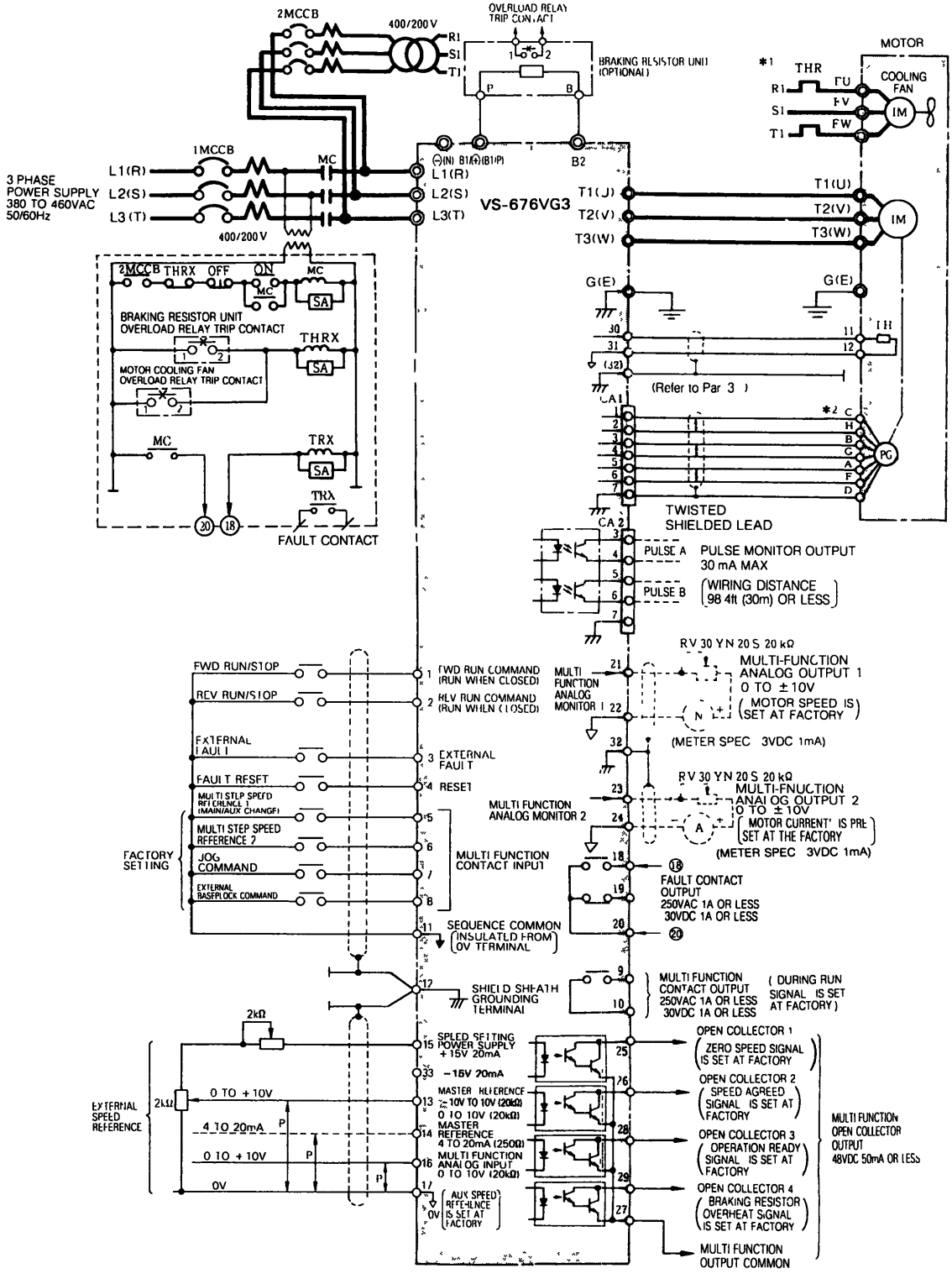
*1 Not required for natural air-cooled type motor.

*2 Not required for motor without PG.

*3 Models CIMR-VG /-VH 2L30 to 2L75 are not provided with terminal P1. Braking unit must be connected across ⊕3 (P3) and ⊖ (N).

3.2 INTERCONNECTION AND TERMINAL FUNCTIONS (Cont'd)

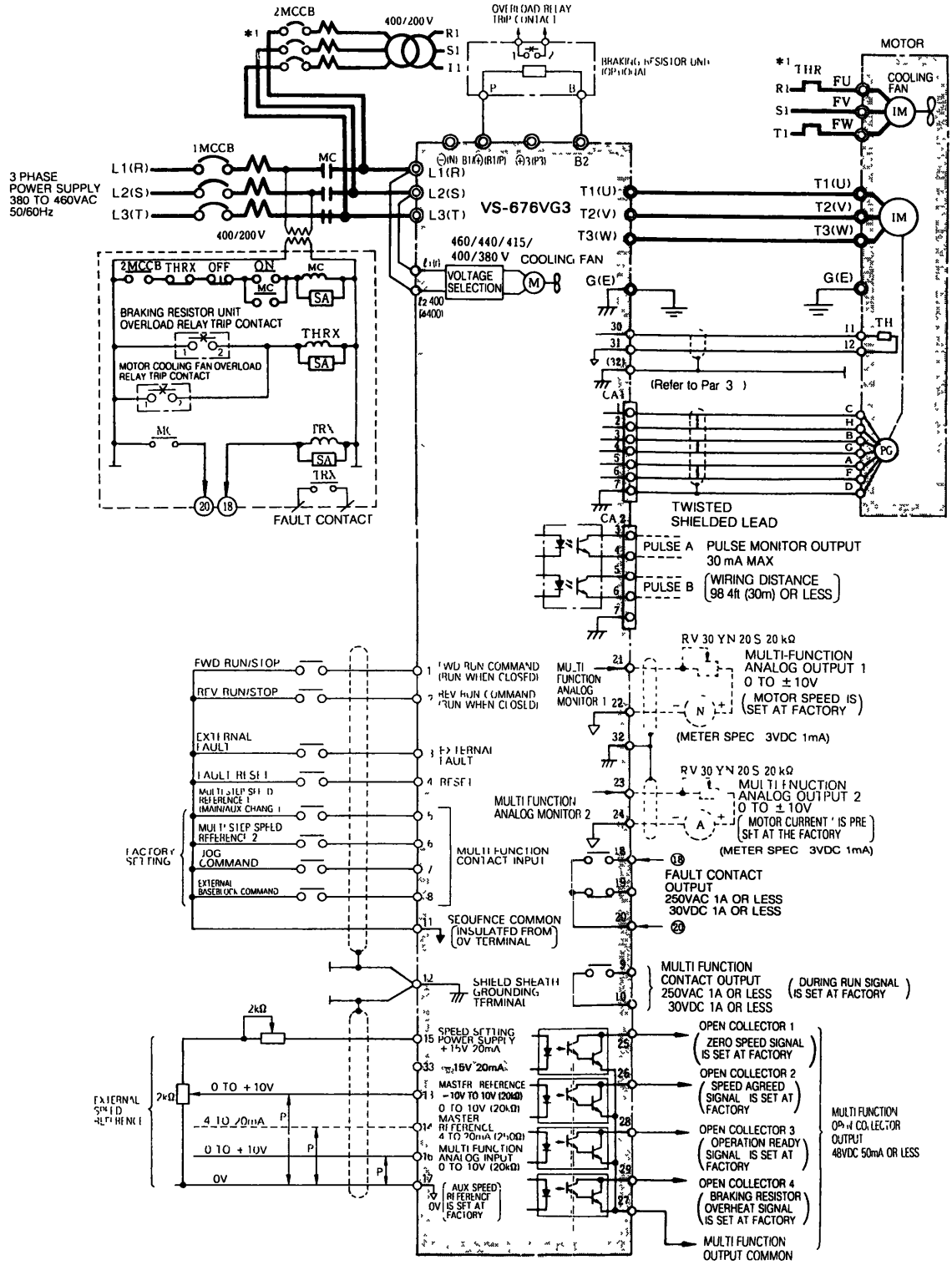
(3) Example of Model CIMR-V 40P4 to -V 47P5 Wiring
[380V to 460V, 0.5 to 10HP (0.4 to 7.5kW) motors are applicable]



*1 Not required for natural air-cooled type motor.
*2 Not required for motor without PG

(4) Example of Model CIMR-V 4011, -V 4015 Wiring

[380V to 460V, 15/20HP (11/15kW) motors are applicable]



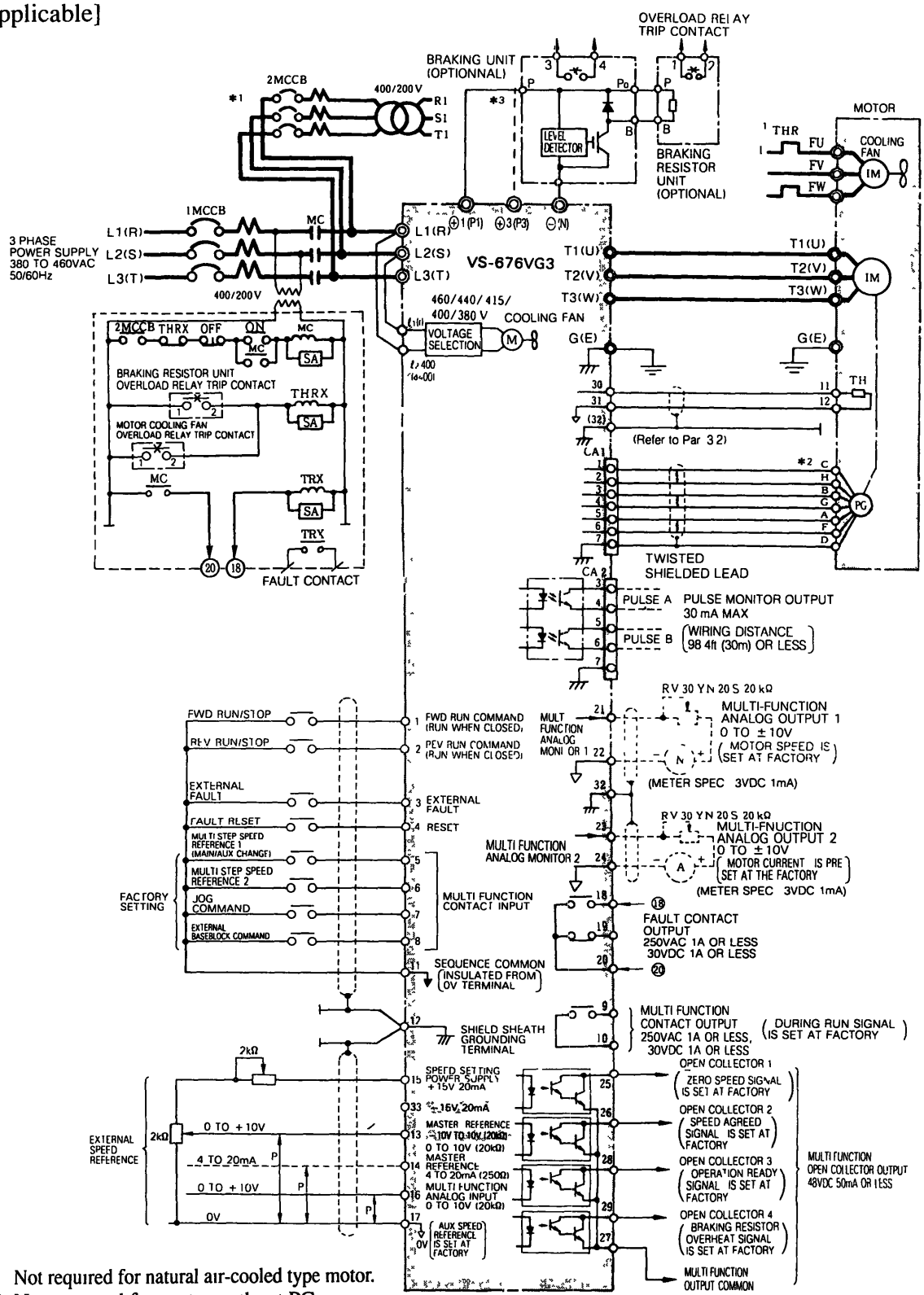
*1 Not required for natural air-cooled type motor

*2 Not required for motor without PG

3.2 INTERCONNECTION AND TERMINAL FUNCTIONS (Cont'd)

(5) Example of Models CIMR-V 4022 to -V 4300, -V 4L55 to -V 4LA6 Wiring

[380V to 460V, 25 to 400HP (18.5 to 300kW) and 75 to 200HP (50 to 160kW) motors are applicable]



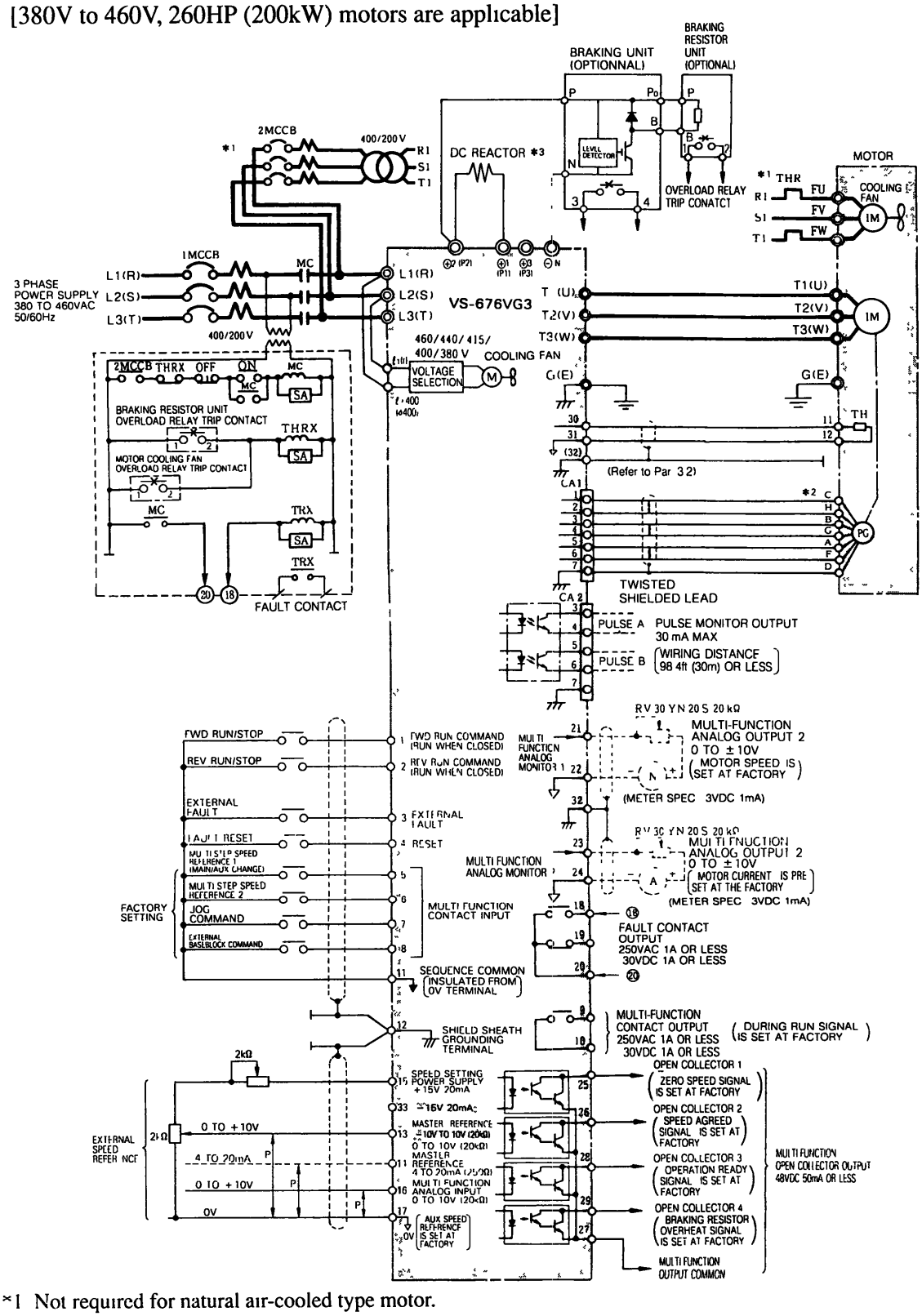
*1 Not required for natural air-cooled type motor.

*2 Not required for motor without PG.

*3 Model CIMR-VG /-VH 4L55 to 4LA6 are not provided with terminal ⊕1 (P1). Braking unit must be connected across ⊕ 3 (P3) and ⊖ (N)

(6) Example of Model CIMR-V 4200 Wiring

[380V to 460V, 260HP (200kW) motors are applicable]



*1 Not required for natural air-cooled type motor.

*2 Not required for motor without PG

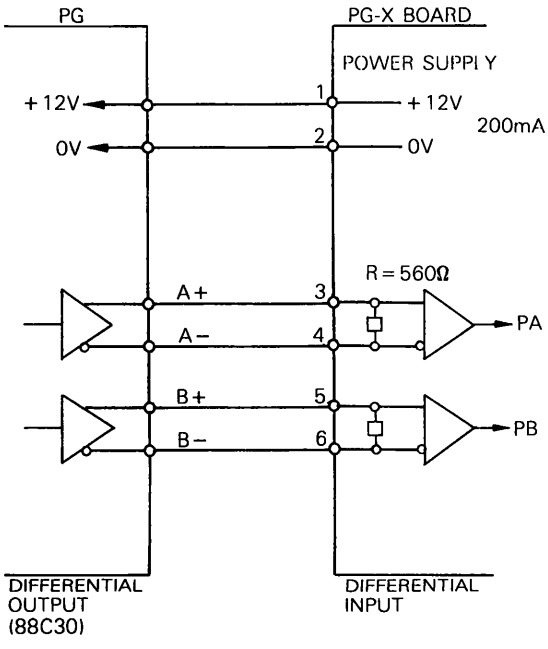
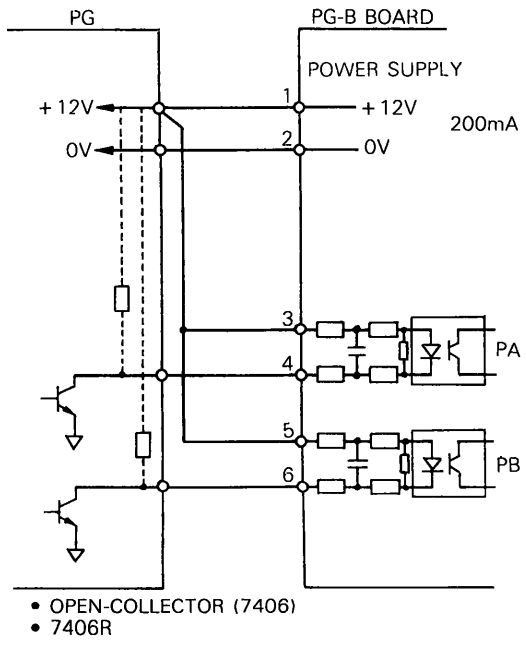
*3 Be sure to connect DC reactor across terminal ⊕1 (P1) and ⊕2 (P2).

3.3 CONNECTION BETWEEN THE PULSE ENCODER (PG) AND INVERTER

PG-X and PG-B are the two types of PG-boards available for the inverter. The input circuits of these boards are different, therefore applicable pulse encoder (PG) types are limited.

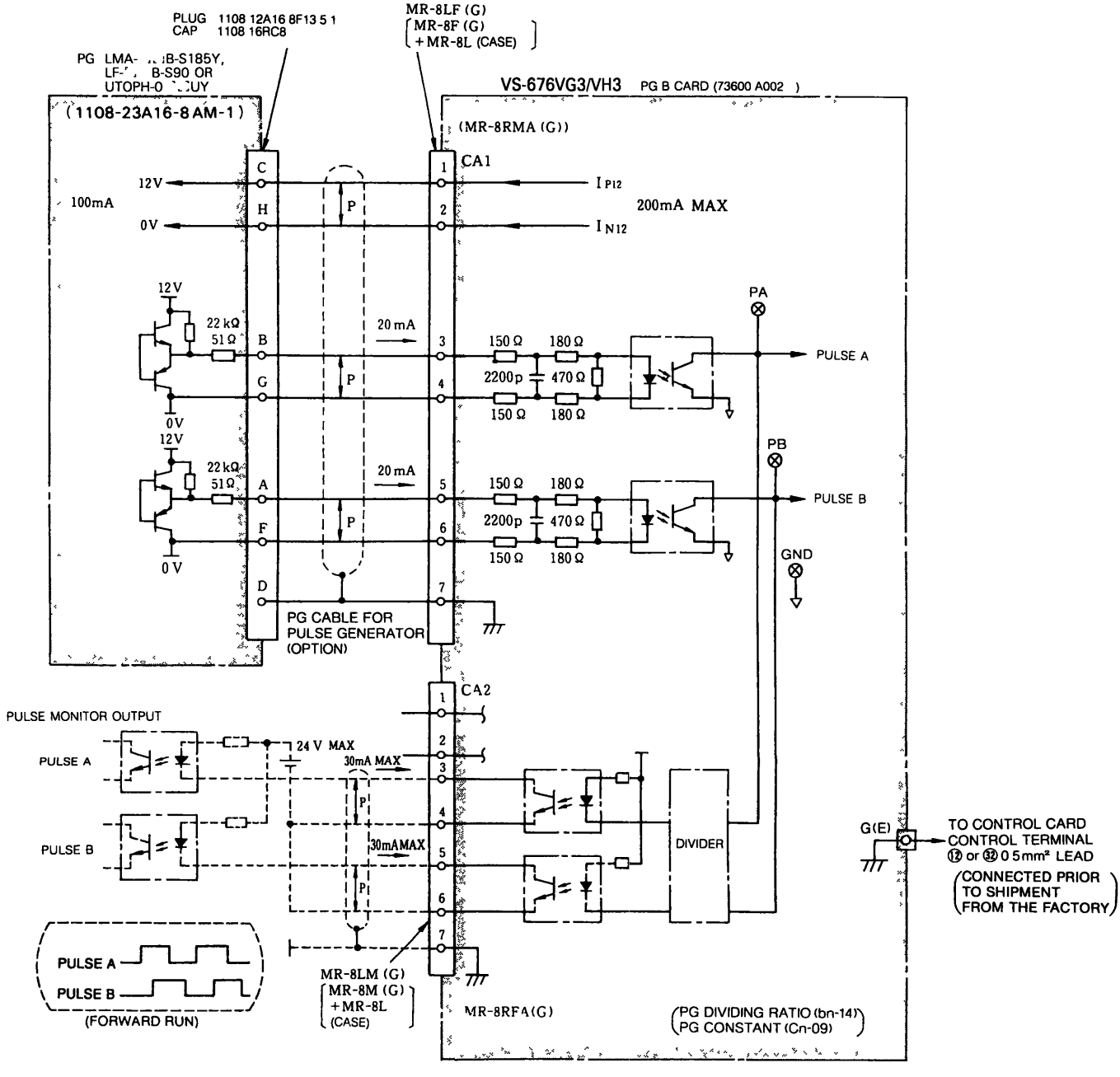
PG-X is for Differential Output type PG (line driver), and PG-B is for Push-Pull type PG (Japanese Standard) or Open Collector type PG. Both PG-X and PG-B are provided with +12V power supply. For other supply voltage type PGs, use separately-installed power supply. PG-X is standard for model CIMR-VGU, and PG-B for model CIMR-VGA/VH (JAPAN use with PG).

Differences between PG-X and PG-B

Type	PG-X (73600-A010)	PG-B (73600-A002)
PG Board Input Circuit and Output Circuit		
Other	PG-X (w/560Ω) is a standard for USA • Input frequency ≦ 300kHz • Cable length < 300ft • Good noise immunity • No pulse divider function	PG-B is for Japan [push-pull type] Not normally recommended • Input frequency < 50kHz • Cable length < 50 ~ (100ft) • Reduced noise immunity

For model CIMR-VGA/VH (JAPAN use with PG), exclusive-use cable connected to both sides of the connector is provided as an option. (Refer to page25.)

[Applicable PG] LMA- B-S185Y (Flange-mounted type) [Made by Samutak K.K.]
LF- B-S90 (Foot-mounted type) [Made by Samutak K.K.]
UTOPH-0__UY (Shaft-mounted type) [Made by YASKAWA]
└── 1/10 of the number of output pulses

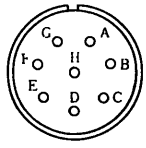


Note . Keep the pulse monitor output cable within 30m

3.3 CONNECTION BETWEEN THE PULSE ENCODER (PG) AND INVERTER (Cont'd)

[PG Terminal] (Provided as standard)

• Model : LMA- B-S185Y
LF- B-S90
UTOPH-0 UY



(Viewed from the soldered side)

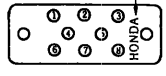
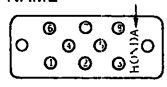
Fig 3 1 PG Terminal

Terminal Specifications

Pin	Signal	Pin	Signal
A	B (+)	E	Body
B	A (+)	F	B (−)
C	12V	G	A (−)
D	Spare terminal	H	0V common

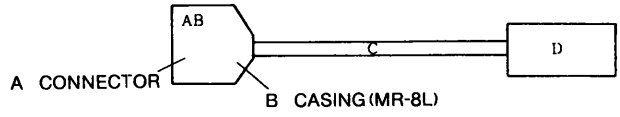
[Connector and lead size]

Table 3 1 Connector and Lead Size

Connector No	Function	Wiring Side Connector Type (Soldered Type)	Terminal Arrangement (Wiring Side)	Lead Size	Manufacturer
CA1	For pulse encoder	MR-8LF (G) (MR-8F (G) + MR-8L (casing))	MANUFACTURER'S NAME  (Viewed from the soldered side)	KPEV-S 0 75 mm² 3-pair lead	Honda Tsushin Co , Ltd
CA2	For pulse monitor	MR-8LM (G) (MR-8M (G) + MR-8L (casing))	MANUFACTURER'S NAME  (Viewed from the soldered side)	KPEV-S 0 75 mm² 3-pair lead	Honda Tsushin Co , Ltd

[Pulse encoder PG cable] (Option)

- Manufacturer : Hitachi Densen Co., Ltd.
- Specification : Polythylene insulation for instrumentation
  Connectors on both ends already connected
  Wiring distance is 164ft(50m) at the maximum*



PG Cable Configuration

- Model : KPEV-S AWG18 (0.75 mm²) 3-pair lead

Cable Length	Code No
16 4ft (5m)	72676-W 0005
32 8ft (10m)	72676-W 0010
65 6ft (20m)	72676-W 0020
98 4ft (30m)	72676-W 0030
164ft (50m)	72676-W 0050

* When using the KPEV-S AWG16 (1 25 mm²) 3-pair lead, extension can be made up to 984ft (300m). In this case, a relay terminal is needed

PG Cable Specifications

A Connector MR-8F (G) (Honda Tsusin Co , Ltd)		C Cable KPEV-S Polyethylene insulation for instrumentation AWG18 (0 75mm²) 3-pair Lead		D Plug TC1108-12A16-8F 13 5 (Tajimi Musen Co , Ltd)
Pin No	Signal	Core	Color	Pin No
1	+12V	Twisted	Blue	C
2	0V		Blue/White	H
3	A (+)	Twisted	Yellow	B
4	A (−)		Yellow/White	G
5	B (+)	Twisted	Green	A
6	B (−)		Green/White	F
7	FG	Shielded		D

3.4 CIRCUIT BREAKER, MAGNETIC CONTACTOR FOR MAIN CIRCUIT

A circuit breaker (MCCB) must always be connected between the AC main circuit power and the inverter input terminals L_1 (R), L_2 (S), L_3 (T). Also connect a magnetic contactor if necessary. Table 3.2 shows recommended cricuit breakers and magnetic contactors.

When using a ground fault interrupter, select one with a sensitivity current of 200mA or more, with an operation time of 0.1 second or longer to prevent malfunction ; also choose one with high-frequency instrumentation.

Table 3 2 Circuit Breaker and Magnetic Contactor

Applicable Inverter				Recommended Circuit Breaker (Mitsubishi Electric Corp)	Recommended Magnetic Contactor (Yaskawa Controls Co , Ltd)
Voltage Class V	Model CIMR-VG[ ] -VH[ ]	Capacity kVA	Rated Current A		
200 to 230	20P4	1	3.2	NF30, 5A	HI-7E
	20P7	1 5	4 8	NF30, 10A	HI-7E
	21P5	2	6 4	NF30, 20A	HI-10-2E
	22P2	3	9 6		
	23P7	5	16	NF30, 30A	HI-20E
	25P5	7 5	24	NF50, 50A	HI-30E
	27P5	10	32	NF100, 60A	HI-50E
	2011	15	48	NF100, 100A	HI-50E
	2015	20	64	NF100, 100A	HI-80E
	2018	25	80	NF225, 150A	HI-100E
	2022	30	96		
	2L30	40	130	NF225, 225A	HI-100E
	2L37, 2037	50	160		
	2L45	60	183	NF400, 300A	HI-200E
	2L55, 2055	70	224	NF400, 400A	HI-300E
	2L75, 2075	100	300	NF600, 600A	HI-500E
380 to 460	40P4	1	1 6	NF30, 5A	HI-7E
	40P7	1 6	2 56		
	41P5	2 5	4 0	NF30, 10A	HI-10-2E
	42P2	3	4 8		
	43P7	5	8	NF30, 20A	HI-20E
	45P5	7 5	12		
	47P5	10	16	NF30, 30A	HI-20E
	4011	15	24	NF50, 50A	HI-30E
	4015	20	32	NF100, 60A	HI-50E
	4018	25	40	NF100, 75A	HI-50E
	4022	30	48	NF100, 100A	HI-50E
	4030	40	64	NF100, 100A	HI-80E
	4037	50	80	NF225, 150A	HI-100E
	4L45, 4045	60	96		
	4L55, 4055	80	128	NF225, 225A	HI-125E
	4L75, 4075	100	165	NF400, 300A	HI-200E
	4LA1, 4110	140	224	NF400, 400A	HI-300E
	4LA6, 4160	200	300	NF600, 600A	HI-500E
	4200	250	400		
	4220	300	450	NF800, 800A	HU-4893E
	4300	400	600	NF1000, 1000A	HU-593E

3.5 SURGE ABSORBER

Always connect surge absorber to magnetic contactors, control relays, magnetic valves, and magnetic brake coils used around the VS-676VG3/VH3. Table 3.3 shows applicable surge absorbers.

Table 3 3 Applicable Surge Absorber

Device \ Surge Absorber		Model	Specification	Code No
200V to 230V	Large-capacity Coil Other than Relay	DCR2-50A22E	250VAC 0 5μF+200Ω	C002417
	Control Relay LY-2, -3 [Omron] HH-22, -23 [Fuji Electric] MM-2, -4 [Omron]	DCR2-10A25C	250VAC 0 1μF+100Ω	C002482
380 to 460V devices		DCR2-50D100B	1000VDC 0.5μF+200Ω	C002630

Note The surge absorbers are made by Marcon Electronics Co., Ltd

3.6 WIRE SIZE

Wire sizes and types are shown in Tables 3.4 and 3.5. The sizes of the closed-loop connectors are shown in Table 3.6.

Table 3 4 200V Class Wire Size

Circuit	Model CIMR-VG□ -VH□	Terminal Symbol	Terminal Screw	75°C Copper Wire Range AWG	75°C Copper Wire Range mm²	Wire Type
Main	20P4	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U) T2(V), T3(W)	M4	14 - 10	2 - 5 5	Power Cable 600V vinyl sheathed lead or equivalent
		G(E)		14 - 10	2 - 5 5	
	20P7	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	14 - 10	2 - 5 5	
		G(E)		14 - 10	2 - 5 5	
	21P5 22P2	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	14 - 10	2 - 5 5	
		G(E)		12 - 10	3 5 - 5 5	
	23P7	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	10	5 5	
		G(E)		10	5 5	
	25P5	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M5	8	8	
		G(E)		10	5 5	
	27P5	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M5	8	8	
		G(E)		10	5 5	
	2011	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M6	4	22	
		G(E)	M8 *	8 - 2	8 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2015	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U) T2(V), T3(W)	M8	3 - 1/0	30 - 60	
		G(E)	M8 *	8 - 2	8 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2018	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3) T1(U) T2(V), T3(W)	M8	2 - 1/0	38 - 60	
		G(E)	M8 *	6 - 2	14 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2022	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M8	1/0	60	
		G(E)	M8 *	6 - 2	14 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2037	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M10	1/0 × 2P	60 × 2P	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2055	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M10	4/0 × 2P	100 × 2P	
		G(E)	M8 *	3 - 2	30 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2075	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M12	300MCM × 2P	150 × 2P	
		G(E)	M8 *	1-2/0	38 - 70	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2L30	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3), T1(U) T2(V), T3(W)	M10	3 / 0	80	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2L37	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3) T1(U), T2(V), T3(W)	M10	2/0 × 2P	70 × 2P	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2L45	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3), T1(U), T2(V), T3(W)	M10	2/0 × 2P	70 × 2P	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2L55	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3), T1(U), T2(V), T3(W)	M10	2/0 × 2P	70 × 2P	
		G(E)	M8 *	3 - 2	30 - 38	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
	2L75	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3), T1(U), T2(V), T3(W)	M12	4/0 × 2P	100 × 2P	
		G(E)	M8 *	1 - 2/0	38 - 70	
		ℓ1(r), ℓ2(⏊)	M4	14 - 10	2 - 5 5	
Control	Common to all models	1 to 32, 33	M3 5	18 - 14	0 75 - 2	Twisted shielded lead with class 1 wiring or equivalent

*Indicates the use of Pressure Lug Terminals.

IMPORTANT

- Lead size should be determined considering voltage drop of leads.
- Use only 75℃ copper wire as described above.

