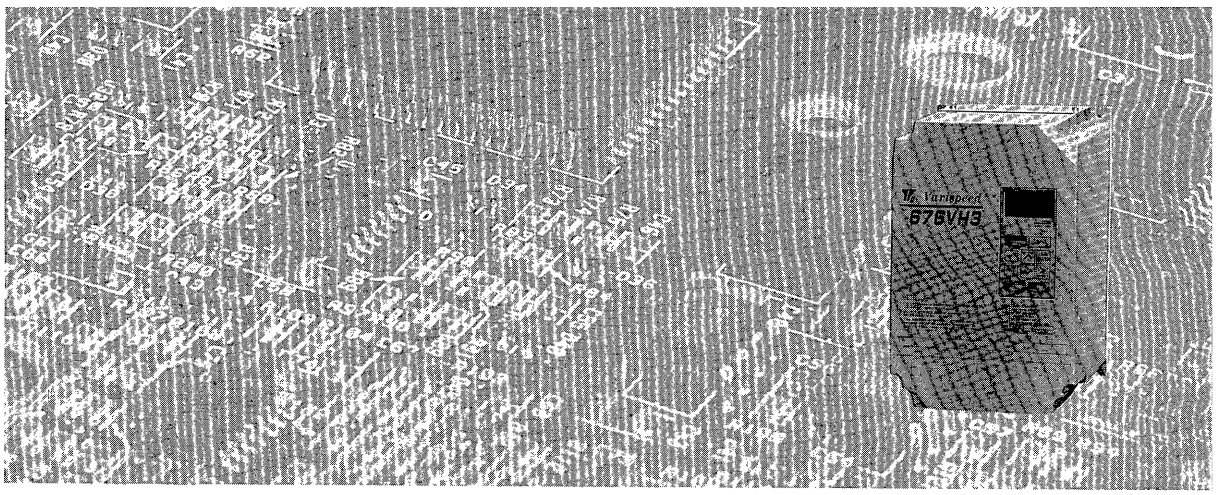
# Varispeed-676VH3 Drive

## NEW VECTOR-CONTROLLED TRANSISTOR INVERTER DRIVE FOR MULTI-DRIVE SYSTEM WITH PG

200V CLASS 0.5 TO 100 HP (0.4 TO 75kW)
400V CLASS 1 TO 180 HP (0.75 TO 132kW)




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

YASKAWA

The Varispeed-676VH3 (VS-676 VH3) is a high-performance transistor inverter that drives a squirrel-cage induction motor by vector control.

The Varispeed series with multi-system PG described here includes our Control Pack CP-213 transmission FA bus interface in the standard configuration, and is offered with the two types of VS-676VHC (control panel-mounted type) and the VS-676VHJ (control center type).

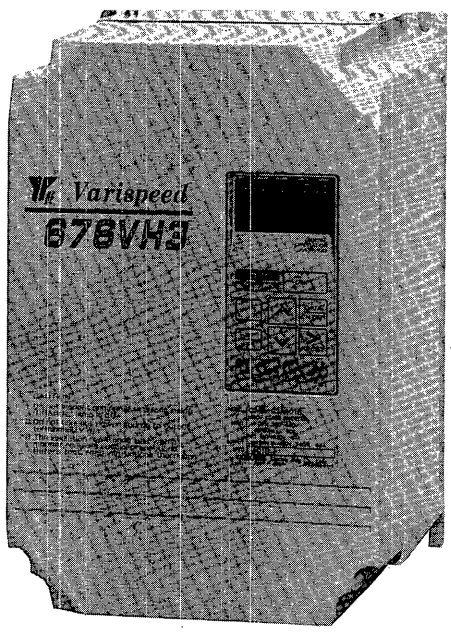
Besides the multi-system type, the single-system type (CIMR-VHA series) is also offered as the driver for analog input and relay sequence input.

Read this instruction manual thoroughly before putting the Varispeed into use.

This instruction manual will also be necessary for daily maintenance, checks and trouble shooting.

[Related document]

SIE-C872-13.1 Control Pack CP-213 FA bus



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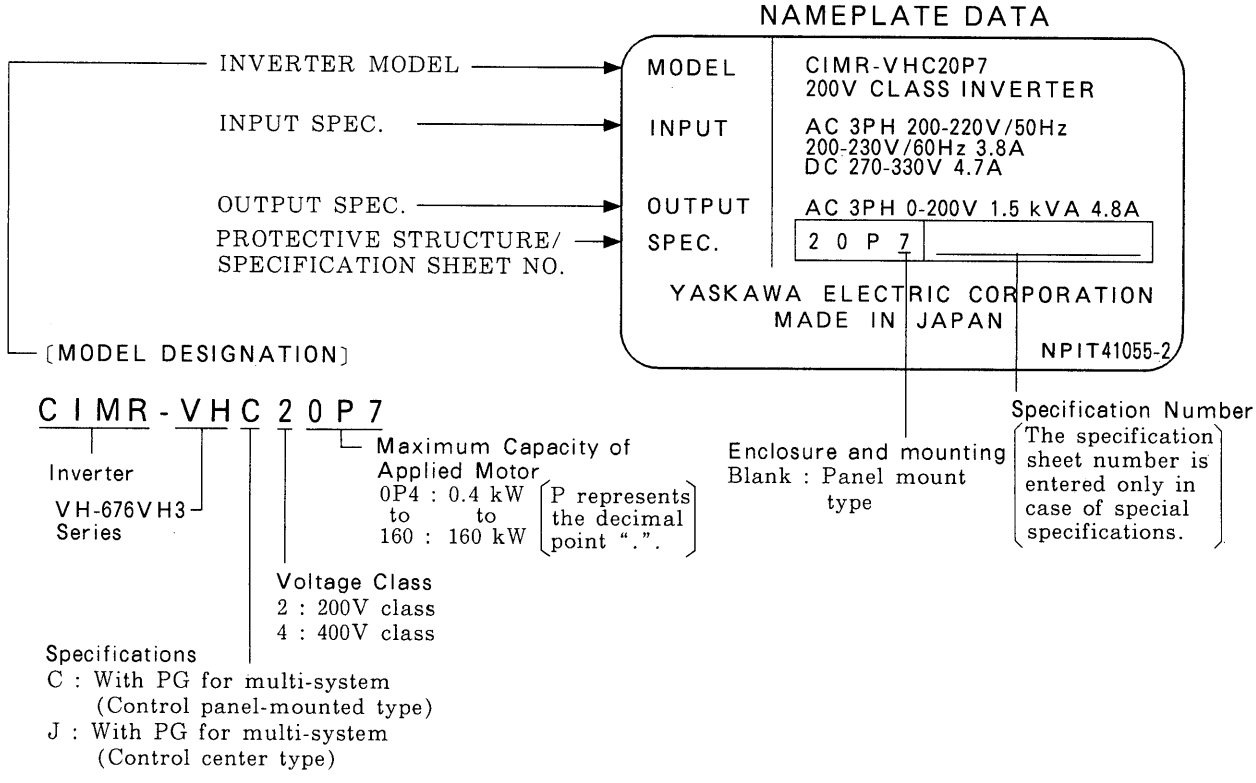
# INDEX (Cont'd)

# 1. CHECK UPON ACCEPTANCE

Check the following as soon as the VS-676VH3 is received.

In case any discrepancy is found, contact your YASKAWA representation without delay.

- Verification of the order sheet items and the delivered items
- Check for any possibility of damage incurred during transportation




## PRECAUTIONS

The following are to be strictly observed.

(1) Do not touch the circuit component after turning off the main circuit power until the CHARGE lamp turns off. (This is dangerous because the capacitors may still be charged.)

(2) Appropriate setting is completed before shipment of the VS-676VH3 at the factory. Do not change the setting unnecessarily.

(3) CMOS IC is used on the control PC board. Do not touch the board, as the static electricity from one's finger may destroy the CMOS IC.

(4) Do not connect or disconnect the wiring and the connector while power is supplied.

(5) Do not check the signals during operation.

(6) Be sure to ground using the ground terminal G (E) (Ground resistance 100Ω or less).

(7) Do not connect output terminals $T_1$ (U), $T_2$ (V), $T_3$ (W) to the AC main circuit power supply.

(8) Do not perform withstand voltage test on the VS-676VH3.

# 2. INSTALLATION

## 2.1 TRANSPORTATION

Handle the Varispeed with care so as not to damage the inverter during transportation.

Do not hold the Varispeed to exert force on the front cover of the inverter.

## 2.2 INSTALLATION

Lift the VS-676VH3 at the bottom for installation. Applying force on the terminal block or front cover can cause damage to the inverter.

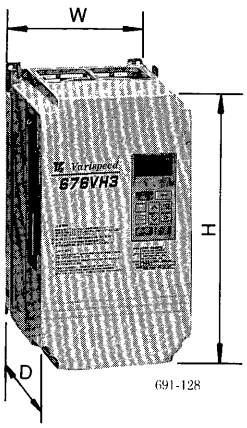
Install the VS-676VH3 where the following conditions are satisfied.

- Protected from rain, wind, or moisture.
- Protected from direct sunlight.
- Protected corrosive gases or liquids.
- Protected from dust or metallic particles.
- Ambient temperature is -10 to + 45℃.
- A minimum of electromagnetic noise (i.e. where there are no welding machines or power machines in the vicinity.)
- Free from vibration.

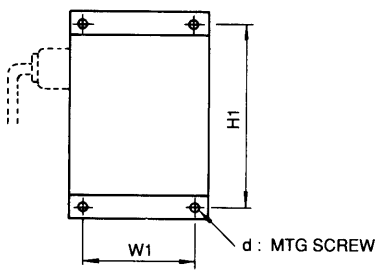
When accommodating multiple sets in a switchgear, use cooling fans to maintain the temperature of the air that enters the inverter to less than 45℃.

## Outside Dimensions and Mounting Dimensions

· Outside Dimensions in mm




· Mounting Dimensions in mm

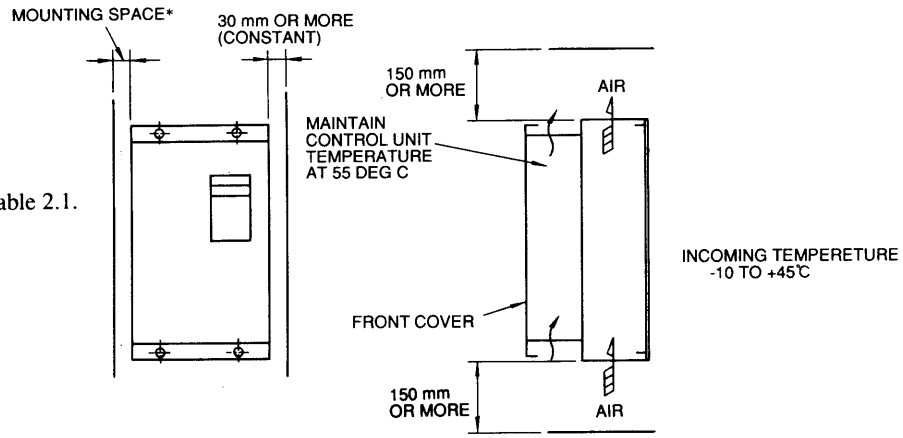



| Voltage Class | Model CIMR-VH⬚ | Nominal Capacity kVA | Outside Dimensions in mm | | | Mtg. Dimensions in mm | | |
|---|---|---|---|---|---|---|---|---|
| | | | W | H | D | W1 | H1 | d |
| 200 V Class | 20P4 | 1 | 204.5 | 304 | 190 | 180 | 285 | M6 |
| | 20P7 | 1.5 | | | | | | |
| | 22P2 | 3 | 204.5 | 304 | 225 | 180 | 285 | M6 |
| | 23P7 | 5 | | | | | | |
| | 25P5 | 7.5 | 204.5 | 354 | 255 | 180 | 335 | M6 |
| | 27P5 | 10 | | | | | | |
| | 2011 | 15 | 250 | 500 | 255 | 200 | 485 | M6 |
| | 2015 | 20 | 325 | 550 | 245 | 275 | 535 | M6 |
| | 2022 | 30 | 325 | 550 | 255 | 275 | 535 | M6 |
| | 2037 | 50 | 475 | 800 | 280 | 375 | 780 | M10 |
| | 2055* | 70 | 475 | 800 | 280 | 375 | 780 | M10 |
| | 2075* | 100 | 600 | 1450 | 450 | 500 | 1415 | M12 |
| 400 V Class | 40P7 | 1.6 | 204.5 | 354 | 220 | 180 | 335 | M6 |
| | 42P2 | 3 | | | | | | |
| | 43P7 | 5 | 204.5 | 354 | 255 | 180 | 335 | M6 |
| | 47P5 | 10 | | | | | | |
| | 4011 | 15 | 250 | 500 | 255 | 200 | 485 | M6 |
| | 4015 | 20 | | | | | | |
| | 4022 | 30 | 325 | 550 | 255 | 265 | 535 | M6 |
| | 4030 | 40 | 350 | 725 | 280 | 250 | 705 | M8 |
| | 4045 | 60 | 350 | 725 | 280 | 250 | 705 | M8 |
| | 4055 | 80 | 575 | 925 | 280 | 475 | 900 | M10 |
| | 4075 | 100 | | | | | | |
| | 4110 | 140 | 575 | 925 | 330 | 475 | 900 | M10 |
| | 4160 | 200 | 600 | 1360 | 453 | 550 | 1325 | M12 |

* Since the above dimensions may be changed without notice, contact your Yaskawa representative.

## 2.3 TERMINAL ARRANGEMENT AND MOUNTING

Always install the VS-676VH3 upright to maintain cooling efficiency, and secure the surrounding space as shown in Fig. 2.1.




* Also refer to Table 2.1.

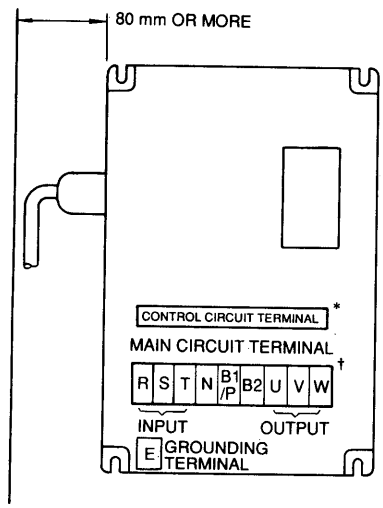
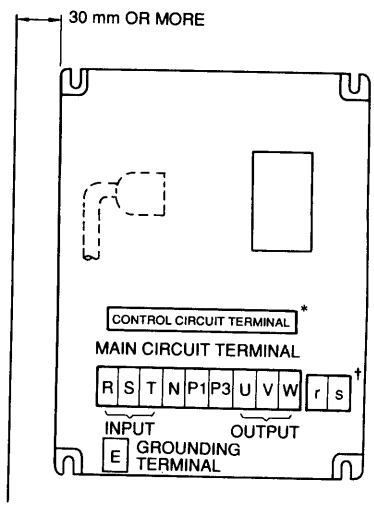
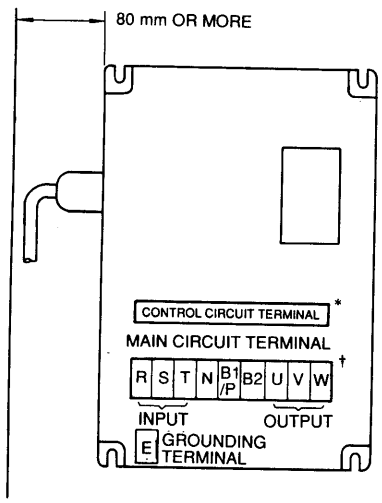
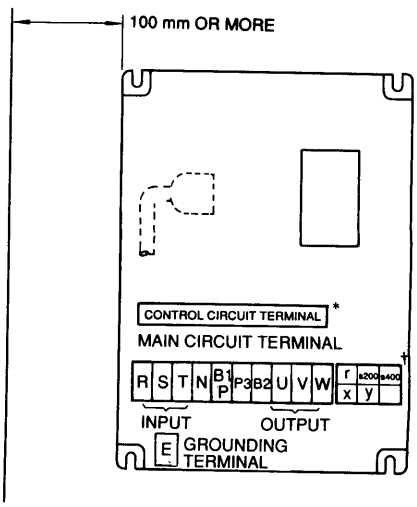
(a) Horizontal Space (b) Vertical Space

Fig. 2.1 VS-676VH3 Mounting Space

## 2.4 TERMINAL ARRANGEMENT

The following is the terminal arrangement and panel-mounted dimensions of the VS-676VH3.

Table 2.1 Terminal Arrangement and Panel-mounted Dimensions

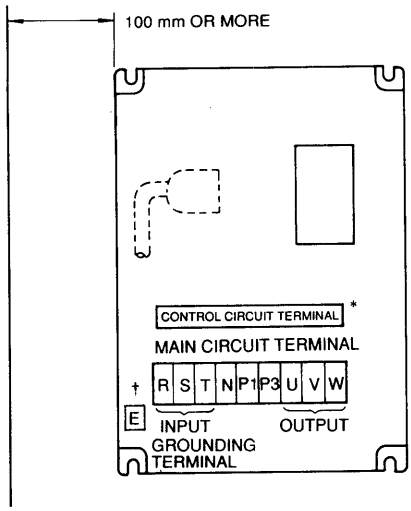
| Model | CIMR-VH□20P4 to -VH□27P5 | CIMR-VH□2011 to -VH□2022 |
|---|---|---|
| Terminal Arrangement |  |  |
| Model | CIMR-VH□40P7 to -VH□47P5 | CIMR-VH□4011, -VH□4015 |
| Terminal Arrangement |  |  |

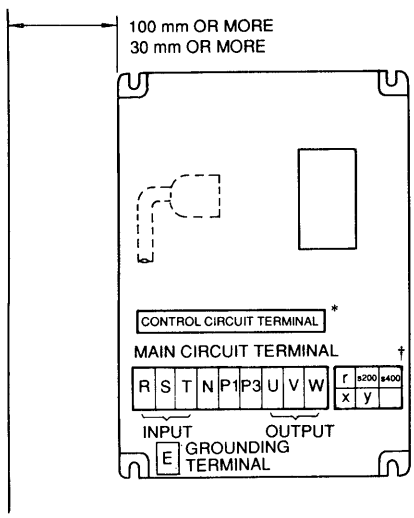
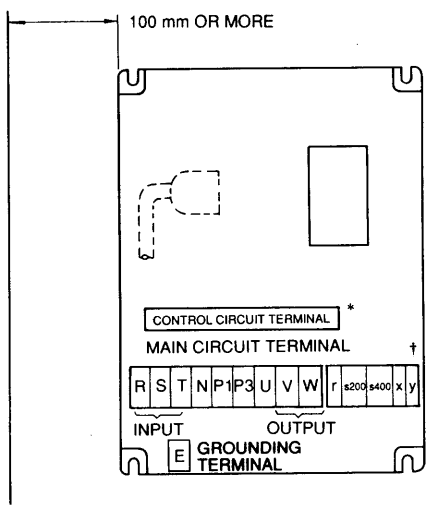
* Control circuit terminal arrangement (common to all models)

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 25 | 26 | 27 | 28 | 29 | 30 | 18 | 19 | 20 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 21 | 22 | 23 | 24 | 31 | 32 | 9 | 10 |

† See Table 3.6 "Size of round crimp terminals" for the terminal size.

## 2.4 TERMINAL ARRANGEMENT (Cont'd)

| Model | CIMR-VH ⬚ 2037 | CIMR-VH ⬚ 2055, -VH ⬚ 2075 |
|---|---|---|
| Terminal Arrangement |  | Contact your representative. |

| Model | CIMR-VH ⬚ 2022 to -VH ⬚ 4045 | CIMR-VH ⬚ 4055 to -VH ⬚ 4160 |
|---|---|---|
| Terminal Arrangement |  |  |

* Control circuit terminal arrangement (common to all models)

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 25 | 26 | 27 | 28 | 29 | 30 | 18 | 19 | 20 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 21 | 22 | 23 | 24 | 31 | 32 | 9 | 10 |

† See Table 3.6 "Size of round crimp terminals" for the terminal size.

# 3. WIRING

## 3.1 INTERCONNECTION

Interconnection is to be accomplished as shown in pages 8 through 14.

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

(List of Wiring Example of Each Inverter Type)

| Model | CIMR-VHC□<br>CIMR-VHJ□ | Wiring Example on Page |
|---|---|---|
| 200 V Class | 20P4 ~ 25P5 | Wiring example (1) page 8 |
| | 27P5 | Wiring example (2) page 9 |
| | 2011 ~ 2075 | Wiring example (3) page 10 |
| 400 V Class | 40P7 ~ 43P7 | Wiring example (4) page 11 |
| | 47P5 | Wiring example (5) page 12 |
| | 4011, 4015 | Wiring example (6) page 13 |
| | 4022 ~ 4160 | Wiring example (7) page 14 |

NOTE

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

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

| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 25 | 26 | 27 | 28 | 29 | 30 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 21 | 22 | 23 | 24 | 31 | 32 | 9 | 10 |

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

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

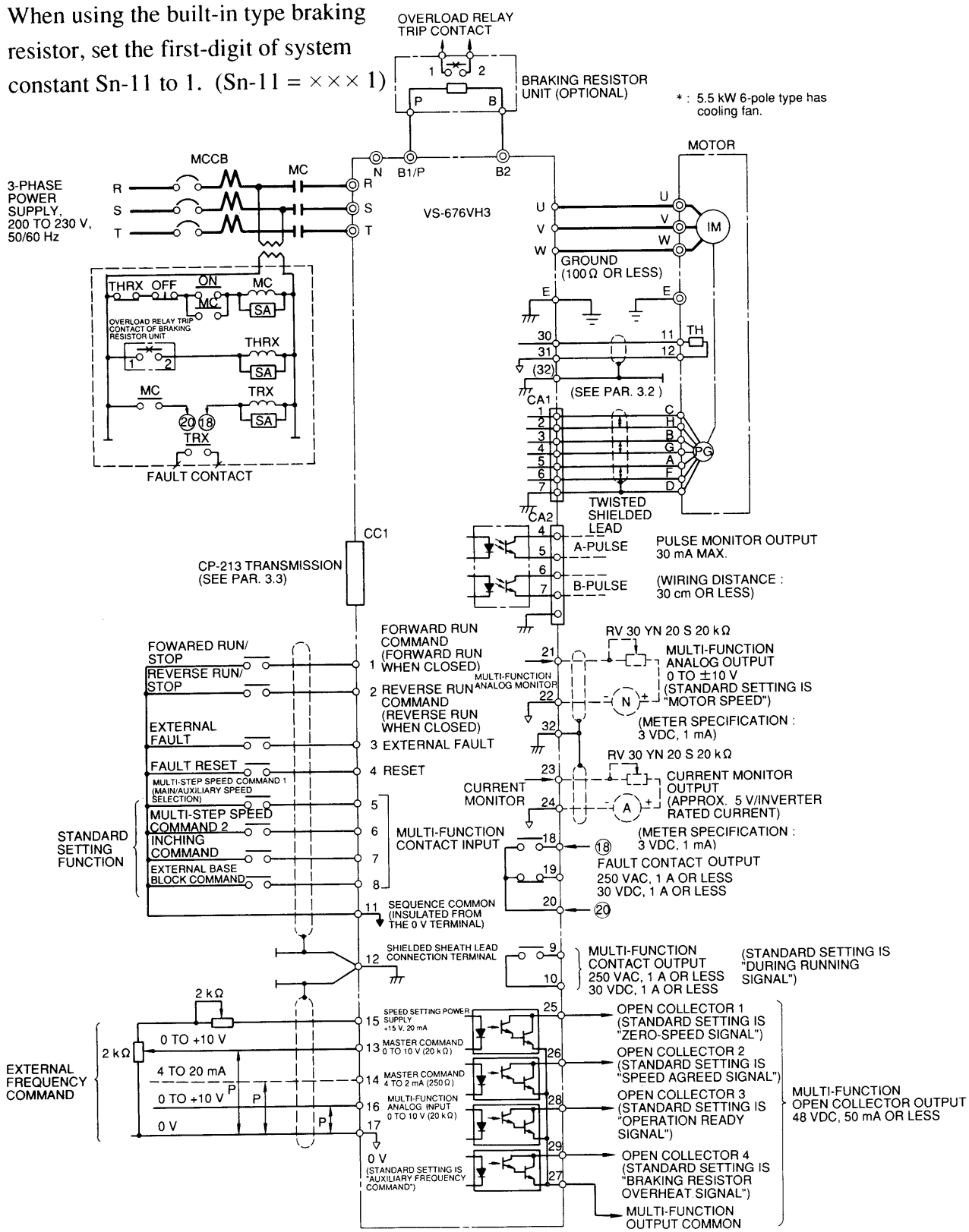
(5) The +15 V output current capacity of external terminal ⑮ is 20 mA maximum.

(6) The multi-function analog output and current monitor output are exclusive meter outputs as for the speed meter, Ammeter, etc.
[It is recommended to use the optional analog monitor card AO-12 for the control system.]

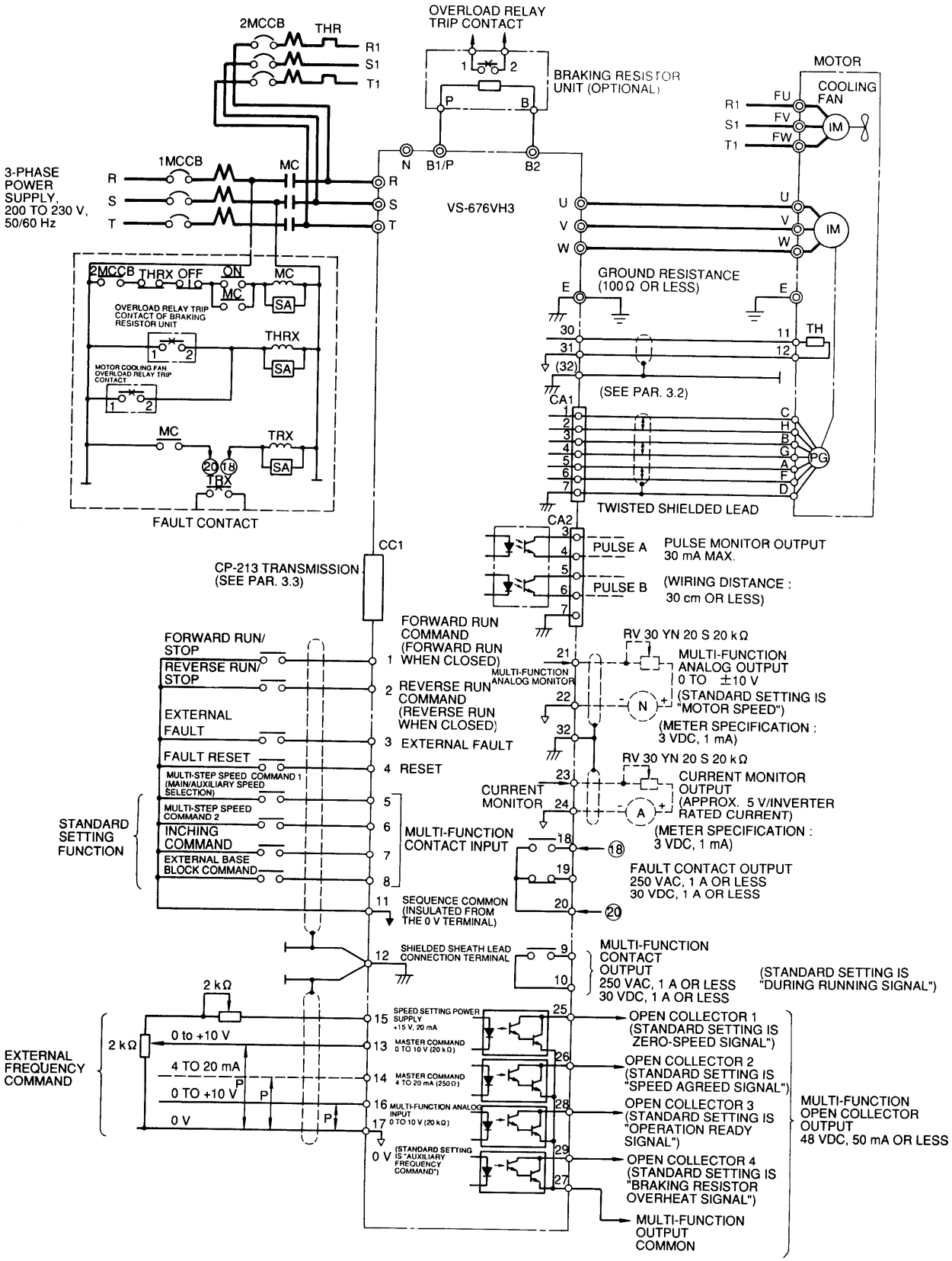
## 3.1 INTERCONNECTION (Cont'd)

### (1) Example of CIMR-VH□20P4 to VH□25P5 Type Wiring (200 V class, 0.4 kW to 5.5 kW * motors are applicable)

When using the built-in type braking resistor, set the first-digit of system constant Sn-11 to 1. (Sn-11 = ×××1)

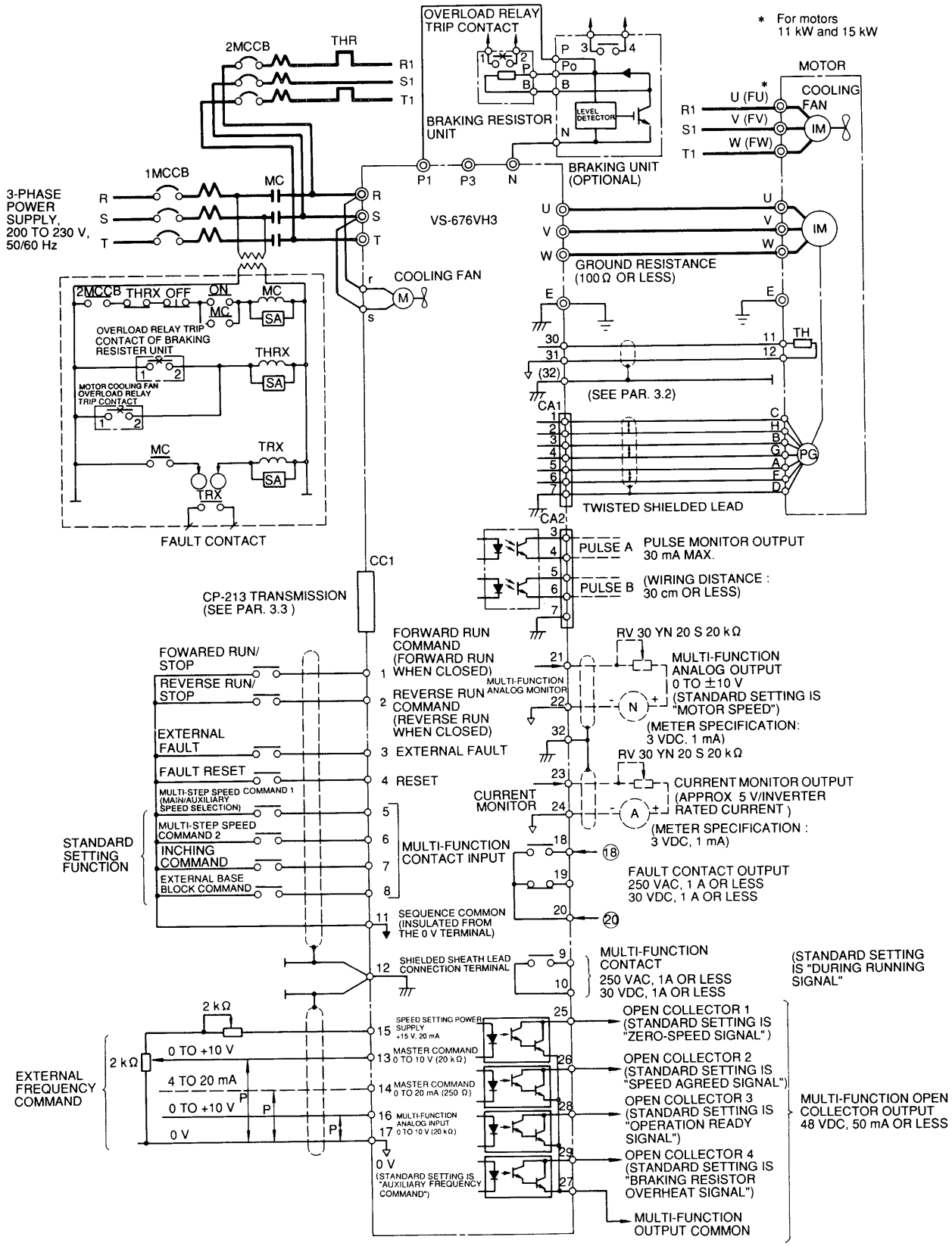


(2) Example of CIMR-VH□27P5 Type Wiring
(200 V class, 7.5 kW motors are applicable)



