HITACHI INVERTER

HFC-VWA$_2$ SERIES

INSTRUCTION MANUAL

Thank you very much for purchasing the Hitachi HFC−VWA$_2$ series inverter.

This instruction manual is intended for use by the operator of the Hitachi inverter. It describes how to install, handle, and maintain the inverter.

Before starting operation, read this instruction manual carefully for installation, maintenance, and inspection.

After reading this manual, keep it at hand for future reference.

Hitachi, Ltd.   N B 4 4 4 E X

Tokyo Japan

(ⓞ) HITACHI

PRECAUTIONS

CAUTION 1 : These instructions should be read and clealy understood before working on the HFC-VWA2 series.

CAUTION 2 : Proper grounds, disconnecting devices and other safety devices and their location are the responsibility of the user and are not provided by Hitachi Ltd.

CAUTION 3 : Be sure to connect any motor thermal switch or overload device back to the HFC-VWA2 sereies control circuit to assure that the inverter will shut down in the event of an overload or an overheated motor.

WARNING 1 : This equipment should be installed, adjusted and serviced by qualified electrical maintenance personal familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in bodily injury.

WARNING 2 : The user is responsible for ensuring that all driven machinery, drive train mechanisms not supplied by Hitachi Ltd., and process line material are capable of safe operation at an applied frequency of 150% of the maximum selected frequency range to the AC motor. Failure to do so can result in destruction of equipment and injury to personnel should a single point failure occur.

WARNING 3 : For protection, install an earth leakage breaker type of a large high-frequency sensitive current to avoid an unnecessary operation. The ground fault protection is not designed to protect personal injury.

DANGER HIGH VOLTAGE $\triangle$

Motor control equipment and electronic controllers are connected to hazardous line voltage. When servicing drives and electronic controllers, there may be exposed components with their cases and protrusions at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power whenever possible to check controllers or to perform maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on an electronic controller or electrical rotating equipment.

CAUTION:

Rotating shafts and above ground electrical potentials can be hazardous. Therefore, it is strongly recommended that all electrical work conform to National Electrical Codes and local regulations. Installation, alignment and maintenance should be performed only by qualified personnel.

Factory recommended test procedures, included in the instruction manual, Should be followed. Always disconnect electrical power before working on the unit.

CONTENTS

Upon unpacking, check to see:

- No part of the inverter has been damaged during transportation.
- The inverter and its instruction manual are contained in the package.
- The inverter is the ordered one (check the specification plate on the cover surface).
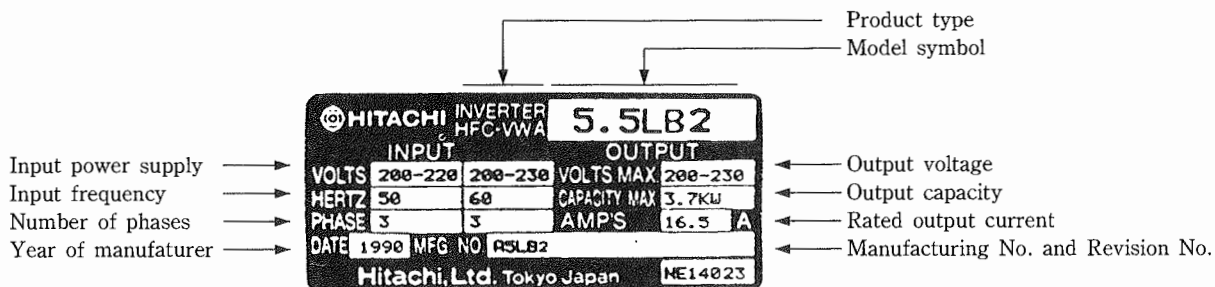
Figure 1 Details of Nameplate

If there is a problem, contact your distributor immediately.

Explanation of the inverter type

HFC-VWA 5.5LB2

Version number

Structure type

B : Without Remote Operator (Fully, Semi–closed and Open type)

D : With Remote Operator (Fully closed type)

F : With Remote Operator (Semi–closed and Open type)

Input voltage

L :   200 V clsaa, Three–phase

H :   400 V class, Three phase

Function and use

 (A :   Low acoustic motor noise type)

Output waveform

(W : PWM control system)

Control system

(V :   Voltage)

Hitachi inverter

Without Remote Operator
(Example of 3.5LB2)

With Remote Operator
(Example of 3.5LD2)

Remote Operator

2. PRECAUTIONS FOR HANDLING

Before operating the inverter, be sure to confirm that there is no problem on the items indicated below. An incorrect operation is dangerous and may cause damage to the inverter.

2.1 Environment Around the Installation Site and Installation Surface

(1) Avoid a high temperature and humidity and easy-to-dew environment and a place exposed to dirt and dust, corrosive gases, and coolant mist, and select a well-ventilated room free of direct sunlight.

(2) Select a place free of substantial vibration.

(3) When the inverter (1.5 to 16LB2, 2.5 to 16HB2) is installed inside the control panel, it can be used within the range of −10 to 40℃. When operating the inverter within the range of −10 to 50℃ :

   • Remove the terminal cover and blind cover (see Figure 8).

   • Set the PWM control carrier frequency (F-41) to **12kHz or less** to use the 3.5 to 5.5LB 2 · LF2, and 33 to 50HB2. When **16kHz** is selected, reduce the rated output current by **10 %.**

(4) When the PWM control carrier freguency **16kHz** (**10kHz** for 60 to 75HB2) is selected on 33 to 40LB2 and 33 to 50 HB2, reduce the rated output current by **10%** or use within the range of **−10 to 40**℃.

(5) Use a nonflammable material such as a steel plate on the wall for installation. (The back of the inverter will generate heat and increase in temperature)

(6) Set the inverter vertically with a marginal space around.

2.2 Input Voltage Class

(1) **Always confirm that the input power matches the name plate raiting of the inverter.**

(2) **Check that the voltage is 1 − phase 220 to 240 V/50Hz, 60Hz for 200V class and 3 − phase 380 to 415V/50Hz, 400 to 460V/60Hz for 400V class.**

2.4 Connection

(1) **Be sure to ground the grounding terminal (⏚mark).**

(2) Be sure to connect the power source to the **input** terminal **(R, S, T)**, and the motor to the **output** terminal **(U, V, W)**. (Malconnections may cause damage to the inverter.)

(3) To start or stop operation, use the 正転運転 FWD RUN , 逆転運転 REV RUN , or 停止 STOP button for the remote operator, or the FW or RV terminal. Do not start and stop inverters with power ON/OFF.

(4) Be sure to connect the control power (**Ro, To**) for 400V class inverter.

2.5 Precautions for Setting High Frequency (V/f Characteristics for Higher Than 50 Hz)

The frequency of the HFC-VWA2 series inverter can be set to up to 360Hz by selecting the V/f pattern or 375Hz by adding 15Hz to the maximum frequency.

When a two-pole motor is used, special care should be taken because the number of rotations reaches about 22500 rpm.

Check thoroughly the mechanical strength of the motor or of the machine to be connected to it before frequency selection.

A standard motor (general-purpose motor) is designed at a frequency of 60Hz. When a frequency of more than 60Hz is required, contact the motor manufacturer for approval. (In case of HITACHI IX motor, it is designed to 120Hz)

It is not possible to set frequency to over 135Hz. If necessary, refer to the page77 and set.

2.6 Maintenance and Adjustment

(1) When the power is turned off, do not touch the charged parts until the POWER lamp or the backlight of LCD on the remote operator goes off for 200V class, and until the CHARGE lamp at the right side of PC Board goes off after the terminal cover is removed for 400V class. (Since the capacitor has a residual voltage, it is dangerous.)

(2) Static electricity may cause damage to MCU or ICs on the printed circuit and inverter module (PM module). Ground the workbench, soldering iron, and human body beforehand.

2.7 Insulation Resistance and Withstand Voltage Tests

Special care should be taken for insulation resistance and withstand voltage tests. Before conducting these tests, be sure to read (3) Insulation resistance test and withstand voltage test in Section 7. 2.

2.8 Data Settings

(1) Storage of Data Values

A memory element is used to store a data value when the power is turned off so that it can be used when the power is turned on again. This data value is stored automatically when the power is turned off.

In the case of a sequence that the reset terminal is turned on when the power is turned off, the above data value can not be stored because the microcomputer is also reset. In this case, disconnect the reset terminal, then turn the power off to store the data value.

There is a limit to the storage count of the memory element. When the data value is changed several times a day the power is turned on or off, the life is about 10 years.

For details on initial settings (data values set by Hitachi before shipment), see the table in Section 9. 2.

(2) Recording Data Values

It is recommended to record data values (settings made by users) in the record sheet for later services, repair, or various checks, though the inverter has been provided with various facilities for these purposes. Please deliver this sheet to the operator of the inverter.

2.9 Standard Set Value (60Hz and Constant Torque)

(1) The standard output frequency is set to 60Hz and the torque is high start torque (constant torque). When changing the frequency to 50Hz, see Section 9. 4 (2)(d).

(2) The standard motor to be used is the **most suitable motor of 4 poles**. When using any motor other than the above, change the settings as follows:
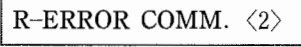
Capacity: [_____] **kw Number of poles:** [_____] **P**

See the table in Section 9. 4 (2)(e).

2.10 Emergency Stop Switch Connection

When a remote operator or copy unit (option) is used to operate the inverter, a fault (such as loose contact or disconnection) in the remote operator, cables, or connectors during inverter operation may disable the function of the 停止 STOP key of the remote operator (namely, the imverter operation may NOT be STOPPED by pressing the 停止 STOP key). To cope with this problem, it is recommended to connect an emergency stop switch to the RS or FRS terminal of the inverter.

L	FM	RS	L	FM	FRS

⇐ Mount an emergency stop switch to the board. (The switch should be set in the HOLD state.)
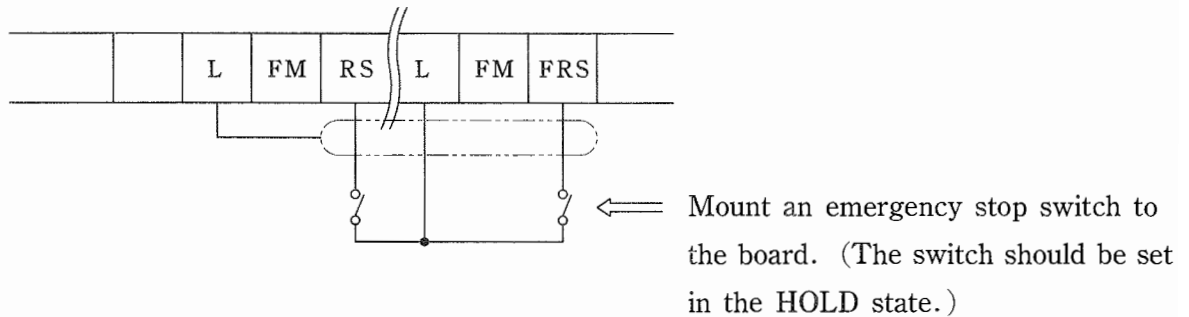
If the reset signal (RS terminal or reset button) is sent to the inverter unit for five seconds or more, communication between the inverter unit and remote operator (copy unit) will be impossible, and the unit will judge the cable to be broken. In this case, R–ERROR COMM. ⟨2⟩ will be displayed, and operation will be stopped. Turning off reset and pressing a key will reset the unit to allow operation.

2.11 Surge voltage suppressor filter across the electric motor terminals, only for 400 voltage class HFC−VWA INVERTER.

In the event of PWM method INVERTER operation, Surge voltage occurs at the motor terminal due to the cable length or cable layout between the motor and the inverter, especially in care of 10m or more cable.
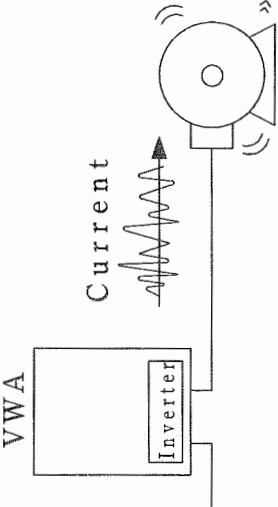
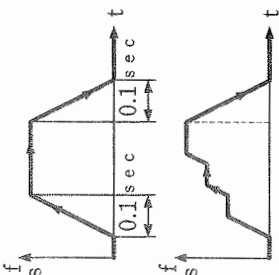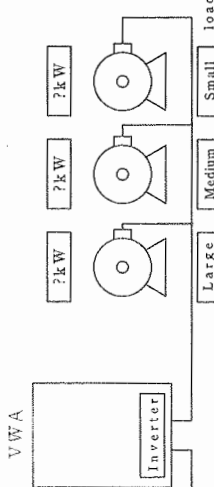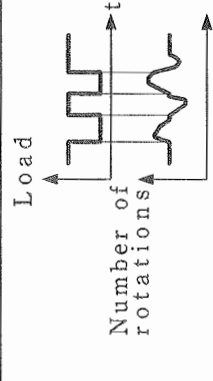To surpress the voltage, special filters are available.

Please contact the nearest representatives.

2.12 Install an earth leakage breaker

The ground fault protection circuit is designed to detect unbalanced current generated between output of the inverter and motor, and to cut off output of the inverter. The protection function is to protect the inverter not to protect man.

Install the earth leakage breaker to input of the inverter in order to protect from electrical shock.

No.	Operation conditions	Error	Modification	Operation procedure, etc.
1	Trial run of motor	The motor does not run uniformly and the number of rotations does not increasd. The current of the motor is pulsated. (VWA — Inverter — Current)	F-00 SLV1→SLV2 CD5→CD6 ⋮ 9 (CD:Motor stabilization constant Large CD:Large stabilization gain)	See Section 9.4(3) (When the CD value is large, the number of rotations of the motor is greatly changed when the load is suddenly fluctuated.)
2	Light load, light inertia load	(Number of rotations vs t, 0.1sec)	F-00 SLV1→SLV2 CD5→CD6 ⋮ 9 F-41 CARRIER16kHz →CARRIER12kHz → 8kHz	See Section 9.4(3)
3	Accelerate or decelerate the light load or the light inertia load in a short time.	(Number of rotations vs t) The number of revolutions of the motor does not increase smoothly.		See Section 9.4(3)
4	Parallel operation of motor	The inverter cannot perform a high start torque operation because the load share of the remote motor is unknown. (VWA — Inverter; ?kW, Large Medium Small, load?)	F-00 SLV1→ VF High start torque Stadard start torque	See Section 9.4(3)
5	Suddenly fluctuating load	(Load, Number of rotations vs t) When the load is fluctuated, the number of rotations of the motor is changed.	F-00 SLV1→SLV2 CD5→CD4 ⋮ 1 (CD:Motor stabilization constant Small CD:Small overshoot Small stabilization gain)	See Section 9.4(3) (When the CD value is small, the current of the motor increases when the load is suddenly fluctuated.)

3. STRUCTURE

3.1 Appearance and Name of Each Unit

Front cover

POWER lamp

Front blind cover

Inverter series name

Current limiting resistor

Rating plate

(Example of 3.5LB2)
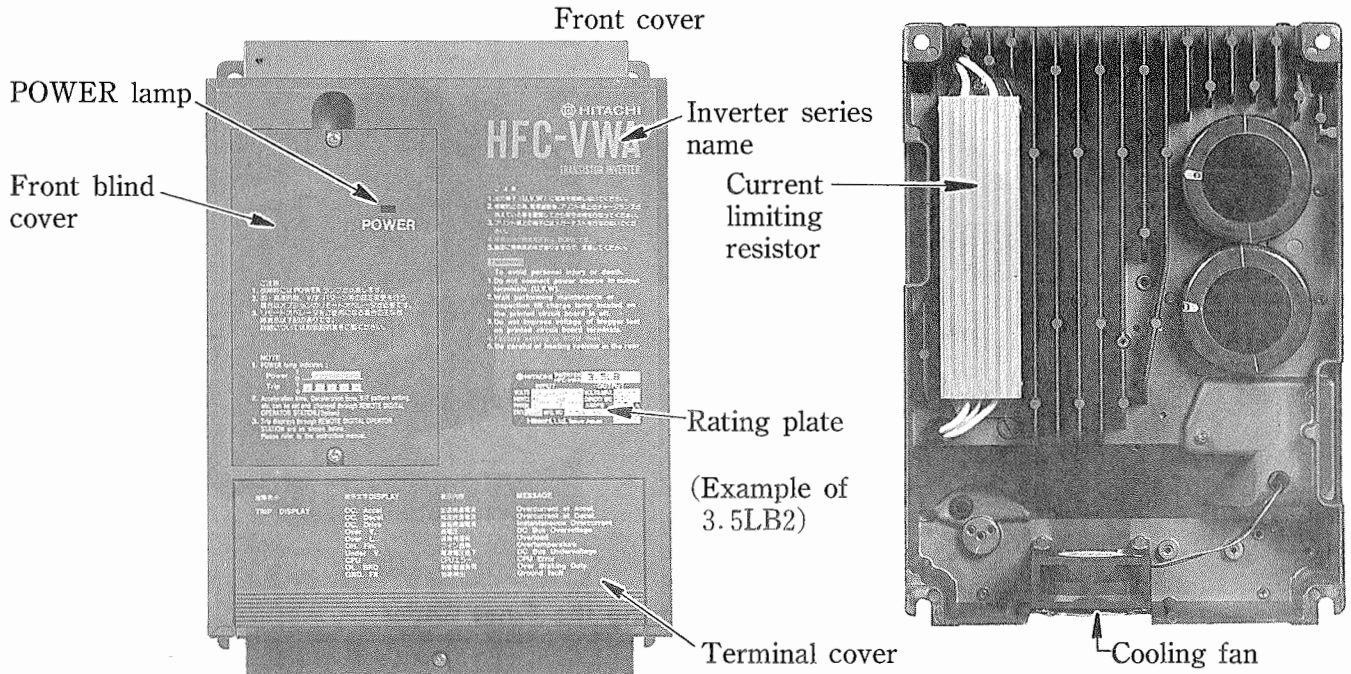
Terminal cover

Cooling fan

Figure 2 − 1 Front Appearance

Figure 2 − 2 Back Appearance

3.2 Removing and Installing the Terminal Cover

Loosen the screw at the lower part of the terminal cover, and press the cover upward to remove it. Connect the cables to the terminals in this state. When attaching the cover, set the pawls at the upper part of the cover to the holes of the from cover, and press the cover.

(a)

(b)

(c)

(d)

Terminal cover pawls
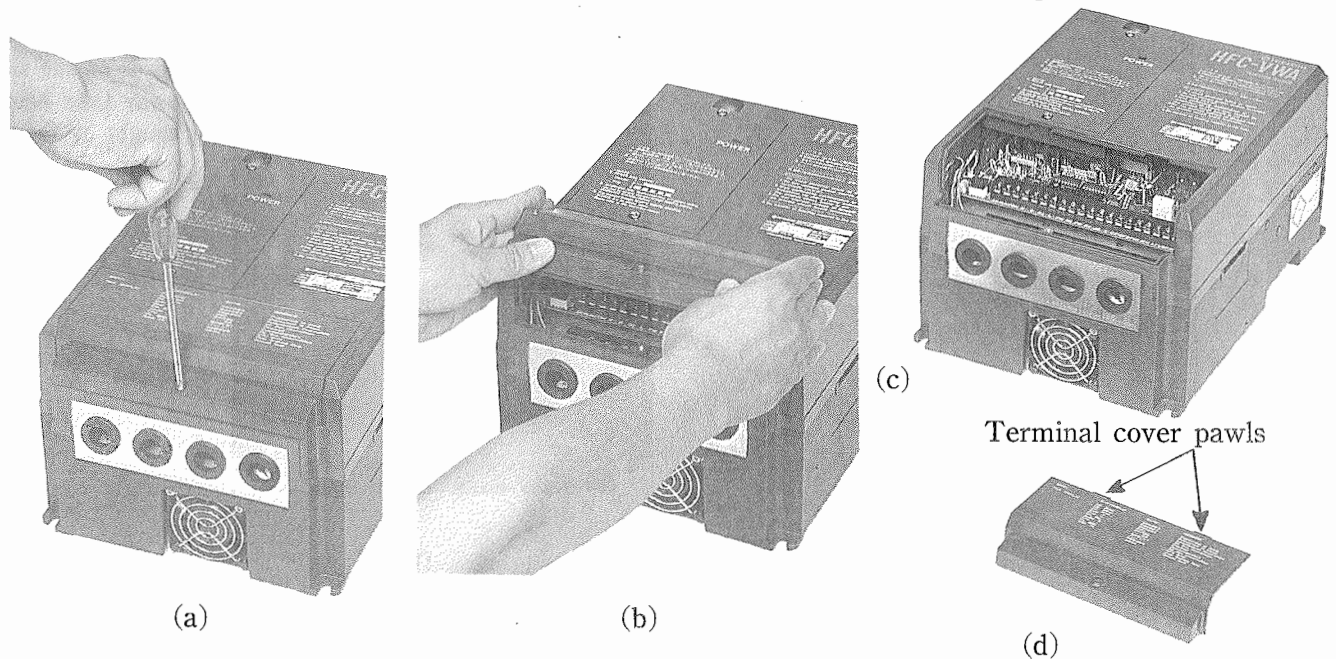
Figure 3 Removing the Terminal Cover

3.3 Removing and Installing the Front Cover

Loosen the two screws (on the right and left) which can be seen when the terminal cover is removed. Remove the frame cover, sliding it upward. (Do not operate the inverter with the front cover removed because it is dangerous.)
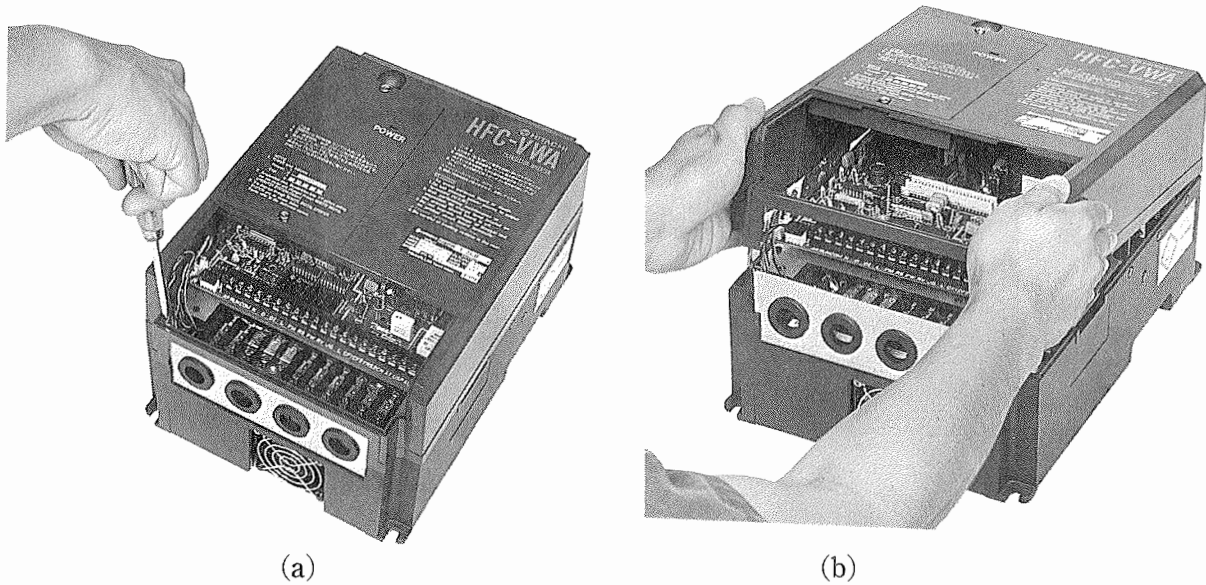

(a)   (b)

Figure 4 — 1 Removing the Front Cover

Insert the two pawls (on the right and left) at the upper part of the main unit into the rectangular holes of the frame, pulling it toward you. Tighten the two screws (on the right and left) at the lower part of the cover.

Keep the lead wires on the side away from being caught by the cover.

(a)   Insert the pawls of the front cover securely into the rectangular holes of the frame.   (b)
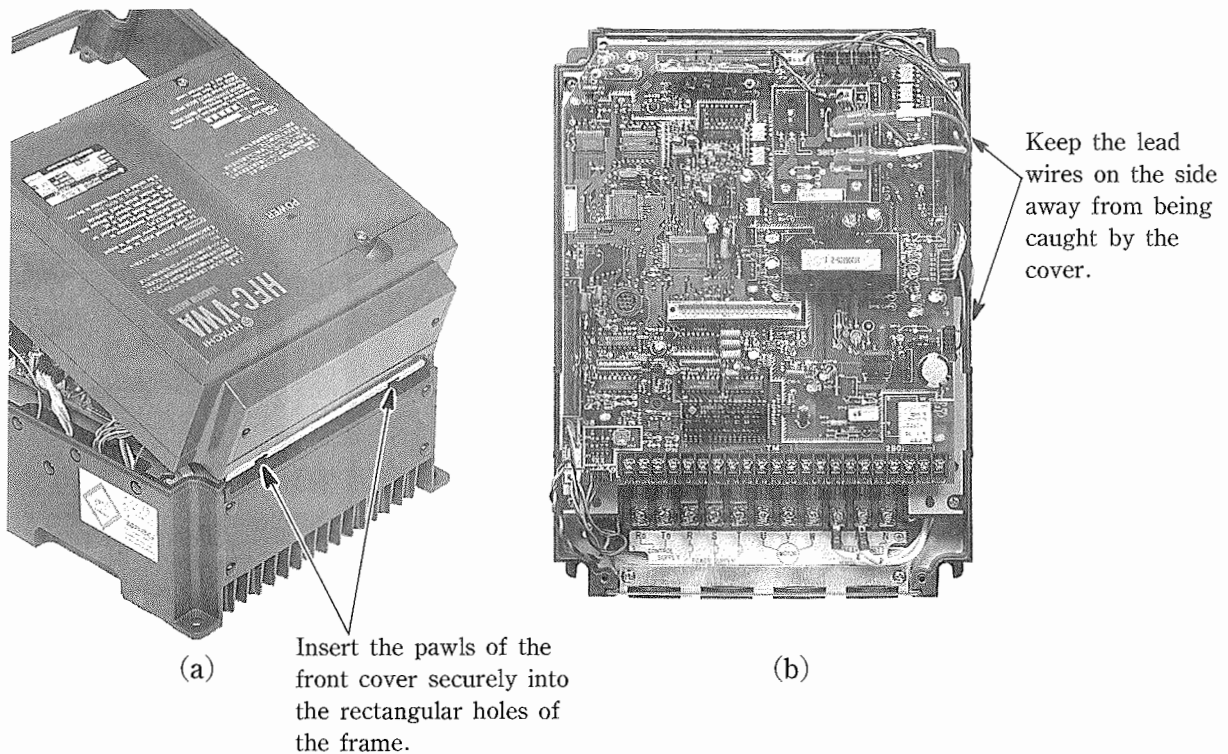
Figure 4 — 2 Installing the Front Cover

3.4 Removing the Front Blind Cover and Installing the Optional Remote Operator (DOP) and Copy Unit (DRW)

Loosen the screws at the upper and lower parts of the front blind cover, and pull the top of the cover upward to remove it.

(a)

(b)

Cut off the pawl.

Figure 5 − 1   Removing the Front Blind Cover

Figure 5 − 2   Top of the Front Blind Cover
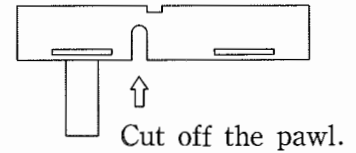
For remote operation, connect a cable to the remote operator connector after removing the front blind cover. Cut off the pawl on the top of the cover in an arrow direction (see Figure 5 − 2), then attach the cover.

Note 1

(a)

(b)

Figure 6 − 1 Remote Operation

When installing the remote operator inside the main unit, connect the cable to the remote operator connector, and set the operator in place. Tighten the screws at the upper and lower parts.

Note 2

0.3 m cable
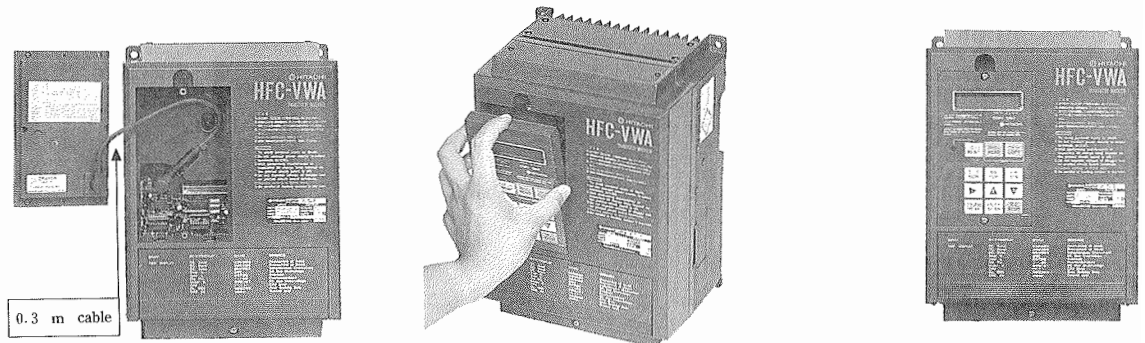
Figure 6 − 2 Installing the Remote Operator in the Main Unit

Note 1: Insert the connector vertically.

Note 2: When installing the remote operator on the front cover, it is recommended to use the DOP−03EA (cable length 0.3m).

4. INSTALLATION

4.1 Transport

Transport the inverter carefully to prevent damage.
Do not apply force to the front cover.

Figure 7 How to Carry the Inverter

4.2 Precautions for Installation (See Section 2.1 for a better understanding.)

(1) When the installation surface is not even, put some plates under the inverter mounting legs to eliminate gaps beforehand. When the inverer is installed with gaps uneliminated, a distortion caused by the installation may affect the main circuit element, causing damage to the inverter.

(2) Use a nonflammable material such as a steel plate on the wall for installation. (A heating element is equipped with on the back. It may increase up to about 150℃ depending on the operation procedure.)

(3) The inverter generates heat of about 5% of the rated capacity. Special care should be given to ventilation when the inverter is installed inside the control panel.

(4) When a plurality of inverters are installed in the control panel, arrange them in two rows on the right and left. When the inverters are stacked, the ambient temperature of the top inverter may rise, causing a fin overheat trip.