Table 3 5 400V Class Wire Size

Circuit	Model CIMR-VG□ -VH	Terminal Symbol	Terminal Screw	75°C Copper Wire Range AWG	75°C Copper Wire Range mm²	Wire Type
Main	40P4 40P7	L1(R), L2(S), L3(T) ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	14 - 10	2 - 5 5	Power Cable 600V vinyl sheathed lead or equivalent
		G(E)		14 - 10	2 - 5 5	
	41P5 42P2	L1(R), L2(S) L3(T), ⊖(N) B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	14 - 10	2 - 5 5	
		G(E)		14 - 10	2 - 5 5	
	43P7	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4 M5	14 - 10	2 - 5 5	
		G(E)		12 - 10	3 5 - 5 5	
	45P5	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	12 - 10	3 5 - 5 5	
		G(E)	M5	12 - 10	3 5 - 5 5	
	47P5	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M4	10	5 5	
		G(E)	M5	10	5 5	
	4011	L1(R), L2(S), L3(T) ⊖(N), B1/⊕(B1/P) B2, T1(U) T2(V), T3(W)	M5	8	8	
		G(E)	M8 *	10 - 2	5 5 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4015	L1(R), L2(S), L3(T), ⊖(N), B1/⊕(B1/P), B2, T1(U), T2(V), T3(W)	M5	8	8	
		G(E)	M8 *	10 - 2	5 5 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4018	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1) ⊕3(P3) T1(U), T2(V), T3(W)	M6	6 -4	14 - 22	
		G(E)	M8 *	8 - 2	8 - 38	
		ℓ1(r) ℓ2 (◢)	M4	14 - 10	2 - 5 5	
	4022	L1(R), L2(S), L3(T) ⊖(N), ⊕1(P1), ⊕3(P3) T1(U) T2(V) T3(W)	M6	4	22	
		G(E)	M8 *	8 - 2	8 - 38	
		ℓ1(r) ℓ2 200(◢ 200) ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4030	L1(R), L2(S) L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M8	3 - 1/0	30 - 60	
		G(L)	M8 *	8 - 2	8 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400) x, y	M4	14 - 10	2 - 5 5	
	4037	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M8	2 - 1/0	38 - 60	
		G(E)	M8 *	6 - 2	14 - 38	
		ℓ1(r), ℓ2(◢)	M4	14 - 10	2 - 5 5	
	4L45 4045	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M8	1/0	60	
		G(E)	M8 *	6 - 2	14 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400) x, y	M4	14 - 10	2 - 5 5	
	4055	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V) T3(W)	M10	3/0	80	
		G(E)	M8 *	4 - 2	22 -38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x y	M4	14 - 10	2 - 5 5	
	4075	L1(R), L2(S) L3(T), ⊖(N) ⊕1(P1), ⊕3(P3) T1(U) T2(V), T3(W)	M10	1/0 × 2P	60 × 2P	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400) x y	M4	14 - 10	2 - 5 5	
	4110	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕3(P3), T1(U), T2(V) T3(W)	M10	4/0 × 2P	100 × 2P	
		G(E)	M8*	3 - 2	30 - 38	
		ℓ1(r) ℓ2 200(◢ 200) ℓ2 400(◢ 400) x y	M4	14 - 10	2 - 5 5	
	4160	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M12	250MCM×2P	150 × 2P	
		G(E)	M8 *	1 - 2/0	38 - 70	
		ℓ1(r), ℓ2 200(◢ 200) ℓ2 400(◢ 400) x y	M4	14 - 10	2 - 5 5	
	4200†	L1(R), L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕(P2), ⊕3(P3), T1(U), T2(V), T3(W)	M12	500MCM×2P	325 × 2P	
		G(E)	M8 *	1/0 - 2/0	60 - 70	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4220†	L1(R), L2(S), L3(T), ⊖(N), ⊕1(P1), ⊕3(P3), T1(U), T2(V), T3(W)	M16	500MCM×2P	325 × 2P	
		G(E)	M8 *	1/0 - 2/0	60 - 70	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4300†	L1(R) L2(S), L3(T), ⊖(N) ⊕1(P1), ⊕3(P3) T1(U), T2(V), T3(W)	M16	900MCM×2P	456 × 2P	
		G(E)	M8 *	2/0	70	
		ℓ1(r) ℓ2 200(◢ 200) ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4L55	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3) T1(U), T2(V), T3(W)	M10	3/10	80	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4L75	L1(R) L2(S) L3(T), ⊖(N) ⊕3(P3) T1(U) T2(V), T3(W)	M10	1/0 × 2P	60 × 2P	
		G(E)	M8 *	4 - 2	22 - 38	
		ℓ1(r), ℓ2 200(◢ 200) ℓ2 400(◢ 400) x y	M4	14 - 10	2 - 5 5	
	4LA1	L1(R), L2(S), L3(T), ⊖(N), ⊕3(P3), T1(U), T2(V), T3(W)	M10	4/0 × 2P	100 × 2P	
		G(E)	M8 *	3 - 2	30 - 38	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x, y	M4	14 - 10	2 - 5 5	
	4LA6	L1(R), L2(S) L3(T), ⊖(N), ⊕3(P3) T1(U), T2(V) T3(W)	M12	250MCM×2P	150 × 2P	
		G(E)	M8 *	1 - 2/0	38 - 70	
		ℓ1(r), ℓ2 200(◢ 200), ℓ2 400(◢ 400), x y	M4	14 - 10	2 - 5 5	
Control	Common to all models	1 to 32, 33	M3 5	18 - 14	0 75 - 2	Twisted shielded lead with class 1 wiring or equivalent

* Indicates the use of Pressure Lug Terminals

† AWG data do not correspond to mm² data.
For UL listed products, select wire size using AWG
For non UL listed products, select size using mm²

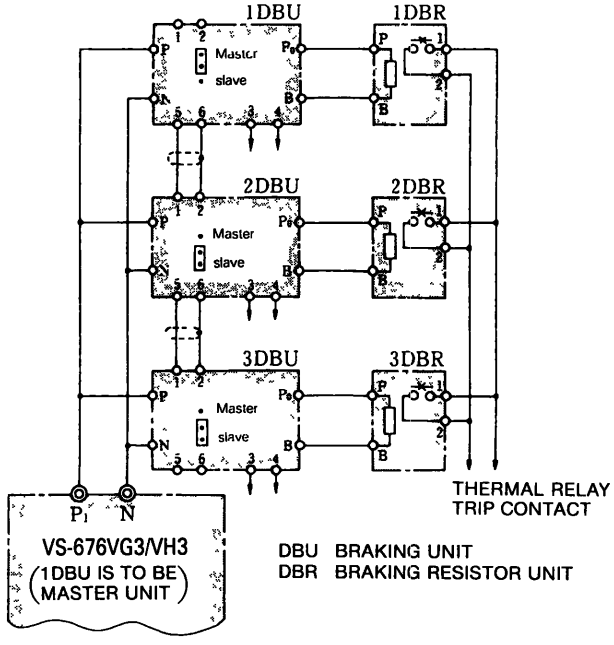
3.6 WIRE SIZES (Cont'd)

Table 3 6 Size of Closed-Loop Connectors (JIS C 2805)
(Common to 200V Class, 400V Class)

AWG	Wire Size mm²	Terminal Screw	Round Crimp Terminal Size
20	0 5	M3 5 M4	1 25-3 5 1 25-4
18	0 75		
16	1 25		
14	2	M4	2-4
		M5	2-5
12	3 5	M4	3 5-4
		M5	3 5-5
10	5 5	M4	5 5-4
		M5	5 5-5
8	8	M5	8-5
		M6	8-6
6	14	M6	14-6
4	22	M8	22-8
3	30	M8	30-8
2	38	M8	38-8
2	38	M10	38-10
1	38		38-10
1/0	60		60-10
2/0	70		70-10
3/0	80		80-10
4/0	100		100-10
4/0	100	M12	100-12
250MCM	150		150-12
500MCM	325		325-12
250MCM	150	M16	150-16
500MCM	325		325-16
900MCM	500		325-16

3.7 TYPICAL WIRING

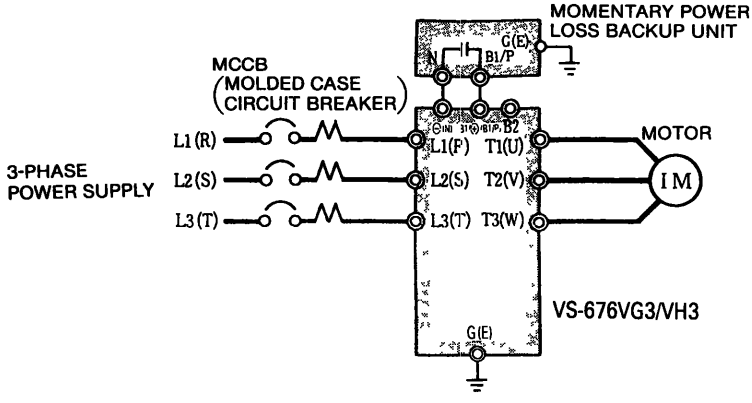
(1) Typical Wiring when Multiple Braking Units are Connected in Parallel



(2) Typical Wiring when Momentary Power Loss Backup Unit is Used
[Applied to 200V class and 400V class 0.5 to 3HP (0.4 to 2.2kW)]

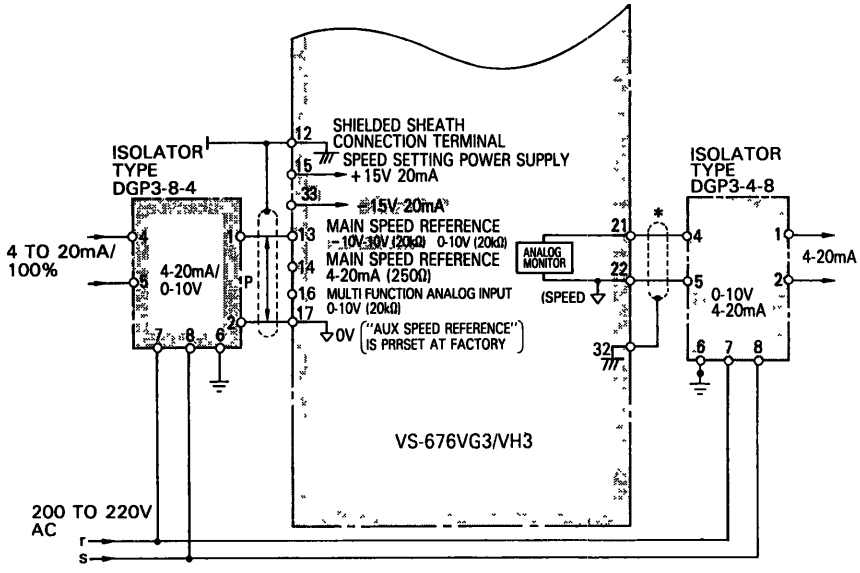
Use the momentary power loss backup unit for any models of 3HP (2.2kW) or less when backup is needed for momentary power loss of 1 to 2 seconds.

200V class : Type P0010, code No. 73600-P0010
400V class : Type P0020, code No. 73600-P0020



3.7 TYPICAL WIRING (Cont'd)

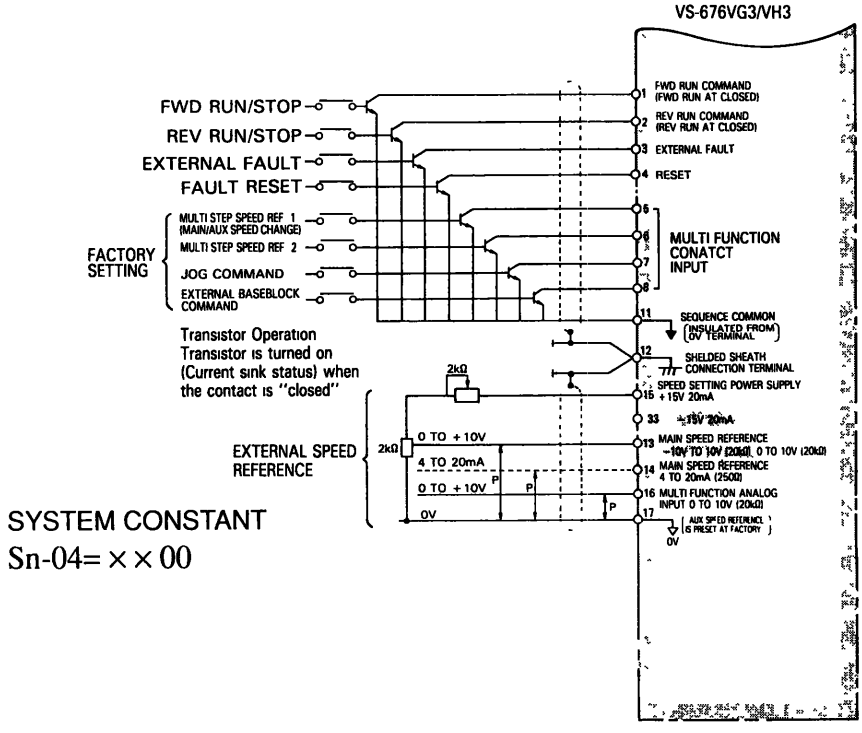
(3) Typical Wiring when Isolator is Used
(4-20mA input reference and 4-20mA output for speed monitoring)



* Set Sn-28 1st digit to 1 so that analog monitor has unipolar (0 to 10V) action.

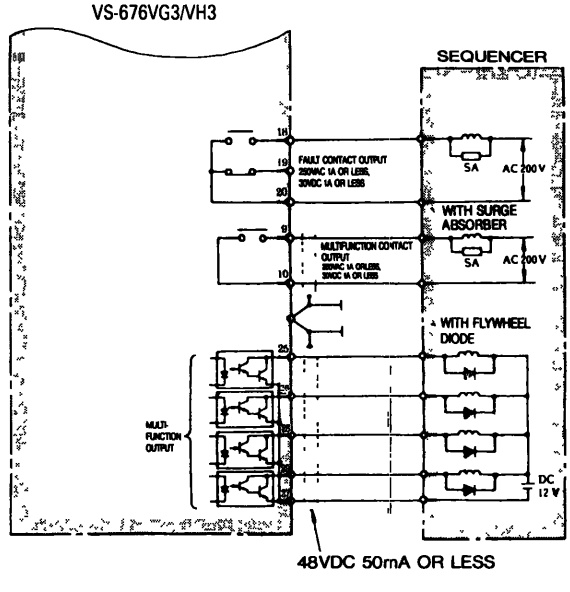
Type	Input Signal	Output Signal	Power Supply	Code No
DGP2 4-4	0 to 10V	0 to 10V	100VAC	CON 000019 25
DGP2 4-8	0 to 10V	4 to 20mA	100VAC	CON 000019 26
DGP2 8-4	4 to 20mA	0 to 10V	100VAC	CON 000019 35
DGP2 3-4	0 to 5V	0 to 10V	100VAC	CON 000019 15
DGP3 4-4	0 to 10V	0 to 10V	200VAC	CON 000020 25
DGP3 4-8	0 to 10V	4 to 20mA	200VAC	CON 000020 26
DGP3 8-4	4 to 20mA	0 to 10V	200VAC	CON 000020 35
DGP3 3-4	0 to 5V	0 to 10V	200VAC	CON 000020 15

(4) Typical Wiring for Operation by Open-collector Transistor



Note: Maximum allowable leakage current across each transistor is 2mA.

(5) Wiring of Contact Input/Output, Open-collector Output



4. INITIAL OPERATION

To assure safety, prior to initial operation, uncouple the motor to isolate it from the machine. If initial operation must be performed while the motor is still coupled to the machine, use great care to avoid potentially hazardous conditions.

4.1 CHECKS BEFORE INITIAL OPERATION

After completion of installation and wiring, check for :
(1) proper wiring and terminal connections
(2) wire clippings that could cause a short circuit
(3) screw-type terminals are tightened
(4) proper load

4.2 SETTING LINE VOLTAGE USING JUMPER

[Required only for models of 400V class 15HP (11kW) or higher]

The line voltage must be set according to the main circuit power supply using jumper, as shown in Fig. 4.1. Insert the jumper at the appropriate location corresponding to the input line voltage. The factory preset is 460V.

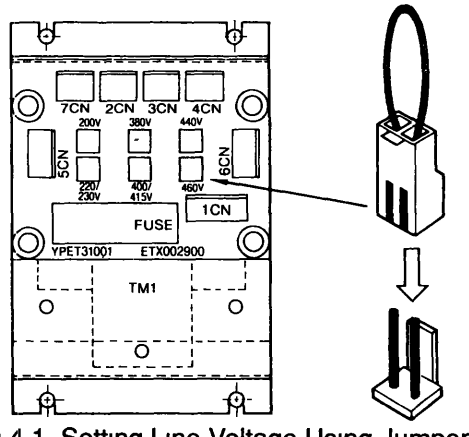
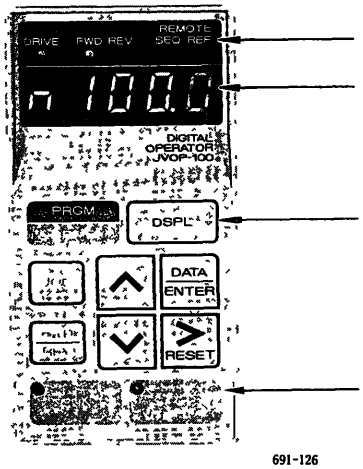


Fig 4 1 Setting Line Voltage Using Jumper

4.3 SUPPLY MAIN CIRCUIT POWER

Supply power to the main circuit, and check that there is no fault (abnomal noise, smoke, odors, etc.). By supplying power to the main circuit, the charge LED displays "CHARGE" indicating that it is ready for operation. The display section of the digital operator will also turn on.



MODE DISPLAY LED DRIVE , FWD or REV LED lights
DISPLAY SECTION . r 100.0 (%) is displayed
DISPLAY SELECTION KEY (Used for speed feedback display)
RUN DISPLAY LED · STOP LED lights

Fig 4 2 Digital Operator

Note : When an exclusive-use thermistor is not provided for the motor a "THM" (thermistor fault) will be displayed In this case, set the second digit of "on-02" to 1 (no-thermistor control mode) and depress the reset key The normal display will now appear

4.4 CHECKING MOTOR ROTATION DIRECTION

Check that the polarity on the digital operator and the rotation of the motor are correct and that the speed display is correct, by displaying the speed detection on the digital operator and turning the motor shaft.

The forward direction of the motor is in the counterclockwise direction when viewed from the drive end. (Fig.4.3) Check that [STOP] LED of digital operator is lit and then perform the following procedure:

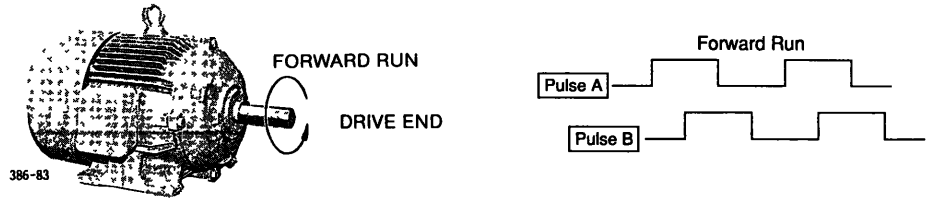


Fig 4 3 Direction of Motor Rotation and PG Phasing

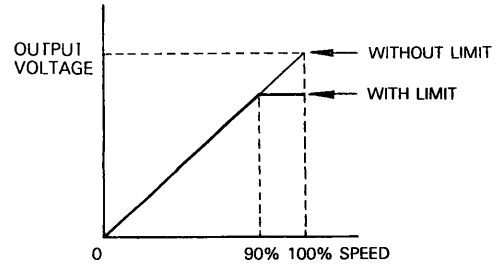
(1) Depress the [DSPL] key to change the display to indicate the motor speed.
n000 0 (%) → 0 0 (%)
(REFERENCE DISPLAY) (FEEDBACK DISPLAY)
(2) Rotate the motor shaft counterclockwise (CCW) when viewed from the drive end.
• (Example) 3 0 (%)
(3) Rotate the motor shaft clockwise (CW) when viewed from the drive end.
• Check that the motor speed is displayed with minus sign and matches the rotation speed.
• (Example) – 3 0 (%)
(4) If a fault occurs, refer to Par.3.3 "CONNECTION BETWEEN THE PULSE GENERATOR (PG) AND INVERTER".

4.5 SETTING LINE VOLTAGE

Set Sn-09 1st digit to 0 or 1 according to Inverter line voltage shown in Table below :

Line Voltage	Sn-09	Description
200 V or more 400V or more	xxx0	without output voltage limit
200v or less 400V or less	xxx1	with output voltage limit

Note : For type FCK motor [1750r/min 100HP (75kW) or more, 1450r/min 75HP (55kW) or more; 1150r/min 75HP (55kW) or more], set Sn-09 1st digit to 0



4.6 SETTING THE CARRIER FREQUENCY

If motor audible or electromagnetic noise causes interference, a low-noise mode can be selected by setting Sn-09 4th digit to 1.

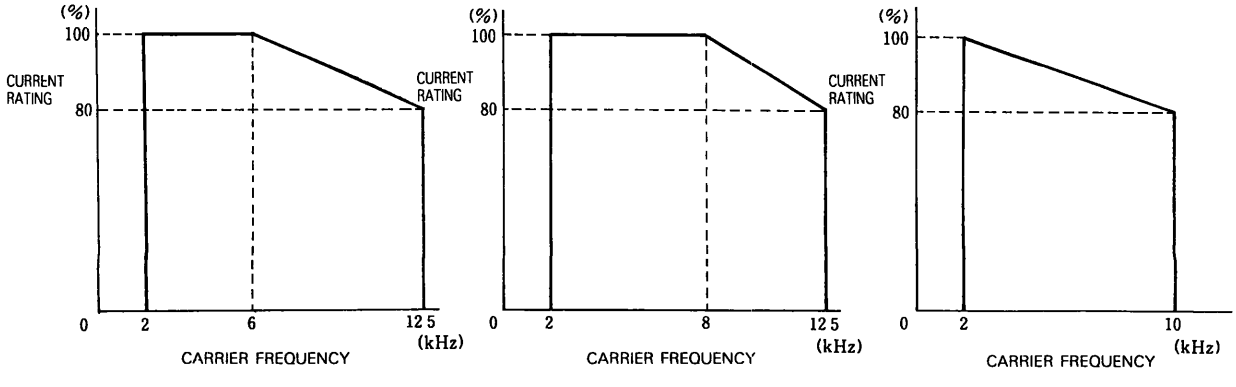
Sn-09 = 0XXX : Normal mode (2kHZ)
1XXX : Low-noise mode

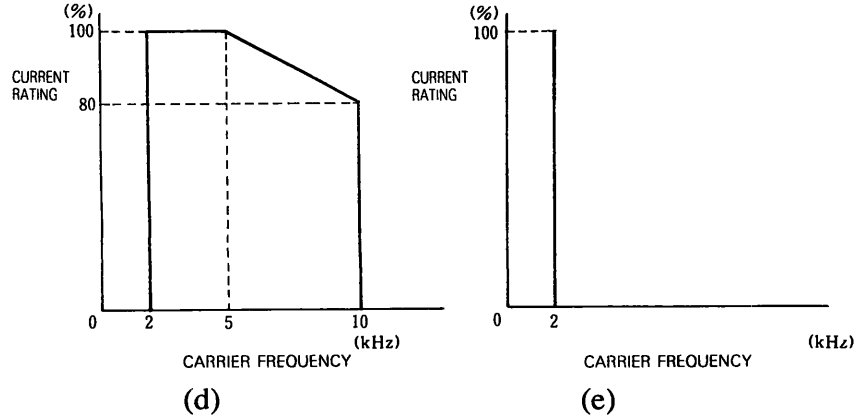
When the low-noise mode is selected, the carrier frequency can be changed by using Cn-52. However, the low-noise mode cannot be selected for some capacity series.

The carrier frequency set prior to shipment is 2kHz (normal mode). The low-noise mode setting range for each capacity is shown in Table 4.1.

Table 4 1 Setting Carrier Frequency

Inverter Model CIMR-VG VH	Low-noise Mode Selection	Setting Range	Continuous Rated Current Characteristics (See figures below)
20P4, 20P7, 21P5, 22P2, 23P7, 25P5, 27P5, 2011, 2015 2018, 2022	Possible	2 to 12 5kHz	(a)
40P4 40P7, 41P5, 42P2, 43P7, 45P5, 47P4, 4011, 4015, 4018, 4022, 4030, 4037, 4L45			(b)
2L30, 2L37, 2L45, 2L55, 2L75	Possible	2 to 10kHz	(c)
4L55, 4L75, 4LA1, 4LA6			(d)
2037, 2055, 2075, 4045, 4055, 4075, 4110, 4160, 4200, 4220, 4300	Inpossible	2kHz	(e)





4.7 SETTING RATED SPEED

If the machine or process requires changing the motor rated speed, use bn-10 to adjust the rated speed.

When Inverter speed reference is 100%:

Motor speed = Max Speed (dn-02) × Rated Speed Adjustment (bn-10)

(Example)

Motor rated speed : 1750 r/min ·····①
Inverter speed reference : 100%

To obtain motor speed 2100r/min, ·····②

① × rated speed adjustment = ②

$$\text{rated speed adjustment} = \frac{②}{①} = \frac{2100}{1750}$$
$$= 1.2000$$

4.8 SETTING IF THERMISTER IS NOT PROVIDED

Standard motors exclusive for inverters are provided with exclusive-use thermisters. However, if the applied motor is a general-purose motor without a thermister, set the On-02 second digit to 1.*

Thermister	On-02
Provided	××0× (Preset at factory)
Not provided	××1×

* Setting of On-02 or On-30 must be made after changing Sn-03 to 1001.
Afte completion of setting, return Sn-03 to 0000

Inverters after code No. ETC67055 -S0404 can be set individually if a thermister is not provided for the 2nd motor. Set On-30 3rd-digit referring to table below.
If a 2nd-motor is not used, On-30 3rd-digit setting is not needed.

Thermister		Constant Setting		Remarks
1st Motor	2nd Motor	On-02	On-30	
Provided	Provided	××0×	×0××	Preset at factory
Provided	Not Provided	××0×	×1××	
Not Provided	Not Provided	××1×	×0××	
Not Provided	Provided	××1×	×1××	

4.9 SETTING THE MOTOR OVERLOAD PROTECTION

This inverter has an electronic thermal function using temperature simulation for motor overload protection. Set the first digit of Sn-38 as shown below according to the motor type.

Motor Type	Sn-38
Inverter exclusive-use motors (including VS-676 standard motors)	×××0 (Preset at factory)
General-purpose motors	×××1

Note : For details of the overload protection curve,
refer to the description of Sn-38 in APPENDIX par. 5 1.

4.10 AUTO-TUNING

The inverter is provided with auto-tuning functions for motor primary resistance, motor cable lead resistance, and motor constants. Perform auto-tuning when necessary, referring to the following description:

Precautions

① Since the motor runs automatically during auto-tuning, disconnect the motor from the machine system for safety so that motor rotation will not be harzardous.

② All control circuit terminal input signals are disregarded in the auto-tuning mode.

③ To use auto-tuning, a TRQ-A card is required.

④ After completion of auto-tuning, do not change Sn-02 (motor selection). Otherwise, the dn constants will be changed.

⑤ Upon execution of auto-tuning, "CAL " is displayed on the digital operator.

• "CAL "
Tuning mode (Sn-37 set value)
Motor number being tuned (1 or 2)

⑥ When a transmission card is mounted, do not change any constants or input a RUN/STOP signal during auto-tuning.

(1) Auto-tuning for Primary Resistance (dn-08)

[Design revision "C" and before]

Verify that T_1 (U), T_2 (V), and T_3 (W) wiring between the inverter and motor is properly connected. Perform auto-tuning as outlined in the following procedure:

Note : To perform auto-tuning of motor constants using the PC support software, this primary resistance tuning procedure is not necessary.

[Procedure]

Step		Operation
1	Select the program mode	Depress PRGM/DRIVE key (DRIVE LED turns OFF)
2	Set Sn-37 to 01	① Depress DSPL key to display "Sn-01" ② Depress ∧ or ∨ key to display "Sn-37" ③ Depress DATA/ENTER key to display the data Initial value "00" ④ Move the cursor to the first digit by using > key, after changing the setting to "01" by using ∧ or ∨ key, depress DATA/ENTER key (Verify that "End" is displayed)
3	Return to the drive mode	① Depress PRGM/DRIVE key (DRIVE LED turns ON) ("CAL" is displayed)
4	Execute tuning	Depress RUN key RUN LED turns ON during tuning and STOP LED turns ON at completion
5	Select the program mode	Depress PRGM/DRIVE key after completion of tuning (DRIVE LED turns OFF)
6	Return Sn-37 to 00	Return the setting of Sn-37 from 01 to 00 in the same way as step 2
7	Return to the drive mode	Depress PRGM/DRIVE key (DRIVE LED turns ON)

Notes:

- Disregarding the setting of Sn-04, execution of primary resistance tuning is only possible by the digital operator RUN key
- When a primary resistance compensated value is entered into dn-08, and by setting Sn-37 to 02 and tuning in the same procedure as described above, Cn-13 (feeder resistance) auto-tuning can be performed.

4.10 AUTO-TUNING (Cont'd)

[Design revision "E" and after]

The follwing points are different from the procedure described above.

- Upon execution of tuning, the digital operator will display "CAL 1" for primary resistance tuning ("CAL 2 1" for second motor tuning) or "CAL 12" for Cn-13 (feeder resistance) tuning ("CAL 22" for second motor tuning).
- "CAL 2 1", "SEQ" and "REF" LEDs along with the RUN LED turn ON during tuning.
- Step 6 is not needed. At completion of tuning, Sn-37 is returned to 00 automatically.

(2) Autotuning of Motor Constants

In order to perform vector control, it is necessary to properly set the motor constants in the inverter.

When motor constants are tuned, determine the tuning mode using the following table:

Sn-37 Set Value	Input Data	Precautions at Input Data Setting
03	Motor data (motor plate value)	Motor rated output in kW
0F	Motor data (motor plate value)	Motor rated output in Hp
04	Motor constant (dn-□□ value)	Set motor constant before changing Sn-37 to 04

- When the motor data (motor nameplate values) are used as input data, perform auto-tuning by the Procedure described below.
- When the motor constants (dn- value) are used as input data, the following two points are different from the Procedure described below.

1. Enter the motor data into constants dn-01 to dn-18.
2. "CAL 14" is displayed on the digital operator upon execution of tuning. When the second motor is selected, "CAL 24" is displayed.

Procedure

Step		Operation
1	Verify safety factors	• Motor is disconnected from machine system • Motor shaft lock key is removed • No person or object is near the motor shaft • Brake is released (when a motor with brake is used) • Check Pars 4-1 and 4-2
2	Turn ON the inverter power supply	Refer to Par 4-3 (Check Par 4-4)
3	Input the motor data	① Select the program mode (depress PRGM/DRIVE) Then the DRIVE LED goes OFF ② Select the control mode • On-02 1st digit: 0 Vector control with PG; 1 Vector control without PG • On-02 2nd digit: 0 Motor with exclusive-use thermistor; 1, Motor without thermistor • Check only Cn-09 for vector control with PG • Set the following only when a constant output motor used On-04 2nd digit (With PG): 0 weakening by $1/\sqrt{N}$ (N speed); 1 weakening by 1/N (N speed) On-04 4th digit (Without PG): 0 weakening by 1/N (N speed); 1 weakening by $1/\sqrt{N}$ (N speed) ③ Input the motor data (motor name plate values) to the following constants

Constant	Input Value
dn-51 (kW)	Set the motor rated output (kW) *1
dn-52 (r/min)	Set the motor's rated r/min
dn-53 (r/min)	Set the motor r/min at maximum machine speed
dn-54 (poles)	Set the number of the motor poles (Example) dn-03=04 when the number of poles is 4
dn-55 (V)	Set the motor rated value (V)
dn-56 (A)	Set the motor rated current (A)
dn-57	Set the motor insulation class 0 Class A (100℃), 1 Class E (120℃), 2 Class B (130℃) 3 Class F (155℃) 4 Class H (180℃)
dn-58 (V)	Set the input power supply voltage (V) to the inverter
Cn-09	Set the number of pulses (p/rev) of the pulse generator (PG)

4	Select the tuning mode	Set Sn-37 to "03" *1 (Initial value "00")
5	Return to the drive mode	Depress PRGM/DRIVE key "DRIVE" LED turns ON and "CAL 13" is displayed *2
6	Execute tuning	Depress RUN key During tuning 'RUN' LED turns ON and "CAL 13" *2 "SEQ" and "REF" LEDs blink After tuning 'STOP" LED turns ON and "End" is displayed for three seconds To interrupt, depress the STOP key, and the motor will coast to a stop Notes 1 When tuning is completed, Sn-37 is returned to "00" automatically 2 To perform tuning again, start from step 1

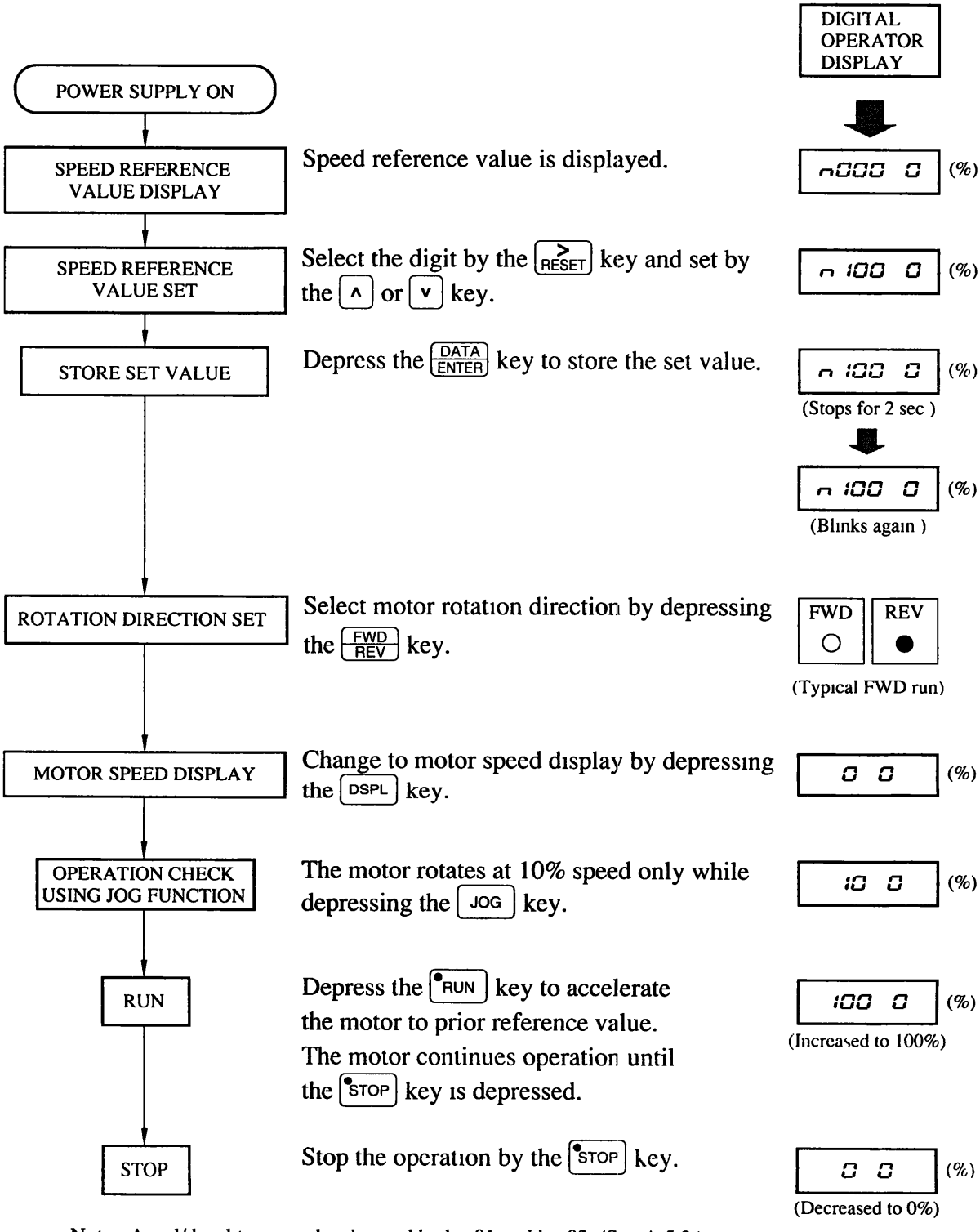
*1 When the motor rated output is in Hp, input the Hp data into dn-51, and set Sn-37 to "0F" at tuning mode selection.