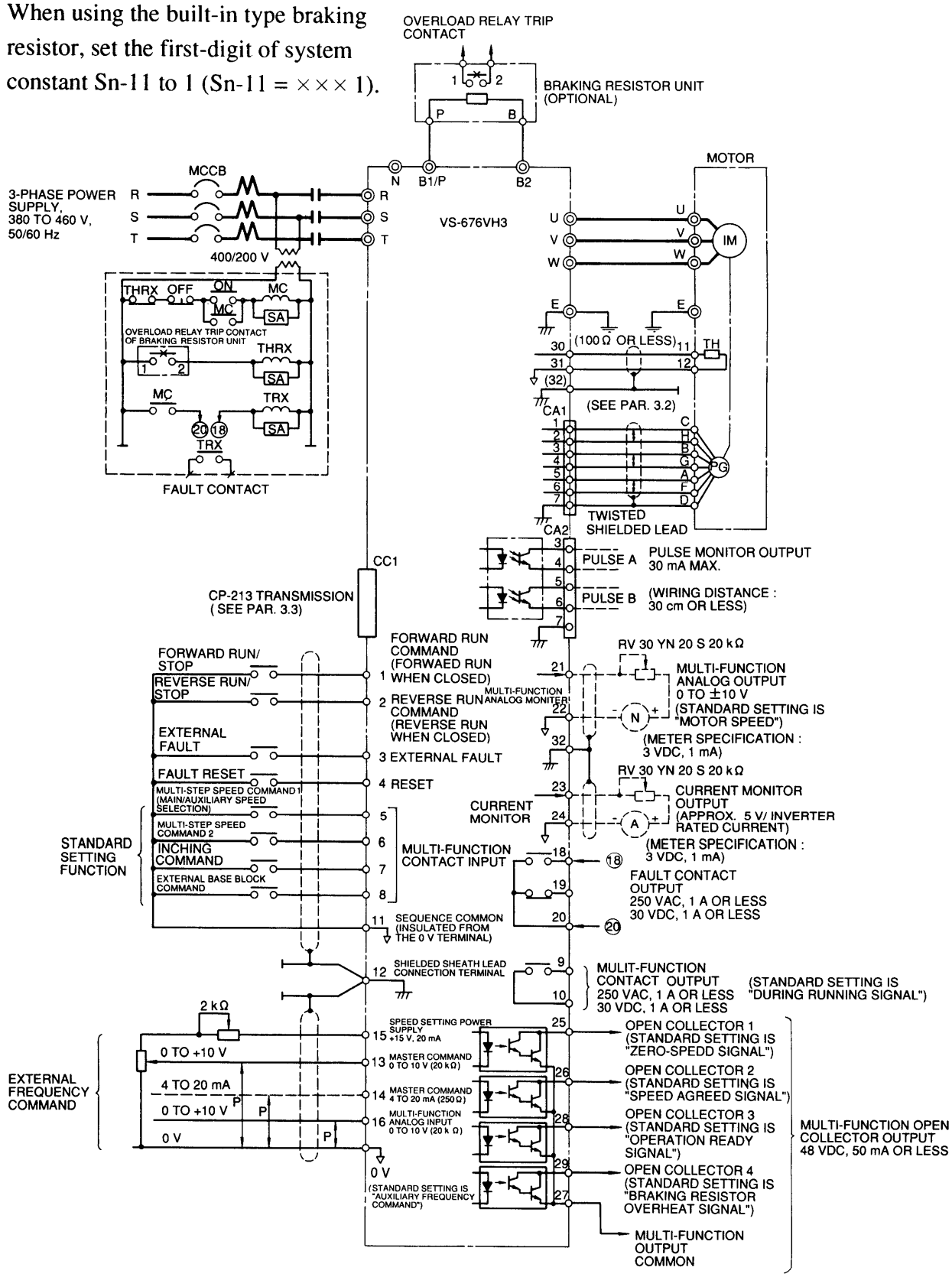
## 3.1 INTERCONNECTION (Cont'd)

### (3) Example of CIMR-VH□2011 to VH□2075 Type Wiring
(200 V class, 11 kW to 75kW motors are applicable)



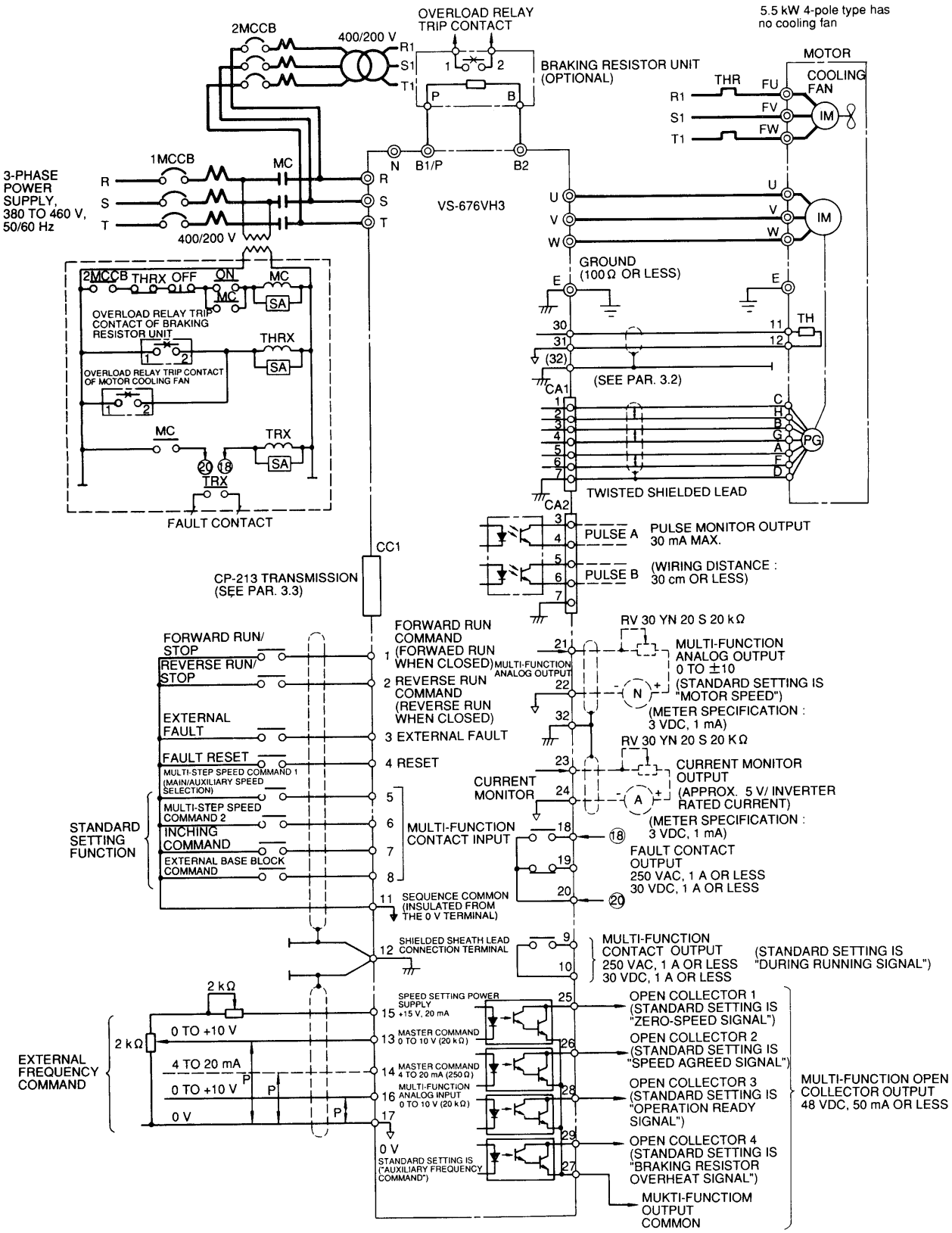
(4) Example of CIMR-VH□40P7 to -V□ 43P7 Type Wiring
(400 V class, 0.75 kW to 3.7 kW motors are applicable)

When using the built-in type braking resistor, set the first-digit of system constant Sn-11 to 1 (Sn-11 = ××× 1).

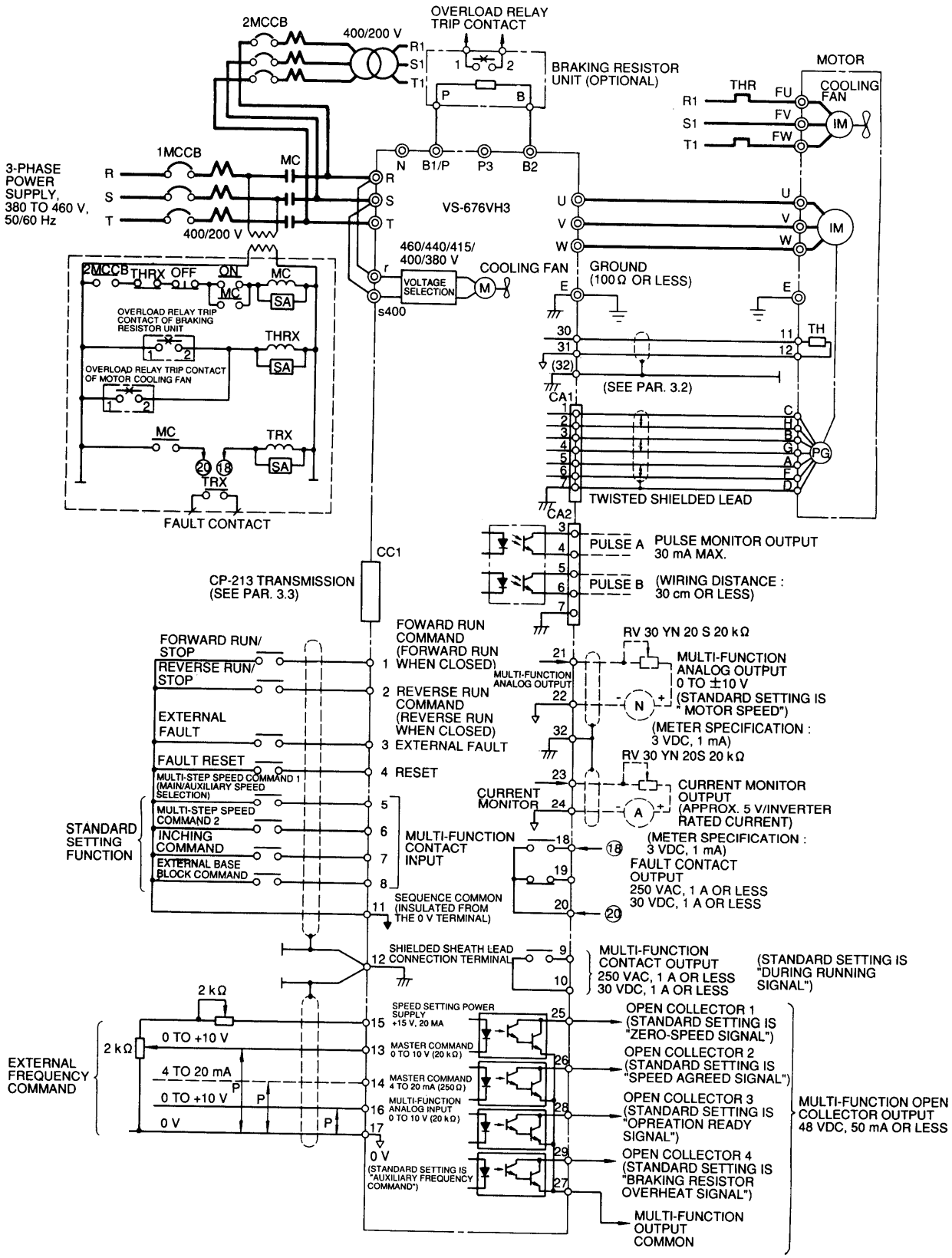


## 3.1 INTERCONNECTION (Cont'd)

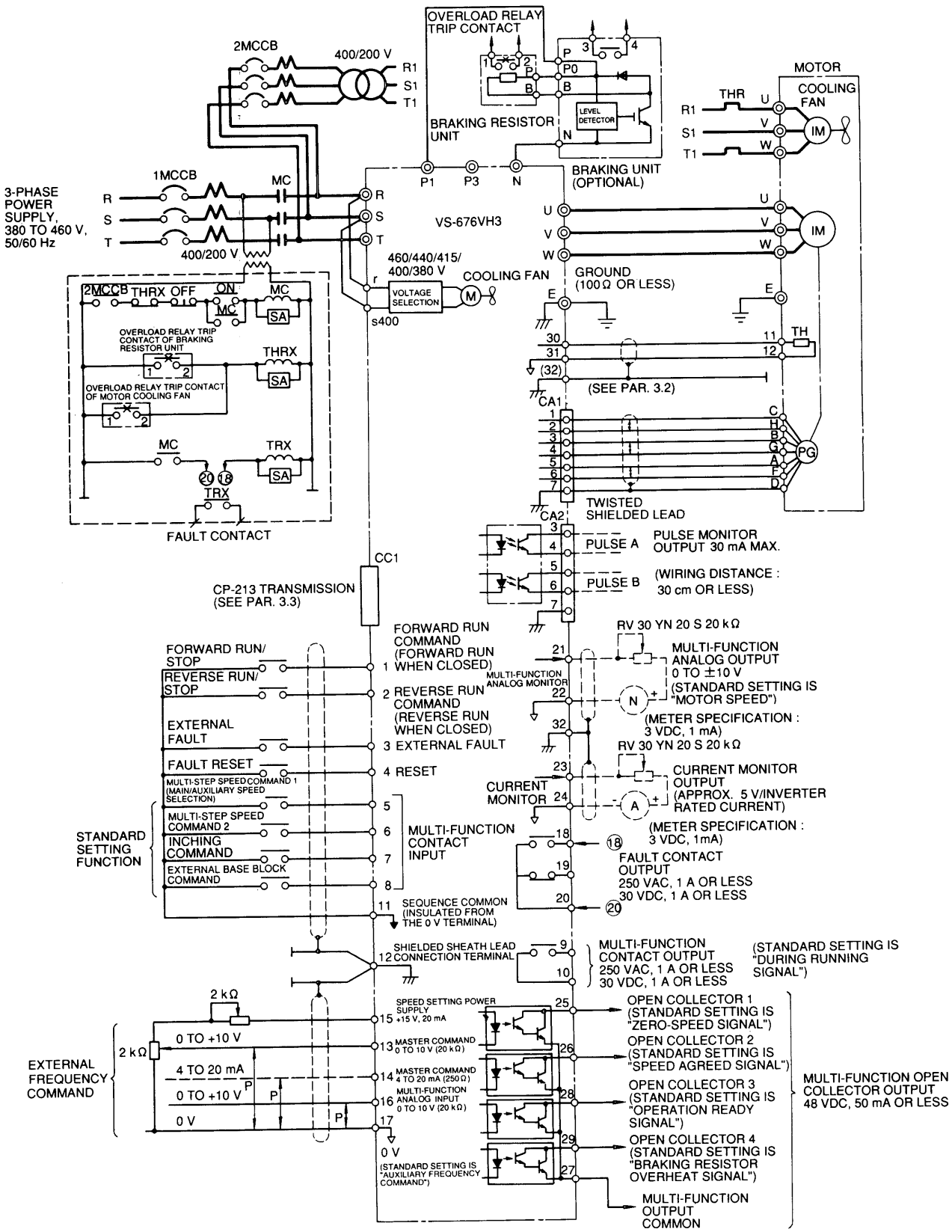
### (5) Example of CIMR-VH□47P5 Type Wiring
(400 V class, 5.5 kW*, 7.5 kW motors are applicable)



(6) Example of CIMR-VH□4011, -VH□4015 Type Wiring
(400 V class, 11 kW, 15 kW motors are applicable)



(7) Example of CIMR-VH□4022 to VH□4160 Type Wiring
(400 V class, 18.5 kW to 132 kW motors are applicable)

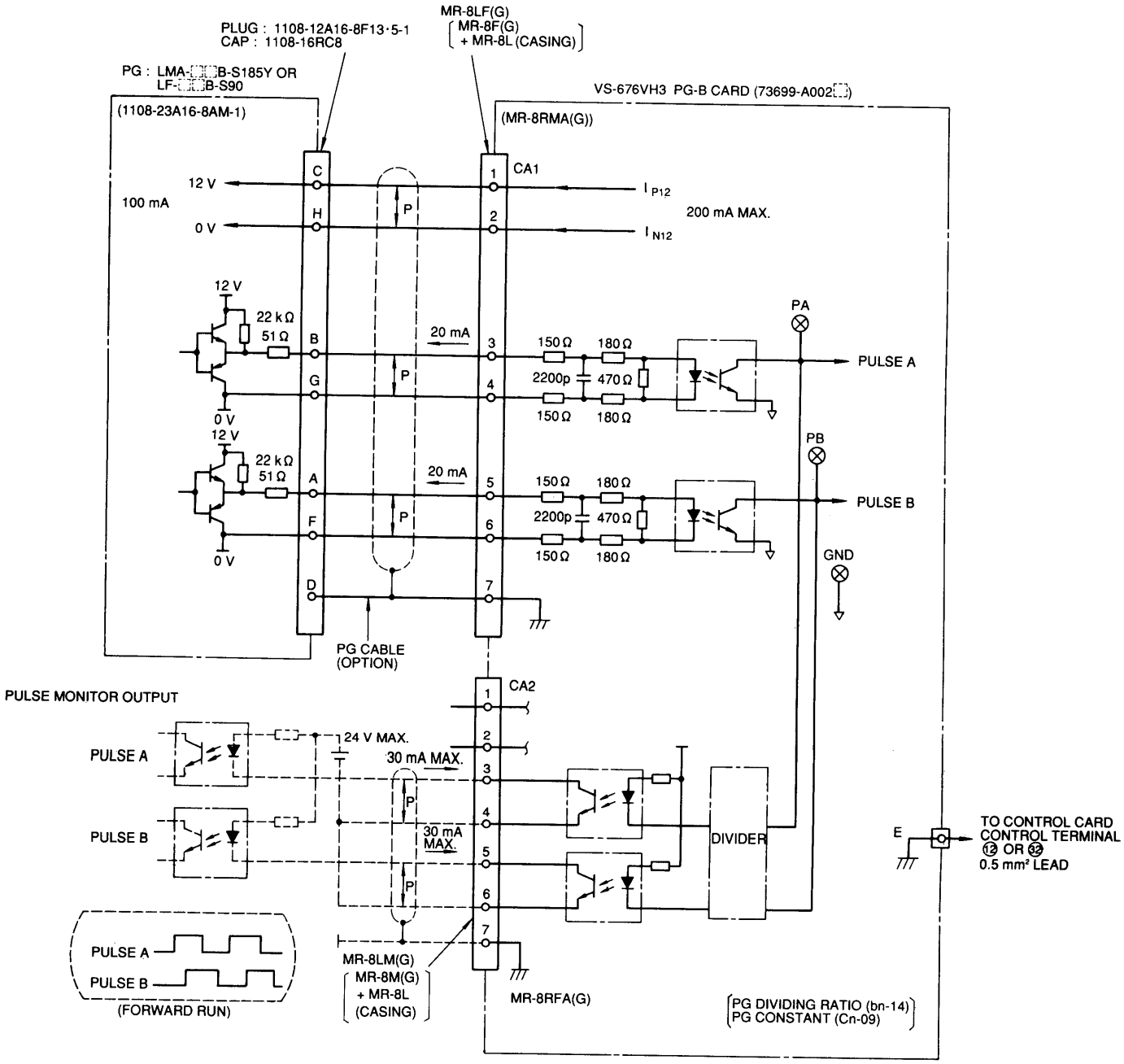


## 3.2 CONNECTION OF PG AND VS-676VH3

[Applicable PG] LF- ☐ ☐ B-S90 (Foot-mounted type)

LMA- ☐ ☐ B-S185Y (Flange-mounted type) [Made by Samutak K.K.]

- ☐ ☐ — 1/10 of the output pulse

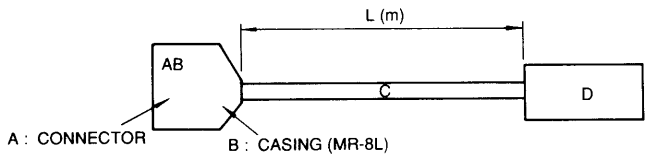



Note: Keep the pulse monitor output cable within 30 m.

## 3.2 CONNECTION OF PG AND VS-676VH3 (Cont'd)

[Pulse generator PG cable] (Option)

- Manufacturer : Hitachi Densen Co., Ltd.
- Specification : Polyethylene insulation for instrumentation, Connectors on both ends already connected Wiring distance is 50 m at the maximum *
- Model : KPEV-S 0.75 mm² 3-pair lead




PG Cable Configuration

| Cable Length | Code No. |
|---|---|
| 5 m | 72676-W 0005 |
| 10 m | 72676-W 0010 |
| 20 m | 72676-W 0020 |
| 30 m | 72676-W 0030 |
| 50 m | 72676-W 0050 |

* When using the KPEV-S 1.25 mm² 3-pair lead, extension can be made up to 300 m. 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 0.75 mm² · 3-pair Lead | | D : Plug TC 1108-12A 16-8F 13.5 (Tajimi Musen Co., Ltd.) |
|---|---|---|---|---|
| Pin No. | Signal | Core | Color | Pin No. |
| 1 | +12 V | Twisted | White | C |
| 2 | 0 V | | Black | H |
| 3 | A (+) | Twisted | White | B |
| 4 | A (−) | | Black | G |
| 5 | B (+) | Twisted | White | A |
| 6 | B (−) | | Black | F |
| 7 | FG | Shielded | | D |

[PG terminal] (Provided as standard)

·Model : LMA- ☐☐ B-S185Y type

LF- ☐☐ B-S90 type

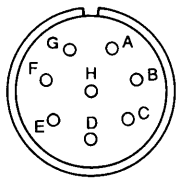


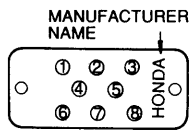
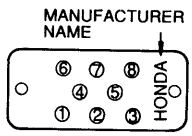

Fig. 3.1 PG Terminal

Terminal Specifications

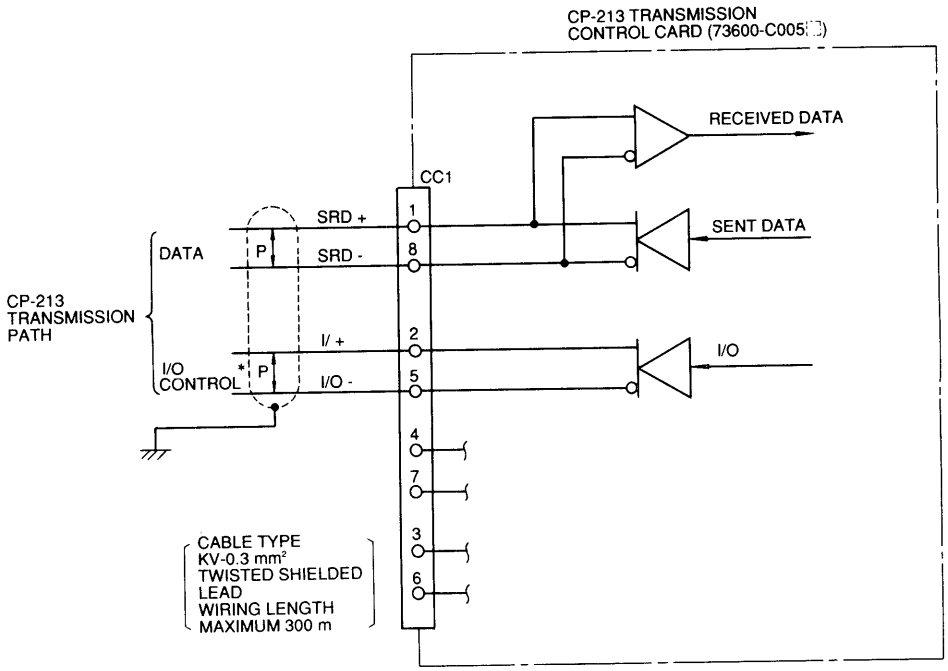
| Pin | Signal |
|---|---|
| A | B (+) |
| B | A (+) |
| C | 12 V |
| D | Spare terminal |
| E | Body |
| F | B (−) |
| G | A (−) |
| H | 0 V common |

[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 generator | MR-8LF(G)<br>{MR-8F (G)<br>+MR-8L (casing)} |  | KPEV-S<br>0.75 mm²<br>3-pair<br>lead | Honda Tsushin Co., Ltd. |
| CA2 | For pulse monitor | MR-8LM(G)<br>{MR-8M (G)<br>+MR-8L (casing)} |  | KPEV-S<br>0.75 mm²<br>3-pair<br>lead | Honda Tsushin Co., Ltd. |

## 3.3 CONNECTION TO CP-213 TRANSMISSION PATH




Adaptable connector MR-8LM(G) [MR-8M(G) + MR-8L (casing)]
(Solder type) [Honda Tsushin's product or equivalent]

* The I/O line is necessary when using the CP-290 sta-coupler (optical conversion).

†

| Cable Name | Cable Model | Pair | Connector Type | Manufacturer |
|---|---|---|---|---|
| Unit Connection | KV (0.3 mm²) | 3 | Connector MR-8M (G)<br>Casing MR-8L<br>Tab housing 171433-1<br>Tab probe 170151-1 | Honda Tsushin<br>Honda Tsushin<br>Nippon AMP<br>Nippon AMP |

This card is designed for general industrial use as the remote command unit and remote signaling unit. 1 Mb/s high-speed transmission is performed according the HLDC method by the electric bus (or optical bus).

## 3.4 CIRCUIT BREAKER, MAGNETIC CONTACT FOR MAIN CIRCUIT

A circuit breaker (MCCB) must always be connected between the AC main circuit power and VS-676VH3 input terminals Ⓡ, Ⓢ, Ⓣ. Also connect the magnetic contactor as necessary. Table 3.2 shows the recommended circuit breakers and magnetic contactors.

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

Table 3.2 Circuit Breaker and Magnetic Contact

| Applicable Inverter | | | | Recommended Circuit Breaker (Mitsubishi Electric Corp.) | Magnetic Contactor (Yaskawa Controls Co., Ltd.) |
|---|---|---|---|---|---|
| Votage Class | VS-676VH3 Model | Capacity kVA | Rated Current A | | |
| 200 V | CIMR-VH□20P4 | 1 | 3.2 | NF 30, 5A | HI-7E |
| | CIMR-VH□20P7 | 1.5 | 4.8 | NF 30, 10A | HI-7E |
| | CIMR-VH□22P2 | 3 | 9.6 | NF 30, 20A | HI-10-2E |
| | CIMR-VH□23P7 | 5 | 16 | NF 30, 30A | HI-20E |
| | CIMR-VH□25P5 | 7.5 | 24 | NF 50, 50A | HI-30E |
| | CIMR-VH□27P5 | 10 | 32 | NF100, 60A | HI-50E |
| | CIMR-VH□2011 | 15 | 48 | NF100, 100A | HI-50E |
| | CIMR-VH□2015 | 20 | 64 | NF100, 100A | HI-80E |
| | CIMR-VH□2022 | 30 | 96 | NF255, 150A | HI-100E |
| | CIMR-VH□2037 | 50 | 160 | NF400, 300A | HI-200E |
| | CIMR-VH□2055 | 70 | 224 | NF400, 400A | HI-300E |
| | CIMR-VH□2075 | 100 | 300 | NF600, 600A | HI-500E |
| 400 V | CIMR-VH□40P7 | 1.6 | 2.56 | NF 30, 5A | HI-7E |
| | CIMR-VH□42P2 | 3 | 4.8 | NF 30, 10A | HI-10-2E |
| | CIMR-VH□43P7 | 5 | 8 | NF 30, 20A | HI-20E |
| | CIMR-VH□47P5 | 10 | 16 | NF 30, 30A | HI-20E |
| | CIMR-VH□4011 | 15 | 24 | NF 50, 50A | HI-30E |
| | CIMR-VH□4015 | 20 | 32 | NF100, 60A | HI-50E |
| | CIMR-VH□4022 | 30 | 48 | NF100, 100A | HI-50E |
| | CIMR-VH□4030 | 40 | 64 | NF100, 100A | HI-80E |
| | CIMR-VH□4045 | 60 | 96 | NF225, 150A | HI-100E |
| | CIMR-VH□4055 | 80 | 128 | NF225, 225A | HI-125E |
| | CIMR-VH□4075 | 100 | 165 | NF400, 300A | HI-200E |
| | CIMR-VH□4110 | 140 | 224 | NF400, 400A | HI-300E |
| | CIMR-VH□4160 | 200 | 300 | NF600, 600A | HI-500E |

## 3.5 SURGE ABSORBER

Always connect surge absorber to the magnetic contactor or control relay, magnetic valve, magnetic brake coils used around the VS-676VH3. Table 3.3 shows the applicable surge absorbers.

Table 3.3 Applicable Surge Absorber

| Device \ Surge Absorber | | Mode | Specification | Code No. |
|---|---|---|---|---|
| 200 V to 230 V | Large-capacity Coil Other than Relay | DCR2-50A22E | 250 VAC 0.5 μF+200Ω | C002417 |
| | Control Relay<br>LY-2, -3 〔Omron〕<br>HH-22, -23 〔Fuji Electric〕<br>MM-2, -4 〔Omron〕 | DCR2-10A25C | 250 VAC 0.1 μF+100Ω | C002482 |
| 380 to 460 V devices | | DCR2-50D100B | 1000 VDC 0.5 μF+220Ω | C002630 |

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

## 3.6 NOTES UPON WIRING

Observe the following when performing external interconnection wiring. Always check the interconnection as soon as the wiring is correctly completed. Never use control circuit buzzer check.

(1) Wiring the Control Circuit

(a) Separate the control circuit leads (terminals ① to ㉜) from the main circuit leads (terminals Ⓡ, Ⓢ, Ⓣ, Ⓑ1/Ⓟ, Ⓑ2, Ⓤ, Ⓥ, Ⓦ, Ⓝ) and other power cables.

(b) Separate the control circuit leads ⑨, ⑩, ⑱, ⑲, ⑳ (contact output) from leads ① to ⑧, ⑪ to ⑰, and ㉑ to ㉜.

(c) Use twisted shielded leads and twisted pair shielded leads to wire the control circuit to prevent operation error caused by noise interference. Terminate the ends as shown in Fig. 3.2.

The wiring must be 50 m or less.

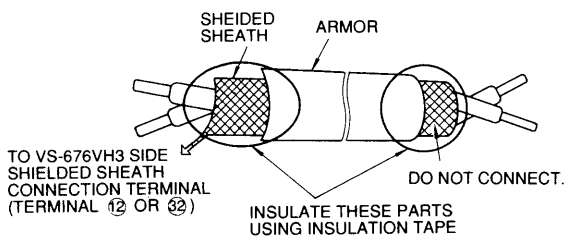



Fig. 3.2 Termination of Twisted Shielded Lead

(2) Wiring the Main Circuit Input/Output

(a) Phase rotation of the input terminals Ⓡ, Ⓢ, Ⓣ can be in either direction.

(b) Do not connect the AC main circuit power supply to the output terminals Ⓤ, Ⓥ, Ⓦ.

(c) Match the VS-676VH3 output terminals Ⓤ, Ⓥ, Ⓦ and the motor terminals Ⓤ, Ⓥ, Ⓦ respectively. When forward run command is given, the motor turns in the clockwise direction when viewed from the load side.

(d) Never let the output wiring touch the cabinet. (This may result in a short-circuit.)

(e) Do not connect power factor correction capacitor or LC, RC noise filter to the VS-676VH3 output side.

(3) Grounding

(a) Ground the ground terminal Ⓔ of the control unit and motor according to the type 3 grounding method (100Ω or less).

(b) Never ground the grounding of the VS-676VH3 in common with large-current electrical equipment as welding machines, motors or with the ground pole. Separate the grounding cable from the leads of large-current equipment.

(c) Use grounding cables that comply with AWG standard, and keep the length as short as possible.

(d) When multiple VS-676VH3 are used, ground them as shown in Fig. 3.3 (a), taking care not to form loops as shown in (b). Also be careful not to form loops between the control unit and the motor, as shown in Fig. 3.4 (c).