(5) When installing the inverter in the control panel, remove the terminal cover at the lower part of the front and the blind cover. (For 1.5 to 11LB2 · LF2, and 2.5HB2 to 11 HB2, a blind cover is provided. See Figure 8.)
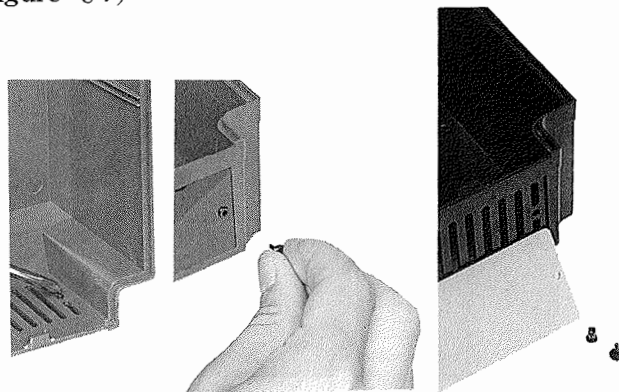

Blind cover

Frame cover

Part A

Terminal cover

Blind cover
$\left(\begin{array}{l}\text{For 1.5 to 11LB·LF2}\\ \text{2.5 to 11HB2}\end{array}\right)$
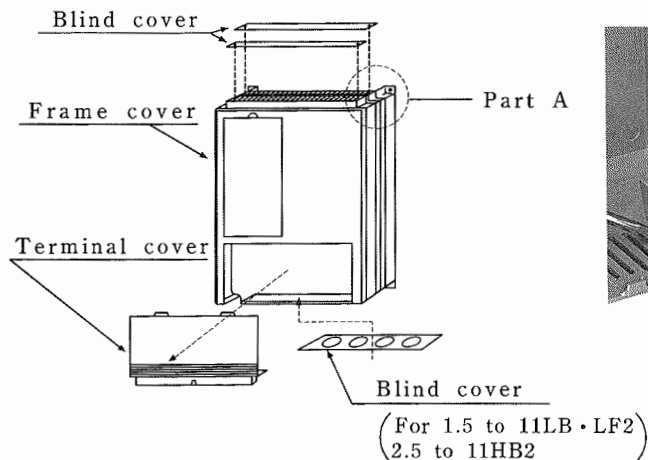
Figure 8 Appearance of the Inverter

Part A of the front cover as viewed from the inside

Figure 9 Removing the Blind Cover

4.3 Installation Direction and Space

Be sure to install the inverter vertically for cooling. Keep the inverter away from other parts and the wall as shown in Figure 10. Foreign substances within the inverter may cause damage to it. Keep the inverter free of foreign substances.
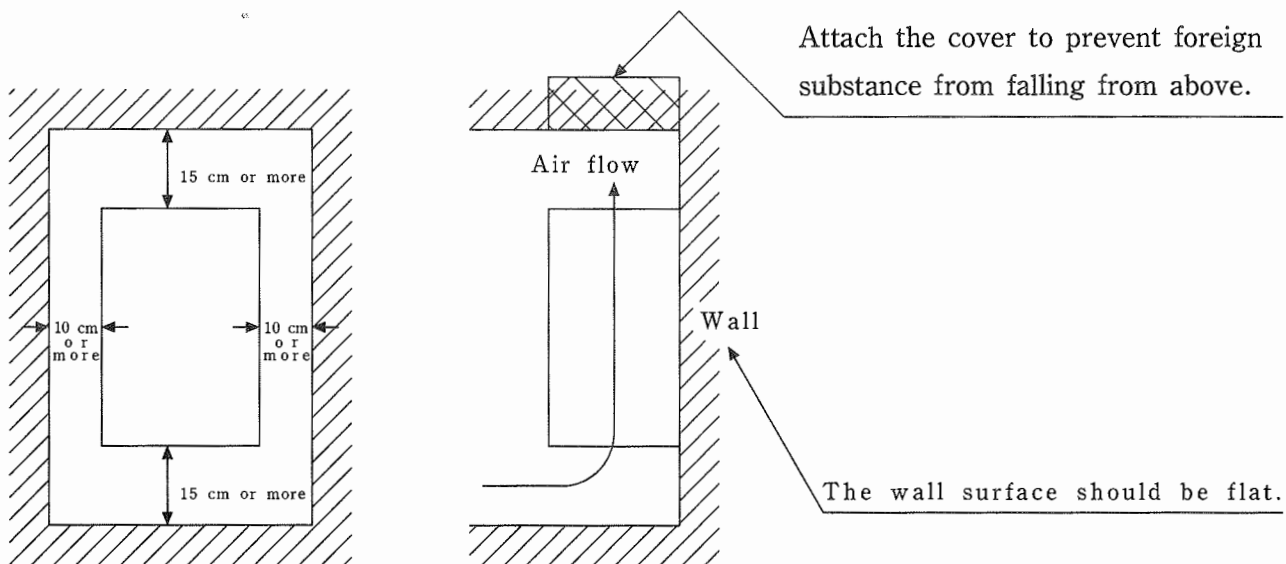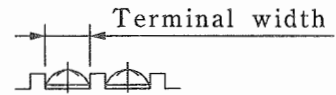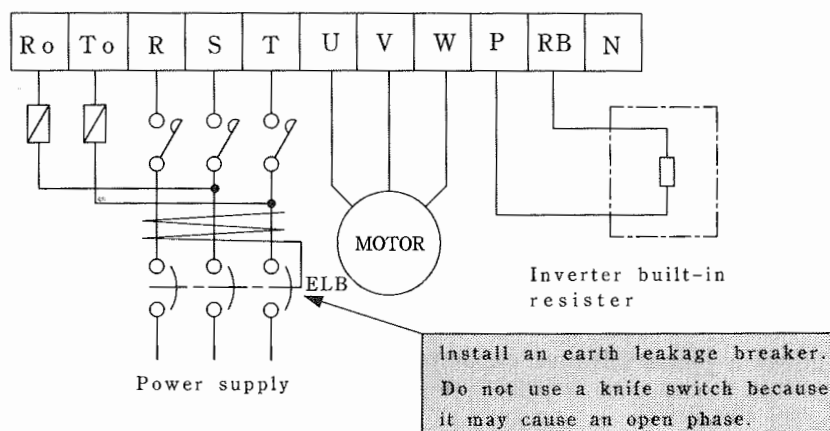
Attach the cover to prevent foreign substance from falling from above.

15 cm or more

10 cm or more

10 cm or more

Air flow

Wall

15 cm or more

The wall surface should be flat.

Figure 10 Installing the Inverter

5.1 Main Circuit Terminal Location

Terminal width

Type	Terminal location	Terminal screw diameter		Terminal width(mm)
1.5–5.5LB 2 1.5–3.5LD 2 5.5LF 2 2.5–5.5HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To R S T U V W P RB N CONTROL SUPPLY / POWER SUPPLY / MOTOR Grounding screw ⊗	Main circuit	M 4	9.7
		Ground	M 4	—
8 –11LB 2 8 –11LF 2 8 –11HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To R S T U V W P RB N CONTROL SUPPLY / POWER SUPPLY / MOTOR / ⊗ Grounding screw	Main circuit	M 5	13
		Ground	M 6	—
16LB 2 16LF 2 16HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To R S T U V W P RB N ⊗ ⏚ Grounding screw	Main circuit	M 5	13
		Ground	M 5	—
22LB 2 40–50HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To ⏚ R S T U V W P RB N Grounding terminal	Main circuit ground	M 6	17
		Control power	M3.5	8.5
33–40LB 2 60–75HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To ⏚ R S T U V W P RB N Grounding terminal	Main circuit ground	M 8	23
		Control power	M3.5	8.5
22–33HB 2	Control power supply / Main power supply / Output (motor line) / Only for BRD Ro To ⏚ R S T U V W P RB N Grounding terminal	Main circuit ground	M 5	13
		Control power	M3.5	8.5

5.2 Main Circuit Terminal Connection

(1) Wiring of the Power Supply and Motor

Install an earth leakage breaker. Do not use a knife switch because it may cause an open phase.

Note 1: If the output terminal (U, V, W) is carelessly applied with a voltage instead of the input power terminal (R, S, T), the inverter is not only damaged but also the operation is dangerous. When the motor is switched to the commercial power supply by the inverter, the same problem is caused. Mg 1 and Mg 2 should be provided with a mechanical interlock.
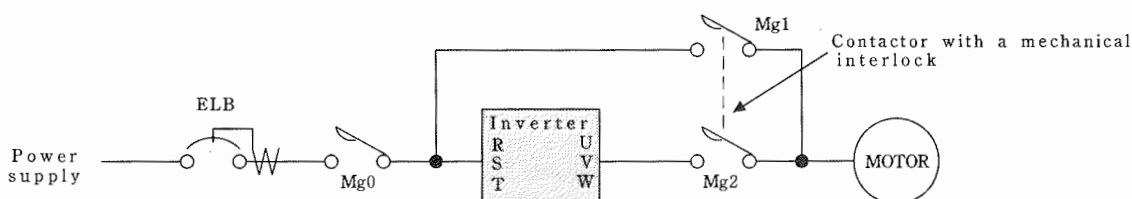
Note 2: When the frequency and the operation command are set in case of power failure for 200V class inverter, the operation resumes when the power failure is recovered. It is recommended MgO be installed on the input side for safety.

Note 3: There is no means provided for human body protection against a leakage current. Therefore, install a leak breaker. (Select an earth leakage breaker of a large high-frequency sensitive current to avoid an unnecessary operation.)

Note 4: Ground as specified (for example, ground is accordance with local legal requirements). Separate the grounding pole of the inverter from that of another power electrical equipment. Never use the same pole for both. When a plurality of inverters are used, the grounding cables should not be looped.
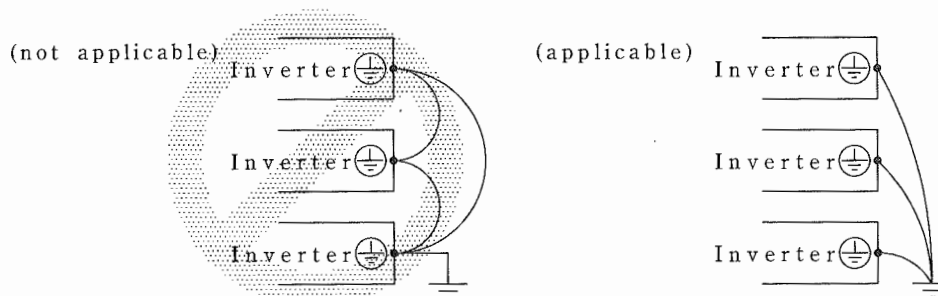
Note 5:   When the inverter is operated or stopped by turning Mg 0 and Mg 2 ON or OFF, an OC trip is caused by an overcurrent due to the direct start. If this occurs repeatedly, the element is damaged. Use the control terminal or the remote operator to operate or stop the inverter.

Note 6:   Wiring of the control circuit power terminals connecting R, S, and T allow the 200V class inverter to operate normally without Ro and To. However, to keep a trouble display or to restart the inverter after a power failure is recovered, or to use 400V class inverter, Ro and To are required. In this case, insert a wire. protection fuse(or a breaker)and supply current from the main power supply.

Note 7:   Be sure not to insert a phase advance capacitor or a surge absorber between the inverter output terminal and the motor.

Note 8:   Be sure to connect the control power(Ro, To)for 400V class inverter. Without connecting, the inverter can not operate.
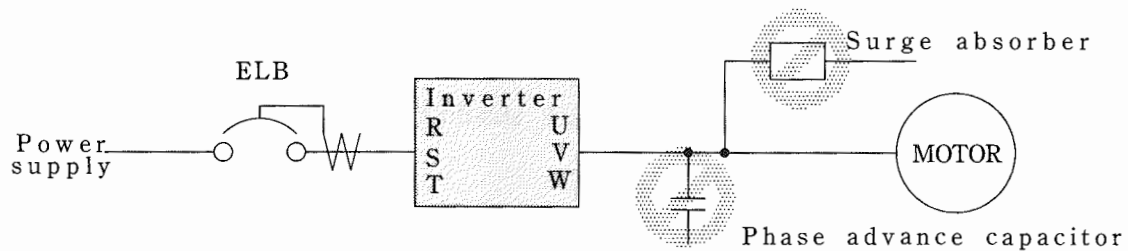
Precautions for wiring

When executing the wiring work or another work, attach a cover on the vent hole (slit) on the top of the inverter to prevent wire chips, weld spatters, iron scraps, or dust from falling into the inverter.
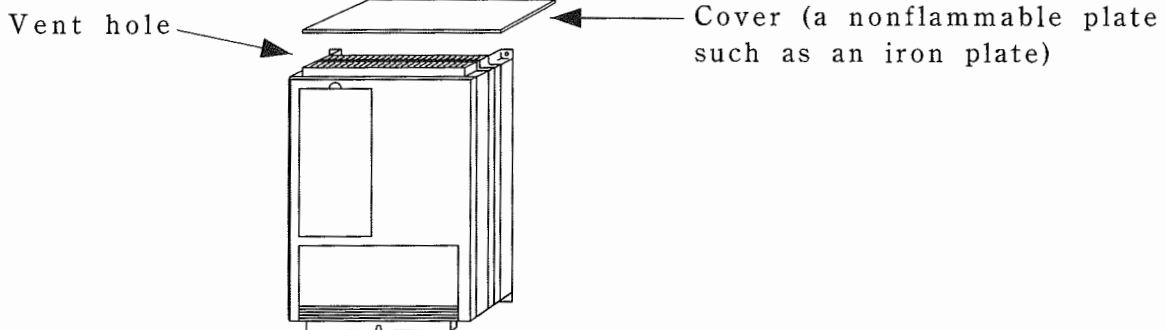
(2) Wiring of Regenerative Braking External Resistors (RB 1 , RB 2 , RB 3)

Regenerative braking internal resistors are connected to the P and RB terminals. When the operation specification of a high-frequency load requires external braking resistors, remove the internal resistors and connect the external resistors.

The teminals of the removed internal resistors should not be left as they are. Insulate the terminals securly or connect them all to the terminal as shown in the figure below.

External resistor	
RB1 (50Ω or more)	1.5–3.5LB2 · LF2
200Ω or more	2.5HB2–5.5HB2
RB2 (2pcs series) 70Ω or more	8–75 HB2
RB1–RB3 (17Ω or more)	8–16LF2 8–40LB2

Internal resistor P and RB terminals

Connect the P and RB terminals of the removed internal resistors to the N terminal.

Note: The wiring distance between the inverter and the external resistor should not be more than 5 m.

Internal resistors (Inside the inverter)

(3) Wiring of Optional Regenerative Braking Units(BRD–E, BRD–S)for 200V class inverter.

Wiring of optional regenerative braking units which are required due to high braking time duty.

Internal resistor P and RB terminals

Internal resistors

Inside the inverter

Connect the P and RB terminals of the removed internal resistors to the RB terminal

To the protection circuit

Note1 : Turn off the main power supply of inverter for protection of BRD and RB.
BRD and RB can not be protected by stop operation of inverter.

Note2 : The wiring distance between the inverter and BRD−E(S) and between the inverter and the external resistors should not be more than 5 m.

5.3 Control Circuit Terminal Location Connection

for Description of Terminals see Section 10.4

AR	RUN	COM	H	O	OI	L	FM	RS	FW	RV	JG	L	CF1	CF2	FRS	2CH	AT	USP	AL1	AL2	AL0

Frequency arrival signal

Running signal

Common

Frequency setting (500 Ω to 2 kΩ)

Current (DC4 to 20 mA)

Frequency meter (1 mA full scale)

DC 27 V
50 mA max.

for meter calibration, see page 80.

Forced reset

Forward

Reverse

Jogging selection

Common terminal

Multistage speed selection

Free run stop

Two-step speed change selection

Current input selection

Recovery restart prevention

failure alarm

Note 3
Note 4

Note 1: The COM terminal is used only for the AR and RUN terminals and isolated from the other terminals. The L terminal is a common terminal to the other terminals. Do not take COM for L. Be sure not to ground both terminals.

Note 2: Use twisted shielding wires as signal lines, and process each shielding wire as shown in the figure below. The wire length should not be longer than 20 m. When a length of more than 20 m is required, use a VX application controller RCD–A (a remote control panel) or CVD–E (an isolation signal converter).

Insulate here

No grounding is required

Connect this lead to the L terminal of the inverter
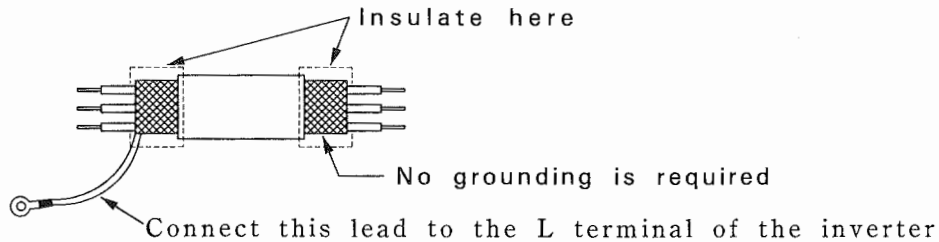
Note 3: When using a contact to turn on or off a frequency setting signal, use a relay with a cross-bar twin contact which is free of a contact error at a micro–current and voltage.

Note 4: Use relays free off a contact error at 12 VDC and 3 mA for the other contacts.

Note 5: Separate the wires from those of the main circuit and relay control circuit. When they should be crossed, cross them perpendicularly to each other.

Main circuit power line
(L1,L2,L3,U,V,W, + ,–,AL0,AL1,AL2,etc.)

A right angle is required

Signal input line
(H,O,OI,L,FW,RV,FM,etc.)

A distance of 10 cm or more is required
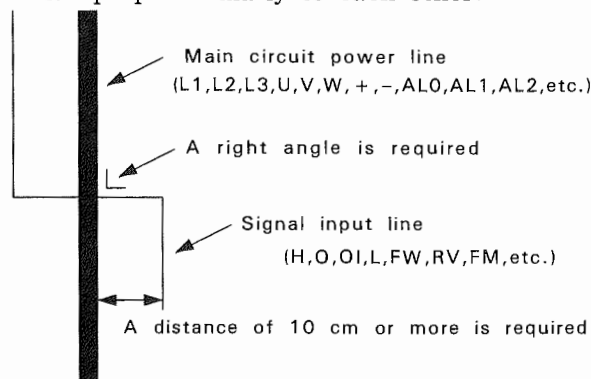
6.1 Before Test Run

Before starting the test run, check the following items.

(1) **Ground the grounding terminal (⏚ mark).**

(2) The power lines (input terminals R, S, and T, output terminals U, V, and W, and braking unit terminals P, RB, and N) are correctly connected. (The U, V, and W terminals should not be taken for the R, S, and T terminals.)
Connect Ro and To for 400V class inverter.

(3) The signal lines are correctly connected.

(4) Other than the specified terminals are not grounded.

(5) The inverter is mounted on the wall. A nonflammable material such as a steel plate is used as a mounting surface.

(6) After wiring, no parts are short-circuited by wire chips or the amplifier. No tools are left.

(7) The output wires are not short-circuited or grounded.

(8) No screws and terminals are loose.

> Execute the insulation resistance test and the withstand voltage test with reference to section 7.2. Other than the specified terminals should not be subject to the above tests.

6.2 Operation Method

The following operation patterns are available for the HFC-VWA2 series including an optional remote operator and copy unit.

Command / Pattern	Frequency command		Operation command		Remarks
	External command from terminal	Optional command	External command from terminal	Optional command	
•1	✔		✔		As delivered from factory (All Model)
2		✔		✔	Operation by remote operator (Option)
3		✔	✔		Operation by remote operator (Option)
4	✔			✔	Operation by remote operator (Option)
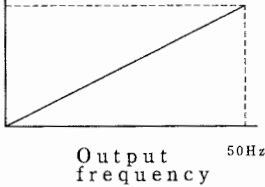
Note 1 : ✳mark means operations from the optional remote operator and copy unit. For further details, refer to the Section 9 or individual instruction manuals. When using the remote operator and copy unit, change the switches on their backs. See Section 9.3 (2) (a).
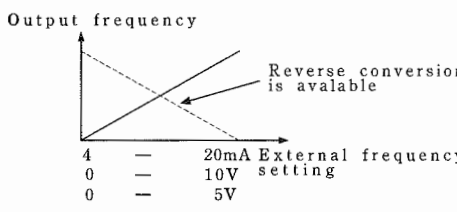
Note 2 : With Remote Operator (LD2, LF2) is standard setting to pattern 2.

6.3 Settings for Each Function Before Test Run

(1) Setting of General Data

The functions of this inverter are set to standard data. When changing any of the set data, see Chapter 9. This section describes the contents of the standard settings of several functions which are often used.

Function name	Standard settings		Indication of standard settings	Description of data change
V/f pattern (F–00)	220 V, 60Hz is set. Voltage Output frequency 50Hz 50Hz Note 1 The maximum frequency of the frequency command is 60Hz. Example : 0 to 10 V : 60Hz at 10 V 0 to 5 V : 60Hz at 5 V 4 to 20 mA : 60Hz at 20 mA		SLV 1 F 60–60 SLV 1 K☐K The most suitable motor is set. Example) 5. 5LB2 3. 7kW SLV 1 P 4 P	See page 65. Use the function mode for setting.
			When using another capacity and number of poles, be sure to change the settings.	See page 64.
Speed change time (F –01) (F –02)	10 seconds		ACCEL–1 10. 0S DECEL–1 10. 0S	See page 68. Use the function mode for setting.
Frequency command	Without remote operator LB, 2HB2	Terminal (Change to the remote operator is avalable)	F–SET–M terminal F/R–SW terminal	See pages 53 to 54. Use the monitor mode for setting.
	With remote operator LD2, LF2 Note 2	Remote operator	F–SET–M Remote F/R–SW Remote	
Frequency setting	Without remote operator LB, 2HB2	Terminal (Change to the remote operator is available)	FS000. 0	See pages 52. Use the monitor mode for setting.
	With remote operator LD, 2LF2 Note 2	Remote operator		

Function name	Standard settings	Indication of standard settings	Description of data change
Electronic thermal level (F −23)	The themal level is a general–purpose motor protection level, and set to 100% of the rated current of the inverter. Set the thermal level to a percent (%) value which provides the current of the moter at 60 Hz given on the rating plate. Example : 5.5 kVA motor, 3.7kW, 4 poles Inverter rated current 16.5 A Rated motor current : 15 A Thermal level set value $=\dfrac{15}{16.5}\times 100=90$	E–therm 100%	See pages 75. Use the function mode for setting.
External frequency setting • Start • End (F −26) (F −27)	The start frequency and the end frequency for an external analog command of 4 to 20 mA, 0 to 10 V or 0 to 5 V are set. The standard setting is 0, and no additional setting is required. Output frequency Reverse conversion is avalable 4 — 20mA External frequency 0 — 10V setting 0 — 5V	F–START 000.0 Hz F–END 000.0 Hz	See page 76. Use the function mode for setting.

Note :

(1) When the start frequency and the end frequency are changed by the external frequency setting function, the set data is changed.

(2) When the inverter with remote operator is used, setting is not have to be changed.

(2) Precaution 1 after Data Setting

Precaution after Data Setting

To store data changed by the [機能 FUN] key, press the [記憶 STR] key. When the power is off, data is stored in an element (EEPROM) wnich can store it after the power is turned off. Data is stored in the Power OFF state (it can be checked by the indicator being turned off). When the RESET switch is turned on simultaneously with Power OFF, no data is stored. For this reason, turn the signal at the reset terminal off, then turn the power off. When data is stored, it is retained even if the reset operation is performed. The figure below shows a circuit requiring an emergency output break.

No data is stored

Mg

R   U
S   V
T   W
       RS
Ro
To   L

Motor

X(Mg)
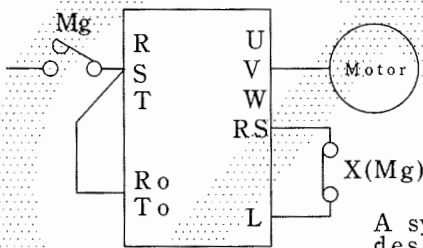
A symbol X designates a weak current relay which operates in the same way as Mg.

When changed data is not stored after power is turned off, it is reset in the figure above, hence it is not stored.

Data is stored

Mg

R   U
S   V
T   W SW
       RS
       FRS
Ro
To   L

Motor

X(Mg)   X(Mg)
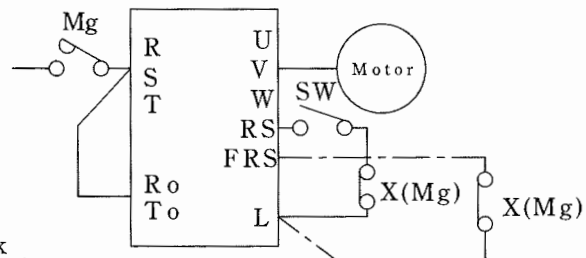
RS used	• Connect SW as shown above. To store data, turn the SW off and turn power off. Then, turn the SW on.
FRS used	• Even if FRS is used instead of RS, an emergency break is available.

Use FRS for emergency break.

(3) Precaution 2 after data setting

ELB

R   U
S   V
T   W
Ro
To
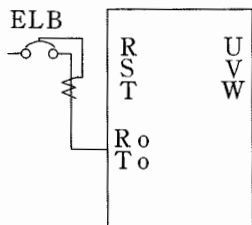
To store date changed by the [モニタ MON] key with only control circuit terminals (Ro, To) connected, or to turn power off, perform the following
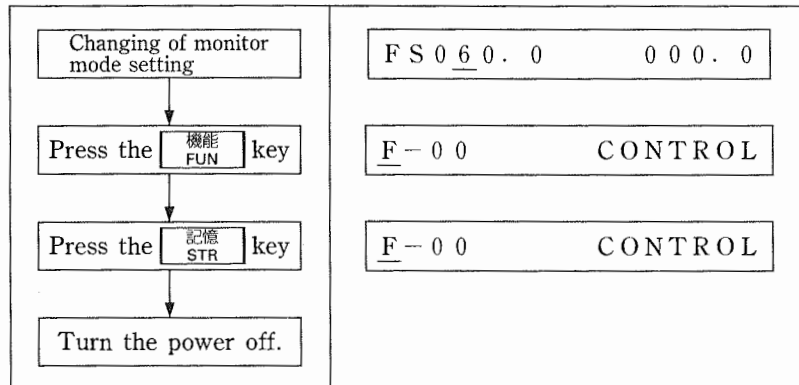
Changing of monitor mode setting	FS0 6 0. 0 0 0 0. 0	(The frequency is changed to 60 Hz.
Press the [機能 FUN] key	F－0 0 CONTROL	
Press the [記憶 STR] key	F－0 0 CONTROL	
Turn the power off.		

Note : When power is turned off unless the [機能 FUN] and [記憶 STR] keys are pessed, an ERROR EEPROM error may by displayed when power is turned on again. Perform the reset operation using the reset terminal, change the data again, if required, and perform the above operations.

6.4 Test Run

(1) Precautions on Operation Sequence

(a) Connection diagram
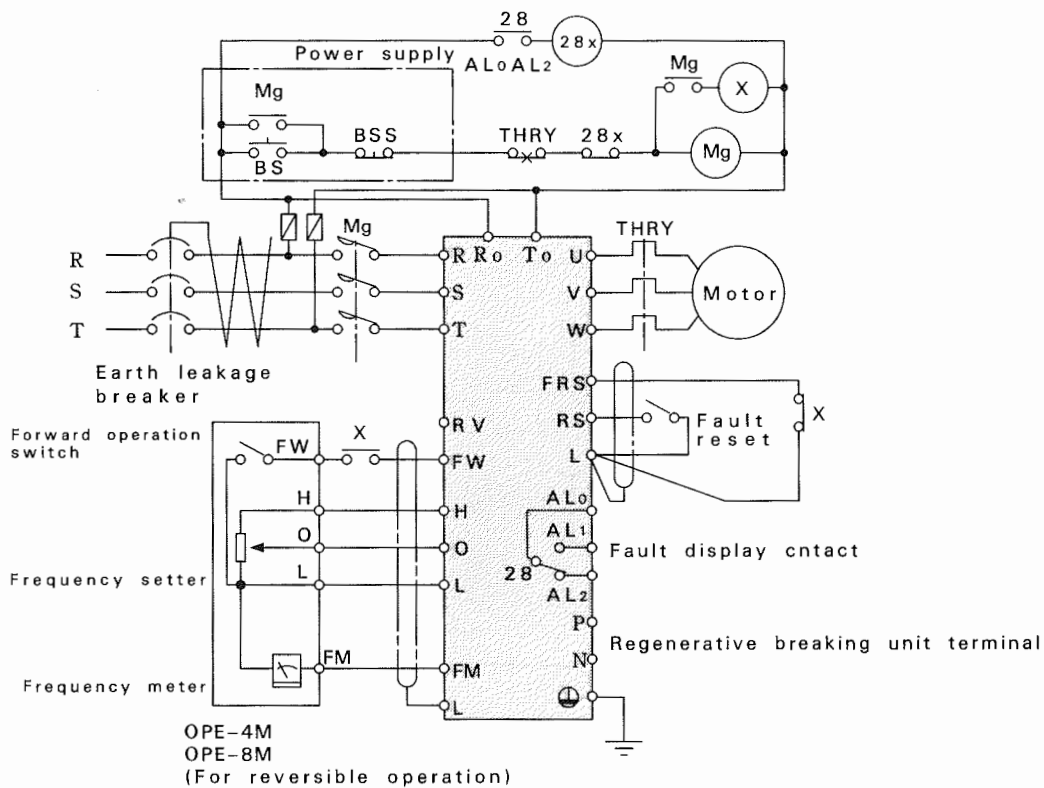
Figure 11 Main Circuit Power and Controlpower Signal Input Sequence

(Forward Operation)

(b) Interlock time chart
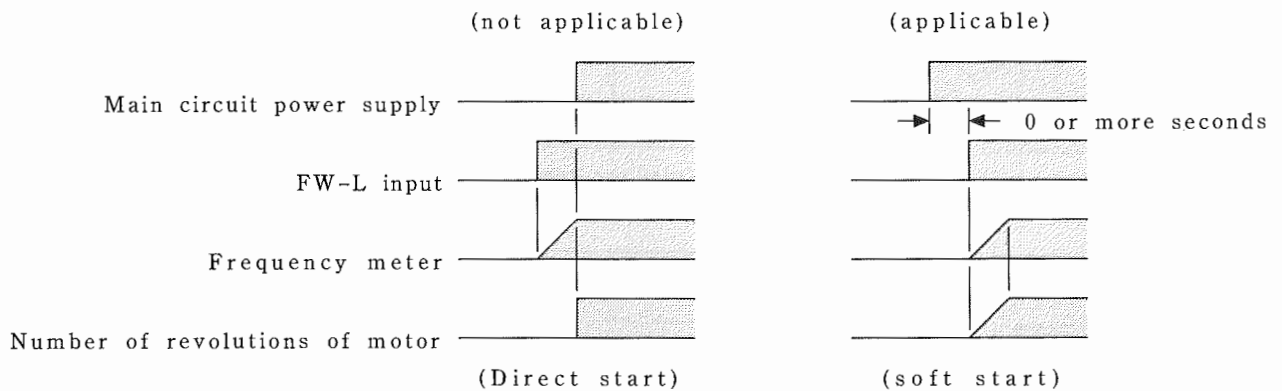
- Turn on the main power Mg, and input the operation command (FW).
- When the operation command is inputted first and Mg is turned on, a direct start results and an overcurrent trip occurs.

（2） Operation Procedure

```
┌─────────────────────────┐
│  Are FW-L and RV-L off? │
└─────────────────────────┘
             │
┌─────────────────────────┐
│         MCB, ON         │
└─────────────────────────┘
             │
┌─────────────────────────┐                    ┌──────────────────┐
│         BS, ON          │    <───────         │ Power is turned  │
└─────────────────────────┘                    │ on.              │
             │                                  └──────────────────┘
          ╱Frequency╲                           ┌──────────────────┐
         ╱ command? ╲      <───────             │ The frequency    │
         ╲          ╱                           │ is set.          │
          ╲────────╱                            └──────────────────┘
```

From the remote operator (from the digital operation panel)		External command (from the terminal)	

```
          ╱Operation╲                          ╱Operation╲                ┌──────────────────┐
         ╱ or stop  ╲                         ╱ or stop  ╲      <─────     │ Operation or     │
         ╲ command  ╱                         ╲ command  ╱                 │ stop command     │
          ╲────────╱                           ╲────────╱                  └──────────────────┘
```

From the remote operator (from the digital operation panel)	External command (from the terminal)	From the remote operator (from the digital operation	External command (from the terminal)
Operation Pattern 2	Operation Pattern 3	Operation Pattern 4	Operation Pattern 1
See page 22 and 24	See page 25	See page 26	See page 21

┌──────────────────┐
│ Procedure   │   ─────> See page 21
│ diagram   │
└──────────────────┘

With remote operator,simple operation for LD2 or LF2 is shown on patlern2	Without remote operator,simple operation for LB2 or HB2 is shown on patlern1

The frequency is set and the operation or stop command is externally executed. (Terminals FW and RV)

In this example, the operation box (OPE-4M, OPE-8M) is used for operation.
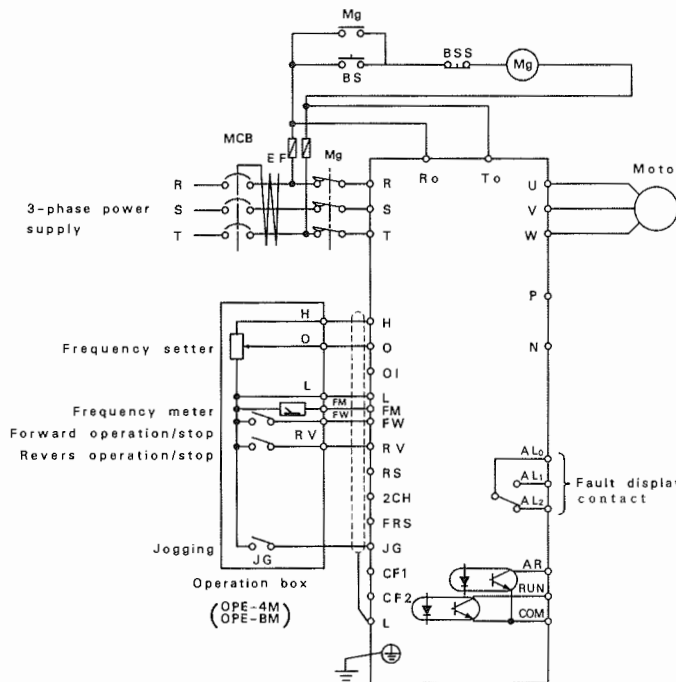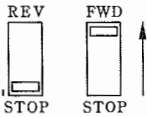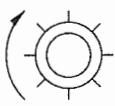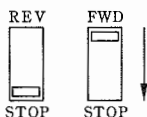
Note 1: The 200V class inverter is normally operated unless the control circuit terminals(Ro, To)are connected. Be sure to connect the terminals in the following casesx and in case of 400V class inverter
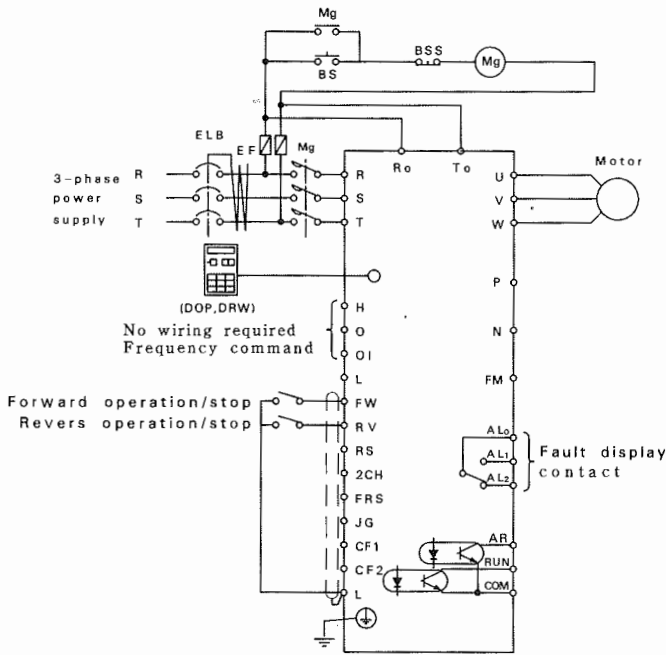
(a) The voltage is switched to the commercial voltage or the inverter restarts after an instantaneous power failure is recovered.