*2 For Hp input, "CAL 1F" is displayed ("CAL 2F" for the second motor)

5. OPERATION

5.1 OPERATION THROUGH DIGITAL OPERATOR (Test Operation)

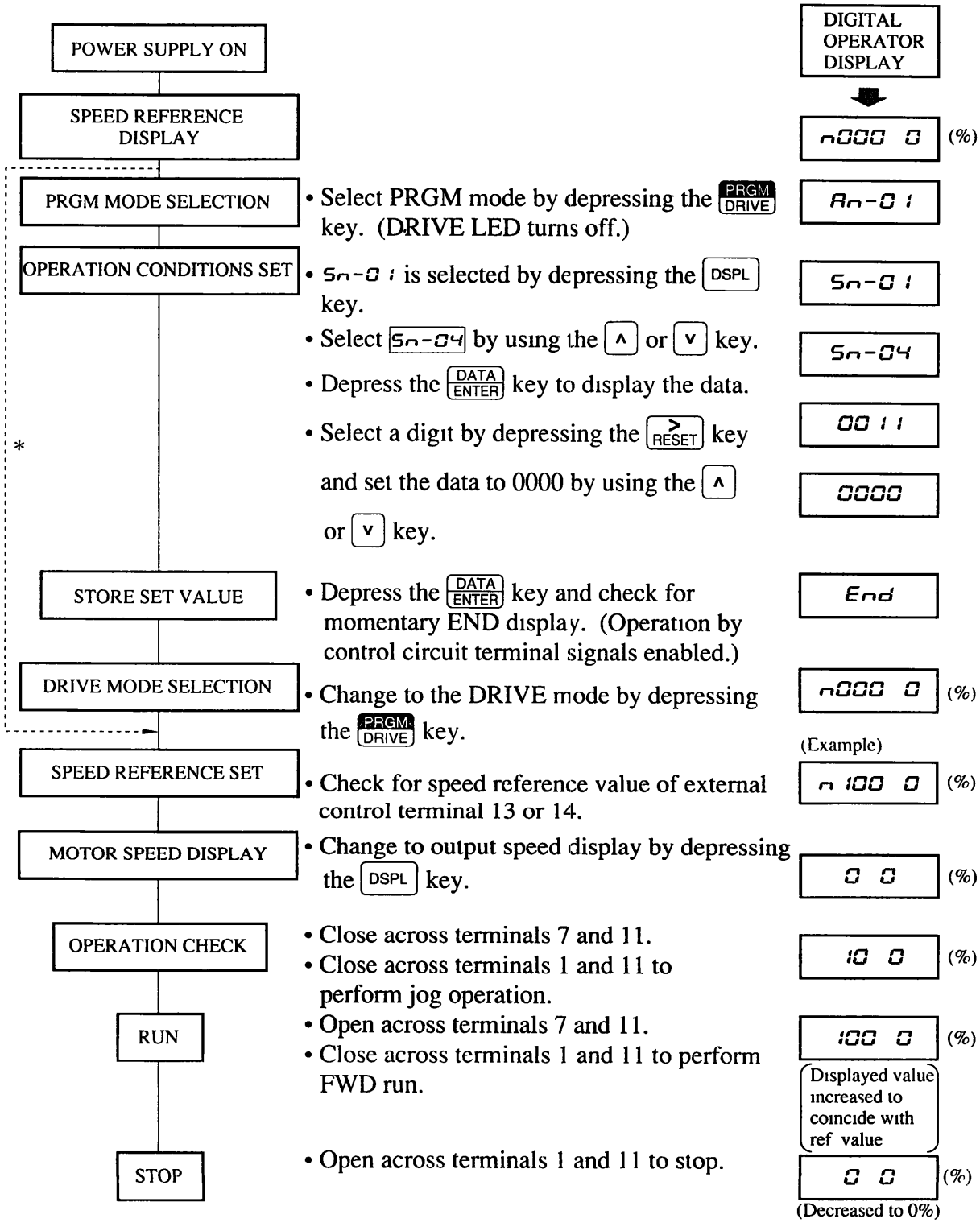
(Sn-04 = 0011)



Note : Accel/decel time can be changed by bn-01 and bn-02 (See A.5 3.)
Initial value is 10 sec.

5.2 OPERATION THROUGH INPUT TERMINALS

To operate the inverter through the terminal inputs, the following procedure should be followed: (Sn-04 = 0000)



* It is only necessary to select the program mode upon initial power up since Sn-04 and all other constants retain their values when the power supply is turned OFF

5.3 OUTLINE OF FUNCTIONS

This inverter is provided with many functions which can be selected by using the Sn- , An- , bn- , and Cn- constants.

The following outlines some of the inverter's main functions. For a complete list, see APPENDIX "Par. 5 CONSTANTS".

5.3.1. Control Mode and Reference Value Input

The speed control mode or torque control mode can be selected to control the motor.

Speed control mode : A mode to control the motor's rotating speed according to a speed reference given to the inverter.
Used normally.

Torque control mode : A mode to control the motor's torque according to a torque reference given to the inverter. This mode is commonly used when tension control is necessary for winding machines, etc.

(1) Speed Control Mode

Any input shown in Table 5.1 can be selected for the inverter's main speed reference.

Table 5 1 How to Input Speed Reference

Speed Reference Input Form / Item		Reference Point	Selecting Method	Remarks
Voltage input 10V/100% (-10 to +10V/-100 to +100%)		Between terminals 13 and 17	Sn-04=xxx0	Resolution 11 bits + sign
Current input (4 to 20mA/0 to 100%)		Between terminals 14 and 17	Sn-04=xxx0	
Digital operator set value		"⌐" display mode or An-01 (See Par 5 1)	Sn-04=xxx1	
Multi-step speed reference (Digital operator set value) See Par 5 3 5		An-01 to An-09	Sn-04=xxx1	Select multi-step speed operation reference to terminals 5 to 8 See Par 5 3 5
Option card	Digital input (Binary or BCD)	DI-16H card	Sn-04=xxx0 Sn-08=xxx0	Binary 16 bits + sign or BCD 4 digits + sign Function selection Sn-26
	Analog input (Voltage/current 3-channel input)	AI-14B card (Between TC1 and TC4)	Sn-04=xxx0 Sn-08=xxx0	Resolution 13 bits + sign Function selection Sn-25=0000 to 0011
	Serial communication	SI-B card	Sn-04=xxx0 Sn-08=xxx0	RS-232/RS-422/RS-485 2400/4800/9600/19200bps

Note Only one option card can be mounted at a time.
Operation is started by inputting a speed reference as shown in Table 5 1 and giving the inverter a run command (forward run or reverse run command)
The rotating speed obtained when 100% reference is given is the value set in dn-02.
The maximum generating torque is limited by the constant set values (bn-07 to bn-09) and the torque limit values (multifunction analog input or AI-14B input).

(2) Torque Control Mode

Any input form shown in Table 5.2 can be selected for torque reference.

Table 5 2 How to Input Torque Reference

Torque Reference Input Form \ Item		Reference Point	Selecting Method	Remarks
Voltage input 5V/100% (-10 to +10V/-200 to +200%)		Between terminals 16 and 17	Sn-04=xxx0 Sn-19=06 or 07	Resolution 11 bits + sign Speed limit Between terminals 13 and 17 Torque limit bn-07 to bn-09
Option card	Analog input (Voltage/current 3-channel input)	AI-14B card (Between TC2 and TC4)	Sn-04=xxx0 Sn-08=xxx0	Resolution 13 bits + sign Function selection Sn-25=1000 or 1001
	Serial communication	SI-B card	Sn-04=xxx0 Sn-08=xxx0	RS-232/RS-422/RS-485 2400/4800/9600/19200bps

Note When the speed control mode is switched to the torque control mode or vice versa by using the multifunction input terminal function (set value 71 or 7C), set the speed control mode using Sn-19 or Sn-25

5.3.2 Selection of Operation Reference

The operation reference as well as the speed reference can be inputted from the digital operator or the control circuit terminals 1 to 8. (See Table 5.3)

Table 5 3 How to Select Operation Reference

Classification		Selecting Method	Remarks
Reference Type	Input Point		
Operation reference	Control circuit terminal	Sn-04=xx0x	Terminals 1 to 8
	Operator	Sn-04=xx1x	
Speed reference	Control circuit terminal or option card	Sn-04=xxx0	Refer to Par 5 3 1
	Operator	Sn-04=xxx1	

For example, to input both the operation reference and the speed reference from the digital operator, set Sn-04=XX11.

When the SI-B option card is used, the operation reference can be provided by serial communication.

5.3.3 Selection of Protective Operation

This inverter is equipped with functions to detect inverter and system faults and perform protective operation.

The basic protective operation immediately shuts OFF the inverter output when a fault is detected (the motor coasts to a stop). However, for some types of faults, the motor can be decelerated to a stop. These protective functions can be selected using Sn-10 to Sn-14.

5.3.4 Selection of Multifunction I/O Terminal Functions

The function of each I/O terminal can be selected using the following table:

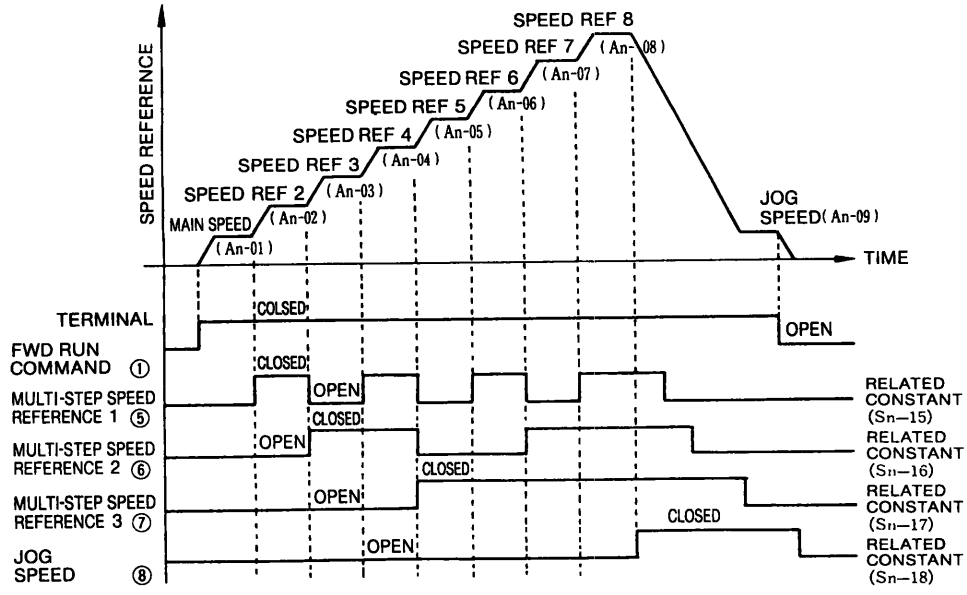
Table 5.4 Selection of Multifunction I/0 Terminal Functions

Terminal Name	Terminal Number	Constant	Description
Multifunction Sequence Input	5	Sn-15	These terminal's functions can be selected individually For a list of functions, refer to the description of Sn-15 to Sn-18 in APPENDIX Par 5 "CONSTANTS" Set values of Sn-15 to Sn-18 must be in the ascending order
	6	Sn-16	
	7	Sn-17	
	8	Sn-18	
Multifunction Sequence output	9, 10	Sn-20	These terminal's functions can be selected individually For a list of functions, "refer to the description of Sn-20 to Sn-24 in APPENDIX Par 5 CONSTANTS"
	25	Sn-21	
	26	Sn-22	
	28	Sn-23	
	29	Sn-24	
Multifunction Analog Input	16, 17	Sn-19	For a list of functions, refer to the description of Sn-19 in APPENDIX Par 5 "CONSTANTS"
Multifunction Analog output	21, 22	bn-17	For a list of functions, refer to the description of bn-17 and bn-26 in APPENDIX Par 5 "CONSTANTS"
	23, 24	bn-26	

Note Multifunction input is also available using DI-08 (option)
See A5 1 SYSTEM CONSTANTS (Sn-50).

5.3.5 Multi-step Speed Operation (Speed Control)

By changing the multifunction input terminals (control circuit terminals 5 to 8), up to 9 speeds can be selected. The following shows the required programming.



9-step speed

Name	Related Constant
Multi-step Speed Setting	An-01 to 09
Multi-step Speed Operation Function	Sn-15 to 18
Operation Method Selection	Sn-04
Multi-function Analog Input	Sn-19

Sn-04=xxx1
Sn-15=03
Sn-16=04
Sn-17=05
Sn-18=06
Sn-19=0F

5.3.6 Setting of Accel/Decel and S-curve Time (Speed Control)

This inverter is equipped with a soft-start function (cushion start) to set the acceleration time, deceleration time, and S-curve time individually.

The following switching of constants during operation can be performed by multifunction terminal sequence input.

- Accel/decel time : bn-01 ↔ bn-03, bn-02 ↔ bn-04
- S-curve time* : bn-19 ↔ Cn-26

For further information, refer to the description of each constant in APPENDIX Par. 5 "CONSTANTS".

Setting Item	Constant No
Accel time 1	bn-01
Decel time 1	bn-02
Accel time 2	bn-03
Decel time 2	bn-04
S-curve time 1	bn-19
S-curve time 2	Cn-26
S-curve time 3	Cn-58
S-curve time 4	Cn-59

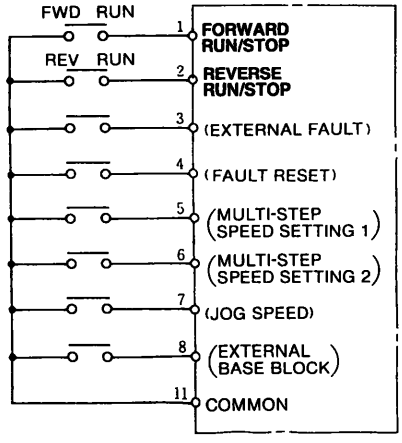
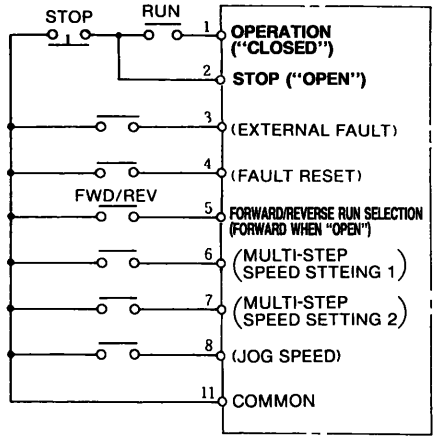
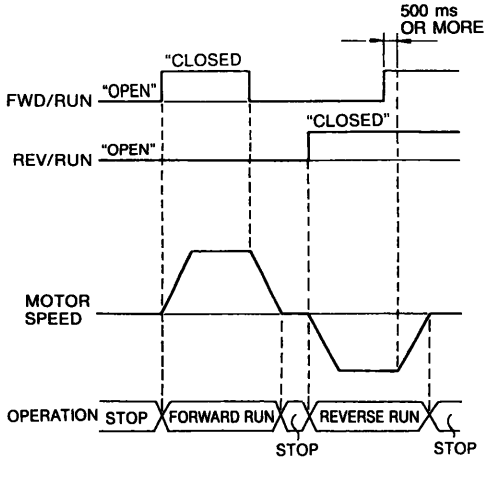
* Changeover of S-curve times 1 and 2 can be executed only when both S-curve times 3 and 4 have been set to "0 "

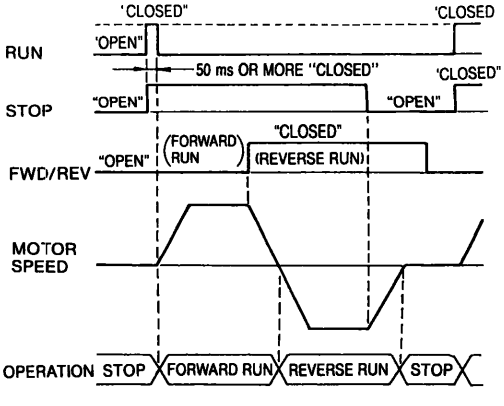
5.3.7 Selecting 2-wire / 3-wire Control Sequence

Use system constant Sn-15 to select 2-wire or 3-wire sequence. The function of control circuit terminals 1, 2 and 5 is outlined in table 5.5.

- Sn-15 data setting value ≠ 00 : 2-wire sequence
  = 00 : 3-wire sequence

Table 5.5 2-wire and 3-wire Sequence

<table>
<tr><th>Sequence / Operation</th><th>2-wire Sequence (Factory Default)</th><th>3-wire Sequence</th></tr>
<tr><td>External Sequence Input Function</td><td> 
</td><td> 
</td></tr>
<tr><td>Operation</td><td> 

Note When FWD/RUN and REV/RUN are "closed" for 500ms or more at the same time, the motor will decelerate to a stop and operation will flash "EF"</td><td> 

Notes
1 When STOP and RUN "closed" for more than 50ms, motor operates
2 When STOP is "open", motor will decelerate and stop regardless of RUN position</td></tr>
</table>

5.3.8 External Fault Signal Selection

External fault signal selections 1 to 4 in multi-function input function (Sn-15 to Sn-18) set external fault signal level (NO/NC contact input), detection (always/during operation), and stop mode at signal input. If external fault occurs, the operator displays EF (terminal No. in)

(Example)

When Sn-15 (terminal 5) is set to 24 and terminal 5 is closed (NO contact), external fault is detected [always detected coasting to a stop (major fault)].

Table 5 6 External Fault Signal Selection

Set Value* (HEX Input)		Selection Mode							
		Contact		Detection		Stop			
2nd Digit	1st Digit	NO Input	NC Input	Always	During Operation	Ramp to a Stop (Major Fault)	Coasting to a Stop (Major Fault)	Emergency Stop (Major Fault)	Operation to Continue (Minor Fault)
2 to 5	0	○		○		○			
2 to 5	1		○	○		○			
2 to 5	2	○			○	○			
2 to 5	3		○		○	○			
2 to 5	4	○		○			○		
2 to 5	5		○	○			○		
2 to 5	6	○			○		○		
2 to 5	7		○		○		○		
2 to 5	8	○		○				○	
2 to 5	9		○	○				○	
2 to 5	A	○			○			○	
2 to 5	B		○		○			○	
2 to 5	C	○		○					○
2 to 5	D		○	○					○
2 to 5	E	○			○				○
2 to 5	F		○		○				○

*If same number among 20 to 5F is not used in Sn-15 to Sn-18, four 20 s (any number from 20 to 2F) can be used

6. MAINTENANCE

6.1 PERIODIC INSPECTION

This inverter requires very few routine checks. However, performing periodic checks as shown in Table 6.1 will prevent potential failure and provide highly reliable operation. Before checking, disconnect the main circuit power, and wait until the CHARGE indicator has extinguished.

Table 6 1 Periodic Inspection

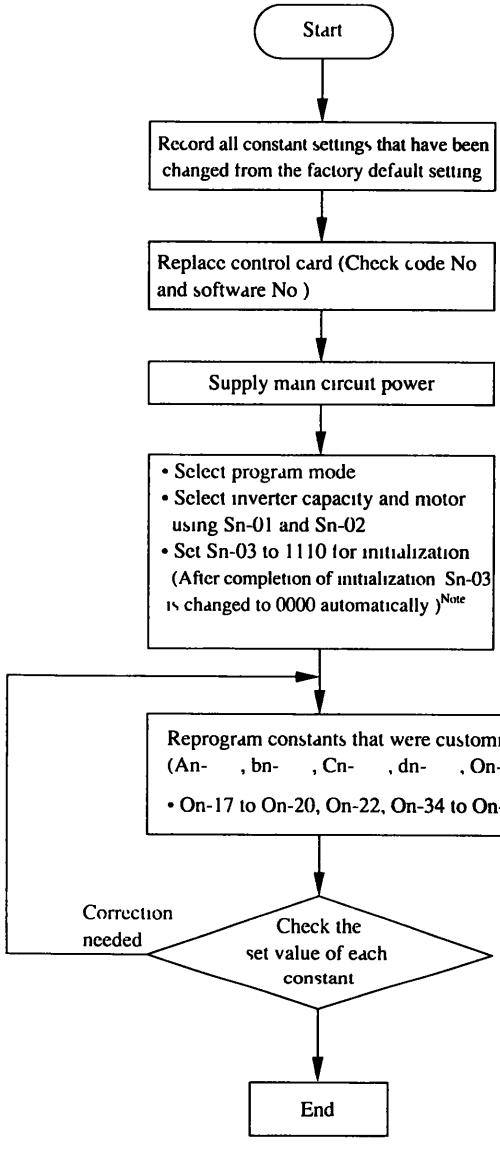
Check Item	Check for	Action
External Terminal, Unit Mounting Bolt, Connector, etc.	Loose screw	Tighten the screw
	Loose connector	Mount the connector again
Cooling Fin	Accumulated dust and dirt	Clean using dry compressed air of 39.2×10^4 to 58.8×10^4 Pa pressure
Printed Circuit Board	Accumulated conductive dust or oil mist	Clean the board If dust and oil still remain, replace the board
Cooling Fan	Excessive noise and vibration Accumulated operation time of 20,000 hours or greater	Replace the cooling fan
Power Element	Accumulated dust and dirt	Blow by dry compressed air of 39.2×10^4 to 58.8×10^4 Pa pressure
Smoothing Capacitor	Discoloration, odor, etc	Replace the capacitor or inverter unit

Table 6 2 Standard Replacement Time

Part Name	Standard Replacement Interval	Replacement, etc
Coolong Fan	2 to 3 years	Replace with a new one
Smoothing Capacitor	5 years	Replace with a new one (determined after inspection)
Breaker Relay	—	Determined after inspection
Fuse	10 years	Replace with a new one
Aluminum Capacitor on Printed Circuit Board	5 years	Replace with a new one (determined after inspection)

Note : Operation conditions
- Ambient temperature : 30℃ / yearly average
- Load factor : 80% or below
- Operation rate : 12 hours or less a day

6.2 REPLACING CONTROL CARD



Note . The following constants are not initialized .
Sn-01, -02, Cn-09, dn- ,
On-17, -18, -19, -20, -22,
On-02, 1st digit, On-10, -14, -15,
On-34, -35, -36, -37, -38, -39, -40,
-42, -44, -46, -47

7. TROUBLESHOOTING

In case of machine failure, check the failure using the following flowcharts. If the machine still does not recover from the failure, contact your YASKAWA representative.

Notes upon Troubleshooting

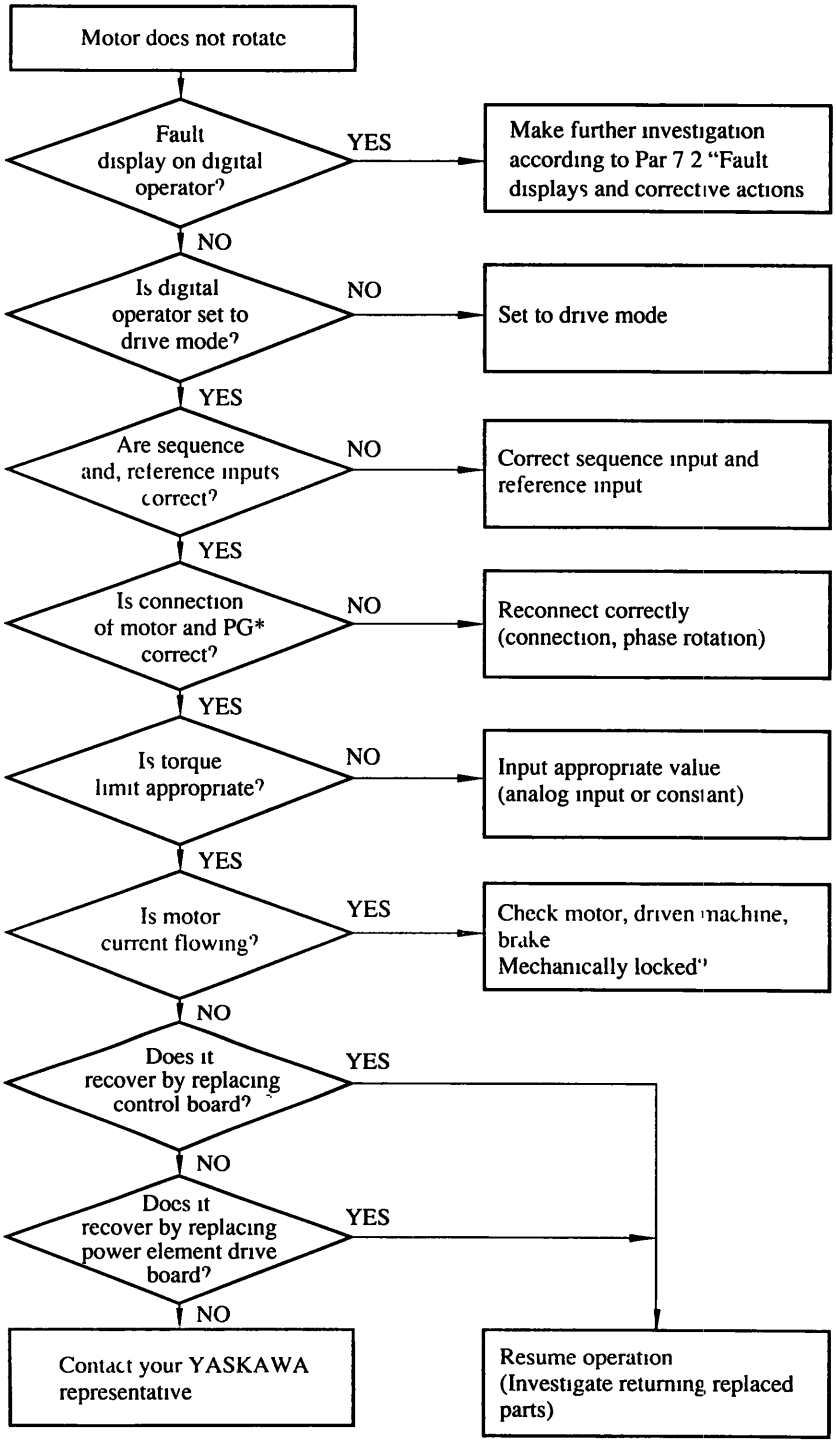
(1) Never disconnect or connect wiring while power is supplied to the inverter.

(2) Before checking or maintaining the main circuit, always disconnect power, wait until the CHARGE indicator has extinguished, and measure the DC voltage (between ⊕ (P) - ⊖ (N)) to see that it is safe.

(3) The fault display is stored even if the power is turned OFF once. When the power is supplied again, the "Fault trace"on the digital operator allows for investigation of the fault. However, the stored memory will be erased if power is turned OFF a second time. Record the"Fault trace"data if necessary.