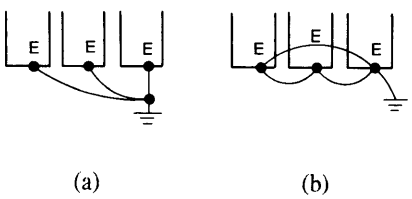



Fig. 3.3 When Grounding Multiple Control Units

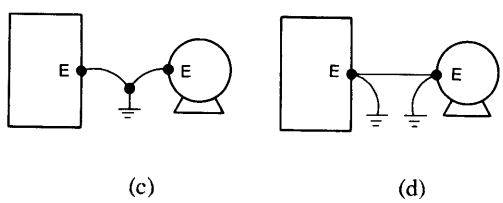



Fig. 3.4 When Grounding the Motor and the Control Unit

## 3.7 WIRE SIZES

The 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 3.4 200 V Class Wire Size

| Circuit | VS-676VH3 Model | Capacity kVA | Terminal Symbol | Terminal Screw | AWG | Wire Size* mm² | Wire Type |
|---|---|---|---|---|---|---|---|
| Main Circuit | CIMR-VH□20P4 | 1 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M4 | 14–10 | 2 to 5.5 | Power cable 〔600 V vinyl sheathed lead or equivalent〕 |
| | | | Ⓔ | | | 2 to 5.5 | |
| | CIMR-VH□20P7 | 1.5 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M4 | 14–10 | 2 to 5.5 | |
| | | | Ⓔ | | | 2 to 5.5 | |
| | CIMR-VH□22P2 | 3 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M4 | 12–10 | 3.5 to 5.5 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | CIMR-VH□23P7 | 5 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M4 | 12–10 | 3.5 to 5.5 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | CIMR-VH□25P5 | 7.5 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M5 | 10–8 | 5.5 to 8 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | CIMR-VH□27P5 | 10 | ⓇⓈⓉⓃ B1/P B2 ⓊⓋⓌ | M5 | 10–8 | 5.5 to 8 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | CIMR-VH□2011 | 15 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M6 | 8–6 | 8 to 14 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□2015 | 20 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M8 | 8–4 | 8 to 22 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□2022 | 30 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M8 | 4–2 | 22 to 38 | |
| | | | Ⓔ | | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□2037 | 50 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M10 | 1–4/0 | 38 to 100 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□2055 | 70 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M10 | 1–4/0 | 38 to 100 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□2075 | 100 | ⓇⓈⓉⓃ P1 P3 ⓊⓋⓌ | M12 | 4/0–MCM400 | 100 to 200 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡⓢ | M4 | 20–14 | 0.5 to 2 | |
| Control Circuit | Common to all models | | ① to ㉜ | M3.5 | 20–14 | 0.5 to 2 | Twisted shielded lead vinyl sheath cable with polyethylene insulation for instrumentation and shield KPEV-S (Made by Hitachi Densen) |

* Use power cable (600 V vinyl sheathed lead, etc.) of 0.5 to 2 mm² for the motor cooling fan.

**Important**

The size of the lead must be determined considering the voltage drop of the leads.

Table 3.5 400 V Class Wire Size

| Circuit | VS-676VH3 Model | Capacity kVA | Terminal Symbol | Terminal Screw | AWG | Wire Size* mm² | Wire Type |
|---|---|---|---|---|---|---|---|
| Main Circuit | CIMR-VH□40P7 | 1.6 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 ⓊⓋⓌ | M4 | | 2 to 5.5 | Power cable 〔600 V vinyl sheathed lead or equivalent〕 |
| | | | Ⓔ | | | | |
| | CIMR-VH□42P2 | 3 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 ⓊⓋⓌ | M4 | | 2 to 5.5 | |
| | | | Ⓔ | | | | |
| | CIMR-VH□43P7 | 5 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 ⓊⓋⓌ | M4 | | 2 to 5.5 | |
| | | | Ⓔ | M5 | | | |
| | CIMR-VH□47P5 | 10 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 ⓊⓋⓌ | M4 | | 3.5 to 5.5 | |
| | | | Ⓔ | M5 | | 2 to 5.5 | |
| | CIMR-VH□4011 | 15 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 Ⓟ3 ⓊⓋⓌ | M5 | | 5.5 to 8 | |
| | | | Ⓔ | M8 | | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | | 0.5 to 2 | |
| | CIMR-VH□4015 | 20 | ⓇⓈⓉⓃ Ⓑ1/⊕ Ⓑ2 Ⓟ3 ⓊⓋⓌ | M5 | | 5.5 to 8 | |
| | | | Ⓔ | M8 | | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | | 0.5 to 2 | |
| | CIMR-VH□4022 | 30 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M6 | | 8 to 14 | |
| | | | Ⓔ | M8 | | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | | 0.5 to 2 | |
| | CIMR-VH□4030 | 40 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M8 | | 22 to 38 | |
| | | | Ⓔ | | | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | | 0.5 to 2 | |
| | CIMR-VH□4045 | 60 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M8 | | 22 to 38 | |
| | | | Ⓔ | | | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | | 0.5 to 2 | |
| | CIMR-VH□4055 | 80 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M10 | 1–4/0 | 38 to 100 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□4075 | 100 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M10 | 1–4/0 | 38 to 100 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□4110 | 140 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M10 | 1–4/0 | 38 to 100 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | 20–14 | 0.5 to 2 | |
| | CIMR-VH□4160 | 200 | ⓇⓈⓉⓃ Ⓟ1 Ⓟ3 ⓊⓋⓌ | M12 | 4/0–MCM400 | 100 to 200 | |
| | | | Ⓔ | M8 | 14–10 | 2 to 5.5 | |
| | | | ⓡ ⓢ200 ⓢ400 ⓧ ⓨ | M4 | 20–14 | 0.5 to 2 | |
| Control Circuit | Common to all models | | ① to ㉜ | M3.5 | | 0.5 to 2 | Twisted shielded lead 〔vinyl sheath cable with polyethylene insulation for instrumentation and shield KPEV-S (Made by Hitachi Densen)〕 |

* Use power cable (600 V vinyl sheathed lead, etc.) of 0.5 to 2 mm² for the motor cooling fan.

## 3.7 WIRE SIZES (Cont'd)

Table 3.6 Size of Closed-Loop Connectors (JIS C 2805)
(Common to 200 V Class, 400 V Class)

| AWG | Wire Size $mm^2$ | Terminal Screw | Round Crimp Terminal Size |
|---|---|---|---|
| 20 | 0.5 | M3.5<br>M4 | 1.25-3.5<br>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 |
| 1 | 38 | M8 | 38-8 |
| 1 | 38 | M10 | 38-10 |
| 2/0 | 60 | | 60-10 |
| 3/0 | 80 | | 80-10 |
| 4/0 | 100 | | 100-10 |
| 4/0 | 100 | M12 | 100-10 |
| MCM 300 | 150 | | 150-12 |
| MCM 400 | 200 | | 200-12 |

# 4. TEST OPERATION

Before starting test operation, make sure that the coupling or belt which connect the motor with the machine are separated, for safety. If operation must be performed connecting the motor directly to the machine, be very careful of any potential danger.

## 4.1 CHECK BEFORE SUPPLYING POWER

Check the following after installation and interconnection.

(1) Interconnection is made correctly.
(2) No short circuit caused by wire chips, etc.
(3) No loose screw terminals.
(4) Load is in good condition.

## 4.2 SETTING THE LINE VOLTAGE

(Required only for models of 400 V class 11 kW or higher)

The line voltage selection connector must be set according to the type of the main circuit power source, as shown in Fig. 4.1. Insert the connector at the position shown in the line voltage to be used.

The connector is preset at the 460 V position upon shipment.

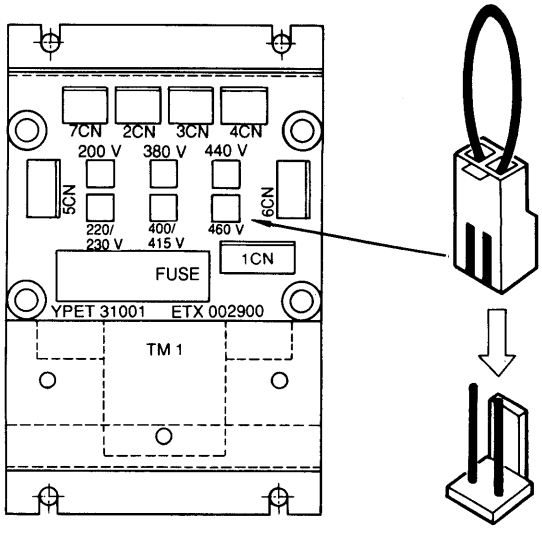



Fig. 4.1 Selection of the Line Voltage

## 4.3 SUPPLY MAIN CIRCUIT POWER

Supply power to the main circuit, and check that there is no fault (abnormal noise, fumes, bad odors, etc.).

By supplying power to the main circuit, the charge LED "CHARGE" lights, to indicate that it is ready for operation. The display section of the digital operator will then turn on.

## 4.4 CHECKING THE PG ROTATION DETECTION DIRECTION

Check that the polarity of the display 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. 4.2)

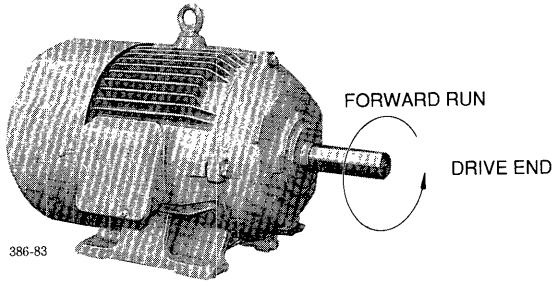
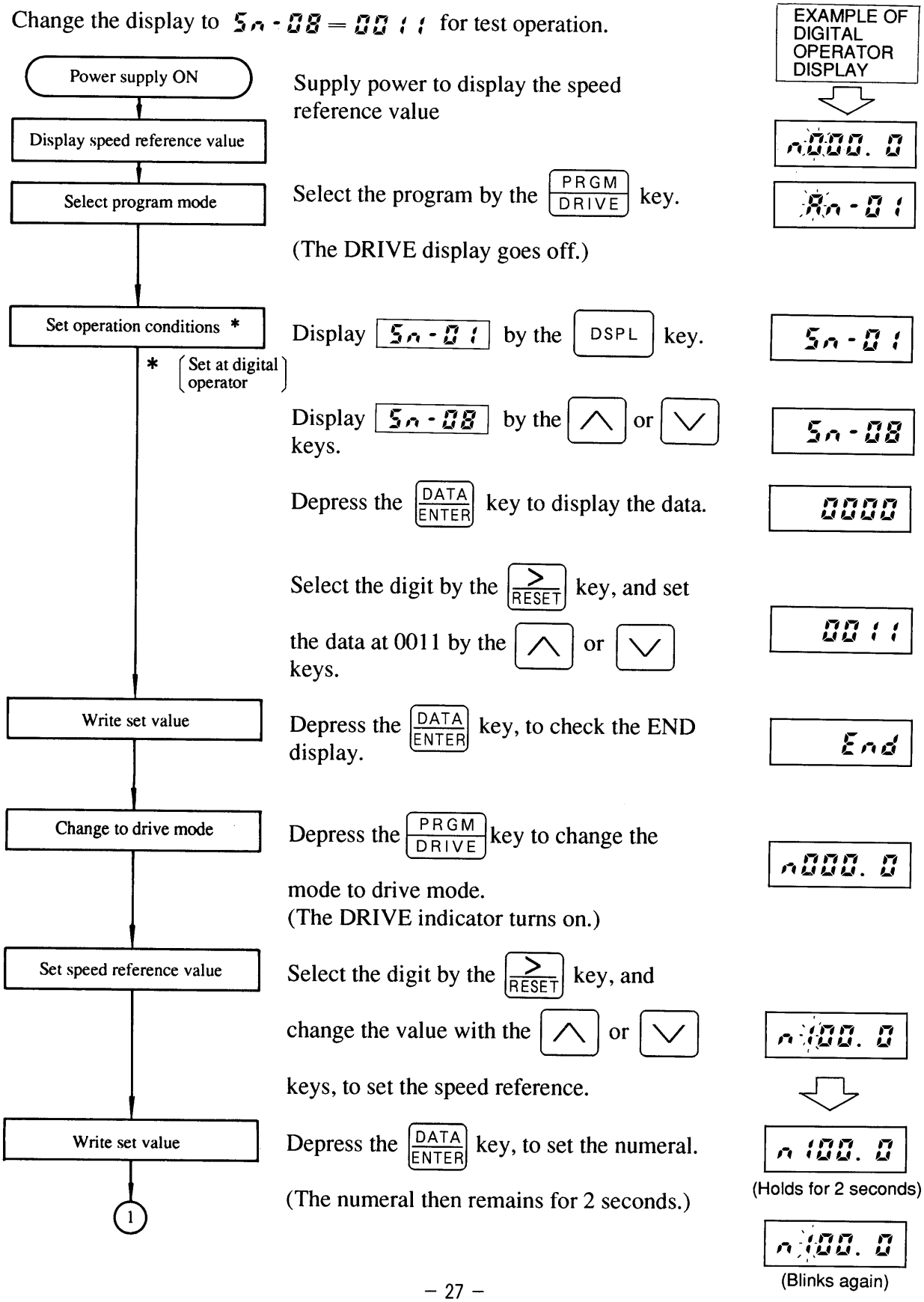


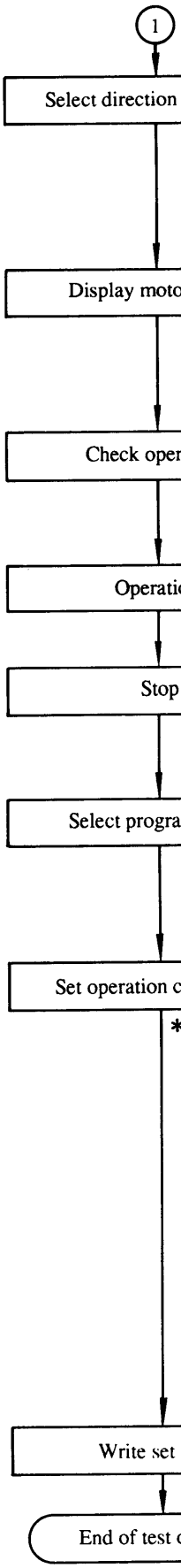

Fig. 4.2 Direction of Motor Rotation

# 5. OPERATION

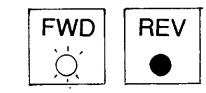
## 5.1 OPERATION BY DIGITAL OPERATOR (Test Operation)

Change the display to $5n-08=0011$ for test operation.



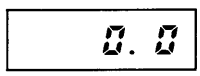



Select the direction of rotation by the FWD/REV key.
[The selected direction is then displayed on the digital operator.]

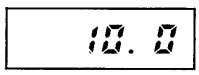



(Example of forward rotation)

Depress the DSPL key to change to the motor speed display.



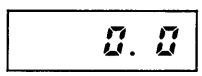

Depress the JOG key to check the motor operation.




Start operation by the RUN key.

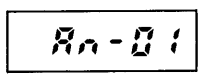

(The display is incremented to 10%)

Depress the STOP key to stop the operation.



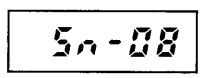

(The display is reduced to 0%)

Select program mode by the PRGM/DRIVE key.




(The DRIVES display then goes out.)

Display Sn-08 by the DSPL key.

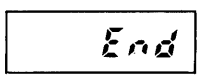



(The previous constant number is stored.)

Depress the DATA/ENTER key to display the data.

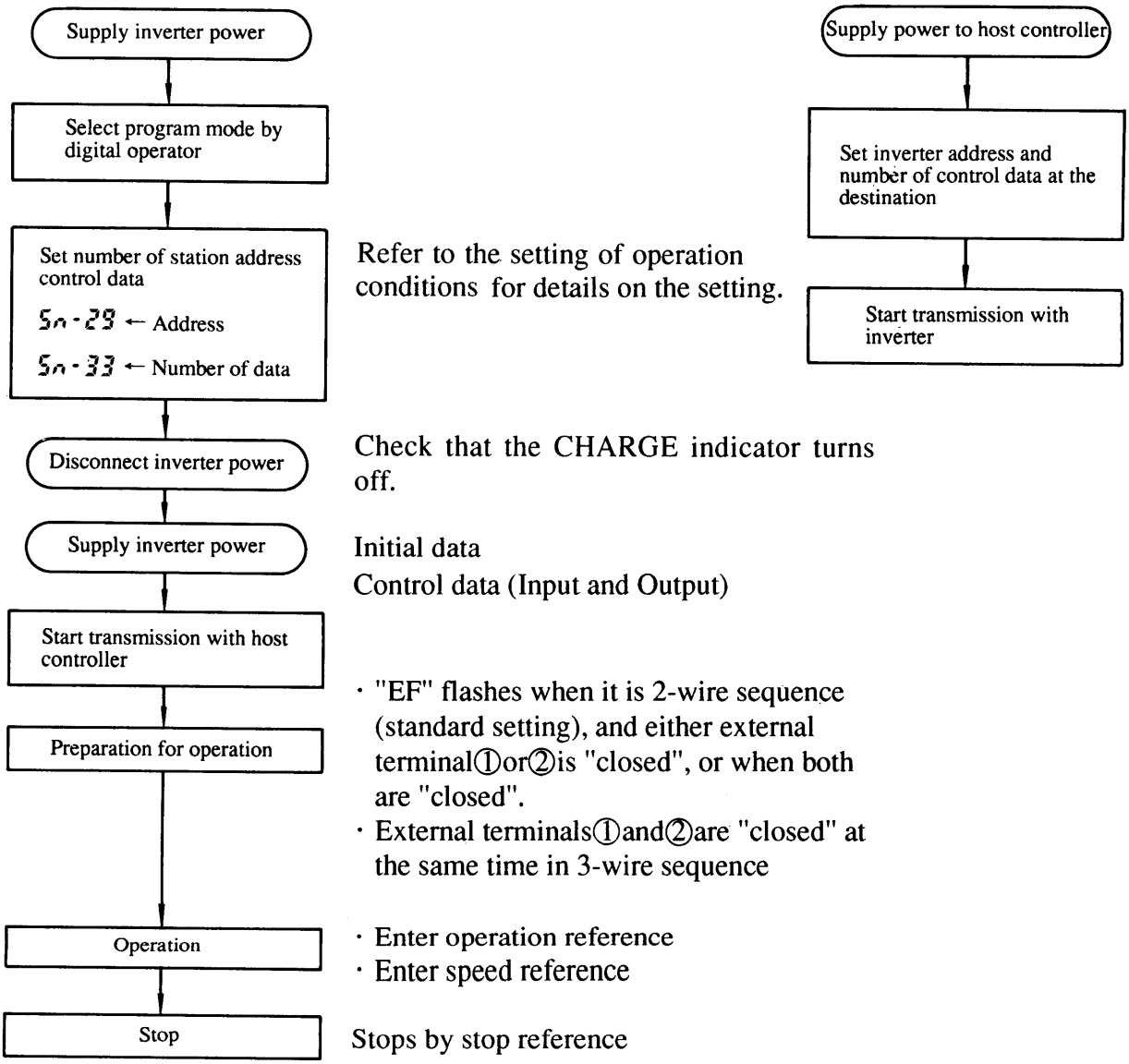

Select the digit by the >/RESET key, and set the data at 0000 by the ∧ or ∨ keys.


Depress the DATA/ENTER key, to check that END is displayed.
(This makes it ready for operation by CP-213 transmission.)



## 5.2 OPERATION BY CP-213 TRANSMISSION (Normal Operation)

The standard setting is the operation mode ( $5n-08 = 0011$ ) by CP-213 transmission.




Note: External terminal and operation when operating by CP-213 transmission

(1) External terminal

(a) Sequence input signal

·Stop reference :
External terminals ①, ② ··· Always enabled

·External fault :
External terminal ③ ···Always enabled

·Fault reset :
External terminal ④ ···Enabled only when stopped

·Multi-function input :
External terminal ⑤ to ⑧ ···Always enabled (Standard setting)

(b) Analog input signal

·Master speed reference :
External terminal ⑬, ⑭ ···Disabled

·Auxiliary reference:
External terminal ⑯ ···Disabled

(c) Sequence output signal ···Always enabled
Analog output signal

(2) Digital operator

(a) Operation reference

·Stop reference : [STOP] key···Disabled

·Fault reset : [RESET] key ···Enabled only when stopped

·Jog reference : [JOG] key···Disabled

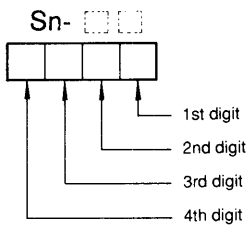
· Forward/reverse rotation selection : [FWD/REV] key ···Disabled

(b) Speed reference... Disabled

## 5.3 FUNCTION SELECTION BY SYSTEM CONSTANT

Select the optimum function for the system.

- Select the torque control mode
- Select the reference position of operation reference, speed reference
- Select the stop method when the stop reference is input
- Select reverse operation prohibition and forward operation prohibition
- Select free run retracting function
- Select how to stop in case of fault
- Select 2-wire sequence or 3-wire sequence




(1) Selecting the Torque Control Mode

The torque control mode is selected by the system constant torque control selection (3rd digit of Sn-30) and the multi-function input function torque control selection (set value 71).

Table 5.1 Torque Cntrol Selection

| Selection / Mode | Torque Control Selection | |
|---|---|---|
| | 3rd Digit of Sn-30 | Milti-function Input (Set Value 71) |
| Speed Control | ××0×× | "Open" or when not selected |
| Torque Control | Sn-03 = ×1×× or Multi-function input = "Closed" (Set value 71) | |

Note : × represents "0" or "1".

(2) Selecting Reference Position of Operation Reference, Speed Reference

The reference position is selected by the operator selection (1st digit and 2nd digit of Sn-04) of the system constant and inverter operation selection (1st and 2nd digits of Sn-08), and the multi-function input operator selection (set value 01) and inverter operation selection (set value 02).

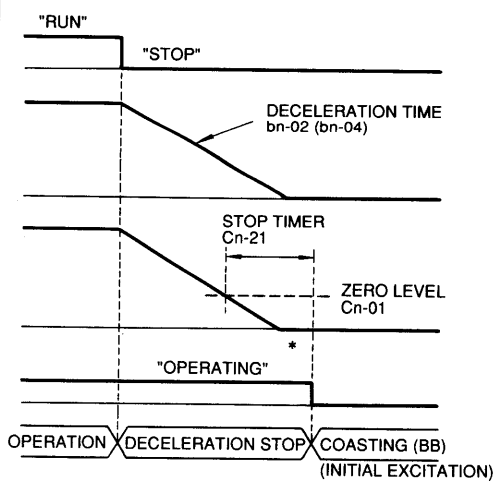
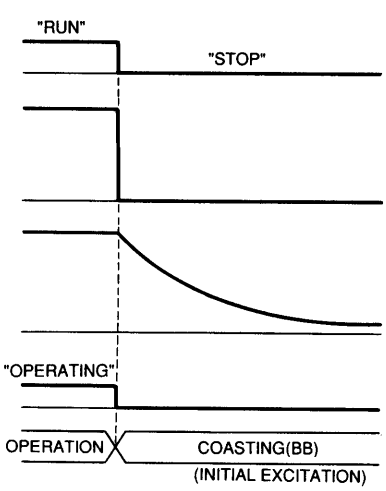
Table 5.2 Selecting the Command Positions

| Selection / Reference Position | Inverter Operation Selection | | Operator Operation Selection | |
|---|---|---|---|---|
| | 1st and 2nd Digit of Sn-08 | Multi-function Input (Set Value 02) | 1st and 2nd Digit of Sn-04 | Multi-function Input (Set Value 01) |
| CP-213 Transmission | ×× 00 | "Open" or not selected | — | — |
| External Terminal | Sn-08 = ×× 11 or multi-function input = "closed" (Set value 02) | | ×× 00 | "Open" or not selected |
| Digital Operator | | | Sn-04 = ×× 11 or multi-function input = "closed" (Set value 01) | |

(3) Selecting the Stop Method when the Stop Reference is Input

The stop method when the stop reference is input can be selected by the system constant Sn-04.

Table 5.3 Selecting the Stop Method

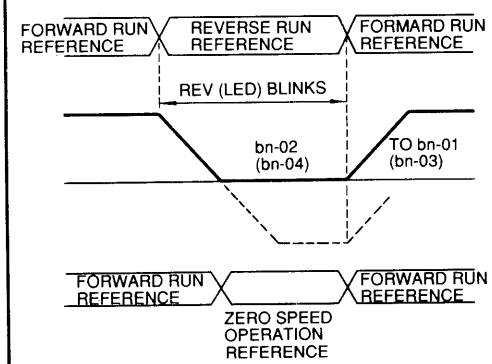
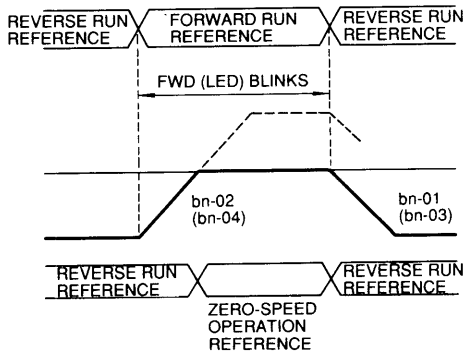
| Sn-04 Set Value / Operation / Stop Mode | 00 ×× | 01 ×× |
|---|---|---|
| | Deceleration Stop | Coasting to a Stop (Inverter BB) |
| Operation Reference<br>Speed Reference (Soft Starter Output)<br>Motor Speed<br>During Operation<br>Operation |  |  |

* See the 2nd digit of the system constant Sn-07 for the ASR control mode when the motor speed is less than the zero level.

(4) Selecting Reverse Run Prohibition and Forward Run Prohibition

The speed reference is accepted only to the specified direction of the motor.

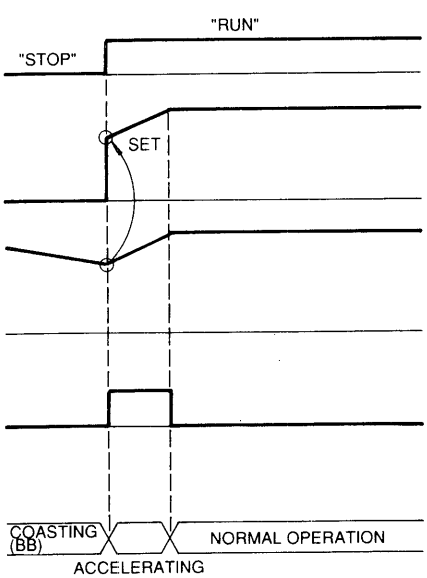
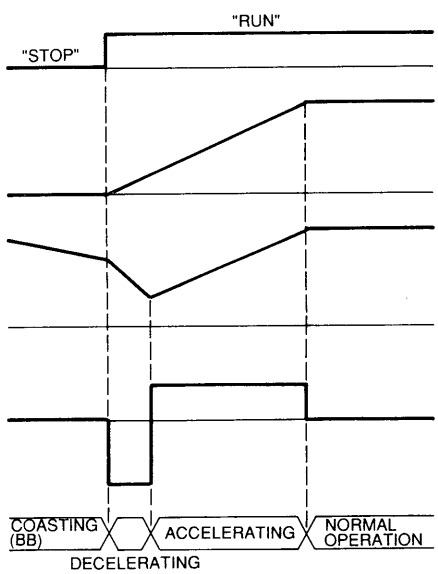
Table 5.4 Selection of Operation Prohibition

| Sn-05 Set Value / Operation / Stop Mode | × 01 × | × 10 × |
|---|---|---|
| | Reverse Run Prohibition | Forward Run Prohibition |
| Operation Reference<br>Speed Reference (Soft Starter Output)<br>Operation |  |  |

(5) Selecting Coasting Retracting Function

When start is to be commanded against a coasting motor, re-acceleration (deceleration) can be accomplished so that the motor reaches the setting speed with a minimum of shock (standard).

Table 5.5 Coasting Retracting Function

| Sn-07 Set Value / Operation / Stop Mode | × × × 0 | × × × 1 |
|---|---|---|
| | With Coasting Retracting Function | Without Coasting Retracting Function |
| Operation Reference<br>Speed Reference (Soft Starter Output)<br>Motor Speed<br>Torque Reference<br>Operation |  |  |

(6) Selecting How to Stop in Case of Fault

The way to stop in case of fault as shown in Table 5.6 can be selected by the system constants.

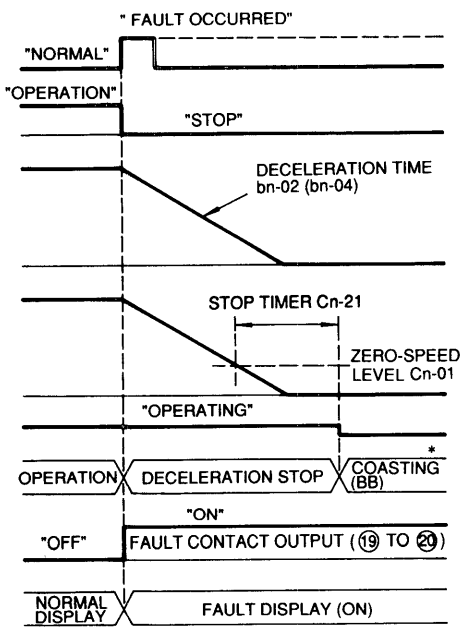
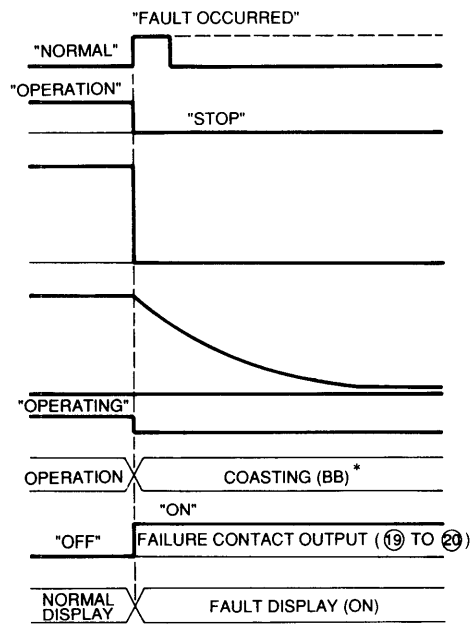
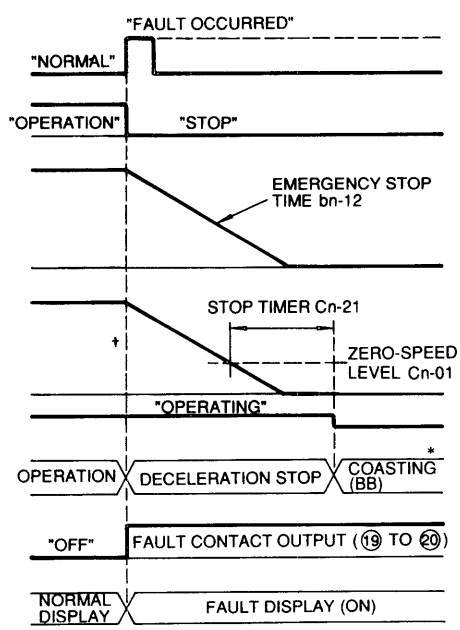
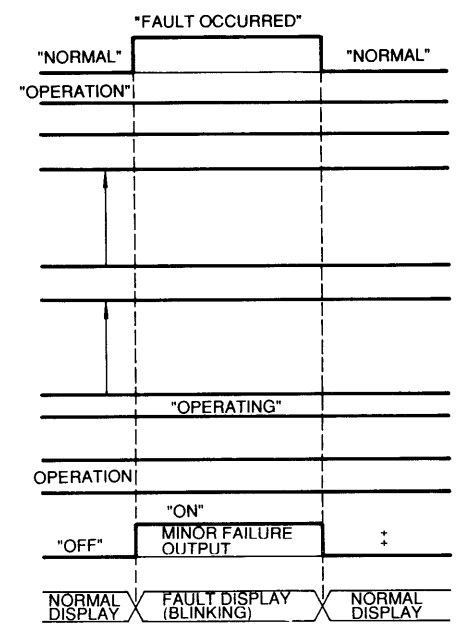
Table 5.6 How to Stop in Case of Fault

| Item | | Related System Constant |
|---|---|---|
| Excess Speed Differential | DEV | Sn-10 1st, 2nd digits |
| Overspeed | OS | Sn-10 3rd, 4th digits |
| External Fault Detection | EF | Sn-12 3rd, 4th digits |
| Inverter Overload | OL2 | Sn-13 1st, 2nd digits |
| Cooling Fan Fault | FAN | Sn-13 3rd, 4th digits |
| Motor Overload | OL1 | Sn-14 1st, 2nd digits |
| Motor Overheat | OH1 | Sn-14 3rd digit |
| Thermister Line Break | THM | Sn-14 4th digit |

See Table 5.7 "Stop in case of fault" for the stop operation.