(b) The fault display should be left.

(c) The alarm relay should be activated in case of a under-voltage or instantaneous power failure trip.

Note 2: When Ro and To are connected, fit a power supply protection fuse EF(250V, 3A).

Note 3: When the frequency and tne operation command are set in case of power failure, the operation resunes when the power failure is recovered. It is recommended Mg be installed on the input side for safety. For further details, see Fig. 11.

Operation procedure	Description
Power ON	When the power is turned on, the POWER lamp comes on.
Operation command	Turn the swich of the operation box(OPE)from STOP to FWD : Forward (STOP to REV : Reverse)
Frequency setting	When the frequency is set by turning the frequency setter of the operation box, the motor starts running.
Stop	When the swich of the operation box is turned from FWD to STOP, the motor decelerates and stops according to the preset deceleration time.
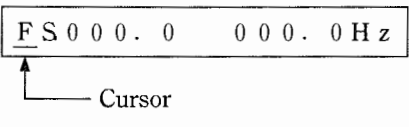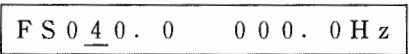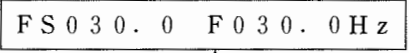
Initial selection when the frequency is set and the inverter is operated or stopped via the digital operation panel

Operation Procedure	Description
Power ON	When power is turned on, the display before power-off appears. (See Section 9.3(2).) F S 0 0 0 . 0 0 0 0 . 0 H z
Selection of frequency commanding method	Press the or ⓶ key once to select the frequency commanding method. F — S E T — M T e r m i n a l Move the cursor to the position of T by using the ▶ key, and press the ▼ key to select the Remote mode. F — S E T — M R e m o t e └—Cursor movement—┘
Selection of operation commanding method	Press the or ⓶ key twice to select the operation commanding method. F / R — S W T e r m i n a l Move the cursor to the position of T by using the ▶ key, and press the ▼ key to select the Remote mode. F / R — S W R e m o t e └—Cursor movement—┘
Selection of ferquency setting mode	Move the cursor to the original position and press the モニタ/MON or ▼ key several times to select the frequency setting mode. F S 0 0 0 . 0 0 0 0 . 0 H z
To Operation Patterns 2, 3, and 4	

• Simple test running method using Operation Pattern 2

The values necessary for operation are all set except the frequency. The operation procedure using only the digital operation panel is as follows. See Section 9.3(2) for more details.
• Set the frequency.
• The forward or reverse command is set in the Remote mode or via the digital operation panel. When the frequency is set, the inverter starts operation by pressing the [正転運転 FWD RUN] or [逆転運転 REV RUN] key.

Operation procedure	Digital operation panel	Digital display	Description
Power ON ↓ Frequency setting		F S 0 0 0 . 0 0 0 0 . 0 H z └── Cursor Set frequency Output frequency	When power is turned on, the set frequency and output frequency are displayed on the same screen. When power is turned on next or later, the screen displayed before power is turned off is displayed. This is a set frequency or output frequency display screen.
	Move the cursor to the cursor–positioned digit by the ▶ key, and set the frequency by the ▲ and ▼ keys.	(45 Hz setting example) F S 0 4 0 . 0 0 0 0 . 0 H z F S 0 4 5 . 0 0 0 0 . 0 H z └── Cursor	Move the cursor in units of digits to set 45.0.
Operation ↓	Press the [正転運転 FWD RUN] or [逆転運転 REV RUN] key.	Changes in frequency are displayed on the upper right of the same screen.	Press the [正転運転 FWD RUN] key for forward operation or the [逆転運転 REV RUN] key for reverse operation. The motor starts softly.
Acceleration or deceleration	Move the cursor by the ▶ key, and change the set frequency by the ▲ and ▼ keys.	(Example of setting of 30 Hz and deceleration) F S 0 3 0 . 0 F 0 3 0 . 0 H z └── Or R	When the set frequency is changed during operation the speed is accelerated or decelerated immediately to the set value.
Stop	Press the [停止 STOP] key.		When the key is pressed, the motor is decelerated to stop.

The frequency is set and the operation or stop command is executed via the digital operation panel.

Note 1: The 200Vclass inverter is normally operated unless the control circuit terminals(Ro, To)are connected. Be sure to connect the terminals in the following casesx and in case of 400V class inverter

(a) The voltage is switched to the commercial voltage or the inverter restarts after an instantaneous power failure is recovered.

(b) The fault display should be left. (See Section 6.3(3).)

(c) The alarm relay should be activated in case of a undervoltage or instantaneous power failure trip. (When Ro and To are not connected, the power is broken, or the voltage is decreased, 〃POWER OFF〃 is displayed and the motor stops.)

Note 2: When Ro and To are connected, fit a cable protection fuse EF(250V, 3A).

Note 3: The standard setting should be changed. With reference to the initial setting, operate the inverter sa specified below.

Operation Procedure	Description
Power ON	When power is turned on, the display before power–off appears. (See Section 9.3(2).)
	FS 000. 0　　　　000. 0　Hz
	└── Cursor
Initial selection	Perform initial selection on the previous page to display the following.
	FS 000. 0　　　　000. 0　Hz
	└── Cursor
Frequency setting	Move the cursor by the ▶ key and enter the set frequency by the ▲ and ▼ keys.
	FS 040. 5　　　　000. 0　Hz
	└── Cursor
Operation command	Press the [正転運転 FWD RUN] key for forward operation or the [逆転運転 REV RUN] key for reverse operation.
Acceleration or deceleration	Move the cursor by the ▶ key, and enter the set frequency by the ▲ and ▼ keys once again. The speed is accelerated or decelerated immediately.
	┌ 1. Press the [停止 STOP] key. The motor starts deceleration immediately according to the preset deceleration time and stops.
Stop	│ 2. Set the frequency to 0. Move the cursor by the ▶ key and set the frequency to 0 by the ▼ key. The motor decelerates according to the preset deceleration time and stops.

The frequency is set via the digital operation panel and the operation or stop command is executed externally (FW, RV).

Note 1: The 200Vclass inverter is normally operated unless the control circuit terminals (Ro, To) are connected. Be sure to connect the terminals in the following casesx and in case of 400V class inverter

(a) The voltage is switched to the commercial voltage or the inverter restarts after an instantaneous power failure is recovered.

(b) The fault display should be left. (See Section 6.3(3).)

(c) The alarm relay should be activated in case of a under-voltage or instantaneous power connected, the power is broken, or the voltage is decreased, ″ POWER OFF ″ is displayed and the motor stops.)

Note 2: When Ro and To are connected, fit a cable protection fuse EF (250V, 3A).

Note 3: Wnen the frequency and the operation command are set in case of power failure, the operation resumes when the power failure is recovered. It is recommended Mg be installed on the input side for safety. For further details, see Figure. 11.

Operation Procedure	Description
Power ON	When power is turned on, the display before power–off appears. (See Section 9.3(2).) F S 0 0 0 . 0 0 0 0 . 0 H z
Selection of frequency commanding method	Press the [モニタ MON] or [▲] key once to select the frequency commanding method. F − S E T − M T e r m i n a l
Selection of frequency setting mode	Move the cursor to the Position of T by using the [▶] key, and press the [▼] key to select the Remote mode. F − S E T − M R e m o t e └─ Cursor movement ─┘ Move the cursor to the original position and press the [モニタ MON] or [▼] key several times to select the frequency setting mode. F S 0 0 0 . 0 0 0 0 . 0 H z
Frequency setting	Move the cursor by the [▶] key and enter the set frequency by the [▲] and [▼] keys. F S 0 4 0 . 5 0 0 0 . 0 H z
Operation command	The forward operation is selected by turning the terminal FW-L on or the reverse operation is selected by turning the RV-L on.
Acceleration or deceleration	Move the cursor by the [▶] key, and enter the set frequency by the [▲] and [▼] keys once again. Open between the PC board terminals FW-L and RV-L. The motor decelerates according to the
Stop	preset deceleration time and stops. In the terminal mode, the motor is stopped by pressing the [停止 STOP] key. The [停止 STOP] key can be invalidated by selection. (See page 80).

The frequency is set externally and the operation or stop command is executed from the digital operation panel.

Note 1: The 200Vclass inverter is normally operated unless the control circuit terminals(Ro, To)are connected. Be sure to connect the terminals in the following casesx and in case of 400V class inverter

(a) The voltage is switched to the commercial voltage or the inverter restarts after an instantaneous power failure is recovered.

(b) The fault display should be left. (See Section 6.3(3).)

(c) The alarm relay should be activated in case of a under-voltage or instantaneous power failure trip. (When Ro and To are not connected, the power is broken, or the voltage is decreased, ″POWER OFF″ is displayed and the motor stops.)

Note 2: When Ro and To are connected, fit a cable protection fuse EF(250V, 3A).

Operation Procedure	Description
Power ON	When power is turned on, the display before power–off appears. (See Section 9.3(2).) `F S   0 0 0 . 0        0 0 0 . 0   H z`

Selection of operation commanding method	Press the [MON] or [▲] key twice to select the operation commanding method.
	
	`F / R − S W          T e r m i n a l`
	
	Move the cursor to the Position of T by using the [▶] key, and press the [▼] key to select the Remote mode.
	
	`F / R − S W          R e m o t e`
	└ Cursor movement ┘

Operation command	Move the cursor to the original position and press the [MON] or [▼] key several times to select the frequency setting mode. `F S   0 0 0 . 0        0 0 0 . 0   H z` {Press the [FWD RUN] key for forward operation. F is displayed. {Press the [REV RUN] key for reverse operation. R is displayed. (Since the set frequency is not entered, the motor does not start running.)
Frequency setting	Enter one of the items on the right to the PC board terminal. /A frequency setter between H, O, and\ L 0 to 10 VDC or 0 to 5 VDC between O and L 4 to 20 mA between OI and L/
Stop	Press the [STOP] key.

3) Example of connecting the motor with a brake

200V 50Hz, 200/220V 60Hz
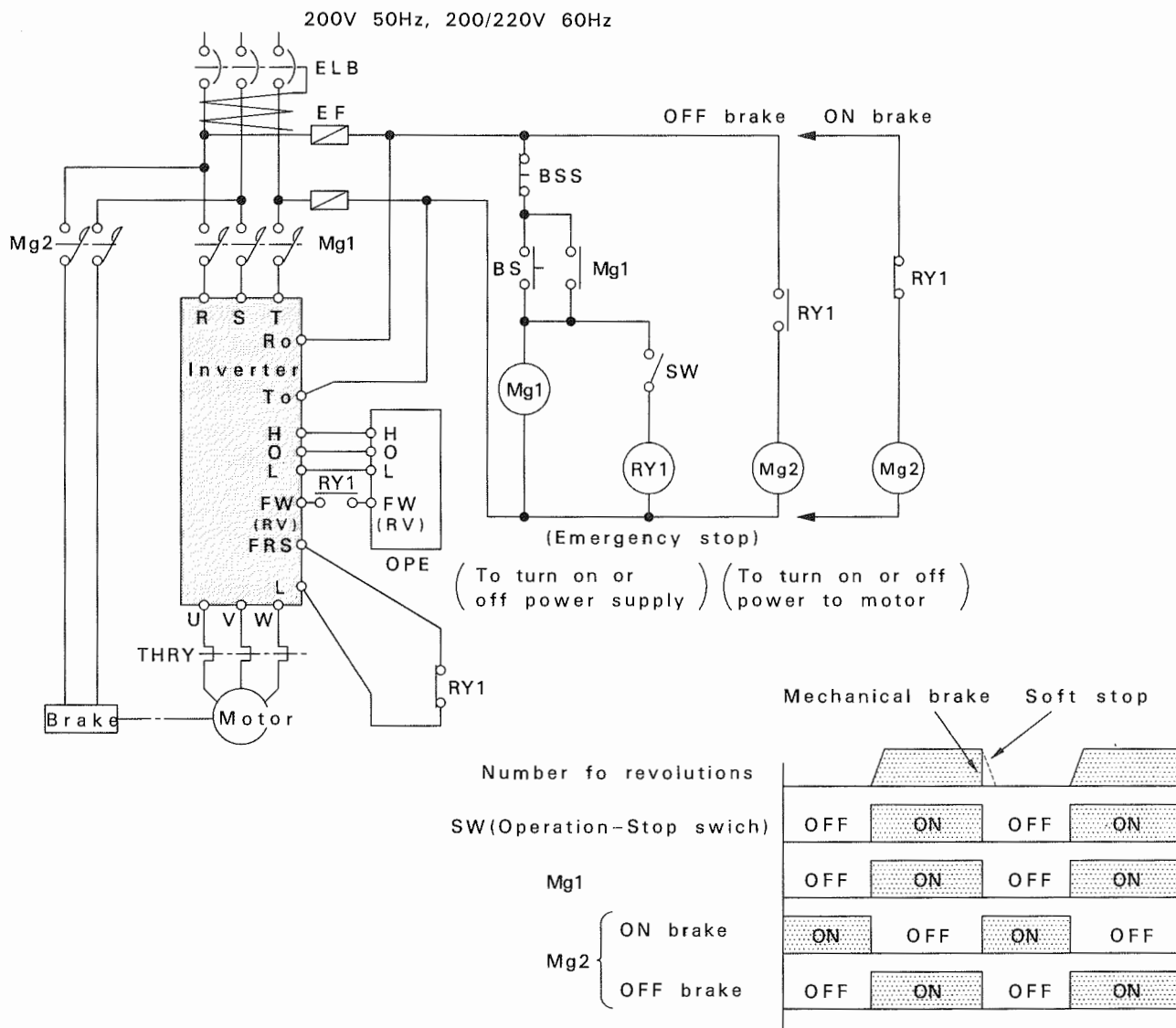
Figure 12 Connection Example (A Motor with a Brake Used)

Number fo revolutions				
SW(Operation-Stop swich)	OFF	ON	OFF	ON
Mg1	OFF	ON	OFF	ON
Mg2 ON brake	ON	OFF	ON	OFF
Mg2 OFF brake	OFF	ON	OFF	ON

The inverter consists of many parts, and will not fulfill the function unless those parts operate normally. Therefore, it is necessary to detect fault signs of the parts and equipment early by periodic inspection and to take measures for them.

Before starting maintenance and inspection

When the inverter is to be restarted, some of the preset data may have to be changed. It is recommended to check the preset data once again before starting maintenance and inspection.

7.1 Precautions for Maintenance and Inspection

(a)	Before starting maintenance and inspection, turn the power off.
(b)	Before starting maintenance and inspection, check that the charge lamp on each PC board goes off after the power is turned off. (About 50 VDC remains immediately after the indicator goes off. Check that the voltage between the main circuit terminals P and N is reduced to less than 15V. About 20 seconds for 5.5LB2 · LF2 and 33LB2 about 1 minutes for 5.5HB2 and 16LB2 and about 3 minutes for 11HB2, and about 4 minutes for 33HB2 and about 6 minutes for 75HB2.)
(c)	When connecting or disconnecting each connector, do not pull the cable.
(d)	Take special care not to misconnect each connector.

• General precautions

Always keep the inverter clean and away from dust. Give special care to disconnection or misconnection, and secure the terminals and connectors. Note that electronic equipment is not resistant to moisture and oil mist, and the insulation is affected by dust or iron powder, causing unexpected trouble.

7.2 Check Items

(1) Daily inspection

(2) Periodic inspection (yearly or so)

(3) Insulation resistance test and withstand voltage test

Short-circuit the terminals as shown below, and conduct the tests under the conditions given below.
• Insulation resistance test : Measure the resistance between the terminal indicated below and the ground with a dynamic 500V megohm-meter. The resistance should not be less than 5 MΩ. (Do not use a battery megohm-meter.)
• The withstand voltage test is not required to be conducted. When the test is required, apply 1500VAC between the terminal indicated below and the ground for one minute. No error should occur. (Apply AC 2000V for 1 minute to 400V class inverter)
• Do not use another terminals for the withstand voltage test.
• Increase the application voltage for the insulation resistance test or the withstand voltage test slowly, and then decrease it slowly to 0 V. Sudden voltage application or reduction may cause damage to the inverter module(PM).
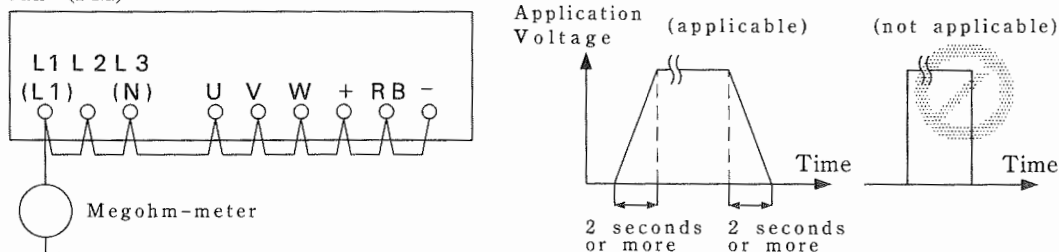
Figure 13 Insulation Resistance Test and Withstand Voltage Test

Teble 1 Daily Inspection and Periodic Inspection

Unit to be checked	Part to be checked	Check time	Inspection cycle Daily	Inspection cycle Periodic	Check method	Criteria	Standard replacement years	Measuring instrument
Entire	Environment	Ambient temperature and humidity, dust, harmful gas, oil mist	✓		See the precautions in Section 2.	Ambient temperature: −10 to 40°C, no freezing. Ambient humidity: 20 to 90% RH, no dew		Thermometer Hygrometer
	General equipment	Vibration, noise	✓		Visual and auditory check	No error		Tester
	Supply voltage	Main circuit voltage, control voltage	✓		Measure the voltage between inverter terminals L1, L2 and L3.	200~220V 50Hz (for 200V class) 200~230V 60Hz (class) 380~415V 50Hz (for 400V class) 400~460V 60Hz (class)		
	General	(1) Insulation resistance test (between main circuit terminal and grounding terminal)		✓	(1) See Section 7.2	(1) See Section 7.2	—	500 V class megohm meter
		(2) Loose tightening parts		✓	(2) Tighten.	(2), (3) No error		
		(3) Overheated parts		✓	(3) Visual check			
		(4) Cleaning		✓				
	Conencted conductor, cable	(1) Distorted conductor		✓	(1), (2) Visual check	(1), (2) No error	—	
		(2) Turn or degraded cable cover (crack, discoloration, etc.)		✓				
	Transformer	Offensive odor, buzzing	✓		Auditory check	No error		
	Terminal block	Damaged terminal		✓	Visual check	No error		
Main circuit	Transistor module Diode module	Resistance between terminals		✓	See Setion 7.4	See Section 7.4		Analog tester
	Smoothing capacitor	(1) Leaked liquid	✓		(1), (2) Visual check	(1), (2) No error	5 years (Note 1)	Capacity meter
		(2) Protruded or swollen safety valve	✓					
		(3) Electrostatic capactiy		✓	(3) Use a capacity meter	(3) Min. 85% of rated-capacity		
	Relay conductor	(1) Beeping during operation		✓	(1) Auditory check	(1) No error		
		(2) Timer operation time		✓				
		(3) Roughed contact		✓				
	Resistor	(1) Large crack, discoloration		✓	(1) Visual check	(1) No error		Tester
		(2) Diconnection		✓	(2) Disconnect one end, and measure the resistance with a tester.	(2) An error of max. +10% of displayed resistance		

Unit to be checked	Part to be checked		Check time	Inspection cycle		Check method	Criteria	Standard replacement years	Measuring instrument
				Daily	Periodic				
Control circuit	Operation		(1) Inter-phase output voltage balance when only the inverter is operated.		✓	(1) Measure the voltage between inverter output terminal U, V and W Phases.	(1) Inter-phase voltage difference 2 % max.		
			(2) Protection and display circuits after the sequence test is conducted		✓	(2) Operate the inverter protection circuit imitatively.	(2) Should be operated without errors	—	
Protection circuit	Parts	Whole	(1) Offensive odor, discoloration	✓		Visual check	No error (Note 2)		
			(2) Excess rust		✓	Visual check			
	PC board	Capacitor	Leaked liquid, deformation	✓		Visual check			
Cooling system	Cooling fan		(1) Vibration, noise	✓		(1) Operate the fan by hand with no voltage applied.	The fan should rotate smoothly.	2 to 3 years	
			(2) Loose connection (plug, screw, etc.)		✓				
			(3) Dirt, dust	✓		(2) Tighen	No error		
Display	Display of digital operation panel		(1) Display status	✓		Visual check	The display should be read (Note 3)	7 years	
			(2) Defective or damaged connector contact		✓				
			(3) Defective lamp	✓					

Note 1 : Note that the life of the inverter is extremely shortened when it is used at a high temperature and heavy load. When replacing the capacitor in use with a capacitor which is stored for more than three years, age it under the conditions indicated below before use.

1. First, apply a voltage equivalent 80% of the rated voltage to the capacitor at room temperature for one hour.

2. Next, apply a voltage equivalent to 90% of the rated voltage to it for one hour.

3. Finally, apply the rated voltage to it at room temperature for five hours.

Note 2 : Precautions for handling the PC board and inverter module

Both the PC board and inverter module need not be maintained under normal use. If maintenance and inspection and required, the following should be taken into consideration :

Electrostatic damage prevention

The IGBT of the inverter module or the MCU or IC on the PC board may be electrostatically damaged. Be sure to ground the workbench, soldering iron, and human body beforehand.

Note 3: The display may not be easily seen depending on the view angle due to a liquid crystal but should be read.

It is recommended to always keep parts indicated below to shorten the non-operation time.

Table 2 Recommended Spare Parts

Parts	Sequence symbol	Quantity		Remarks
		In use	Spare	
Inverter module	PM	1 − 3	1 − 3	
Cooling fan	FAN	1	1	Unnecessary for 1.5LB2 · LD2
Converter module	DM	1 − 3	1 − 3	
Smoothing capacitor	CB	1 − 2	1 − 2	Store them at −20 to +30℃
PC board	Control board	1	1	The PC board is exclusive
PC board	BRD PC board	1	1	1.5～5.5LB2 · LF2
PC board	FAN PC board	1	1	22～40LB2, 22～75HB2

7.3 Measurement Method for I/O Voltage, Current, and Power

General measuring instruments for I/O voltage, current, and power are indicated below. The voltage to be measured is a fundamental wave effective voltage and power to be measured is a total effective value.
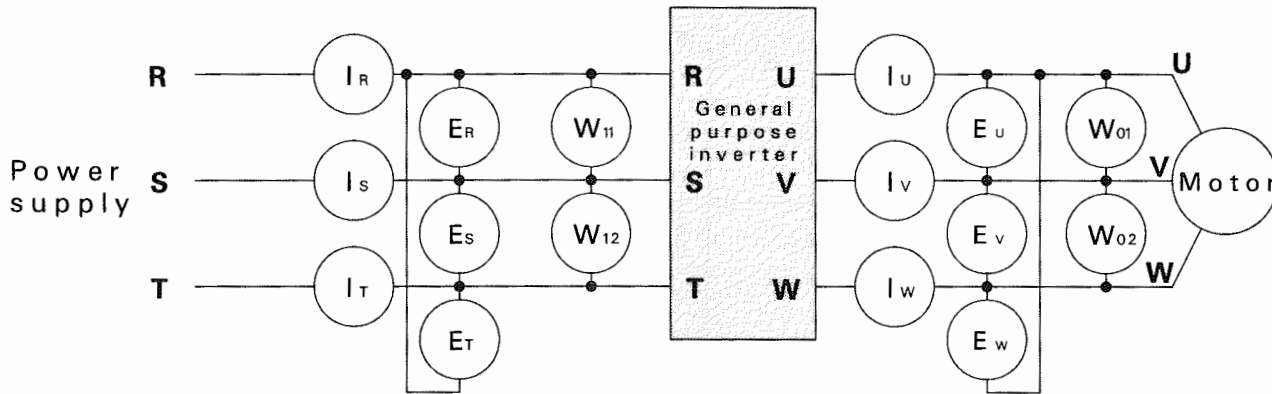
Table 3 Parts to be Measured

Measurement item	Parts to be measured	Measuring instrument		Remarks	Reference value
Supply voltage E_1	Between R and S, S and T, T and R $(E_R)(E_S)(E_T)$		Moving–iron type voltmeter or rectifier type voltmeter	Fundamental wave effective value	Commercial supply voltage (200V class) 180–242V 50Hz 180–253V 60Hz
Supply current I_1	R, S, T $(I_R)(I_S)(I_T)$		Moving–iron type ammeter	Total effective value	
Supply power W_1	Between R and S, S and T $(W_{11})(W_{12})$		Electrodynamic type wattmeter	Total effective value	
Supply power factor pf_1	Calculate the supply power factor from the measured supply voltage, E_1, supply current I_1 and supply power W_1. $$Pf_1 = \frac{W_1}{\sqrt{3} \cdot E_1 \cdot I_1} \times 100(\%)$$				
Output voltage E_0	Between U and V, V and W, W and U $(E_U)(E_V)(E_W)$		See page 33 or use a rectifier type voltmeter	Total effective value	
Output current I_0	U, V, W $(I_U)(I_V)(I_W)$		Moving–iron type ammeter	Total effective value	
Output Power W_0	Between U and V, V and W $(W_{01})(W_{02})$		Electrodynamic type wattmeter	Total effective value	
Output power factor Pf_0	Calculate the output power factor from the output voltage E_0, output current I_0, and output power W_0. $$Pf_0 = \frac{W_0}{\sqrt{3} \cdot E_0 \cdot I_0} \times 100(\%)$$				

Note 1: Use a meter indicating a fundamental wave effective value for voltage, and meters indicating total effective values for current and power.

Note 2: The inverter output waveform is a distorted wave, and a low frequency may cause an error. However, the measuring instruments and methods indicated provide comparatively accurate values.

Do not use a tester because it is not suitable for distorted waveform.

With a load	Without a load

With a load (left diagram):

R U
S V
T W

→ Motor

Diode
600V 0.1A min. (200V class)
1000V 0.1A min. (400V class)

220kΩ 2W

V_{DC}

300 V (200 V class)
600 V (400 V class)
moving-coil type

Fundamental wave effective value:
$V_{AC} = 1.1 \times V_{DC}$

Without a load (right diagram):

R U
S V
T W

Additional resistor
5 kΩ 50W

Diode
600 V 0.1 A min. (200 V class)
1000 V 0.1 A min. (400 V class)

220kΩ 2W

V_{DC}

300 V (200 V class)
600 V (400 V class)
moving-coil type
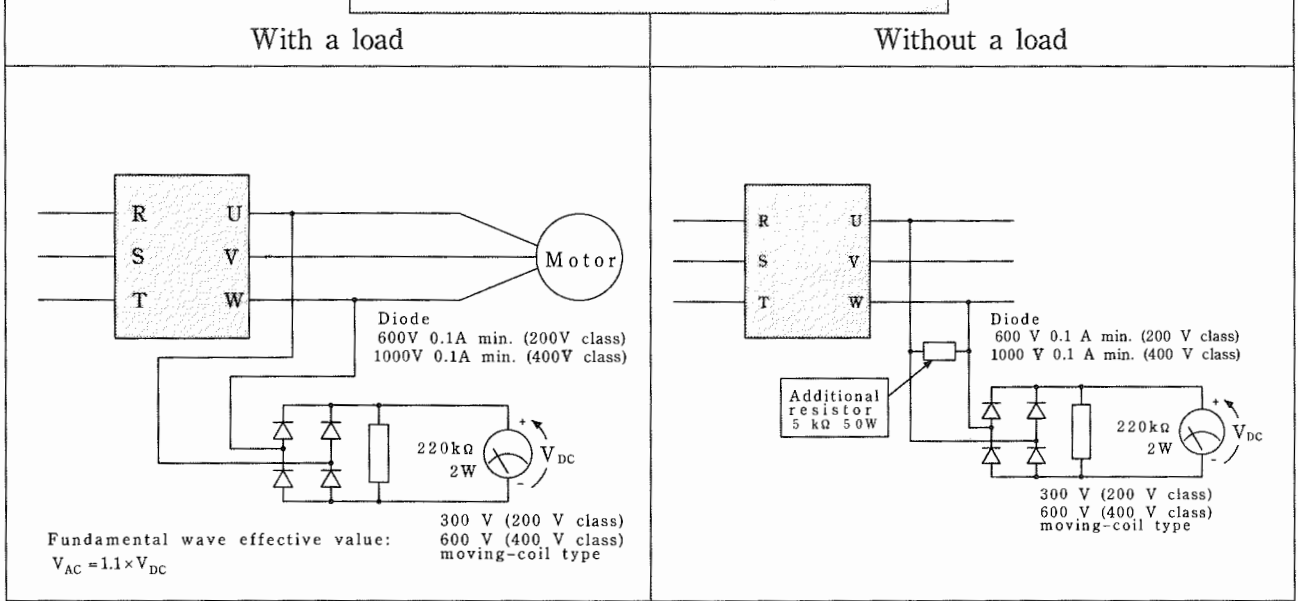
7.4 Check Method for Converter and Inverter Modules

Note : • Turn power off and check that the voltage between P and N is reduced to less than 15 VDC before starting operation.
  • Use a tester (set to 1 Ω range).

Circuit diagram	Outline view

P

L1
L2
L3

N

200 V class: 5.5 kVA max.   200 V class : 8 to 16 kVA
400 V class: 8 kVA max.   400 V class : 11 to 16 kVA
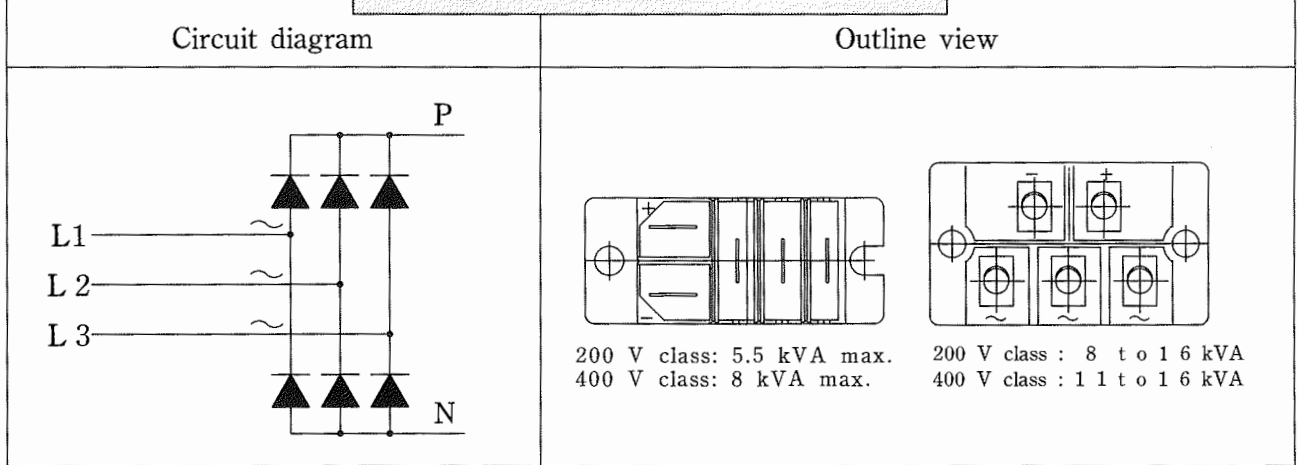
Tester terminals $- \rightarrow +$	Resistance
$\sim \rightarrow \sim$ 3 Ways (R–S, S–T, R–T or equivalent)	50 kΩ or more
P(+)→ each terminal	50 kΩ or more
Each terminal →P(+)	50 kΩ or less
N(−)→ each terminal	50 kΩ or less
Each terminal →N(−)	50 kΩ or more

Note : Check the converter module itself.

