

FRENIC

5000H11S

INSTRUCTION MANUAL

High-frequency Inverter

200V Series

2.2kW/FRN2.2H11S-2

to 18.5kW/FRN18.5H11S-2

CAUTION

- Read all operating instructions before installing, connecting (wiring), operating, servicing, or inspecting the inverter.
- Ensure that this instruction manual is made available to the final user of the inverter.
- Store this manual in a safe, convenient location.
- The product is subject to change without prior notice.

Preface

Thank you for purchasing our FRENIC5000H11S series inverter. This product is used to drive a 3-phase induction motor at variable speed. As incorrect use of this product may result in personal injury and/or property damage, read all operating instructions before using.



As this manual does not cover the use of option cards, etc., refer to relevant manuals for option operations.

Safety Instructions

Read this manual carefully before installing, connecting (wiring), operating, servicing, or inspecting the inverter.


Familiarize yourself with all safety features before using the inverter.

In this manual, safety messages are classified as follows:


 WARNING	Improper operation may result in serious personal injury or death.
 CAUTION	Improper operation may result in slight to medium personal injury or property damage.


Situations more serious than those covered by CAUTION will depend on prevailing circumstances. Always follow instructions.

Instructions on use

 WARNING	
<ul style="list-style-type: none">• This inverter is designed to drive a 3-phase induction motor and is not suitable for a single-phase motor or others, as fire may result.• This inverter may not be used (as is) as a component of a life-support system or other medical device directly affecting the personal welfare of the user.• This inverter is manufactured under strict quality control standards. However, safety equipment must be installed if the failure of this device may result in personal injury and/or property damage. There is a risk of accident.	

Instructions on installation

 WARNING	
<ul style="list-style-type: none">• Mount this inverter on an incombustible material such as metal. There is a risk of fire• Do not place combustible or flammable material near this inverter, as fire may result.	

 CAUTION	
<ul style="list-style-type: none">• Do not hold or carry this inverter by the surface cover. Inverter may be dropped causing injury.• Ensure that the inverter and heat sink surfaces are kept free of foreign matter (lint, paper dust, small chips of wood or metal, and dust), as fire or accident may result.• Do not install or operate a damaged inverter or an inverter with missing parts, as injury may result.	

Instructions on wiring

WARNING

- Connect the inverter to power via a line-protection molded-case circuit breaker or Fuse, **as fire may result.**
- Always connect a ground wire, **as electric shock or fire may result.**
- A licensed specialist must perform the wiring works, **as electric shock may result.**
- Turn off the power before starting the wiring work, **as electric shock may result.**
- Wire the inverter after installation is complete, **as electric shock or injury may occur.**

CAUTION

- Confirm that the phases and rated voltage of this product match those of the AC power supply, **as injury may result.**
- Do not connect the AC power supply to the output terminals (U, V, and W), **as injury or failure may result.**
- Do not connect a braking resistor directly to the DC terminals (P(+) and N(-)), **as fire may result.**
- Ensure that the noise generated by the inverter, motor, or wiring does not adversely affect peripheral sensors and equipment, **as accident may result.**

Instructions on operation

WARNING

- Be sure to install the surface cover before turning on the power (closed). Do not remove the cover while power to the inverter is turned on.
Electric shock may occur.
- Do not operate switches with wet hands, **as electric shock may result.**
- When the retry function is selected, the inverter may restart automatically after tripping.
(Design the machine to ensure personal safety in the event of restart)
Accident may result.
- When the torque limiting function is selected, operating conditions may differ from preset conditions (acceleration/deceleration time or speed). In this case, personal safety must be assured.
Accident may result.
 - As the STOP key is effective only when a function setting has been established, install an emergency switch independently, and when an operation via the external signal terminal is selected, the STOP key on the keypad panel will be disabled.
Accident may result.
- As operations start suddenly if alarm is reset with a running signal input, confirm that no running signal is input before resetting alarm.
Accident may result.
- Do not touch inverter terminals when energized even if inverter has stopped.
Electric shock may result

CAUTION

- Do not start or stop the inverter using the main circuit power.
Failure may result.
- Do not touch the heat sink or braking resistor because they become very hot.
Burns may result
- As the inverter can set high speed operation easily, carefully check the performance of motor or machine before changing speed settings.
Injury may result.
- Do not use the inverter braking function for mechanical holding.
Injury may result.

Instructions on maintenance, inspection, and replacement

WARNING

- Wait a minimum of five minutes after power has been turned off (open) before starting inspection. (Also confirm that the charge lamp is off and that DC voltage between terminals P(+) and N(-) do not exceed 25V.)