# 5.3 FUNCTION SELECTION BY SYSTEM CONSTANT (Cont'd)

Table 5.7 Stop in Case of Fault

| Operation Mode \ Stop Mode | Deceleration Stop (Major Failure) | Coasting to a Stop (Major Failure) |
|---|---|---|
| Fault, Operation Reference (Internal), Speed Reference (Soft Starter Output), Motor Speed, Operating, Operation, Failure Output, Operator Display |  |  |
| **Operation Mode \ Stop Mode** | **Emergency Stop** | **Operation Continued (Minor Failure)** |
| Fault, Operation Reference (Internal), Speed Reference (Soft Starter Output), Motor Speed, Operating, Operation, Failure Output, Operator Display |  |  |

* It is also BB when initial excitation is selected for the fault contact input selection.

† The emergency torque compensation (Cn-11) is added to the ASR output.

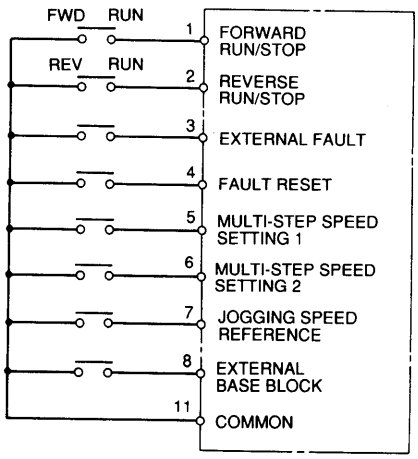
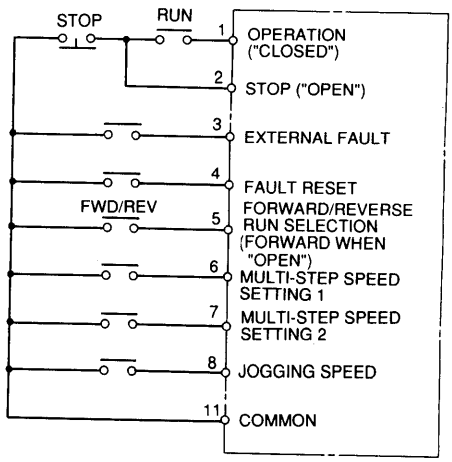
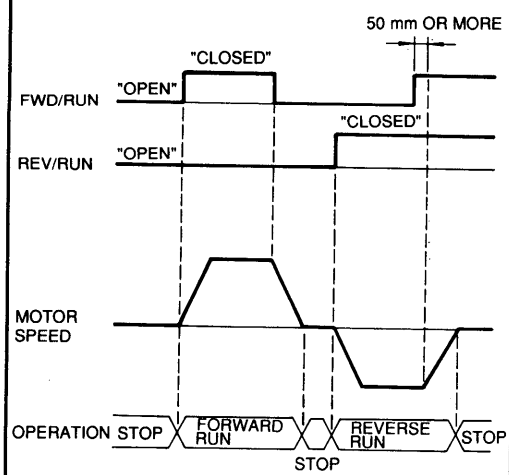
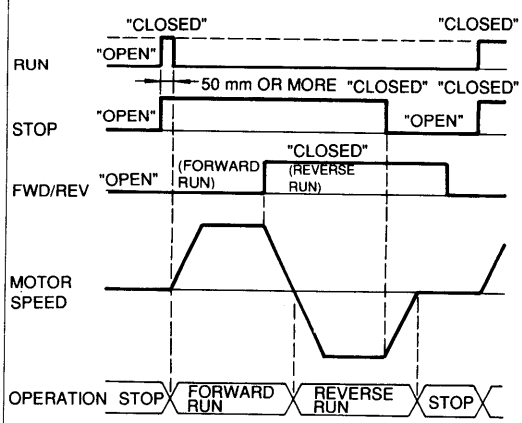
‡ When minor fault output is selected for the multi-function contact output selection, the hold/reset status after recovery from the fault can be selected by the 4th digit of Sn-08.

(7) Selecting 2-wire Sequence or 3-wire Sequence

Data can be set in system constant Sn-15 to select between 2-wire sequence and 3-wire sequence.

·Sn-15 data setting value ≒ 0 ... 2-wire sequence
= 0 ... 3-wire sequence

Table 5.8 2-wire Sequence and 3-wire Sequence

| Operation \ Sequence | 2-wire Sequence (Default Upon Shipment from Plant) | 3-wire Sequence |
|---|---|---|
| External Sequence Input Function |  |  |
| Operation |  |  |

## 5.4 OVERVIEW OF APPLICATION CONSTANTS

Table 5.9 Overview of Application Constants

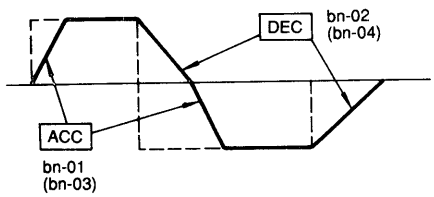
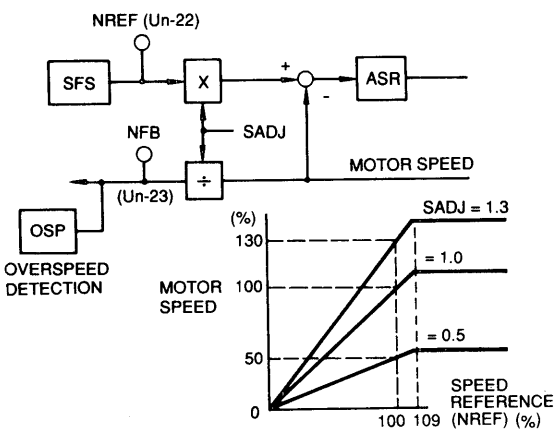
| Constant No. | Name | Function | Remarks |
|---|---|---|---|
| bn-01<br>bn-02<br>bn-03<br>bn-04 | Acceleration time (ACC1)<br>Deceleration time (DEC1)<br>Acceleration time (ACC2)<br>Deceleration time (DEC2) | • Sets the speed reference accel/decel rate<br>• Sets the 0 ⟷ 100% speed reference time<br>• Accel/decel can be set separately<br>  | • The minimun deceleration time is decided by the regenerative power processing capacity of the system.<br>• When transmission control data, operation signal accel/decel time selection (No. 1 bit 6) are selected, bn-03 and bn-04 are enabled. |
| bn-05<br>bn-06 | ASR proportional gain (ASRP)<br>ASR integral time (ASRI) | Sets the proportional gain and integral time of the speed controller.<br>$K \cdot \left(1 + \frac{1}{ST}\right)$<br>ASRP ASRI | Setting must be made so that the speed control system does not start hunting. |
| bn-07<br>bn-08<br>bn-09 | Forward side torque limit (TLF)<br>Reverse side torque limit (TLR)<br>Regeneration side torque limit (TLG) | Sets the electric and regenerative torque limit.<br>T<br>Reverse, regenerative (TLF and TLG have the lowest priority)<br>Forward, electric (TLF)<br>N<br>0<br>Reverse, electric (TLR)<br>Forward, regenerative (speed) (TLF and TLG have the lowest priority) | Internally operates as the limit of the secondary current command (I2R) (See figure on left). |
| bn-10 | Rated speed adjustment (SADJ) | • Fine adjustment of the motor rated speed at 100% speed reference.<br>  <br>• Constant output characteristics when motor speed is 1.0 r/min or more. | Used for fine adjustment of the speed of the motor by gear. |

Table 5.9 Overview of Application Constants (Cont'd)

<table>
<tr><th>Constant No.</th><th>Name</th><th>Function</th><th>Remarks</th></tr>
<tr><td>bn-11</td><td>Trace sampling time (TSAP)</td><td>Sets the trace data sampling period.<br>(20 ms to 60 s)</td><td>Updates the shared memory by the sampling period.</td></tr>
<tr><td>bn-12</td><td>Emergency stop time (DEMG)</td><td>The stop mode in case of fault sets the stop time for emergency stop.</td><td>Emergency stop has priority over the normal deceleration time (bn-02 or bn-04)</td></tr>
<tr><td>bn-13</td><td>Monitor number upon power supply (MONSEL)</td><td>Sets the display of the digital operator when the power is supplied.<br><table><tr><th>Set Value</th><th>Display</th><th>Unit</th></tr><tr><td>1</td><td>Speed reference</td><td>%</td></tr><tr><td>2</td><td>Speed feedback</td><td>%</td></tr><tr><td>3</td><td>Output current</td><td>A</td></tr></table></td><td>The speed reference, speed feedback unit and display numeral can be changed by Cn-12.</td></tr>
<tr><td>bn-14</td><td>PG division rate (PGRAT)</td><td>Divides the pulse from the PG and outputs the result as the pulse monitor.<br>(Sets the division rate)<br>Division rate $= \frac{n+1}{m}$ $\left(\text{Setting range } \frac{1}{2} \text{ to } \frac{1}{32}\right)$<br>Data  <br>m : 2 to 32<br>n : 0, 1</td><td>The division is for the pulse monitor, and has nothing to do with the control.</td></tr>
</table>

## 5.5 OVERVIEW OF THE CONTROL CONSTANT

Table 5.10 Overview of the Control Constant

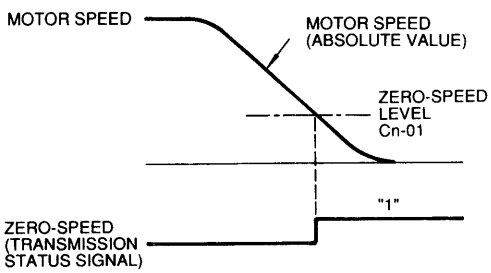
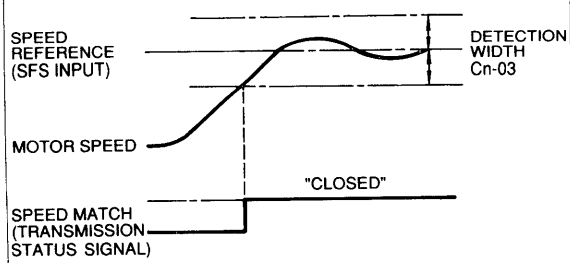
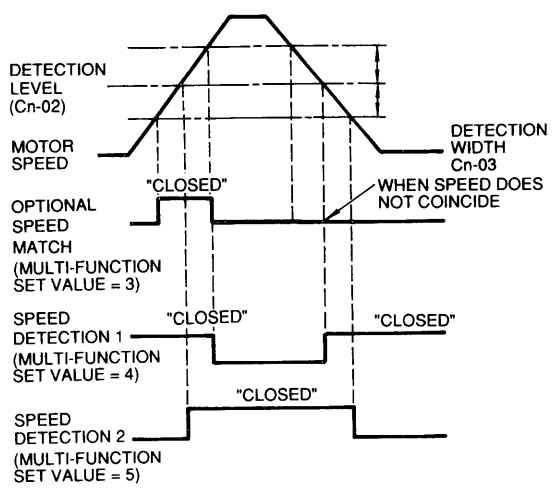
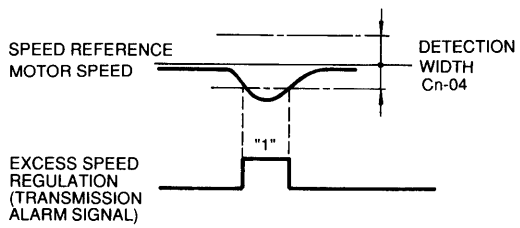
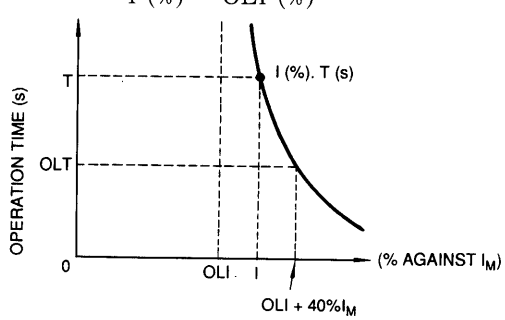
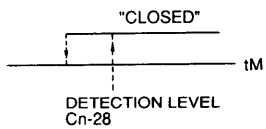
| Constant No. | Name | Function | Remarks |
|---|---|---|---|
| Cn-01 | Zero-speed level (ZSP) | Sets the zero-speed detection level. (Initial value 2%)<br>  | The stop process during zero-speed detection follows the setting of Sn-07.<br>(Multi-function setting 1) |
| | | Speed match :<br>"Closed" when the speed reference and motor speed come within the following detection range.<br>  | Detection process only is performed (no stop process, etc.).<br>(Multi-function setting 2) |
| Cn-02<br><br>Cn-03 | Speed agree detection level (NDETL)<br><br>Speed agree detection width (NAGRW) | Optional speed match :<br>"Closed" when the speed matches and the motor speed is within the following detection range.<br>  | Function selection for multi-function setting output terminal<br>See Sn-20 to Sn-24. |

Table 5.10 Overview of the Control Constant (Cont'd)

| Constant No. | Name | Function | Remarks |
|---|---|---|---|
| Cn-04 | Excess speed regulation level (DEVL) | Outputs alarm when the speed reference and motor speed come within the following detection range.<br>Not detected during accel/decel and during torque control<br>  | The stop in case alarm occurs follows the setting of Sn-10.<br>(Transmission alarm signal) |
| Cn-07 | ASR output delay time (DTL) | Sets the primary delay time constant that restricts the variation of the secondary current command (ASR output).<br>$\frac{1}{1 + ST_1}$<br>$T_1$ : ASR delay time (Cn-07) | Prevents twisted resonation, generation of overtorque, etc. caused by rapid change of the torque reference. |
| Cn-09 | PG constant (PGC) | Sets the number of pulses of the used PG (pulse generator). The set value is the number of pulses per rotation of motor (pulse/rev). | |
| Cn-10 | Speed limit bias (EXSP) | Sets the bias against the speed limit input during torque control. | Effective only when under the torque control mode. |
| Cn-11 | Emergency torque compensation (ETC) | Sets the torque compensation value given as fixed value instead of the torque compensation amount (TCMP) from the host when transmission error is detected. | See the functional block diagram. |
| Cn-14<br>Cn-15 | Motor OL start current (%) (OLI)<br>Operation time (s) at OLI + 40% IM (OLT) | • Sets the motor OL protection operation area.<br>• OLI : Sets the motor OL start point by the % against the motor rated current. ($I_M$)<br>• The motor OL time (T) against the output current I (% against the rated current of motor) is as shown in the following expression.<br>$T\ (s) = \frac{40\ (\%)}{I\ (\%) - OLI\ (\%)} \times OLT\ (s)$<br>  | The motor OL operation stop method is set by Sn-14. |

## 5.5 OVERVIEW OF THE CONTROL CONSTANT (Cont'd)

Table 5.10 Overview of the Control Constant (Cont'd)

| Constant No. | Name | Function | Remarks |
|---|---|---|---|
| Cn-16 | Overspeed level (OSP) | Sets the motor overspeed level (initial value is 120%). | The overspeed detection stop method is set by Sn-10. |
| Cn-27 | Torque reference delay time | Sets the primary delay time constant that restricts the variation of the torque reference input. | |
| Cn-28 | Motor temperature rise detection level | Output when the temperature detection in motor with thermistor is above the value preset in Cn-28.<br><br>Motor temperature rise detection (Multi-function setting value = 34)<br><br>  <br> | Function selection of multi-function output terminal<br><br>See Sn-20 to Sn-24. |
| Cn-29 | Motor temperature transmission selection | Specifies the number (1 to 14) of the control data (inverter → host) when transmitting the motor detection temperature to the host controller. | See CP-213 transmission data. |

# 6. MAINTENANCE

## 6.1 PERIODIC INSPECTION

VS-676VH3 requires very few routine checks. However, performing daily checks as shown in Table 6.1 will prevent potential accidents and secure highly reliable operation for a long time. Before checking, disconnect the main circuit power, and check that the CHARGE indicator is off.

Table 6.1 Periodical 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 | Blow by dry compressed air of 4 to 6 kg/cm$^2$ pressure |
| Printed Circuit Board | Accumulated conductive dust or oil mist | Clean the board<br>If dust and oil still remain, replace the board |
| Cooling Fan | Excessive noise and vibration<br>Whether cumulative operation time exceeds 20,000 hours | Replace the cooling fan |
| Power Element | Accumulated dust and dirt | Blow by dry compressed air of 4 to 6 kg/cm$^2$ pressure |
| Smoothing Capacitor | Discoloration, odor, etc | Replace the capacitor or inverter unit |

## 6.2 SPARE PARTS

It is recommended that friction parts to be replaced for safe use of the VS-676VH3 for a long time span. Refer to Table 6.2, Table 6.3, Table 6.4 for list of spare parts, and Table 6.5 for standard time of replacement.

Table 6.2 Common Spare Parts

| Spare Part Name / Spare Part Specification | Control Card | PG-B Card | Digital Operator | CP-213 Transmission Control Card |
|---|---|---|---|---|
| Model | — | — | JVOP-100 | — |
| Code No. | ETC67002□-S20□□ | 73600-A002□ | CDR 000070 | 73600-C005□ |
| Quantity | 1 | 1 | 1 | 1 |

Table 6.3 200 V Class Spare Parts

| VS-676VH3 Model / Spare Parts Names / Spare Parts Specifications | | Power Supply Board | Power Board (Note 2) | Main Circuit Transistor | Main Circuit Diode | Fuse | Cooling Fan |
|---|---|---|---|---|---|---|---|
| CIMR-VH□20P4 | Model | — | | 6MBI10-060 | 10L6P44 | CR2LS-10/UL | — |
| | Code No. | ETC67010□ | ETP67001□ | STR000335 | SID000429 | FU000823 | — |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | — |
| CIMR-VH□20P7 | Model | — | | 6MBI15-060 | 10L6P44 | CR2LS-10/UL | — |
| | Code No. | ETC67010□ | ETP67002□ | STR000336 | SID000429 | FU000823 | — |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | — |
| CIMR-VH□22P2 | Model | — | | 6MBI30-60 | 6R130E-080 | CR2LS-20/UL | 4710NL-05W-B49 |
| | Code No. | ETC67010□ | ETP67024□ | STR000337 | SID000430 | FU000799 | FAN000175 |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | 1 |
| CIMR-VH□23P7 | Model | — | | 6MBI50-60 | 6R130E-080 | CR2LS-30/UL | 4710NL-05W-B49 |
| | Code No. | ETC67010□ | ETP67025□ | STR000338 | SID000430 | FU000791 | FAN000175 |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | 1 |
| CIMR-VH□25P5 | Model | — | — | MG75J2YS1 | 6R150E-080 | CR2LS-50/UL | 4710NL-05W-B49 |
| | Code No. | ETC67010□ | ETP67026□ | STR000339 | SID000431 | FU000797 | FAN000175 |
| | Q'ty | 1 | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□27P5 | Model | — | — | MG100J2YS1 | 6R175E-080 | CR2LS-50/UL | 4710NL-05W-B49 |
| | Code No. | ETC67010□ | ETP67027□ | STR000340 | SID000432 | FU000797 | FAN000175 |
| | Q'ty | 1 | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□2011 | Model | — | — | MG150J2YS1 | 100L6P41 | CR2LS-75-UL | THA1V-7556XV |
| | Code No. | — | ETP67003□ | STR000364 | SID000291 | FU000792 | FAN000176 |
| | Q'ty | — | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□2015 | Model | — | — | MG200J2YS1 | 110L2G43 | CR2LS-100 | THA1V-7556XV |
| | Code No. | — | ETP67003□ | STR000365 | SID000412 | FU000794 | FAN000176 |
| | Q'ty | — | 1 | 3 | 3 | 1 | 1 |
| CIMR-VH□2022 | Model | — | — | CM300HA-12 | 110L2G43 | CR2L-150 | THA1V-7556XV |
| | Code No. | — | ETP67004□ | STR000374 | SID000412 | FU000750 | FAN000176 |
| | Q'ty | — | 1 | 6 | 3 | 1 | 1 |
| CIMR-VH□2037 | Model | — | — | CM500HA-H | 160L2G43 | CR2L-260 | THA1V-7556XV |
| | Code No. | — | ETC67015□ | STR000316 | SID000447 | FU000752 | FAN000176 |
| | Q'ty | — | 1 | 6 | 6 | 1 | 2 |
| CIMR-VH□2055 CIMR-VH□2075 | Model | Contact your Yaskawa representative. | | | | | |
| | Code No. | | | | | | |
| | Q'ty | | | | | | |

Notes :

1. Spare parts in [shaded] are recommended to be replaced by units, to maintain the quality.
2. The gate drive card is specified for model CIMR-H□2011 and above.

Table 6.4 400 V Class Spare Parts

| VS-676VH3 Model \ Spare Parts Names / Spare Parts Specifications | | Power Supply Board | Power Board (Note 2) | Main Circuit Transistor | Main Circuit Diode | Fuse | Cooling Fan |
|---|---|---|---|---|---|---|---|
| CIMR-VH□40P7 | Model | — | — | 6MBI8-120 | RM10TA-24 | 80LF15 | 4710NL-05W-B49 |
| | Code No. | ETC67011□ | ETP67008□ | STR000344 | SID000434 | FU000760 | FAN000175 |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | 1 |
| CIMR-VH□42P2 | Model | — | — | 6MBI15-120 | RM10TA-24 | 80LF15 | 4710NL-05W-B49 |
| | Code No. | ETC67011□ | ETP67029□ | STR000345 | SID000434 | FU000760 | FAN000175 |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | 1 |
| CIMR-VH□43P7 | Model | — | — | 2MBI25-120 | 30Q6P42 | 80LF25 | 4710NL-05W-B49 |
| | Code No. | ETC67011□ | ETP67030□ | STR000367 | SID000435 | FU000761 | FAN000175 |
| | Q'ty | 1 | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□47P5 | Model | — | — | 2MBI50-120 | 30Q6P42 | 80LF25 | 4710NL-05W-B49 |
| | Code No. | ETC67011□ | ETP67031□ | STR000368 | SID000435 | FU000761 | FAN000175 |
| | Q'ty | 1 | 1 | 1 | 1 | 1 | 1 |
| CIMR-VH□4011 | Model | — | — | MG75Q2YS1 | 50Q6P43 | 80LF50 | THA1V-HS4556MV |
| | Code No. | — | ETC67005□ | STR000353 | SID000407 | FU000762 | FAN000180 |
| | Q'ty | 1 | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□4015 | Model | — | — | MG100Q2YS1 | 100Q6P43 | 80LF50 | THA1V-HS4556MV |
| | Code No. | — | ETC67005□ | STR000354 | SID000443 | FU000762 | FAN000180 |
| | Q'ty | 1 | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□4022 | Model | — | — | MG150Q2YS1 | 100Q6P43 | CR6L-100 | THA1V-HS7556XV |
| | Code No. | — | ETC67006□ | STR000355 | SID000408 | FU000758 | FAN000176 |
| | Q'ty | — | 1 | 3 | 1 | 1 | 1 |
| CIMR-VH□4030 | Model | — | — | CM300HA-24 | 110Q2G43 | CR6L-100 | THA1V-7556XV |
| | Code No. | — | ETC67020□ | STR000376 | SID000409 | FU000758 | FAN000176 |
| | Q'ty | — | 1 | 6 | 3 | 1 | 1 |
| CIMR-VH□4045 | Model | — | — | CM300HA-24 | 110Q2G43 | CR6L-150 | THA1V-7556XV |
| | Code No. | — | ETC67026□ | STR000376 | SID000409 | FU000756 | FAN000176 |
| | Q'ty | — | 1 | 6 | 3 | 1 | 1 |
| CIMR-VH□4055 | Model | — | — | CM400HA-24 | 160Q2G43 | CR6L-200 | THA1V-7556XV |
| | Code No. | — | ETC67030□ | STR000385 | SID000410 | FU000755 | FAN000176 |
| | Q'ty | — | 1 | 6 | 6 | 1 | 2 |
| CIMR-VH□4075 | Model | — | — | CM400HA-24 | 160Q2G43 | CR6L-300 | THA1V-7556XV |
| | Code No. | — | ETC67031□ | STR000385 | SID000410 | FU000754 | FAN000176 |
| | Q'ty | — | 1 | 6 | 6 | 1 | 2 |
| CIMR-VH□4110 | Model | — | — | CM300HA-24 | 160Q2G43 | CR6L-350 | THA1V-7556XV |
| | Code No. | — | ETC67035□ | STR000425 | SID000410 | FU000818 | FAN000176 |
| | Q'ty | — | 1 | 12 | 9 | 1 | 2 |
| CIMR-VH□4160 | Model | — | — | CM400HA-24 | RM250DZ-24 | CR6L-600 | THA1V-7556XV |
| | Code No. | ETC67036□ | ETC67039□ | STR000455 | SID000411 | FU000916 | FAN000176 |
| | Q'ty | 1 | 1 | 12 | 6 | 1 | 2 |

Notes :

1. Spare parts in [shaded] are recommended to be replaced by units, to maintain the quality.
2. The gate drive card is specified for model CIMR-VH□4011 and above.

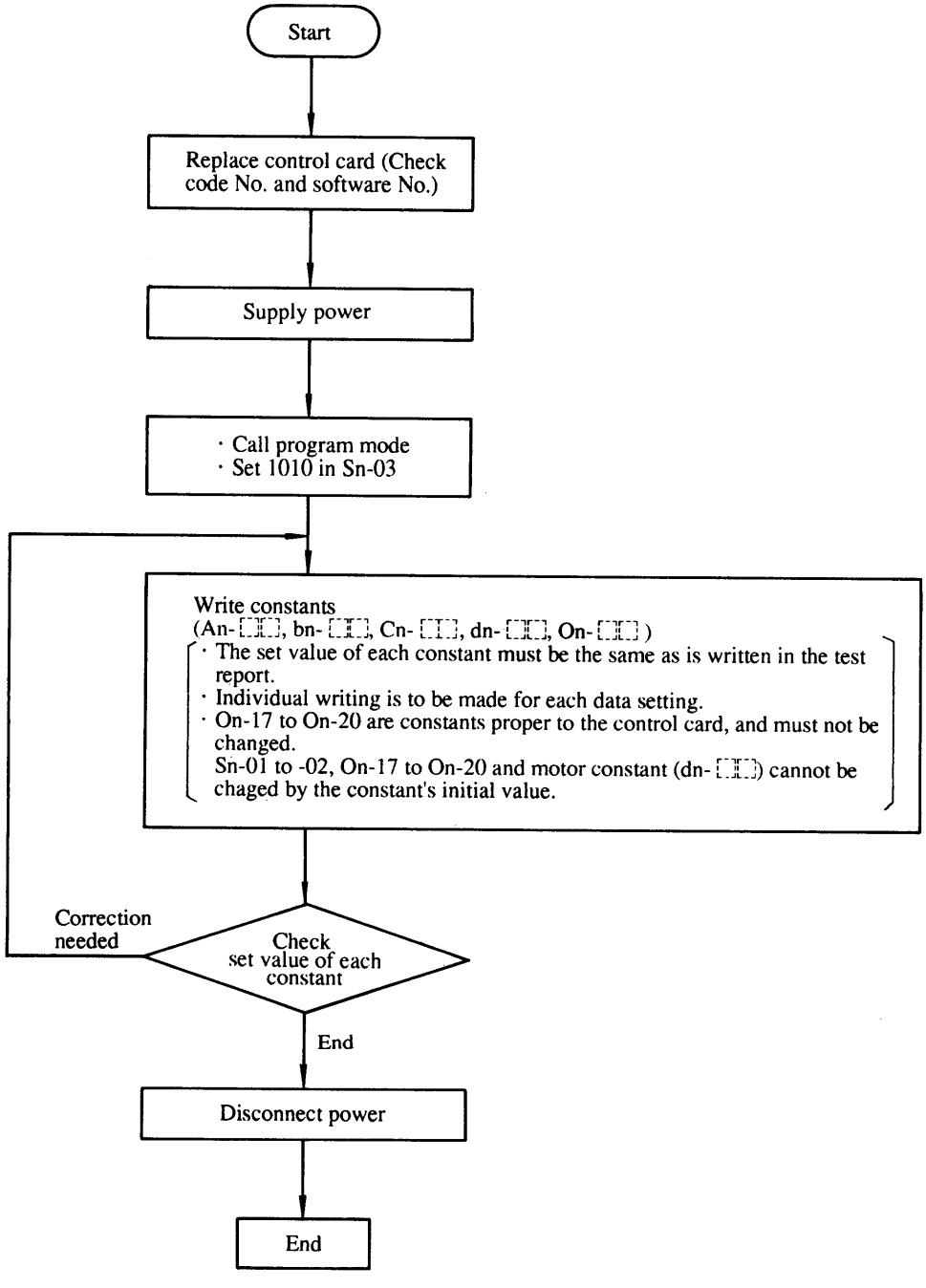
## 6.2 SPARE PARTS (Cont'd)

Table 6.5 Standard Replacement Time

| Part Name | Standard Replacement Interval | Replacement, etc. |
|---|---|---|
| Cooling Fan | 2 to 3 years | Replace with a new one |
| Smoothing Capacitor | 5 years | Replace with a new one (determined after inspection) |
| Breaker<br>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°C / yearly average
- Load factor : 80% or below
- Operation rate : 12 hours or less a day

## 6.3 PEPLACING THE CONTROL CARD



# 7. TROUBLESHOOTING

In case the machine fails, check the failure as shown below, and take necessary measurements. If it still does not recover from the failure, contact your YASKAWA representative.

Notes upon Troubleshooting

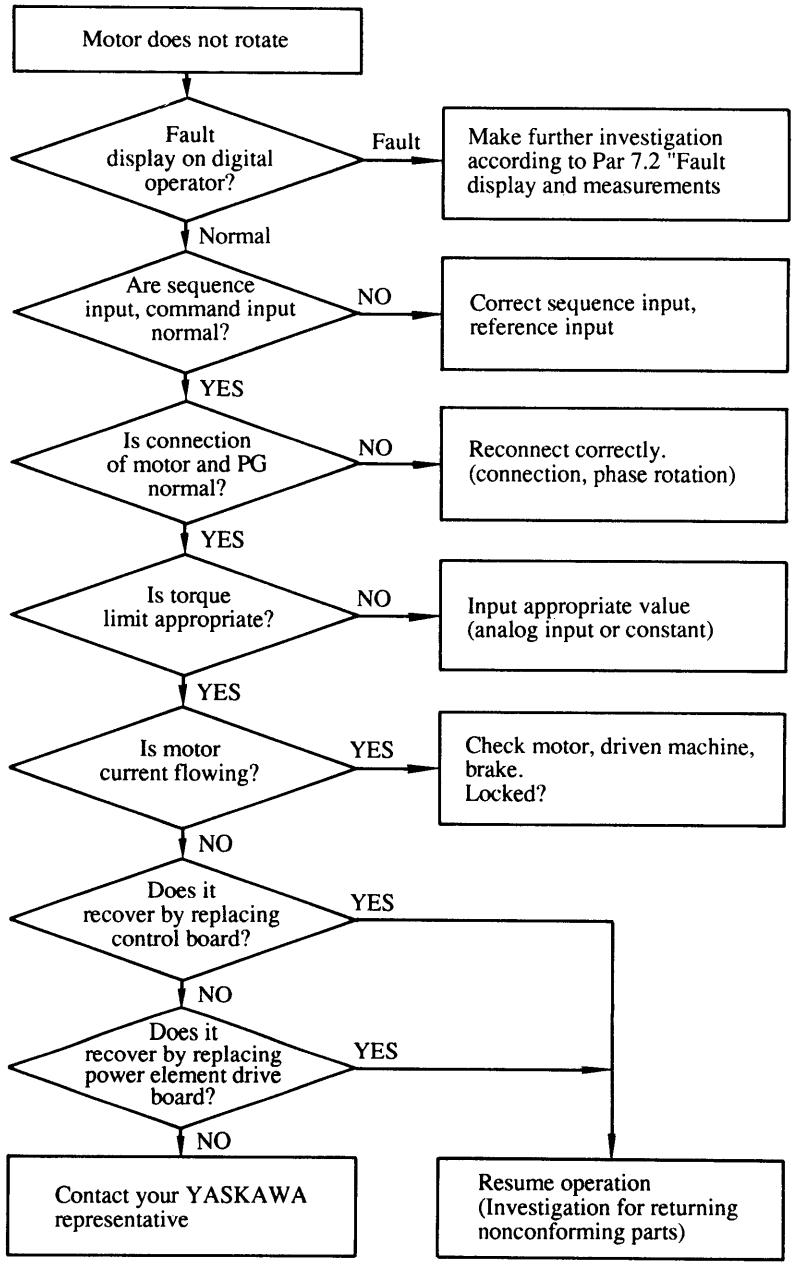
(1) Never disconnect or connect the wiring while the power is supplied.