Inverter module unit
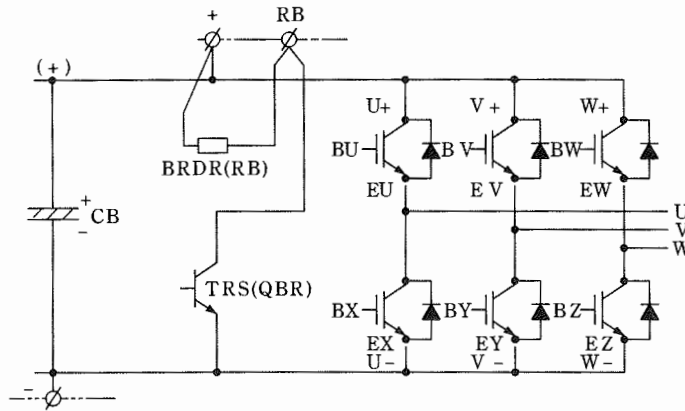
Outline of inverter module (PM)		**External view of braking transistor (TRS)**

Note : The inverter may be electrostatically damaged. Ground the human body beforehand.

(200 V class: 8 to 16 kVA)
(400 V class: 2.5 to 5.5 kVA)

(200V class : 1.5 to 2.5kVA.)
(200V class : 3.5kVA)
(400V class : 2.5 to 3.5kVA)
(200V class : 5.5 to 16kVA)
(400V class : 5.5 to 11kVA)

(400 V class: 8 to 75 kVA)
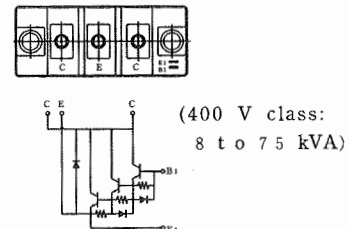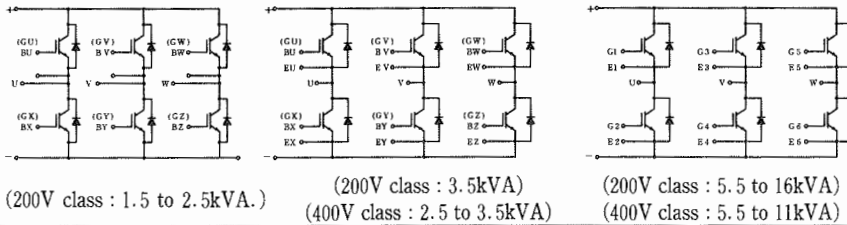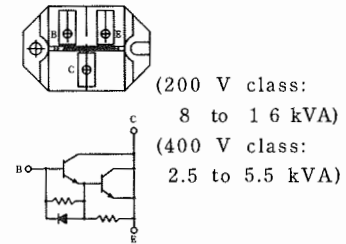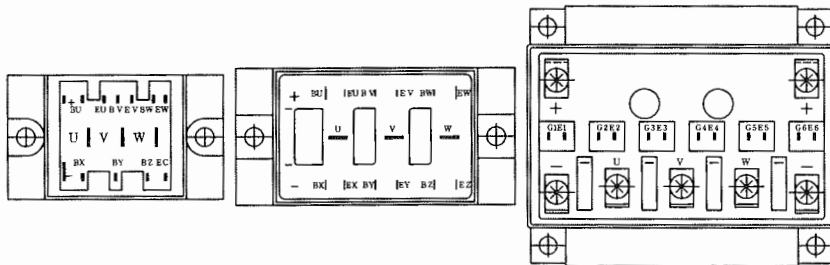
Assembled inverter unit			Disassembled inverter unit		
Tester terminal color Black — Red	Resistance	Part to be checked	Tester terminal color Black — Red	Resistance	Part to be checked
P — U		U phase upper arm	B U — U +		U phase upper arm
P — V	50 kΩ or more	V phase upper arm	B V — V +	50 kΩ or more	V phase upper arm
P — W		W phase upper arm	B W — W +		W phase upper arm
N — U		U phase lower arm	B X — U		U phase lower arm
N — V	50 Ω or less	V phase lower arm	B Y — W	50 kΩ or more	V phase lower arm
N — W		W phase lower arm	B Z — W		W phase lower arm
U — P		U phase upper arm	U — B U		U phase upper arm
V — P	50 Ω or less	V phese upper arm	V — B V	50kΩ or more	V phase upper arm
W — P		W phase upper arm	W — B W		W phase upper arm
U — N		U phase lower arm	U — — B X		U phase lower arm
V — N	50 kΩ or more	V phase lower arm	V — — B Y	50 kΩ or more	V phase lower arm
W — N		W phase lower arm	W — — B Z		W phase lower arm
N — R B	50 Ω or less	Braking transistor (TRS) Note : 1.5 to 5.5LB2 · LF2 : On the PC board			
R B — N	50 kΩ or more				

When the inverter causes an error, check the cause and take appropriate action by referring to the table below before restarting operation. When no cause is found, its parts are demaged, or problems occur, please contact your distributor.
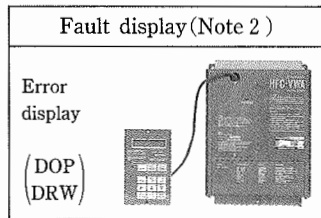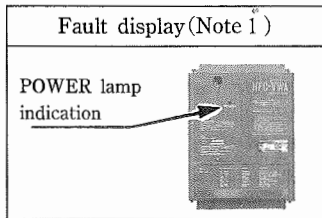
Fault display (Note 1)	Fault display (Note 2)		Reset method
POWER lamp indication	Error display (DOP DRW)	A	Operate the breaker or the electromagnetic contactor.
		B	Short – circuit between the PC board terminals RS and L.

8.1 Cause and Action to be Taken

Symptom				Fault cause	Reset method	Check points	Countermeasures
MCB operation	Mg operation	(Note 2) Error display (?ERROR ////)	Alarm relay				
✔	—	—	—	Error between the power MCB and inverter output terminal	A	• Is the power source short--circuited? • Is the MCB capacity correct? • Is the inverter or power source grounded?	• Repair the short–circited part. • Increae the MCB capacity. • Repair the grounded part.
						Is the converter module damaged?	Replace or repair the converter module.
						Is the magnet switch of the inverter normal?	Replace or repair the magnet switch.
						Is the rush current control resistor of the inverter normal?	Replace or repair the rush current control resistor.
✔		OC Accel OC Decel OC Drive GND Flt	—		A	• Is the inverter module damaged? • Is the motor or cable grounded?	• Repair or repair the motor. • Repair the grounded part.
	✔	—	—	Power failure	A	• power failure?	• Repair the power source.
						• Is the contact of the MCB or Mg defective?	Replace the MCB or Mg.
		Under. V	✔	Voltage error (undervoltage)	A	Is the direct motor or large capacity motor of the same power system in operation?	Check the power supply capacity.
						Is the contact of the MCB or Mg defective?	Replace the MCB or Mg.
		Inst. P−F	✔	Power supply error (instantaneous power failure)	A	• Is the contact of the MCB or Mg defective? • Is power turned on when the inverter displays POWER OFF after the power is turned off?	• Replace the MCB or Mg. • Turn power on after the inverter display is erased. • When the load is low, the POWER OFF display time is increased.

Note 1 : POWER lamp on front cover indicates fault display.

Note 2 : When an optional remote operator or copy unit is connected, the error contents are displayed.

Symptom				Fault cause	Reset method	Check points	Countermeasures
MCB operation	Mg operation	(Note 2) Error display (?ERROR ▨)	Alarm relay				
		Over V.	✔	Overvoltage of DC smoothing circuit	B	• Is the supply voltage 264 V (200V class) 506 V (400V class) or more? • Is the phase advance capacitor turned on or off? • Is the operation speed suddenly decelerated?	• Decrease the supply voltage. • Do not turn the phase advance capacitor on or off. • Insert a AC reactor on the input side. • Increase the deceleration time. • Set the time suited to the load inertia. • Check the regenerative braking use rate once again.
		CT	✔	CT error	B	• Is the CT normal?	• Replace the CT.
		USP	✔	USP error	B	• Is power turned on after the USP is selected? • Is the operation command issued when an error occurs in the power source?	• Select the USP after power is turned on. • Check the power supply capacity.
		OC. Accel	✔	Overcurrent during motor acceleration	B	• Is the motor suddenly accelerated? • Is there an output short-circuit or ground fault? • Is the start or jogging frequency high? • Is the torque boost high? • Is the motor restrained?	• Increase the acceleration time. • Repair the short-circuited or grounded part. • Decrease the start or jogging frequency. • Decrease the torque boost. • Release the restraint of the motor.
		OC. Decel	✔	Overcurrent during motor deceleration	B	• Is the motor suddenly decelerated? • Is there an output short-circuit or ground fault?	• Increase the deceleration time. • Set the time suited to the load inertia. • Repair the short-circuited or grounded part.
		OC. Drive	✔	Overcurrent during constant speed operation of motor	B	• Is the load suddenly changed? • Is there an output shourt-circuit or ground fault?	• Replace or repair the motor. • Repair the grounded part.
		Over. L	✔	Inverter overload	B	• Is the load heavy? • Is the electronic thermal level correct?	• Decrease the load. • Increase the appropriate motor level. (Note 1)
		Over. C	✔	Overcurrent immediately after the power is turned on.	B	Is the current sensor or the PC board circuit normal?	Check the current sensor or the PC board detection circuit.
		OH. Fin	✔	High temperature rise • Power element cooling fan • Regenerative braking discharge resistor • Rush current limitation resistor	B	• Is the cooling fan running? • Is the inverter air suction or exhaust part closed? • Is the ambient temperature high? • Is the set regenerative braking use rate correct? • Is the electromagnetic contactor of the inverter normal?	• Replace the cooling fan. • Keep the suction or exhaust part unclosed. • Decrease the ambient temperature. • Decrease the set value of BRD%ED. • Replace the electromagnetic contactor of the inverter.
		CPU	✔	(CPU error)	B	• Is a high noise source nearby? • Is the inverter normal?	• Keep the noise source away from the inverter. • Repair the inverter.
		NG. Op	✔	Incorrect insertion of optional PC board (When used)	B	• Is the optional PC board rdrrectly inserted? • Is the contact satisfactory?	• Insert the optional PC board once again. • Replace the optional PC board.
		Op. ERR	✔	Option error	B	• Malfunction or fault of the PC board	• Check for an error of the optional PC board.
		NG. JOG	✔	Jogging error	B	The commercial supply voltage is switched during jogging.	• Check for a malfunction.

MCB operation	Mg operation	(Note 2) Error display (?ERROR ▨)	Alarm relay	Fault cause	Reset method	Check points	Countermeasures
		UV WAIT	N.A.	Supply voltage error (undervoltage)	A	When the restart function is selected, the supply voltage is dropped up to the undervoltage level.	Repair the power source.
		OL.BRD	✔	The regenerative braking time exceeds the set value of BRD%ED.	B	The regenerative braking resistor which is built in the inverter is used as it is.	• Increase the deceleration time. • Increase the operation duty cycle. • Increase the set value of BRD%ED using an external option resister.
						The regenerative braking resistor is externally mounted.	• Use a separate type regenerative braking unit BRD-E.
		EEPROM	✔	Soft memory element (EEPROM) data error	—	• How many times is data written a day? • See 6.3(3). • Is the power source turned off during copy operation?	Replace or repair the part. The writing count of the soft memory element is limited to about 10000. (About 10 years at a rate of several times per day)
		RESTART ⌐‑‑‑¬ s Numeral	N.A.	This is not a fault. The unit counts the time of IPS–R–T down.	—	• This is not a fault.	—
		R–ERROR SYSTEM	N.A.	RAM error		RAM R/W unmatch error of the digital operation panel	Replace the digital opreration panel.
				ROM error		ROM sum check error of the digital operation panel	
				Microcomputer error		Microcomputer malfunction	
		R–ERROR COMM <*>	N.A.	Communication error *=1 : Prity framing overrun, BCC error, protocol error *=2 : Time out		• A communication error occurs between the digital operation panel and the inverter body. • See 9.3(2)(a). • Is the setting of switch on the back correct? • Is the connection cable broken? • Is a high noise source nearby?	• Press one of the keys on the digital operation panel. • When the key is pressed, the unit returns to the status just prior to the error occurrence. • Replace the cable. • Remove any electrical noise source be separating wires.
		R–ERROR INV RUN	N.A.	During inverter operation		A copy operation is performed during inverter operation.	• Press one of the keys on the digital operation panel.
		R–ERROR INV TRIP	✔	Inverter trip		A copy operation is performed in the inverter trip state.	• When the key is pressed, the unit returns to the status just prior to the error occurrence.
		R–ERROR INV TYPE	N.A.	Inverter type code unmatch		The inverter type code is not as specified when the copy operation is performed.	
		R–ERROR DATA ROM	N.A.	EEPROM sum check error		An EEPROM sum check error occurs during inverter transfer by the copy unit.	
		R–ERROR RD LOCK	N.A.	—		The copy unit reads data when the read lock is set.	
		R–ERROR COPY ROM	N.A.	—		An unmatch occurs in data comparison of the inverter body after the data is copied.	

Note 1 : See the overload protection of inverter and motor.

(3) Open Phase on the Input Side

This inverter is not provided with an open–phase protection unction on the input side.
In case of open–phase, the inverter enters the state indicated below.

(a) 1.5 to 2.5LB2 · LD2

• When little load is applied, the inverter is normally operated, though the ripple current of the main capacity is increased snd the life of the main capacity(CB)is extremely shortened.

• When a load is applied, the overcurrent protection function is performed. The resistor RS is overheated and the alarm OH.Fin function may be performed. The converter module(DM)is rarely damaged.

(b) 3.5LB2 · LD2 to 40LB2, 2.5 to 75HB2

Open phase	Model	Error
S or T	3.5 to 5.5LB2 · LF2 25 to 75HB2	Since the relay 84 is not turned on, the resistor RS is overheated, the alarm OH –Fin indicator comes on, and a power failure may be caused
R or S	8 to 40LB 2 8 to 16LF 2	
R	3.5 to 5.5LB2 · LF2 2.5 to 75HB2	Same as (a)
T	8 to 40LB 2 8 to 16LF 2	

(c) The control power supply circuit on the PC board may be damaged. (A circuit consisting of Ro and To)

The inverter is normally operated, though the alarm hold circuit is not operated.

(4) Converter Module Damage

• The unbalance factor of supply voltage is 3% or more.

• The power supply capacity is 10 times or more of the inverter capacity and 500kVA or more.

• The supply voltage is suddenly changed.

Example :

• A plurality of inverters are connected with short bus conductors.

• The phase advance capacitor is turned on or off.

In the above cases, it is recommended to insert a reactor of about 3% (a voltage drop at the rated current) of the supply voltage on the power supply side.

8.3 Troubleshooting

□ The motor does not run.

The Terminal mode is selected before delivery for the inverter without remote operator

The Terminal mode is selected.

The motor dese not run.

POWER lamp ON? — No → Check the no-fuse circuit breaker, electromagnetic contactor, or power unit for an error.

POWER lamp ON? — Yes → Rated voltage supplied to power supply terminals R,S and T — No → Check the no-fuse circuit breaker, electromagnetic contactor, or power unit for an error.

Rated voltage supplied to power supply terminals R,S and T — Yes → Trip display?

Trip display? — Yes → Cause found?

Cause found? — Yes → Take action

Cause found? — No → Mount the digital operation panel (remote operation). Note 1 → Take action accoding to the trip display contents.

Trip display? — No

No digital operation panel is mounted.

The digital operation panel (remote operation) is mounted.

Turn power OFF.

Mount the digital operation panel (remote operator).

Turn power ON.

Digital operation panel in monitor mode — No → Select the monitor mode.

Digital operation panel in monitor mode — Yes → Monitor mode display Fs000.0, F000.0Hz ?

Monitor mode display Fs000.0, F000.0Hz ? — No

Monitor mode display Fs000.0, F000.0Hz ? — Yes

Remote mode is selected before delivery for the inverter without remote operator.Turn to Terminal mode

[STOP] key pressd? — Yes → Stop the operation command from the terminal, and enter the operation command once again

[STOP] key pressd? — No

Input FRS or RS command left unprocessed? — Yes → Release the FRS or RS command.

Input FRS or RS command left unprocessed? — No

Operation command entered? — No → Enter the operation command

Operation command entered? — Yes

Select the monitor mode.

Use the variable resistor for operation.

About +10 VDC is applied between terminals H and L? — No → The inverter is damaged.
Yes ↓

Frequency command enterd? (A voltage is applied between O and L.) — No → Enter the frequency command.
Yes ↓

Voltage applied to inverter terminals U, V, and W? — No → The inverter is damaged.
Yes ↓

Voltage applied to motor terminals U, V and W? — No → check the wiring between the inverter and motor.
Yes ↓

U, V, and W inter-phase voltage balanced? (Inter-phase voltage 2% max.) — No → The inverter is damaged.
Yes ↓

Load torque high? — Yes → ·Turn the power off, and increase the V/F of the inverter. ·Decrease the load torque. (Disconnect the load for checking.) ·Increase the capacities of the inverter and motor.
No ↓

The motor is damaged.

Note 1: Before installing or removing the digital operation panel, turn the inverter off except for a trip.

— 4 4 —

□ The inverter does not operate.

Phenmena	Check points	Countermeasures
The inverter does not operate.	Is the ⌈停止 STOP⌉ key on the digital operation panel pressed in the Terminal mode?	Stop the operation command from the "Terminal", and then enter the operation command once again. (Or, specify "Validity" or "Invalidity" by selecting SWITCH 2.)
	Is the DB command entered to the optional PC board (A–OP–PCB)?	Release the DB command, and then enter the operation command.
	Is the FRS command entered?	Release the FRS command, and then enter the operation command.
	Is the frequency set to 0?	Set the frequency to the desired one.
	Does the digital operation panel display the function mode?	Press the ⌈モニタ MON⌉ key to select the monitor mode.
	Is the inverter tripped?	Reset the inverter.
	Is the speed command entered between O and L or OI and L when the frequency commanding method (F–SET–M) is "Terminal"?	Check the speed command circuit once again.
	Is a command entered to the multistage speed input terminals CF 1 and CF 2, or are Speed 1 to Speed 3 set to 0 Hz?	Set Speed 1 ～Speed 3 to the desired frequency, or release the command to CF 1 and CF 2.
	Is the RS command entered?	Release the RS command.
	Is a command externally entered with the internal command (Remote) mode selected, or is a command entered from the digital operation panel with the external command (Terminal) selected?	Check the operation mode. (Enter the operation command in the preset mode.)
	• Are the ⌈正転運転 FWD RUN⌉ and ⌈逆転運転 REV RUN⌉ keys simultaneously pressed in the internal command (Remote) mode? • Are the FW and RV terminals simultaneously turned on in the external command (Terminal) mode?	Be sure to allow the forward or reverse operation to be performed.
	• Is the set frequency less than the minimum frequency?	Set the frequency to more than the minimum frequency.
	Is the operation command, which is not accepted in the forward or reverse command mode, entered in such a mode?	Check the operation mode. ☞ See F–28⑤
The jogging operation is not performed. When the expansion multistage speed mode is selected, the jogging operation is not performed but the multistage speed operation is done. The set value is max. 9.9 Hz.	• Is the frequency set? • Are the multistage speed terminals CF 1 and CF 2 turned on?	• Set the frequency to 0. • Do not turn CF 1 and CF 2 ON.
	• Is the relationship between the jogging frequency setting (Fj) and the minimum frequency setting (Fmin) that Fj ＜ Fmin?	Set the relationship to Fj ≧ Fmin
The motor does not run smoothly and the number of revolutions does not increase.	• Motor capacity⌐___⌐ kw and number of pole⌐___⌐ P are set correctly? • Is the motor current pulsated? • Is the motor no–load current pulsated and increased?	• Set the correct data to the motor. See F–00 • Remove the cause of the load torque pulsation. • Decrease the carrier frequency of the inverter. ☞ See F–41.

□ When the rotational speed of the motor is high, check the number of poles of the motor and the set frequency.

This chapter explains how to operate the inverter using an optional digital operation panel (copy unit). A remote operator (DOP) and a copy unit (DRW) can be used for inverter operation. This operation panel can be incorporated into inverter body or installed separately.

9.1 Name of Each Unit of the Digital Operation Panel and Description

(Example of copy unit(DRW))

Digital display area
(16-digit liquid crystal display(LCD))

LED
This indicator comes on when the copy unit is correctly connected to the inverter

Mode selection

Data setting and change

Operation-stop command

COPY UNIT

HITACHI

CONNECT THE CABLE WITH INVERTER AFTER TURNING OFF THE INPUT POWER of INVERTER

DEPRESS KEYS FOR LONGER THAN TIME PUSHING TIME of INVERTER KEYS

リモート REMT	読出し READ	コピー COPY
モニタ MON	機能 FUN	記憶 STR
▶	▲	▼
正転運転 FWD RUN	逆転運転 REV RUN	停止 STOP

└ COPY ┘

READ key
The READ Key reads data of the inverter body into the copy unit and stores it in the memory element of the copy unit. Even if the read data is changed by pressing another key, the data of the inverter body is changed though that of the copy unit is not changed. To copy the changed data into another inverter, press the READ key once again and then the COPY key.

COPY key
When copying data, which is read by pressing the READ key, into another inverter, press the COPY key.

Copy unit

Classification	Key	Key name	Description
Mode selection	モニタ MON	Monitor	This key selects the monitor mode.
	機能 FUN	Function	This key selects the function mode. Function 1 mode : This mode selects the function name, and sets or changes data. Function 2 mode : This mode sets or changes data. Function 3 mode : This mode sets or changes data.
	記憶 STR	Storage	This key stores the data which is set by the function mode.
Data setting, change	▶	Cursor movement	This key moves the cursor to the position of the data to be set or changed.
	▲	UP	This key sets or change data. • Numeric(0 , 1 , 2 , ···, 8 , 9) : The ▲ key increments 1 and the ▼ key decrements 1. When 9 is increased to 0 , a carry occurs. • Character: The ▲ key selects the next character (for example, from A to B) and the ▼ key selects the previous character (for example, from B to A). • Code : The ▲ key selects the next code (for example, from Remote to Terminal) and the ▼ key selects the previous code (for example, from Terminal to Remote). • Mode : The ▲ key selects the next mode (for example, from F-00 CONTROL to F-01 ACCEL-1) and the ▼ key selects the previous code (for example, from F-01 ACCEL-1 to F-00 CONTROL). (Holding one key pressed changes data continuously.)
	▼	DOWN	
Operation Stop	正転運転 FWD RUN	Forward operation	This key directs forward operation.
	逆転運転 REV RUN	Reverse operation	This key directs reverse operation.
	停止 STOP	Stop	This key stops operation.

9.2 Return to Initial Settings (Status Before Delivery)

This section explains how to restore the initial setting.

Operation procedure	Description
Power ON	When power is turned on, the display before power is turned off appears. `F S  0 0 0 . 0          0 0 0 . 0 H z`
DIP switch selection	Set the second DIP switch (from the right end) of the PC board to ON. ☞ See Figure 16

Function mode switch selection 3 selection	Press the FUN key once, the ▲ key 24 times, and the FUN key once.
	
	 `S W I T C H   3      S L C T   S P D`
	
	 Move the cursor to the S position by the ▶ key, and press the ▲ key three times.
	
	 `S W I T C H   3      S T D T   R S T`
	 Cursor movement

Standard value selection	Move the cursor to the R position by the ▶ key, and press the ▲ key. `S W I T C H   3  *  S T D T   S E T` Cursor movement Press the STR key to store the standard value.
Reset command	Reset the RS terninal. (Close the switch.) Closed 0.1 sec min.
Release the DIP switch selection.	Set the second DIP switch to OFF. Set this DIP switch to OFF. Note : When the second switch(soft lock)from the left end of the DIP switch is set to the ON position(see page 93), the initial setting can not be restored.
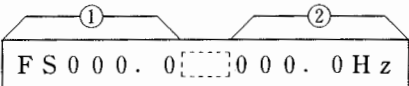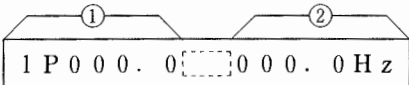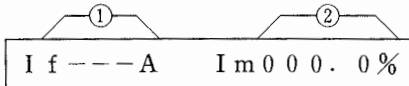
Note: In initial setting the inverter with remot operator, frequency setting and operation command change from Remote(Remote operator side)to Terminal(terminal side)

9.3 Monitor Mode

(1) Monitor Mode List

The monitor mode initial display contents, standard set values, and change range are as follows :

✔ : The set values can be changed when the inverter is in operation.

N.A. : No set value can be changed during operation.

— : Only display

Se-quence	Monitor name	Initial display contents	Standard set value	Changes	Data setting, changes	Remarks
1	Frequency setting, output frequency	① ② FS000. 0[___]000. 0Hz	000.0	000.0– 375.0	✔	• ① designates a set value. • ② designates an output value. • [___] is displayed when the operation command is turned on. F : Forward R : Reverse • The multistage speed is displayed when the terminal is turned on. • When the multistage speed is selected, the jogging is one of the multistage speed, and the inverter starts or stops soft.
	Multistage speed setting, output frequency	1S000. 0[___]000. 0Hz				
		2S000. 0[___]000. 0Hz				
		3S000. 0[___]000. 0Hz				
	Expansion multistage	4S000. 0[___]000. 0Hz				
		5S000. 0[___]000. 0Hz				
		6S000. 0[___]000. 0Hz				
	Jogging frequency setting, output frequency	JG001. 0[___]000. 0Hz	1.0	0.0, 0.5– 9.9		
	Process stepping setting, output frequency	① ② 1P000. 0[___]000. 0Hz	000.0	000.0– 375.0	N.A.	• ① designates a set value. • ② designates an output value. • [___] is displayed when the operation command is turned on. F : Forward R : Reverse • The process stepping is displayed when the terminal is turned on. • The set frequency can be changed.
	Process stepping, output frequency	2P000. 0[___]000. 0Hz				
		3P000. 0[___]000. 0Hz				
		0P000. 0 000. 0Hz				
2	Frequency commanding method	F－SET－M Terminal	Terminal	Remote, Terminal or Option－b	N.A.	Remote : A command from the remote operator Terminal : Inverter terminal command Option－b : A command from the A－SC－OCB
3	Operation commanding method	F／R－SW Terminal	Terminal Note 1	Remote, Terminal or Option－b	N.A.	
4	Motor rotational speed displsy	RPM 4P 00000RPM	4	2–48	✔	The periodic speed is displayed.
5	Frequency converted value display	／Hz00. 0 00000. 00	00.0	00.0– 99.9	✔	Optional values per Hz are displayed.
6	Output current display	① ② If－－－A Im000. 0%	—	3.0–260	✔	① designates the rated current of the inverter and ② designates the output current.

The monitor mode initial display contents,

standard set values, and change range are as follows :

✔ : The set values can be changed when the inverter is in operation.

N.A. : No set value can be changed during operation.

-- : Only display

Sequence	Monitor name	Initial display contents		Standard set value	Changes	Data setting, changes	Remarks
7	Manual torque boost adjustment	CONTROL VF	V- Boost Code<031>	031	000–099	✔	
		CONTROL SLV 1 or CONTROL SLV 2	V- Boost Code<110>	110	000–150	✔	
8	Output voltage gain adjustment	V－Gain 100％		100	100–50	✔	
9	Jogging frequency setting	Jogging 01.0Hz		1.0	0.0, 0.5–9.9	✔	
10	Set parameter check	CHECK + CHECK － OK		—	—	—	OK designates that the parameters are not contradictory to each other. When the parameters are contradictory to each other, the parameter contents are displayed.
11	Forced rewriting of set parameters	FORCE SET + ? WARN **–**		—	—	—	This mode is valid when the parameters are contradictory to each other. The contents of a parameter farcibly rewritten are displayed.
12	Terminal monitor	TERMINL 00000000 FW RV JG CF 1 CF 2 FRS 2 CH USP		—	—	—	1 is displayed when a terminal input signal is low or 0 is displayed when it is high.
13	Fault display	＃ ? ERROR Over V.		—	—	—	# designates the normal operation. When a fault occures, the fault contents are displayed in a priority base.
14	Fault trace display	? ERR COUNT 000		—	—	—	The contents of the last three faults including the current one are displayed. (Current and frequency when the fault occurs)

Note 1 : The inverter with remote operator (LD2, LF2) is Remote mode.

(2) Monitor Mode Operation

(a) Before using the remote operator(DOP)and copy unit(DRW)

When the HFC–VWA inverter is used, change the switches on the back as follows:

1: ON→OFF, 2: OFF→ON.

Unless the switches are changed, no operation can be performed.

Before changing	After changing

DOP or DRW
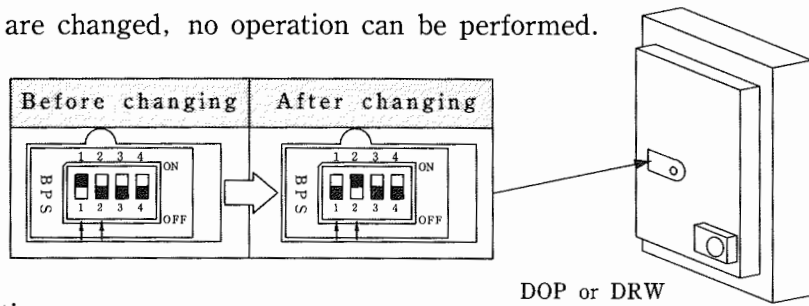
(b) Monitor mode operation

When the inverter is turned on, the monitor mode ` F S 0 0 0. 0 ......... ` is displayed.

When the following is displayed when power is turned off before turning it on, the display appears once again.

- Frequency setting, multistage speed setting, and jogging frequency
- Motor speed, frequency converted value, and output current
- Jogging frequency setting
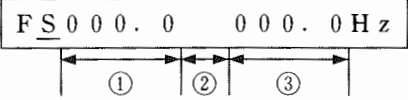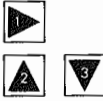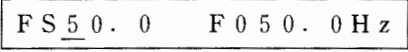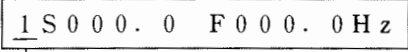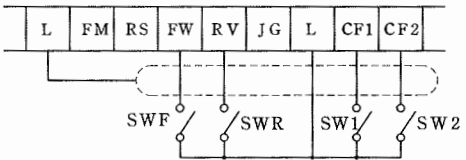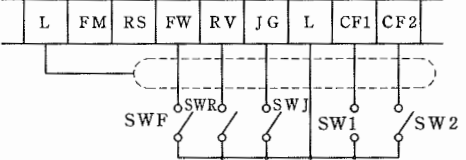
Monitor mode screen scrolling method and cursor moving method
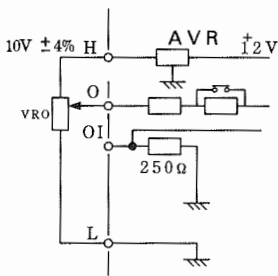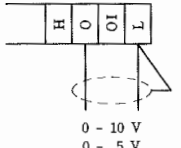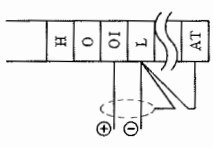
Note : When the dip switch is ON(soft lock), the cursor will not be moved.
(For details on soft lock, see page 93.)