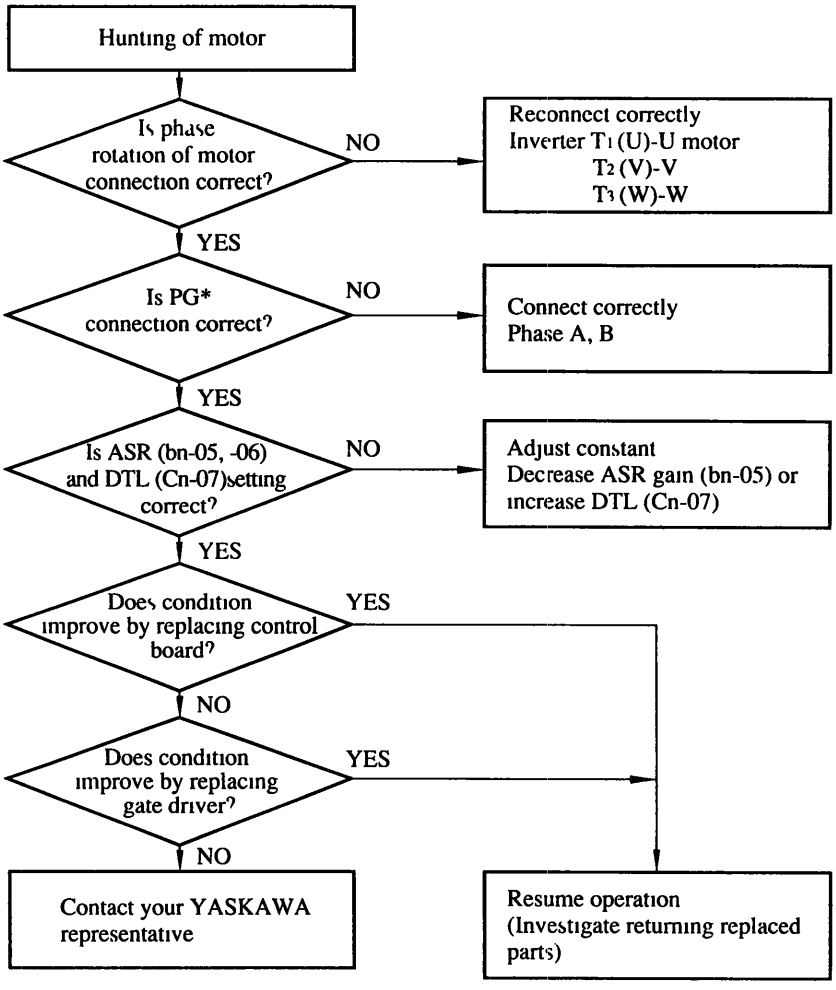
7.1 MOTOR FAULTS

(1) The Motor does not Rotate



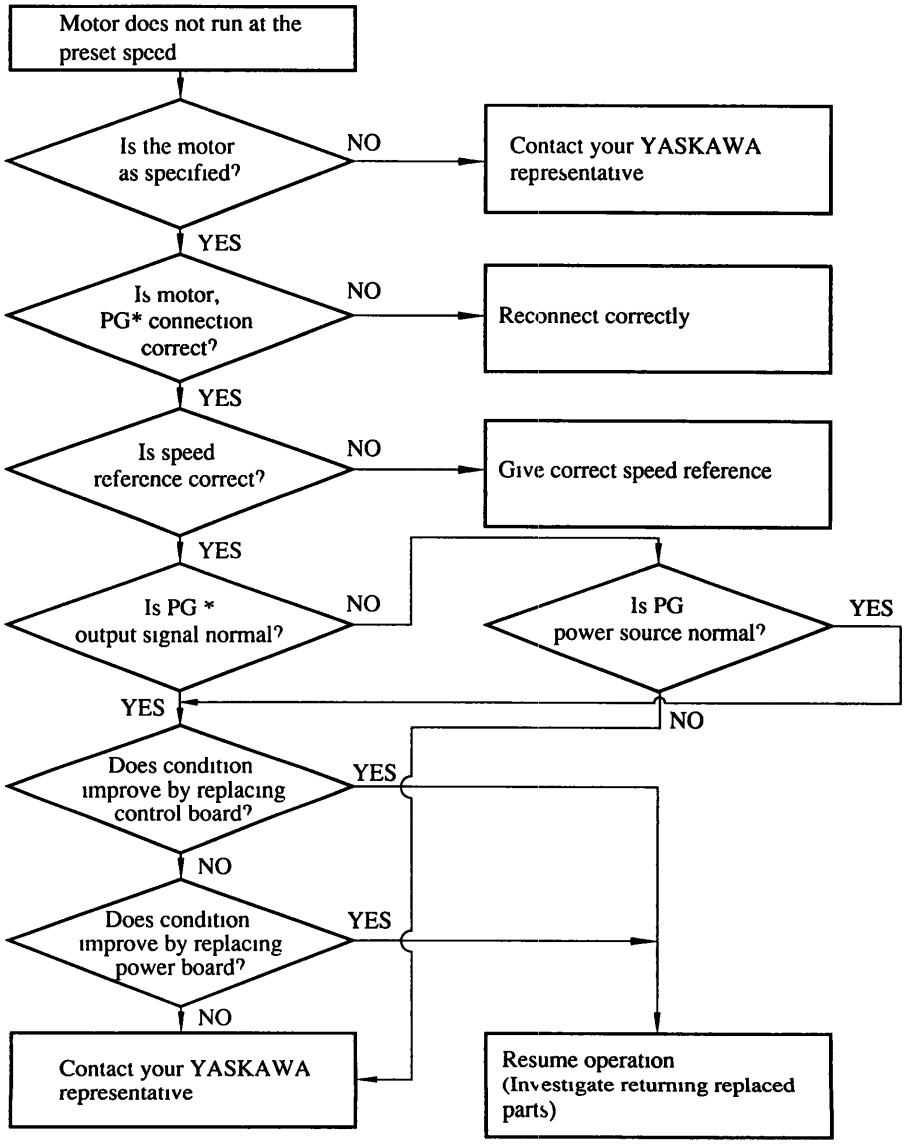
*For inverter with PG

(2) Motor Hunting



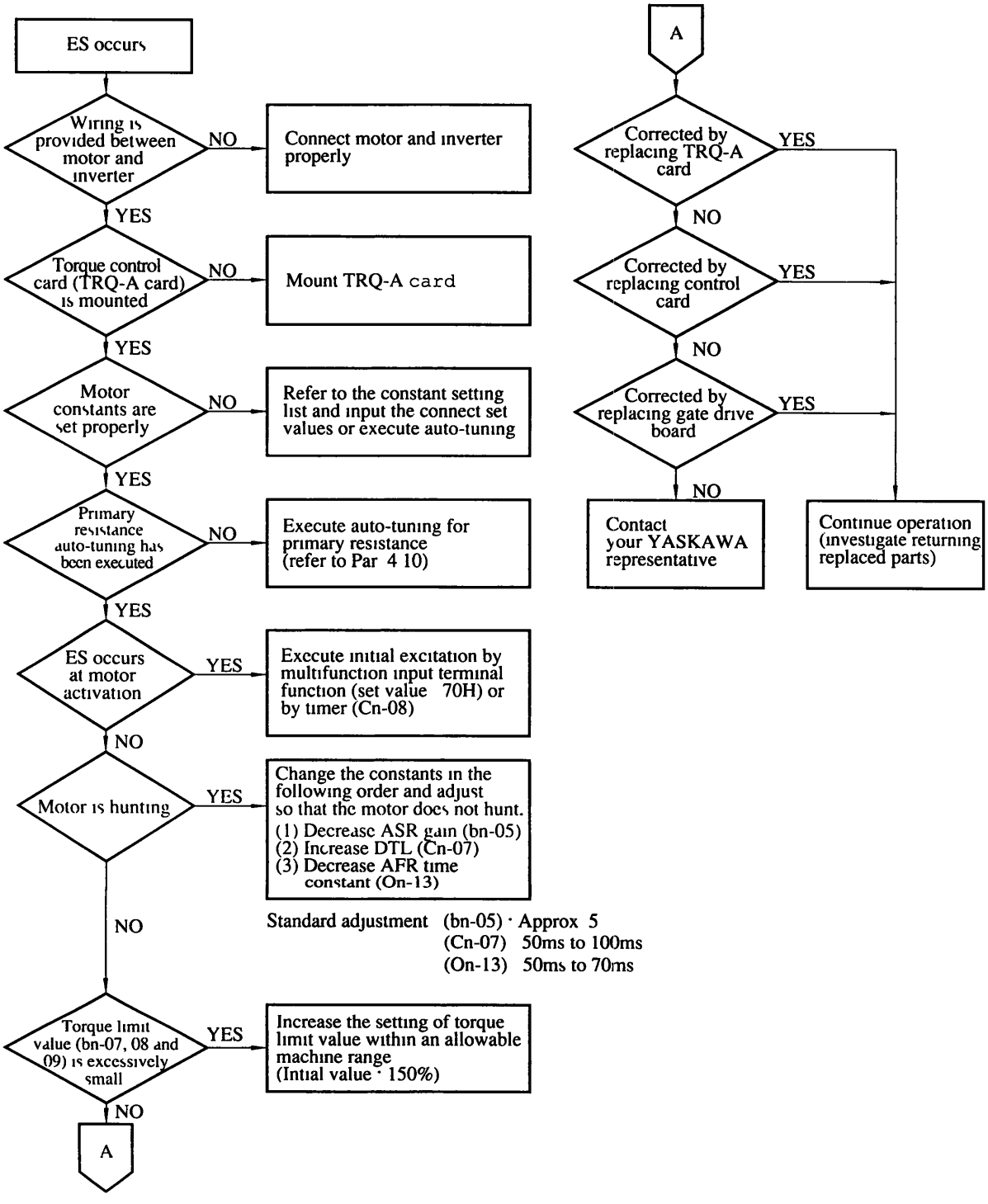
*For inverter with PG

(3) The Motor does not Rotate at the Preset Speed



*For inverter with PG.

(4) Speed Estimation Fault (ES) Occurs (at PG-less Control Only)



7.2 FAULT DISPLAYS AND CORRECTIVE ACTIONS

If the inverter detects a fault, it will indicate the fault on the digital operator, and operate according to the specific fault constant setting.

Table 7 1 Fault Displays and Corrective Actions

Fault Display	Description	Details	Corrective Action	Rank (Preset Value)
Uu 1	Main circuit undervoltage (PUV)	Undervoltage in the direct current main circuit during running Momentary power loss time was exceeded (Cn-17, -19) (Detection level 200 V class Approx 210 V or less 400 V class Approx 420 V or less)	• Check the wiring of the power source equipment • Correct the line voltage	A
Uu2	Control circuit undervoltage (CUV)	Undervoltage in the control circuit during running		A
Uu3	MC fault	The pre-charge contactor opened during running		A
Uu	Momentary power loss	• The main circuit direct current voltage fell below the PUV level • The control power source fell below the CUV level • The pre-charge contactor opened	Check the power source for momentary power loss	B
oC	Overcurrent (OC)	• The inverter output current exceeded the OC level (Detection level 120% of transistor rated current) • The grounding current exceeded 25% of transistor rated current	• Check the motor coil resistance, extend the accel/decel time • Check the motor insulation • Insulation check (megger check)	A
GF	Grounding (GF)	• Inverter output grounding current exceeded 50% of inverter rated current	• Check that motor insulation has not deteriorated. • Check that connection between inveter and motor is not damaged	A
ou	Overvoltage (OV)	• The main circuit direct current voltage exceedec the OV level (Detection level 200 V class Approx 400 V 400 V class Approx 800 V)	Extend the deceleration time, add braking circuit	A
FU	Fuse blown (FU)	• The direct current circuit fuse is blown • The output transistors were damaged	Check for damaged transistor, load side short circuit, grounding, etc	A
oH 1	Motor overheat (OH1)	The motor temperature exceeded the allowable value in (dn-18)	Check the motor cooling fan	A
oH2	Cooling fin overheat (OH2)	The transistor cooling fin temperature exceeded the allowable value [Detection level 90°C ±5°C]	Check the fan and ambient temperature (45°C or less)	A
oH2 (Blink)	Inverter overheat warning	Inverter overheat warning is input at multifunction input terminal (OBH)	Check the external circuit for mltifunction input	B
oL 1	Motor overload (OL1)	• Inverter output exceeded the motor overload level (Cn-14, Cn-15)(Initial value 150%/60s) • 90% of motor overheat level	Measure the motor temperature rise, lighten the load	A
oL2	Inverter overload (OL2)	Inverter output exceeded the inverter overload level (150%/60s)	Lighten the load, extend the acceleration time	A
rHn	Thermister line break (THM)	The motor thermistor is broken	Check the thermister	A
rr	Brake transistor failure	The brake transistor has failed	Replace the inverter	A
rH	Braking resistor overheat	The allowable braking resistor temperature was exceeded (Sn-11)	Lighten the regenerative load	A
FAn	Cooling fan fault (FAN)	The cooling fan stopped while the power was supplied	Check the cooling fan	A
oS	Overspeed (OS)	The motor speed exceeded the overspeed level (Cn-16)	Check the load	A
PGo	PG line break (PGO)	The PG line is broken	• Check the PG line • Check the condition of the motor lock or the load • Check the torque limit • Check the PG constant (Cn-09)	A
dEu	Speed deviation (DEV)	The deviation of the speed reference and speed feedback exceeded the regulation level (Cn-04)	Check the load	B

Table 7.1 Fault Displays and Corrective Actions (Cont'd)

Fault Display	Description	Details	Corrective Action	Rank (Preset Value)
EF	Operation reference fault	Both FWD and REV run commands were closed more than 500ms	Check sequence circuit	B
EF0	Transmission data external fault	The upper controller had fault	Check the upper controller	A
EF3	External fault of terminal ③	Fault occurred in the external circuit (Stop method can be selected using Sn-12)	Check the condition of the input terminal by using Un-07 (If the LED lights when terminal is not connected, replace the inverter)	A
EF5	External fault of terminal ⑤	Fault occurred in the external circuit (Stop method can be selected using Sn-15 to 18)		B
EF6	External fault of terminal ⑥			B
EF7	External fault of terminal ⑦			B
EF8	External fault of terminal ⑧			B
LC	During current reference limit (LC)	Inverter output exceeded current limit	• Reduce torque limit value • Check inverter capacity	B
LF	Open-phase load (LF)	Open-phase in the inverter output circuit	Check the inverter output circuit	B (W PG) A (W/O PG)
SvE	Servo error	Rotating position was shifted by 536,870,912/Cn-09 revolutions during zero-servo operation	• Check torque limit (excessively small) • Check load torque (excessively large) • Check PG signal noise	A
ES	Speed estimstion fault (W/O PG)	Speed estimation error occured during PG-less operation	Refer to par 7.1 (4)	A
SE10	Motor changeover sequence fault 1	Motor changeover command was input during operation	Check sequence circuit	B
SE11	Motor changeover sequence fault 2	Changeover answer signal was not returned within 1 second after motor changeover command was input (Effective only when answer signal is selected for multifunction input.)	Check changeover answer signal	A
CPF00	Control circuit fault 1 (CPF00) (Operator transmission fault)	• Transmission between the inverter and operator cannot be established 5 seconds after supplying power • MPU peripheral element check fault (initial) • DSP peripheral element check fault (initial)	• Insert the operator connector again • Replace the control card • Check the wiring of control circuit	A
CPF01	Control circuit fault 2 (CPF01) (Operator transmission fault)	• Transmission between the inveter and operator is established once after supplying power, but later transmission fault continued for more than 2 seconds • MPU peripheral element check fault (online)	• Insert the operator connector again • Replace the control card • Check the wiring of control circuit	A
CPF02	Baseblock circuit fault (CPF02)	The inverter control unit fault	Replace the control card	A
CPF03	NV-RAM (S-RAM) fault (CPF03)			A
CPF04	Constant destroyed (CPF04)			A
CPF05	CPU internal A/D converter fault (CPF05)			A
CPF06	Option connection fault (CPF06)	The option card is not installed correctly	Install the option card again	A
CPF07	A/D convereter fault (CPF07)	Control card hardware was damaged	Replace the control card	A
CPF10	DSP hardware fault (CPF10)	DSP and peripheral circuit fault	Replace the control card	A
CPF20	A/D converter fault in analog speed reference card (CPF20)	Option card (AI-14B) A/D converter fault	Replace the option card	A
CPF21	Transmission control card hardware fault (CPF21)	• Checking error of elements in transmission card • Data sending/receiving error between transmission control card and control card	Replace the transmission card	A
CPF22	Transmission control card hardware fault error (CPF22)	Transmission control acrd ROM does not support inverter model code F7	• Replace the transmission card • Set Sn-34 4th digit to 1	A

Table 7.1 Fault Displays and Corrective Actions (Cont'd)

Fault Display	Description	Details	Corrective Action	Rank (Preset Value)
CPF23	Transmission control card transmission error (CPF23)	Data of diagnositic codes are not updated for 0 2 second or more between transmission control card and control card	Replace the transmission card	A
CPF24	High-precision torque control card internal A/D converter fault (CPF24)	The A/D converter of the high-precision torque card (TRQ-A) has failed	Replace the high-precision torque control card	A
oPE01	kVA selection fault (OPE01)	kVA selection fault (Sn-01)	Check and set the constant data	C1
oPE02	Constant setting range fault (OPE02)	Constant data is out of range	Check the constant data	C1
oPE03	Multi-funcion input selection fault (OPE03)	The Sn-15 to Sn-18 multi-function setting values are not in ascending order Or, data other than F and FF are overlapping	Check the function selection	C1
oPE05	Reference priority setting fault (OPE05)	Setting of Sn-08 2nd digit is improper	If reference or transmission option card is not provided, set Sn-08 2nd digit to 1	C1
oPE20	Improper torque control selection (OPE20)	Torque conrtol is selected simultaneously by multi-function input function selection (Sn-15 to -18) and AI optional function (Sn-25)	Check the function selection	C1
oP	Digital monitor device fault (OP)	The monitor is mounted when under the program mode or during operation by the operator	• Check the function • Set Sn-04 1st-and 2nd-digit to 00	C2
oP1	Torque control mode fault (OP1)	Torque control is selected by multi-function input function seclection, but torque reference input area is not provided	Check the reference priority (Sn-04, -08)	C2
oP2	Base test mode fault (OP2)	The main circuit direct current voltage exceeded 20V during test	Decrease the main circuit direct current voltage	C2
oP3	Connected to unknown option card (OP3)	Unknown option card is installed	Check for applicable option cards	C2
oP4	TRQ-A card not installed (OP4)	Control w/o PG was selected without installation of TRQ-A card	Check that TRQ-A card is installed	C2
oP5	Applicable motor capacity incorrect (too small) (OP5)	Motor rated current is less than 10% of inverter rated current	• Check motor constants • Check applicable motor capacity	C2
oP6	Control mode selection transmission error (OP6)	Speed/torque control changeover function was selected for multifunction input terminal while torque control mode was selected by constant setting in Sn-25	Select speed control mode when speed/torque control is changed by multifunction input	C2
Err	EEPROM writing fault (ERR)	EEPROM internal data did not match when initializing the constant	Replace the control card	C2
CP213	CP-213 transmission error	Control data was not received normally when power supply is turned ON	Check transmission devices and transmission signals	C1
CALL	SI-B transmission error	Control data was not received normally when power supply is turned ON	Check transmission devices and transmission signals.	C1
bUS	Transmission error	Control data received for 2 seconds after initial communication.	Check transmission devices and transmission signals	A
Aborr	R_1, R_f tuning not completed (abort)	Tuning of R_1 and R_f was not completed within the specified time	• Check wiring between TRQ-A and control card • Check wiring between inverter and motor • Check that TRQ-A card is installed • Replace TRQ-A card	C3
Er-E1	Input data error at auto-tuning.	Motor nameplate value input error	• Check motor nameplate value input • Check inverter or motor capacity	C1
Er-52 Er-62 Er-72 Er-82	Motor does not accelerate normally at auto-tuning	Motor did not accelerate in the specified time	• Disconnect motor from machine system if motor is connected with machine • Increase acceleration time (bn-01)	C3

7.2 FAULT DISPLAYS AND CORRECTIVE ACTIONS (Cont'd)

Table 7 1 Fault Displays and Corrective Actions (Cont'd)

Fault Display	Description	Details	Corrective Action	Rank (Preset Value)
Er- 13 Er-53 Er-63 Er-73 Er-83	Excessively small auto-tuning result	Tuning was not completed within the constant setting range (lower limit side)	• Check motor nameplate inout • Check motor constants when tuning is started. • Check that TRQ-A card is installed • Replace TRQ-A card • Check PG constants (Cn-09 or dn-39).	C3
Er- 14 Er-54 Er-64 Er-74 Er-84	Excessively large auto-tuning result	Tuning was not completed within the constant setting range (upper limit side)	• Check motor nameplate input • Check motor constants when tuning is started. • Check that TRQ-A card is mounted • Replace TRQ-A card	C3
Er-F5	TRQ-A card not mounted at auto-tuning	Tuning was attempted without installing TRQ-A card (In control with PG)	Check that TRQ-A card is mounted	C1
Er-F6	PG, motor wiring fault	Improper connection of inverter with PG (Phases A and B) or motor (phases U, V and W)	• Check PG wiring • Check motor wiring	C3
Er-F7	Excessively large torque reference during auto-tuning	Torque reference became excessively large (100%) during tuning	• Disconnect motor from machine • Increase acceleration time (bn-01) • Check PG constant (Cn-09 or dn-39)	C3
Er-58 Er-68 Er-78 Er-88	Auto-tuning was not completed	Tuning was not completed within the specified time	• Decrease ASR proportional gain (bn-05) • Increase AΦR time constant (On-11 or dn-45) • Check motor wiring or TRQ-A card wiring • Replace TRQ-A card	C3
Er-59	Exciting current cannot be measured	Motor flux does not reach 40 % of rated flux	Increase motor rated current 10% using dn-56	C3
Er-FF	Tuning mode error	Undefined tuning mode was selected.	Contact your YASKAWA representastive	C1

Notes

Rank A : Major fault (Motor coasts to a stop, operator indication lights, and FAULT contact is output.)

Rank B · Fault [Operation continues, operator indication blinks, no FAULT contact is output, and fault contact is output (when multi-function output is selected)].

Rank C1 : Warning (Operation cannot be performed, operator indication lights, no FAULT contact is output)

Rank C2 : Warning [Operation cannot be performed, (Motor decelerates and stops if during operation), operator indication blinks, no FAULT contact is output].

Rank C3 : Warning [Operation cannot be performed (Motor coasts to a stop during operation), operator indication blinks, no FAULT contact is output].

[Auto-turning error code]

Er - ⋮ ⋮

Error contents see Table 7.1

Error occured dn-No.

1 dn-08 or -28 (primary resistance)
5. dn-07 or -27 (excitation current)
6: dn-12 or -32 (secondary circuit time constant)
7: dn-16 or -36 (core saturation compensation coefficient 1)
8 dn-17 or -37 (core saturation compensation coefficient 2)
E dn-51 to -57 (input data for auto-turning)
F others

The following fault displays and corrective actions are applied to parallel inverter.

Table 7 2 Fault Displays and Corrective Actions for Parallel Inverter

Fault Display	Description	Details	Corrective Action	Rank (Preset Value)
Uu 1A	Main circuit undervoltage (PUV) (Mater)	See Uu 1 in table 7 1	See Uu 1 in table 7 1	A
Uu 1b	Main circuit undervoltage (PUV) (Slave)			
Uu2A	Control circuit undervoltage (CUV) (Master)	See Uu2 in table 7 1	See Uu2 in table 7 1	A
Uu2b	Control circuit undervoltage (CUV) (Slave)			
Uu3A	MC fault (Master)	See Uu3 in table 7 1	See Uu3 in tabele 7 1	A
Uu3b	MC fault (Slave)			
UuA	Momentary power loss (Master)	See Uu in table 7 1	See Uu in table 7 1	B
Uub	Momentary power loss (Slave)			
oCA	Overcurrent (Master) (OCA)	See oC in table 7 1	See oC in table 7 1	A
oCb	Overcurrent (Slave) (OCR)			
ouA	Overvoltage (Master) (OVA)	See ou in table 7 1	See ou in table 7 1	A
oub	Overvoltage (Slave) (OVB)			
FUA	Fuse blown (Master) (FUA)	See FU in table 7 1	See FU in table 7 1	A
FUb	Fuse blown (Slave) (FUB)			
oH2A	Cooling fin overheat (Master) (OH2A)	See oH2 in table 7 1	See oH2 in table 7 1	A
oH2b	Cooling fin overheat (Slave) (OH2B)			
oL2A	Inverter overload (Master) (OL2A)	See oL2 in table 7 1	See oL2 in table 7 1	A
oL2b	Inverter overload (Slave) (OL2B)			
FAnA	Cooling fan fault (Master) (FANA)	See FAn in table 7 1	See FAn in table 7 1	A
FAnb	Cooling fan fault (Slave) (FANB)			
UC	Unbarance current (UC)	Unbarance current >20% of inverter rated current Inverter capacity: 600 HP / 800HP Inverter rated current: 855 A / 1140 A	• Check the output reactor wiring • Inspect the inverter main circuit	A
LoH	Reactor overheat (LOH)	Output reactor temp exceeded allowable value	Check the fan and ambient temp (45°C max)	A
oP9	kVA selection change (OP9)	Sn-01 was changed	Turn on control power	C2

Notes

Rank A · Major fault (Motor coasts to a stop, operator indication lights, and FAULT contact is output)

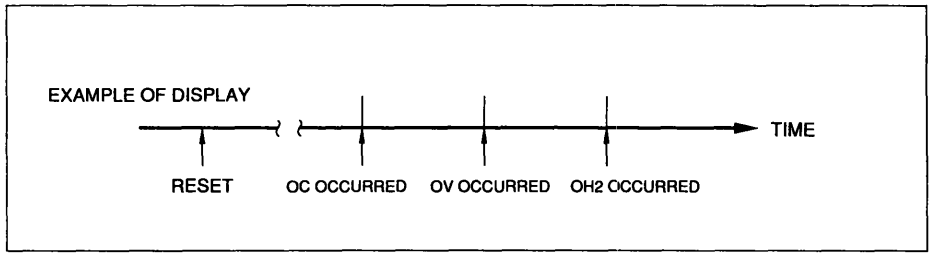
Rank B · Fault [Operation continues, operator indication blinks, no FAULT contact is output, and fault contact is output (when multi-function output is selected)]

Rank C2 Warning [Operation cannot be performed, (Motor decelerates and stops if during operation), operator indication blinks, no FAULT contact is output]

7.2 FAULT DISPLAYS AND CORRECTIVE ACTIONS (Cont'd)

(1) Displaying the Faults in Sequence of Occurrance

In case of failure other than a watch dog error. (CPF00, CPF01), depress the [∧] key to display the faults in the sequence in which they occured (maximum of 4 faults).



① Initial display oC

② Depress the [∧] key. 1 oC

③ Depress the [∧] key. 2 ou

④ Depress the [∧] key. 3 oH2

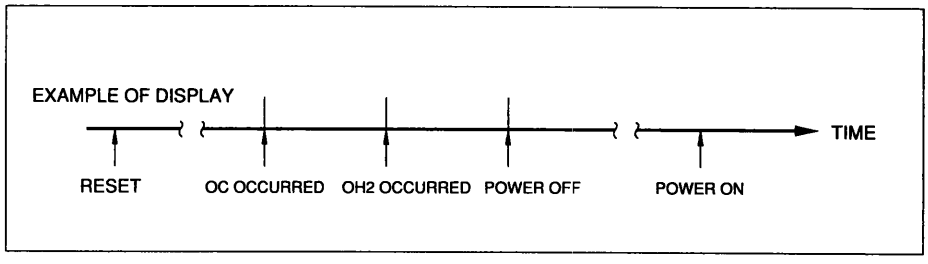
⑤ Depress the [∧] key. 1 oC ← Returns to condition ②.

(2) Fault Tracing

Design Revision Order "C" and before

When the power is supplied again, the faults that occurred before the power was interrupted are displayed in sequence (maximum 4 faults).

The faults that occurred before power loss are stored in NVRAM, and are displayed when the power recovers.



① After the power is supplied, the first that fault occurred before the power was interrupted blinks for 5 seconds. U 1 oC

② After 5 seconds, the item selected by bn-13 is displayed on the monitor.

③ Depress the DSPL key to display the fault that occurred before the power was disconnected. U 1 oC

④ Depress the ∧ key to update the fault sequence. U2 oH2

⑤ Depress the ∧ key to update the fault sequence. (Return to ③) U 1 oC

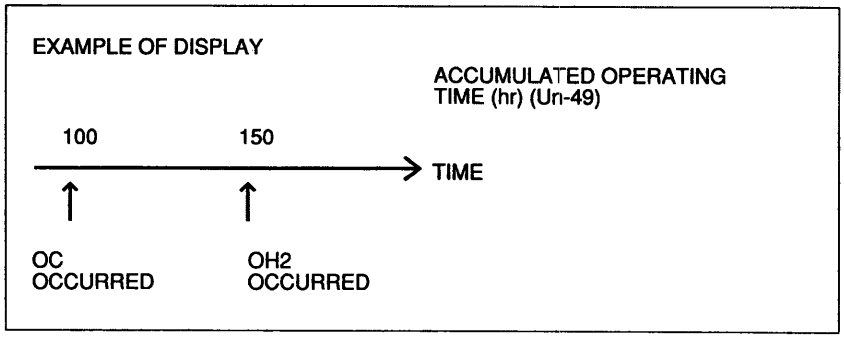
Note . CPFXX displays the first 3 digits only.

(Example) CPF10 is U 1 F 1 0

7.2 FAULT DISPLAYS AND CORRECTIVE ACTIONS (Cont'd)

Design Revision Order "E" and after

The latest information of up to four faults including the fault content and accumulated operating time (Un-49) is displayed. (Since the fault contents and accumulated operating time at fault occurrence are stored in NVRAM, they are stored even when the power supply is turned OFF.



① Depress [DSPL] key to display the fault history. U 10H2

Depress [DATA ENTER] key to display the accumulated operating time at OH2 occurrence. 150

Depress [DSPL] key to return to the previous display. U 10H2

② Depress [∧] key to update the fault occurring order. U20C

Depress [DATA ENTER] key to display the accumulated operating time at OC occurrence. 100

Depress [DSPL] key to return to the previous display. U20C

③ Depress [∧] key to update the fault occurring order. (Return to ①) U 10H2

Note : CPFXX is displayed only for the lower three digits.
Example : CPF05 is displayed as "U 1F05".

APPENDIX

A1. INVERTER STANDARD SPECIFICATIONS

A1.1 STANDARD SPECIFICATIONS

200V Class

Items \ Type / Model CIMR-VG -VH		Low Noise Type																Compact Low-Carrier Frequency Type		
		20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011	2015	2018	2022	2L30	2L37	2L45	2L55	2L75	2037	2055	2075
Max Applicable Motor Output*1 Hp (kW)		0.5 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	50 (37)	75 (55)	100 (75)
Capacity		1	1.5	2	3	5	7.5	10	15	20	25	30	40	50	60	70	100	50	70	100
Rated Current*2		3.2	4.8	6.4	9.6	16	24	32	48	64	80	96	130	160	183	224	300	160	224	300
Continuous Rated Current Characteristics*3		(a)											(c)					(e)		
Overload Current Rating		150% continuous rated current for one minute																		
Rated Output Voltage		180V																		
Power Supply	Voltage Frequency	3-Phase, 200/208/220V, 50Hz, 200/208/220/230V 60Hz																		
	Allowable Voltage Fluctuation	±10%																		
	Allowable Frequency Fluctuation	±5%																		

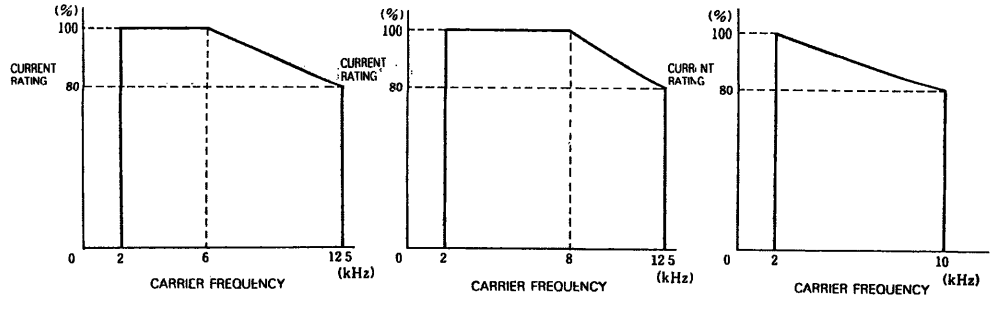
400V Class

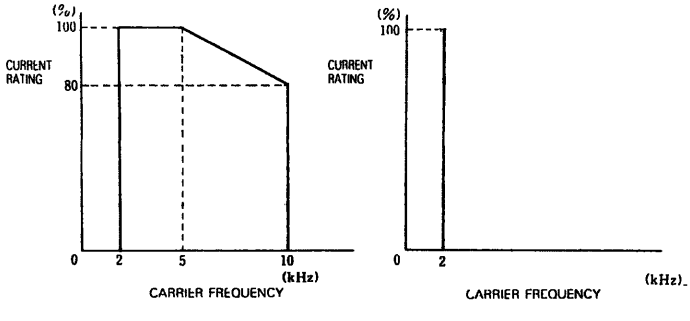
Items \ Type / Model CIMR-VG -VH		Low Noise Type																	Compact Low-Carrier Frequency Type						
		40P4	40P7	41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022	4030	4037	4L45	4L55	4L75	4LA1	4LA6	4045	4055	4075	4110	4160	4200	4220	4300
Max Applicable Motor Output*1 Hp (kW)		0.5 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	150 (110)	200 (160)	60 (45)	75 (55)	100 (75)	150 (110)	200 (160)	260 (200)	300 (220)	400 (300)
Capacity		1	1.6	2	3	5	7.5	10	15	30	25	30	40	50	60	80	100	140	200	60	80	100	140	200	250	300	400
Rated Current*2		1.56	2.6	4	4.8	8	12	16	24	32	40	48	64	80	96	128	165	224	300	96	128	165	224	300	400	450	600
Continuous Rated Current Characteristics*3		(b)														(d)		(e)								
Overload Current Rating		150% continuous rated current for one minute																								
Rated Output Voltage		360V																								
Power Supply	Voltage Frequency	3-Phase, 380/400 /415/440/460V 50/60Hz																								
	Allowable Voltage Fluctuation	±10%																								
	Allowable Frequency Fluctuation	±5%																								

*1 Standard 4-pole motor is used for max applicable motor output.

*2 Continuous rated current depends on set value of carrier frequency.