(2) Before checking or maintaining the main circuit, always disconnect the power, wait until the CHARGE indicator goes off, and measure the direct current mother line voltage (between P-N) to see that it is safe.

(3) Fault display is stored even after the power is once disconnected. When the power is supplied again, the "Fault trace" on the monitor panel allows investigation of the fault. However, the stored memory will go out if the power is disconnected one more time. Record the "Fault trace" data if necessary.

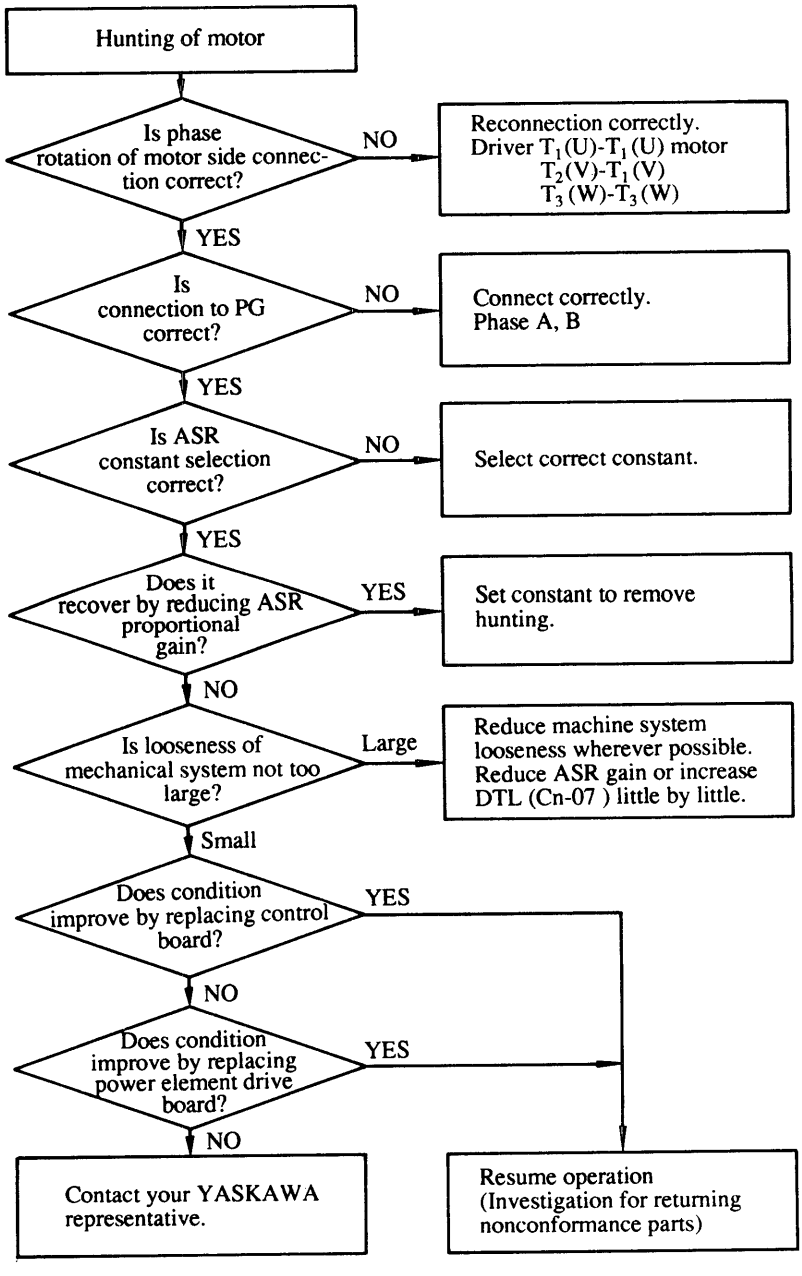
## 7.1 FAILURE OF MOTORS

### (1) The Motor does not Rotate

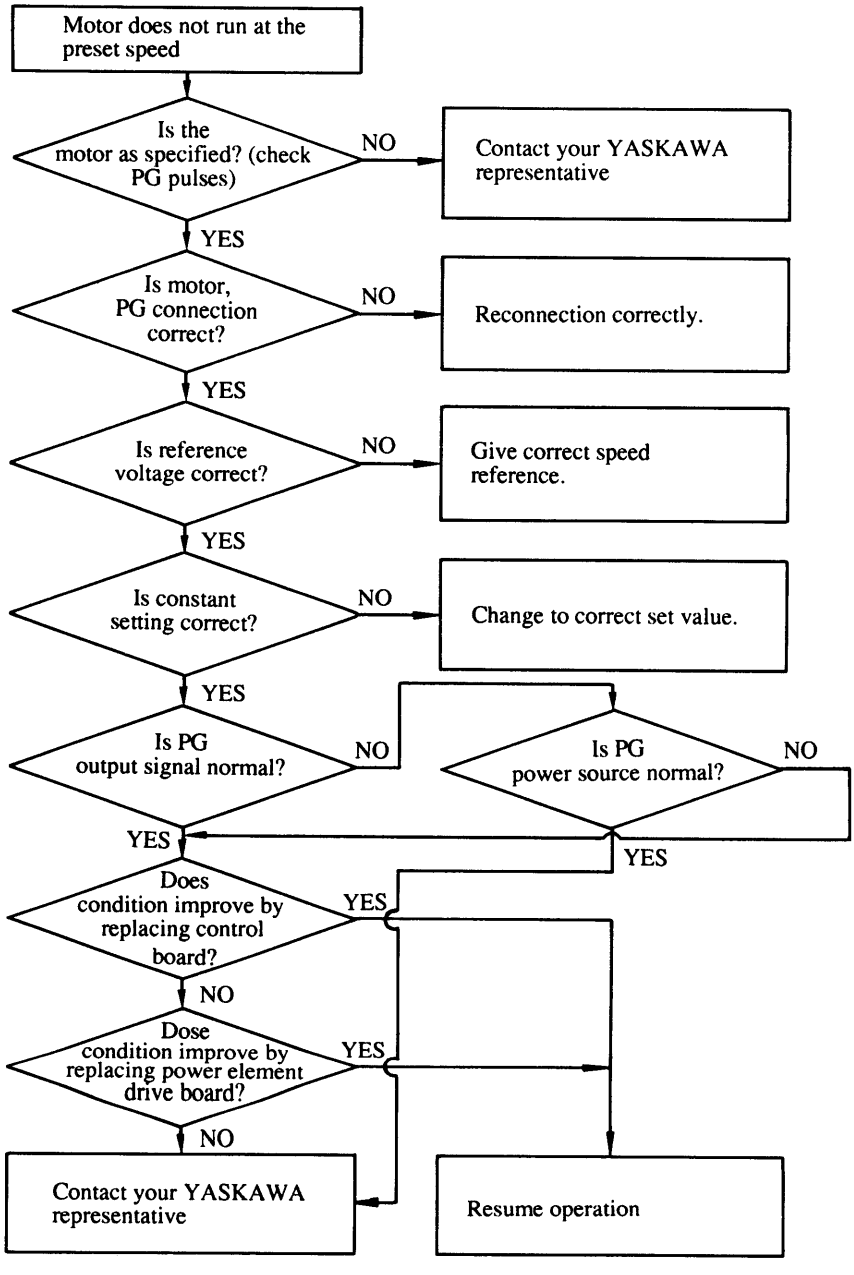


## 7.1 FAILURE OF MOTORS (Cont'd)

### (2) Motor Hunting



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



## 7.2 FAILURE INDICATION AND MEASUREMENT

If the VS-676VH3 detects a fault, it indicates the fault on the digital operator, and operates the fault contact output according to the condition, to stop the motor by coasting or by deceleration.

Table 7.1 Fault Indication and Measurement

| Fault Indication | Description | Details | Measurement | (Note) Ranking (Standard Value) |
|---|---|---|---|---|
| Uu 1 | Low voltage (PUV) | Low voltage in the direct current main circuit during operation. (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 side equipment<br>• Correct the line voltage | A1 |
| Uu2 | Low voltage (CUV) | Low voltage in the control circuit during operation. | | A1 |
| Uu3 | Low voltage (Abnormal MC-ANS) | The rush current control contact opened during operation. | | A1 |
| Uu | Momentary power failure | • The main circuit direct current voltage fell below the PUV level<br>• The rush current control contact opened.<br>• The control power source fell below the PUV level. | — | B |
| oC | Overcurrent (OC) | • The inverter output current exceeded the OC level. (Detection level : 120% of transistor rated current)<br>• The grounding current exceeded 25% of inverter rated current. | Check the motor coil resistance, extend the accel/decel time. | A1 |
| ou | Overvoltage (OV) | • The main circuit direct current voltage exceeded the OV level. (Detection level 200 V class : Approx. 400 V 400 V class : Approx. 800 V) | Extend the deceleration time, add braking resistor. | A1 |
| FU | Fuse blown (FU) | The direct current circuit fuse blown. | Check for damaged transistor, load side short circuit, grounding, etc. | A1 |
| 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) | A1 |
| oL 1 | Motor overload (OL1) | • The motor exceeded the withstand overload level. (Cn-14, Cn-15) (Initial value 150% /60 s)<br>• It exceeded 90% of motor overheat level. | Measure the motor temperature rise, lighten the load. | B |
| oL2 | Inverter overload (OL2) | It exceeded the inverter overload resistance level. (150%/60 s) | Lighten the load, extend the acceleration time. | A1 |
| oH 1 | Motor overheat (OH1) | The motor temperature exceeded the allowable value (dn-18). | Check the motor cooling fan. | A1 |
| rHn | Thermister line break (THM) | The motor temperature detection thermistor is broken. | Check the thermister. | A1 |
| rr | Brake transistor error | The operation of the brake transistor has failed. | Replace the inverter. | A1 |

Table 7.1 Fault Indication and Measurement (Cont'd)

| Fault Indication | Description | Details | Measurement | (Note) Ranking (Standard Value) |
|---|---|---|---|---|
| rH | Braking resistor unit overheat | The braking resistor unit temperature exceeded the allowable. (Only internal inverter type is protected.) | Lighten the regenerative load. | A1 |
| FAn | Cooling fan fault (FAN) | The cooling fan stopped while the power was supplied. | Replace the cooling fan. | A1 |
| oS | Overspeed (OS) | The motor speed exceeded the overspeed level (Cn-16). | — | A1 |
| PGo | PG line break (PGO) | The PG line is broken. | Check the PG line. | A1 |
| dEv | Excess speed regulation (DEV) | The regulation of the speed reference and monitor speed exceeded the regulation level (Cn-04). | Check the load. | B |
| EF3 | External fault of external terminal ③ | Fault occurred in the external circuit. | Check the condition of the input terminal by the Un-07 data. (If the LED lights when the terminal is not connected, replace the inverter.) | A1 |
| EF5 | External fault of external terminal ⑤ | Fault occurred in the external circuit. (Stop method of multi-function input terminal fault can be selected.) | | B |
| EF6 | External fault of external terminal ⑥ | | | B |
| EF7 | External fault of external terminal ⑦ | | | B |
| EF8 | External fault of external terminal ⑧ | | | B |
| LF | Open-phase load | Open-phase in the 3-phase output circuit. | • Check the inverter output circuit | B |
| CPF00 | Control circuit fault 1 (Operator transmission fault) | • Transmission between the VH3 and operator cannot be established 5 seconds after supplying power.<br>• MPU peripheral element check fault (initial) | • Insert the operator connector again.<br>• Replace the control card. | A1 |
| CPF01 | Control circuit fault 2 (Operator transmission fault) | • Transmission between the VH3 and operator is established once after supplying power, but later transmission fault continued for more than 2 seconds.<br>• MPU peripheral element check fault (online) | • Insert the operator connector again.<br>• Replace the control card. | A1 |
| CPF02 | Base-block circuit failure | The inverter control unit failure. | Replace the control card. | A1 |
| CPF03 | NV-RAM (S-RAM) failure | | | A1 |
| CPF04 | Constant destroyed | | | A1 |
| CPF05 | CPU internal A/D converter failure | | | A1 |
| CPF06 | Option connection failure | The option card is not connected correctly. | Insert the option card connector again. | A1 |
| CPF10 | DSP hardware failure | DSP and peripheral circuit failure. | Replace the control card. | A1 |

## 7.2 FAILURE INDICATION AND MEASUREMENT (Cont'd)

Table 7.1 Fault Indication and Measurement (Cont'd)

| Fault Indication | Description | Details | Measurement | (Note) Ranking (Standard Value) |
|---|---|---|---|---|
| CPF21 | Transmission control card hardware failure | • Transmission control card internal element check fault<br>• Data transmission/reception fault between transmission control card and control card | Replace the transmission control card. | A1 |
| CPF23 | Transmission control card transmission fault | No updating of the diagnosis code between the transmission control card and the control card for more than 0.2 second. | Replace the transmission control card. | A1 |
| bUS | CP-213 transmission fault | • No command from the host controller for more than 2 seconds after receiving the control data.<br>• CRC check error | Check the CP-213 bus. | A1 |
| CP213 | Waiting to receive control data | Waiting for reception of the control data from the host after supplying the power. | • Check the station address, control data length.<br>• Check the CP-213 bus. | C |
| CPF24 | High-precision torque control card internal A/D converter failure | The A/D converter of the option card (TRQ-A) has failed. | Replace the high-precision torque control card. | A1 |
| oPE01 | kVA selection fault | kVA selection fault (Sn-01) | Check and set the constant data. | C1 |
| oPE02 | Constant setting range fault | The constant data are out of range | Check the constant data. | C1 |
| oPE03 | Multi-function input selection fault | 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 |
| oP | Digital monitor device failure | The monitor is mounted when under the program mode or during operation by the operator. | Check the function. | C2 |
| oP2 | Base test mode fault | The main circuit direct current voltage exceeded 20 V during test. | Decrease the main circuit derect current voltage. | C2 |
| oP3 | Connected to unmatching option card | Unknown option card is mounted. | Check the applicable options. | C2 |
| Err | NVRAM writing fault | NVRAM internal write data did not match when initializing the constant. | Replace the control card. | C2 |

Notes :

Rank A1 : Major fault (Motor coasts to a stop, operator indication lights, and FAULT contact is output.)

Rank A2 : Major fault (Motor decelerates and stops, indication display lights, and FAULT contact is output.)

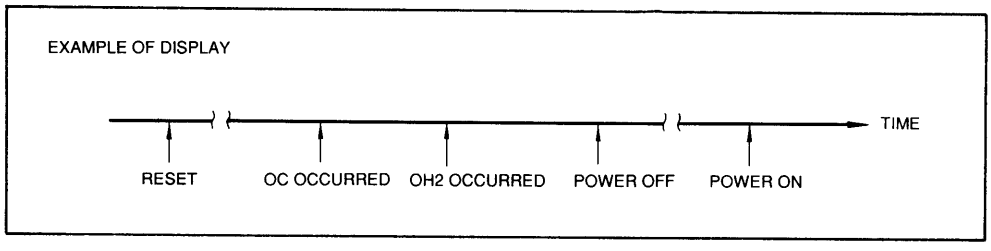
Rank B : Fault [Operation continues, operator indication blinks, no FAULT contact is output, and fault contact is output (when multi-function output is selected)].

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

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

(1) Fault Tracing

When the power is supplied again, the faults that occurred before the power was disconnected (when CUV was detected) are displayed in the occurring sequence (Max. 4 faults (The error that occurred before power loss is stored in the NVRAM, and is displayed when the power recovers.)




① After the power is supplied the fault occurred before the power was disconnected is blinks for 5 seconds. U1 oC

② After the 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. U1 oC

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

⑤ Depress the [∧] key, to update the fault sequence. (Return to ③) U1 oC

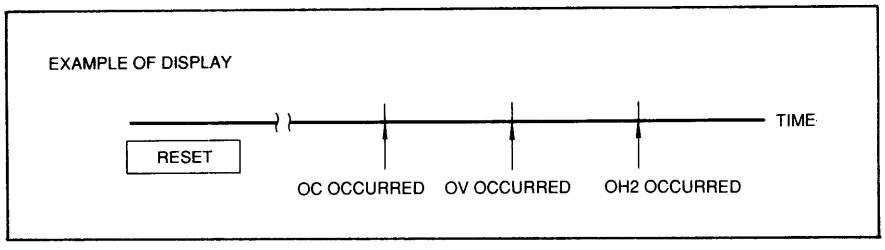
Note: CPFXX displays the lower 3 digits only.

(Example) CPFIO is U1 F10 .

## 7.2 FAILURE INDICATION AND MEASUREMENT (Cont'd)

(2) Displaying the Faults in Sequence of Occurrance

In case of failure other than the watch dog error, CPF00, CPF01 occurred, depress the [^] key to display the faults in sequence of occurance. (Max. 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 the condition of ②.

## 7.3 TRACE BACK FUNCTION

The VS-676VH3 has the trace back function, in which data as shown in Table 7.2 can be traced. Use this function to find the cause of fault.

(1) Trace Stop Conditions
  (i) Trace stop instruction from the CP-313, etc.
  (ii) When major failure occurred in the VS-676VH3.

(2) Trace Start Conditions (No restarting while the trace stop conditions are satisfied)
  (i) Upon power supply, master reset
  (ii) When operation command is input (when RUN is input)
  (iii) When transmission of the trace data to the CP-313, etc. ended.

(3) Trace Data Reference
  (i) Trace back screen of CP-313, etc. ... Trend graph display

(4) Trace Sampling Time
  Can be set by the application constant (bn-11) (TSAP)
  TSAP: 20 ms to 60 s (Initial value: 60 ms)

(5) Trace Data

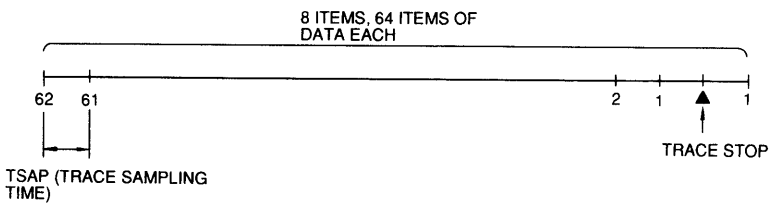



Table 7.2 Trace Back Data

| No. | Name | Remarks |
|---|---|---|
| 01 | Status signal | |
| 02 | Alarm signal | |
| 03 | Speed reference | 30,000/100% |
| 04 | Primary frequency reference | 10,000/100% |
| 05 | Speed feedback | 30,000/100% |
| 06 | Torque reference | 10,000/100% |
| 07 | Output current | 10,000/100% |
| 08 | Voltage reference | 10,000/100% |

Note : See Appendix A 5.2 (Inverter → host controller) (p. 68).

# APPENDIX

# A 1. INVERTER STANDARD SPECIFICATIONS

## A 1.1 200 V CLASS

| | Model CIMR-VHC□ CIMR-VHJ□ | | 20P4 | 20P7 | 22P2 | 23P7 | 25P5 | 27P5 | 2011 | 2015 | 2022 | 2037 | 2055 | 2075 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output Rating | Nominal Capacity (kVA) | | 1 | 1.5 | 3 | 5 | 7.5 | 10 | 15 | 20 | 30 | 50 | 70 | 100 |
| | Rated Current (A) | | 3.2 | 4.8 | 9.6 | 16 | 24 | 32 | 48 | 64 | 96 | 160 | 224 | 300 |
| | Overload Capacity | | 150% for one minute | | | | | | | | | | | |
| | Rated Output Voltage | | 180 V | | | | | | | | | | | |
| Power Supply | Voltage, Frequency | | 3-phase, 200/208/220 V 50 Hz ; 200/208/220/230 V 60 Hz | | | | | | | | | | | |
| | Allowable Voltage Fluctuation | | ±10% | | | | | | | | | | | |
| | Allowable Frequency Fluctuation | | ±5% | | | | | | | | | | | |
| Control Characteristics | Control Method | | All-digital vector control, sine wave PWM | | | | | | | | | | | |
| | Speed Control | Range | 1 : 1000 (can be operated to stall) | | | | | | | | | | | |
| | | Precision | ±0.01% (−10 to +40°C), (by transmission) | | | | | | | | | | | |
| | Torque Control | Range | 1 : 50 | | | | | | | | | | | |
| | | Linearity | ±3%* | | | | | | | | | | | |
| | Speed, Torque Reference Setting Signal | | Speed setting 30,000/100%, Torque setting 10,000/100% (by transmission) | | | | | | | | | | | |
| | Speed Reference Setting Signal | | 0 to +10 VDC (20 kΩ) or 4 to 20 mA (250Ω) | | | | | | | | | | | |
| | Accel/Decel Time | | 0 to 3000 seconds (resolution : 0.1 second), accel/decel can be set individually | | | | | | | | | | | |
| | Torque Limit | | Setting range 0 to 300%, forward and reverse sides can be set individually | | | | | | | | | | | |
| | Application Function | | Multi-step speed (max. 9 types) operation, zero-speed control, servo lock, optional torque detection, etc. | | | | | | | | | | | |
| Protective Function | Inverter Protection | | Overcurrent, overvoltage, cooling fin overheat, low voltage, cooling fan stop, ground fault, etc. | | | | | | | | | | | |
| | Motor Protection | | Thermister, current overload, overheat protection, overspeed by PG, etc. | | | | | | | | | | | |
| | System Protection | | Excess speed regulation, open-phase load, momentary power loss continuous operation (stops when it exceeds 15 ms, up to 2 seconds can be set) | | | | | | | | | | | |
| Environmental Conditions | Location | | Indoor (where there is no corrosive gas, dust, etc.) | | | | | | | | | | | |
| | Ambient Temperature | | −10 to +45°C (panel-mount type) not to be frozen | | | | | | | | | | | |
| | Storage Temperature‡ | | −20 to +60°C | | | | | | | | | | | |
| | Humidity | | 90% RH or less (non-condensing) | | | | | | | | | | | |
| | Vibration | | 1 G (less than 20 Hz), 0.2 G (20 to 50 Hz) allowed | | | | | | | | | | | |
| Options | Braking Transistor | | Standard specification# | | | | | | | | Braking unit (external mount, option) | | | |
| | Braking Resistor | | Built-in type (option)** | | | | | | | | Braking resistor unit (external mount, option) | | | |
| | Option Card (Built-in Type) | | Analog monitor card (AO-12), Digital output card (DO-08), High-precision torque control card (TRQ-A) | | | | | | | | | | | |

* When torque control precision is required, motor combination test must be performed by YASKAWA.

† The back-up capacitor unit for momentary power loss must be set on the external side, to guarantee 2-second monentary power loss in models of 3 kVA or less. (Not required for 1 second or less.)

‡ The storage temperature is the short time temperature during transportation.

\# When the braking torque is 100%, 10-second 10% or more ED, the braking unit must be set on the external side.

** When the braking torque is 100%, 10-second 3% or more ED, the braking resistor unit must be set on the external side.

## A 1.2 400 V CLAS

| | Model CIMR-VHC□ CIMR-VHJ□ | | 40P7 | 42P2 | 43P7 | 47P5 | 4011 | 4015 | 4022 | 4030 | 4045 | 4075 | 4110 | 4160 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output Rating | Nominal Capacity (kVA) | | 1.6 | 3 | 5 | 10 | 15 | 20 | 30 | 40 | 60 | 100 | 140 | 200 |
| | Rated Current (A) | | 25.6 | 4.8 | 8 | 16 | 24 | 32 | 48 | 64 | 96 | 165 | 224 | 300 |
| | Overload Capacity | | 150% for one minute | | | | | | | | | | | |
| | Rated Output Voltage | | 360 V | | | | | | | | | | | |
| Power Supply | Voltage, Frequency | | 3-phase, 380/400/415/440/460 ; 50/60 Hz | | | | | | | | | | | |
| | Allowable Voltage Fluctuation | | ±10% | | | | | | | | | | | |
| | Allowable Frequency Fluctuation | | ±5% | | | | | | | | | | | |
| Control Characteristics | Control Method | | All-digital vector control, sine wave PWM | | | | | | | | | | | |
| | Speed Control | Range | 1 : 1000 (can be operated to stall) | | | | | | | | | | | |
| | | Precision | ±0.01% (−10 to +40°C), (by transmission) | | | | | | | | | | | |
| | Torque Control | Range | 1 : 50 | | | | | | | | | | | |
| | | Linearity | ±3%* | | | | | | | | | | | |
| | Speed, Torque Reference Setting Signal | | Speed setting 30,000/100%, Torque setting 10,000/100% (by transmission) | | | | | | | | | | | |
| | Speed Reference Setting Signal | | 0 to +10 VDC (20 kΩ) or 4 to 20 mA (250Ω) | | | | | | | | | | | |
| | Accel/Decel Time | | 0 to 3000 seconds (resolution : 0.1 second), accel/decel can be set individually | | | | | | | | | | | |
| | Torque Limit | | Setting range 0 to 300%, forward and reverse sides can be set individually | | | | | | | | | | | |
| | Application Function | | Multi-step speed (max. 9 types) operation, zero-speed control, servo lock, optional torque detection, etc. | | | | | | | | | | | |
| Protective Function | Inverter Protection | | Overcurrent, overvoltage, cooling fin overheat, low voltage, cooling fan stop, ground fault, etc. | | | | | | | | | | | |
| | Motor Protection | | Thermister, current overload, overheat protection, overspeed by PG, etc. | | | | | | | | | | | |
| | System Protection | | Excess speed regulation, open-phase load, momentary power loss continuous operation (stops when it exceeds 15 ms, up to 2 seconds can be set)† | | | | | | | | | | | |
| Environmental Conditions | Location | | Indoor (where there is no corrosive gas, dust, etc.) | | | | | | | | | | | |
| | Ambient Temperature | | −10 to +45°C (panel-mount type) not to be frozen | | | | | | | | | | | |
| | Storage Temperature‡ | | −20 to +60°C | | | | | | | | | | | |
| | Humidity | | 90% RH or less (non-condensing) | | | | | | | | | | | |
| | Vibration | | 1 G (less than 20 Hz), 0.2 G (20 to 50 Hz) allowed | | | | | | | | | | | |
| Options | Braking Transistor | | Standard specification# | | | | | | | | Braking unit (external mount, option) | | | |
| | Braking Resistor | | Built-in type (option)** | | | | | | | | Braking resistor unit (external mount, option) | | | |
| | Option Card (Built-in Type) | | Analog monitor card (AO-12), Digital output card (DO-08), High-precision torque control card (TRQ-A) | | | | | | | | | | | |

* When torque control precision is required, motor combination test must be performed by YASKAWA.

† The back-up capacitor unit for momentary power loss must be set on the external side, to guarantee 2-second monentary power loss in models of 3 kVA or less. (Not required for 1 second or less.)

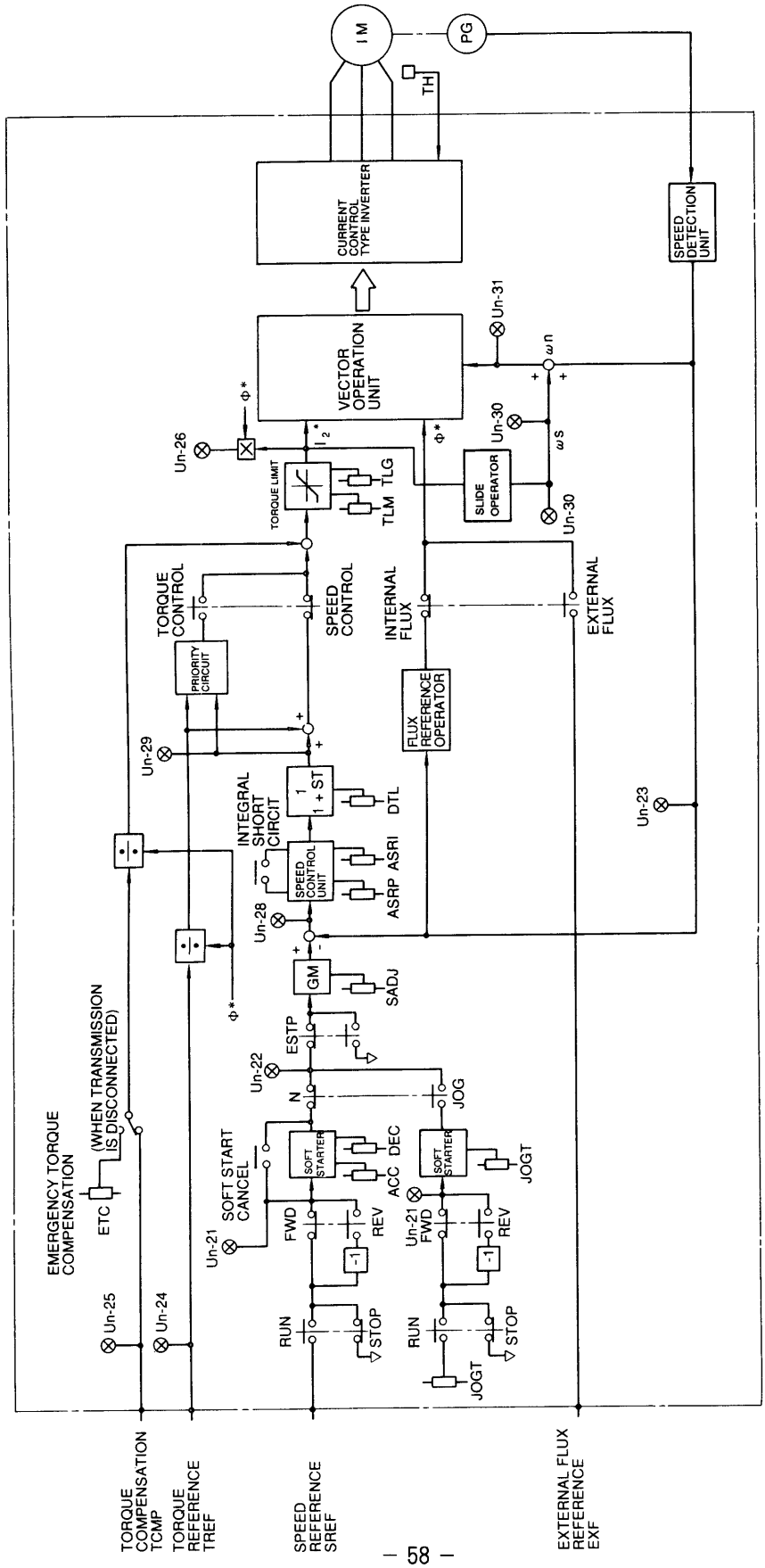
‡ The shelf temperature is the short time temperature during transportation.

\# When the braking torque is 100%, 10-second 10% or more ED, the braking unit must be set on the external side.