Scrolling of monitor mode screen			Cursor movement		
Key operation		Display	Key operation	Display	The cursor moves in one direction, from left to right.
Advance to next mode	Return to Previous mode				
モニタ MON		F S 0 0 0. 0　　0 0 0. 0 H z	▶	F S 0 0 0. 0　　0 0 0. 0 H z ← Cursor	
モニタ MON ▲2	▼3	F－S E T－M　T e r m i n a l	▶	F S 0 0 0. 0　　0 0 0. 0 H z ← Cursor	
		F／R－S W　T e r m i n a l	▶	F S 0 0 0. 0　　0 0 0. 0 H z	
モニタ MON ▲2	▼3	. . . . . .	▶	F S 0 0 0. 0　　0 0 0. 0 H z	
		＃1, 2, 3,	▶	F S 0 0 0. 0　　0 0 0. 0 H z	
モニタ MON ▲2	▼3	F S 0 0 0. 0　　0 0 0. 0 H z (The initial display appears after a round.)	▶	F S 0 0 0. 0　　0 0 0. 0 H z	

Note : No operation command is issued.

Key operation		Display
▶		F S 0 0 0. 0 [ ] 0 0 0. 0 H z
▶		F S 0 0 0. 0 [ ] 0 0 0. 0 H z
Increase	**Decrease**	
▲ ↓	▼ ↑	F S 0 1 0. 0 [ ] 0 0 0. 0 H z
▲ ↓	▼ ↑	F S 0 2 0. 0 0 0 0. 0 H z
▲ ⋮	▼ ↑	F S 0 3 0. 0 0 0 0. 0 H z
⋮	⋮	⋮
↓		F S 0 8 0. 0 0 0 0. 0 H z
▲	▼	F S 0 9 0. 0 0 0 0. 0 H z

Example that the digital operation panel is changed to the terminal for frequency setting and then the terminal is changed to the operation panel

Key operation	Display
▲ ▼ ↓ ↑ ▲ ▼	F－S E T－M R e m o t e
	F－S E T－M T e r m i n a l

Note : When the operation command is issued, F or R is displayed in the ① area, and the output frequency is displayed in the ② area.

(c) In the monitor mode, the [記憶 STR] key is not required to be pressed after data is set or changed. When the inverter is tripped, however, no data can be set or changed. Reset the inverter beforehand.

With connected Ro and To only, and when setting and changing data, see 6. 3 (3)

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
1	Frequency setting command, Output frequency display	Mode selection モニタ MON ▲ ▼	Initial display `F S 0 0 0 . 0      0 0 0 . 0 H z` ① ② ③	• Frequency setting when the Remote mode is selected end frequency monitor •When the Remote mode is not selected, `F S . . . . . . . . . .` cannot be set.(When the Terminal mode is selected, the display appears.) The frequency is set in the ① area. When the operation command is entered, the out-put frequency is increased to the preset fre-quency. To increase or decrease the frequen-cy during operation, change the frequency in the ① area. F is dispalyed in the ② area when the forward operation is selected or R is displayed when the reverse operation is selected. The output frequency is displayed in the ③.
		Data setting ▶ ▲ ▼ Operation command 正転運転 FWD RUN	`F S 5 0 . 0    F 0 5 0 . 0 H z`	
			Multistage speed set (Initial display 0) `1 S 0 0 0 . 0  F 0 0 0 . 0 H z` No 1 st stage: 1 ─ expansion mul- 2 nd stage: 2 │ tistage speed is 3 rd stage: 3 ─ selected. 4 th stage: 4 ─ The mul- 5 th stage: 5 │ tistage speed 6 th stage: 6 │ is selected. 7 th stage: JG ─ 8 th stage: FS Notes: 1 . When SW 1 and SW 2 or SWJ is turned on in the monitor mode, the multistage speed displayed above is available. 2 . Values, which are set in the moni-tor mode, can be changed when the inverter is in operation. 3 . Values can also be set in the func-tion mode. When the monitor mode is selected after setting, the set values are displayed.	• Multistage speed | L	FM	RS	FW	RV	JG	L	CF1	CF2 | SWF SWR SW1 SW2 |	SW 1	SW 2	—: OFF
1 st stage	ON	—
2 nd stage	—	ON
3 rd stage	ON	ON | • Multistage speed | L	FM	RS	FW	RV	JG	L	CF1	CF2 | SWF SWR SWJ SW1 SW2 |	SW 1	SW 2	SWJ	—: OFF
1 st stage	ON	—	—
2 nd stage	—	ON	—
3 rd stage	ON	ON	—
4 th stage	ON	—	ON
5 th stage	—	ON	ON
6 th stage	ON	ON	ON
7 th stage	—	—	ON
8 th stage	—	—	—	 └─ Set by FS
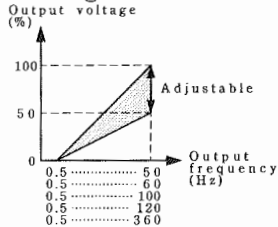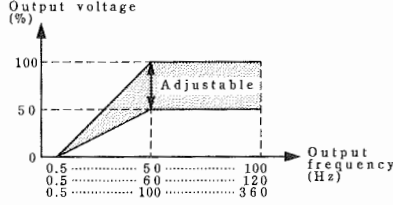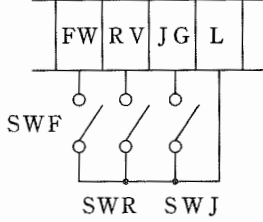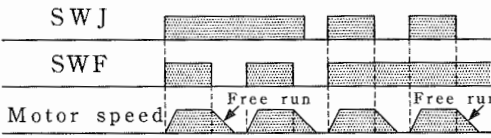
Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
			1 S　0 1 0 . 0　0 0 0 . 0 H z When setting the multistage speed beforehand, it is convenient to use the function mode. When data is set in the function mode and then changed in the monitor mode, the data, which is set in the function mode, is simultaneously changed.	Note 1:　Use SWITCH 2 for expansion multistage speed selection. 　　　　(See page 82) Note 2:　When the expansion multistage speed is selected, the jogging terminal(JG)command is a multistage speed function instead of a jogging function. For this reason, remember the following : • For acceleration, the inverter starts or stops soft. • The set value ranges from 0.5 to 9.9 Hz. • The initial value is 1 Hz. • A frequency jump cannot be set. See the section of multistage speed in the function mode(page 71).
2	Frequency cmmanding method	Mode selection モニタ MON ▲2 ▼3	Initial display F−S E T−M　T e r m i n a l Dip switch (At 0 to 10 VDC) (At 0 ot 5 VDC) The dip switch can be seen on the PC board when the terminal cover is removed.	Input signal Frequency setting command (O:Voltage input OI:Current input) VRO specification 　2 W 500Ω 　1 W 1KΩ, 2KΩ Set the frequency as specified below. (a)　By variable resistor connect a variable resistor VRO between H, O, and L on the PC board. Input impedance 30KΩ (b)　By an externally preset signal • Voltage setting input impedance 　0 to 10 V:30 KΩ 　0 to 5 V:15KΩ 0 - 10 V 0 - 5 V Note : Do not apply a voltage of 12 VDC or more between O and L. • Current setting Input impedance: 250Ω 4−20mA Note:Connect AT and L to make OI input valid.
		Data setting ▶1 ▲ ▼	F−S E T−M　R e m o t e F−S E T−M　O p t i o n−b	Select when the Remote(the digital operation unit)mode is used for frequency setting FS. Select when the A−SC−PCB(Option)is used for frequency setting FS.
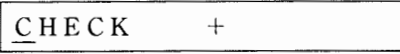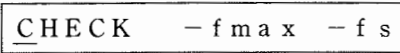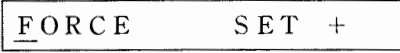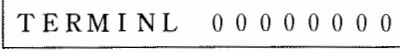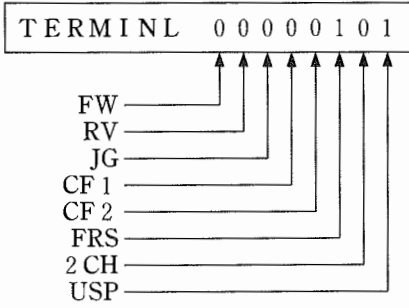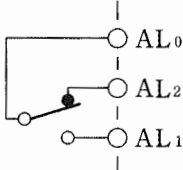
Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal

| 3 | Operation commanding method | Modo selection
モニタ / MON
▲2 ▼3 | Initial display (without remote operator)

$\underline{F}/R-SW \qquad Terminal$

Initial display (with remote operator)

$\underline{F}/R-SW \qquad Remote$ | Forward operation command (FW)

Reverse operation command (RV)

SWF OFF   ON   OFF

SWR   ON
Fmin (deceleration)
Forward
Frequency
Reverse
Adjustable (F stop–T) 0~15sec |

FW, RV, JG, CF 1, CF 2, RS
Level L≦0.3V I_L≒3.5mA
Level H≧2.4V
Minimum input pulse width ≧50 ms

Note: To stop the inverter, turn SWF(SWR) OFF or press the 停止/STOP key on the digital operation panel. When it is undersirable to stop the inverter by the 停止/STOP key on the digital operation panel, select "Valid" or "Invalid" by SWITCH 2 (see page 80). The standard setting is "Valid" or "STOP ON"; that is, the inverter stops. When stopping the inverter in the Remote mode and restarting it in the Terminal mode, turn SWF(SWR) off beforehand. Otherwise, the inverter cannot be restarted.

| | | Data setting
▶1
▲2 ▼3 | $F/R-SW \qquad \underline{R}emote$

$F/R-SW \qquad \underline{O}ption-b$ | Select when the operation command is issued from the digital operation panel.
Forward ⇨ 正転運転/FWD RUN Reverse ⇨ 逆転運転/REV RUN
Select when operation command is issued from the option board A–SC–PCB |

| 4 | Motor speed display | Mode selection
モニタ / MON
▲2 ▼3 | Initial display

$\underline{R}PM \quad 4P \qquad 00000rpm$
①   ② | When the number of poles of the motor is displayed in the ① area, the number of synchronization revolutions of the motor in operation is displayed in the ② area.

Motor pole count code |

| | | Data setting
▶1
▲2 ▼3 | $RPM \quad \underline{4}P \qquad 01500rpm$ | |

Display sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Number of poles	2	4	6	8	10	12	14	16	18	20	24	32	36	48

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
5	Frequency conversion display	Mode selection モニタ MON ▲² ▽³	Initial display ∠Hz00.0 00000.0 ① ②	Optional values per Hz are displayed in the ① area. The display area ② displayes the product of the output frequency and the value in the ① area. ② = ① × output frequency
		Data setting ▶¹ ▲² ▽³	∠Hz33.3 02000.0	
6	Output current display	Mode selection モニタ MON ▲² ▽³	Initial display If---A Im 000.0% ① ②	When the rated current is not displayed in the ① area, the rate of the rated current to the rated current of the inverter is displayed in the ② area in %. When the inverter rated current given in the table below is entered in the ① area, the effective value (A) of inverter output current is displayed in the ① area.
		Data setting ▶¹ ▲² ▽³	If5.0A Im 004.5A	
		—	If---A Im 090.0%	

Inverter rated current code

Display sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Inverter rated current	3.0	3.8	5.0	5.3	7.5	8.6	10.5	13.0	16.0	16.5	23	24	32	46

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
48	58	64	75	90	95	110	121	145	149	176	182	217	220	260

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
7	Manual torque boost adjustment	Mode selection モニタ MON △2 ▽3	Initial display (at CONTROL VF) V－Ｂｏｏｓｔ　Ｃｏｄｅ＜031＞	The output voltage at the time of start or in the low frequency band is increased for boost adjustment.
		Data setting ▷1 △2 ▽3	V－Ｂｏｏｓｔ　Ｃｏｄｅ＜099＞	(%) V 100 About 21 5 ⋯⋯ 25 ⋯⋯ 50 (Hz) 6 ⋯⋯ 30 ⋯⋯ 60 Output frequency 10 ⋯⋯ 50 ⋯⋯ 100 12 ⋯⋯ 60 ⋯⋯ 120 36 ⋯⋯ 180 ⋯⋯ 360 This is valid when the F–00 standard start torque VF is selected. (Since the boost value is increased, the current is increased and an OC trip is easily caused.)
		Mode selection モニタ MON △2 ▽3	Initial display (at CONTROL SLV 1 or SLV 2) V－Ｂｏｏｓｔ　Ｃｏｄｅ＜31＞	The output voltage at the time of start or in the low frequency band (below 5 Hz)is increased for boost adjustment.
		Data setting ▷1 △2 ▽3	V－Ｂｏｏｓｔ　Ｃｏｄｅ＜99＞	(%) V 100 About 10 5 ⋯⋯ 50 (Hz) 60 Output frequency 100 120 360 This is valid when the F–00 high start torque SLV 1 or SLV 2 is selected. Motor speed can be adjusted by changing the output voltage at low frequency(1 ∼ 3 Hz). (Since the boost value is decreased, the torque is decreased too.)

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
8	Output voltage gain adjustment	Mode selection モニタ MON ▲2 ▼3	Initial display V－G a i n 1 0 0 ％	The gain of the output voltage for the frequency is changed.
		Data setting ▶1 ▲2 ▼3	V－G a i n 5 0 ％	
9	Jogging frequency setting	Mode selection モニタ MON ▲2 ▼3	Initial display J o g g i n g 0 1 . 0 H z	• The jogging frequency is set. • Jogging is a direct operation, causing a trip. Set the frequency to less than 5 Hz. • When the switch is turned off, a free run will result. Jogging operation when the operation command is externally performed
		Data setting ▶1 ▲2 ▼3	J o g g i n g 0 5 . 0 H z	
				Note 1 : The jogging operation is not performed in the following cases: 1) The multistage speed is selected and JG is one of the speeds. 2) A frequency other than the jogging frequency is set. 3) The terminals CF 1 and CF 2 for multistage speed are turned on. 4) The preset minimum frequency (Fmin) is higher than the jogging frequency. 5) The process stepping mode is selected. Note 2 : The optional remote operator or copy unit is not available for jogging. (Jogging is not accepted and the normal operation is selected.)

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal
10	Set parameter check	Mode selection モニタ MON ▲2 ▼3	Initial display C H E C K +	• A contradiction between the parameters for setting the frequency is checked, and contradictory parameters are displayed. • For detailed errors, refer to Appendix Table 1.
		Data setting ▶1 記憶 STR	Normal C H E C K − O K Error C H E C K − f m a x − f s	• The display on the left indicates that fs > f max. Set the data once again so that f max does not exceed fs.
11	Preset parameter forced rewriting	Mode selection モニタ MON ▲2 ▼3	Initial display F O R C E S E T +	• A contradictory frequency parameter is forcibly rewritten so as to eliminate the contradiction. • For rewritten data, refer to Appendix Table 2.
		Data setting ▶1 記憶 STR	F O R C E S E T −	
12	Terminal monitor	Mode selection モニタ MON	Initial display T E R M I N L 0 0 0 0 0 0 0 0	• 1 is displayed when a terminal input signal is low or 0 is displayed when it is high. • The relationship between each terminal and the display is as follows: T E R M I N L 0 0 0 0 0 1 0 1 FW —— RV —— JG —— CF 1 —— CF 2 —— FRS —— 2 CH —— USP ——

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal

13	Fault display	Mode selection モニタ MON ▲ ▼	Initial display
			
			`#`
			
			Fault
			
			`? E R R O R    O v e r . V`
				• A symbol # designates the normal operation.
				• When the inverter fails, the fault display automatically appears in a priority basis.
				
				• For detailed display contents, see Table 4 on page 38.

When a fault occurs, a fault signal is outputted simultaneously with fault display.

Output circuit

○ AL0
○ AL2
○ AL1

Contact specification

Power supply	Operation status	AL_0–AL_1	AL_0–AL_2
ON	Normal	open	closed
ON	Abnormal	closed	open
OFF	—	open	closed

max.	min.
AC250V, 2.5A(load R)0.2A(cosϕ=0.4)	AC100V, 10mA
DC 30V, 3.0A(load R)0.7A(cosϕ=0.4)	DC 5 V, 100mA

Display sequence	Monitor name	Key operation	Display	Relationship between contents and I/O signal

14	Fault trace display	モニタ MON ▶ ▲2 ▲2 ▲2 ▼3 ▼3 ▶ ▲2 ▲2 ▲2 ▲2 ▶	`#`
			
			A fault occurs.
			
			`? E R R O R    O C .  A c c e l`
			`? E R R    C O U N T    0 0 1`
			`? E R R    C O U N T    0 0 1`
			`? E R 1    O C .  A c c e l`
			`? E R 2`
			`? E R 3`
			`? E R 1    O C .  A c c e l`
			`? E R 1    O C .  A c c e l`
			`? E R 1    F 0 1 0 . 0 H z`
			`? E R 1    I f  2 2 0 . 0 %`
			`? E R 1    O C .  A c c e l`
			`? E R R O R    O C .  A c c e l`
				• The contents of the last three faults including the current line are displayed.
				• When no fault occurs, # is dispalyed.
				
				Display contents
				
				• Fault contents
				• Current when the fault occurs: If(Note)
				• Frequency when the fault occurs:F
				
				Note : The current If at fault occurrence is a reference value. It may differ from the actual value.

9.4 Function Mode

(1) Function Mode List

The function 1 mode selects a function name.(No data can be set or changed in this mode).
The function 2 mode sets or changes data. The function 3 mode sets the F–OOV/f pattern and selects the F–10 multistage speed or process stepping mode.

The following table gives the initial display contents, standard settings, and change range.
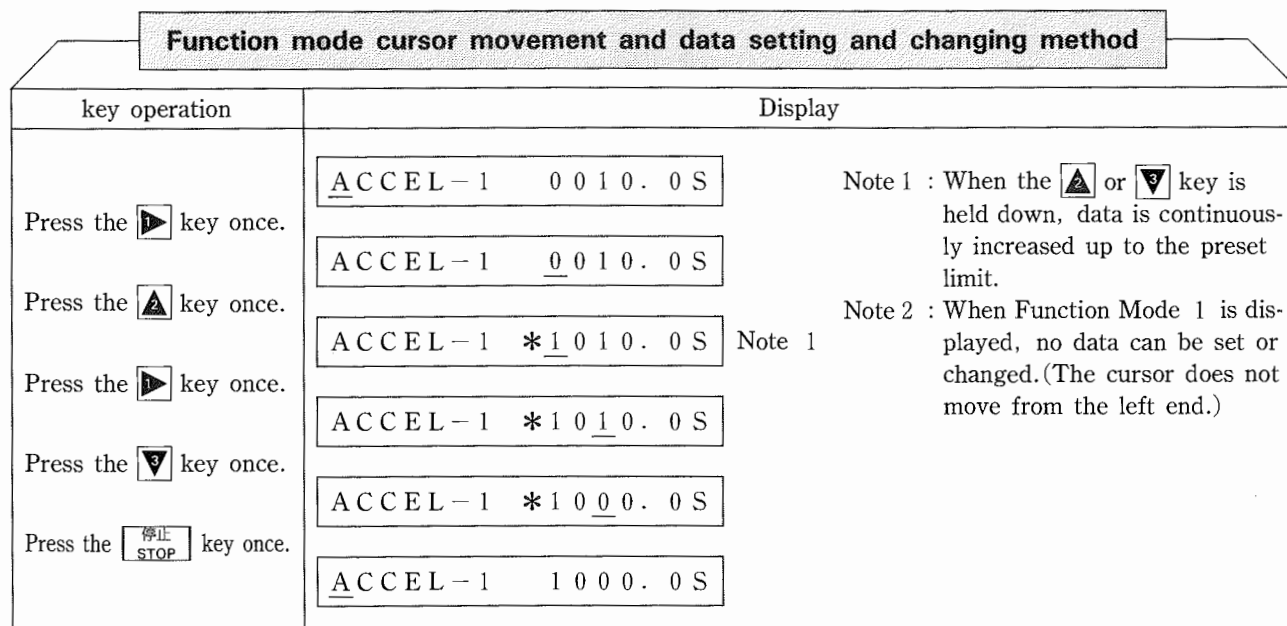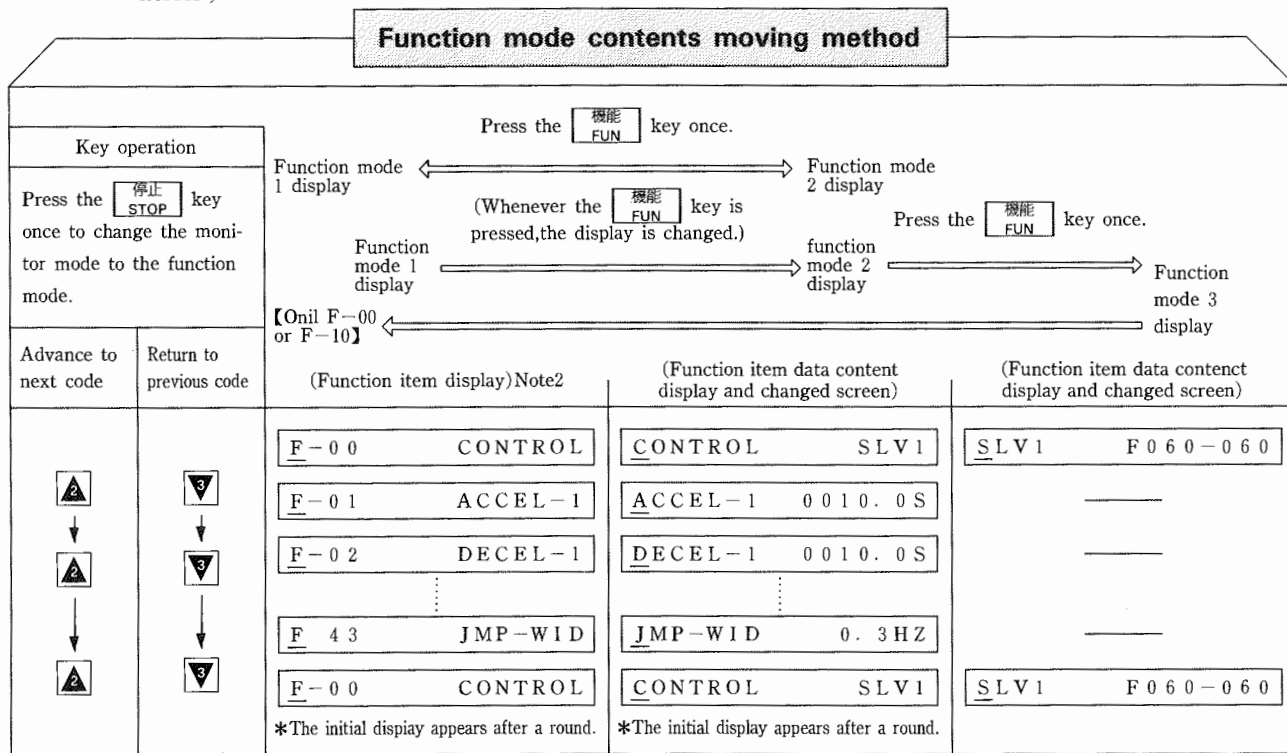
Display sequence	Function name	Function 1 mode	Display contens	Function 2 mode
1	V/f pattern setting	F – 0 0	CONTROL	CONTROL
2	Acceleration time setting	F – 0 1	ACCEL – 1	ACCEL – 1
3	Deceleration time setting	F – 0 2	DECEL – 1	DECEL – 1
4	Maximum frequency adjustment	F – 0 3	+Fmax.	+Fmax.
5	Start frequency adjustment	F – 0 4	Fmin.	Fmin.
6	Maximum frequency limiter setting	F – 0 5	H–LIM–F	H–LIM–F
7	Minimum frequency limiter setting	F – 0 6	L–LIM–F	L–LIM–F
8	Jump frequency 1 setting	F – 0 7	JUMP–F1	JUMP–F1
9	Jump frequency 2 setting	F – 0 8	JUMP–F2	JUMP–F2
10	Jump frequency 3 setting	F – 0 9	JUMP–F3	JUMP–F3
11	Multistage speed/process stepping selection	F – 1 0	SEL–S/P	SEL–S/P
12	Start frequency stop time adjustment	F – 1 1	Fstop–T	Fstop–T
13	2–stage acceleration time setting	F – 1 8	ACCEL – 2	ACCEL – 2
14	2–stage deceleration time setting	F – 1 9	DECEL – 2	DECE1 – 2
15	DC braking frequency adjustment	F – 2 0	F–DCB	F–DCB
16	DC braking power adjustment	F – 2 1	V–DCB	V–DCB
17	DC braking time adjustment	F – 2 2	T–DCB	T–DCB
18	Electronic thermal level adjustment	F – 2 3	E–therm	E–therm
19	Linear–curve acceleration selection	F – 2 4	ACCline	ACCline
20	Linear–curve deceleration selection	F – 2 5	DECline	DECline
21	External frequency setting start	F – 2 6	F–START	F–START
22	External frequency setting end	F – 2 7	F–END	F–END
23	Switch selection 1	F – 2 8	SWITCH1	SWITCH1
24	Switch selection 2	F – 2 9	SWITCH2	SWITCH2
25	Switch selection 3	F – 3 0	SWITCH3	SWITCH3
26	Overload warning level adjustment	F – 3 1	OLalarm	OLalarm
27	Overload limit constant	F – 3 2	LM. CONS	LM. CONS
28	Allowable instantaneous power failure time setting	F – 3 3	IPS–T	IPS–T
29	Restart standby time setting after instantaneous power failure recovery	F – 3 6	IPS–R–T	IPS–R–T
30	Regenerative braking use rate setting	F – 3 8	BRD–%ED	BRD–%ED
31	Speed arrival signal optional frequency setting	F – 3 9	SPD–ARV	SPD–ARV
32	Simple orientation	F – 4 0	ORIENT	ORIENT
33	Carrier frequency setting	F – 4 1	CARRIER	CARRIER
34	Parameter setting commanding method	F – 4 2	PARMSET	PARMSET
35	Jump frequency range setting	F – 4 3	JMP–WID	JMP–WID

Initial display contents	Standard setting	Setting, changing range	Remarks
S L V 1	SLV 1	VF, SLV 1, or SLV 2	Standard start torque (VF), high start torque (SLV 1, SLV 2)
0 0 1 0 . 0　S	10	0.1－2999.9(S)	
0 0 1 0 . 0　S	10	0.1－2999.9(S)	
0 0 0 . 0　H Z	0	0－15(Hz)	
0 0 0 . 5　H Z	0.5	0.5－5.0(Hz)	
0 0 0 . 0　H Z	0	0－375(Hz)	Valid for up to the maximum frequency of the select-
0 0 0 . 0　H Z	0	0－375(Hz)	ed V/f pattern
0 0 0 . 0　H Z	0	0－375(Hz)	Valid for up to the maximum frequency of the selected V/f pattern
0 0 0 . 0　H Z	0	0－375(Hz)	//
0 0 0 . 0　H Z	0	0－375(Hz)	//
S p e e d	Speed	Multistage speed or process stepping	Selection of multistage speed (Speed) or process stepping (Process)
0 0 0 . 0　S	0	0－15(S)	
0 0 1 0 . 0　S	10	0.1－2999.9(S)	
0 0 1 0 . 0　S	10	0.1－2999.9(S)	
0 0 0 . 5　H Z	0.5	0.5－375(Hz)	
0 0 0	0	000－020	
0 0 0 . 0　S	0	00－600(S)	
1 0 0 ％	100	100－20％	
L i n e a r	Linear	Linear, S-curve, or U-curve	
L i n e a r	Linear	Linear, S-curve, or U-curve	
0 0 0 . 0　H Z	0	0－375(Hz)	
0 0 0 . 0　H Z	0	0－375(Hz)	
D C B　O N	See the left		
D B　E D G	See the left		
S L C T　S P D	See the left	SPD or PRC	
1 0 0 ％	100	50－150(％)	Valid only when an optinal PC board is used.
1 2 5 ％ 0 1 . 0	125/01.0	50－150(％)/0.3－30	
0 0 1 . 0　S	1	0.3－3.0(S)	
0 0 0 1 . 0　S	1	0.3－100.0(S)	
0 1 . 5　％	1.5	0.1－31.0(％)	
1 0 0 ％	100	0－100(％)	
f c　0 . 5 H Z	0.5	0.5－9.9(Hz)	Valid only when an optional PC board is used
T w　0 . 0 1 S	0.01	0.01－9.99(S)	(A–OP–PCB).
1 6　k H z	16	8, 10, 12, 16kHz	Standard setting of 33～50kVA units is 12kHz and 60～75kVA depends upon model.
R e m o t e	See the left	Remote or Option－b	
0 . 3 H Z	See the left	0.3－9.9(Hz)	

(2) Function Mode Operation

(a) Set or change data in the function mode when the inverter is stopped. (No data can be set or changed when the inverter is in operation.) No data can be set or changed when the inverter is stopped in one of the states indicated below.

- The control circuit terminals RS and L on the PC board are short-circuited and the inverter is stopped.
- The inverter is tripped and stopped.

(b) After data is set or changed, be sure to press the [記憶 STR] key. (Otherwise, the data setting or changing operation is made invalid and the previous data is left unchanged.)

(c) In the function mode, the motor cannot be started running. Press the [モニタ MON] key to select the monitor mode beforehand. (The function mode cannot be referred to during operation.)

Function mode contents moving method

Key operation		(Function item display) Note2	(Function item data content display and changed screen)	(Function item data contenct display and changed screen)
Press the [停止 STOP] key once to change the monitor mode to the function mode.		Press the [機能 FUN] key once. Function mode 1 display ⟷ Function mode 2 display (Whenever the [機能 FUN] key is pressed, the display is changed.) Press the [機能 FUN] key once. Function mode 1 display ⟹ function mode 2 display ⟹ Function mode 3 display 【Onil F—00 or F—10】		
Advance to next code	Return to previous code			
[▲] ↓ [▲] ↓ [▲]	[▼] ↓ [▼] ↓ [▼]	F－0 0　　CONTROL F－0 1　　ACCEL－1 F－0 2　　DECEL－1 ⋮ F　4 3　　JMP－WID F－0 0　　CONTROL	CONTROL　　SLV1 ACCEL－1　0010. 0S DECEL－1　0010. 0S ⋮ JMP－WID　　0. 3HZ CONTROL　　SLV1	SLV1　　F060－060 —————— —————— —————— SLV1　　F060－060
		*The initial display appears after a round.	*The initial display appears after a round.	

Function mode cursor movement and data setting and changing method

key operation	Display	
Press the [▶] key once.	ACCEL－1　　0010. 0S	Note 1 : When the [▲] or [▼] key is held down, data is continuously increased up to the preset limit.
Press the [▲] key once.	ACCEL－1　　0010. 0S	
Press the [▶] key once.	ACCEL－1　＊1010. 0S　Note 1	Note 2 : When Function Mode 1 is displayed, no data can be set or changed. (The cursor does not move from the left end.)
Press the [▼] key once.	ACCEL－1　＊1010. 0S	
Press the [停止 STOP] key once.	ACCEL－1　＊1000. 0S	
	ACCEL－1　　1000. 0S	

(d) Setting and Changing Example

The frequency of the V/f pattern is changed from 60 Hz to 50 Hz.

Output voltage		Output voltage
100%	⟹	100%
50 Hz Output frequency		60 Hz Output frequency

Operation procedure	Key operation	Display	Description
1	機能 FUN	F－0 0 CONTROL	This key selects Fnction Mode 1 and the V/f pattern setting mode.
2	機能 FUN	CONTROL SLV1	This key selects Function Mode 2.
3	機能 FUN	SLV1 F 0 5 0－0 5 0	This key selects Function Mode 3.
4	▶	SLV1 F 0 5 0－0 5 0	Press the ▶ key to move the cursor to the position indicated on the left. Note 2
5	▲	SLV1 ＊F 0 5 0－0 6 0	Press the ▲ key once.
6	▶	SLV1 ＊F 0 5 0－0 6 0	Press the ▶ key thrice to move the cursor to the position indicated on the left.
7	▲	SLV1 ＊F 0 6 0－0 6 0	Press the ▲ key once to set 60 Hz.
8	記憶 STR	SLV1 F 0 6 0－0 6 0	This key stores the set data. When the data is stored, the ＊ mark is erased.

Note 1 : When a reset signal is entered before power is turned off, the set or changed data is not stored. When turning power off after data is set or changed, do not enter a reset signal simultaneously.