*3 See characteristics graphs shown below





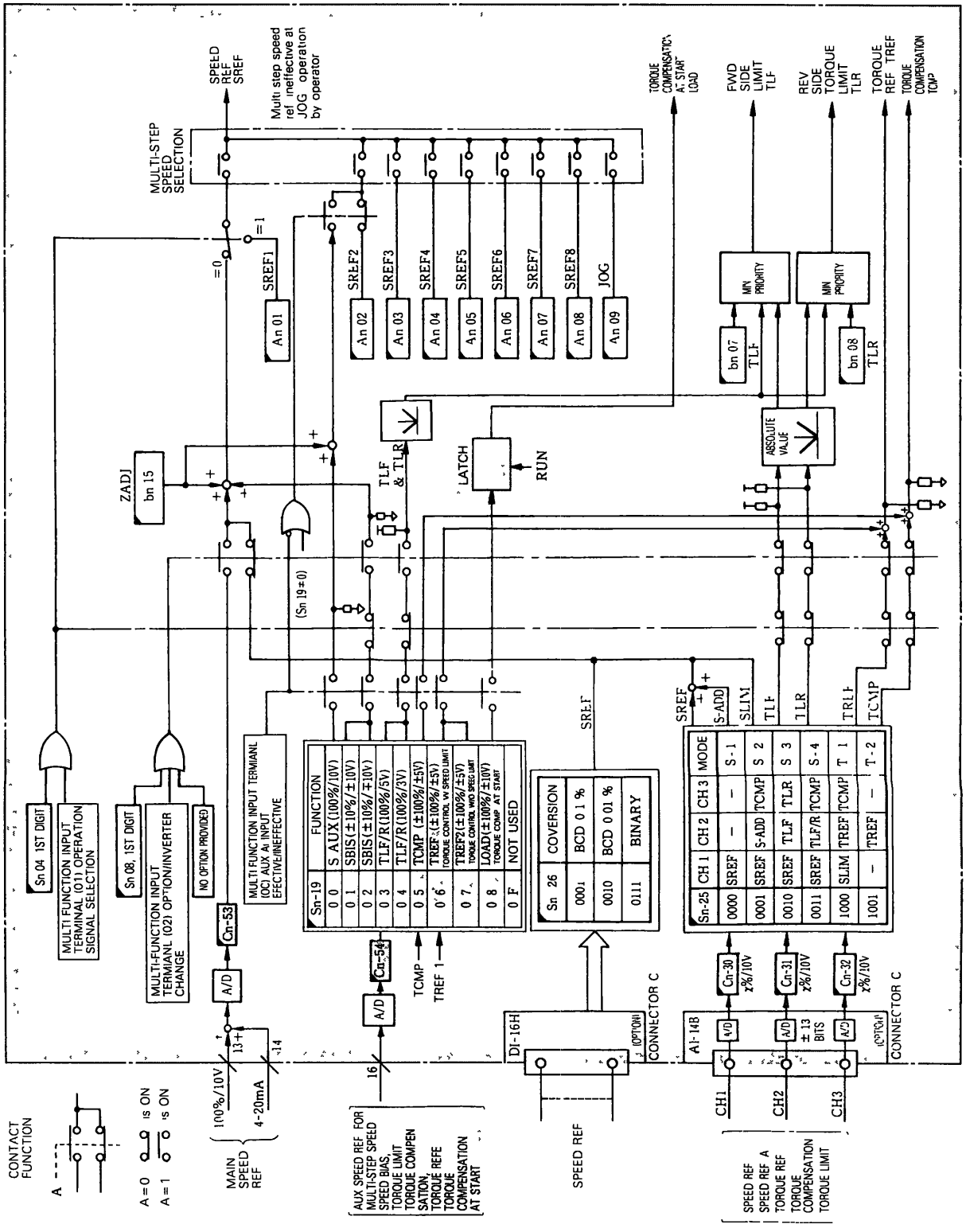
A1.2 COMMON SPECIFICATIONS

Items				Specifications
Control Method				All-digital vector control, sine wave PWM
Control Characteristics	Speed Control	With PG	Range	1000 1 (can be operated at zero speed)
			Precision	Digital reference ±0 01% (-10 to +40℃), Analog reference ±0 1% (25℃±10℃)
		Without PG	Range	50 1
			Precision	With thermister ± 0 2%, without thermister ±0 5% (25 ±10℃)
	Speed Setting Resolution			0 1% (10 bits/10V) 0 05% (11 bits/10V) or 0 01% [Multi-step speed run, digital reference card (option), high-accuracy analog input card (option), communication card]
	Speed Reference Signal			Analog (0 to +10V, 0 to ± 10V, 4 to 20mA) Digital [16-bit binary or BCD 4-digit (preset run by digital operation possible) Transmission (30000/100%)
	Speed-Torque			4-quadrant run possible (FWD electric/regenerative, REV electric/regenerative)
	Accel/Decel time			Linear accel/decel + S-curve accel/decel • 0 to 3000 seconds resolution 0 1 seconds or 0 to 300 seconds : resolution 0 01 seconds • accel/decel set individually 2-stage change possible • S-curve time 0 to 10 0 seconds 2-stage change possible
	Torque Limit			0 to 300%, (forward and reverse sides can be set individually
	Braking Torque			125% 200V, 10HP (7 5kW) or less, 400V 20HP (15kW) or less braking resistor installed separatelly 200V, 15HP (11kW) or more, 400V, 25HP (18 5kW) or more braking unit, braking resistor installed separatelly Approx 20% without braking circuit
	Rated Output Range			• 1 2 at weakening by 1/N (N speed) • 1 4 at weakening by 1/$\sqrt{N}$ (N speed)
Protection Function	Inverter			Overcurrent, overvoltage, cooling fin overheat, undervoltage, cooling fan stop, ground fault, DC fuse blown, overload, braking transistor fault, control circuit fault
	Motor			Overload, overheat, over speed, PG line disconnected
	System			Excess speed deviation, open-phase load, momentary power loss continuous operation, external fault
Alarm Function				Motor overheat, over torque, constant setting error
Momentary Power Loss Back up				15ms, up to 2 seconds can be set by setting parameter (max 1 second for 3HP (2 2kW) or less, 2 seconds possible with option)
Input Signal	Speed Reference			0 to +10VDC (20kΩ), 0 to ± 10V (20kΩ), 4 to 20mA (250Ω) 16-bit binary or BCD 4-digit (option) Transmission (30000/100%)
	Multi-function Analog Input			Any one of aux speed references, speed bias 1 (+10%/10V), bias 2 (-10%/10V) external torque limit 1 (±100%/5V), limit 2 (±100%/3V), torque compensation, torque reference, etc
	Contact	① to ④		Forward run, reverse run, external fault, fault reset
		Multi-function ⑤ to ⑧		Any four of multi-step speed reference 1, 2, 3, jog speed, 3-wire mode selection, accel/decel time change, external baseblock, accel/decel prohibit, external overheat prediction, P/PI control change, initial excitation, speed/torque control change, zero-servo on/off, s-curve time change, etc
Output Signal	Analog	Multi-function Monitors ㉑ - ㉒ ㉓ - ㉔		Any two of inverter current, motor output power, speed feedback, torque reference, speed reference, DC voltage, slip frequancy, speed deviation, motor temperature, etc (Up to four points with option)
	Contact	Fault ⑱ to ⑳		1 NONC (250VAC, 1A, 30VDC, 1A)
	Open Collector	Multi-function ⑨, ⑩, ㉕ to ㉙	1 NO	During operation, zero speed, speed agreed, speed detection, ready for operation, zero-servo completion, motor temperature detection, over torque detection, etc
			Open collector 4 points	
Environmental Conditions	Location			Indoor (where there is no corrosive gas, dust, etc)
	Ambient Temperature			-10 to + 45℃ (panel-mounted type) not to be frozen
	Storage Temperature			-20 to +60℃
	Humidity			90% RH or less (non-condensing)
	Vibration			9 81m/s² (1G) (less than 20Hz), 1 96m/s² (0 2G) (20 to 50Hz) allowed

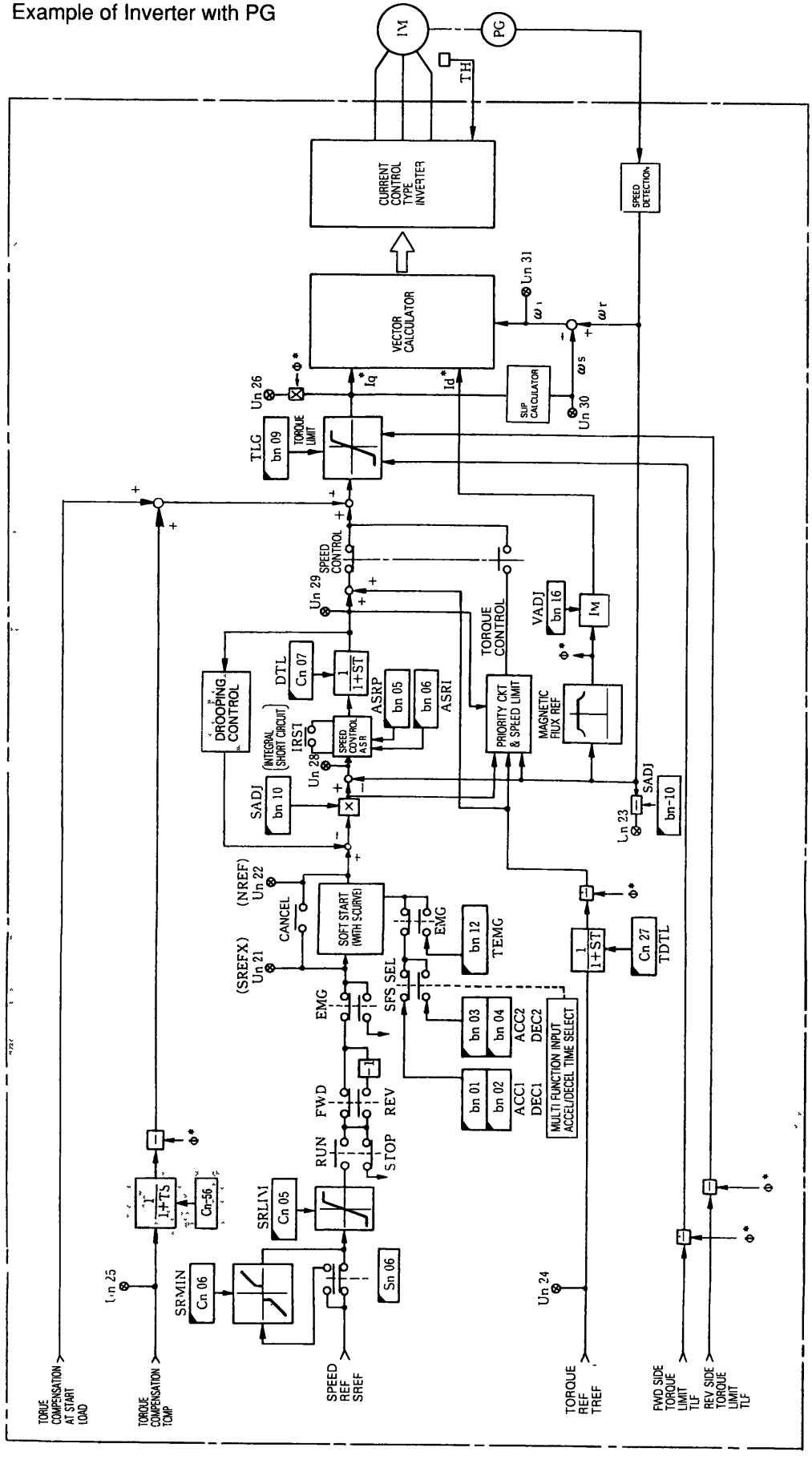
A2. BLOCK DIAGRAM

A2.1 FUNCTION

Example of Inverter with PG



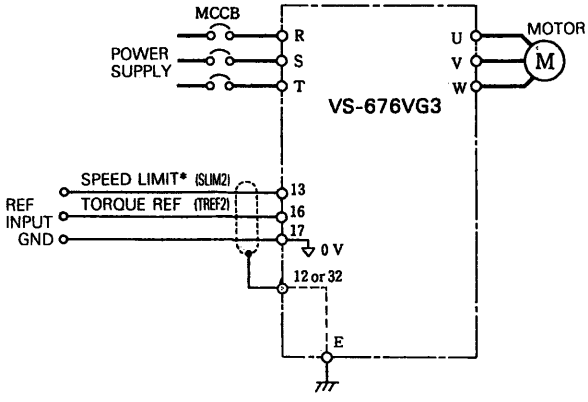
Example of Inverter with PG



A2.2 TORQUE CONTROL OPERATION (FOR WINDER, UNWINDER)

Connection Diagram

(1) When using Multi-function Analog Input Terminal 16



*Digital operator input can be selected by using Sn-04=XXX1 to set.

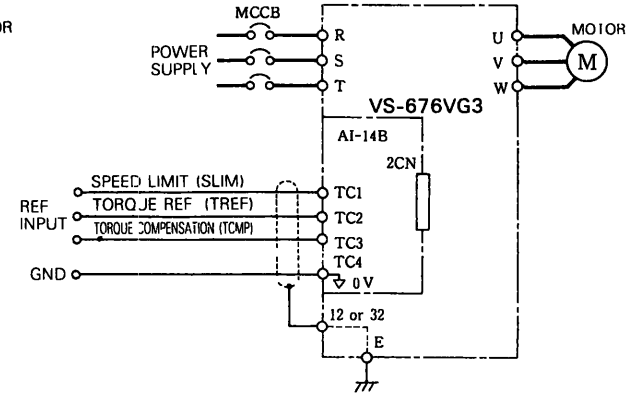
Note .

1 Setting : Sn-19=06

2. Input resolution : ±11 bits/±10V

3 Torque compensation function cannot be used

(2) When using AI-14B Card (Option)

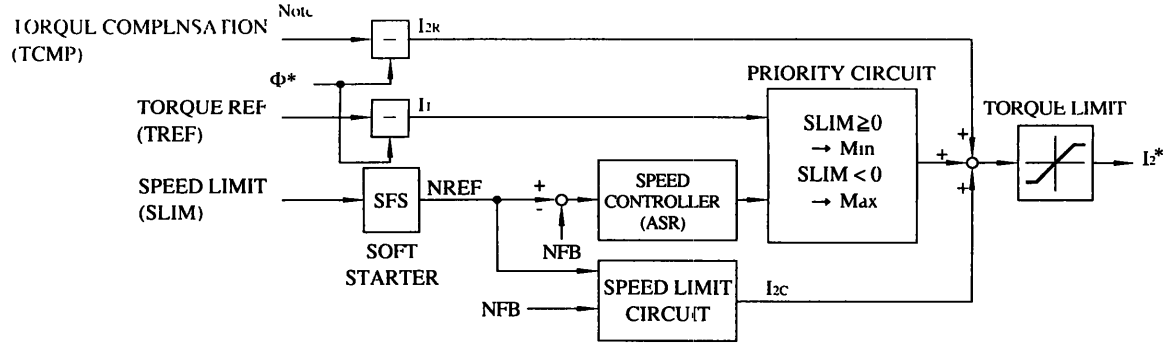


Notes

1. Setting . Sn-25=1000

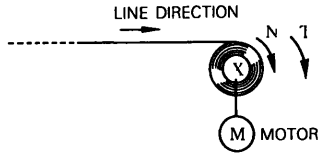
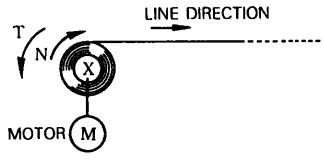
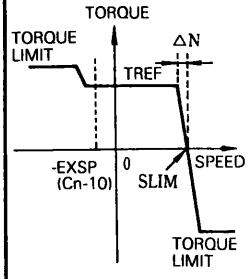
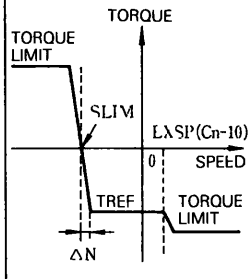
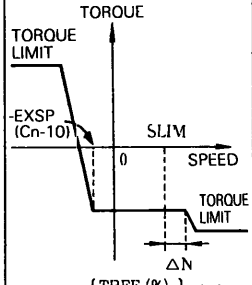
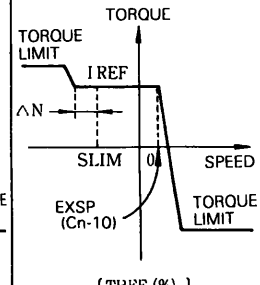
2 Input resolution ±13 bits/±10V

Block Diagram



Note· Only when using AI-14B card

Torque Control Operation

		Winder Control		Unwinder Control	
Configuration					
Direction of Motor Rotation		Forward	Reverse	Forward	Reverse
Ref Polarity	Torque Ref (TREF)	⊕	⊖	⊖	⊕
	Speed limit (SLIM)	⊕	⊖	⊕	⊖
Torque Profile		 $\Delta N\ (\%) = \frac{TREF\ (\%)}{bn - 05}$	 $\Delta N\ (\%) = \frac{TREF\ (\%)}{bn - 05}$	 $\Delta N\ (\%) = \left\{\frac{TREF\ (\%)}{bn\ 05}, Cn - 10\ (\%)\right\}$ whichever is smaller	 $\Delta N\ (\%) = \left\{\frac{TREF\ (\%)}{bn - 05}, Cn - 10\ (\%)\right\}$ whichever is smaller
Constant Setting	Multi-function Analog Input (Terminal 16)	Sn - 19 = 06 (Torque control mode 1), bn - 06 = 0 (ASR P control)			
	AI-14B Card (Option)	Sn - 25 = 1000 (Torque control mode 1), bn - 06 = 0 (ASR P control)			

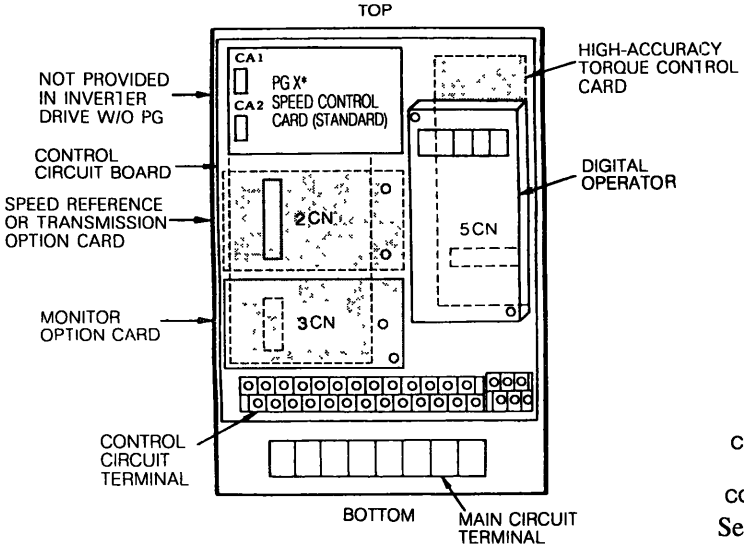
A3. OPTIONS

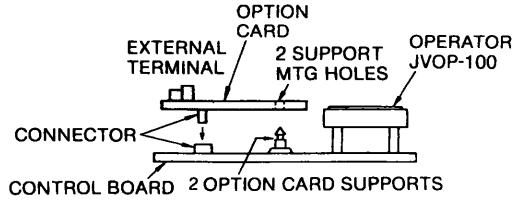
A3.1 OPTION CARDS

BUILT-IN TYPE (INSTALLED ONTO CONTROL BOARD)

Type	Name	Type (Code No.)	Function	Mounting Position	Remarks
Speed Reference Option Card	Analog Reference Card AI-14B	(73600-C002)	Permits setting of a high-accuracy high-resolution analog speed or torque reference • Input signal level , -10 to +10VDC (20kΩ) 4 to 20mA DC (580Ω) 3 channels • Input resolution 13 bit + sign (1/8192) • System constants Sn-25, Sn-30 to 32 • Monitor constants Un-36 to -38	Attach the card at 2CN on the control circuit board (See Note 1)	Torque control possible by using this card TOE-C736-30 14
	Digital Reference Card DI-16H	(73600-C004)	Permits setting of a 16-bit digital speed reference • Input signal Binary 16 bits/BCD 4 digit + sign • Input voltage +24V (isolated) • Input current 8mA/point • Input channel 1 channel • System constants Sn-26 • Monitor constants Un-12 ,Un-13		TOE-C736-30 16
Transmission Option Card	Communication Interface Card SI-B	(73600-C006X)	Permits operation or constant setting by command from master controller • Communication method Synchronous • Communication speed 19.2kBPS (up to 136.5kBPS possible) • Interface RS-232, RS-422, RS-485	Attach the card at 2CN on the control circuit board (See Note 1)	—
Monitor Option Card	Analog Monitor Card AO-08	(73600-D001X)	Provides an analog signal for monitoring the output state (output frequency, output current etc) of the inverter • output resolution 8 bits (1/256) • Output voltage 0 to + 10V (non-insulation) • Output channel 2 channels • Application constants bn-22 to -25	Attach the card at 3CN on the control circuit board (See Note 2)	TOE-C736-30 21
	Analog Monitor Card AO-12	(73600-D002)	Provides an analog signal for monitoring the output state (output frequency, output current, etc) of the inverter • Output resolution 11 bit (1/2048)+sign • Output voltage -10 to + 10V (non insulation) • Output channel 2 • Application constants bn-22 to -25		TOE-C736-30 22
	Digital Output Card DO-08	(73600-D004)	Inverter operation status or fault contents are output (Multi-function output) • 1NO contact 2 points (250VAC 1A or less 30VDC 1A or less) • Open collector 6 points (48V 50mA) • System constant Sn-27 • Monitor constant Un-14		TOE-C736-30 24
High-accuracy Torque Control Card TRQ-A		(73600-B001)	• Provided as a standard for inverter without PG • Need at auto-tuning execution • Temperature compensation is available without thermistor (with PG)	Attach the card at 5CN on the control circuit board	—

Notes 1 Only one of the speed reference or communication option cards can be installed at 2CN at one time
2 Only one of the monitor option cards can be installed at 3CN at one time





Sectional Diagram Viewed from the Bottom

*Model CIMR -VGA, -VHC, -VHJ (JAPAN use with PG) are provided with PG-B as standard

Option Card Installing Position

A3.2 OPTION UNITS

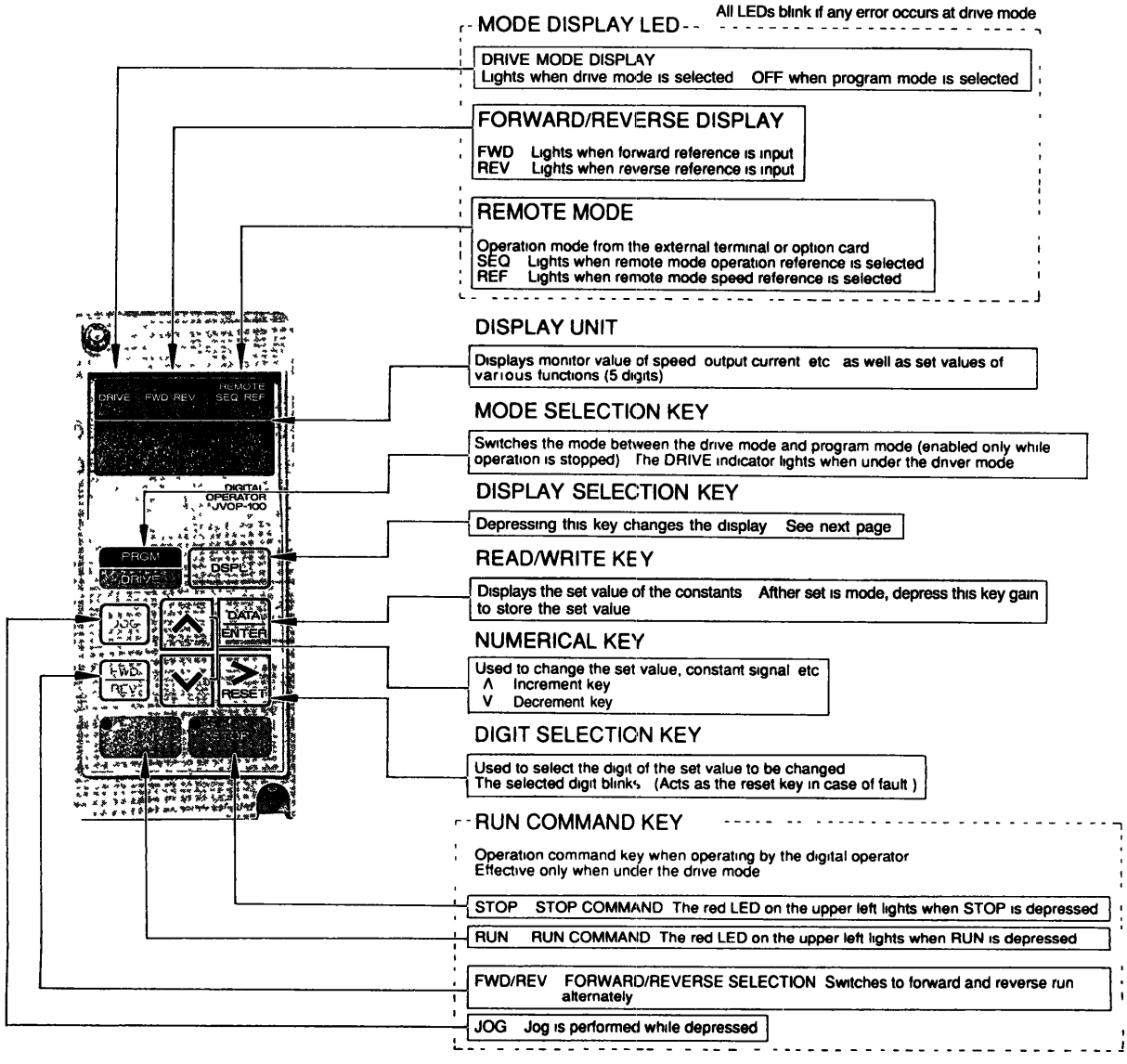
Type	Name	Model (Code No)	Function	Mount Position	Remarks
Mounted on the Inverter	Digital Monitor	JVOP-101 (73041-0911X)	The speed, current and fault can be displayed on the digital monitor Run/stop operation and modification of constants cannot be made	Inverter* faceplate	Document TOE C730-50 4
	Adaptor panel for Digital Operator/ Digital Monitor	JVOP-109 (73041-09190)	When removing the digital operator or digital monitor from the inverter faceplate, this adaptor panel can be used to insert/remove the extension cable at the inverter faceplate When using the adaptor panel, the adaptor panel extension cable must be purchased separately		Document TOE- C736-50 11
	Extension Cable for Adaptor Panel	1 m cable (72616-W3001-01) 3 m cable (72616-W3003-01)	Special extension cable used for remote control of the digital operator and digital monitor using the adaptor panel (JVOP-109) cable length=3 28 ft (1 m), 9 84 ft (3 m)	—	
Separately-mounted Type	Extension Cable for Digital Operator /Digital Monitor† (With Blank Cover)	1 m cable (72616-W3001) 3 m cable (72616-W3003)	Extension cable used for operation, removing the digital operator or digital monitor from the inverter faceplate Cable length=3 28 ft (1 m), 9 84 ft (3 m)	Inverter* faceplate	Document TOE- C736-50 10
	Remote Operator	JVOP-102 (73041-0912X)	Operation, operation status monitoring can be performed at 5 meters or more away from the inverter (max 328 ft (100 m))	Separetely-mounted	Document TOE- C736-20 4
	Remote Monitor	JVOP-103 (73041-0913X)	The operation status can be monitored 5 meters or more away from the inverter (max 328 ft (100 m))		
	Amplifier for Remote Operator/ Monitor	JVOP-104 (73041-0914X)	Necessary when using the remote operator or remote monitor		
	Braking Unit	CDBR- (72600-R 0)	Used with the braking resistor unit to shorten the motor deceleration time	Separetely-mounted	Document TOE- C736-50 5
	Braking Resistor Unit	LKEB- (72600-K 0)	Dissipates the motor regenerative energy by a resistor to reduce the deceleration time (operation factor 10% ED)	Separetely-mounted	Document TOE- C736-50 5
	Braking Resistor (Built-in Type)	ERF-150WJ (R00)	Dissipates the motor regenerative energy by a resistor to reduce the deceleration time (operation factor 3% ED)	—	—
	Back-up capacitor for Momentary power Loss	P00 0 (73600-P00 0)	Used in case of momentary power loss (for the power loss of less than 2 seconds)	Separetely-mounted	Document TOE- C736-50 6
	PG Cable (For model CIMR-VGA/VH)	72676-W00 0	Connection cable (with connector) between the motor PG and the inverter 1 32 8ft (10m) 2 65 6ft(20m) 3 98 4ft(30m) 5 164 0ft(50m)	—	—
	Support Tool Package	72676-F00 X	Software package for auto-tuning, constant filing management, trace back (with 2 m cable) 2 For IBM PC/AT 25-pin 3 For IBM PC/AT 9-pin	—	EZZ 005865

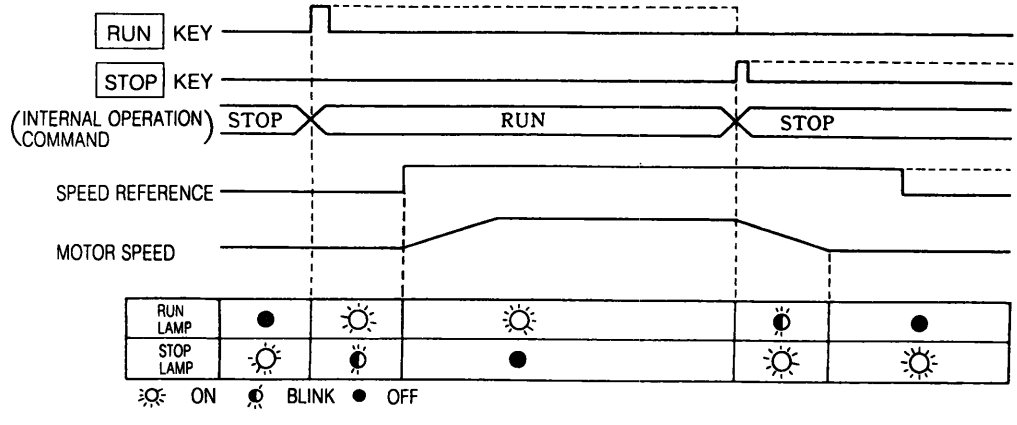
* When mounting option (JVOP-101,-109 type, blank cover) on the faceplate of the inverter, remove the digital operator (JVOP-100 type)

† The extension cable cannot be inserted/removed without removing the inverter faceplate

A4. DIGITAL OPERATOR

A4.1 DIGITAL OPERATOR DISPLAY UNIT, CONTROL UNIT





The RUN and STOP lamps turn on/off or blink according to operation state

A4.2 OPERATION MODE AND CONSTANT GROUP

The drive mode and program mode can be switched by the PRGM/DRIVE key as necessary, when the operation is stopped. When function selection or change of set value is necessary according to the application, select the program mode and change the setting of the constants.

DRIVE MODE

- Operation is performed under this mode
- Operation can also be performed by the RUN, STOP, JOG, or FWD/REV keys.
- The speed reference value, accel/decel time setting can also be changed during operation.

PROGRAM MODE

- Modification (function selection, constant setting) is made to the program under this mode. No operation can be performed.

Operation Mode			Drive Mode	Program Mode	Related Constant (Set value)
Operation Function	Operation and Speed Reference Input		Operation can be performed by the digital operator	—	Sn-04 (××11)
	Constant Setting	An- bn-	Setting is performed	Setting is performed	Sn-03 (0000)
		Cn- dn-	Reference only	Setting is performed	
	Function Selection	Sn-			
Monitor Function	Monitor Variable Display Un-		Monitoring can be performed	—	—
	Effective at Fault		Displays details of the fault		—

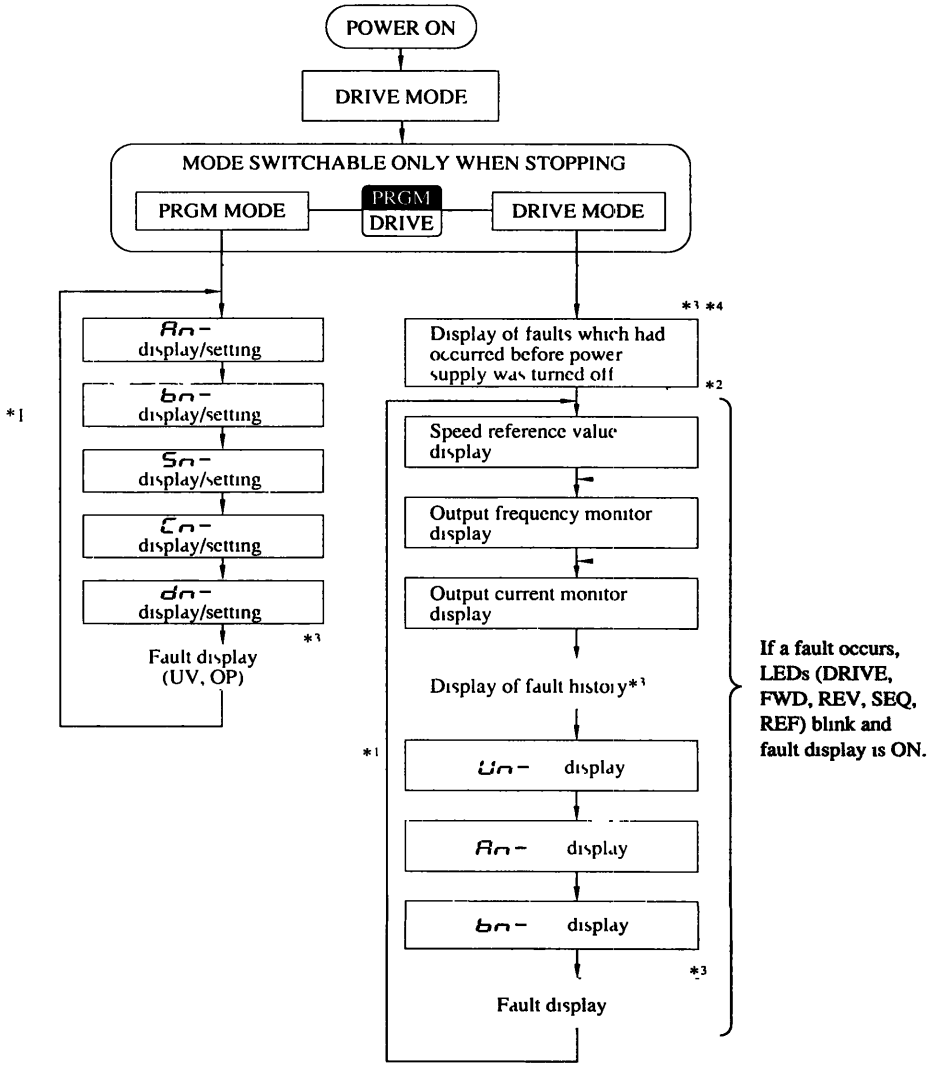
Constant group

- An- ··· Reference setting constant group. Sets the speed reference.
- bn- ··· Application constant group. Setting can be made during operation.
- Cn- ·· Control constant group. Constants related to operation characteristics.
- dn- ··· Motor constant group. Constants related to motor characteristics.
- Sn- ··· System constant group. Constants used to select functions.
- On- ·· Order constant group. Constants related to unnecessarily functions. (Do not change the factory setting unnecessarily.)

A4.3 DRIVE MODE AND PRGM MODE

- When the power is supplied, the drive mode is activated. The drive mode LED lights.
- When the program mode is selected, the drive mode LED turns OFF.

Example of Sn-03=0000



- Fault occurrence order can be referenced using the [∧] or [∨] key while a fault is displayed.
- While fault history is displayed, the following display can be referenced :

  Fault contents using the [∧] or [∨] key.

  Accumulated operating time at fault occurrence using [DATA ENTER] key.

*1 The constant group displayed is changed each time the display key [DSPL] is depressed.

*2 Monitor upon power-up can be changed by using bn-13.

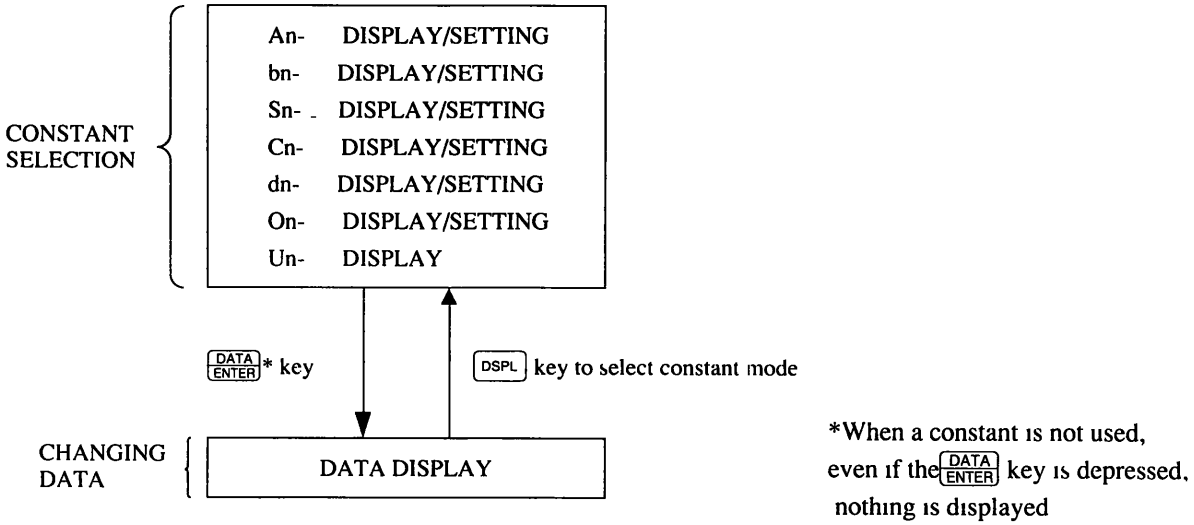
*3 When no fault has occurred, the fault display is skipped.