Electrical shock may result.

- Only authorized personnel should perform maintenance, inspection, and replacement operations. (Take off metal jewelry such as watches and rings. Use insulated tools.)

Electric shock or injury may result.

Instructions on disposal

CAUTION

- Treat as industrial waste when disposing it.

Injury may result.

Other instructions

WARNING

- Never modify the product.

Electric shock or injury may result.

General instructions

Although figures in this manual may show the inverter with covers and safety screens removed for explanation purposes, do not operate the device until all such covers and screens have been replaced.

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1. Before Using This Product

1-1 Receiving Inspections

Unpack and check the product as explained below.

If you have any questions about the product, contact the nearest Fuji sales office or your local distributor where you purchased the unit.

- ① Check the ratings nameplate to confirm that the delivered product is the ordered one.

TYPE : Inverter type

FUJI ELECTRIC	
TYPE	FRN2. 2H11S-2
SOURCE	3PH 200-230V 50/60Hz 16.1A
OUTPUT	3PH 3.8 kVA 200-230V 1.0-1667 Hz 10 A 125%-1min
SER.No.	071234R0001
Fuji Electric Co., Ltd. Made in Japan	

Ratings nameplate

FRN 2.2 H11S-2 Power supply voltage system
 :2→ 200V grade
 Series name:H11S
 Nominal applied motor:2.2→2.2kW
 Product type: FRENIC5000

SOURCE : Power rating
OUTPUT : Output rating
SER.No. : Serial number

0 7 1 2 3 4 R 0 0 0 1

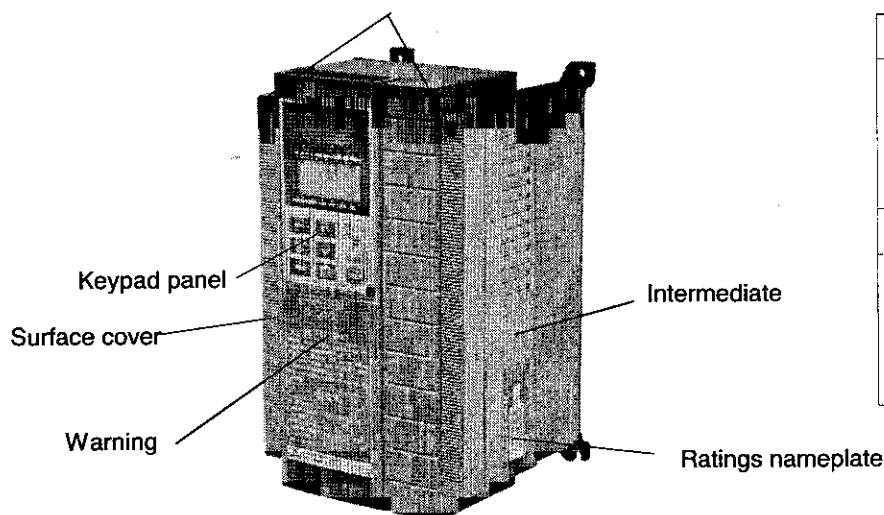
Production lot serial number
 Production month:1to 9: January to September,
 X: October, Y: November, Z: December
 Production year: Last digit of year
 (0--> 2000)

- ② Check for damaged and/or missing parts upon delivery.

- ③ In addition to the inverter unit and this manual, the package contains rubber bushing and a terminating resistor (1/2 W, 120Ω). The terminating resistor is packed in a sack. This terminating resistor is required for RS485 communication. The resistor need not be removed regardless of RS485 communication status.

1-2 Appearance

Mounting screws of surface cover



⚠ WARNING	
■	Refer to the user's manual before installation and operation.
■	Do not remove this cover while applying power and at least 5 min. after disconnecting power.
■	Securely ground (earth) the equipments.
■ 危険	
■	けが・感電のおそれあり 絶え付け運転時の前に、必ず取扱説明書を読んで、その指示に従うこと
■	感電のおそれあり 過電中及び電源遮断後5分以内は、表面カバーを開けないこと
■	確実に接地をおこなうこと

1-3 Handling the Product

(1) Removing the surface cover

Loosen the screws that fix the surface cover, and then remove the cover by pulling the top (see Figure 1-3-1).