Note 2 : When setting F050–050 to F060–060, set F050–060 first and change it to F060–060.
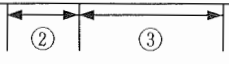
(e) Motor Capacity and Pole Count Operation Example

| Motor capacity | 3.7 kW | ➡ | 2.2 kW |
| Motor pole count | 4 P | | 2 P |

Operation procedure	Key operation	Display	Description
1	機能 FUN	F－0 0 CONTROL	This key selects Function Mode 1.
2	機能 FUN	CONTROL SLV 1	This key selects Function Mode 2.
3	機能 FUN	SLV 1 F 0 5 0－0 5 0	This key selects Function Mode 3.
4	▶1	SLV 1 F 0 5 0－0 5 0	Press the ▶ key once.
5	▲2	SLV 1 K 3. 7 0 k	Press the ▲ key once to display the motor capacity selection screen.
6	▶1	SLV 1 K 3. 7 0 k	Press the ▶ key once.
7	▼3	SLV 1 *K 2. 2 0 k	Press the ▼ key once to select 2.2 kW.
8	記憶 STR	SLV 1 K 2. 2 0 k	This key stores the set data.
9	▶1	SLV 1 K 2. 2 0 k	Press the ▶ key once.
10	▲2	SLV 1 P 4 p	Press the ▲ key once to display the motor pole count selection screen.
11	▶1	SLV 1 P 4 p	Press the ▶ key once.
12	▼3	SLV 1 *P 2 p	Press the ▼ key once to set 2 P.
13	記憶 STR	SLV 1 P 2 p	This key stores the set data.

(3) Function mode display, setting, and contents

Data in the cursor-positioned digit of the data setting column can be changed.

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal

1	(F—00)
	
	V/f Pattern setting
			Initial setting
			
			C O N T R O L ⎯SLV 1
			
			機能 FUN
			
			S L V 1 F 0 6 0 - 0 6 0
			             (＊1) (＊2)
			  ① ② ③
			
			Selection to SLV 2
			
			C O N T R O L SLV 1
			C O N T R O L SLV 2
			
			S L V 2 F 0 6 0 - 0 6 0
			            (＊1) (＊2)
			  ① ② ③
				High start torque selection
				① Selection of high start torque 1 and 2
				  SLV 1: Hitachi general-purpose motor
				  SLV 2: Exclusive motor
				② Selection of frequency, motor capacity, and motor pole count
				  F: Basic frequency and maximum frequency setting
				  K: Motor capacity selection
				③ Basic frequency and maximum frequency setting
				
				|		

＊1 Basic frequency	50–120	50–360
＊2 Maximum frequency	50–120	50–360	 Freely set (Note 2) (Note 3)

	Key operation	Display	Relationship to I/O signal

	Data setting	S L V 1 ⎯K 2．2 0 K
		        ② ③
			② Selection of motor capacity
			  K: Motor capacity selection
			③ Motor capacity display

Note1 : Set the motor capacity and pole count according to the motor to be used. When an unmatch occurs, satisfactory characteristics cannot be obtained.

Note2 : When a plurality of motors are to be used, high start torque cannot be used. Select the standard torque beforhand. CONTROL VF

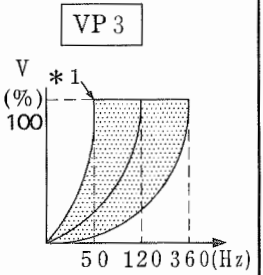| Display	0.40K	0.75K	1.50K	2.20K	3.70K	5.50K	7.5K ～75K
Capacity	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW ～75kW
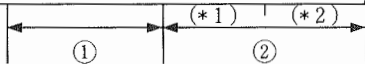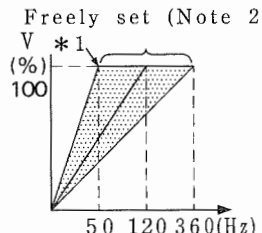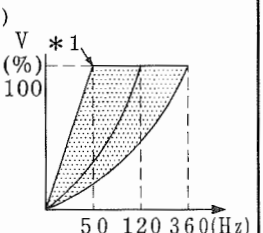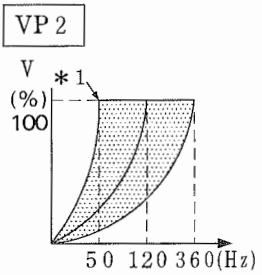
The most suitable motor is set as standard setting for each inverter.

Example)

inverter	motor capacity	standard setting
3.5SBE	2.2kW	2.20K
5.5 HBE/HFE	4.0kW	4.00K

S L V 1   ⎯P   4 p
    ②   ③

② Selection of motor pole count
  P: Selection of motor pole count
③ Motor pole count display
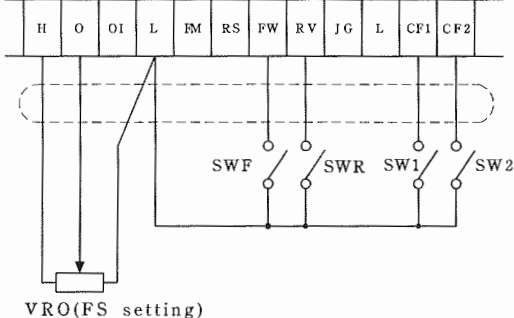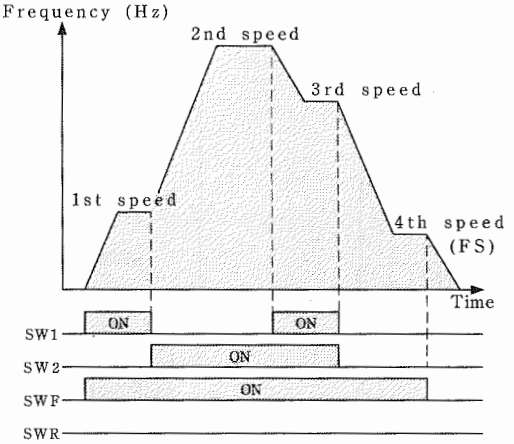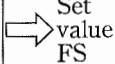
Display	2 P	4 P	6 P	8 P
Capacity	2 poles	4 poles	6 poles	8 poles

Note 1: When the basic frequency to be used is more than 60 Hz, a special motor should be used instead of a general-purpose motor. Therefore, a different most suitable motor should be used. When the KW indication is the same, the inverter capacity should be increased.

Note 2: When the basic frequency and maximum frequency to be used are more than 120 Hz, set F-28③ to Fmax 360 (see page 75).(An interlock when a high frequency is selected)

Note 3: When a high frequency is to be selected, thoroughly check the mechanical strength of the motor and load.

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
1	(F—00) V/f Pattern setting			Note 4: When high frequency is selected, V／f pattern may drop a little bit at around 60 Hz. But this is not abnormal. If compensation is needed, use the followings. Decrease the carrier frequency 16KHz→12→10→8 ☞ See (F-41)
		▶1 ▲2 ▼3 記憶 STR 機能 FUN	Selection of SLV 2 C O N T R O L S̲ L V 1 C O N T R O L S̲ L V 2 S̲ L V 2 F 0 6 0 － 0 6 0 (＊1) (＊2) ① ② ③	High start torque selection ① Selection of high start torque 　SLV 2: Exclusive motor ② Selection of frequency, motor capacity, and motor pole count 　F: Basic frequency and maximum frequency setting 　K: Motor capacity selection 　P: Selection of motor pole count ③ Basic frequency and maximum frequency setting
		▶1 ▲2 ▼3 記憶 STR	S L V 2 K̲ 2 . 2 k S L V 2 P̲ 4 P ② ③ Note : Set the motor capacity and pole count according to the motor to be used. When an unmatch occurs, satisfactory characteristics cannot be obtained.		* 1 Basic frequency	50–120	50–360
* 2 Maximum frequency	50–120	50–360	
			S L V 2 A̲ 0 0 0 2 2 0 ② S L V 2 B̲ 0 0 0 3 3 0 S L V 2 C̲ 0 0 0 4 4 0 S L V 2 C̲ D 0 5 Note : When a plurality of motors are to be used, high start torque cannot be used. Select the standard torque beforehand. CONTROL VF	② Selection of motor constant and stabilization 　A……motor constant 　B……motor constant 　C……motor constant 　C D…motor stabilization gain 00～15 　　See Section 2.12 Note 1: The copy unit is available for all setting of SLV 2 . Note 2: Motor constant ＞ 0 　　Do not set 0 for motor constant.

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal

1	(F—00)
	
	V/f Pattern setting
			CONTROL SLV 1	Selection of standard start torque
				① VF setting
				   V C : Constant torque
				   V P 1: Reduced torque (to the 1.5th power)
				   V P 2: Reduced torque (to the 1.7th power)
				   V P 3: Reduced torque (to the 2 nd power)
				② Basic frequency and maximum frequency setting

		▶1 ▼3 記憶 STR	CONTROL VF	
		機能 FUN	VF－VC 050－050	

Note 1: When basic frequency to be used is more than 50 Hz, a special motor should be used instead of a general-purpose motor. Therefore, a different most suitable motor should be used. When KW indicates the same, the inverter capacity should be increased.

Note 2: When the basic frequency and maximum frequency to be used are more than 120 Hz, set F-28 ③ to Fmax 360 (see page 77). (An interlock when a high frequency is selected)

Note 3: When a high frequency is to be selected, thoroughly check the mechanical strength of the motor and load.

Data setting key sequence displays:
- VF－VP 1   050－050
- VF－VP 2   050－050
- VF－VP 3   050－050
- VF－VC   050－050

Return to SLV 1:
- VF－VC   060－060
- E－00   CONTROL
- CONTROL   VF
- CONTROL   VF
- CONTROL   SNSLES
- CONTROL   *SLV 1
- CONTROL   SLV 1

	Basic frequency	50–120	50–360
* 1	Basic frequency	50–120	50–360
* 2	Maximum frequency	50–120	50–360

Display sequence	Function code, func-tion name	Key operation	Display	Relationship to I/O signal
8 9 10	(F−07) (F−08) (F−09) Jump frequency1 setting Jump frequency2 setting Jump frequency3 setting		Initial set value (0 Hz) J UMP − F 1 0 0 0 . 0 H z J UMP − F 2 0 0 0 . 0 H z J UMP − F 3 0 0 0 . 0 H z	To prevent a resonance with the load, the frequency can be jumped at up to 3 points. The setting sequence may be changed.
		Data setting 	J UMP − F 1 0 1 0 . 0 H z J UMP − F 2 0 3 0 . 0 H z J UMP − F 3 0 4 5 . 0 H z	Note 1 : Jump frequency: No frequency can be set in the region of the set frequency ±0.3 Hz. When passing, a frequency in the jump region can be outputted. Note 2 : The jump frequency width can be changed. ☞ See F-43 for details.

Display sequence	Function code,function name	Key operation	Display	Relationship to I/O signal

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
11	(F−10)		Initial set value $\underline{S}$ E L − S ／ P　　　　S p e e d	The multistage speed function or the process stepping function is selected, and data is set.

Multistage speed/process stepping

Expansion multistage speed

Key operation:
機能 FUN
▲2 ▼3

Initial set value (0 Hz)

$\underline{S}$ p e e d − 1　0 0 0 . 0　H z

$\underline{S}$ p e e d − 2　0 0 0 . 0　H z

$\underline{S}$ p e e d − 3　0 0 0 . 0　H z

$\underline{S}$ p e e d − 4　0 0 0 . 0　H z

$\underline{S}$ p e e d − 5　0 0 0 . 0　H z

$\underline{S}$ p e e d − 6　0 0 0 . 0　H z

1) Multistage speed A maximum of 4 stages of operations including the frequency command from the digital operation panel (or external) and Spped−1 to Speed−3 can be performed.

SWITCH 2 :
⎡ SEL JOG : Jogging mode
⎢ SEL EXP : Expansion multistage
⎣　　　　　　　speed　　　　⎦
SEL JOG is selected (standard setting).

Data setting:
▶1
▲2 ▼3
記憶 STR

S p e e d − 1　0 1 0 . 0　H z

S p e e d − 2　0 2 0 . 0　H z

S p e e d − 3　0 3 0 . 0　H z

S p e e d − 4　0 2 5 . 0　H z

S p e e d − 5　0 6 0 . 0　H z

S p e e d − 6　0 4 0 . 0　H z

VRO (FS setting)

* − : OFF

Terminal		Set frequency (Hz)	
CF 1	CF 2		
—	—	Frequency command in the Remote or Terminal mode	Set value FS
ON	—	Value set by Speed−1　(1 s)	
—	ON	Value set by Speed−2　(2 s)	
ON	ON	Value set by Speed−3　(3 s)	

| Display sequence	Function code,function name	Key operation	Display	Relationship to I/O signal

2) Expansion multistage speed

A maximum of 8 stages of operations including the frequency command from the digital operation panel(or external), the jogging set frequency, and Speed-1 to Speed-6 can be performed.

Note : The jogging operation cannot be performed by the multistage speed function.(When the inverter is operated at the jogging set frequency, the jogging operation is not performed but the inverter is operated according to the set acceleration and deceleration time.)

SWITCH 2 :
$$\left[\begin{array}{l}\text{SEL JOG : Jogging mode}\\ \text{SEL EXP : Expansion multistage}\\ \qquad\qquad\qquad\text{speed}\end{array}\right]$$
SEL EXP is selected.
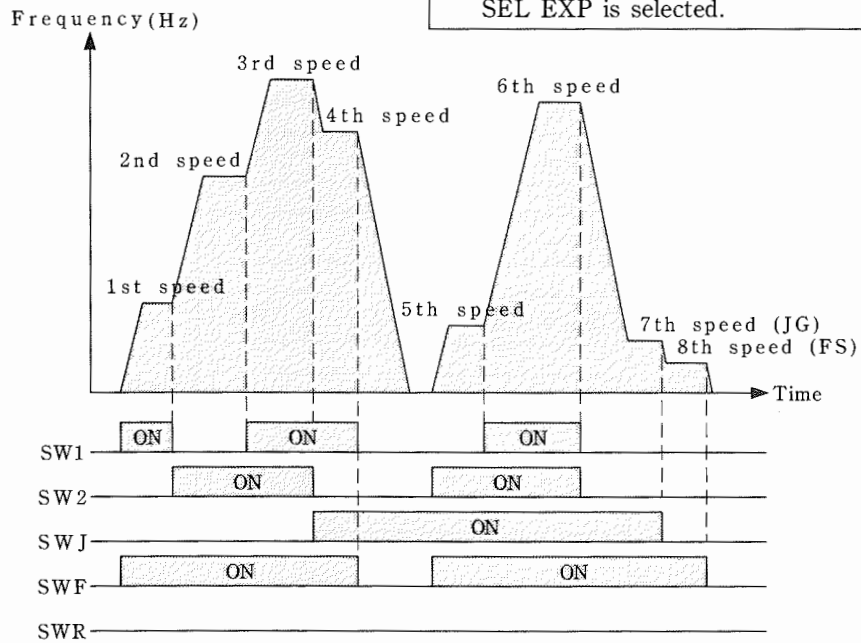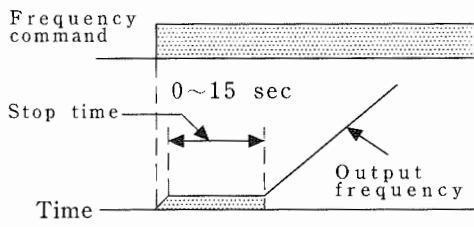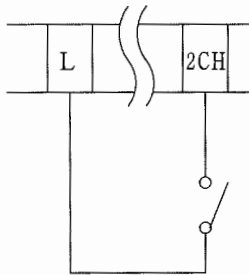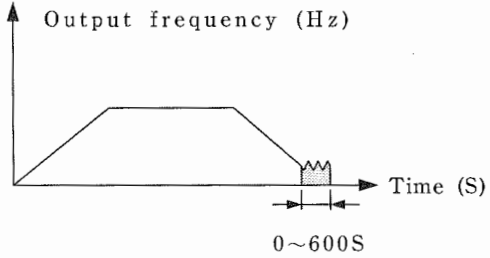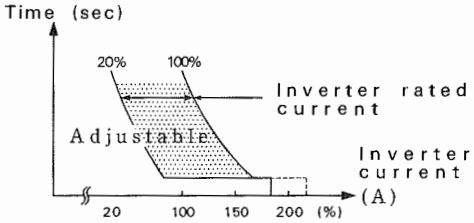
	Terminal		Set frequency(Hz)	
CF 1	CF 2	JG		FS set in the Terminal ⇒ mode in the above example
—	—		Frequency command in the Remote or Terminal mode	
ON	—	—	Value set by Speed-1　(1 S)	
—	ON		Value set by Speed-2　(2 S)	
ON	ON		Value set by Speed-3　(3 S)	
ON	—		Value set by Speed-4　(4 S)	
—	ON	ON	Value set by Speed-5　(5 S)	
ON	ON		Value set by Speed-6　(6 S)	Jogging in the ⇒ monitor mode
—	—		Value set by the jogging set frequency(JG)	
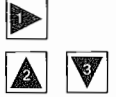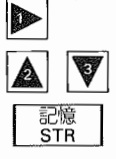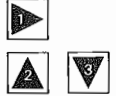
*—: OFF

- 72 -

Display sequence	Function code,function name	Key operation	Display	Relationship to I/O signal

Left two columns (vertical text): Multistage speed/process stepping — (F-10)

Key operation / Display rows:

▶1 → `SEL-S/P    Speed`

▲2 / 記憶 STR / 機能 FUN →
`SEL-S/P    Proces`
`Proces1  F000.0Hz` ——①

▲2 ▶1 → `Proces2  F000.0Hz`

▲2 → `Proces2  T0000.0S` ——②

▲2 → `Proces2  TM  - - -` ——③

▲2 → `Proces2  ADL  FAD1` ——④

Data setting ▶1 / ▲2 ▼3 / 記憶 STR → `Proces1  F020.0Hz`

▶1 / ▲2 → `Proces1  T0000.0S`

▶1 / ▲2 ▼3 / 記憶 STR → `Proces1  T0010.0S`

▲2 → `Proces2  F000.0Hz`

Repeat the same operation →
`Proces2  F040.0Hz`
`Proces2  T0015.0S`
`Proces2    TM  JG`
`Proces3  F060.0Hz`
`Proces3  T0005.0S`   Note 1 ⇐
`Proces4  F030.0Hz`
`Proces4  T0015.0S`

Relationship to I/O signal:

2) Process stepping

① : Maximum frequency
　　0, 0.5 to maximum frequency

② : Timer time setting
　　0.1 to 3276.5S

③ : Terminal setting
　　JG–CF1–CF2–2CH

④ : Acceleration or deceleration selection
　FAD1 : Forward acceleration/deceleration 1
　RAD1 : Reverse acceleration/deceleration 1
　FAD2 : Forward acceleration/deceleration 2
　RAD2 : Reverse acceleration/deceleration 2

A maximum of 10 processes are stepped.(5 points from the input terminal)Each process is switched when the preset timer time or the specified input terminal is turned on.

Timer points : 10 points
Input terminal : 5 points

Example:

Terminal		Process	Set frequency(Hz)	Timer time
SWF	SWJ			
ON	--	1	20	10
ON	ON	2	40	15
ON	–	3	60	5
ON	–	4	30	15
ON	–	5	0	10

The terminal mode is selected in the above example.

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
			P r o c e s 5 F 0 0 0 . 0 H z P r o c e s 5 T 0 0 1 0 . 0 S	Note 1 : When the timer and the input terminal are set, each process is switched under their logical sum conditions.(Even when the input terminal is turned on prior to the preset timer time, the process is switched.) Note 2 : The process stepping function is performed when the process stepping SLCT PRC is selected from Multistage speed/Process stepping selection in F–30 switch selection 3 ①. Note 3 : The process stepping operation is started by SWF(or SWR). When the digital operation panel is used, press the FWD RUN 正転運転 FWD RUN (or REV RUN)key 逆転運転 REV RUN Note 4 : The copy unit is available for Processes 1 to 3 copy but not available for Processes 4 to 10 copy.
12	(F–11) Frequency stop time adjustment at start		Initial set value(0.0S) F s t o p – T 0 0 0 . 0 S	This is a temporary frequency stop time to prevent an overcurrent of the motor at start.
		Data setting ▶ ▲ ▼ 記憶 STR	F s t o p – T 0 1 5 . 0 S	Frequency command 0~15 sec Stop time Output frequency Time The stop frequency is about 1/12 of the basic frequency or the minimum frequency whichever higher. (Invalid when S–Curve is selected) (Invalid when U–Curve is selected)
19 20	(F–18) (F–19) 2–stage acceleration time setting 2–stage deceleration time setting		Initial set value(10S) A C C E L – 2 0 0 1 0 . 0 S D E C E L – 2 0 0 1 0 . 0 S	☞ See F–01 and F–02. L 2CH
		Data setting ▶ ▲ ▼ 記憶 STR	A C C E L – 2 0 1 0 0 . 0 S D E C E L – 2 0 1 5 0 . 0 S	

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
21	(F-20) DC braking frequency adjustment		Initial set value (0.5Hz) F-DCB 000.5 Hz	When DC braking is selected, the deceleration DC braking start frequency is set. This is a temporary frequency stop time to prevent an overcurrent of the motor at start. When F-DCB is set, the inverter is decelerated at less than the set frequency under the conditions indicated below. ①Both (F-21) V-DCB and (F-22) T-DCB are set. ②F-28① is set to DCB ON (with DC braking). ③The stop command is entered or the preset frequency is 0 Hz. When all ①, ② to ③ are not satisfied, the inverter can be operated down to the minimum frequency. ☞ See ① of F-28 and ① of F-29.
		Data settin ▶1 ▲2 ▼3 記憶 STR	F-DCB 015.0 Hz	
22	(F-21) DC braking power adjustment		Initial set value (0) V-DCB 000	The DC braking power is changed. When the set value is 000, the DC braking operation is not started. ☞ See ① of F-28 and ① of F-29.
		Data setting ▶1 ▲2 ▼3 記憶 STR	V-DCB 020	
23	(F-22) DC braking time adjustment		Initial set value (0.0S) T-DCB 000.0S	The DC braking time is adjusted. When the set value is 000.0S, the DC braking operation is not started. ☞ See ① of F-28 and ① of F-29. Output frequency (Hz) Time (S) 0～600S
		Data setting ▶1 ▲2 ▼3 記憶 STR	T-DCB 600.0S	
24	(F-23) Electronic thermal level adjustment		Initial set value (100%) E-therm 100%	The electronic thermal level can be changed. (100 to 20%) Set the level according to the most suitable current of the motor. Time (sec) 20% 100% Inverter rated current Adjustable Inverter current (A) 20 100 150 200 (%) Adjustment level = $\frac{\text{motor rated current}}{\text{inverter rated current}} \times 100(\%)$ ☞ See ④ and ⑤ of F-29, "Electronic thermal characteristic selection".
		Data setting ▶1 ▲2 ▼3 記憶 STR	E-therm 050%	

Display sequence	Function code, func-tion name	Key operation	Display	Relationship to I/O signal
30	(F—29)		Initial set value (See the indication below) SWITCH2　　DB　　EDG	A specific selection is performed. ① DC braking DB EDG: Edge operation DB LVL: Level operation
		Data setting ▶1 ▶1 ▲2 ▼3 記憶 STR	SWITCH2　　DB　　LVL	
		▶1 ▲2 ▼3	SWITCH2　　SEL　JOG	② Jogging/expansion multistage speed SEL JOG: Jogging mode selection SEL EXP: Expansion multistage speed mode selection
	Switch selection 2	Data setting ▶1 ▲2 ▼3 記憶 STR	SWITCH2　　SEL　EXP	
		▶1 ▲2 ▼3	SWITCH2　STOP　ON	③ STOP key selection Selection of "validity" or "invalidity" of the STOP key when the operation command terminal mode is selected STOP ON: The [停止 STOP] key is valid. STOP OFF: The [停止 STOP] key is invalid.
		Data setting ▶1 ▲2 ▼3 記憶 STR	SWITCH2　STOP　OFF	
		▶1 ▲2 ▼3	SWITCH2　Ethm　000	④ Electronic thermal characteristic selection Ethm 000 : Reduced characteristics (for general-purpose motor) Ethm 100 : Constant characteristics (for constant torque motor)
		Data setting ▶1 ▲2 ▼3 記憶 STR	SWITCH2　Ethm　100	

F—00 V/f pattern setting	High start torque SLV 1, 2	Standard start torque	
		VF–VC	VF–VP1, 2, 3
Ethm 000	✔	✔	✔　Note
Ethm 100	✔	✔	
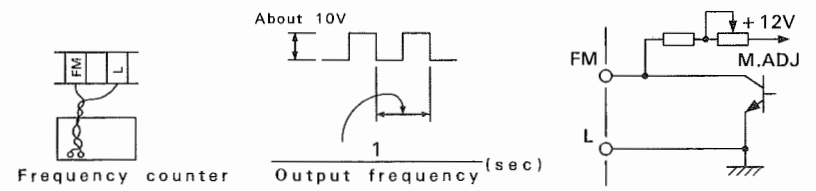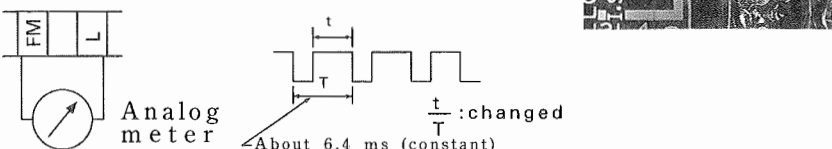
Note: When VF—VP 1 (VP 2, VP 3) is set, Ethm 000 and Ethm 100 are not displyed since electronic ther-mal characteristic is automatically selected Ethm 000.

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
30	(F—29)	▶ ▲2 ▼	SWITCH2　CMSL　OFF	A specific selection is performed.
		Data setting ▶ ▲2 ▼3 記憶 STR	SWITCH2　CMSL　ON	⑤ Commercial operation switching. Whether or not to match the frequency when the commercial operation is switched to the inverter operation is selected. CMSL ON: The frequency is not matched. CMSL OFF: The frequency is matched.
	Switch selection 2	▶ ▲2 ▼3	SWITCH2　SLOK　OFF	⑥ Soft lock selection If SLOK ON is selected while the dip switch LOCK is ON, only the frequency setting is valid. SLOK ON: In the soft lock state, FS cannot be set or changed. SLOK OFF: In the soft lock state, FS can be set or changed.
		Data setting ▶ ▲2 ▼3 記憶 STR	SWITCH2　SLOK　ON	Note: Set this switch before setting the dip switch of the main unit.

		SWITCH 1		
			①～⑥	

F—28	①	DCB OFF	Without DC braking	See F—20 to F—22.
		DCB ON	With DC braking	
	②	FM DIG	Frequency digital monitor	Frequency counter digital monitor A pulse train of a frequency which is the same as the output frequency is outputted. The duty is about 50%.
		FM ANA	frequency analog monitor	Analog meter monitor A duty (t/T) in proportion to the output frequency is outputted. Adjust the variable resistor (M.ADJ) and the variable resistor of the frequency meter so that the meter indicates the maximum value at the maximum frequency. (Load resistor 10 to 22kΩ, 1 mA max., 0 to 10 V full scale) Note : • This is a dedicated indicator, so that it cannot be used as a line speed signal. • Indication accuracy after adjustment : About ± 5 % (The accuracy of some meter may exceed this value.)
	③	fmax 120	Standard V/f	A frequency of 120 Hz or less (see page 61) is set for V/f pattern selection.
		fmax 360	Special V/f	A frequency of 120 Hz or more (see page 61) is set for V/f pattern selection.
	④	PWER ALM	Trip	Standard setting (1) When Ro and To are not connected to power supply. In other than the cases indicated below, the inverter is tripped and outputs an alarm signal. • Power OFF: "POWER OFF" is displayed and the inverter is stopped. (Since it is decided that the power is turned off in the normal state, no alarm signal is outputted.) (2) When Ro ant To are connected to power supply. An alarm signal is outputted according to instantaneous power failure, undervoltage, or trip contents.
		PWER FTP	Deceleration and stop after turning on power again	After power is turned on once again, the inverter is decelerated and stopped according to the preset deceleration time.
		PWER RST	Auto re—start function	When one of the trips indicated below occurs, a reoperation is performed. (When the frequency is more than 60 Hz, a zero start may result.) • Overcurrent • Overvoltage • Undervoltage • Instantaneous power failure The number of reoperations is 3 times/10 minutes (16 times for instantaneous power failure and undervoltage). In case of instantaneous power failure, the time required for reoperation is set by F—36 (IPS—R—T). For commercial operation switching, see F29 ⑥ of SWITCH 2 .

	④ PWER ZST	Zero start function when the power is turned on again	Zero start when power is turned on once again is set. The contents are the same as those of PWER RST, though a zero start is specified for the reoperation. The time required for reoperation is set by F-36 (IPS-R-T). When inertia of the fan is a heavy load, set the time required for the motor shaft to stop by IPS-R-T.
	⑤ FWD OFF	Forward operation unavailable	The forward operation command is not accepted.
	FWD ON	Forward operation	The forward operation can be performed.
F-28	REV OFF	Reverse operation unavailable	The reverse operation command is not accepted.
	REV ON	Reverse operation	The reverse operation can be performed.
	⑥ OLMT ON	With overload limit	The overload limit is valid during acceleration or constant speed operation.
	OLMT OFF	Without overload limit	The overload limit is invalid during acceleration but valid during constant speed operation.

Note : When the auto re-start function is on, the motot is in the free run mode. This function should not be applied to a use requiring a falling object to be held by a mechanical brake during free run.