*4 Design revision "C" and before

4.4 CHANGING CONSTANTS

To display and/or change constant data, first, depress [DATA ENTER] key in each constant mode : An- , bn- , Sn- , Cn- , dn- , On- and Un- . When the constant data is displayed, you can change the data using the [>RESET], [∧], and [∨] keys. Finally, depress the [DATA ENTER] key to store the data change. This operation depends on Sn-03 setting.

OPERATION CHART
(Example of Sn-03=1001)



HOW TO CHANGE DATA

1. Use the [>RESET], [∧], and [∨] key to change data.
2. Depress the [DATA ENTER] key to store the data change. (End display)

Note · If input data is not possible, the data will blink first, then previous data will be displayed

A5. CONSTANTS

A5.1 SYSTEM CONSTANTS (Sn-)

Constant No	Name	Setting Unit	Initial Value	User Set Value
Sn-01	Inverter Capacity Selection	2-digit HEX	Factory setting	
Sn-02	1st Motor Code Selection	4-digit HEX	Factory setting	
Sn-03	Operator status (constant display mode and constant initialization)	4-digit BINARY	0000	
Sn-04	Run Mode Selection 1 (speed torque/operation signal/stopping method)	4-digit BINARY	0011	
Sn-05	Run Mode Selection 2 (operator STOP, FWD/REV RUN prohibit)	4-digit BINARY	0000 0001 Note 2	
Sn-06	Run Mode Selection 3 (operation mode at minimum speed reference or less)	4-digit BINARY	0000 (W PG) 1000 (W/O PG)	
Sn-07	Run Mode selection 4 (Synchronous restart, ASR control mode at zero speed or less coasting (full-in at start)	4-digit BINARY	0000	
Sn-08	Run Mode Selection 5 (speed torque/operation signal, minor fault processing)	4-digit BINARY	0010 Note 1 0000 Note 2	
Sn-09	Run Mode Selection 6 (Output voltage limit, carrier frequency)	4-digit BINARY	0000	
Sn-10	Protective Function Selection 1 (excessive speed deviation, overspeed)	4-digit BINARY	0111	
Sn-11	Protective Function Selection 2 (momentary power loss, undervoltage, built-in resistor, etc)	4-digit BINARY	0000	
Sn-12	Protective Function Selection 3 (external fault terminal 3 function selection)	4-digit BINARY	0100	
Sn-13	Protective Function Selection 4 (inverter protection OL2, FAN)	4-digit BINARY	0101	
Sn-14	Protective Function Selection 5 (motor protection OL1, OH1, THM)	4-digit BINARY	1101	
Sn-15	Multi-function Input Terminal Function Slection (Terminals 5-11)	2-digit HEX	03	
Sn-16	Multi-function Input Terminal Function Selection (Terminals 6-11)	2-digit HEX	04	
Sn-17	Multi-function Input Terminal Function Selection (Terminals 7-11)	2-digit HEX	06	
Sn-18	Multi-function Input Terminal Function Selection (Terminals 8-11)	2-digit HEX	08	
Sn-19	Multi-function Analog Input Terminal Function Slection (Terminals 16-17)	2-digit HEX	00	
Sn-20	Multi-function Output Terminal Function Selection (Terminals 9-10)	2-digit HEX	00	
Sn-21	Multi-function Output Terminal Function Selcetion (Terminals 25-27)	2-digit HEX	01	
Sn-22	Multi-function Output Terminal Function Selection (Terminals 26-27)	2-digit HEX	02	
Sn-23	Multi-function Output Terminal Function Selection (Terminals 28-27)	2-digit HEX	06	
Sn-24	Multi-function Output Terminal Function Selection (Terminals 29-27)	2-digit HEX	0D	
Sn-25	AI-14B (Option) Function Selection	4-digit BINARY	0000	
Sn-26	DI-16H (Option) Function Selection	4-digit BINARY	0001	
Sn-27	DO-08 (Option) Function Selection	4-digit BINARY	0000	
Sn-28	Other Function Selection 1	4-digit BINARY	0000	
Sn-29	Transmission Station Address	2-digit HEX	FF	
Sn-30	Transmission Function Selection 1	4-digit BINARY	0000	
Sn-31	Transmission Function Selection 2	4-digit BINARY	0100	
Sn-32	Transmission Function Selection 3	4-digit BINARY	0001	
Sn-33	Transmission Function Selection 4	4-digit BINARY	0000	
Sn-34	Transmission Function Selection 5	4-digit BINARY	0001	
Sn-37	Auto-tuning Mode Selection	2-digit HEX	00	
Sn-38	Other Function Selection 2	4-digit BINARY	0000	
Sn-42	Other Function Selection 3	4-digit BINARY	0000	
Sn-50	DI-08 (option) Function Selection	4-digit HEX	1000	

Notes 1. 0000 before design revision "C".

2 For multi-system of design revision "C" and before

A5.1 SYSTEM CONSTANTS (Sn-) (Cont'd)

System Constants (1 of 9)

<table>
<tr><th>Constant No</th><th>Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>Sn-01</td><td>Inverter Capacity Selection</td><td>Set the capacity of the inverter (Preset before shipment)
When replacing control board, set the capacity according to the following tables
<table>
<tr><th colspan="3">200V Class</th></tr>
<tr><th colspan="2">CIMR-V[ ][ ][ ]</th><th>Sn-01 Setting</th></tr>
<tr><td colspan="2">20P4</td><td>00</td></tr>
<tr><td colspan="2">20P7</td><td>01</td></tr>
<tr><td colspan="2">21P5</td><td>02</td></tr>
<tr><td colspan="2">22P2</td><td>03</td></tr>
<tr><td colspan="2">23P7</td><td>04</td></tr>
<tr><td colspan="2">25P5</td><td>05</td></tr>
<tr><td colspan="2">27P5</td><td>06</td></tr>
<tr><td colspan="2">2011</td><td>07</td></tr>
<tr><td colspan="2">2015</td><td>08</td></tr>
<tr><td colspan="2">2018</td><td>09</td></tr>
<tr><td colspan="2">2022</td><td>0A</td></tr>
<tr><td></td><td>2L30</td><td>0B</td></tr>
<tr><td>2037</td><td>2L37</td><td>0C</td></tr>
<tr><td></td><td>2L45</td><td>0D</td></tr>
<tr><td>2055</td><td>2L55</td><td>0E</td></tr>
<tr><td>2075</td><td>2L75</td><td>0F</td></tr>
</table>
<table>
<tr><th colspan="4">400V Class</th></tr>
<tr><th>CIMR-V[ ][ ][ ]</th><th>Sn-01 Setting</th><th>CIMR-V[ ][ ][ ]</th><th>Sn-01 Setting</th></tr>
<tr><td>40P4</td><td>20</td><td>4075, 4L75</td><td>2F</td></tr>
<tr><td>40P7</td><td>21</td><td>4110, 4LA1</td><td>31</td></tr>
<tr><td>41P5</td><td>22</td><td>4160, 4LA6</td><td>33</td></tr>
<tr><td>42P2</td><td>23</td><td>4220</td><td>35</td></tr>
<tr><td>43P7</td><td>24</td><td>4300</td><td>36</td></tr>
<tr><td>45P5</td><td>25</td><td>4200</td><td>3E</td></tr>
<tr><td>47P5</td><td>26</td><td>4440 (4220M)</td><td>39</td></tr>
<tr><td>4011</td><td>27</td><td>4600 (4300M)</td><td>3A</td></tr>
<tr><td>4015</td><td>28</td><td></td><td></td></tr>
<tr><td>4018</td><td>29</td><td></td><td></td></tr>
<tr><td>4022</td><td>2A</td><td></td><td></td></tr>
<tr><td>4030</td><td>2B</td><td></td><td></td></tr>
<tr><td>4037</td><td>2C</td><td></td><td></td></tr>
<tr><td>4045</td><td>2D</td><td></td><td></td></tr>
<tr><td>4L45</td><td>3F</td><td></td><td></td></tr>
<tr><td>4055, 4L55</td><td>2E</td><td></td><td></td></tr>
</table></td><td>Factory setting</td></tr>
<tr><td>Sn-02</td><td>Motor Selection</td><td>Sets the code of the motor to be operated
When setting the following code to Sn-02, Yaskawa standard motor (w PG) constants are read out in motor constants (dn-01 to dn-18) Set "FFF" for non-standard motors,and also set motor constant dn-[ ][ ] by auto-tuning
Standard Motor Code Table
<table>
<tr><th rowspan="2">Motor Output HP (kW) \ Speed r/min</th><th colspan="3">200V Class</th><th colspan="3">400V Class</th></tr>
<tr><th>1750</th><th>1450</th><th>1150</th><th>1750</th><th>1450</th><th>1150</th></tr>
<tr><td>0 5 (0 4)</td><td>000</td><td>100</td><td>200</td><td>000</td><td></td><td></td></tr>
<tr><td>1 (0 75)</td><td>001</td><td>101</td><td>201</td><td>001</td><td></td><td></td></tr>
<tr><td>2 (1 5)</td><td>002</td><td>102</td><td>202</td><td>002</td><td>102</td><td></td></tr>
<tr><td>3 (2 2)</td><td>003</td><td>103</td><td>203</td><td>003</td><td>103</td><td>203</td></tr>
<tr><td>5 (3 7)</td><td>004</td><td>104</td><td>204</td><td>004</td><td>104</td><td>204</td></tr>
<tr><td>7 5 (5 5)</td><td>005</td><td>105</td><td>205</td><td>005</td><td>105</td><td>205</td></tr>
<tr><td>10 (7 5)</td><td>006</td><td>106</td><td>206</td><td>006</td><td>106</td><td>206</td></tr>
<tr><td>15 (11)</td><td>007</td><td>107</td><td>207</td><td>007</td><td>107</td><td>207</td></tr>
<tr><td>20 (15)</td><td>008</td><td>108</td><td>208</td><td>008</td><td>108</td><td>208</td></tr>
<tr><td>25 (18 5)</td><td>009</td><td>109</td><td></td><td>009</td><td>109</td><td></td></tr>
<tr><td>30 (22)</td><td>00A</td><td>10A</td><td>20A</td><td>00A</td><td>10A</td><td>20A</td></tr>
<tr><td>40 (30)</td><td>00B</td><td>10B</td><td>20B</td><td>00B</td><td>10B</td><td>20B</td></tr>
<tr><td>50 (37)</td><td>00C</td><td>10C</td><td>20C</td><td>00C</td><td>10C</td><td>20C</td></tr>
<tr><td>60 (45)</td><td>300</td><td>10D</td><td>20D</td><td>300</td><td></td><td></td></tr>
<tr><td>75 (55)</td><td>301</td><td></td><td>20E</td><td>301</td><td></td><td></td></tr>
<tr><td>100 (75)</td><td></td><td></td><td></td><td>00F</td><td>10F</td><td></td></tr>
<tr><td>120 (90)</td><td></td><td></td><td></td><td>010</td><td>110</td><td>210</td></tr>
<tr><td>150 (110)</td><td></td><td></td><td></td><td></td><td>111</td><td></td></tr>
<tr><td>175 (132)</td><td></td><td></td><td></td><td>012</td><td></td><td>212</td></tr>
</table></td><td>
<table>
<tr><th>Inverter CIMR VG VH</th><th>Sn-02 Setting</th></tr>
<tr><td>20P4, 40P4</td><td>000</td></tr>
<tr><td>20P7, 40P7</td><td>001</td></tr>
<tr><td>21P5, 41P5</td><td>002</td></tr>
<tr><td>22P2, 42P2</td><td>003</td></tr>
<tr><td>23P7, 43P7</td><td>004</td></tr>
<tr><td>25P5, 45P5</td><td>005</td></tr>
<tr><td>27P5, 47P5</td><td>006</td></tr>
<tr><td>2011, 4011</td><td>007</td></tr>
<tr><td>2015, 4015</td><td>008</td></tr>
<tr><td>2018, 4018</td><td>009</td></tr>
<tr><td>2022, 4022</td><td>00A</td></tr>
<tr><td>4030</td><td>00B</td></tr>
<tr><td>4037</td><td>00C</td></tr>
<tr><td>4045</td><td>300</td></tr>
<tr><td>4L45</td><td>300</td></tr>
</table></td></tr>
<tr><td>Sn-03</td><td>Operator Status</td><td>Select Digital Operator Function
<table>
<tr><th rowspan="2">Constant No</th><th colspan="7">Sn-03 Setting Value</th></tr>
<tr><th>0000</th><th>0101</th><th>1010</th><th>1001</th><th>0110</th><th>1110</th><th>1111</th></tr>
<tr><td>An-[ ][ ]</td><td>◎</td><td>◎</td><td>◎</td><td>◎</td><td>Δ</td><td rowspan="6">Constant initialization (2-wire sequence)</td><td rowspan="6">Constant initialization (3-wire sequence)</td></tr>
<tr><td>bn-[ ][ ]</td><td>◎</td><td>Δ</td><td>◎</td><td>◎</td><td>Δ</td></tr>
<tr><td>Cn-[ ][ ]</td><td>○</td><td>Δ</td><td>○</td><td>◎</td><td>Δ</td></tr>
<tr><td>dn-[ ][ ]</td><td>○</td><td>Δ</td><td>○</td><td>◎</td><td>Δ</td></tr>
<tr><td>On-[ ][ ]</td><td>×</td><td>×</td><td>○</td><td>◎</td><td>Δ</td></tr>
<tr><td>Sn-[ ][ ]</td><td>○</td><td>Δ</td><td>○</td><td>○</td><td>Δ</td></tr>
</table>
◎ .. Setting can be changed regardless of the operation mode
○ Setting can be changed only when the program mode is selected
Δ . . Reference only can also be made (setting cannot be changed)
× No reference (Constants are hidden)
Note Set value cannot be changed during constant initialization
The Sn-03 set value becomes 0000 when the initialization of constants is completed</td><td>0000</td></tr>
</table>

System Constants (2 of 9)

Constant No	Name	Description				Initial Value
		Digit		Data		
Sn-04	Run Mode Selection 1	1	Speed torque reference selection	0	From control circuit terminal or option card	0011
				1	From operator (speed refernce An-01)	
		2	Operation signal selection	0	From control circuit terminal	
				1	From operator	
		3 • 4	Stopping method selection (When stop reference is input)	00	Deceleration stop	
				01	Coasting stop	
				10	—	
				11	—	
Sn-05	Run Mode Selection 2	1	Stop priority during control circuit terminal operation	0	Operator STOP key enabled	0000 0001 Note 2
				1	Operator STOP key disabled	
		2 • 3	Forward/reverse run prohibition	00	Forward/reverse run enabled	
				01	Reverse run prohibited	
				10	Forward run prohibited	
				11	—	
		4	Not used	0	—	
Sn-06	Run Mode Selection 3	1	Not used	0	—	0000 (W/PG) 1000 (W/O PG)
		2	Not used	0	—	
		3 • 4	Run mode when the speed reference is less than the minimum speed reference (Cn-06)	00	Normal operation (Cn-06 is invalid)	
				01	Zero-speed operation (by speed ref 0)	
				10	Stop (by Sn-04 3rd and 4th digits)	
				11	Minimum speed operation (speed reference is Cn-06)	
Sn-07	Run Mode Selection 4	1	Coasting pull-in function	0	With coasting pull-in	0000
				1	Without coasting pull-in	
		2	ASR control mode when less than zero-speed (Cn-01)	0	ASR processing is PI control (normal mode)	
				1	ASR processing is P control	
		3	Coasting pull-in at start (W/O PG)	0	Disabled	
				1	Enabled	
		4	Not used	0	—	
Sn-08	Run Mode Selection 5	1	Speed torque reference selection	0	Option card has priority	0010 Note 1 0000 Note 2
				1	Option card is disabled	
		2	Operation signal selection	0	Option card has priority	
					Option card is disabled	
		3	Not used	0	—	
		4	Minor fault display mode	0	Automatic reset	
				1	Fault held until external reset signal is input	
Sn-09	Run Mode Selection 6	1	Output voltage limit	0	No limit	0000
				1	90% limit of no load voltage	
		2	Not used	0	—	
		3	Not used	0	—	
		4	Carrier frequency	0	General (2 0kHz)	
				1	Low noise selection (Changed by Cn-52)	

Notes 1 Design revision "C" and before is 0000.
2 For multi-system of design revision "C" and before.

A5.1 SYSTEM CONSTANTS (Sn-) (Cont'd)

System Constants (3 of 9)

Constant No	Name	Description				Initial Value
		Digit		Data		
Sn-10	Protection Function Selection 1 (System Protection)	1 • 2	Stop method when excess speed deviation (DEV) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	0111
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12)(major fault)	
				11	Continue operation (minor fault)	
		3 • 4	Stop method when overspeed (OS) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12)(major fault)	
				11	Not used	
Sn-11	Protection Function Selection 2	1	Built-in braking resistor Overheat fault (rH) selection	0	Disabled	0000
				1	Enabled, only use with Yaskawa resistor	
		2	Fault contact signal during fault retry	0	No fault contact signal is output during retry	
				1	Fault contact signal is output during retry	
		3	Momentary power loss protection selection	0	Operation stops when momentary power loss is detected (coasting)	
				1	Automatic operation restarts after recovery from momentary power loss	
		4	Undervoltage (PUV) detection level selection	0	Standard (210VDC/200V class, 420VDC/400V class)	
				1	Undervoltage detection level is set in Cn-17	
Sn-12	Protection Function Selection 3	1	External fault signal level	0	External fault is NO contact input	0100
				1	External fault is NC contact input	
		2	External fault signal detection condition	0	External fault is always detected	
				1	No external fault is detected while operation is stopped (BB)	
		3 • 4	Stop method when external fault (EF3) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	
				11	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12)(major fault)	
				11	Continue operation (minor fault)	
Sn-13	Protection Function Selection 4 (Inverter Protection)	1 • 2	Stop method when inverter overload fault (OL2) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	0101
				01	Coast to a stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12) (major fault)	
				11	Continue operation (minor fault)	
		3 • 4	Stop method when inverter cooling fan fault (FAN) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12)(major fault)	
				11	Continue operation (minor fault)	
Sn-14	Protection Function Selection 5 (Motor Protection)	1 • 2	Stop method when motor overload fault (OL1) is detected	00	Deceleration stop (deceleration time is set in bn-02)(major fault)	1101
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12)(major fault)	
				11	Continue operation (minor fault)	
		3	Stop method when motor overload fault (OH1) is detected	0	Emergency stop (deceleration time is set in bn-12)(major fault)	
				1	Coast to stop (major fault)	
		4	Stop method when thermister line break fault (THM) is detected	0	Emergency stop (deceleration time is set in bn-12)(major fault)	
				1	Coast to stop (major fault)	

Constant No	Name		Description	Initial Value
Sn-15	Multi-function Input Terminal Function Selection	Terminals 5-11 Function		03
Sn-16		Terminals 6-11 Function		04
Sn-17		Terminals 7-11 Function		06
Sn-18		Terminals 8-11 Function		08

Set Value	Function (Hold 50ms min.)	
0	Forward/reverse selection (3-wire operation mode)	
1	Operator selection	
2	Inverter unit speed ref. selection	
3	Multi-speed reference 1	Speed reference settings (An-01 to -09) are selected using these inputs (See Para. 5.3 (5))
4	Multi-speed reference 2	
5	Multi-speed reference 3	
6	Jog speed selection	
7	Accel/decel time selection (bn-03, -04 at "close")	
8	External baseblock (NO contact)	
9	External baseblock (NC contact)	
0A	Accel/decel stop (speed hold)	
0B	Inverter overheat prediction	
0C	Auxiliary analog input (terminal 16) enable/disable (enable at "close")	
0E	ASR integral reset	
0F	DI function (enable at use of transmission option)	
20 to 2F	External fault signal selection 1 (See table 5.6)	
30 to 3F	External fault signal selection 2 (See table 5.6)	
40 to 4F	External fault signal selection 3 (See table 5.6)	
50 to 5F	External fault signal selection 4 (See table 5.6)	
70	Initial excitation	
71	Speed control/torque control mode 1 selection (torque control without speed limit at "close")	
72	Zero-servo on/off (on at "close")	
73	S-curve time selection (Cn-26 at "close")	
74	Integral hold (ASR)	
75	Torque reference sign selection	
77	ASR proportional gain selection (Cn-22 at "close")	
78	Motor selection (2nd motor at "close")	
79	Motor selection (2nd motor at "open")	
7A	1st motor answer signal	
7B	2nd motor answer signal	
7C	Speed control/torque control 2 selection	
7E	Load input selection (for elevator only)	
7F	Battery operation (for elevator only)	
FF	Not used	

Note: Set Sn-15 to Sn-18 in ascending order.
Simultaneous setting of 71 with 7C, and 78 with 79 is not allowed.

Sn-19	Multi-function Analog Input Terminal Function Selection	Terminals 16-17 Function		00

Set Value	Function
00	Multi-speed auxiliary speed reference (100%/10V)
01	Speed bias 1 (+10%/+10V, −10%/−10V)
02	Speed bias 1 (−10%/+10V, −10%/−10V)
03	Torque limit 1 (±100%/5V) Both directions (FWD/REV)
04	Torque limit 2 (±100%/3V) Both directions (FWD/REV)
05	Torque compensation (±100%/±5V)
06	Torque reference (±100%/±5V) (with speed limit)
07	Torque reference (±100%/±5V) (without speed limit)
08	Torque compensation at start (±100%/±10V)
0F	Not used

Note: Gain adjustment is possible by Cn-54

A5.1 SYSTEM CONSTANTS (Sn-) (Cont'd)

System Constants (5 of 9)

Constant No	Name		Description	Initial Value
Sn-20	Multi-function Output Terminal Function Selection	Terminals 9-10 Function	(see table below)	00
Sn-21		Terminals 25-27 Function		01
Sn-22		Terminals 26-27 Function		02
Sn-23		Terminals 28-27 Function		06
Sn-24		Terminals 29-27 Function		0D

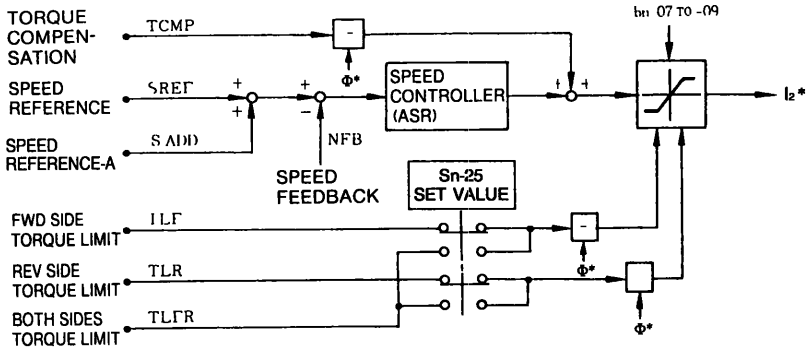
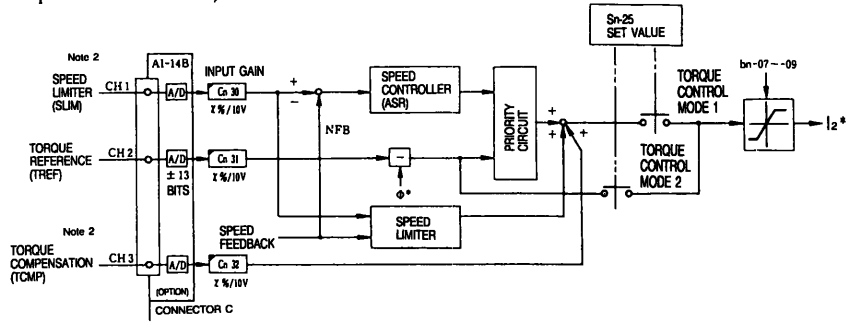
Set Value	Function (Hold 100ms min)
0	During operation (RUNX) ("closed" $\overline{BB}$ U operation ref ON)
1	Zero-speed (ZSPX) "Closed ' NFB≦(Cn-01)
2	Speed agree (AGREE) "Closed" |SREF-NFB| ≦ |Cn-03|
3	Optional speed agree (AGREE-1) (→Cn-02, -03)
4	Speed detection 1 (NDET 1) (→Cn-02, -03)
5	Speed detection 2 (NDET 2) (→Cn-02, -03)
6	Ready for operation (RDYX)
7	Undervoltage detection (UV) mode
8	Baseblock (BB) mode
9	Speed reference mode (REFMOD)
0A	Operation signal mode (SEQMOD)
0D	Braking resistor overheat (rH)
0E	Fault (FLTX) (other than CPF00, CPF01)
0F	DO output
10	Minor fault output (ALMX)
11	Reset signal input mode
30	Torque limit mode (TLMX)
31	Speed reference input limit mode (Cn-05)
32	During low frequency regenerative torque limit (On-07)
33	Zero-servo completion
34	Motor temperature detected ("Closed" Motor temperature≧Cn-28)
35	Torque detection 1 ("Closed ' Internal torque reference≧Cn-33)
36	Torque detection 2 ("Closed ' Internal torque reference≧Cn-34)
37	During operation 2 ("Closed" not (BB or EXC))
38	Motor overheat alarm ("Closed" Motor temperature≧dn-18 × 0 95)
39	Inverter overheat (major fault)
3A	Forward operation
3B	Reverse operation
3C	During 2nd motor selection ("Closed" 2nd motor selection)
3F	Ready for speed reference input (for elevator only)
41	During inputting operation reference See A5 4 CONTROL CONSTANTS

Constant No	Name	Description	Initial Value
Sn-25	AI-14B (Option) Function Selection	Analog input function is selected	0000

Sn-25 Set Value	Control Mode	CH1 (TC1-TC4)	CH2 (TC2-TC4)	CH3 (TC3-TC4)
0000	Speed control mode 1	Speed reference	—	—
0001	Speed control mode 2	Speed reference	Speed reference A	Torque compensation
0010	Speed control mode 3	Speed reference	FWD side torque limit	REV side torque limit
0011	Speed control mode 4	Speed reference	Both side torque limit	Torque compensation
1000	Torque control mode 1	Speed limit	Torque reference	Torque compensation
1001	Torque control mode 2	—	Torque reference	—

Note Input levels of CH1 to CH3 can be adjusted by Cn-30 to Cn-32, respectively

System Constants (6 of 9)

Constant No	Name	Description	Initial Value
Sn-25	AI-14B (Option) Function Selection	(Speed Control Mode)  (Torque Control Mode)  Notes 1 AI-14B input voltage is displayed in Un-36 to -38 2 Not provided with speed limiter, or torque compensation on input	0000
Sn-26	DI-16H (Option) Function Selection	Speed reference input data format is selected Sn-26 Set Value: Input Data Format (4 Digits) 0001: BCD 0.1% accuracy (−109.2 to +109.2%) 0010: BCD 0.01% accuracy (−109.22 to +109.22%) □□□□ └ Possible to input from 0 to A (A=10) 0111: BINARY (−32766 to +32766, 30000/100%)	0001

A5.1 SYSTEM CONSTANTS (Sn-) (Cont'd)

System Constants (7 of 9)

<table>
<tr><th>Constant No</th><th>Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>Sn-27</td><td>DO-08 (Option) Function Selection</td><td>
Sn-27 Bit 0 = 0000 Output signal combination 1
<table>
<tr><th>Terminal No</th><th>Output</th></tr>
<tr><td>TD5-TD11</td><td>Overcurrent (OC, GF)</td></tr>
<tr><td>TD6-TD11</td><td>Overvoltage (OV)</td></tr>
<tr><td>TD7-TD11</td><td>Inverter overload, overheat (OL2, OH2)</td></tr>
<tr><td>TD8-TD11</td><td>Blown fuse (FU)</td></tr>
<tr><td>TD9-TD11</td><td>Overspeed (OS), estimate speed fault (ES)</td></tr>
<tr><td>TD10-TD11</td><td>Motor overload, overheat (OL1, OH1)</td></tr>
<tr><td>TD1-TD2</td><td>Zero-speed detection (ZSP)</td></tr>
<tr><td>TD3-TD4</td><td>Speed agree (AGREE)</td></tr>
</table>
When Sn-27=0001 Output signal combination 2 (coded output)
<table>
<tr><th colspan="2">Terminal No</th><th>Output</th></tr>
<tr><td>TD5-TD11</td><td>Bit 0</td><td rowspan="4">Coded output (See table below)</td></tr>
<tr><td>TD6-TD11</td><td>Bit 1</td></tr>
<tr><td>TD7-TD11</td><td>Bit 2</td></tr>
<tr><td>TD8-TD11</td><td>Bit 3</td></tr>
<tr><td colspan="2">TD9-TD11</td><td>Zero-speed detection (ZSP)</td></tr>
<tr><td colspan="2">TD10-TD11</td><td>Speed agree (AGREE)</td></tr>
<tr><td colspan="2">TD1-TD2</td><td>Running (RUN)</td></tr>
<tr><td colspan="2">TD3-TD4</td><td>Minor fault (ALM)</td></tr>
</table>
<table>
<tr><th>Bits 3210</th><th>Output</th><th>Bits 3210</th><th>Output</th></tr>
<tr><td>0000</td><td>No fault</td><td>1000</td><td>External fault (EFXX)</td></tr>
<tr><td>0001</td><td>Overcurrent (OC, GF)</td><td>1001</td><td>Inverter controller fault (CPFXX)</td></tr>
<tr><td>0010</td><td>Overvoltage (OV)</td><td>1010</td><td>Motor overload (OL1)</td></tr>
<tr><td>0011</td><td>Inverter overload (OL2)</td><td>1011</td><td>Motor overheat (OH1)</td></tr>
<tr><td>0100</td><td>Inverter overheat (OH2, rH, rr)</td><td>1100</td><td>Power loss (including momentary loss) (UV)</td></tr>
<tr><td>0101</td><td>Overspeed (OS, ES)</td><td>1101</td><td>Excess speed deviation (DEV)</td></tr>
<tr><td>0110</td><td>Blown fuse (FU)</td><td>1110</td><td>PG line break (including thermister line break)(PGO, THM)</td></tr>
<tr><td>0111</td><td>Open phase (LF)</td><td>1111</td><td>Cooling fan fault (FAN)</td></tr>
</table>
</td><td>0000</td></tr>
<tr><td>Sn-28</td><td>Other Function Selection 1</td><td>
<table>
<tr><td>1</td><td>Analog monitor output selection</td><td>0</td><td>Bipolar output (−10 to +10V)</td></tr>
<tr><td></td><td></td><td>1</td><td>Absolute value output (0 to +10V)</td></tr>
<tr><td>2</td><td>Terminal 3 function selection</td><td>0</td><td>External fault (EF3)</td></tr>
<tr><td></td><td></td><td>1</td><td>Baseblock (NC contact)</td></tr>
<tr><td>3, 4</td><td>Not used</td><td>0</td><td>—</td></tr>
</table>
</td><td>0000</td></tr>
</table>

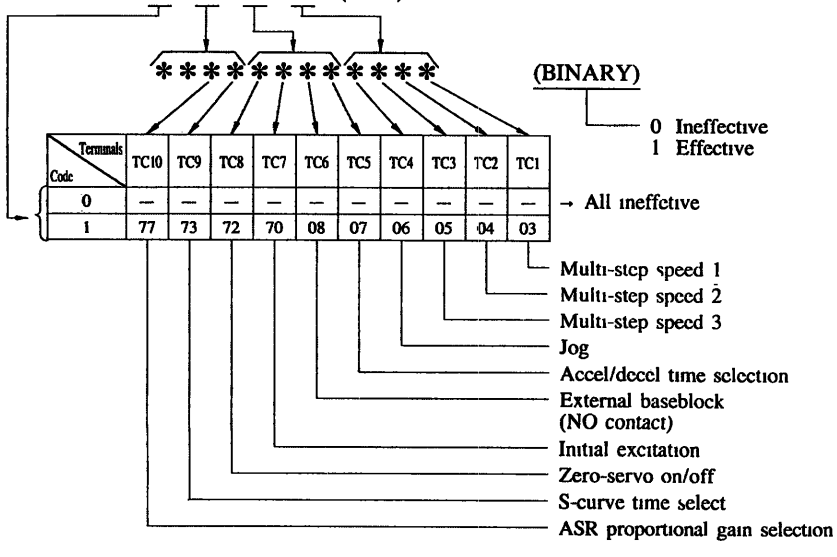
System Constants (8 of 9)

Constant No	Name	Description				Initial Value
Sn-29	Transmission Station Adress	Station adrress is set (HEX 00 to FF)*				FF
Sn-30	Transmission 1 Function Selection	Digit	Function	Data	Description	0000
		1	ASR proportional gain*	0	Initial data	
				1	Control data	
		2	Regenerative torque limit*	0	Initial data	
				1	Control data	
		3	Control mode	0	Speed control mode	
				1	Torque control mode	
		4	Magnetic flux reference	0	Internal magnetic flux reference	
				1	External magnetic flux reference	
Sn-31	Transmission 2 Function Selection	1	External fault bit select	0	Fault at "1"	0100
				1	Fault at "0"	
		2	External fault detection mode	0	Always detected	
				1	Only detected while in operation	
		3 • 4	Stop method when external fault is detected	00	Deceleration stop (deceleration time is set in bn-02) (major fault)	
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12) (major fault)	
				11	Continue operation (minor fault)	
Sn-32	Transmission 3 Function Selection	1 • 2	Stop method in case of bus error	00	Deceleration stop (deceleration time is set in bn-02) (major fault)	0001
				01	Coast to stop (major fault)	
				10	Emergency stop (deceleration time is set in bn-12) (major fault)	
				11	Continue operation (minor fault)	
		3 • 4	Not used	00		
Sn-33	Transmission 4 Function Selection	1	Number of control data* (Master → Inverter)	0	8 words	0000
				1	16 words	
		2	Number of control data* (Inverter → Master)	0	8 words	
				1	16 words	
		3	Request to send initial data* (Inverter → Master)	0	Request to send	
				1	No request to send	
		4	Control data* (Master → Inverter)	0	Control data provided	
				1	Control data not provided	
Sn-34	Transmission 5 Function Selection	1	Speed monitor filter	0	Without filter	0001
				1	With filter (100 ms)	
		2	No. 8 control data function selection	0	Output voltage reference	
				1	ASR Output	
		3	Auxiliary AI function	0	Ineffective	
				1	Effective	
		4	Inverter model code selection	0	Inverter model code = F7 (New)	
				1	Inverter model code = F8 (Old)	