** When the braking torque is 100%, 10-second 3% or more ED, the braking resistor unit must be set on the external side.

# A 2. BLOCK DIAGRAM

## A 2.1 FUNCTIONAL BLOCK DIAGRAM

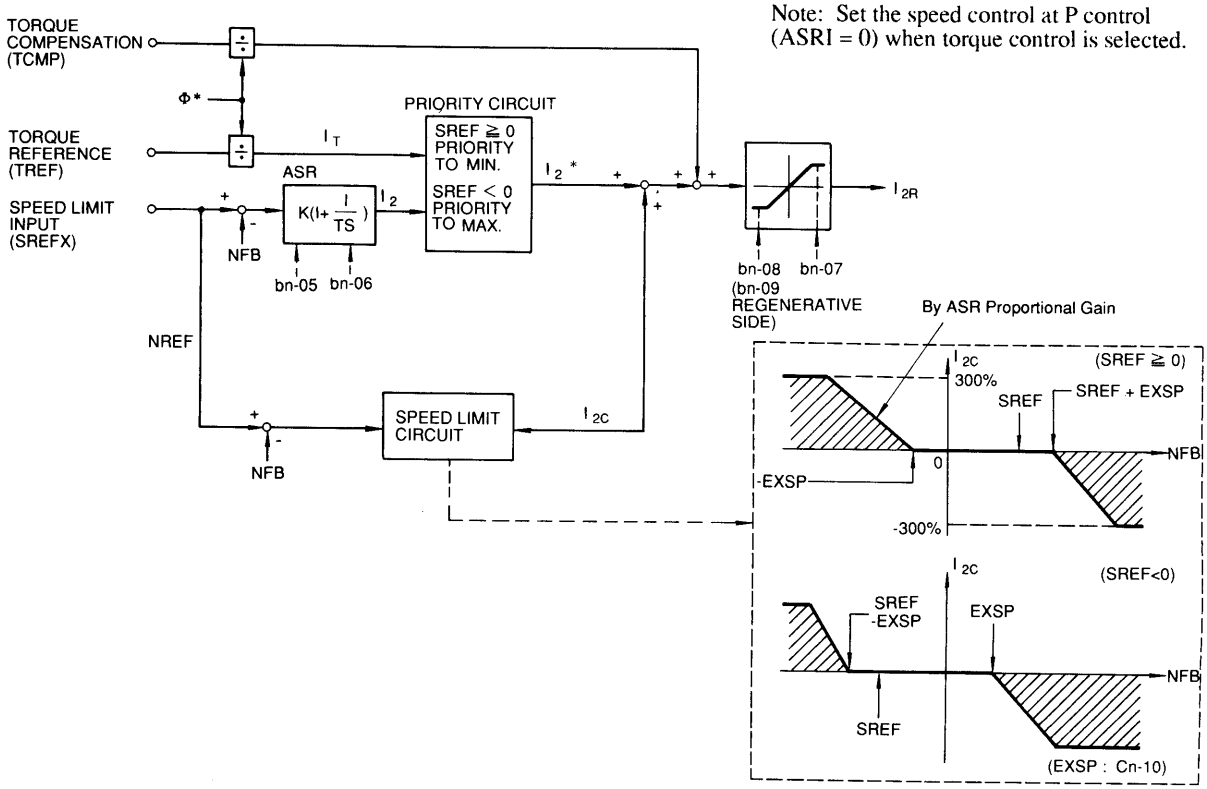



Note: ⊕ : Set by application constant.

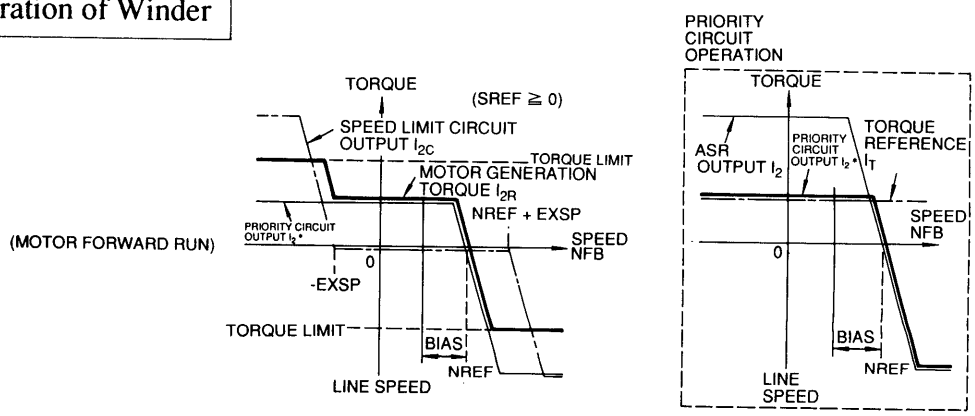
* : Reference

# A 2.2 BLOCK DIAGRAM AT TORQUE CONTROL

Note: Set the speed control at P control (ASRI = 0) when torque control is selected.

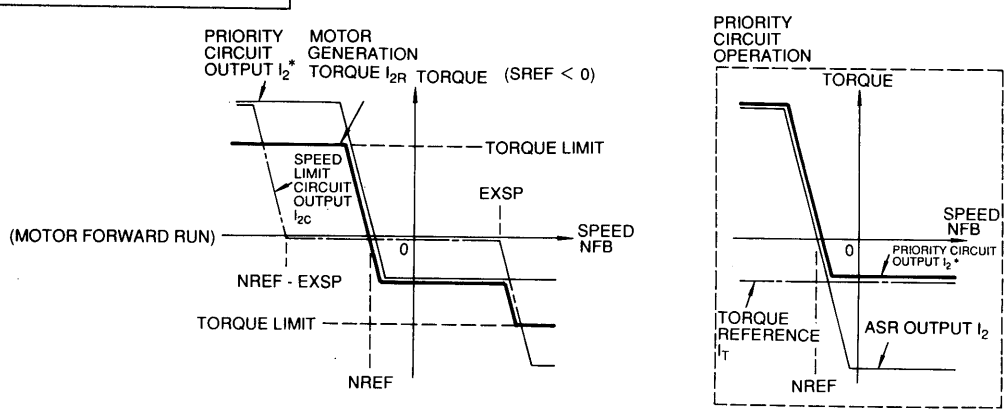



## Operation of Winder




Speed Limit Input (Winding)

## Operation of Rewinder



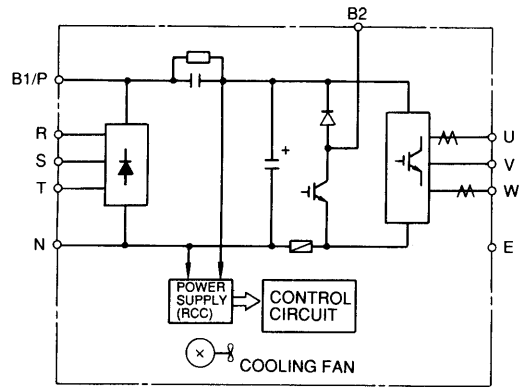

Speed Limit Input (Rewinding)

# A 3. TERMINAL FUNCTIONS

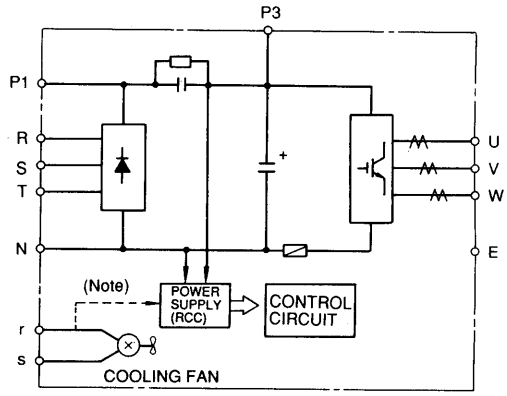
## A 3.1 MAIN CIRCUIT TERMINAL

<table>
<tr><th>Voltage Class<br>Model CIMR-VHC□<br>CIMR-VHJ□<br>Terminal Symbol</th><th colspan="2">200 V Class</th><th colspan="3">400 V Class</th></tr>
<tr><th></th><th>20P4 to 27P5</th><th>2011 to 2075</th><th>40P7 to 47P5</th><th>4011, 4015</th><th>4022 to 4160</th></tr>
<tr><td>R</td><td rowspan="3" colspan="2">Main circuit input power supply</td><td rowspan="3" colspan="3">Main circuit input power supply</td></tr>
<tr><td>S</td></tr>
<tr><td>T</td></tr>
<tr><td>U</td><td rowspan="3" colspan="2">Inverter output</td><td rowspan="3" colspan="3">Inverter output</td></tr>
<tr><td>V</td></tr>
<tr><td>W</td></tr>
<tr><td>B1/P</td><td rowspan="2">• For braking resistor unit connection (B1/P-B2)<br>• Direct current line input (B1/P-N)</td><td>—</td><td rowspan="2">• For braking resistor unit connection (B1/P-B2)<br>• Direct current line input (B1/P-N)</td><td rowspan="2">• For braking resistor unit connection (B1/P-B2)<br>• Direct current line input (B1/P-N)<br>• For main circuit capacitor extension (P3-N)</td><td rowspan="2">—</td></tr>
<tr><td>B2</td><td></td></tr>
<tr><td>N</td><td rowspan="6">—</td><td rowspan="3">• For braking resistor unit connection (P1-N)<br>• Direct current line input (P1-N)<br>• For main circuit capacitor extension (P3-N)</td><td rowspan="6">—</td><td rowspan="3">• For braking unit connection (P1-N)<br>• Direct current line input (P1-N)<br>• For main circuit capacitor extension (P3-N)</td></tr>
<tr><td>P3</td></tr>
<tr><td>P1</td></tr>
<tr><td>s</td><td rowspan="3">• Cooling fan power supply</td><td>—</td></tr>
<tr><td>r</td><td rowspan="4">—</td><td rowspan="3">• Cooling fan power supply (control power supply)<br>r-s200 :<br>200 to 230 V input<br>r-s400 :<br>380 to 460 V input</td></tr>
<tr><td>s200</td><td rowspan="3">—</td></tr>
<tr><td>s400</td></tr>
<tr><td>x</td><td rowspan="2">—</td><td rowspan="2">• For external power supply (230 VAC, 10 VA)</td><td rowspan="2">• For external power supply (230 VAC, 10 VA)</td></tr>
<tr><td>y</td></tr>
<tr><td>E</td><td colspan="2">Ground terminal (100Ω or less)</td><td colspan="3">Ground terminal (100Ω or less)</td></tr>
</table>

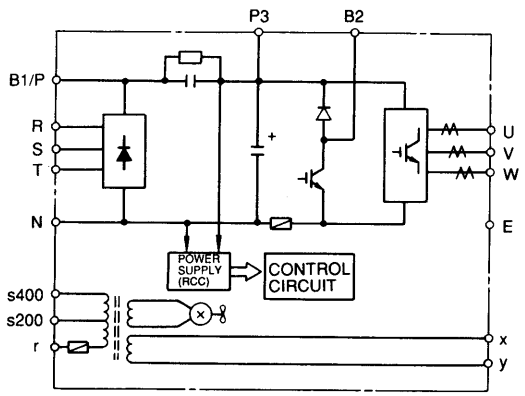
CIMR-VH□20P4 to 27P5 (200 V 1 to 10 kVA)
CIMR-VH□40P7 to 47P5 (400 V 1.6 to 10 kVA)



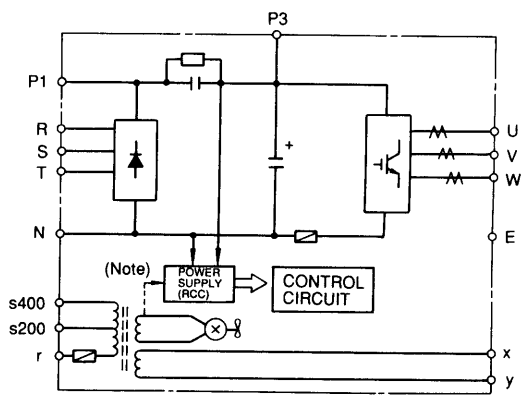

CIMR-VH□2011 to 2022 (200 V 15 to 30 kVA)




CIMR-VH□4011, 4015 (400 V 15, 20 kVA)




CIMR-VH□4022 to 4045 (400 V 30 to 60 kVA)




Note : FoModels CIMR-VH □ 2030 or over, and CIMR-VH □ 4055 or over, RCC power input is supplied from control power source. If control power and main circuit power are separately supplied, turn on the power to the control circuit and then to the main circuit.

# A 3.2 CONTROL CIRCUIT TERMINAL

List of Terminal Functions when Operating by CP-213 Transmission

| Type | Terminal Symbol | Signal Name | Terminal Function | | Remarks |
|---|---|---|---|---|---|
| Sequence Input Signal | 1 | Operation-stop signal | Operating when either is "closed", and stopped in other cases (2-wire sequence) | | |
| | 2 | Operation-stop signal | | | |
| | 3 | External fault input | "Closed" : fault, "open" : normal | | |
| | 4 | Fault reset | "Closed" : reset | | |
| | 5 | Main/aux speed selection (Multi-step command 1) | "Closed" : auxiliary speed reference | • Multi-function input*<br>• Sn-15 to Sn-18<br>• Set value "F" : DI function | Reflected to control data (INV → host) No. 15 bit 0 to 7 |
| | 6 | Multi-step speed command 2 | "Closed" : multi-step setting 2 enabled | | |
| | 7 | Jogging command | "Closed" : jog operation | | |
| | 8 | External base block | "Closed" : inverter output stop | | |
| | 11 | Sequence control input common | — | | — |
| Analog Input Signal | 15 | Speed reference power supply terminal | Speed reference power supply | | — |
| | 13 | Master speed A/D conversion | 0 to 1023 (0 to +10 V) | | Reflected to control data (INV → host) No. 13 |
| | 14 | | | | |
| | 16 | Auxiliary reference | 0 to 1023 (0 to +10 V) | | Reflected to control data (INV → host) No. 14 |
| | 17 | Control common | 0 V | | — |
| | 12 | For shielded sheath lead connection | — | | — |
| Sequence Output Signal | 9 | "Operating" signal (NO contact) | "Closed" : operating | Multi-function output<br>• Sn-20 to bn-18<br>• Applied when set value is other than "F". | Outputs data of control data (host → INV)No. 1 bits C to F<br>• Sn-20 to Sn-23<br>• Applied when set value is other than "F". |
| | 10 | | | | |
| | 25 | Zero-speed detection | "Closed" when zero-speed level (Cn-01) or less | | |
| | 26 | Speed agree detection | "Closed" when it falls within the detection range, (Cn-03) of the set speed reference | | |
| | 28 | Ready for operation | "Closed" when it is ready for operation | | ** |

List of Terminal Functions when Operating by CP-213 Transmission (Cont'd)

| Type | Terminal Symbol | Signal Name | Terminal Function | | Remarks |
|---|---|---|---|---|---|
| Sequence Output Signal | 29 | Braking resistor overheat | "Closed" when the braking resistor overheats | Multi-function output ‡<br>• Sn-20 to bn-18<br>• Applied when set value is other than "F". | Outputs data of control data (host → INV) No.9 bit F<br>• Sn-24<br>• Applied when set value is "F". |
| | 27 | Open collector output common | — | | — |
| | 18 | Fault output signal common (NONC contact) | "Closed" between ⑱ and ⑳ in case of fault.<br>"Open" between ⑲ and ⑳ in case of fault. | | — |
| | 19 | | | | |
| | 20 | | | | |
| Analog Output Signal | 21 | Speed meter output (+) | 0 to 10 V/100% speed | Multi-function analog monitor #<br>• bn-17, bn-18<br>• Applies when control data (host → INV) No.9 bit 0 = "0" | Outputs data of control data (host → INV) No.10 bit F<br>• 0 to 255 (−10 to +10 V)<br>• Applied when control data (host → INV) No.9 bit 0 = "1" |
| | 22 | Common (−) | | | |
| | 23 | Current monitor (+) | Approx. 5 V/ inverter rated current | — | — |
| | 24 | Common (−) | | | |
| | 32 | For shielded sheath lead connection | — | | — |
| Thermister | 30 | Motor thermister terminal | Performs temperature detection of motor | | — |
| | 31 | Common | | | |
| PG Input | CA1 | PG power supply (+ 12 V)<br>PB pulse :<br>A, B pulse | Inputs PG output pulse | | — |

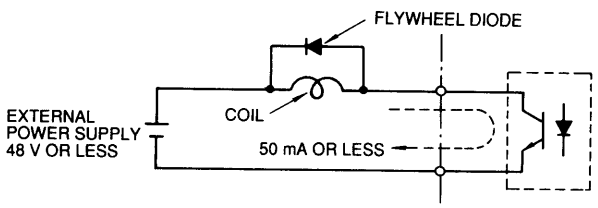
* See multi-function input terminal function selection (system contents Sn-15 to Sn-18).

† See multi-function analog input terminal function selection (system constant Sn-19).

‡ See multi-function output terminal function selection (system constant Sn-20 to Sn-24).

\# The monitor variable and its gain can also be selected for the multi-function analog monitor.
bn-17 : Set monitor variable Un-□□ item number to be monitored (Bit information cannot be set.)
bn-18 : Monitor output gain (setting range : 0.000 to 10.000)
(Gain setting 1 : 100%/10 V, gain setting 2 : 50%/10 V)

** If operating L-load such as a relay coil, use the flywheel diode.




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

# A 3.2 CONTROL CIRCUIT TERMINAL (Cont'd)

List of Terminal Functions when Operating by External Terminal

| Type | Terminal Symbol | Signal Name | Terminal Function | | Remarks |
|---|---|---|---|---|---|
| Sequence Input Signal | 1 | Forward run stop reference | Foward run when "Closed" ; stopped when "Open" | | + 24 VDC, 8 mA Photocoupler insulation |
| | 2 | Reverse run stop reference | Reverse run when "Closed" ; stopped when "Open" | | |
| | 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 reference | "Closed" : jog operation | | |
| | 8 | External base block | "Closed" : stop inverter output | | |
| | 11 | Sequence control input common | — | | — |
| Analog Input Signal | 15 | Speed reference power supply terminal | Speed reference power supply | | +15 V (allowable current is max. 20 mA) |
| | 13 | Master speed reference | 0 to 10 V/100% speed | | 0 to +10 V (20 kΩ) |
| | 14 | | 4 to 20 mA/100% speed | | 4 to 20 mA (250Ω) |
| | 16 | Auxiliary reference | 0 to 10 V/100% | Multi-function † analog input (Sn-19) | 0 to +10 V (20 kΩ) |
| | 17 | Control common | 0 | | — |
| | 12 | For shielded sheath lead connection | — | | — |
| Sequence Onput Signal | 9 | "Operating" signal (NO contact) | "Closed" : operating | Multi-function output ‡ • Sn-20 to Sn-24 | Dry contact Contact capacity 250 VAC, 1 A or less 30 VDC, 1 A or less |
| | 10 | | | | |
| | 25 | Zero-speed detection | L-level when below zero-speed level (Cn-01) | | Open collector + 48 V 50 mA or less |
| | 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 | | ** |

List of Terminal Functions when Operating by CP-213 Transmission (Cont'd)

| Type | Terminal Symbol | Signal Name | Terminal Function | | Remarks |
|---|---|---|---|---|---|
| Sequence Output Signal | 29 | Braking resistor overheat | "Closed" when the braking resistor overheats | Multi-function output ‡<br>• Sn-20 to bn-18<br>• Applied when set value is other than "F". | Outputs data of control data (host → INV) No.9 bit F<br>• Sn-24<br>• Applied when set value is "F". |
| | 27 | Open collector output common | — | | — |
| | 18 | Fault output signal common (NONC contact) | "Closed" between ⑱ and ⑳ in case of fault.<br>"Open" between ⑲ and ⑳ in case of fault. | | — |
| | 19 | | | | |
| | 20 | | | | |
| Analog Output Signal | 21 | Speed meter output (+) | 0 to 10 V/100% speed | Multi-function analog monitor #<br>• bn-17, bn-18<br>• Applies when control data (host → INV) No.9 bit 0 = "0" | Outputs data of control data (host → INV) No.10 bit F<br>• 0 to 255 (−10 to +10 V)<br>• Applied when control data (host → INV) No.9 bit 0 = "1" |
| | 22 | Common (−) | | | |
| | 23 | Current monitor (+) | Approx. 5 V/ inverter rated current | — | — |
| | 24 | Common (−) | | | |
| | 32 | For shielded sheath lead connection | — | | — |
| Thermister | 30 | Motor thermister terminal | Performs temperature detection of motor | | — |
| | 31 | Common | | | |
| PG Input | CA1 | PG power supply (+ 12 V)<br>PB pulse :<br>A, B pulse | Inputs PG output pulse | | — |

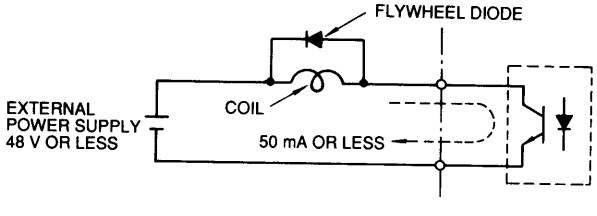
* See multi-function input terminal function selection (system contents Sn-15 to Sn-18).

† See multi-function analog input terminal function selection (system constant Sn-19).

‡ See multi-function output terminal function selection (system constant Sn-20 to Sn-24).

\# The monitor variable and its gain can also be selected for the multi-function analog monitor.
bn-17 : Set monitor variable Un-□□ item number to be monitored (Bit information cannot be set.)
bn-18 : Monitor output gain (setting range : 0.000 to 10.000)
(Gain setting 1 : 100%/10 V, gain setting 2 : 50%/10 V)

** If operating L-load such as a relay coil, use the flywheel diode.




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

# A 4. OPTION

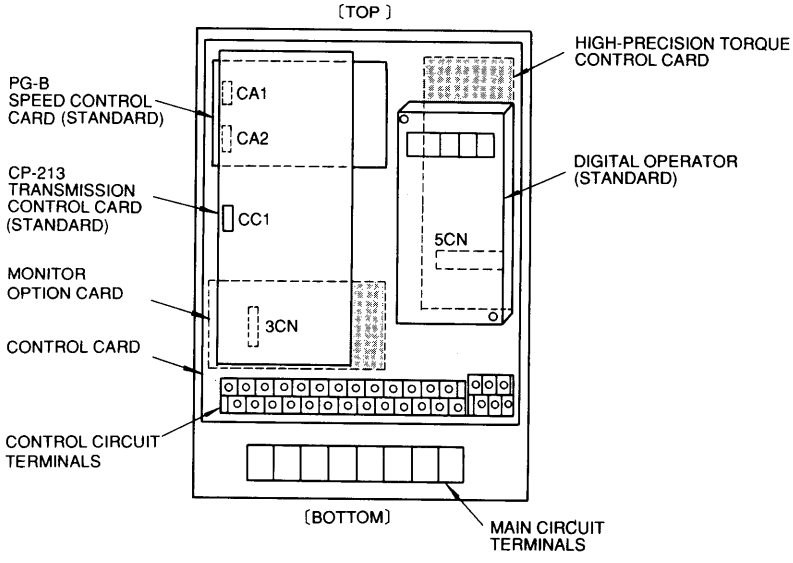
## A 4.1 OPTION CARD

| Type | | Name | Model (Cord No.) | Function | Mount Position | Remarks |
|---|---|---|---|---|---|---|
| Built-in Type (Mounted on Connector) | Monitor Operation Card | Analog* Monitor Card AO-12 | (73600-D002X) | • Outputs analog signal to monitor† operation status (output speed, torque, etc.)<br>• Output resolution : 11 bits (1/2048)<br>• Output voltage : 0 to ±10 V (not insulated)<br>• Output channels : 2 channels<br>• Related system constant bn-22 to bn-25 | Mounted on control card surface (1 piece alone can be mounted) | Document TOE-C736-30.22 |
| | | Digital Output Card DO-08 | (73600-B004X) | Outputs inverter operation status, fault. (Multi-function output)<br>• NO contact : 2 points (250 VAC 1A or less, 30 VDC, 1A or less)<br>• Open collector : 6 points (48 V 50mA)<br>• Related system constant Sn-27 | | |
| | High-precision Torque Control Card (TRQ-A) | | (73600-B001X) | The torque control precision can be improved by mounting the option. | Control card surface Mounted on 5CN | |

* AO-12 is included in the standard configuration of the CIMR-VHJ series.

† The monitor variable and gain can be selected for the analog monitor.

| Channel 1 | Channel 2 | Description |
|---|---|---|
| bn-22 | bn-24 | Set the item number of the monitor variable Un-□□ to be monitored. (Excluding the bit information items) |
| bn-23 | bn-25 | Monitor output gain (setting range 0.000 to 10.000)<br>(Gain setting 1 : 100%/10 V, gain setting 2 : 50%/10 V) |




Positions of the Option Card Devices

# A 4.2 OPTION UNIT

| 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, so it is safe to keep the monitor on site. | Inverter* faceplate | Document TOE-C736-50.4 |
| | 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 Specialized 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 = 1 m, 3 m | | |
| Separately-mounted Type | Extension Cable Specialized 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 = 1 m, 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. 100 m). | | |
| | Remote Monitor | JVOP-103 (73041-0913X) | The operation status can be monitored 5 meters or more away from the inverter (Max. 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 the resistor to reduce the deceleration time (operation factor 10% ED). | Separetely-mounted | Document TOE-C736-50.5 |
| | Braking Resistor (Built-in Type) | ERF-150WJ□□□ (R 00□□□□□) | Dissipates the motor regenerative energy by the resistor to reduce the deceleration time (operation factor 3% ED). | | |
| | Back-up Capacitor for Momentary Power Loss | P 00□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 | 72676-W 00□0 | Connection cable(with connector) between the motor PG and the inverter. 1 : 10 m 2 : 20 m 3 : 30 m 5 : 50 m | | |

* When mounting operation (JVOP-101, -109 type, black cover) on the faceplate of the inverter, remove the digital operator (JVOP-100 type : standard).

† The special extension cable with blank cover cannot be inserted/ejected on the inverter faceplate. When remote operation of the digital operator/monitor (1 m, 3 m) is to be performed, select the special extension cable (with blank cover) or adaptor panel + adaptor panel special extension cable.

## A 4.3 PERIPHERALS

| Name | Model | Application |
|---|---|---|
| Speedometer | DCF-6A | |
| Speed Setter<br>Speedometer Adjusting<br>Potentiometer Speed<br>Setting Knob | — | Available as separete components for remote control from several locations. |
| Potentiometer | — | Mounted on the control circuit terminal to calibrate the speed reference, speedometer and ammeter.<br>For 2 kΩ : ETX002780, for 20 kΩ : ETX002910 |
| AC Reactor | UZBA - ☐ | Used when the power capacity is large compared to the inverter capacity (10 times or more). Also effective for improvement of the power factor. |
| Radio Noise Protective Filter | HF, LF | Filter that suppresses high-frequency noise generated by the inverter to affect the power supply unit. Reduces radio noise. When operating the inverter in locations where the electric field intensity is weak, mount the noise filter on the input side, to prevent electric wave disturbance to radio and TV. |
| VS System Module | JGSM - ☐ | System controller that can be combined with the necessary VS system module according to the automatic control system to structure the optimum system. |
| Molded-case Circuit Breaker (MCCB) | NF ☐ | MCCB must be set at the power supply side to protect the inverter connection. |
| Magnetic Contactor | HI - ☐ E | Connects/disconnects the inverter power.<br>When a braking function is provided, always set the MC to prevent burning the braking resistor. |
| Surge Absorber | DCR2 - ☐ | Absorbs surge current by opening and closing of the MC and control relays. Always set the surge absorber on MC and relays near the inverter. |
| Output Voltmeter | SCF-12NH | Voltmeter specialized to the PWM inverter. |
| Isolator | DGP ☐ | Insulates the inverter I/O signals. Effective to prevent inductive noise. |

# A 5. CP-213 TRANSMISSION DATA

The multi-system inverter can structure the CP-213 transmission system by combination with the host controller (CP-3300, CP-3500, CP-313M, etc.).

## A 5.1 INITIAL DATA

| No. | Name | Range | Initial Value | Updated Constant | Remarks |
|---|---|---|---|---|---|
| 1 | User Heading | F8F8 | — | — | * |
| 2 | No. 3 and No. 7 Selection Flag | — | — | — | † |
| 3 | ASR Proportional Gain | 0 to 300 | 20 | bn-05 | |
| 4 | ASR Integral Time | 0 to 30,000 ms | 1000 ms | bn-06 | |
| 5 | Positive Torque Limit | 0.00 to 300.00% | 150.00% | bn-07 | |
| 6 | Negative Torque Limit | 0.00 to 300.00% | 150.00% | bn-08 | |
| 7 | Regenerative Torque Limit | 0.00 to 300.00% | 150.00% | bn-09 | |
| 8 | Acceleration Time 1 | 0.0 to 3000.0 s | 10.0 s | bn-01 | |
| 9 | Deceleration Time 1 | 0.0 to 3000.0 s | 10.0 s | bn-02 | |
| 10 | Rated Speed Adjustment | 0.5000 to 1.3000 | 1.000 | bn-10 | |
| 11 | Trace Sampling Time | 0.020 to 60.000 s | 0.06 s | bn-11 | Setting unit is 0.02 s |

* Initial data can be added by user heading to write the An, bn, Cn, dn, on constants.