			SWITCH 2	
			①～⑧	

F−29	①	DB EDG	Edge operation	Output frequency / During DB / Operation command / T-DCB	During DB / Output frequency Stop / Operation command / T-DCB
		DB LVL	Level operation	Output frequency / During DB / Valid in the Terminal mode / Operation command / T-DCB In valid in the process stepping mode	☞ See F−20 to F−22.
	②	SEL JOG	Jogging mode	The inverter can be operated by the frequency command from the digital operation panel(or external terminal)and the multistage speed(Speed 1 to Speed 3)command from a combination of the terminals CF 1 and CF 2, or by the jogging command from the JG terminal and the expansion multistage speed. ☞ See(F−10).	
		SEL EXP	Expansion multistage speed mode	Up to 8−stage speeds including the frequency command from the digital operation panel(or external terminal), Speed 1 to Speed 6 from a combination of the terminals CF 1 and CF 2, and the JOG multistage speed command can be used. ☞ See(F−10).	
	③	STOP ON	停止 STOP Key valid	When the operation command is issued in the Terminal mode, the 停止 STOP key on the digital operation panel is valid.	
		STOP OFF	停止 STOP Key invalid	When the operation command is issued in the Terminal mode, the 停止 STOP key on the digital operation panel is invalid.	
	④	Ethm 000	Electronic thermal relay reduced characteristics	Output current Ethm 100(in the case of a constant torque motor)setting	
		Ethm 100	Output current Ethm 100(for a constant torque motor)setting	Output current 100% / 80% / 50% / Ethm000 / Setting (In the case of a standard motor) (In the high frequency region of more than 60 Hz, the output current is not reduced from 100%) / 0 5Hz 20Hz 60Hz 120Hz / Output frequency	
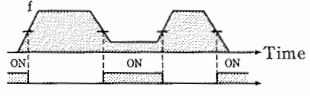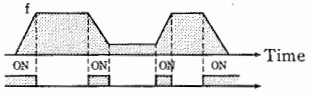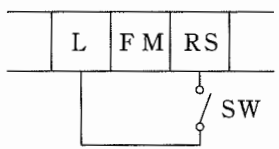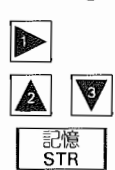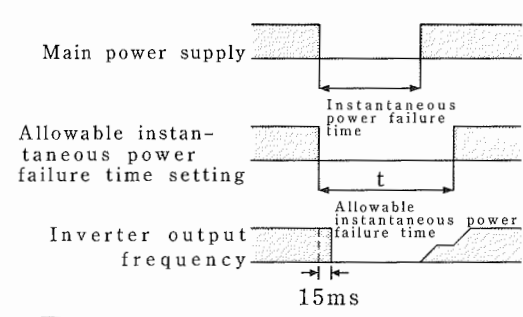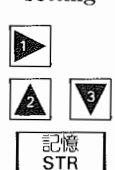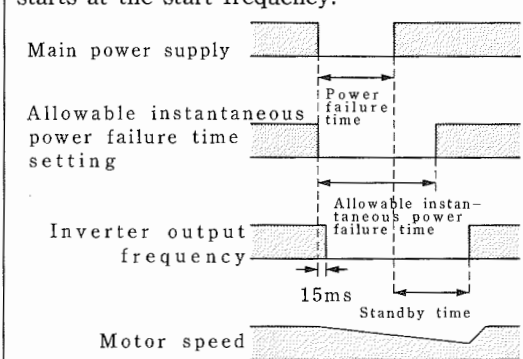
		SWITCH 2		
		①～⑧		
F-29	⑤	CMSL OFF	No commercial power switch over	After the reset is released, the inverter performs zero start. In this case, the commercial operation cannot be switched. About 0.3 sec after the reset is released, the inverter starts outputting.
		CMSL ON	Commercial power switch over	After the reset is released, the motor speed is detected. When the motor is in the free run state, the inverter starts outputting according to the motor speed. When switching the commercial operation, set CMSL ON. About 1.2 sec after the reset is released, the inverter starts outputting.
	⑥	SLOK OFF	FS setting, change possible	FS can be set or changed in the soft lock mode(Dip switch LOCK ON).
		SLOK ON	FS setting, change impossible	FS cannot be set or changed in the soft lock mode(Dip switch LOCK ON).
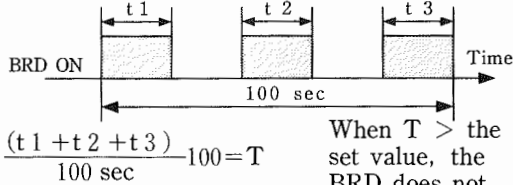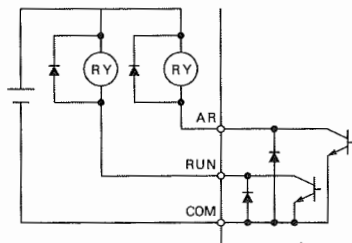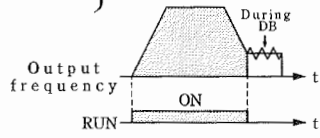
Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
30	(F—29)	▷ ② ▽	SWITCH2 CMSL OFF	A specific selection is performed.
		Data setting ▷ ② ▽ STR	SWITCH2 CMSL ON	⑤ Commercial run selection. When changing from commercial power run to inverter run, select whether frequency matching is performed or not. CMSL OFF: Not perform. CMSL ON: Perform.
		▷ ② ▽	SWITCH2 SLOK OFF	⑥ Soft lock selection When dip switch LOCK is ON, and SLOK ON is selected, setting frequency is available. SLOK ON: Prophibitted to change FS setting in soft lock. SLOK OFF: Possible to chang FS setting in soft lock.
	Switch selection 2	Data setting ▷ ② ▽ STR	SWITCH2 SLOK ON	Note: Set this switch before setting the dip switch of the main unit.
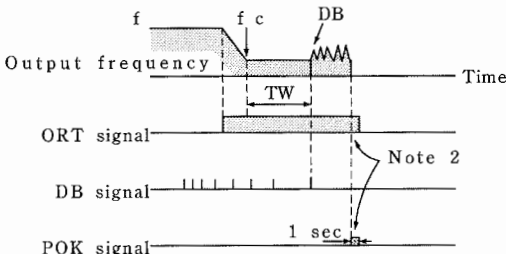
Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
31	(F-30)		Initial set value (See the indication below) S W I T C H 3　S L C T　S P D	A specific selection is performed. ① Multistage speed/process stepping selection SLCT SPD : multistage speed SLCT PRC : process stepping
		Data setting ▶1 ▲2 ▼3 記憶 STR	S T I T C H 3　S L C T　P R C	
	Switch selection 3	▶1 ▲2 ▼3	S W I T C H 3　　O R T　O F F	② Simple orientation ORT OFF : No orientation ORT ON : Orientation
		Data setting ▶1 ▲2 ▼3 記憶 STR	S W I T C H 3　　O R T　　O N	
		▶1 ▲2 ▼3	S W I T C H 3　　F A R V　2	③ Frequency arrival signal selection FARV 1 : Output at the specified frequency
		Data setting ▶1 ▲2 ▼3 記憶 STR	S W I T C H 3　　F A R V　1	FARV 2 : Output at a constant speed Note : ON for ±0.5Hz, ±1.5Hz OFF
		▶1 ▲2 ▼3	S W I T C H 3　S T D T　R S T	④ Initial setting (status before delivery) selection. Selection when returning the inverter to the initial status before delivery for some reason STDT RST : Initial setting invalid (standard) STDT SET : Returned to the initial setting The inverter can be reset in the above state. (Between RS and L)
		Data setting ▶1 ▲2 ▼3 記憶 STR	S W I T C H 3　S T D T　S E T	Note : After reset, STDT SET is automatically changed to STDT RST. Note : See Section 9. 2.
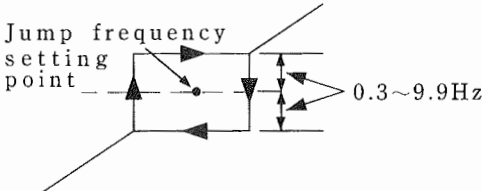
Display sequence	Function code, func-tion name	Key operation	Display	Relationship to I/O signal
31	(F—30) Switch selection 3	▶1 ▲2 ▼3	Initial set value (See the indication below) SWITCH3 TRIP OFF	A specific selection is performed. ⑤ Selection of a trip or no trip when an undervoltage or instantaneous power failure occurs during inverter stop TRIP OFF: No trip TRIP ON: Trip
		Data setting ▶1 ▲2 ▼3 記憶 STR	SWITCH3 TRIP ON	
32	(F—31) Overload warning level adjustment (optional)		Initial setting (100) OLalarm 100%	Overload warning can be outputted within an overload range from 50 to 150%. When the load reaches that level, a warning signal is outputted. (Overload warning signal relay output: When an optional PC board is used) ☞ Refer to the function option (A-OP-PCB).
		Data setting ▶1 ▲2 ▼3 記憶 STR	OLalarm 150%	
33	(F—32) Overload limit constant setting		Initial setting LM. CONS 125%01. 0	This is an overload limit level and overload characteristic constant. This function controls the inverter output current. When the output courrent exceeds the preset current level as the load increases. The function reduces the number of revolutions of the motor and suppresses an increase in current. ① Selection of over load limit level The set value is adjustable between 50—150% of inverter rated current. When an OC trip often occurs with the standard value set, increase the set value. ② Selection of overload characteristic constant When an OC trip often occurs with the standard value set, decrease the set value.
		Data setting ▶1 ▲2 ▼3 記憶 STR	LM. CONS 150%01. 0 ① ②	
		Data setting ▶1 ▲2 ▼3 記憶 STR	LM. CONS 150%00. 5	

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
34	(F−33) Allowable instantaneous power failure time setting	Data setting ▷ ① ② ③ STR 記憶	Initial setting(1.0S)　　　200V class I P S − T　　　0 0 1 . 0　　S Initial setting(0.3S)　　　400V class I P S − T　　　0 0 0 . 3　　S I P S − T　　　0 0 3 . 0　　S Note:Do not set the instantaneous power failure time 0.4 sec or more for 400V class inverter When the time is set 0.4 sec or more the inverter does not restart operation. 　　　　　　　　t(sec) 200V class　　0.3～3.0 400V class　　0.3	The time from instantaneous power failure occurrence to recovery is set. When the power failure is recovered within the set time with PWER RST(④ of SWITCH 1) set, the inverter automatically restarts operation. When the digital operation panel or optional PC board is used, or the inverter load is heavy, the inverter display may be erased before recovery even if the power failure is recovered within the preset allowable instantaneous power failure time because the control supply voltage is early dropped. If this occurs, turn power off. An operation same as the restart when the inverter is reset is performed. ☞　See F−28 and F−36.
35	(F−36) Restart standby time setting after instantaneous power failure recovery	Data setting ▷ ① ② ③ STR 記憶	Initial set value(1.0S) I P S − R − T　　0 0 0 1 . 0　　S I P S − R − T　　0 0 0 3 . 0　　S	The standby time from instantaneous power failure to reoperation after recovery can be set. When the power failure is recovered within the set allowable instantaneous power failure time set by F−33, the time from recovery to automatic reoperation of the inverter is set. When the inverter starts reoperation, the motor speed is detected. When the motor speed cannot be detected, however, the detection operation is repeated. Therefore, the inverter operates longer than the preset time. When the motor speed cannot be detected, the inverter judges it as a zero start and starts at the start frequency. ☞　See F−28 and F−33.

Display sequence	Function code,function name	Key operation	Display	Relationship to I/O signal
36	(F-38) Regenerative braking use rate setting		Initial set value (01.5%) B R D – % E D 0 1 . 5 %	The BRD use rate for 100 seconds is set. When the BRD use rate exceeds this setting, the BRD will not operate.
		Data setting ▶ ▲ ▼ 記憶 STR	B R D – % E D 0 2 . 0 % Note: When the Optional Regenerative Braking Units is used, set to 31.0. In this case remove resistor built in .	 $$\frac{(t\,1 + t\,2 + t\,3)}{100 \text{ sec}} - 100 = T$$ When T > the set value, the BRD does not operate. When only the built-in braking resistor is used, the set value should not be more than the value indicated below. Setting value upon shipment from factory.

Inverter type	1.5~3.5LB2 · LD2 2.5~3.5HB2	5.5~16LF2 5.5~75HB2 5.5~40LB2
%	2	1.5

Display sequence	Function code,function name	Key operation	Display	Relationship to I/O signal
37	(F-39) Speed arrival signal optional frequency setting		Initial set value (100%) S P D – A R V 1 0 0 %	The frequency arrival signal is outputted at an optional frequency. The set value is a rate to a maximum frequency of 100%.
		Data setting ▶ ▲ ▼ 記憶 STR	S P D – A R V 0 5 0 %	 Note : Valid when F-30 SWITCH 3 FARV 1 is selected. –0.5 Hz: ON, –1.5 Hz: OFF *RUN is a running signal, which is outputted when the inverter is in operation. Contact specification. Open collector 27 V, 50 mA max. Forward voltage drop : About 1 V

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
38	(F-40) Simple orientation		Initial set value (See the indication below.) ORIENT fc 0.5Hz	The inverter can be oriented. The creep speed and standby time are set. fc : Creep speed Tw : DB signal standby time (DB signal mask time) Note 1 : • An optional PC board (A-OP-PCB) is required. • Valid when F-30 SWITCH 3 ORT ON is selected Note 2 : The POK signal is received and the ORT signal is turned OFF. { ORT : Orientation start signal DB : Dynamic brake signal Signal to the optional PC board (A-OP-PCB) POK : Orientation completion signal
		Data setting ▶1 ▶1 ▲2 ▼3 記憶STR	ORIENT fc 9.9Hz	
		Data setting ▶1 ▲2 ▼3 ▶1 ▲2 ▼3 記憶STR	ORIENT Tw 0.01S ORIENT Tw 9.99S	
39	(F-41) Carrier frequency setting		Initial set value (16KHz) CARRIER 16KHz	The PWM control carrier frequency can be changed.
		Data setting ▶1 ▲2 ▼3 記憶STR	CARRIER 10KHz	

The PWM control carrier frequency can be changed.

	kHz				Inverter type
	8	10	12	16	
Standard setting				✓	1.5-22LB2 2.5-22HB2 1.5-16LF2
			✓(Note)		33~40HB2 33~50HB2
	✓(Note)				60 to 75HB2

Note: When the inverter (33~40LB2, 33~60HB2) is used at carrier frequency 16 KHz (12Hz for 75HB2), reduce the rating output current by 10% or use within the range of -10 to 40℃.

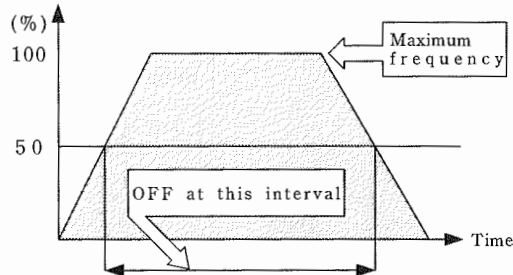| 40 | (F-42) Parameter setting commanding method | | Initial set value (See the indication below.)

PARMSET Remote | Whether to set various parameters such as monitor mode [モニタ MON] and function mode [機能 FUN] from the digital operation panel or from the external terminal using an optional PC board (A-SC-PCB) can be selected.

Note : Valid only when an optional PC board is mounted. |
| | | Data setting ▶1 ▲2 ▼3 記憶STR | PARMSET Option-b | |

Display sequence	Function code, function name	Key operation	Display	Relationship to I/O signal
41	(F-43) Jump frequency range setting		Initial setting J M P－W I D 0．3 H z	The jump frequency range can be set by F-07, F-08, or F-09. The jump frequency width can be changed.
		Data setting [1▶] [2▲] [3▼] 記憶 STR	J M P－W I D 1．0 H z	Jump frequency setting point ... 0.3~9.9Hz When the frequency band to be jumped is wide, use a large set value.
Remarks	Copy function	コピー COPY	W R I T E R R E M T→→ I N V	The preset data(all the data in the monitor and function modes)of the digital operation panel can be transferred to the inverter in a batch. When the コピー COPY key is pressed, the message on the left is displayed and the data is transferred.
		読出し READ	W R I T E R I N V→→ R E M T	The preset data(all the data in the monitor and function modes)of the inverter can be read into the digital operation panel in a batch. When the 読出し READ key is pressed, the message on the left is displayed and the data is transferred.

9.5 Restart after instantaneous power failure and power source switching from commercial power supply to inverter.

(1) Restart after instantaneous power.

		Data setting for restart after instantaneous power failure		
Monitor mode		F−SET−M Terminal	←	Set to Terminal
		F／R−SW Terminal	←	Set to Terminal
Function mode	F−28	SWITCH1 PWER RST	←	Set to PWER RST (Retry mode)
	F−29	SWITCH2 CMSL ON	←	Set to CMSL ON
	F−33	IPS−T 001.0S	←	0.3～3.0 (S) variable···200V class / 0.3 (S)·····················400V class
	F−36	IPS−R−T 0001.0S	←	0.3～100 (S) variable / Set to 0.3 to 3 for detecting speed in case of restart after instantaneous power failure

Connect Ro and To to power supply

Note: Since retry mode is selected, the inverter is possible to restart when the inverter trips due to overcurrent(OC), overvoltage(OV) and under voltage(UV). Do not use this function for the application that mechanical brake for prerenting something falling down is needed while the motor is running free.

Restart will start at the minimum frequency in the following cases.
① Setting restart stand−by time to over three seconds(Function mode F−36, IPS−R−T)
② Output frequency exceeds 60Hz.
③ Output frequency is maximum and the frequency at 60Hz is less than half of the basic frequency.
④ The induced voltage of a motor goes down rapidly (For example, the motor speed reduces in less than a few seconds such as pump or high reducing gear.)
⑤ The above function F−29 is set from CMSL ON to CMSL OFF.
⑥ The keeping time of control power of an inverter depends upon load status, connection of remote opera-tor and deviation of input voltage. It also depends upon model.

Unit: second

Remote operator	1.5LB2	2.5LB2	3.5～5.5LB2	8～11LB2	16LB2	22～40LB2
With ※	0.3～1.5	0.3～2.0	0.8～2.0	2.5～6.5	4.5～14.0	1.0～2.0
Without	0.3～2.0	0.4～2.5	1.0～2.5	3.5～7.5	5.5～16.0	1.0～2.0

※ The digital operation panel is equipped (LD2、LF2)

Note 1 : Allowable power failure time set by F−33 can be set to 0.3 to seconds for 200V class and to 0.3 seconds for 400V class. The keeping time of an inverter depends upon model, operation status and input voltage. When the keeping time set by F−33 is used for an interlock, set the shortest time of the above.

Note 2 : When setting other than above is selected. it is reset by OFF. Operation restarts after power come back when operation command is ON.
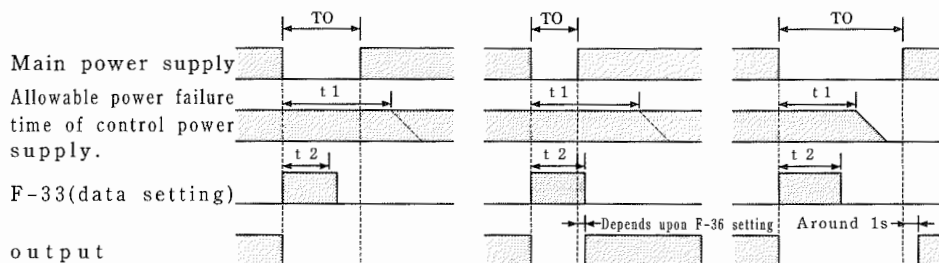
TO : Allowable power failure time
T1 : Keeping time of control power supply when power supply is shut down
T2 : Setting data in F−33

（2） Power supply switching from commercial power supply to inverter

Data setting inthe function		
Monitor mode {	F－SET－M Terminal	← Set to Terminal
	F／R－SW Terminal	← Set to Terminal
Function mode F－29	SWITCH2 CMSL ON	← Set to CMSL ON
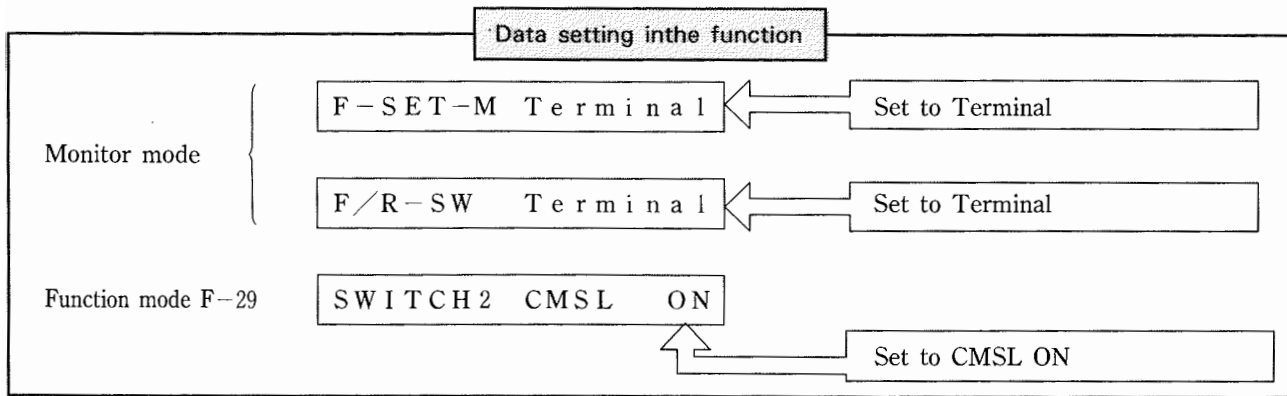
Connection diagrams and timing charts for commercial power supply switching are shown below.

Mg
BS BSS ALX Mg THRY Operation using commercial power supply
Mg 2B Mg1 Inverter operation
Mg2
2B
2A
Mg2 FWY Forward rotation
Stop
Inverter FWY RVY Reverse rotation
2A RSY Reset
RVY
ALX
AL0 AL1

Be sure to use Mg1 and Mg2 with interlock features.

EF EF
ELBC
Power supply ELB Mg R U IM
S V
T W Mg2
Inverter
H
O
L
FWY FW AL1
RVY RV AL2
RSY RS AL0
L
L

Motor

Note 1 : Wen the ELB causes a trip due to a ground fault or another failure, the commercial power supply circuit does not either function. If backup power is required, connect the commercial power supply circuit to the ELBC.

Note 2 : Use relays dedicated to electronic circuits as FWY, RVY, and RSY. Use separate relays for AC and DC. The sequences in this figure are reference data for timing charts.

2B(interlock time of Mg1 and Mg2)
Time set by timer 2A
(It is from 0.2s to 1.0s. Usually, it is set to 0.5s however.)

Mg1 ON
Mg2 OFF ON
RS-L ON OFF
FWY RVY ON
about 1s
Start of inverter operation Operation

Fiqure14 Sample Connection and Timing Charts for Commercial Power Supply Switching

10. SPECIFICATION

10. 1 Block Diagram
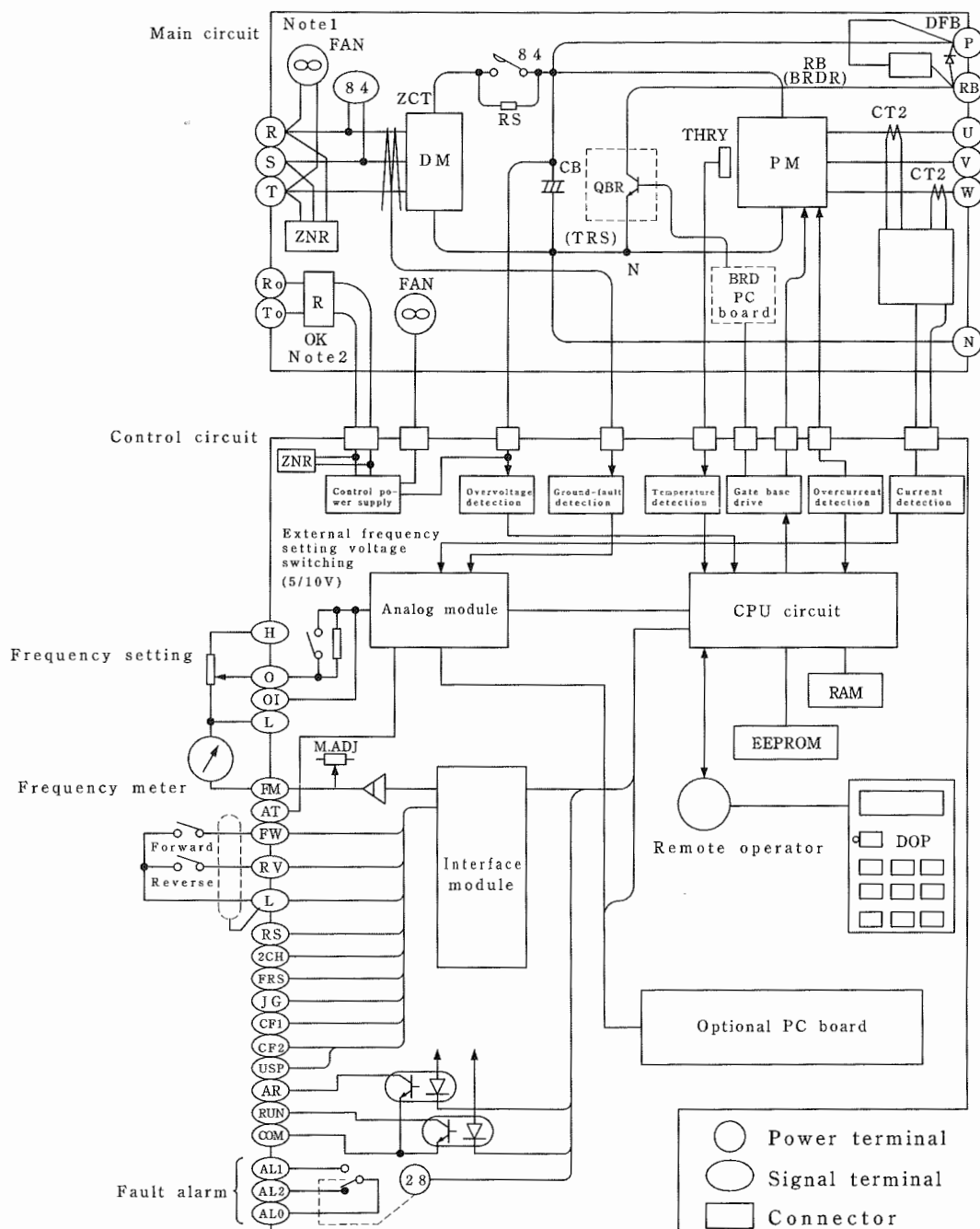
Note : Description of symbols

- (84) : Electromagnetic contactor (Not provided for 1.5 to 2.5LB2)
- DM : Diode module (Converter module)
- CB : Smoothing capacitor
- (28) : Fault alarm relay
- ZNR : Surge absorber
- TRS : Braking transistor (1.5LB2 to 5.5LB2 : (QBR) Mounted on the BRD PC board)

- FAN : 2.5 to 16LB2 : 1pce 22LB2 : 2pcs 33LB2 : 4pcs
- [ ] : BRD PC board
- ZCT : Current transformer
- R–S : Current limiting resistor
- PM : Power module (Inverter module)
- THRY : Temperature detection relay
- CT 2 : Current transformer
- BRDR : Built–in braking resistor (for 3.5 to 40LB2 only)
- T : Transformer (for 400V class)

Note 1 : Only for 16LB2

Note 2 : Transformer is used for 2.5 to 75HB2

Figure 15 Block Diagram

10.2 PC Board Layout

The layout of the HFC–VWA PC board is shown below.
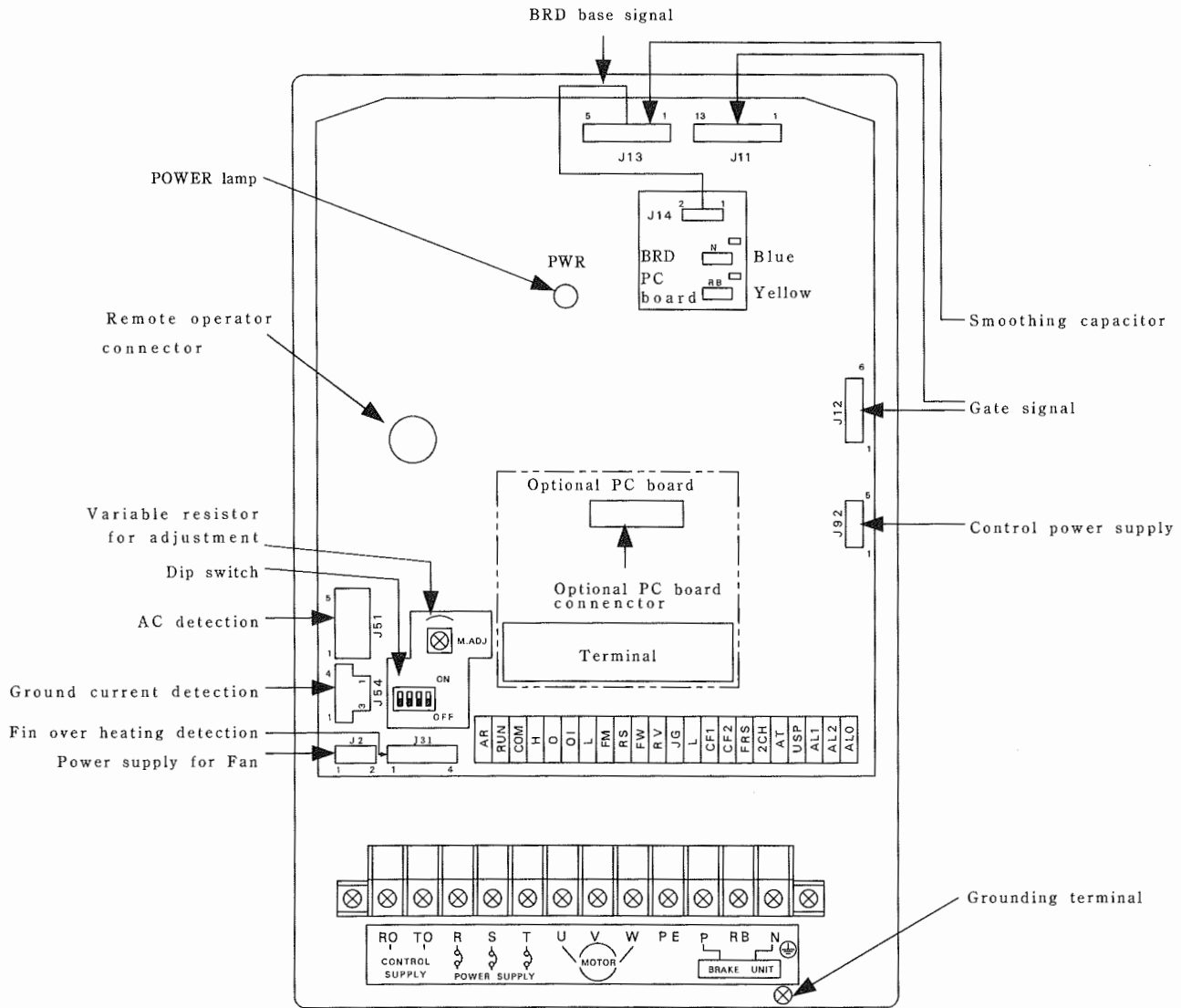
Figure 16 PC Board Layout Drawing(Example : 2.5LB2 to 5.5LB2)
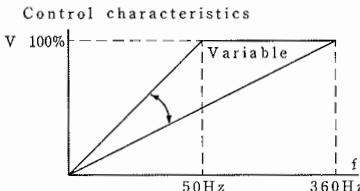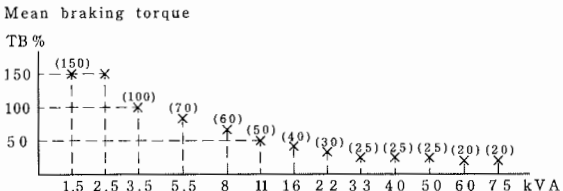
Series name			200 V class HFC-VWA2 series									
Inverter type abbreviation(Type)			1.5LB2	2.5LB2	3.5LB2	5.5LB2	8 LB2	11LB2	16LB2	22LB2	33LB2	40LB2
Protection structure			Fully closed(IP40)			Semi-closed type(IP20)				Open type(IP00)		
Most suitable motor(4 P, kW)			0.75	1.5	2.2	3.7	5.5	7.5	11	15	22	30
Rated capacity (kVA)	200V		1.7	2.6	3.6	5.7	8.3	11	16	22	33	42
	220V		1.9	2.9	4.0	6.3	9.1	12	18	24	36	46
Rated input AC voltage			3-phase 200 to 220/200 to 230V ±10%, 50/60Hz ± 5 %									
Rated output voltage			3-phase, 200 to 230V (corresponding to input voltage)									
Rated output current(A)			5	7.5	10.5	16.5	24	32	46	64	95	121

Control specification	Control method	Space vector PWM control
	Output frequency range	0.5～360Hz
	Frequency accuracy	Digital command value ±0.01% of maximum frequency, analog command value ±0.5%(at 25±10℃)
	Frequency resolution function	0. 01Hz
	Control characteristics (V/f characteristics) Mean braking torque(TB)	
	Start torque	150% min(1 Hz Hitachi 4 -pole general-purpose motor at 200, 220, and 230V)
	Mean braking torque	(short time)regenerative braking torque %ED set DC braking
	Overload current rating	150%/60 sec(Once per 10 minutes)
Operation specification	Acceleration, deceleration time	0.1S to about 3000S for linear or curve acceleration or deoeleration, individually set for acceleration and deceleration(S-curve, U-curve)
	Multistage speed operation	Max. 8 stages(3 a contact command)
	Jogging operation	0.5 to 9.9 Hz(1 a contact command)
	2-stage acceleration, deceleration	2-stage command for acceleration or deceleration time
	Fault reset	Fault reset, output instantaneous failure(1 a contact command)
	Maximum frequency adjustment	Maximum frequency + 15Hz
	Start frequency adjustment	0.5-5Hz
	Maximum, minimum limiter	Maximum, minimum frequency limiter
	Gain bias function by analog input	Adjustment of start or stop frequency for analog command
	Reclosing during free run	Power can be turned on once again in the motor free run mode.(Zero start in the low speed state)
I/O signal	Setting — Digital operation panel	Each unit setting, Operation/stop, forward/reverse, (installation and removal available : 0.3m, 1 m or 3 m, with copy function), digital operation panel optional
	Setting — External signal	Current input selection, 0 to 5 VDC, 0 to 10 VDC, 4 to 20 mA
	Frequency arrival signal	OFF at frequency arrival(open collector output 27 VDC, 50 mA max), OFF for constant frequency, OFF for specified frequency
	Running signal	ON during inverter running(open collector output 27 VDC, 40 mA max.)
	Frequency monitor	Analog meter(0 to 10 VDC, 1 mA full scale), monitor by digital frequency counter
	Free run stop	Output cut-off by external input(1 a contact command)
	Process stepping control	5 input points, 10 timer points(timer, input terminal logic method)
	Fault display	OFF when the inverter is abnormal or without input power supply(1 c contact output), 3 faults stored

Series name		200V class HFC-VWA E series								
Protection function	Instantaneous overcurrent	Protection by electronic circuit								
	Overvoltage	The inverter is stopped at a converter output voltage of								
	Undervoltage	The inverter is stopped at an input voltage of about 160V or less								
	Fin overheating	Protection by temperature relay								
	Electronic thermal relay	Time interval electronic thermal relay (20 to 100% can be set.)								
	Restart after instantaneous power failure	The inverter can be restarted after 15ms to 3s.								
		instantaneous power failure is recovered.								
	Overload limit function	The current is controlled by output current detection (The operation level can be set.)								
	Ground-fault protection	The inverter is protected by an electronic circuit.								
General specification	Ambient temperature	−10 to 40℃ (without terminal cover: −10 to 50℃, storagetemperature : −20 to 60℃)						−10 to 50℃ (Storage temperature: −20 to 60℃)		
	Humidity	20 to 90% RH (No dew condensation allowed)								
	Vibration	4.9m/s²(0.5G)(10∼ 55Hz)As per JIS C 0911(1984)						2m/s²(0.2G) (10∼ 55Hz)		
	Operating site	1,000m or less in altitude, indoors (place free of corrosive gas and dust or dirt)								
	External color	Munsell 10Y3.1/0.3 diecast cases are black corresponding to Munsell N2.)								
Option	Optional PC Board (A-OP-PCB)	Simple orientation, DC brake external command, Inverter output current signal, Relay output of running signal, Relay output of frequency arrival signal, Relay output of overload warning signal								
	Remote operator (DOP)	Installing on front cover (DOP-03EA) ···Cable length 0.3m Remote operating (DOP-1 EA, DOP-3 EA) ···Cable length 1 m, 3 m								
	Copy unit (DRW)	Easily setting to several inverters (DRW-1 EA) ···Cable length 1 m								
Approx, Mass (kg)		6.2	6.2	6.2	6.6	12.0	13.5	19.0	26	26	40

Notes :

The inverter (1.5 to 3.5LD2 and 5.5 to 16LF2) is equipped with a remote operator.