*Only for SI-A2(CP-213)

A5.1 SYSTEM CONSTANTS (Sn-) (Cont'd)

System Constants (9 of 9)

<table>
<tr><th>Constant No</th><th>Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>Sn-37</td><td>Tuning Mode</td><td>
<table>
<tr><th>Set Value</th><th>Tuning Mode</th><th>Description</th></tr>
<tr><td>00</td><td>Normal operation</td><td>For normal operation</td></tr>
<tr><td>01</td><td>R1 tuning</td><td>For primary resistance (dn-08)</td></tr>
<tr><td>02</td><td>Rf tuning</td><td>For feeder resistance (Cn-13)</td></tr>
<tr><td>03</td><td>Motor constant tuning 1</td><td>By inputting nameplate value motor output unit kW</td></tr>
<tr><td>0F</td><td>Motor constant tuning 2</td><td>By inputting nameplate value motor output unit Hp</td></tr>
<tr><td>04</td><td>Motor constant tuning 3</td><td>By inputting dn-××</td></tr>
</table>
Note For tuning, refer to para 4 10
</td><td>00</td></tr>
<tr><td>Sn-38</td><td>Other Function Selection 2</td><td>
<table>
<tr><th>Digit</th><th>Function</th><th>Data</th><th>Description</th></tr>
<tr><td>1</td><td>OL curve selection</td><td>0</td><td>Vector-duty, motor (TENV or TEBC)</td></tr>
<tr><td></td><td></td><td>1</td><td>For general-purpose motor (TEFC)</td></tr>
<tr><td>2</td><td>OL time constant</td><td>0</td><td>8 minute</td></tr>
<tr><td></td><td></td><td>1</td><td>5 minute</td></tr>
<tr><td>3</td><td>Not used</td><td>0</td><td>—</td></tr>
<tr><td></td><td></td><td>1</td><td>—</td></tr>
<tr><td>4</td><td>Not used</td><td>0</td><td>—</td></tr>
<tr><td></td><td></td><td>1</td><td>—</td></tr>
</table>
</td><td>0000</td></tr>
<tr><td>Sn-42</td><td>Other Function Selection 3</td><td>
<table>
<tr><td>1</td><td>Accel/decel time unit select</td><td>0</td><td>0 1 s unit</td><td rowspan="2">For bn-01, bn-02, bn-03, bn-04, bn-12, bn-19, Cn-26</td></tr>
<tr><td></td><td></td><td>1</td><td>0 01 s unit</td></tr>
<tr><td>2</td><td>Not used</td><td>0</td><td colspan="2">—</td></tr>
<tr><td></td><td></td><td>1</td><td colspan="2">—</td></tr>
<tr><td>3</td><td>Not used</td><td>0</td><td colspan="2">—</td></tr>
<tr><td></td><td></td><td>1</td><td colspan="2">—</td></tr>
<tr><td>4</td><td>Not used</td><td>0</td><td colspan="2">—</td></tr>
<tr><td></td><td></td><td>1</td><td colspan="2">—</td></tr>
</table>
</td><td>0000</td></tr>
<tr><td>Sn-50</td><td>DI-08 Function Selection</td><td>
Set value = × × × × (HEX)


Note Duplicate functions set in Sn-15 to Sn-18 will be disabled
</td><td>1000</td></tr>
</table>

A5.2 REFERENCE SETTING CONSTANTS (An-□□)

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
An-01	Speed Reference 1 (Master speed)*	0 01%	0 00 to 109 22	0 00	
An-02	Speed Reference 2 (Multi-speed)†	0 01%	0 00 to 109 22	0 00	
An-03	Speed Reference 3 (Multi-speed)	0 01%	0 00 to 109 22	0 00	
An-04	Speed Reference 4 (Multi-speed)	0 01%	0 00 to 109 22	0 00	
An-05	Speed Reference 5 (Multi-speed)	0 01%	0 00 to 109 22	0 00	
An-06	Speed Reference 6 (Multi-speed)	0 01%	0.00 to 109 22	0 00	
An-07	Speed Reference 7 (Multi-speed)	0 01%	0 00 to 109 22	0 00	
An-08	Speed Reference 8 (Multi-speed)	0 01%	0 00 to 109 22	0 00	
An-09	Jog Speed Reference (Multi-speed)	0 01%	0 00 to 109 22	10 00	

* Selection between master speed analog input (terminal 13 or 14) and An-01 value is possible using Sn-04 1st digit (An-01 is enabled when Sn-04=xxx1).

† Selection between auxiliary analog input (terminal 16) and An-02 value is possible using Sn-19 (An-02 is enabled when Sn-19≠00).

Note .The speed reference of An-01 to An-09 is restricted by the speed reference input limit (Cn-05)

Reference Setting Constants Selection

Selection of speed reference constants (An-) is possible by using multi-function input terminal multi-step speed reference selection. Refer to 5.3 FUNCTION SELECTION BY CONSTANT (7) Selecting Multi-step Speed Operation.

Multi-function Input Terminal				Speed Reference Constant to be Selected
JOG Speed Reference	Multi-step Speed Reference 3	Multi-step Speed Reference 2	Multi-step Speed Reference 1	
0	0	0	0	An-01
0	0	0	1	An-02
0	0	1	0	An-03
0	0	1	1	An-04
0	1	0	0	An-05
0	1	0	1	An-06
0	1	1	0	An-07
0	1	1	1	An-08
1	—	—	—	An-09

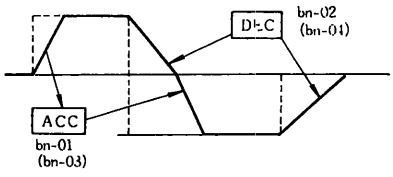
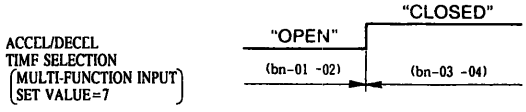
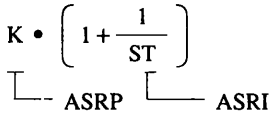
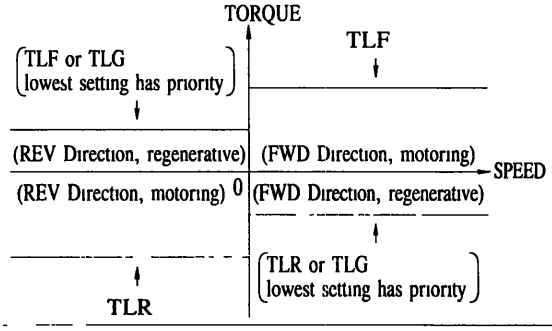
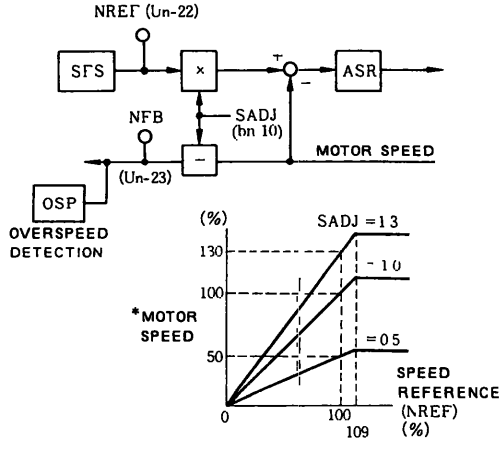
(1 : "closed", 0: "open"or not selected, – : no effect)

A5.3 APPLICATION CONSTANTS (bn-□□)

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
bn-01	Acceleration Time 1	0 1s *1	0 0 to 3000 0	10 0	
bn-02	Deceleration Time 1	0 1s *1	0 0 to 3000 0	10 0	
bn-03	Acceleration Time 2	0 1s *1	0 0 to 3000 0	10 0	
bn-04	Deceleration Time 2	0 1s *1	0 0 to 3000 0	10 0	
bn-05	ASR Proportional Gain	0 1 *2	0 0 to 300 0	20 0 (W PG) 10 0 (W/O PG)	
bn-06	ASR Integral Time	1ms	0 to 30000	1000 (W PG) 500 (W/O PG)	
bn-07	Positive Torque Limit	0 01%	0 00 to 300 00	150 00	
bn-08	Negative Torque Limit	0 01%	0 00 to 300 00	150 00	
bn-09	Regenerative Torque Limit	0 01%	0 00 to 300 00	150 00	
bn-10	Rated Speed Adjustment	0 0001	0 5000 to 1 3000	1 0000	
bn-11	Trace sampling time (for SI-A2 card only)	0 020s	0 000 to 60 00	0 060	
bn-12	Emergency Stop Time	0 1s *1	0 0 to 3000 0	10 0	
bn-13	Monitor Number Upon Power Up	1	1 to 3	1	
bn-14	PG Division Rate (Pulse Monitor Output)	1	0 01 to 0 32 104 to 132	002 *3	
bn-15	Speed Zero Adjustment	0 01%	−50 00 to +50 00	0 00	
bn-16	Voltage Adjustment	0 001	0 800 to 1 200	1 000	
bn-17	Multi-function Monitor 1 Output Selection	1	1 to 44	23	
bn-18	Multi-function Monitor 1 Output Gain	0 001	0 000 to 10 000	1 000	
bn-19	S-curve Time 1	0.1s *1	0 0 to 10 0	0 0	
bn-20	Current reference gain (V/f test mode 2)	0.1	0 0 to 1.5	1 1	
bn-21	Not used	—	—	Not used	
bn-22	AO-12 CH1 Output Selection	1	1 to 44	22	
bn-23	AO-12 CH1 Output Gain	0 001	0 000 to 10 000	1.000	
bn-24	AO-12 CH2 Output Selection	1	1 to 44	23	
bn-25	AO-12 CH2 Output Gain	0 001	0.000 to 10 000	1 000	
bn-26	Multi-function Monitor 2 Output Selection	1	1 to 44	2	
bn-27	Multi-function Monitor 2 Output Gain	0 001	0 000 to 10.000	1.000	

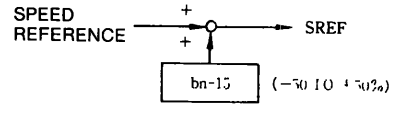
*1 Setting unit can be changed using the 1st digit of Sn-42.
*2 Design revision "C" and before : "1"
*3 Design revision "C" and before "001"

Application Constants (1 of 3)

Constant No	Name	Function	Remarks
bn-01 bn-02 bn-03 bn-04	Acceleration time 1 (ACC1) Deceleration time 1 (DEC1) Acceleration time 2 (ACC2) Deceleration time 2 (DEC2)	• Sets the speed reference accel/decel rate • Sets the time to go from 0 ⟷ 100% speed reference • Accel/decel times can be set separately  	• The minimun deceleration time is dependent upon the regenerative power capacity of the system • Accel/decel time can be switched using multi-function input.
bn-05 bn-06	ASR proportional gain (ASRP) ASR integral time (ASRI)	Sets the proportional gain and integral time of the automatic speed regulator (ASR) 	• Setting should be made so that the speed control system is stable and does not hunt • Related constants Cn-22, Cn-23 • ASR proportional gain can be switched using multifunction input
bn-07 bn-08 bn-09	Positive torque limit (TLF) Negative torque limit (TLR) Regenerative torque limit (TLG)	Sets the motoring and regenerative torque limits. 	
bn-10	Rated speed adjustment (SADJ)	• Fine adjustment of the motor r/min at 100% speed reference  • Field weakening characteristics when motor speed is base speed (dn-01) or more (When the 1st digit of Sn-09 set value is "1", field weakening characteristics start at 90% of base speed)	Used for fine adjustment of the speed of the motor The motor rotation speed is indicated as a percentage of the maximum r/min (dn-02)

A5.3 APPLICATION CONSTANTS (bn- ' ') (Cont'd)

Application Constants (2 of 3)

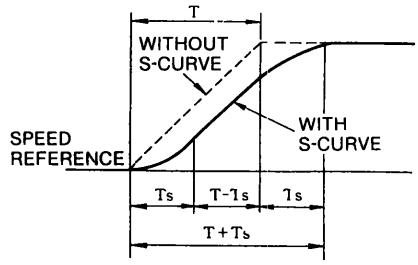
<table>
<tr><th>Constant No</th><th>Name</th><th>Function</th><th>Remarks</th></tr>
<tr><td>bn-12</td><td>Emergency stop time</td><td>Alternative stop time when selected for protective functions in Sn-10 to Sn-14</td><td></td></tr>
<tr><td>bn-13</td><td>Monitor number on power supply</td><td>Sets the display of the digital operator when power is supplied
<table><tr><th>Set Value</th><th>Display</th><th>Unit</th><th>Typical Display</th></tr><tr><td>1</td><td>Speed reference</td><td>%</td><td>n100.0</td></tr><tr><td>2</td><td>Speed feedback</td><td>%</td><td>100.0</td></tr><tr><td>3</td><td>Output current</td><td>A</td><td>3.2A</td></tr></table></td><td>The speed reference and speed feedback unit can be customized by using Cn-12</td></tr>
<tr><td>bn-14</td><td>PG division rate</td><td>Divides the pulse from the PG and outputs the result as the pulse monitor (Sets the division rate)
Division rate $= \frac{n+1}{m}$ (Setting range $\frac{1}{1}$ to $\frac{1}{32}$)
Data [ ][ ][ ]
m 1 to 32
n 0,1</td><td>• The division function is for the pulse monitor, and has no effect on inverter control
• Only effective for the PG-B option card</td></tr>
<tr><td>bn-15</td><td>Speed zero adjustment</td><td>Speed reference bias component is set
 
</td><td>This setting has no effect on speed references from the digital operator</td></tr>
<tr><td>bn-16</td><td>Voltage adjustment</td><td>Motor excitation can be adjusted</td><td>Normally, adjustment is not necessary</td></tr>
<tr><td>bn-17

bn-18</td><td>Multi-function Monitor Output 1 Selection

Multi-function Monitor Output 1 Gain</td><td>The output of multi-function analog monitor 1 (control circuit terminals 21, 22) is selected and the output gain is set
Selection item*. Un-02 to 05, Un-21 to 44
Output level Monitor variable output level × bn-18</td><td>Initial value
Speed feedback
(gain = 1.000)</td></tr>
</table>

* Design revision "C" and before Un-03 to 05, Un-21 to 44

Application Constants (3 of 3)

<table>
<tr><th>Costant No</th><th>Name</th><th>Function</th><th>Remarks</th></tr>
<tr><td>bn-19</td><td>S-curve time 1</td><td>Motor accel/decel pattern corners can be rounded by using S-curve
 

(Accel/decel time with S-curve is T + Ts)</td><td>Related constant Cn-26, Cn-58, Cn-59</td></tr>
<tr><td>bn-20</td><td>Current reference gain (Used in V/f test mode 2)</td><td>The magnitude of the current reference is obtained by dn-07 (exitation current reference) × bn-20 (current reference gain) when V/f test mode 2 is selected
• The following table outlines reference input points in V/f test mode (On-01 = × 100) and set values of Sn-04 and -08.
• In V/f test mode 2, only the current reference in the following table is changed to (dn-07) × (bn-20).
<table>
<tr><th>Sn-04</th><th>Sn-08</th><th>Frequency Reference</th><th>Current Reference</th><th>Remarks</th></tr>
<tr><td>×××0</td><td>×××1</td><td>Inverter AI (main speed) 10V/100%</td><td>Inverter AI (auxiliary) 5V/100%</td><td></td></tr>
<tr><td>×××0</td><td>×××0</td><td>AI-14B (ch1)</td><td>AI 14B (ch2)</td><td>When AI-14B is connected</td></tr>
<tr><td>×××0</td><td>×××0</td><td>DI-16H</td><td>An-02</td><td>When DI-16H is connected</td></tr>
<tr><td>×××1</td><td>××××</td><td>An-01</td><td>An-02</td><td></td></tr>
</table></td><td></td></tr>
<tr><td></td><td>AO option</td><td rowspan="4">The output of analog monitor option cards AO-08 and AO-12 is selected and the output gain is set
(Selection item*. Un-02 to 05, Un-21 to 44
Output level. Monitor variable output level × bn-23 or bn-25)</td><td rowspan="4">Initial value
CH1 (Speed reference gain = 1.000)
CH2 (Speed feedback gain = 1 000)</td></tr>
<tr><td>bn-22</td><td>CH1 output selection</td></tr>
<tr><td>bn-23</td><td>CH1 output gain</td></tr>
<tr><td>bn-24</td><td>CH2 output selection</td></tr>
<tr><td>bn-25</td><td>CH2 output gain</td><td></td><td></td></tr>
<tr><td>bn-26</td><td>Multi-function monitor 2 output selection</td><td rowspan="2">The output of multi-function analog monitor 2 (control circuit terminals 23, 24) is selected and output gain is set
(Selection item* Un-02 to 05, Un-21 to 44
Output level: Monitor variable output level × bn-27)</td><td rowspan="2">Initial value
Inverter output current (gain = 1.000)</td></tr>
<tr><td>bn-27</td><td>Multi-function monitor 2 output gain</td></tr>
</table>

* Design revision "C" and before Un-03 to 05, Un-21 to 44

A5.4 CONTROL CONSTANTS (Cn -)

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
Cn-01	Zero-speed Level	0 01%	0 00 to 20 00	2 00	
Cn-02	Speed Agree Detection Level	0 01%	0 00 to 100 00	100 0	
Cn-03	Speed Agree Detection Bandwidth	0 01%	0 00 to 100 00	2 00	
Cn-04	Excess Speed Deviation Level (Speed Control)	0 01%	0 00 to 130 00	10 00	
Cn-05	Speed Reference Input Limit	0 01%	20 00 to 109 22	109 00	
Cn-06	Minimum Speed Reference	0 01%	0 00 to 20 00	2 00	
Cn-07	ASR Output Lag Filter Time	1ms	0 to 500	4 (W PG) 10 (W/O PG)	
Cn-08	Initial Excitation Timer (1st Motor)	0 1s	0 0 to 10 0	0 0 (W PG) dn-12 (W/O PG)	
Cn-09	PG Constant (1st Motor)	1P/R	0 to 6000	600	
Cn-10	Speed Limit Bias (Torque Control Model)	0 01%	0 00 to 109 22	*2	
Cn-11	Torque Compensation Value at Bus Fault	0 1%	−200 0 to +200 0	0 0	
Cn-12	Operator Display Mode	1	0 to 39155	0	
Cn-13	Motor Cable Resistance (1st Motor)	0 1%	0 0 to 5 0	0 0	
Cn-14	Motor OL1 Detection Start Current	1%	50 to 200	110	
Cn-15	Motor OL1 Operation Time	1s	1 to 120	60	
Cn-16	Overspeed Detection Level	1%	50 to 130	120	
Cn-17	PUV Detection Level*1	1V	131 to 210 (200V class)	210	
			262 to 420 (400V class)	420	
Cn-18	PG Line Break Detection Time (at Speed Control)	0.01s	0.00 to 2.00	1 00	
Cn-19	Momentary Power Loss Ride Through Time	0 01s	0 00 to 2 00	*4	
Cn-20	Number of Fault Reset Attempts	1	0 to 10	0	
Cn-21	Stop Timer	0.1s	0.0 to 10.0	1.0	
Cn-22	ASR Proportional Gain 2	0.1 *3	0 to 300	20 0 (W PG) 10 0 (W/O PG)	
Cn-23	ASR Proportional Gain Changeover Speed	0 01%	0 00 to 100.00	0	
Cn-24	Zero-servo Gain (only with PG)	1	0 to 100	5	
Cn-25	Zero-servo Bandwidth (only with PG)	1 pulse	0 to 16383	10	
Cn-26	S-curve Time 2	0 1s *3	0 0 to 10 0	0 0	
Cn-27	Torque Reference Lag Filter Time	1ms	0 to 10000	0	
Cn-28	Motor Temperature Detection Level	1°C	0 to 200	80	
Cn-29	Motor Temperature Transmission Selection	1	0 to 14	0	
Cn-30	AI-14B CH1 Input Gain	0.1%	−999.9 to 1000 0	100 0	

*1 Contact your YASKAWA representative since PUV detection level is limited by main circuit.
*2 • Design revision "E" and after and multi system · 20.00
• Design revision "C" and before and single system · 0.00
*3 Setting unit can be changed using 1st-digit of Sn-42.
*4 The initial value differs according to the kVA selection (Sn-01 set value).

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
Cn-31	AI-14B CH2 Input Gain	0 1%	−999.9 to 1000 0	100 0	
Cn-32	AI-14B CH3 Input Gain	0 1%	−999.9 to 1000 0	100 0	
Cn-33	Torque Detection Level 1	0 01%	0 00 to 300 00	100 00	
Cn-34	Torque Detection Level 2	0 01%	0 00 to 300 00	100 00	
Cn-36	Number of Fault Reset Attempts for ES (only W/O PG)	1	0 to 10	5	
Cn-37	Torque Compensation Integral Time at Start	1ms	0 to 5000	0	
Cn-41	Operation Reference min. ON Time (FWD)	0 01s	0.00 to 10.00	0.00	
Cn-42	Operation Reference min ON Time (REV)	0 01s	0.00 to 10.00	0.00	
Cn-43	Minimum Speed Timer	0 01s	0 00 to 10 00	0 00	
Cn-44	Minimum Speed Level	0 01%	0 00 to 20.00	0.00	
Cn-46	Drooping Compensation Gain	0.1%	0.0 to 15 0	0.0	
Cn-47	Drooping Compensation Lag Filter Time	1ms	0 to 2000	20	
Cn-48	Torque Detection Timer 1	1ms	0 to 2000	0	
Cn-49	Torque Detection Timer 2	1ms	0 to 2000	0	
Cn-52	Carrier Frequency Selection (Effective when Sn-09=1×××)	1kHz	2 to 12	Carrier frequency upper limit (Sn-01)	
Cn-53	Master Reference Input Gain	0 1%	−999 9 to 1000.0	100.0	
Cn-54	Multi-function Analog Input Gain	0 1%	−999 9 to 1000.0	100.0	
Cn-56	Torque Compensation Lag Filter Time	1ms	0 to 10000	0	
Cn-58	S-curve Time 3	0 1s *3	0 0 to 10 0	0.0	
Cn-59	S-curve Time 4	0 1s *3	0 0 to 10 0	0.0	

*1 Contact your YASKAWA representative since PUV detection level is limited by main circuit

*2 • Design revision "E" and after and multi system 20 00

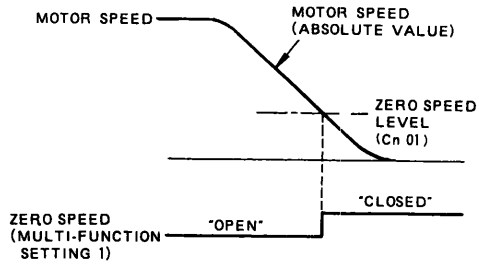
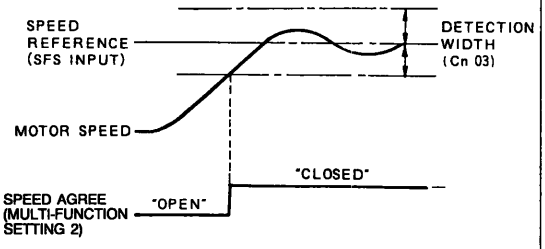
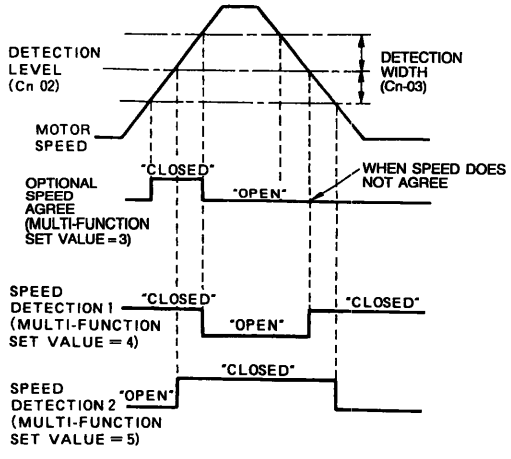
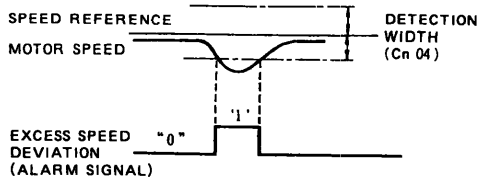
• Design revision "C" and before and single system . 0 00

*3 Setting unit can be changed using 1st-digit of Sn-42.

*4 The initial value differs according to the kVA selection (Sn-01 set value).

A5.4 CONTROL CONSTANTS (Cn -) (Cont'd)

Control Constants (1 of 7)

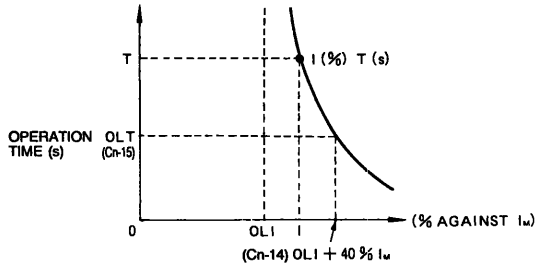
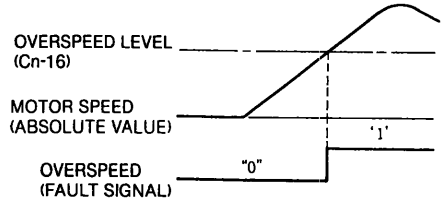
Constant No	Name	Function	Remarks
Cn-01	Zero-speed level	Sets the zero-speed detection level (Initial value 2%) 	• The stop process during zero-speed detection follows the setting of Sn-07. • Function selection for multi-function output terminal See Sn-20 to Sn-24. • The stop timer Cn-21 Activates at zero speed level detection.
Cn-02 Cn-03	Speed agree detection level Speed agree detection bandwidth	Speed agree "Closed" when the speed reference and motor speed come within the following detection range 	• Function selection for multi-function output terminal See Sn-20 to Sn-24
		Optional speed agree "Closed" when the speed reference and the motor speed are within the following detection range 	Function selection for multi-function output terminal See Sn-20 to Sn-24
Cn-04	Excess speed deviation level	Outputs when the motor speed falls outside of the following detection range Not detected during accel/decel and during torque control 	• The stopping method follows the setting of Sn-10. • Ineffective at torque control • Ineffective at 0.00 setting

Control Constants (2 of 7)

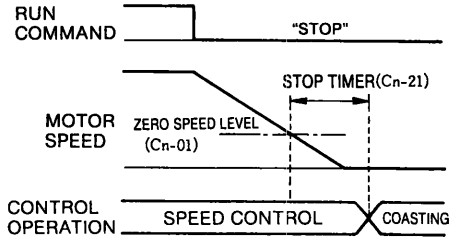
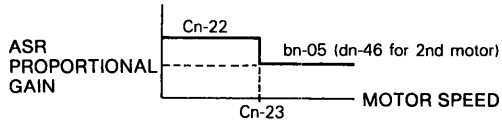
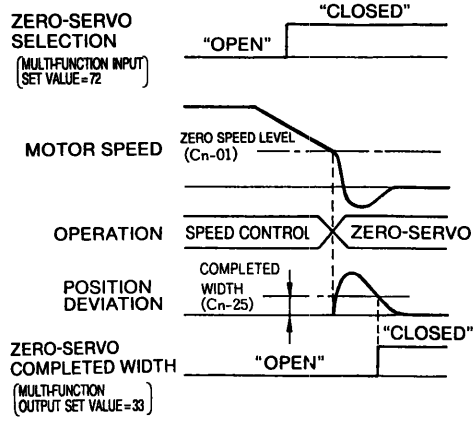
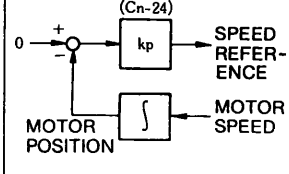
<table>
<tr><th>Constant No</th><th>Name</th><th>Function</th><th>Remarks</th></tr>
<tr><td>Cn-05</td><td>Speed reference input limit</td><td>Maximum input limit level of the speed reference is set</td><td></td></tr>
<tr><td>Cn-06</td><td>Minimum speed reference</td><td>Sets the speed reference level below which the control method in Sn-06 becomes effective
Speed reference > Cn-06 Normal control
Speed reference ≦ Cn-06 Sn-06 3rd and 4th digits</td><td>Related constant
Sn-06</td></tr>
<tr><td>Cn-07</td><td>ASR output Lag Filter Time Constant</td><td>Sets the first-order lag filter time constant of the secondary current command (ASR output)
$\frac{1}{1+ST_1}$ T_1 ASR delay time (Cn-07)</td><td>Prevents instability or hunting caused by rapid change of the torque reference</td></tr>
<tr><td>Cn-08</td><td>Initial excitation timer</td><td>Before starting operation, sets the time for the initial excitation to build the magnetic flux Rated flux occurs within approx two or three times the motor secondary circuit time constant (dn-12) No initial excitation is performed when the initiation speed is 2% or more</td><td>•The timer is separate from initial excitation function using multi-function input (Set value· 70)</td></tr>
<tr><td>Cn-09</td><td>PG constant</td><td>Sets the pulses per revolution (ppr) of the PG used</td><td></td></tr>
<tr><td>Cn-10</td><td>Speed limit bias</td><td>Sets the bias against the speed limit input during torque control mode 1</td><td>Ineffective at speed control</td></tr>
<tr><td>Cn-12</td><td>Operator display mode</td><td>Speed reference and speed feedback display of the digital operator is selected
<table><tr><th>Set Value</th><th>Display Mode</th></tr><tr><td>00000</td><td>% display</td></tr><tr><td>00001</td><td>r/min display</td></tr><tr><td>00040 to 39155</td><td>Value displayed at 100% speed is set (digits 1 to 4) The number of digits to the right of the decimal point is set using the 5th digit (Except for 9156 to 9999, 10000, 20000, 30000</td></tr></table></td><td>(Example)
When Cn-12=12345; "234 5" is displayed at 100% speed reference</td></tr>
<tr><td>Cn-13</td><td>Motor cable resistance</td><td>Motor cable resistance value between inverter and motor is set in % impedance
$Cn\text{-}13=\frac{\sqrt{3} \times \text{RESISTANCE VALUE} \times dn\text{-}05}{dn\text{-}04} \times 100$</td><td>Set when high-accuracy torque control card is used</td></tr>
</table>

A5.4 CONTROL CONSTANTS (Cn-) (Cont'd)

Control Constants (3 of 7)

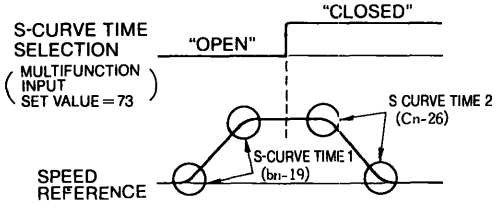
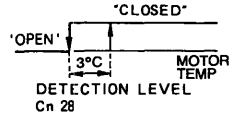
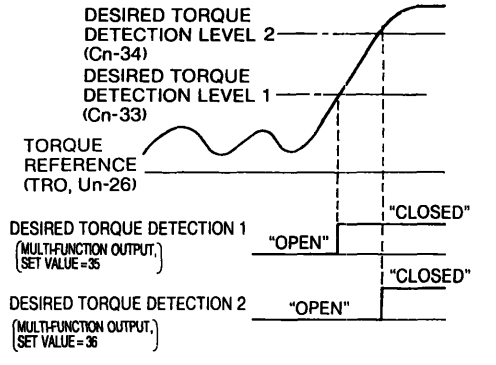
Constant No	Name	Function	Remarks
Cn-14 Cn-15	Motor OL start current (%) (OLI) Operation time (s) at OLI +40% I_M (OLT)	• Sets the motor OL protection curve • OLI Sets the motor OL start point (% of the motor rated current (I_M)) • The motor OL time (T) versus the output current I (% of the motor rated current) is shown in the following expression $T\ (s) = \frac{40\ (\%)}{I\ (\%) - OLI\ (\%)} \times OLT\ (s)$  	The motor OL operation stop method is set by Sn-14
Cn-16	Overspeed level (OSP)	Sets the motor overspeed level (Fault signal is output when motor speed absolute value exceeds the overspeed level)  	The overspeed detection stop method is set by Sn-10
Cn-17	PUV detection level	• Main circuit undervoltage (PUV) detection level is set • Applicable for applications where momentary power supply voltage variation exceeds 20% • Effective when Sn-11 4th digit=1	• Since there may be a limitation of main circuit, contact your YASKAWA representative before changing this constant • Related constant Sn-11
Cn-18	PG line break detection time	If the following conditions are met for a period exceeding the Cn-18 set value, the PG line break fault will be activated • Speed reference > 1% • Speed feedback = 0	The speed indicates ratio against the max speed (dn-02)
Cn-19	Momentary power loss ride through time	Sets the maximum momentary power loss time in which automatic recovery operation is enabled (1 sec: 200V class CIMR-22P2 (3kVA) or less, 400V class CIMR-42P2 (3kVA) or less 2 sec All others)	

Control Constants (4 of 7)