† Initial data or control data must be selected for the ASR proportional gain and regenerative torque limit.
See the 1st and 2nd digits of system constant Sn-30 for this selection.

| Set Value | ASR Proportional Gain | Regenerative Torque Limit |
|---|---|---|
| 1 | Control data are used | Initial data are used |
| 2 | Initial data are used | Control data are used |
| 3 | Control data are used | Control data are used |
| Others | Initial data are used | Initial data are used |

# A 5.2 CONTROL DATA

## (a) Host Controller → Inverter

| No. | Data Name | | | Description 1 | Description 0 | Remarks |
|---|---|---|---|---|---|---|
| 1 | Operation Signal | 0 | Operation Reference | Operation reference | Stop reference | |
| | | 1 | Reverse Operation Reference | Reverse operation reference | Forward operation reference | |
| | | 2 | Bace Block Reference | Bace block reference | Bace Block reference release | |
| | | 3 | Trace Stop | Trace back stop reference | Trace back start reference | |
| | | 4 | External Fault | External fault | External fault release | |
| | | 5 | Fault Reset | Fault reset reference | Fault reset reference release | |
| | | 6 | Accel/Decel Time Selection | Select acceleration time 2; deceleration time 2 | Select acceleration time 1; deceleration time 1 | |
| | | 7 | Accel/Decel Stop | Maintain speed | Maintain speed release | |
| | | 8 | Initial Excitation Reference | Initial excitation reference | Initial excitation reference release | |
| | | 9 | Integral Reset | Integral reset | Integral reset release | |
| | | A | Integral Hold | Integral hold | Integral hold release | |
| | | B | Soft Starter Cancel | No soft starter | With soft starter | |
| | | C | Multi-function Output 1 (Contact : Terminal No. 9, 10) | Contact output is "Closed" when Sn-20 is "F" | Contact output is "Open" when Sn-20 is "F" | |
| | | D | Multi-function Output 2 (PHC 1 : Terminal No. 25) | PHC output is "Closed" when Sn-21 is "F" | PHC output is "Open" when Sn-21 is "F" | |
| | | E | Multi-function Output 3 (PHC 2 : Terminal No. 26) | PHC output is "Closed" when Sn-22 is "F" | PHC output is "Open" when Sn-22 is "F" | |
| | | F | Multi-function Output 4 (PHC 3 : Terminal No. 28) | PHC output is "Closed" when Sn-23 is "F" | PHC output is "Open" when Sn-23 is "F" | |
| 2 | Speed Reference | | | Setting resolution is 30,000/100% ; setting range is −109 to +109% | | |
| 3 | Torque Reference | | | Setting resolution is 10,000/100% ; setting range is −300 to +300% | | |
| 4 | Torque Compensation | | | Setting resolution is 10,000/100% ; setting range is −300 to +300% | | |
| 5 | External Magnetic Flux Reference (Effective when Sn-30, 4th Digit = 1") | | | Setting resolution is 10,000/100% ; setting range is +20 to +120% | | |
| 6 | ASR Proportional Gain (Effective when Sn-30, 1st Digit = 1") | | | Setting range is 0 to +300 | | |
| 7 | Regenerative Torque Limit (Effective when Sn-30, 2nd Digit = 1") | | | Setting resolution is 10,000/100% ; setting range is 0 to +300% | | |
| 8 | Not Used | | | — | | |
| 9 | AO/DO Output Enable Bit | 0 | Analog Monitor Output | Outputs CP-213 control data No. 10 set value. | Outputs the monitor items set by bn-17. | |
| | | 1 | AO-08 Option CH-1 Output | Outputs CP-213 control data No. 12 set value. | Outputs the monitor items set by bn-22. | |
| | | 2 | AO-08 Option CH-2 Output | Outputs CP-213 control data No. 13 set value. | Outputs the monitor items set by bn-24. | |
| | | 3 | AO-12 Option CH-1 Output | Outputs CP-213 control data No. 14 set value. | Outputs the monitor items set by bn-22. | |
| | | 4 | AO-12 Option CH-2 Output | Outputs CP-213 control data No. 15 set value. | Outputs the monitor items set by bn-24. | |
| | | 5 | DO-08 Option Output | Outputs CP-213 control data No. 11 set value. | Outputs the data set by bn-27. | |

# A 5.2 CONTROL DATA (Cont'd)

| No. | Data name | | | Description 1 | Description 0 | Remarks |
|---|---|---|---|---|---|---|
| 9 | AO/DO Output Enable Bit | 6 | Not Used | — | — | |
| | | 7 | Not Used | — | — | |
| | | 8 | Not Used | — | — | |
| | | 9 | Not Used | — | — | |
| | | A | Not Used | — | — | |
| | | B | Not Used | — | — | |
| | | C | Not Used | — | — | |
| | | D | Not Used | — | — | |
| | | E | Not Used | — | — | |
| | | F | Multi-function Output 5 (PHC4 : Terminal No. 29) | PHC output is "Closed" when Sn-24 is "F" | PHC output is "Open" when Sn-24 is "F" | |
| 10 | Inverter Unit Analog Monitor Output Value | | | 0000H to 00FFH (−11 V to +11 V) | | |
| 11 | Option DO-08 Output Value | | | 0000H to 00FFH | | |
| 12 | Option AO-08 CH1 Output Value | | | 0000H to 00FFH (0 V to +11 V) | | |
| 13 | Option AO-08 CH2 Output Value | | | 0000H to 00FFH (0 V to +11 V) | | |
| 14 | Option AO-12 CH1 Output Value | | | 0000H to 0FFFH (−11 V to +11 V) | | |
| 15 | Option AO-12 CH2 Output Value | | | 0000H to 0FFFH (−11 V to +11 V) | | |
| 16 | Not Used | | | — | | |

## (b) Inverter → Host Controller

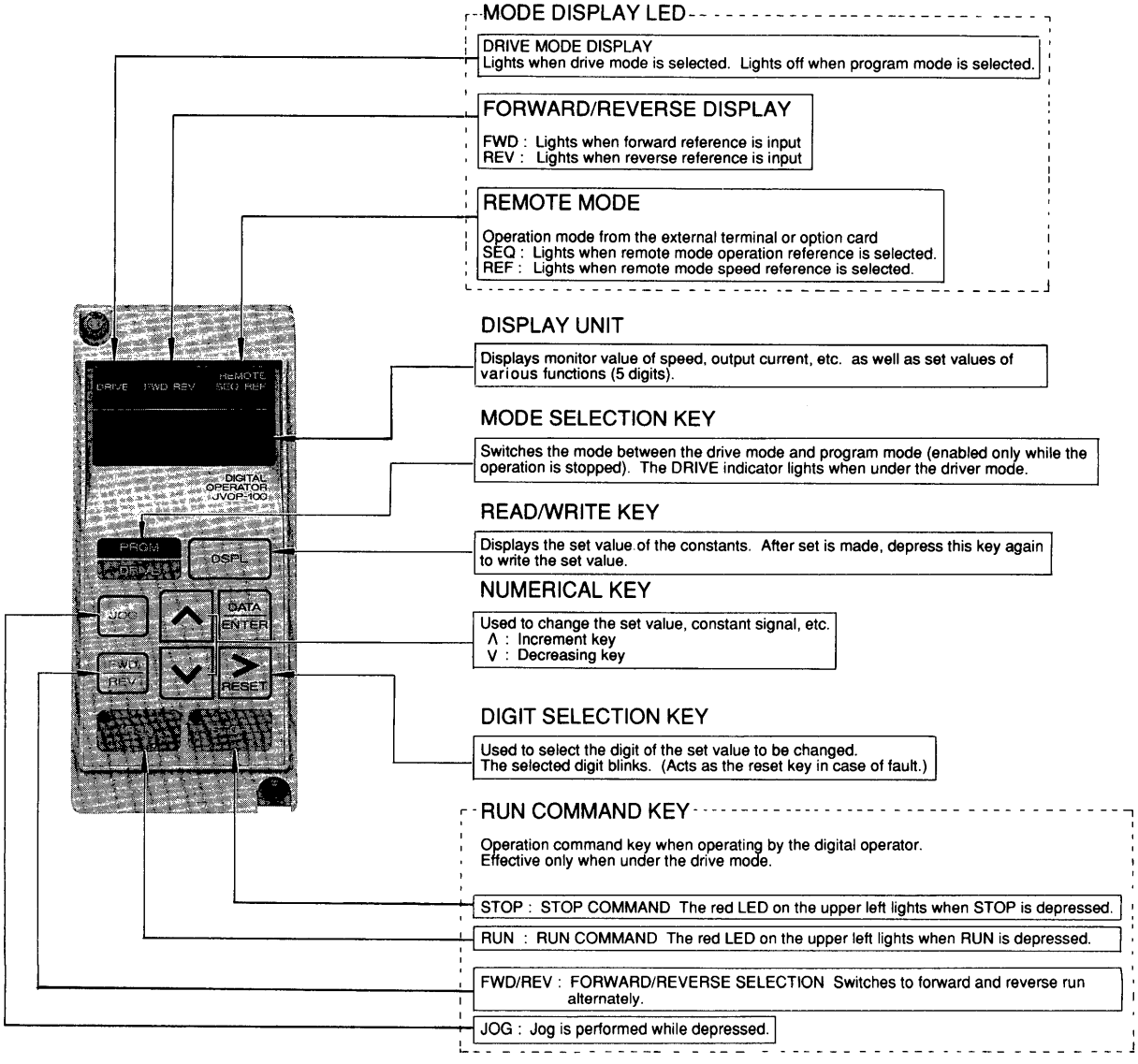
| No. | Data name | | | Description 1 | Description 0 | Remarks |
|---|---|---|---|---|---|---|
| 1 | Status Signal | 0 | Operating | Operating | Stopping | Trace back area |
| | | 1 | Zero-speed | Zero-speed | Not zero-speed | |
| | | 2 | Reverse Operation | Reverse operation | Forward operation | |
| | | 3 | Inputting Reset Signal | Inputting fault reset signal | Fault reset signal input | |
| | | 4 | Speed Agree | Speed agree detection | Speed agree release | |
| | | 5 | Ready for Inverter Operation | Ready for inverter operation | Not ready for inverter operation | |
| | | 6 | Normal Failure | Normal failure detected | Normal failure release | |
| | | 7 | Major Failure | Major failure detected | Fatal failure release | |
| | | 8 | Reference Fault | CP-213 control data upper/ lower limit fault | CP-213 control data upper/ lower limit error release | |
| | | 9 | Power Loss Recovery | Power loss recovery | Momentary power loss recovery | |
| | | A | Operation Mode | Operation stop from CP-213 | Operation stopped from other than CP-213 | |
| | | B | Recieved Initial Data | Recieved initial data | Initial data not received | |
| | | C | Multi-function Input 1 (Terminal No. 5) | Multi-function input 1 (Terminal No. 5) is "Closed". | Multi-function input 1 (Terminal No. 5) is "Open". | |
| | | D | Multi-function Input 2 (Terminal No. 6) | Multi-function input 2 (Terminal No. 6) is "Closed". | Multi-function input 2 (Terminal No. 6) is "Open". | |
| | | E | Multi-function Input 3 (Terminal No. 7) | Multi-function input 3 (Terminal No. 7) is "Closed". | Multi-function input 3 (Terminal No. 7) is "Open". | |
| | | F | Multi-function Input 4 (Terminal No. 8) | Multi-function input 4 (Terminal No. 8) is "Closed". | Multi-function input 4 (Terminal No. 8) is "Open". | |
| 2 | Alarm Signal | 0 | Overcurrent (Including Ground Fault) | Overcurrent (including ground fault) detected | Reset overcurrent | |
| | | 1 | Overvoltage | Overvoltage detected | Reset overvoltage | |
| | | 2 | Inverter Overload | Inverter overload detected | Reset inverter overload | |
| | | 3 | Inverter Overheat | Inverter overheat detected | Reset inverter overheat | |
| | | 4 | Overspeed | Overspeed detected | Reset overspeed | |
| | | 5 | Fuse Blown | Blown fuse detected | Reset fuse break | |
| | | 6 | Open Load | Open load detected | Reset open load | |
| | | 7 | External Fault | External fault detected | Reset external fault | |
| | | 8 | Hardware Fault | Hardware fault detected | Reset hardware fault | |
| | | 9 | Motor Overload | Motor overload detected | Reset motor overload | |
| | | A | Motor Overheat | Motor overheat detected | Reset motor overheat | |
| | | B | Regenerative Resistance, Regenerative Transistor Fault | Regenerative resistance, regenerative transistor fault detected | Reset regenerative resistance, regenerative transistor fault | |
| | | C | Power Loss, Low Voltage | Power loss, low voltage detected at speed control | Reset power failure, low voltage | |
| | | D | Excess Speed Regulation | Excess speed deviation detected | Reset excess speed deviation | |
| | | E | PG Line Breaking, Thermister Line Breaking | PG line break, thermister line break detected | Reset PG line break, thermister line break | |
| | | F | Cooling Fan Failure | Cooling fan failure detected | Reset cooling fan failure | |
| 3 | Speed Reference | | | Resolution is 30,000/100% | | |
| 4 | Primary Frequency Reference | | | Resolution is 10,000/100% | | |
| 5 | Speed Feedback | | | Resolution is 30,000/100% | | |
| 6 | Torque Reference | | | Resolution is 10,000/100% | | |
| 7 | Output Current | | | Resolution is 10,000/100% | | |
| 8 | Voltage Reference | | | Resolution is 10,000/100% | | |

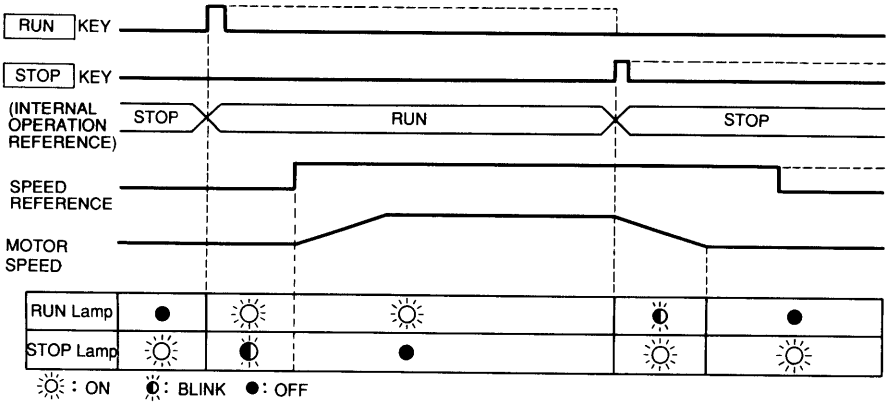
# A 5.2 CONTROL DATA (Cont'd)

| No. | | Data name | Description 1 | Description 0 | | Remarks |
|---|---|---|---|---|---|---|
| 9 | | Main Circuit DC Voltage | Resolution is 10,000/100% 〔400 V (800V) /100%〕 | | | Trace back area |
| 10 | | Speed Detection Count | 0 to 65535 | | | |
| 11 | | Momentary Power Loss | Resolution is 30,000/100% | | | |
| 12 | | Torque Feedback | Resolution is 10,000/100% | | | |
| 13 | | Inverter Unit Master Speed A/D Conversion Value | 0 to 1023 (0 V to +10 V) | | | |
| 14 | | Inverter Unit Auxiliary Speed A/D Conversion Value | 0 to 1023 (0 V to +10 V) | | | |
| 15 | 0 | Inverter Unit Input Terminal 1 | Inverter unit input terminal 1 is "Closed" | Inverter unit input terminal 1 is "Open" | | |
| | 1 | Inverter Unit Input Terminal 2 | Inverter unit input terminal 2 is "Closed" | Inverter unit input terminal 2 is "Open" | | |
| | 2 | Inverter Unit Input Terminal 3 | Inverter unit input terminal 3 is "Closed" | Inverter unit input terminal 3 is "Open" | | |
| | 3 | Inverter Unit Input Terminal 4 | Inverter unit input terminal 4 is "Closed" | Inverter unit input terminal 4 is "Open" | | |
| | 4 | Inverter Unit Input Terminal 5 | Inverter unit input terminal 5 is "Closed" | Inverter unit input terminal 5 is "Open" | | |
| | 5 | Inverter Unit Input Terminal 6 | Inverter unit input terminal 6 is "Closed" | Inverter unit input terminal 6 is "Open" | | |
| | 6 | Inverter Unit Input Terminal 7 | Inverter unit input terminal 7 is "Closed" | Inverter unit input terminal 7 is "Open" | | |
| | 7 | Inverter Unit Input Terminal 8 | Inverter unit input terminal 8 is "Closed" | Inverter unit input terminal 8 is "Open" | | |
| | 8 | Low Voltage | Low voltage detected | Release low voltage | Normal failure is set only when so selected by the system constant. 〔Sn-10 to Sn-14〕 | Normal failure information |
| | 9 | Overvoltage During Stop | Overvoltage detected during stop | Release overvoltage during stop | | |
| | A | Motor Overload | Motor overload detected | Release motor overload | | |
| | B | Inverter Overload | Inverter overload detected | Release inverter overload | | |
| | C | Not Used | — | — | | |
| | D | Cooling Fan Failure | Cooling fan failure detected | Release cooling fan failure | | |
| | E | Inverter Overheat Warning | Inverter overheat warning detected | Release inverte overheat warning | | |
| | F | Open Load | Open load detected | Release open load | | |
| 16 | 0 | Not Used | — | — | | |
| | 1 | Operation Sequence Input Fault (2-wire) | Operation sequence input fault detected | Release operation sequence input fault (2-wire) | | |
| | 2 | External Fault (CP-213 Control Data) | External fault detected | Release external fault | | |
| | 3 | External Fault (Input Terminal 3) | External fault detected | Release external fault | | |
| | 4 | External Fault (Input Terminal 5) | External fault detected | Release external fault | | |
| | 5 | External Fault (Input Terminal 6) | External fault detected | Release external fault | | |
| | 6 | External Fault (Input Terminal 7) | External fault detected | Release external fault | | |
| | 7 | External Fault (Input Terminal 8) | External fault detected | Release external fault | | |
| | 8 | CP-213 Transmission Fault | CP-213 transmission fault detected | Release external fault | | |
| | 9 | Not Used | — | — | | |
| | A | Not Used | — | — | | |
| | B | Excess Speed Regulation | Excess speed regulation (only when speed is limited) | Release excess speed regulation | | |
| | C | Not Used | — | — | | |
| | D | Not Used | — | — | | |
| | E | Not Used | — | — | | |
| | F | Not Used | — | — | | |

# A 6. DIGITAL OPERATOR

## A 6.1 DIGITAL OPERATOR DISPLAY UNIT, CONTROL UNIT




The RUN, STOP lamp light, blink, lights off as necessary.

## A 6.2 OPERATION MODE AND CONSTANT GROUP

The VS-676VH3 has the drive (DRIVE) mode and the program (PRGM) mode.

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, 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.

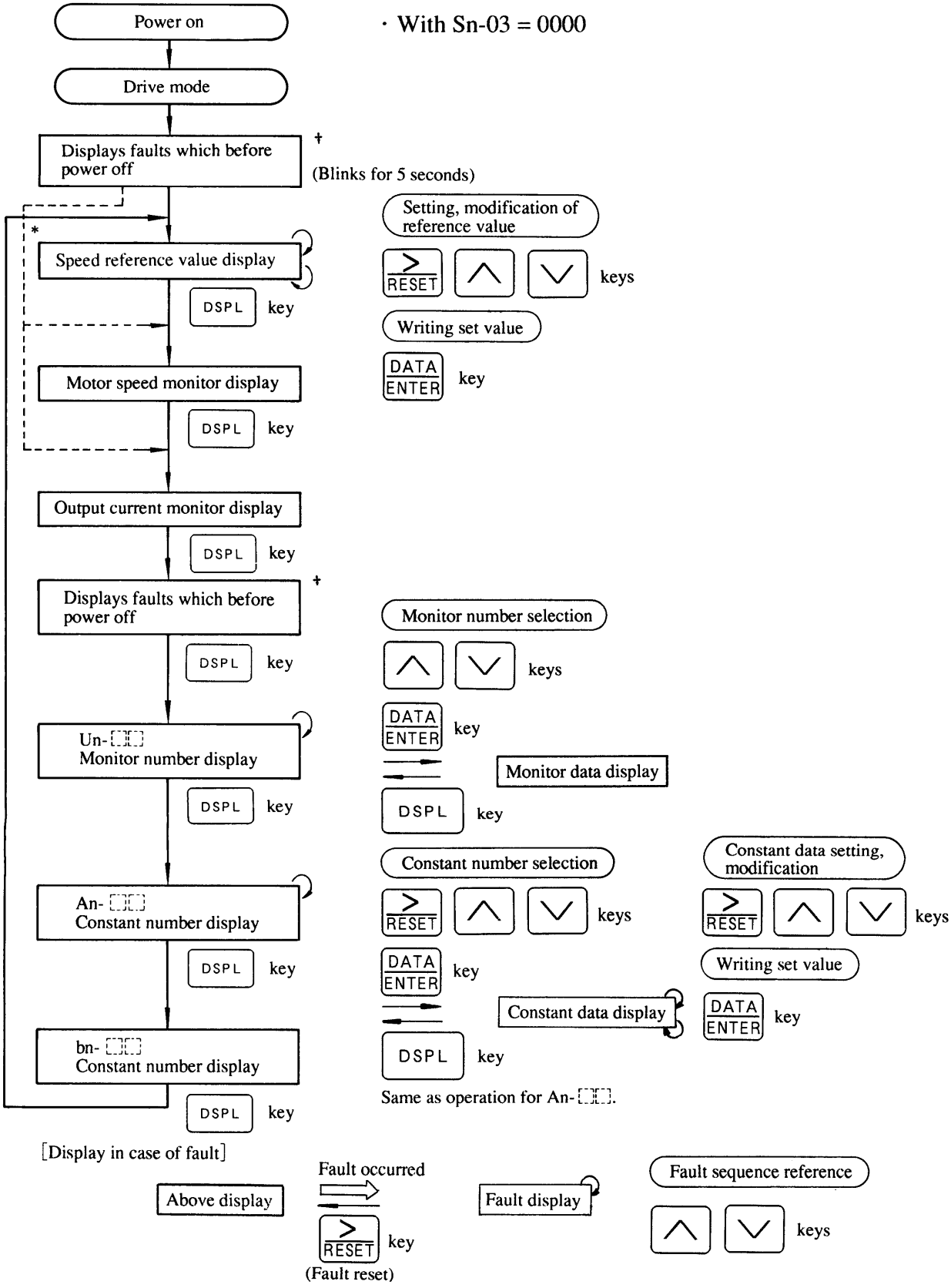
| Operation Mode | | | Drive Mode | Program Mode | Related Constant (Set value) |
|---|---|---|---|---|---|
| Operator Function | Operation and Speed Reference Input | | Operation can be performed by the digital operator. | — | Sn-04 (××11) |
| | Constant Setting | An - □□<br>bn - □□ | Setting is performed. | Setting is performed. | Sn-03 (0000) |
| | | Cn - □□<br>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 | | bn-13 (1) |

(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 the operation characteristics.
- ·dn- □□ ··· Motor constant group. Constants related to the motor characteristics.
- ·Sn- □□ ··· System constant group. Constants used to select functions.
- ·On- □□ ··· Order constant group. Constants related to dedicated functions.

## A 6.3 DISPLAY UNDER DRIVE MODE

The mode when the power is supplied is the drive mode, with the drive mode lamp on.

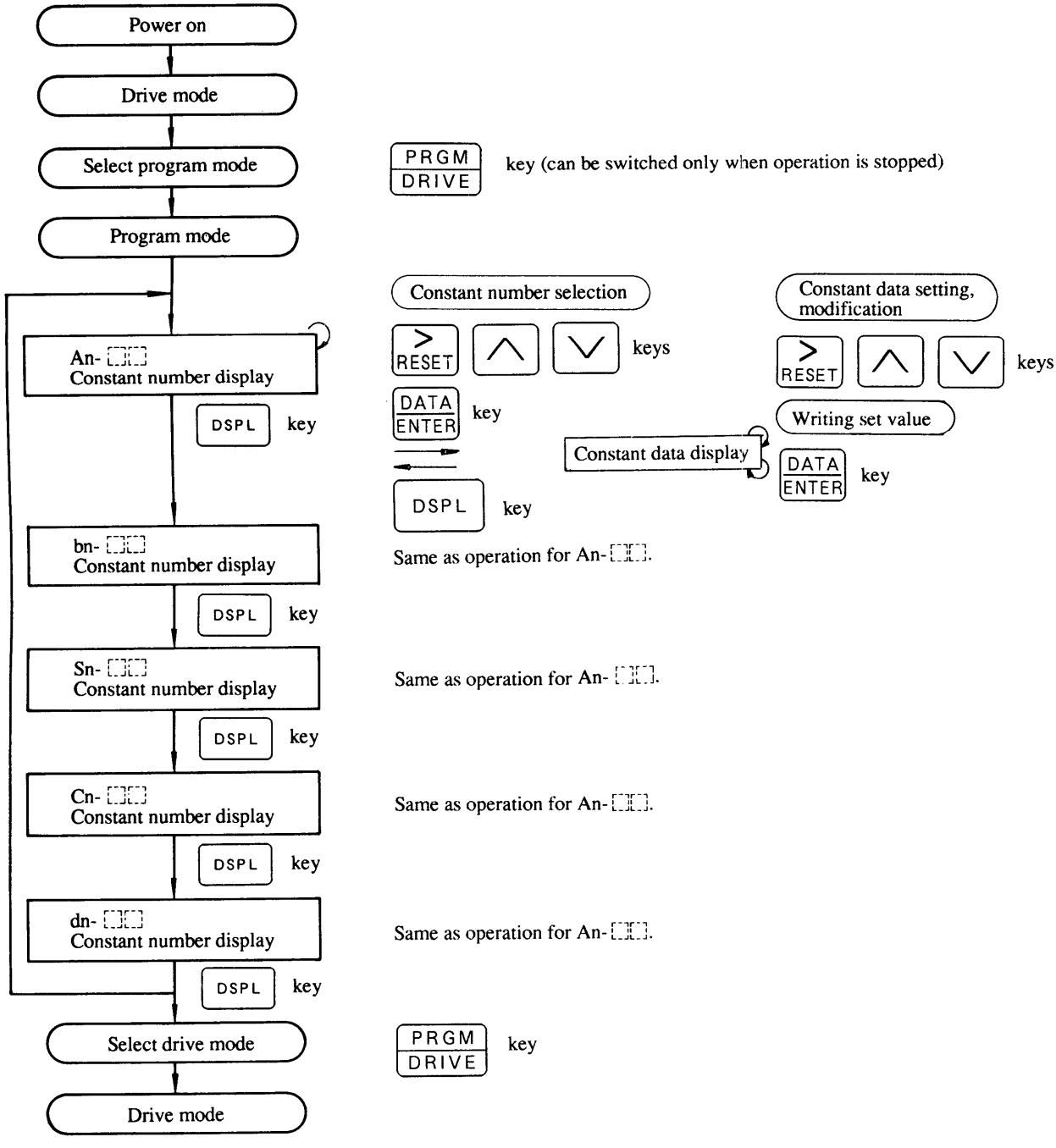



* Can be changed by constant bn-13 (monitor number when power is supplied.)
† This display is skipped if no fault occurred before disconnecting power.

## A 6.4 PROGRAM MODE DISPLAY

- Function selection or constant setting, modification are performed according to the application under this mode.
- The program mode can be selected by the PRGM/DRIVE key if the operation is stopped.

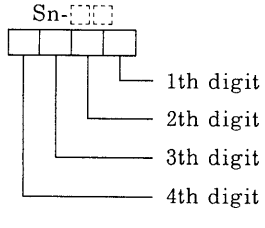
When the program mode is selected, the drive mode lamp lights off.



# A 7. CONSTANTS

## A 7.1 SYSTEM CONSTANTS (Sn-□□)

System Constants (1 of 8)

<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)<br><br>200 V Class (Note) Set value cannot be changed at constant initialization.
<table>
<tr><td>CIMR-VHA</td><td>20P4</td><td>20P7</td><td>22P2</td><td>23P7</td><td>25P5</td><td>27P5</td><td>2011</td><td>2015</td><td>2022</td><td>2037</td><td>2055</td><td>2075</td></tr>
<tr><td>Sn-01 Set Value</td><td>00</td><td>01</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td>0A</td><td>0C</td><td>0E</td><td>0F</td></tr>
<tr><td>Inverter Rated Current</td><td>3.2</td><td>4.8</td><td>9.6</td><td>16</td><td>24</td><td>32</td><td>48</td><td>64</td><td>96</td><td>160</td><td>224</td><td>300</td></tr>
</table>
400 V Class
<table>
<tr><td>CIMR-VHA</td><td>40P7</td><td>42P2</td><td>43P7</td><td>47P5</td><td>4011</td><td>4015</td><td>4022</td><td>4030</td><td>4L45</td><td>4045</td><td>4055</td><td>4075</td><td>4110</td><td>4160</td></tr>
<tr><td>Sn-01 Set Value</td><td>21</td><td>23</td><td>24</td><td>26</td><td>27</td><td>28</td><td>2A</td><td>2B</td><td>3F</td><td>2D</td><td>2E</td><td>2F</td><td>31</td><td>33</td></tr>
<tr><td>Inverter Rated Current</td><td>2.56</td><td>4.8</td><td>8</td><td>16</td><td>24</td><td>32</td><td>48</td><td>64</td><td>76.8</td><td>96</td><td>128</td><td>165</td><td>224</td><td>300</td></tr>
</table></td><td>Factory set</td></tr>
<tr><td>Sn-02</td><td>Motor Selection</td><td>Set the code of the motor to be operated. (Preset at the factory prior to shipment)<br>The following is the standard motor. Set "FFF" for non-standard motors, and also set motor constant dn - □□.<br>When motor code (set value) is changed, the initial value corresponding to the motor is set to motor constant dn-01 to dn-18.<br>Set value cannot be changed at constant initialization.
<table>
<tr><td colspan="2">Motor Output kW</td><td>0.4</td><td>0.75</td><td>1.5</td><td>2.2</td><td>3.7</td><td>5.5</td><td>7.5</td><td>11</td><td>15</td><td>18.5</td><td>22</td></tr>
<tr><td rowspan="3">Sn-02 Set Value</td><td>1750 r/min</td><td>000</td><td>001</td><td>002</td><td>003</td><td>004</td><td>005</td><td>006</td><td>007</td><td>008</td><td>009</td><td>00A</td></tr>
<tr><td>1450 r/min</td><td>100</td><td>101</td><td>102</td><td>103</td><td>104</td><td>105</td><td>106</td><td>107</td><td>108</td><td>109</td><td>10A</td></tr>
<tr><td>1150 r/min</td><td>200</td><td>201</td><td>202</td><td>203</td><td>204</td><td>205</td><td>206</td><td>207</td><td>208</td><td>209</td><td>20A</td></tr>
</table>
<table>
<tr><td colspan="2">Motor Output kW</td><td>30</td><td>37</td><td>45</td><td>55</td><td>75</td><td>90</td><td>110</td><td>132</td></tr>
<tr><td rowspan="3">Sn-02 Set Value</td><td>1750 r/min</td><td>00B</td><td>00C</td><td>00D</td><td>00E</td><td>00F</td><td>010</td><td>011</td><td>132</td></tr>
<tr><td>1450 r/min</td><td>10B</td><td>10C</td><td>10D</td><td>10E</td><td>10F</td><td>110</td><td>111</td><td>112</td></tr>
<tr><td>1150 r/min</td><td>20B</td><td>20C</td><td>20D</td><td>20E</td><td>20F</td><td>210</td><td>211</td><td>212</td></tr>
</table></td><td>Factory set</td></tr>
<tr><td>Sn-03</td><td>Operator Status</td><td>Select Digital Operator Function
<table>
<tr><td rowspan="2">Constant No.</td><td colspan="6">Sn-03 Setting Value</td></tr>
<tr><td>0000</td><td>0101</td><td>1010</td><td>1001</td><td>1110</td><td>1111</td></tr>
<tr><td>An - □□</td><td>◎</td><td>◎</td><td>◎</td><td>◎</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>△</td><td>◎</td><td>◎</td></tr>
<tr><td>Cn - □□</td><td>○</td><td>△</td><td>○</td><td>◎</td></tr>
<tr><td>dn - □□</td><td>○</td><td>△</td><td>○</td><td>◎</td></tr>
<tr><td>On - □□</td><td>×</td><td>×</td><td>○</td><td>◎</td></tr>
<tr><td>Sn - □□</td><td>○</td><td>△</td><td>○</td><td>○</td></tr>
</table>
◎…Setting can be changed regardless of the operation mode<br>
○…Setting can be changed only when the program mode is selected<br>
△…Reference only can also be made (setting cannot be changed)<br>
×…No reference<br>
* The Sn-03 set value becomes 0000 when the initialization of constants is completed.<br><br>

</td><td>0000</td></tr>
</table>

# A 7.1 SYSTEM CONSTANTS (Sn- □□) (Cont'd)

System Constants (2 of 8)

| Constant No. | Name | Description | | | | Initial Value |
|---|---|---|---|---|---|---|
| | | Digit | | Data | | |
| Sn-04 | Run Mode Selection 1 | 1 | Speed reference selection | 0 | From external terminal | 0011 |
| | | | | 1 | From operator (speed reference An-01) | |
| | | 2 | Operation reference selection | 0 | From external terminal | |
| | | | | 1 | From operator | |
| | | 3 • 4 | Stop method selection (When stop reference is input) | 00 | Deceleration stop | |
| | | | | 01 | Coasting to a stop | |
| | | | | 10 | — | |
| | | | | 11 | — | |
| Sn-05 | Run Mode Selection 2 | 1 | Stop priority during external terminal operation | 0 | Operator STOP key enabled | 0001 |
| | | | | 1 | Operator STOP key disabled | |
| | | 2 | Reverse run prohibition | 0 | Normal operation (reverse operation also enabled) | |
| | | | | 1 | Reverse run inhibited | |
| | | 3 | Forward run prohibition | 0 | Normal operation (forward run also enabled) | |
| | | | | 1 | Forward run prohibited | |
| | | 4 | Not used | 0 | — | |
| Sn-06 | Run Mode Selection 3 | 1 | Not used | 0 | — | 0000 |
| | | 2 | Not used | 0 | — | |
| | | 3 • 4 | Run mode when the speed reference is less that the minimum speed reference (Cn-06) | 00 | Normal operation (Cn-06 is invalid) | |
| | | | | 01 | Zero-speed operation | |
| | | | | 10 | Coasting prohibited | |
| | | | | 11 | Not used | |
| Sn-07 | Run Mode Selection 4 | 1 | Coasting pull-in function for re-operation | 0 | With coasting pull-in | 0000 |
| | | | | 1 | Without coasting pull-in | |
| | | 2 | Control mode when less than zero-speed (Cn-01) | 0 | ASR processing is PI control (normal mode) | |
| | | | | 1 | ASR processing is P control | |
| | | 3 | Not used | 0 | — | |
| | | 4 | Not used | 0 | — | |
| Sn-08 | Run Mode Selection 5 | 1 | Speed reference selection | 0 | From transmission side | 0000 |
| | | | | 1 | From inverter unit (external terminal or operator) | |
| | | 2 | Operation reference selection | 0 | From transmission side | |
| | | | | 1 | From inverter unit (external terminal or operator) | |
| | | 3 | Not used | 0 | — | |
| | | 4 | Processing mode after normal failure occurred | 0 | Internal automatic reset | |
| | | | | 1 | Failure is maintained until external reset signal is input | |
| Sn-09 | Run Mode Selection 6 | 1 | Inverter input power supply | 0 | H: 220/230 V @200 V class, 440/460 V @400 V class | 0000 |
| | | | | 1 | L : 200 V @200 V class, 400 V @400 V class | |
| | | 2 | Not used | 0 | — | |
| | | 3 | Not used | 0 | — | |
| | | 4 | Carrier frequency | 0 | L : 2.08 kHz | |
| | | | | 1 | H : 12.5 kHz (low noise selection) | |

System Constants (3 of 8)

| Constant No. | Name | Digit | Description | Data | | Initial Value |
|---|---|---|---|---|---|---|
| Sn-10 | Protection Characteristics Slection 1 | 1 • 2 | Stop method when excess speed deviation (DEV) is detected | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | 0111 |
| | | | | 01 | Coasting to a stop (major failure) | |
| | | | | 10 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 11 | Operation is continued (normal failure) | |
| | | 3 • 4 | Stop method when overspeed (OS) is detected | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | |
| | | | | 01 | Coasting to a stop (major failure) | |
| | | | | 10 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 11 | Not used | |
| Sn-11 | Protection Characteristics Slection 2 | 1 | Built-in braking resistor | 0 | Without built-in braking resistor | 0000 |
| | | | | 1 | With built-in braking 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 | 0 | Operation stops when momentary power loss is detected (coasting) | |
| | | | | 1 | Automatic operation restarts after recovery from momentary power loss | |
| | | 4 | Low voltage (PUV) detection level selection | 0 | 80% (210 V @200 V class, 420 V @400 V class) | |
| | | | | 1 | Low voltage detection level is set in Cn-17 | |
| Sn-12 | Protection Characteristics Slection 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 acceptance | 0 | External fault is always detected | |
| | | | | 1 | No external fault is detected while operation is stopped (BB) | |
| | | 3 • 4 | Stop method when external fault is detected | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | |
| | | | | 11 | Coasting to a stop (major failure) | |