Series name	400 V class HFC-VW2 E series										
Inverter type abbreviation(Type)	2.5HB2	3.5HB2	5.5HB2	8HB2	11HB2	16HB2	22HB2	33HB2	40HB2	50HB2	60HB2	75HB2
Protection structure	Fully closed(IP40)		Semi-closed type(IP20)				Open type(IP00)					
Most suitable motor(4 P, kW)	1.5	2.2	4.0	5.5	7.5	11	15	22	30	37	45	55
Rated capacity (kVA) — 220V/380V	2.5	3.5	5.7	8.6	11	15	21	32	38	49	59	72
Rated capacity (kVA) — 240V/415V	2.7	3.8	6.2	9.3	12	17	23	35	42	54	65	79
Rated input AC voltage	3-phase 380 to 415/400 to 460V ±10%, 50/60Hz ± 5 %											
Rated output voltage	3-phase, 380 to 460V (corresponding to input voltage)											
Rated output current(A)	3.8	5.3	8.6	13	16	23	32	48	58	75	90	110

Control specification

Control method	Space vector PWM control
Output frequency range	0.5～360Hz
Frequency accuracy	Digital command value ±0.01% of maximum frequency, analog command value ±0.5%(at 25±10℃)
Frequency resolution function	0.01Hz
Control characteristics (V/f characteristics) / Mean braking torque(TB)	Control characteristics — V 100% Variable, 50Hz 360Hz f; Mean braking torque — TB % 150 (150) 100 (100)(70)(60)(50)(40)(30)(25)(25)(25)(20)(20) 50; 1.5 2.5 3.5 5.5 8 11 16 22 33 40 50 60 75 kVA
Start torque	150% min(1 Hz Hitachi 4-pole general-purpose motor rated Voltage(400, 400V))
Mean braking torque	(short time)regenerative braking torque %ED set; DC braking
Overload current rating	150%/60 sec(Once per 10 minutes)

Operation specification

Acceleration, deceleration time	0.1S to about 3000S for linear or curve acceleration or deoeleration, individually set for acceleration and deceleration(S-curve, U-curve)
Multistage speed operation	Max. 8 stages(3 a contact command)
Jogging operation	0.5 to 9.9 Hz(1 a contact command)
2-stage acceleration, deceleration	2-stage command for acceleration or deceleration time
Fault reset	Fault reset, output instantaneous failure(1 a contact command)
Maximum frequency adjustment	Maximum frequency + 15Hz
Start frequency adjustment	0.5-5Hz
Maximum, minimum limiter	Maximum, minimum frequency limiter
Gain bias function by analog input	Adjustment of start or stop frequency for analog command
Reclosing during free run	Power can be turned on once again in the motor free run mode.(Zero start in the low speed state)

I/O signal

Setting	Digital operation panel	Each unit setting, Operation/stop, forward/reverse, (installation and removal available : 0.3m, 1 m or 3 m, with copy function), digital operation panel optional
	External signal	Current input selection, 0 to 5 VDC, 0 to 10 VDC, 4 to 20 mA
Frequency arrival signal		OFF at frequency arrival(open collector output 27 VDC, 50 mA max), OFF for constant frequency, OFF for specified frequency
Running signal		ON during inverter running(open collector output 27 VDC, 40 mA max.)
Frequency monitor		Analog meter(0 to 10 VDC, 1 mA full scale), monitor by digital frequency counter
Free run stop		Output cut-off by external input(1 a contact command)
Process stepping control		5 input points, 10 timer points(timer, input terminal logic method)
Fault display		OFF when the inverter is abnormal or without input power supply(1 c contact output), 3 faults stored

Series name	400V class HFC-VWA E series

Protection function	Instantaneous overcurrent	Protection by electronic circuit
	Overvoltage	The inverter is stopped at a converter output voltage of about 800V
	Undervoltage	The inverter is stopped at an input voltage of about 320V or less
	Fin overheating	Protection by temperature relay
	Electronic thermal relay	Time interval electronic thermal relay (20 to 100% can be set.)
	Restart after instantaneous power failure	The inverter can be restarted after a 15ms to 3s
		instantaneous power failure is recovered.
	Overload limit function	The current is controlled by output current detection (The operation level can be set.)
	Ground-fault protection	The inverter is protected by an electronic circuit.

General specification	Ambient temperature	−10 to 40℃ (without terminal cover: −10 to 50℃, storage temperature : −20 to 60℃)	−10 to 50℃ (Storage temperature: −20 to 60℃)
	Humidity	20 to 90% RH (No dew condensation allowed)	
	Vibration	4.9m/s²(0.5G)(10~ 55Hz) As per JIS C 0911(1984)	2m/s²(0.2G) (10~ 55Hz)
	Operating site	1,000m or less in altitude, indoors (place free of corrosive gas and dust or dirt)	
	External color	Munsell 10Y3.1/0.3 diecast cases are black corresponding to Munsell N2.)	

Option	Optional PC Board (A-OP-PCB)	Simple orientation, DC brake external command, Inverter output current signal, Relay output of running signal, Relay output of frequency arrival signal, Relay output of overload warning signal
	Remote operator(DOP)	Installing on front cover(DOP-03EA)···Cable length 0.3m Remote operating(DOP-1 EA, DOP-3 EA)···Cable length 1 m, 3 m
	Copy unit(DRW)	Easily setting to several inverters(DRW-1 EA)···Cable length 1 m

Approx, Mass(kg)	6.2	6.2	8.5	13.5	13.5	23	28	28	42	42	45	45

Notes :

1. $\dfrac{1.5 \text{ to } 3.5\text{SBE}}{2.5 \text{ to } 33\text{HBE}}$: Without the Remote Operator

2. 2.5HDE to 75HFE : With the Remote Operator (DOP-03EA)

10. 4 Description of Terminals

Terminal symbol	Terminal circuit	Description
AR	Frequency arrival terminal	When the frequency reaches the preset value, the transistor output is turned off.
RUN	Running signal terminal	The transistor output is turned on during running.
COM	Common terminal	Dedicated AR and RUN common terminal(Not grounding)
H	Frequency setting power supply terminal	10VDC
O	Frequency setting terminal	0–10VDC, 0–5VDC(Can be switched by the dip switch): Input impedance : $0-5V(15K\Omega)$ $0-10V(30K\Omega)$
OI	Frequency setting terminal	4 to 20 mA(input impedance 250Ω)
L	Common terminal	Common control terminal(Not grounding)
FM	Frequency monitor terminal	A terminal for the digital frequency counter or the analog meter can be selected.(0 to 10 V, 1 mA full scale, load resistor 0 to 22 KΩ)
RS	Fault reset terminal	Contact(closed): Fault signal reset
FW	Forward operation/stop terminal	Contact(closed):Forward operation, contact(open):stop
RV	Reverse operation/stop terminal	Contact(closed):Reverse operation, contact(open):stop
JG	Jogging/expansion multi-stage speed/process terminal	Contact(closed):Jogging operation/expansion multistage speed/process stepping terminal
L	Common terminal	Common control terminal(Not grounding)
CF 1	Multistage speed/process terminal	Contact(closed):Multistage speed operation/process stepping input terminal
CF 2	Multistage speed/proess terminal	Contact(closed):Multistage speed operation/process stepping input terminal
FRS	Free run stop/process terminal	Contact(open):Inverter stop, motor free run stop (the fault is not reset)/process stepping input terminal
2 CH	2–stage acceleration–deceleration/process terminal	Contact(closed): 2 –stage acceleration–deceleration terminal/process stepping input terminal
AT	Current input selection terminal	Contact(closed):OI terminal input valid Contact(open):O terminal input valid
USP	Recovery restart prevention(Note 1)	Contact(open):Recovery restart prevention valid Contact(closed):Recovery restart prevention invalid
AL 1	Fault alarm terminal (Note 2)	Abnormal:AL 0 –AL 1 (closed) (See page.57.) AL 0 –AL 2 (open)
AL 2		Contact rating:250 VAC, 2. 5A(resistor load)0. 2A(COS ϕ0. 4)
AL 0		30 VDC, 3 A(resistor load)0. 7A(COS ϕ0. 4)

(Leftmost spanning label: Control circuit terminal)
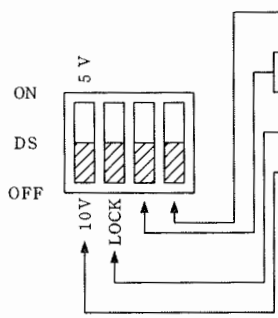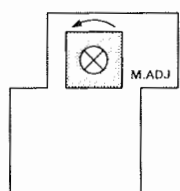
Note 1 : When the power failure frequency and operation command are set, the inverter can start reoperation when the power failure is recovered. This terminal is used to prevent such an unexpected operation. To start the reoperation, turn the FW, RV signal OFF, and then turn it ON once again or reset the inverter by the RS terminal and turn the FW or RV signal ON.
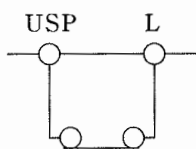
Note 2 : A relay for the control circuit terminals other than AL 0 to AL 2 should be a weak current relay(12 VDC and 3 mA should be able to be applied).

10. 5 Variable Resistor and Dip Switch

Name		Description
Dip switch		Keep the dip switch OFF. This switch can be used to return the inverter to the initial setting(status before delivery). For details, see Section 9.2. After operation, turn the switch OFF. Soft lock:When the LOCK switch is turned ON, no data can be changed. See F-29⑥. External frequency setting voltage switching : 　　5 V side: 0 to 5 VDC/ 0 to Fmax 　　10 V side: 0 to 10 VDC/ 0 to Fmax
Potentiometer for adjustment		This can be used for adjustment of an external frequency meter(analog meter).(See page 78.)

10. 6 Wiring Instruments

Wiring Instruments and wire thickness are given in the table below. Note that they depend on the wiring length and power supply capacity.

(200V class)

0.75	HFC–VWA1.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–30F(10A)	H10C
1.5	HFC–VWA2.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–30F(15A)	H10C
2.2	HFC–VWA3.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–30F(20A)	H20
3.7	HFC–VWA5.5LB2	3.5mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–30F(30A)	H20
5.5	HFC–VWA 8 LB2	5.5mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(50A)	H25
7.5	HFC–VWA11LB2	8 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–60F(60A)	H35
11	HFC–VWA16LB2	14mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(75A)	H50
15	HFC–VWA22LB2	22mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(100A)	H65
18.5	HFC–VWA33LB2	30mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(100A)	H80
22	HFC–VWA33LB2	38mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–225F(150A)	H100
30	HFC–VWA40LB2	60mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–225F(200A)	H125

(400V class)

1.5	HFC–VWA2.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(10A)	H10C
2.2	HFC–VWA3.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(15A)	H20C
3.7	HFC–VWA5.5LB2	2 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(15A)	H20C
5.5	HFC–VWA 8 LB2	3.5mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(30A)	H20C
7.5	HFC–VWA11LB2	3.5mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(30A)	H20C
11	HFC–VWA16LB2	5.5mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–50F(50A)	H25C
15	HFC–VWA22LB2	8 mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–60F(60A)	H35C
18.5	HFC–VWA33LB2	14mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–60F(60A)	H50C
22	HFC–VWA33LB2	14mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(75A)	H50C
30	HFC–VWA40LB2	22mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(100A)	H65C
37	HFC–VWA50LB2	22mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–100F(100A)	H80C
45	HFC–VWA60LB2	38mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–255F(150A)	H100C
55	HFC–VWA75LB2	60mm min.	2 mm min.	0.75mm min. shielding wire	2 mm min.	F–255F(175A)	H125C

Note 1 : The instruments are those for a Hitachi standard 3-phase squirrel-cage motor, 4-pole.

Note 2 : For the circuit breaker, select an instrument suited to its breaking capacity.
   Install an earth leakage breaker to avoid an electrical shock.
   EX(30, 50B, 60), RX(100. 225) ···for 200V class.   EX(50C, 60B), RX(100, 225) ···for 400V class.

Note 3 : When a standard motor(Hitachi standard 3-phase squirrel-cage motor, 4-pole)is used at 10 Hz to 60 Hz,
   no thermal relay is required.

Note 4 : Give consideration to the power supply system and the wiring system when selecting the breaking capacity.

Note 5 : Use grounding cables 3.5 ㎟ for 8 kVA or higher, and grounding cables in the same diameter as that of the
   power cable for 5.5kVA or lower.

10. 7 OPTIONS

(1)   Remote operator(OPE− 4 M and OPE− 8 M)

Standard specifications and internal wiring drawing are shown as below.

Use shield wire connecting a remote operator with an inverter.

M o d e l	OPE− 4 M	OPE− 8 M
Protection structure	Fully closed	
Frequency meter	43mm square (0∼50 Hz, 0∼100Hz ; 0∼60 Hz, and 0∼120Hz are common indication.)	80mm square (0∼50 Hz, 0∼100Hz, 0∼200 Hz ; 0∼60Hz, 0∼120 Hz, 0∼240Hz are common indication)
Frequency setting	0.5W 1 kΩ	
S w i t c h	FWD/STOP, REV/STOP, JOG (DC10V, 10mA)	
External color	Munsell5Y7/1	
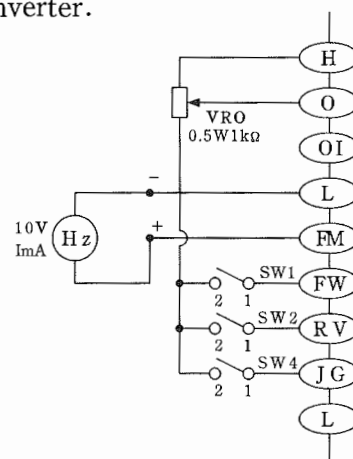
Note 1 : Internal impedance of a frequency meter should be in the range of 10KΩ to 22 KΩ.

Note 2 : To adjust a frequency meter, use the potentiometer built in a frequency meter and the
   potentiometer in an inverter.

(2)   Remote operator(DOP−03A, DOP−1A, DOP−3A)and Digital copy unit(DRW−1A)

When operating the digital operation panel in remote or setting many inverters simply, re-
mote operator and copy unit are available.

See the figure 5 and 6 in attaching a connector.

Follow the instruction manual of a remote operator for detail.

(3)   Function option(A−OP−PCB)

Mounting a PC board(A−OP−PCB) on an inverter extends functions to six kinds.
such as orientation function and output.

(a)   Mounting

A-OP-PCB printed circuit board

PCB holder (Nikko Kogyo PCB-10L);
two are included.

Inverter unit of the
HFC-VWA series.
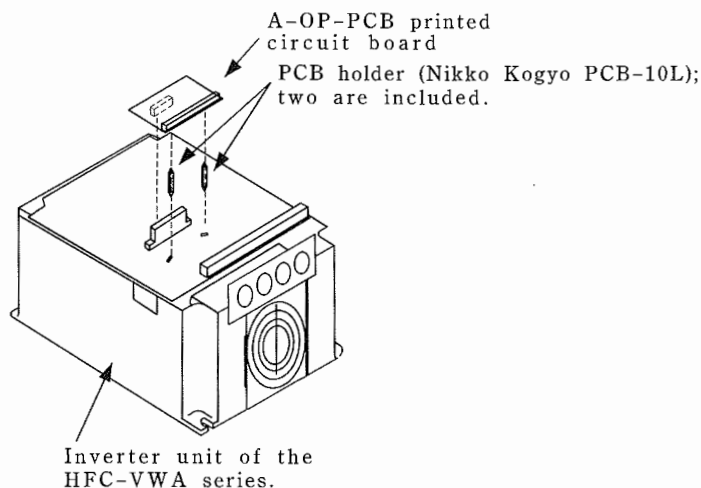
(b) CONNECTIONS
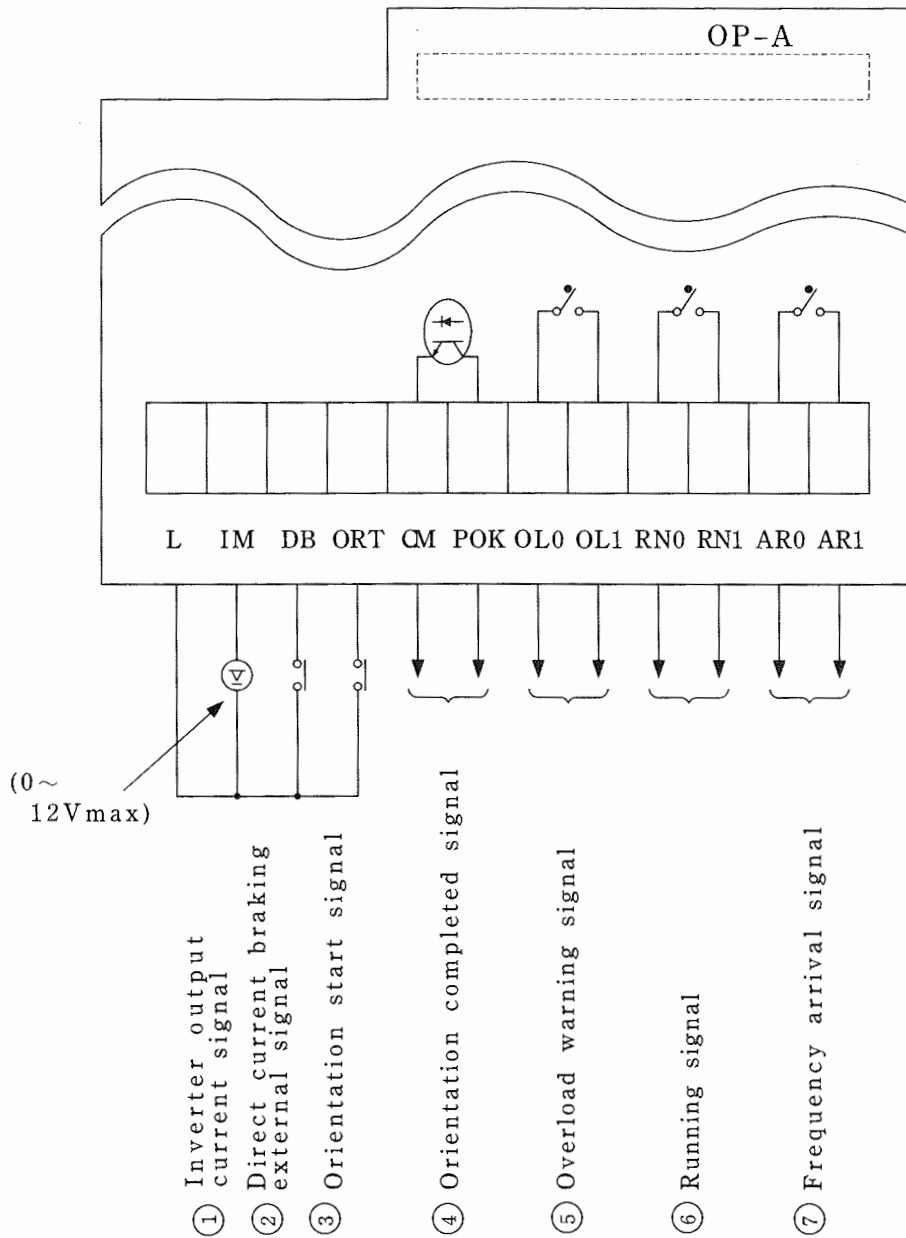
Note 1 : CM is a common terminal especially for POK and it is insulated from the orher terminals. The terminal is the common terminal fot the other terminals, and is also common with the L terminal on the printed circuit board of the main unit of the inverter. Do not ground either CM or L.

Note 2 : Use twisted shield wire for the signal lines.

(c) FUNCTIONS

Function No.	Function name	Terminal used	Contents	Terminal specifications
①	Inverter output current signal	IM−L	• A voltage which is propor-tionate to the output current of the inverter will be output. Output voltage at the rated current= 4 VDC Accuracy: ±0.4V (full range)	
②	Direct current braking external instruction	DB−L	• By short circuiting DB and L, direct current braking will be forced during deceleration. • The optional digital operation panel can be used to make the adjustments tn the table below. (table below) • By combining with ③ the ORT terminal, this can be used for the orientation function. Refer to function No. ③ for details. • If DB and L are short circuited even once during reoperation, then output will remain cut off. This can be released by using reset. • When orientation is set, short circuiting DB and L does not cause direct current braking.	Contact specifications Open collector 27V 50mA max. Forward voltage drop approximately 1V
③	Simple orientation	ORT−L DB−L POK−CM	• By combining this function with the position detector(proximity switch, etc.) on the main spindle of the machine tool, home position stopping of the main spindle can be executed(orientation function).	
④	Overload warning signal Relay output	OL 0 −OL 1	• When the overload warning leval is reached the contact will close. • The onerload warning level can be adjusted between 100 to 150 percent of the rating with the optional remote operator(DOP)	OR0, RN0,AR0
⑤	Running signal Relay output	RN 0 −RN 1	• The contact will close during operation of the inverter.	OL1, RN1,AR1
⑥	arrival reached signal Relay output	AR 0 −AR 1	• When the frequency which is set is reached, the contact will close. • The optional digital operation panel can be used to select between constant frequency and designated frequency outputs. Refer ro F−30 (3) and F−39.	Contact specifications AC250V 2.5A (resistor load) 0.2A(cosφ=0.4) DC30V 3.0A (resistor load) 0.7A(cosφ=0.4)

Function mode No.	Function name	Variable range	Factory setting
F−21	DC braking power adjustment	0 ~20	0
F−22	DC braking time adjustment	0 ~15sec	0 sec

11. ORDERING SPARE PARTS OR REQUESTING PRODUCT INFORMATION

When ordering the spare parts of a product or when requiring information about the product, contact your distributor or a service station in your area with the following information:

(1) Type

(2) Output(kVA)

(3) Manufacturing number(MFG, NO.)

(4) Fault

When information printed on the nameplate is not readable because the nameplate is old, inform only the clear items with a simple sketch showing the parts required.

To shorten the non-operation time, it is recommended to store the parts in Table 2 on page 31.

Warranty

The warranty period under normal installation and handling conditions shall be one (1) year after the date of delivery. The warranty shall cover the repair of only the main unit of the delivered inverter.

• In the following cases the repair shall be charged to the purchaser even within the warranty period.

  (a) Malfunction or damage caused by mis-operation, remodelling, or improper repair

  (b) Malfunction or damage caused by drop after your purchase or transportation

  (c) Malfunction or damage caused by fire, earthquake, flood, falling or thunderbolt, natural calamities, pollution, or abnormal voltage

• When the product is to be repaired on your worksite, all expenses associated with field repair shall be charged to the purchaser.

• This manual will not be re-issued. Always keep it at hand. Do not lose it.

	Panel display	Fault cause	Description	Fault alarm output	Recovery method
1	Fmax–Fs	Fmax < Fs	Fmax : Maximum frequency + maximum frequency adjusted value	OFF	Correct the frequency. (When the inverter is operated with-out the frequency being cor–rected, the settings are automatically changed to those in Ap–pendix Table 2 .)
2	Fmax–Fup	Fmax < Fup			
3	Fmax–Flw	Fmax < Flw	Fmin : Start frequency		
4	Fmax–Fm	Fmax < Fm			
5	Fmax–Fpr	Fmax < Fpr	Fup : Maximum limit		
6	Fmax–Fes	Fmax < Fes	Flw : Minimum limit		
7	Fmax–Fee	Fmax < Fee	Fs : Set frequency		
8	Fmin–Fs	Fmin > Fs	Fj : Jogging frequency		
9	Fmin–Fj	Fmin > Fj	Fm : Multistage speed		
10	Fmin–Fup	Fmin > Fup	Fpr : Process stepping		
11	Fmin–Flw	Fmin > Flw	Fes : External frequency start		
12	Fmin–Fm	Fmin > Fm			
13	Fmin–Fpr	Fmin > Fpr	Fee : External frequency end		
14	Fmin–Fcr	Fmin > Fcr			
15	Fup–Fs	Fup < Fs	Fcr : Orientation creep speed		
16	Fup–Fm	Fup < Fm			
17	Fup–Fpr	Fup < Fpr	Fp : Jump frequency		
18	Flw–Fs	Flw > Fs			
19	Flw–Fm	Flw > Fm			
20	Flw–Fpr	Flw < Fpr			
21	Fp–Fs	Fp–0. 3 < Fs < Fp + 0. 3			
22	Fp–Fj	Fp–0. 3 < Fj < Fp + 0. 3			
23	Fp–Fm	Fp–0. 3 < Fm < Fp + 0. 3			
24	Fp–Fpr	Fp–0. 3 < Fpr < Fp + 0. 3			
25	Fp–Fcr	Fp–0. 3 < Fcr < Fp + 0. 3			

	Error display	Fault cause	Forcibly rewritten value
1	Fmax–Fs	$Fmax < Fs$	Fs $\leftarrow$ Fmax
2	Fmax–Fup	$Fmax < Fup$	Fs $\leftarrow$ Fmax
3	Fmax–Flw	$Fmax < Flw$	Flw $\leftarrow$ Fmax
4	Fmax–Fm	$Fmax < Fm$	Fm $\leftarrow$ Fmax
5	Fmax–Fpr	$Fmax < Fpr$	Fpr $\leftarrow$ Fmax
6	Fmax–Fes	$Fmax < Fes$	Fes $\leftarrow$ Fmax
7	Fmax–Fee	$Fmax < Fee$	Fee $\leftarrow$ Fmax
8	Fmin–Fs	$Fmin > Fs$	Fs $\leftarrow$ 0
9	Fmin–Fj	$Fmin > Fj$	Fj $\leftarrow$ 0
10	Fmin–Fup	$Fmin > Fup$	Fup $\leftarrow$ Fmin
11	Fmin–Flw	$Fmin > Flw$	Flw $\leftarrow$ Fmin
12	Fmin–Fm	$Fmin > Fm$	Fm $\leftarrow$ Fmin
13	Fmin–Fpr	$Fmin > Fpr$	Fpr $\leftarrow$ Fmin
14	Fmin–Fcr	$Fmin > Fcr$	Fcr $\leftarrow$ 0
15	Fup–Fs	$Fup < Fs$	Fs $\leftarrow$ Fup
16	Fup–Fm	$Fup < Fm$	Fm $\leftarrow$ Fup
17	Fup–Fpr	$Fup < Fpr$	Fpr $\leftarrow$ Fup
18	Flw–Fs	$Flw > Fs$	Fs $\leftarrow$ Flw
19	Flw–Fm	$Flw > Fm$	Fm $\leftarrow$ Flw
20	Flw–Fpr	$Flw > Fpr$	Fpr $\leftarrow$ Flw
21	Fp–Fs	$Fp-0.3 < Fs < Fp+0.3$	When all of Fs, Fj, Fm, Fpr, and Fcr are expressed by F, change F–0.3 to F. When the result is not satisfactory under another conditions, change F+0.3 to F.
22	Fp–Fj	$Fp-0.3 < Fj < Fp+0.3$	
23	Fp–Fm	$Fp-0.3 < Fm < Fp+0.3$	
24	Fp–Fpr	$Fp-0.3 < Fpr < Fp+0.3$	
25	Fp–Fcr	$Fp-0.3 < Fcr < Fp+0.3$	

Appendix Table 3 HFC-VWA Series DATA SETTING LIST

HFC-VWA inverter has many function so that the setting data can be changed by customers.

It is recommended to fill the setting data out the following data sheet for service, maintenance and investingation of trouble.

TYPE : HFC-VWA [   ] ⎫ Described on spec.

MFG. No. : [   ]   ⎭ label on top cover

● Monitor Mode

Display sequence	Monitor name	Initial display contents	Standard setting	Setting data
1	Frequency setting and output frequency	FS 000.0 00.0Hz	—	
2	Frequency commanding method	F-SET-M Terminal	Terminal	
3	Operation commanding method	F/R-SW Terminal	Terminal	
4	Motor rotational speed display	RPM 4P 00000RPM	4	
5	Frequency converted value display	/Hz00.0 00000.00	—	
6	Output current display	If----A Im000.0%	—	
7	Manual torque boost adjustment	V-Boot Code<110>	CONTROL VF 031 / CONTROL SLV1 or SLV2 110	
8	Output voltage gain adjustment	V-Gain 100%	100	
9	Jogging frequency setting	Jogging 01.0Hz	1.0	
10	Set parameter Check	CHECK +	—	
11	Forced rewriting of set parameters	FORCE SET +	—	
12	Terminal monitor	TERMINL 00000000	—	
13	Fault display	#	—	
14	Fault trace display	?ERR COUNT 000	—	

● Function mode

Display sequence	Function name	Standard setting	Setting data
1	V/f pattern setting	SLV 1 050 − 050	
2	Acceleration time setting	10	
3	Deceleration time setting	10	
4	Maximum frequency adjustment	0	
5	Start frequency adjustment	0.5	
6	Maximum frequency limiter setting	0	
7	Maximum frequency limiter setting	0	
8	Jump frequency 1 setting	0	
9	Jump frequency 2 setting	0	
10	Jump frequency 3 setting	0	
11	Multistage speed/process stepping selection	Speed	
	Multistage speed 1 setting	0	
	Multistage speed 2 setting	0	
	Multistage speed 3 setting	0	
	Multistage speed 4 setting	0	
	Multistage speed 5 setting	0	
	Multistage speed 6 setting	0	
12	Start frequency stop time adjustment	0	
13	2 − stage acceleration time setting	10	
14	2 − stage deceleration time setting	10	
15	DC braking frequency adjustment	0.5	
16	DC braking power adjustment	0	
17	DC braking time adjustment	0	
18	Electronic thermal level adjustment	100	
19	Linear−curved acceleration selection	Linear	

Display sequence	Function name		Standard setting	Setting data
20	Linear–curved deceleration selection		Linear	
21	External frequency setting start		0	
22	External frequency setting end		0	
23	Switch selection 1	DC braking	DCB ON	
		Frequency monitor	FM ANA	
		Maximum frequency switching	fmax 120	
		Restart after instantaneous power failure	PWER ALM	
		Operation method designation	FED ON	
			REV ON	
		Overload limit selsction	OLMT ON	
24	Switch selection 2	DC braking	DB EDG	
		Jogging/expansion multistage speed	SEL JOG	
		STOP key selection	STOP ON	
		Electronic thermal characteristic selection	Ethm 000	
		Commercial operation switching	CMSL OFF	
		Soft lock selection	SLOK OFF	
25	Swiching selection 3	Multistage speed/process stepping selection	SLCT SPD	
		Simple orientation	ORT OFF	
		Frequency arrival signal selection	FARV 2	
		Initial setting selection	STDT RST	
		Trip or no trip selection	TRIP OFF	
26	Overload warning level adjustment		100	
27	Overload limit constant		125%01.0	
28	Allowwable instantaneous power failure timer setting		1	
29	Restart standby time setting after instantaneous power failure recovery		1	
30	Regenerative braking use rate setting		1.5	
31	Speed arrival signal optional frequency setting		100	
32	Simple orientation		fc 0.5	
			Tw 0.01	
33	Carrier frequency setting		16	
34	Parameter setting commanding method		Remote	
35	Jump frequency range setting		0.3	