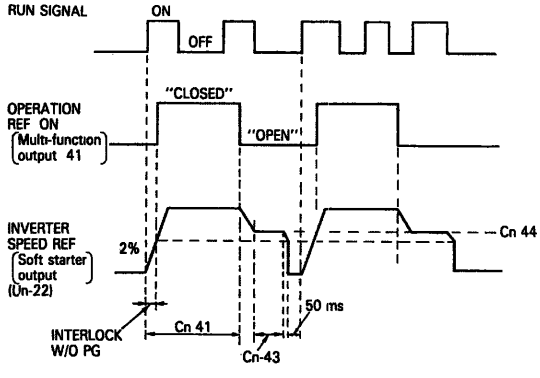
Constant No	Name	Function	Remarks
Cn-20	Number of fault reset attempts	When a fault occurs, an automatic fault reset is attempted once a second for the number of reset attempts set (However, UV3 or CPFXX cannot be retried)	
Cn-21	Stop timer	Stop assurance time is activated when speed feedback falls below zero speed level (Cn-01) during stop Inverter continues speed control even at zero speed for the length of the stop timer 	• Effective at deceleration to stop • In vector control without PG, initial excitation is for the length of the stop timer
Cn-22 Cn-23	ASR porportional gain 2 ASR proportional gain changeover speed	ASR (speed controller) proportional gain can be changed using motor speed (Cn-23 set value) [Proportional gain is changed to linearity by bn-06 (dn-47 for 2nd motor)] 	Proportional gain is not changed in the following cases • Cn-23=0 • When 77 is selected in Sn-15 to Sn-18
Cn-24 Cn-25	Zero-servo gain Zero-servo bandwidth	Zero-servo function can be selected by using the multi-function input zero-servo selection The motor position is memorized when motor speed feedback is less than the zero-speed level (Cn-01) and zero-servo selection is "CLOSED " 	• For multi-function input terminal functions, refer to Sn-15 to Sn-18 • For multi-function output terminal functions, refer to Sn-20 to Sn-24 

A5.4 CONTROL CONSTANTS (Cn-) (Cont'd)

Control Constants (5 of 7)

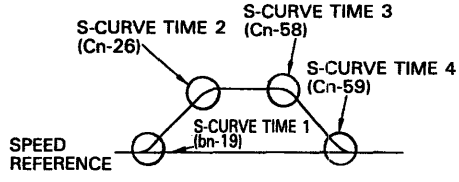
Constant No	Name	Function	Remarks
Cn-26	S-curve time 2	Motor accel/decel pattern corners can be rounded by using S-curve • S-curve time 2 is selected by multi-function input S-curve time selection 	• S-Curve selection command is not recognized when inverter is in operation • Only effective with both S-curve times 3 and 4 set to 0 Related constant bn-19, Cn-58, Cn-59
Cn-27	Torque reference lag filter time constant	Sets the first-order lag filter time constant of the torque reference in torque control mode (with AI-14B)	
Cn-28	Motor temperature detection level	Output when the temperature in motor is above the value preset in Cn-28 Motor temperature detection (Multi-function setting value=34) 	• For multi-function output terminal functions, refer to Sn-20 to Sn-24 • Only effective with thermistor option
 Cn-30 Cn-31 Cn-32	AI-14B (option) CH1 input gain CH2 input gain CH3 input gain	Analog reference option card AI-14B input gain is set The value obtained by multiplying the input reference by the gain is the internal reference (X %/10V)	Related constant Sn-25
Cn-33 Cn-34	Torque detection level 1 Torque detection level 2	Torque reference (TRO) output level is detected [torque signal (multi-function output) is output when torque reference absolute value exceeds the value set in Cn-33 or Cn-34] 	For multi-function output terminal functions, refer to Sn-20 to Sn-24

Control Constants (6 of 7)

Constant No	Name	Function	Remarks
Cn-36	Number of Fault Reset Attempts for ES	The number of automatice fault reset attempts for a speed estimation fault (ES) is set (Only W/O PG) Independent from Cn-20 function	
Cn-37	Torque Compensation Integral Time Constant at Start	Torque compensation increase time (time to reach 300%) at start is set The maximum value is set by multi-function analog input (Sn-19=08)	
Cn-41 Cn-42	Operation Reference Min ON Time (FWD) Operation Reference Min ON Time (REV)	• When RUN signal ON time is shorter than taht of Cn-41 or Cn-42, operation reference will stop after holding the time set to Cn-41 or Cn-42. (Regardless of RUN signal input status at stop.) • At stop, after speed feedback is less than Cn-01 (zero speed level), next operation reference is not effective for 50ms. (When Cn-41 and Cn-42 are 0, inverter does not operate.) Example of Operation: Forward, without PG, Cn-21 (stop timer)=0.00  	• When RUN signal ON time is shorter than 0.2 s in control W/O PG, determine set value based on 0. 20. • If Cn-41 and Cn-42 are set to 0, this function is not effective.
Cn-43 Cn-44	Min Speed Timer Min Speed Level	Motor coasts to a stop after the following conditions are executed· After stop reference is input, and speed reference (soft starter output) reaches min. speed level, the motor runs at min. speed level for the time set by the min speed timer.	
Cn-46 Cn-47	Drooping Compensation Gain Drooping Compensation Lag Filter Time Constant	Constants to provide speed drooping characteristic in proportion to load torque • Speed reduction amount at rated (100%) load at maximum speed (dn-02) is set to Cn-46. • When Cn-47 is decreased, drooping response increases but the motor is more apt to hunt.	
Cn-48 Cn-49	Torque Detection Timer 1 Torque Detection Timer 2	Torque detection signal timer is set • When the toque reference ≧ Cr-33 (Cn-34) for a time ≧ Cn-48 (Cn-49), the torque detection 1 (2) signal activates (closed)	

A5.4 CONTROL CONSTANTS (Cn-[ ]) (Cont'd)

Control Constants (7 of 7)

Constant No	Name	Function	Remarks
Cn-52	Carrier Frequency Selection	• Carrier frequency when low-noise mode is selected can be set in units of 1kHz • Factory setting is the upper limit value. • Carrier frequency setting range differs depending on inverter capacity (refer to Par. 4.6).	
Cn-53	Inverter Main Speed Reference Input Gain	Inverter main speed reference input (terminals 13 - 17) gain can be changed. Setting is made for a reference percentage (%) at 10V input.	
Cn-54	Inverter Multi-function Input Gain	Inverter main speed reference input (terminals 16 - 17) gain can be changed. Setting is made as a reference percentage (%) at 10V input.	
Cn-56	Torque Compensation Lag Filter Time Constant	Sets the first-order lag filter time constant of the torque compenstaion command (TCMP).	
Cn-58 Cn-59	S-curve time 3 S-curve time 4	• Motor accel/decel pattern corners can be rounded by using S-curve (4 points set individually). • When S-curve time 3 or 4 is not 0, the following S-curve can be obtained. Changeover of S-curve (bn-19 ←→Cn-26) using multi-function input is not effective 	When both S-curve time 3 and 4 are 0, all S-curve times become S-curve time 1 (bn-19) Changeover of S-curve time (bn-19 ←→ Cn-26) using multi-function is effective. Related constant bn-19, Cn-26

A5.5 MOTOR CONSTANTS (dn-□□)

Do not change the setting except for auto-tuning since the motor constants are set properly at the factory prior to shipment (Note 1)

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
dn-01	Base Speed	1r/min	100 to 12000*7	1750	
dn-02	Maximum Speed*1	1r/min	100 to 12000*7	1750	
dn-03	Motor Poles*1	1pole	2 to 48*8	4	
dn-04	No-load Voltage	1V	50 to 240 (200V class)	170	
			100 to 480 (400V class)	340	
dn-05	Secondary Current	0 01A	*2		
dn-06	Slip Frequency	0 01Hz	0.00 to 10.00	1.00	
dn-07	Excitation Current	0 1%	10 0 to 200 0	30 0	
dn-08	Primary Resistance	0 1%	0 0 to 15 0	2 0	
dn-09	Leakage Coefficient	0 01%	0 00 to 50.00	20 00	
dn-10	Motor Core Loss	0 1%	0 0 to 15 0	2.0	
dn-11	Motor Mechanical Loss	0 1%	0 0 to 10 0	0 5	
dn-12	Secondary Circuit Time Constant	1ms	0 to 10000*9	100	
dn-13	Leak Saturated Coefficient	0 01	1 00 to 2 00	1.20	
dn-14	Rotor Thermal Gain	0.01	0 00 to 2 00	0 00	
dn-15	Rotor Thermal Time Constant	1min	0 to 180	30	
dn-16	Core Saturation Compensation Coefficient 1	0 01	0 00 to 1 00*3	0 50	
dn-17	Core Saturation Compensation Coefficient 2	0 01	0 00 to 1 00*3	0 75	
dn-18	Motor Overheat Temperature	1°C	50 to 200*4	120	
dn-21	Base Speed (2nd Motor)	1r/min	100 to 12000	1750	
dn-22	Maximum Speed (2nd Motor)*1	1r/min	100 to 12000	1750	
dn-23	Motor Poles (2nd Motor)*1	1pole	2 to 48	4	
dn-24	No-load Voltage (2nd Motor)	1V	50 to 240 (200V class)	170	
			100 to 480 (400V class)	340	
dn-25	Secondary Current (2nd Motor)	0.01A	*2	0	
dn-26	Slip Frequency (2nd Motor)	0.01Hz	0 00 to 10.00	1.00	
dn-27	Excitation Current (2nd Motor)	0 1%	10.0 to 200.0	30.0	
dn-28	Primary Resistance (2nd Motor)	0.1%	0.0 to 15.0	2 0	
dn-29	Leak Coefficient (2nd Motor)	0.01%	0.00 to 50 00	20 00	
dn-30	Motor Core Loss (2nd Motor)	0.1%	0.0 to 15 0	2 0	
dn-31	Motor Mechanical Loss (2nd Motor)	0 1%	0 0 to 10.0	0.5	
dn-32	Secondary Circuit Time Constant (2nd Motor)	1ms	0 to 10000	100	
dn-33	Leakage Coefficient (2nd Motor)	0 01	1 00 to 2 00	1.20	
dn-34	Rotor Thermal Gain (2nd Motor)	0 01	0.00 to 2 00	0.00	
dn-35	Rotor Thermal Time Constant (2nd Motor)	1min	0 to 180	30	

Constant No	Name	Setting Unit	Setting Range	Initial Value	User Set Value
dn-36	Core Saturation Compensation Coefficient 1 (2nd Motor)	0.01	0 00 to 1 00*3	0 50	
dn-37	Core Saturation Compensation Coefficient 2 (2nd Motor)	0 01	0 00 to 1.00*3	0 75	
dn-38	Motor Overheat Temperature (2nd Motor)	1°C	50 to 200*4	120	
dn-39	PG Constant (2nd Motor)	1P/R	0 to 6000*5	600	
dn-40	CEMF Compensation (2nd Motor)	0 001	0 000 to 1.300	1.000	
dn-41	Feeder Resistance (2nd Motor)	0 1%	0 0 to 5 0	0 0	
dn-42	Initial Excitation Timer (2nd Motor)	0.1s	0 0 to 10 0	0 0 dn-32 W/O PG	
dn-45	AΦR Time Constant (2nd Motor)	1ms	0 to 10000	decided by dn-32 set value	
dn-46	ASR Proportional Gain (2nd Motor)	0.1	0 to 300 0	200 (W PG) 10 0 (W/O PG)	
dn-47	ASR Integral Time (2nd Motor)	1ms	0 to 30000	1000 (W PG) 500 (W/O PG)	
dn-51	Motor Rated Output (Auto-tuning)	0.01kW (0 01HP)	0 01 to 400 00	(000.00)	
dn-52	Base Speed (Auto-tuning)	1r/min	100 to 12000	(0000)	
dn-53	Maximum speed (Auto-tuning)	1r/min	100 to 12000	(0000)	
dn-54	Motor Poles (Auto-tuning)	1pole	2 to 48	(00)	
dn-55	Motor Rated Voltage (Auto-tuning)	1V	50 to 600	(000)	
dn-56	Motor Rated Current (Auto-tuning)	0.1A	0 1 to 800.0	(0.0)	
dn-57	Insulation Class (Auto-tuning)	1	0 to 4*6	(0)	
dn-58	Inverter Input Voltage (Auto-tuning)	1V	180 to 660	(000)	

*1 The setting range is . $0\text{Hz} \leqq \frac{\text{dn}-02\,(\text{dn}-22) \times \text{dn}-03\,(\text{dn}-32)}{120} \leqq 400\text{Hz}$

*2 The setting range is 0 to 110% of inverter rated current.

*3 The setting range is , 0 00 ≦ dn-16 (dn-36) ≦ dn-17 (dn-37) ≦ 1 00

*4 Motor overheat (OH1) temperature is set (only when thermister is provided).
(A type : 100℃, E type : 120℃, B type 130℃, F type : 155℃, H type : 180℃)
Motor overload (OLI) activates at 90% of this set value of temperature.

*5 When the set value is 0, control without PG is enabled for the second motor.

*6 Set according to the motor insulation class :

Insulation class	dn-57 Set Value
A (105℃)	0
E (120℃)	1
B (130℃)	2
F (155℃)	3
H (180℃)	4

*7 Design revision "C" and before 100 to 6000

*8 Design revision "C" and bofore . 2 to 32

*9 Design revision "C" and bofore · 0 to 2000

Notes .

1 The initial value differs according to the motor selection (set value of Sn-02)
The defaults shown above are set up when a nonstandard motor is used (Sn-02=FFF), and the motor must be modified before starting operation If a nonstandard motor is to be used, specify motor constant before use (for example, by auto turning)
No setting value is changed by constant initialization
Initial value corresponding to the motor is input according to the timing of changing the Sn-02 setting value (motor code)

2 dn-21 to -58 for only design revision "E" and after

A5.6 ORDER CONSTANTS (On- ⁚ .)

Do not change the setting since the motor constants are set properly at the factory prior to shipment (Note)

Constant No	Name	Description				Initial Value
		Digit		Data		
On-01	Control Status 1	1 to 3	RUN mode	000	Normal operation	0000
				010	Simulation mode	
				011	Base test mode	
				100	V/f test mode 1	
				101	V/f test mode 2	
		4	PG line break detection	0	PG line break detected	
				1	No PG line break detected	
On-02	Control Status 2	1	Control mode (1st motor)	0	With PG	0000 (W PG)
				1	Without PG	
		2	Thermistor*	0	Control with thermister	0001 (W/O PG)
				1	Control without thermister	
		3	Rotor thermal model	0	Provided	
				1	Not provided	
		4	Slip frequency compensation function (with PG and TRQ-A)	0	Effective	
				1	Ineffective	
On-03	Control Status 3	1	Initial excitation phase (only with PG)	0	Phase is fixed	0010
				1	Adjusted to the rotor position	
		2	Magnetic field forcing	0	Provided	
				1	Not provided	
		3	Overvoltage suppression function	0	Not provided	
				1	Provided	
		4	Current control A/D automatic offset adjustment	0	Provided	
				1	Not provided	
On-04	Control Status 4	1	Interlock (without PG)	0	Provided	0000
				1	Not provided	
		2	Field-weakening method (with PG)	0	Weakening by 1 / $\sqrt{N}$ (N speed)	
				1	Weakening by 1 / N (N· speed)	
		3	Speed estimate fault detection (without PG)	0	Provided	
				1	Not provided	
		4	Field-weakening method (without PG)	0	Weakening by 1 / N (N speed)	
				1	Weakening by 1 / $\sqrt{N}$ (N speed)	

* For the 1st motor only, in control card ETC 67055-S0404 and after.
For the 2nd motor, see On-30 description.

A5.6 ORDER CONSTANTS (On-□□) (Cont'd)

Constant No	Name	Setting Unit	Setting Range	Initial Value	Remarks
On-05	Inverter Low Frequency OL Gain	0 1	1 0 to 5 0	*1	
On-06	Inverter Low Frequency OL Frequency	0 01Hz	0 00 to 5 00	*1	
On-07	Regenerative Torque Limit during Low Frequency	0 01%	0 00 to 300 00	50 00	
On-08	Current Amplifier Characteristics	DEC code	000 to 254	020	
On-09	ASR Output Lead Filter Time Constant	1ms	0 to 500	0	
On-10	CEMF Compensation (1st Motor)	0 001	0 000 to 1 300	1 000	
On-11	AΦR Time Constant (1st Motor)	1ms	0 to 10000	*2	
On-12	AFR Gain (without PG)	0 01	0 00 to 2 00	0 60	
On-13	AFR Time Constant (without PG)	1ms	50 to 2000	100	
On-14	Magnetic Flux Feedback Gain (with TRQ-A)	0 001	0 800 to 1 200	1 000	
On-15	Current Feedback Gain (with TRQ-A)	0 001	0 800 to 1 200	1 000	
On-16	Software No	—	0 to 9999	*3	
On-17	A/D Converter U-phase Gain	0 0001	0 9000 to 1 1000	Factroy Setting	
On-18	A/D Converter U-phase Offset	1	−819 to +819	Factroy Setting	
On-19	A/D Converter W-phase Gain	0 0001	0 9000 to 1 1000	Factroy Setting	
On-20	A/D Converter W-phase Offset	1	−819 to +819	Factroy Setting	
On-21	ON-DELAY Compensation Gain	0 01	0 00 to 2 00	1 00	
On-22	Multi-function Monitor Output 1 D/A Adjustment Offset	0 001V	−5 000 to 5 000	Factroy Setting	
On-26	ACR Proportional Gain (enabled when On-08=254)	0 01	0 00 to 5 00	2 20	
On-27	ACR Integral Time (enabled when On-08=254)	0 1ms	0 0 to 5 00	1 0	

*1 : kVA selection (Sn-01) dependent.
*2 Determined by dn-12 set value.
*3 : Displays the lower 4 digits of the EPROM number

Current Amplifier Characteristics Selection

Set Value / ON-08	0	1	2	3	4	5
1st Digit (Current Amplifier Time Constant)	1 0 ms	1 5 ms	2 0 ms	2 5 ms	3 0 ms	—
2nd Digit (Current Amplifier Gain)	0 75	1.50	2 20	2 75	3.20	3 70

Constant No	Name	Description				Initial Value	Remarks
		Digit		Data			
On-30	Control Status 5	1	Not used	0	—	0000	
				1	—		
		2	PG-B card selection (Clock selection)	0	PG-B1 (73600-A 0023 and after)/10 MHz		
				1	PG-B (73600-A 0002 and before)/5 MHz		
		3	Thermister * (2nd motor)	0	See table "Thermister selection" below.		
				1			
		4	Not used	0	—		
				1	—		

* Effective for control card ETC67055 -S0404 and after

Thermistor selection

Thermistor		Constant Setting	
1st Motor	2nd Motor	On-02	On-30
Provided	Provided	××0×	×0××
Provided	Not Provided	××0×	×1××
Not Provided	Provided	××1×	×0××
Not Provided	Not Provided	××1×	×1××

Constant No	Name	Setting Unit	Setting Range	Initial Value	Remarks
On-34	Main Speed Input A/D Gain	0 0001	0 9000 to 1 1000	Factory setting	
On-35	Main Speed Input A/D Offset	1 (DEC)	−819 to 819	Factory setting	
On-36	Multi-function Analog Input A/D Gain	0.0001	0 9000 to 1 1000	Factory setting	
On-37	Multi-function Analog Input A/D Offset	1 (DEC)	−819 to 819	Factory setting	
On-38	Multi-function Monitor Output 1 D/A Gain	0 0001	0 8000 to 1 2000	Factory setting	
On-39	Multi-function Monitor Output 2 D/A Offset	0 001 V	−5 000 to 5 000	Factory setting	
On-40	Multi-function Monitor Output 2 D/A Gain	0 0001	0.8000 to 1.2000	Factory setting	
On-42	U-phase Voltage Reference Offset	0 01%	−10.00 to 10 00	Factory setting	
On-44	V-phase Voltage Reference Offset	0.01%	−10 00 to 10 00	Factory setting	
On-46	W-phase Voltage Reference Offset	0 01%	−10 00 to 10 00	Factory setting	
On-47	Elapsed Time in Operation	1Hour	0 to 65535	Factory setting	
On-58	2nd Motor Code Selection	4-digit HEX	0 to FFFF	FFFF	
On-59	Password Setting	4-digit HEX	0 to FFFF	FFFF	
On-60	Password	4-digit HEX	0 to FFFF	0001	

A5.6 ORDER CONSTANTS (On- . ') (Cont'd)

Parallel inverter is provided with the following constants.

Constant No	Name	Description				Initial Value	Remarks
		Digit		Data			
On-32	Control Status 7	1	LOH detection	0	Disabled	0000	
				1	Enabled		
		2	Not used	0	—		
				1	—		
		3	Not used	0	—		
				1	—		
		4	Not used	0	—		
				1	—		

Constant No	Name	Setting Unit	Setting Range	Initial Value	Remarks
On-66	Unbarance Current Control Gain	0 01	0 00 to 2 50	0 50	
On-67	Unbarance Current Control Time Constant	0 1ms	0 50 to 25 0ms	2 0ms	
On-68	Unbarance Current Control Limiter	0 1%	0 0 to 25 0%	5 0%	

A5.7 MONITOR VARIABLES (Un-□□)

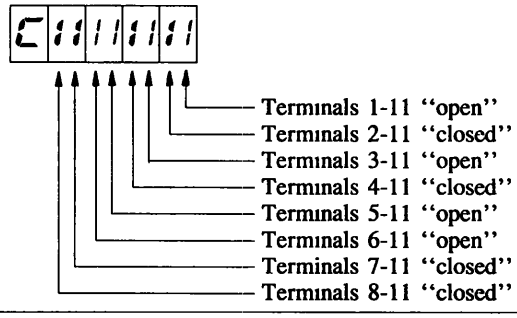
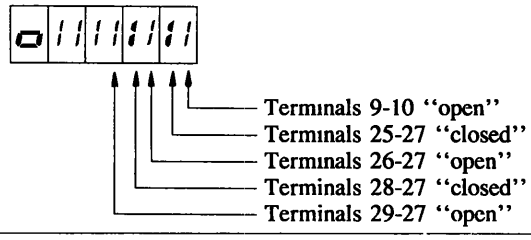
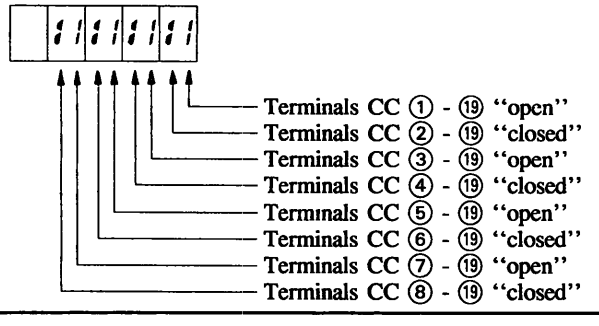
Constant No	Name	unit	Analog Monitor (AO-08, AO-12) Output level *1
Un-01	Not used	—	0
Un-02	Inverter Output Current (Inverter Rated Current Base)	A	5V/inverter rated current
Un-03	Inverter Output Current (Motor Rated Current Base)	A	10V/motor rated current (Sn-01) *2
Un-04	Voltage Reference	V	10V/no-load voltage (dn-04)
Un-05	DC Voltage	V	10V/400V (200V class), 10V/800V (400V class)
Un-07	Input Terminal Status	—	0
Un-08	Output Terminal Status	—	0
Un-09	LED Check	—	0
Un-10	Control Board Software No	—	0
Un-11	Option Board Software No	—	0
Un-12	DI-16H (Option) Input Terminal Status (Lower 8-bit)	—	0
Un-13	DI-16H (Option) Input Terminal Stauts (Upper 8-bit)	—	0
Un-14	DO-08 (Option) Output Terminal Status	—	0
Un-15	Master Controller Command 1	—	0
Un-16	Master Controller Command 2	—	0
Un-17	Internal Control Status 1	—	0
Un-18	Internal Control Status 2	—	0
Un-21	Speed Reference (Soft-start Input)	%	10V/100%
Un-22	Speed Reference (Soft-start Output)	%	10V/100%
Un-23	Speed Feedback	%	10V/100%
Un-24	External Torque Reference (at Torque Control)	%	10V/100%
Un-25	Torque Compensation	%	10V/100%
Un-26	Torque Reference	%	10V/100%
Un-27	Torque Feedback (only with TRQ-A card)	%	10V/100%
Un-28	Speed Controller (ASR) Input (Speed Deviation)	%	10V/100%
Un-29	Speed Controller (ASR) Output (After Lag Filter)	%	10V/100%
Un-30	Slip Frequency Reference	%	10V/100%
Un-31	Primary Frequency Reference	%	10V/100%
Un-32	Motor Temperature	°C	10V/200°C
Un-33	Zero-servo Moving Pulse (4-multiplier)	Pulse	10/32767
Un-34	Control circuit Terminal ⑬ - ⑰ or ⑭ - ⑰ Input Voltage	V	10V/10V
Un-35	Control Circuit Terminal ⑯ - ⑰ Input Voltage	V	10V/10V
Un-36	AI-14B (Option) CH1 Input Voltage	V	10V/10V
Un-37	AI-14B (Option) CH2 Input Voltage	V	10V/10V
Un-38	AI-14B (Option) CH3 Input Voltage	V	10V/10V
Un-41	ACR (q-Axis) Integral Value	%	10V/10%
Un-42	Magnetic Flux Feedback (Amplitude)	%	10V/100%
Un-43	AΦR Output (only with TRQ-A card)	%	10V/100%
Un-44	Motor Output (kW)	%	10V/motor rated output
Un-49	Accumulated Operation Time	hr	0

*1 Max analog monitor output : Approx. 11V
Output level can be adjusted with bn-18, bn-23, bn-25.

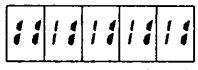
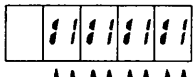
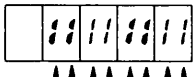
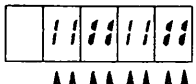
*2 Motor rated current = (dn – 05) $\sqrt{1 + (dn - 07/100)^2}$

A5.7 MONITOR VARIABLES (Un-□□)(Cont'd)

Monitor Variables (1 of 4)

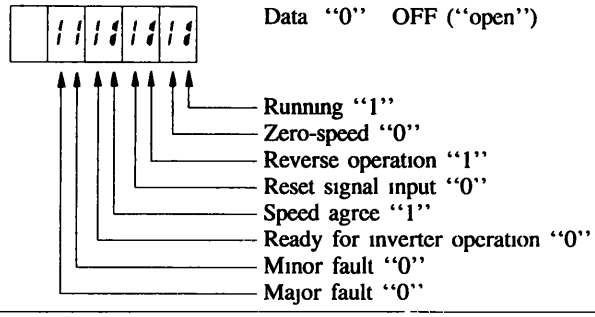
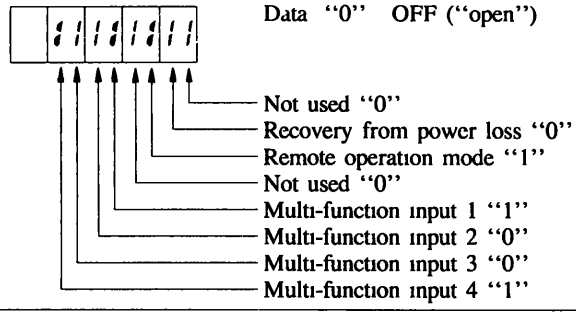
Constant No	Name	Unit	Description
Un-02 Un-03	Inverter Output Current	A	Displays the inverter output current in actual value. Display example: 12.5A (12.5A)
Un-04	Voltage Reference	V	Displays the inverter output voltage (reference) in actual value Display example 200V (200V)
Un-05	Direct Current Voltage	V	Displays the direct current voltage (between P-N) Display example PN270 (PN 270V)
Un-07	Input Terminal Status	—	Displays the status of the sequence input terminals (1 to 8) Lights when "closed", extinguished when "open" 
Un-08	Output Terminal Status	—	Displays the status of the sequence output terminals Lights when "closed", extinguished when "open" 
Un-09	LED Check	—	All LEDs on the operator light when Un-09 is selected Display example 88888 (All segments light)
Un-10	Control Board Software No.	—	Displays the software version No of the control board EPROM (Lower 4 digits) Display example 1234 (NSW 671234)
Un-11	Optional Board Software No.	—	Displays the software version No of the optional board EPROM (Lower 4 digits) Display example: 1234 (NST 671234)
Un-12	Input Terminal Status of DI-16H (Option) (Lower 8-bit)	—	Status of the input pin of the lower eight bits of digital reference card DI-16H (option) is displayed. Lights when "closed" (data. "1"), and goes out when "open" (data 0") 

Monitor Variables (2 of 4)

Constant No	Name	Uint	Description
Un-13	Input Terminal Status of DI-16H (Option) (Upper 10-bit)	—	Status of the input pin of the upper eight bits of digital reference card DI-16H (option) is displayed. Lights when "closed" (data "1"), and goes out when "open" (data: 0")  Terminals CC ⑨ - ⑲ "closed" Terminals CC ⑩ - ⑲ "open" Terminals CC ⑪ - ⑲ "closed" Terminals CC ⑫ - ⑲ "open" Terminals CC ⑬ - ⑲ "closed" Terminals CC ⑭ - ⑲ "open" Terminals CC ⑮ - ⑲ "closed" Terminals CC ⑯ - ⑲ "open" Terminals CC ⑰ - ⑲ "closed" Terminals CC ⑱ - ⑲ "closed"
Un-14	Output Terminal Status (DO-08) (Option) (Lower 8-bit)	—	Displays the status of the output pin of the digital output card DO-08 (option) Lights when "closed" (data "1"), and goes out when "open" (data "0")  Terminals TD-5-TD11 "open" Terminals TD-6-TD11 "closed" Terminals TD-7-TD11 "open" Terminals TD-8-TD11 "closed" Terminals TD-9-TD11 "open" Terminals TD-10-TD11 "closed" Terminals TD-1-TD2 "open" Terminals TD-3-TD4 "closed"
Un-15	Host Reference 1	—	Displays the reference from the host. Data. "1" : ON Data "0" : OFF  Operation reference "0" Reverse reference "0" Base block reference "1" Trace stop reference "1" External fault "0" Fault reset "0" Accel/decel time selection "1" Accel/decel stop "1"
Un-16	Host Reference 2	—	Displays the reference from the host. Data. "1" : ON Data "0" : OFF  Initial excitation "1" Integral reset "1" Integral hold "0" Soft starter cancel "0" Multi-function output 1 "1" Multi-function output 2 "1" Multi-function ouptut 3 "0" Multi-function output 4 "0"

A5.7 MONITOR VARIABLES (Un-) (Cont'd)

Monitor Variables (3 of 4)

Constant No	Name	Uint	Description
Un-17	Internal Control Status 1	—	Displays the internal control status Data "1" ON ("closed") Data "0" OFF ("open") 
Un-18	Internal Control Status 2	—	Dislays the internal control status Data "1" ON ("closed") Data "0" OFF ("open") 
Un-21	Speed Reference (SFS Input)	%	Displays the speed reference of the soft start input Represented as a % of the motor maximum speed (dn-02) Display example 100.0 (%)
Un-22	Speed Reference (SFS Output)	%	Displays the speed reference of the soft start output Represented as a % of the motor maximum speed (dn-02) Display example 100.0 (%)
Un-23	Speed Feedback	%	Displays the actual speed of the motor Represented as a % of the motor maximum speed (dn-02) Display example 100.0 (%)
Un-24	External Torque Reference	%	Displays the torque reference when under torque control Represented as a % of the motor rated torque
Un-25	Torque Compensation	%	Displays the torque compensation reference Represented as a % of the motor rated torque.
Un-26	Torque Reference	%	Displays the torque reference. Displays the secondary current reference value multiplied the magnetic flux reference value, when under speed control Represented as a % of the motor rated torque
Un-27	Torque Feedback	%	Displays the motor torque calculated value Represented as a% of motor rated torque (with TRQ-A card)
Un-28	ASR Input (Speed Deviation)	%	Displays deviation between the speed reference (soft starter output) and the speed feedback Represented as a % of the motor maximum speed (dn-02)
Un-29	ASR Output (After Filter)	%	Displays the output of the speed control unit (ASR) This is the motor secondary current reference value Represented as a % of the motor rated secondary current (dn-05)
Un-30	Slip Frequency Reference	%	Displays the motor slip frequency reference Represented as a % of the motor rated slip frequency (dn-06)

Monitor Variables (4 of 4)

Constant No	Name	Unit	Description
Un-31	Primary Frequency Reference	%	Displays the inverter output frequency. Represented as a % of the motor rated synchronous frequency (dn-02 × dn-03/120)
Un-32	Motor Temperature	°C	Displays the motor stator temperature (Thermister detection)
Un-33	Zero-servo Moving Pulse (4-multiplier)	Pulse	Displays the number of pulses from the zero-servo start point (Effective when zero-servo function selected)
Un-34	Inverter A/D Input Voltage	V	Displays the input voltage to the inverter main speed A/D. (Terminal 13 or 14)
Un-35	Inverter A/D Aux Input Voltage	V	Displays the input voltage to the inverter auxiliary speed A/D (Terminal 16)
Un-36	AI-14B CH1 Input Voltage	V	Displays the analog reference card AI-14B CH1 input voltage.
Un-37	AI-14B CH2 Input Voltage	V	Displays the analog reference card AI-14B CH2 input voltage.
Un-38	AI-14B CH3 Input Voltage	V	Displays the analog reference card AI-14B CH3 input voltage
Un-41	ACR (q-Axis) Integral Value	%	For adjustment of On-10.
Un-42	Magnetic Flux Feedback	%	Displays the magnetic flux detected value in % (with TRQ-A card)
Un-43	Magnetic Flux Controller Output	%	Displays the magnetic flux controller (AΦR) output.
Un-44	Motor Output	%	Displays the motor rated output.
Un-49	Accumulated Operating Time	hr	Displays the inverter accumulated operating time

Note See Appendix Par 2.1 "Functional Block Diagram" for where to monitor

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