# A 7.1 SYSTEM CONSTANTS (Sn-□□) (Cont'd)

System Constants (4 of 8)

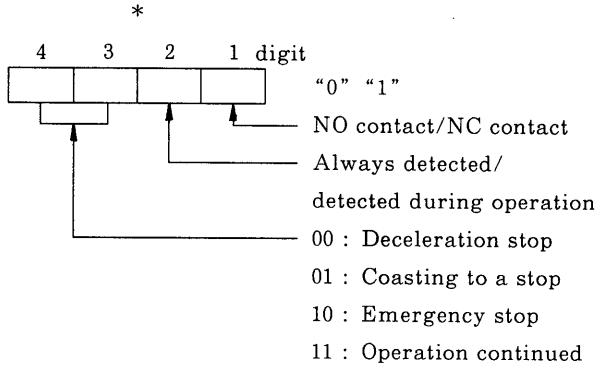
| Constant No. | Name | Dscription | | | | Initial Value |
|---|---|---|---|---|---|---|
| | | Digit | | Data | | |
| Sn-12 | Protection Characteristics Selection 3 (Cont'd) | 3 • 4 | Stop method when external fault is detected | 10 | Emergency stop (deceleration time is set in bn-12) (major failure) | 0100 |
| | | | | 11 | Operation is continued (normal failure) | |
| Sn-13 | Protection Characteristics Selection 4 | 1 • 2 | Stop method in case of inverter overload (OL2) | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | 0101 |
| | | | | 01 | Coasting to a stop (major failure) | |
| | | | | 10 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 11 | Operation is continued (normal failure) | |
| | | 3 • 4 | Stop method in case of inverter cooling fan (FAN) failure | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | |
| | | | | 01 | Coasting to a stop (major failure) | |
| | | | | 10 | Emergency stop (decelration time is set in bn-12) (major failure) | |
| | | | | 11 | Operation is continued (normal failure) | |
| Sn-14 | Protection Characteristics Selection 5 | 0 • 1 | Stop method in case of motor overload (OL1) | 00 | Deceleration stop (deceleration time is set in bn-02) (major failure) | 1101 |
| | | | | 01 | Coasting to a stop (major failure) | |
| | | | | 10 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 11 | Operation is continued (normal failure) | |
| | | 2 | Stop method in case of motor overheat (OH1) | 0 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 1 | Coasting to a stop (major failure) | |
| | | 3 | Stop method in case thermister line break (THM) is detected | 0 | Emergency stop (deceleration time is set in bn-12) (major failure) | |
| | | | | 1 | Coasting to a stop (normal failure) | |

System Constants (5 of 8)

| Constant No. | Name | | Description | Initial Value |
|---|---|---|---|---|
| Sn-15 | Multi-function Input Terminal Function Selection | Terminal 5 Function | | 03 |
| Sn-16 | | Terminal 6 Function | | 04 |
| Sn-17 | | Terminal 7 Function | | 06 |
| Sn-18 | | Terminal 8 Function | | 08 |
| | Set the value from Sn-15 to Sn-18 in ascending order. No overlapping other than F and FF. | | | |

| Set Value | Function | |
|---|---|---|
| 0 | Forward/reverse selection (3-wire operation mode) | |
| 1 | Run signal selection 1 (operator selection) | |
| 2 | Run signal selection 2 (inverter unit operation selection) | |
| 3 | Multi-speed reference 1 | Multi-speed reference has priority over transmission speed reference |
| 4 | Multi-speed reference 2 | |
| 5 | Multi-speed reference 3 | |
| 6 | Jog speed selection | |
| 7 | Accel/decel time selection | |
| 8 | External base block (NO contact) | |
| 9 | External base block (NC contact) | |
| A | Accel/decel stop (maintain speed) | |
| B | Inverter overheat prediction | |
| C | Auxiliary analog input (terminal 16) enable/disable | |
| E | ASR integral reset | |
| F | DI function | |
| 20 to 2F | External fault signal selection 1 | * |
| 30 to 3F | External fault signal selection 2 | |
| 40 to 4F | External fault signal selection 3 | |
| 50 to 5F | External fault signal selection 4 | |
| 70 | Initial excitation | |
| 71 | Speed control/torque control selection (torque control is selected) | |
| 72 | Zero-servo on/off | |
| 74 | Integral hold(ASR) | |

Setting Value 0 of F



# A 7.1 SYSTEM CONSTANTS (Sn-□□) (Cont'd)

System Constants (6 of 8)

<table>
<tr><th>Constant No.</th><th colspan="2">Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>Sn-19</td><td>Multi-function Analog Input Terminal Function Selection</td><td>Terminal 16 Function</td><td><table><tr><th>Set Value</th><th>Function</th></tr><tr><td>00</td><td>Multi-speed auxiliary speed reference (100%/10 V)</td></tr><tr><td>01</td><td>Speed bias 1 (+10%/10 V)</td></tr><tr><td>02</td><td>Speed bias 1 (−10%/10 V)</td></tr><tr><td>03</td><td>Torque limit 1 (±100%/5 V)</td></tr><tr><td>04</td><td>Torque limit 2 (±100%/3 V)</td></tr></table></td><td>00</td></tr>
<tr><td>Sn-20</td><td rowspan="6">Multi-function Output Terminal Function Slection</td><td>Terminal 9-10 Function</td><td rowspan="6"><table><tr><th>Set Value</th><th>Function</th></tr><tr><td>0</td><td>During operation (RUNX)</td></tr><tr><td>1</td><td>Zero-speed (ZSPX)</td></tr><tr><td>2</td><td>Speed agree (AGREE)</td></tr><tr><td>3</td><td>Optional speed agree (AGREE 1)</td></tr><tr><td>4</td><td>Speed detection 1 (NDET 1)</td></tr><tr><td>5</td><td>Speed detection 2 (NDET 2)</td></tr><tr><td>6</td><td>Ready for operation (RDYX)</td></tr><tr><td>7</td><td>Low-voltage detection (UV) mode</td></tr><tr><td>8</td><td>Base block (BB1) mode</td></tr><tr><td>9</td><td>Speed reference mode (REFMOD)</td></tr><tr><td>A</td><td>Operation signal mode (SEQMOD)</td></tr><tr><td>D</td><td>Braking resistor overheat (RH)</td></tr><tr><td>E</td><td>Fault (FLTX) (other than CPF00, CPF01)</td></tr><tr><td>F</td><td>DO function (signal information is output from host)</td></tr><tr><td>10</td><td>Normal failure output (ALMX)</td></tr><tr><td>11</td><td>Reset signal input mode</td></tr><tr><td>30</td><td>Torque limit mode (TLMX)</td></tr><tr><td>31</td><td>Speed reference input limit mode</td></tr><tr><td>32</td><td>Regenerative torque is limited by inverter OL</td></tr><tr><td>33</td><td>End of zero-servo</td></tr><tr><td>34</td><td>Motor temperature rise detected</td></tr></table></td><td>00</td></tr>
<tr><td>Sn-21</td><td>Terminal 25 Function</td><td>01</td></tr>
<tr><td>Sn-22</td><td>Terminal 26 Function</td><td>02</td></tr>
<tr><td>Sn-23</td><td>Terminal 28 Function</td><td>06</td></tr>
<tr><td>Sn-24</td><td>Terminal 29 Function</td><td>0D</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Sn-25<br>Sn-26</td><td colspan="2">Not used</td><td>—</td><td></td></tr>
</table>

System Constants (7 of 8)

<table>
<tr><th>Constant No.</th><th>Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>Sn-27</td><td>Digital Monitor Output (DO-08) Output Function Selection</td><td>
Sn-27 Bit 0 = 0000 : Output signal combination 1
<table>
<tr><th>DO-08 Bit 0 to 7</th><th>Output</th></tr>
<tr><td>PHC Output 1</td><td>Overcurrent (OC)</td></tr>
<tr><td>PHC Output 2</td><td>Overvoltage (OV)</td></tr>
<tr><td>PHC Output 3</td><td>Inverter overload, overheat (OL2, OH2)</td></tr>
<tr><td>PHC Output 4</td><td>Fuse blown (FU)</td></tr>
<tr><td>PHC Output 5</td><td>Overspeed (OS)</td></tr>
<tr><td>PHC Output 6</td><td>Motor overload, overheat (OL1, OH2)</td></tr>
<tr><td>Contact Output 1</td><td>Detecting zero-speed (ZSP)</td></tr>
<tr><td>Contact Output 2</td><td>Coinciding speed (AGREE)</td></tr>
</table>
When Sn-27 Bit 0 = 0001 : Output signal combination 2 (coded output)<br>PHC output 1 to 4
<table>
<tr><th>DO-08 Bit 3 to 0</th><th>Output (Code Output)</th><th>Bit 3 to 0</th><th>Output (Code 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 (including ground fault) (OC)</td><td>1001</td><td>Inverter hardware 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)</td><td>1100</td><td>Power loss (including momentary loss) (UV)</td></tr>
<tr><td>0101</td><td>Overspeed (OS)</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) (PG, THM)</td></tr>
<tr><td>0111</td><td>Open load (LF)</td><td>1111</td><td>Cooling fan failure (FAN)</td></tr>
</table>
* Including braking resistor overheat (rH), braking transistor failure (rr)
<table>
<tr><th>DO-08 Bit 4 to 7</th><th>Output</th></tr>
<tr><td>PHC Output 5</td><td>Detecting zero-speed (ZSP)</td></tr>
<tr><td>PHC Output 6</td><td>Coinciding speed (AGREE)</td></tr>
<tr><td>Contact Output 1</td><td>Operating (RUN)</td></tr>
<tr><td>Contact Output 2</td><td>Normal failure (ALM)</td></tr>
</table>
</td><td>0000</td></tr>
<tr><td>Sn-28</td><td>Not Used</td><td></td><td></td></tr>
</table>

# A 7.1 SYSTEM CONSTANTS (Sn-□□) (Cont'd)

System Constants (8 of 8)

| Constant No. | Name | Description | | | | Initial Value |
|---|---|---|---|---|---|---|
| Sn-29 | CP-213 Transmission Station Address | Sets the station address (HEX01 to FF) | | | | FF |
| | | Digit | | Data | | |
| Sn-30 | CP-213 Transmission Function Selection 1 | 1 | ASR proportional gain | 0 | Initial data are used | 0000 |
| | | | | 1 | Control data are used | |
| | | 2 | Regenerative torque limit | 0 | Initial data are used | |
| | | | | 1 | Control data are used | |
| | | 3 | Control mode | 0 | Speed control | |
| | | | | 1 | Torque control | |
| | | 4 | Magnetic flux reference | 0 | Internal magnetic flux reference is used | |
| | | | | 1 | External magnetic flux reference is used | |
| Sn-31 | CP-213 Transmission Function Selection 2 | 1 | External fault bit selection | 0 | Fault when "1" | 0100 |
| | | | | 1 | Fault when "0" | |
| | | 2 | External fault detection mode | 0 | Always detected | |
| | | | | 1 | Not detected while operation is stopped (only during operation) | |
| | | 3 to 4 | Stop method in case of external fault | 00 | Deceleration stop (deceleration time bn-02) | |
| | | | | 01 | Coasting to a stop | |
| | | | | 10 | Emergency stop (deceleration time bn-12) | |
| | | | | 11 | Operation is continued | |
| Sn-32 | CP-213 Transmission Function Selection 3 | 1 to 2 | Stop method in case of bus fault | 00 | Deceleration stop (deceleration time bn-02) | 0001 |
| | | | | 01 | Coasting to a stop | |
| | | | | 10 | Emergency stop (deceleration time bn-12) | |
| | | | | 11 | Operation is continued | |
| | | 3 | Not used | 0 | — | |
| | | 4 | Not used | 0 | — | |
| Sn-33 | CP-213 Transmission Function Selection 4 | 1 | Number of control data (host → inverter) | 0 | 8 words (host → inverter) | 0000 |
| | | | | 1 | 16 words (host → inverter) | |
| | | 2 | Number of control data (inverter → host) | 0 | 8 words (inverter → host) | |
| | | | | 1 | 16 words (inverter → host) | |
| | | 3 | Initial data reception request (inverter → host) | 0 | Initial data reception request | |
| | | | | 1 | No initial data reception request | |
| | | 4 | Control data from host | 0 | Control data | |
| | | | | 1 | No control data | |
| Sn-34 | CP-213 Transmission Function Selection 5 | 1 | Speed monitor filter | 0 | No filter | 0001 |
| | | | | 1 | 100 ms filter | |
| | | 2 | 8th control data (inverter → host) | 0 | Output voltage reference | |
| | | | | 1 | ASR output | |
| | | 3 | Not used | 0 | — | |
| | | 4 | Not used | 0 | — | |

# A 7.2 REFERENCE SETTING CONSTANT (An-□□)

| Constant No. | Name | Setting Unit | Setting Range | Initial Value | Remarks |
|---|---|---|---|---|---|
| An-01 | Speed Reference 1 (Master Speed) * | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-02 | Speed Reference 2 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-03 | Speed Reference 3 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-04 | Speed Reference 4 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-05 | Speed Reference 5 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-06 | Speed Reference 6 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-07 | Speed Reference 7 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-08 | Speed Reference 8 (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 0.00 | |
| An-09 | Jogging Speed Reference (Multi-speed) † | 0.01% | 0.00 to 109.22 (10000/100.00%) | 10.00 | |

* Effective when the digital operator (JVOP-100) has the priority to set.

† Effective when the multi-function input terminal is set at multi-speed.

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

# A 7.3 APPLLICATION CONSTANT (bn-□□)

| Constant No. | Name | Setting Unit | Setting Range | Initial Value | Remarks |
|---|---|---|---|---|---|
| bn-01 | Acceleration Time 1 | 0.1 s | 0.0 to 3000.0 | 10.0 | |
| bn-02 | Acceleration Time 1 | 0.1 s | 0.0 to 3000.0 | 10.0 | |
| bn-03 | Acceleration Time 2 | 0.1 s | 0.0 to 3000.0 | 10.0 | |
| bn-04 | Acceleration Time 2 | 0.1 s | 0.0 to 3000.0 | 10.0 | |
| bn-05 | ASR Proportional Gain | 1 | 0 to 300 | 20 | |
| bn-06 | ASR Integral Time | ms | 0 to 30000 | 1000 | |
| bn-07 | Forward Torque Limit | 0.01% | 0.00 to 300.00 | 150.00 | |
| bn-08 | Reverse 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 | 0.020 s | 0.020 to 60.000 | 0.060 | |
| bn-12 | Emergency Stop Time | 0.1 s | 0.0 to 3000.0 | 10.0 | |
| bn-13 | Monitor Number Upon Power Supply | 1 | 1 to 3 | 1 | |
| bn-14 | PG Division Rate (Pulse Monitor Output) | 1 | 002 to 032 (n=0)<br>104 to 132 (n=1) | 002 | |
| 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 Output Selection | 1 | 1 to 41 | 23 | |
| bn-18 | Multi-function Monitor Output Gain | 0.001 | 0.000 to 10.000 | 1.000 | |
| bn-19 | Not used | — | — | 0 | |
| bn-20 | Not used | — | — | 0 | |
| bn-21 | Not used | — | — | 0 | |
| bn-22 | AO Option CH1 Output Selection | 1 | 1 to 41 | 22 | |
| bn-23 | AO Option CH1 Output Gain | 0.001 | 0.000 to 10.000 | 1.000 | |
| bn-24 | AO Option CH2 Output Selection | 1 | 1 to 41 | 23 | |
| bn-25 | AO Option CH2 Output Gain | 0.001 | 0.000 to 10.000 | 1.000 | |

# A 7.4 CONTROL CONSTANT (Cn-□□)

| Constant No. | Name | Setting Unit | Setting Range | Initial Value | Remarks |
|---|---|---|---|---|---|
| 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 Width | 0.01% | 0.00 to 100.00 | 2.00 | |
| Cn-04 | Excess Speed Deviation Level | 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 Delay Time | ms | 0 to 500 | 4 | |
| Cn-08 | Not Used | — | — | 0 | |
| Cn-09 | PG Constant | P/R | 0 to 6000 | 600 | |
| Cn-10 | Speed Limit Bias (During Torque Control) | 0.01% | 0.00 to 109.22 | 20.00 | |
| Cn-11 | Emergency Torque Compensation | 0.1% | −200.0 to 200.0 | 0.0 | |
| Cn-12 | Operator Display Mode | 1 | 0 to 39999 | 0 (% repre-sentation) | |
| Cn-13 | Feeder Resistor | 0.1% | 0.0 to 5.0 | 0.0 | |
| Cn-14 | Motor OL Detection Start Current | % | 50 to 200 | 110 | |
| Cn-15 | Motor OL Operation Time | s | 1 to 120 | 60 | |
| Cn-16 | Overspeed Detection Level | % | 50 to 130 | 120 | |
| Cn-17 | PUV Detection Level | V | 131 to 210 | 150 | 200 V class |
| | | | 262 to 420 | 300 | 400 V class |
| Cn-18 | PG Line Break Detection Time (During Speed Control) | 0.01 s | 0.00 to 2.00 | 1.00 | |
| Cn-19 | Momentary Power Loss Guarantee Time* | 0.01 s | 0.00 to 2.00 | 2.00 | |
| Cn-20 | Fault Retry Count | 1 | 0 to 10 | 0 | |
| Cn-21 | Stop Timer | 0.1 s | 0.0 to 10.0 | 0.0 | |
| Cn-22 | ASR Proportional Gain 2 | 1 | 0 to 300 | 20 | |
| Cn-23 | ASR Proportional Gain Selection Speed | 0.01% | 0.00 to 100.00 | 0 | |
| Cn-24 | Zerp-servo Gain | 1 | 0 to 100 | 5 | |
| Cn-25 | End of Zero-servo Width | puls | 0 to 16383 | 10 | |
| Cn-26 | Not Used | — | — | 0 | |
| Cn-27 | Torque Reference Delay Time | ms | 0 to 10000 | 0 | |
| Cn-28 | Motor Temperature Rise Detection Level | ℃ | 0 to 200 | 80 | |
| Cn-29 | Motor Temperature Transmission Selection | — | 0 to 14 | 0 | |
| Cn-30 | Not Used | — | — | 0 | |
| Cn-31 | Not Used | — | — | 0 | |
| Cn-32 | Not Used | — | — | 0 | |
| Cn-33 | Not Used | — | — | 0 | |
| Cn-34 | Not Used | — | — | 0 | |

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

# A 7.5 MOTOR CONSTANT (dn-□□)

| Constant No. | Name | Setting Unit | Setting Range | Initial # Value | Remarks |
|---|---|---|---|---|---|
| dn-01 | Base Speed * | r/min | 100 to 6000 | 1750 | |
| dn-02 | Maximum Speed * | r/min | 100 to 6000 | 1750 | |
| dn-03 | Motor Poles * | Pole | 2 to 32 | 4 | |
| dn-04 | No-load Voltage | V | 50 to 240 | 170 | 200 V class |
| | | | 100 to 480 | 340 | 400 V class |
| dn-05 | Motor Rated Secondary Current † | 0.01 A | 0.00 to 655.35 | 0.00 | |
| dn-06 | Rated Slide Frequency | 0.01 Hz | 0.00 to 5.00 | 1.00 | |
| dn-07 | Excitation Current Reference | 0.1% | 10.0 to 200.00 | 30.0 | |
| dn-08 | Primary Resistance | 0.1% | 0.0 to 15.0 | 2.0 | |
| dn-09 | Leak 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 | ms | 0 to 2000 | 100 | |
| dn-13 | Leak Saturated Coefficient | 0.01 | 1.00 to 2.00 | 1.20 | |
| dn-14 | Rotor Heat Gain | 0.01 | 0.00 to 2.00 | 0.00 | |
| dn-15 | Rotor Heat Time Constant | min | 0 to 180 | 30 | |
| dn-16 | Core Saturation Compensation Coefficient 1 ‡ | 0.01 | 0.00 to 1.00 | 0.50 | |
| dn-17 | Core Saturation Compensation Coefficient 2 ‡ | 0.01 | 0.00 to 1.00 | 0.75 | |
| dn-18 | Motor Overheat Temperature | ℃ | 50 to 200 | 120 | |

* The setting range is ; $0\text{Hz} \leqq \dfrac{(\text{dn-01 or dn-02}) \cdot \text{dn-03}}{120} \leqq 199.99\text{Hz}$

† The setting range is 30 to 110% of inverter rated current (set value of Sn-01).

‡ The setting range is ; $0.00 \leqq \text{dn-16} \leqq \text{dn-17} \leqq 1.00$

# The initial value differs according to the motor selection (set value of Sn-02). The above are non-standard values.

# A 7.6 ORDER CONSTANT (On-□□)

| Constant No. | Name | Description | | | | Initial Value |
|---|---|---|---|---|---|---|
| | | Digit | | Data | | |
| On-01 | Control Status 1 | 1 to 3 | RUN mode | 000 | Normal operation | 0000 |
| | | | | 001 | Not used | |
| | | | | 010 | Simulation mode | |
| | | | | 011 | Base test mode | |
| | | | | 100 | V/f test mode | |
| | | 4 | PG line break detection | 0 | PG line break detected | |
| | | | | 1 | No PG line break detected | |
| On-02 | Control Status 2 | 1 | Control mode 1 | 0 | Vector control with PG | 0000 |
| | | | | 1 | Vector control without PG | |
| | | 2 | Control mode 2 | 0 | Control with thermister | |
| | | | | 1 | Control without thermister | |
| | | 3 | Control mode 3 | 0 | Rotor heat model effective | |
| | | | | 1 | Rotor heat model invalid | |
| | | 4 | Control mode 4 | 0 | Adaptor control effective | |
| | | | | 1 | Adaptor control invalid | |
| On-03 | Control Status 3 | 1 | Initial excitation medium phase | 0 | Phase is fixed | 1010 |
| | | | | 1 | Adjusted to the rotor position | |
| | | 2 | Magnetic field forging | 0 | Provided | |
| | | | | 1 | Not provided | |
| | | 3 | Overvoltage suppressing function | 0 | Not provided | |
| | | | | 1 | Provided | |
| | | 4 | DSP A/D automatic offset adjustment | 0 | Provided | |
| | | | | 1 | Not provided | |
| On-04 | Control Status 4 | Not used | | | | 0000 |

# A 7.6 ORDER CONSTANT (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 | 1.0 | |
| On-06 | Inverter Low Frequency OL Frequency * | 0.01 Hz | 0.00 to 5.00 | 0.00 | |
| 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 Leading Time | ms | 0 to 500 | 0 | |
| On-10 | CEMF compensation | 0.001 | 0.000 to 1.300 | 1.000 | |
| On-11 | AΦR Time Constant † | ms | 0 to 2000 | 200 | |
| On-12 | AFR Gain (for without PG) | 0.01 | 0.00 to 2.00 | 1.00 | |
| On-13 | AFR Time Constant (for without PG) | ms | 50 to 2000 | 120 | |
| On-14 | Magnetic Flux Feedback Gain | 0.001 | 0.800 to 1.200 | 1.000 | |
| On-15 | Current Feedback Gain | 0.001 | 0.800 to 1.200 | 1.000 | |
| On-16 | NV-RAM Software No. ‡ | — | 0 to 9999 | | |
| On-17 | DSP AD Converter U-phase Gain | 0.0001 | 0.9000 to 1.1000 | 1.0000 | |
| On-18 | DSP AD Converter U-phase Offset | 1 | −819 to 819 | 0 | |
| On-19 | DSP AD Converter W-phase Gain | 0.0001 | 0.9000 to 1.1000 | 1.0000 | |
| On-20 | DSP AD Converter W-phase Offset | 1 | −819 to 819 | 0 | |
| On-21 | ON-DELAY Compensation Gain | 0.01 | 0.00 to 2.00 | 1.00 | |
| On-22 | Not Used | — | — | 0 | |
| On-23 | Not Used | — | — | 0 | |
| On-24 | Not Used | — | — | 0 | |
| On-25 | Not Used | — | — | 0 | |

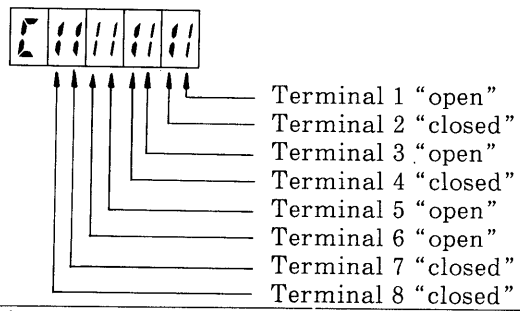
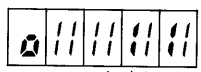
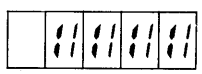
* Initial value differs according to the kVA selection (Sn-01).

† Initial value differs according to the motor selection (Sn-02).

‡ Displays the lower 4 digits of the program software number.

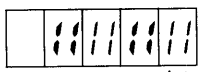
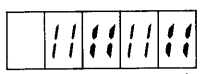
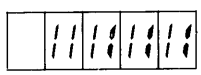
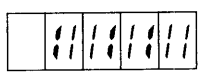
# A 7.7 MONITOR VARIABLE (Un-□□)

List of Monitor Variables (1 of 3)

| Constant No. | Name | Abbreviated Name | Unit | Description |
|---|---|---|---|---|
| Un-01 to -02 | Not Used | — | — | — |
| Un-03 | Inverter Output Current | I1 | A | Displays the inverter output current in actual value.<br>Display example : 12.5A (12.5 A) |
| Un-04 | Voltage Reference | VR | V | Displays the inverter output voltage (reference) in actual value.<br>Display examlpe : 200. (200 V) |
| Un-05 | Direct Current Voltage | VPN | V | Displays the direct current mother line voltage (between P-N)<br>Display example : PN270 (PN 270 V) |
| Un-06 | Not Used | — | — | — |
| Un-07 | Input Terminal Status | INRLY | — | Displays the status of the sequence input terminals (1 to 8). Lights when "closed", and goes out when "open".<br>  <br>Terminal 1 "open"<br>Terminal 2 "closed"<br>Terminal 3 "open"<br>Terminal 4 "closed"<br>Terminal 5 "open"<br>Terminal 6 "open"<br>Terminal 7 "closed"<br>Terminal 8 "closed" |
| Un-08 | Output Terminal Status | OUTRLY | — | Displays the status of the sequence output terminals. Light when "closed", and goes out when "open".<br>  <br>Terminals 9-10 "open"<br>Terminals 25-27 "closed"<br>Terminals 26-27 "open"<br>Terminals 28-27 "closed"<br>Terminals 29-27 "open" |
| Un-09 | LED Check | LESCHK | — | All the LEDs on the operator light when Un-09 is selected. |
| Un-10 | Control Unit Software No. | SNO | — | Displays the software version No. of the control unit P-ROM. (Lower 5 digits)<br>Display example : 71234 (NSW 671234) |
| Un-11 | Optional Unit Software No. | ONO | — | Displays the software version No. of the optional unit P-ROM.<br>Display example : 00011 (NST 671234) |
| Un-12 to -13 | Not Used | — | — | — |
| Un-14 | Output Terminal Status (DO-8) | DO 08W | — | Displays the status of the output signals of the DO-08 card. Lights when "closed", and goes out when "open".<br>  <br>Terminals TD5-TD11 "open"<br>Terminals TD6-TD11 "closed"<br>Terminals TD7-TD11 "open"<br>Terminals TD8-TD11 "closed"<br>Terminals TD9-TD11 "open"<br>Terminals TD10-TD11 "closed"<br>Terminals TD1-TD2 "open"<br>Terminals TD3-TD4 "closed" |

# A 7.7 MONITOR VARIABLE (Un-□□) (Cont'd)

List of Monitor Variables (2 of 3)

| Constant No. | Name | Abbreviated Name | Unit | Description |
|---|---|---|---|---|
| Un-15 | Host Reference 1 | CMD | — | Displays the reference from the host.<br>Data : "1" : On<br>Data : "0" : Off<br>  <br>Operation reference "0"<br>Reverse reference "0"<br>Base block reference "1"<br>Trace stop reference "1"<br>External fault "0"<br>Fault reset "0"<br>Accel/decel time selection "1"<br>Accel/decel stop "1" |
| Un-16 | Host Reference 2 | CMD | — | Displays the reference from the host.<br>Data : "1" : On<br>Data : "0" : Off<br>  <br>Initial excitation "1"<br>Integral reset "1"<br>Integral hold "0"<br>Soft starter cancel "0"<br>Multi-function output 1 "1 "<br>Multi-function output 2 "1 "<br>Multi-function output 3 "0 "<br>Multi-function output 4 "0 " |
| Un-17 | Status 1 | STSL | — | Displays the internal control status.<br>Data : "1" : On<br>Data : "0" : On<br>  <br>Running "1"<br>Zero-speed "0"<br>Reverse operation "1"<br>Inputting reset signal "0"<br>Speed agree "1"<br>Ready for inverter operation<br>Normal failure<br>Major failure |
| Un-18 | Status 2 | STSH | — | Displays the internal control status.<br>Data : "1" : On<br>Data : "0" : On<br>  <br>Control data upper/lower limit fault "0"<br>Recovery from power loss "0"<br>Operation mode "1"<br>Received initial data "0"<br>Multi-function input 1 "1"<br>Multi-function input 2 "0"<br>Multi-function input 3 "0"<br>Multi-function input 4 "1" |

List of Monitor Variables (3 of 3)

| Constant No. | Name | Abbreviated Name | Unit | Description |
|---|---|---|---|---|
| Un-19 to -20 | Not Used | — | — | — |
| Un-21 | Speed Reference (SFS Input) | SREFX | % | Displays the speed reference of the soft starter former stage. Represented by % against the motor rated (maximum) speed. Display example : 100.0 |
| Un-22 | Speed Reference (SFS Output) | NREF | % | Displays the speed reference of the soft starter latter stage. Represented by % against the motor rated (maximum) speed. Display example : 100.0 |
| Un-23 | Speed Feedback | NFB | % | Displays the actual speed of the motor. Represented by % against the motor rated (maximum) speed. Display example : 100.0 |
| Un-24 | External Torque Reference | TREF | % | Displays the torque reference when under torque control. |
| Un-25 | Torque Compensation | TCMP | % | Displays the torque compensation reference. Represeted by % against the motor rated torque. |
| Un-26 | Torque Reference | TRO | % | Torque reference. Displays the secondary current reference value multiply the magnetic flux reference value, when under speed control. Represented by % against the motor rated torque. |
| Un-27 | Torque Feedback | TFB | % | Motor torque operation value. Displayed only when the torque detector (option card) is mounted. Represented by % against the motor rated torque. |
| Un-28 | ASR Input (Speed Deviation) | SPDEV | % | Displays deviation between the speed reference (soft starter latter step) and the speed feedback. Represented by % against the motor rated (maximum) speed. |
| Un-29 | ASR Output (After Filter) | I2RS | % | Displays the output of the speed control unit (ASR). This is the motor secondary current reference value. Represented by % against the motor rated secondary current. |
| Un-30 | Slide Frequency Reference | SFR | % | Motor slide frequency reference. Represented by % against the motor rated slide frequency. |
| Un-31 | Primary Frequency Reference | F1R | % | Inverter output frequency. Represented by % against the motor rated synchronous frequency. |
| Un-32 | Motor Temperature | MTEMP | ℃ | Displays the motor stator temperature. |
| Un-33 | Zero-servo Move Pulse (4 Times) | GAP | PLS | Number of move pulses from the zero-servo start point. |
| Un-34 | Inverter A/D Input Voltage | | V | Input voltage to the inverter main speed A/D. |
| Un-35 | Inverter A/D Aux. Input Voltage | | V | Input voltage to the inverter auxiliary speed A/D. |
| Un-36 to -38 | Not Used | — | — | — |
| Un-39 | Magnetic Flux Feedback ($\alpha$ phase) | PHIA | % | Detected magnetic flux ($\alpha$ phase) from the high-precision torque control card. |
| Un-40 | Magnetic Flux Feedback ($\beta$ phase) | PHIB | % | Detected magnetic flux ($\beta$ phase) from the high-precision torque control card. |
| Un-41 | ACR Compensation Amount | DLI1 | % | Compensation amount of the current amplitude (for adjustment of On-10) |

Note : See Appendix Par. 2.1 "Functional Block Diagram" for when to monitor.

# Varispeed-676VH3 Drive

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