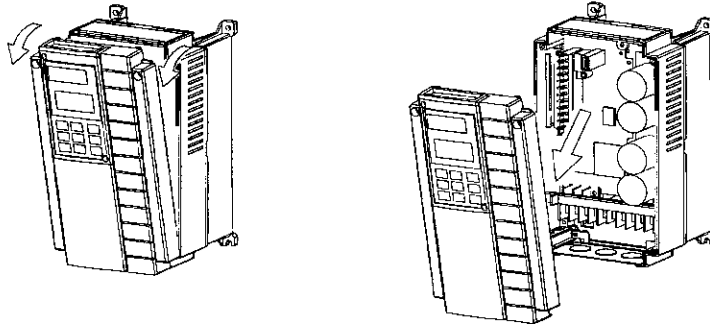


Fig.1-3-1 Removing the surface

(2) Removing the keypad panel

After removing the surface cover as explained in (1), loosen the mounting screws of the keypad panel and remove as shown in Figure 1-3-2.

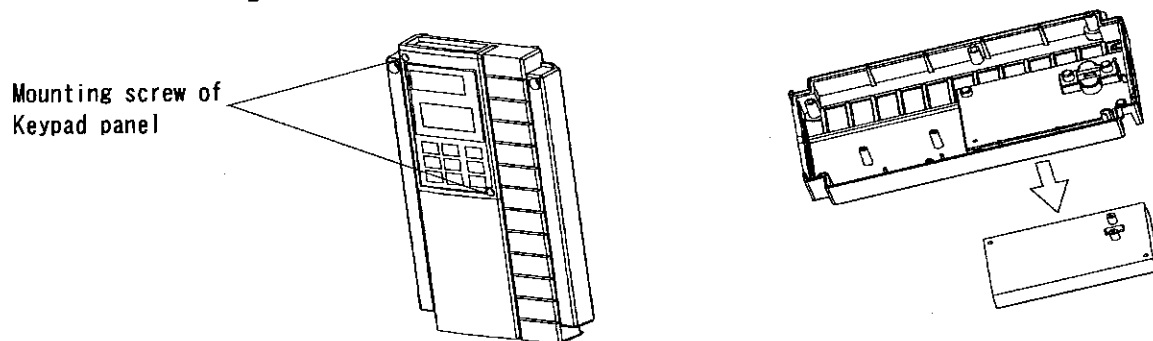


Fig.1-3-2 Removing the keypad panel

1-4 Carrying

Carry the product by the main unit.

Do not carry the product by holding the cover or parts other than the main unit.

Use a crane or hoist to carry a product equipped with hanging holes.

1-5 Storage

Temporary storage

Temporary storage of this product must meet those conditions listed in Table 1-5-1.

Table 1-5-1 Storage environment

Item	Specifications	
Ambient temperature	-10 to +50 °C	Condensation or freezing must not occur as a result of sudden temperature changes.
Storage temperature	-25 to +65	
Relative humidity	5 to 95% ^{Note2}	
Atmosphere	Pollution degree 2	
Air pressure	Operation/storage : 86 to 106 kPa Transport : 70 to 106 kPa	

Note1: The storage temperature applies only to short periods such as transport.

Note2: As a large change in temperature within this humidity range may result in condensation or freezing, do not store where such temperature changes may occur.

- ① Do not place this product directly on a floor.
- ② To store the product in an extreme environment, pack in vinyl sheet, etc.
- ③ If the product is stored in a high-humidity environment, insert a drying agent (e.g., silica gel) and pack the product in vinyl sheet.

Long-term storage

If the product is to be stored for an extended period after purchase, the method of storage depends primarily on storage location.

The general long-term storage method is as follows:

- ① The above conditions for temporary storage must be satisfied.
When the storage period exceeds three months, the upper limit of ambient temperature must be reduced to 30°C to prevent the deterioration of the electrolytic capacitors.
- ② Pack the product thoroughly to eliminate exposure to moisture and include a drying agent to ensure a relative humidity of about 70% or less.
- ③ If the product is mounted on a unit or control panel and is left unused and exposed to the elements like moisture or dust (particularly on a construction site), remove the product and store in a suitable environment.
- ④ Electrolytic capacitors not provided with power for an extended period will deteriorate. Do not store electrolytic capacitors for one year or longer without providing power.

2. Installation and Connection

2-1 Operating Environment

Install this product in a location that meets those conditions listed in Table 2-1-1

Table 2-1-1 Operating environment

Item	Specifications
Location	Indoor
Ambient temperature	-10 to +50°C (The ventilating covers must be removed if ambient temperature exceeds +40°C)
Relative humidity	5 to 95% (No condensation)
Atmosphere	Free from corrosive gases, flammable gases, oil mist, dusts, and direct sunlight.
Air pressure	86 to 106 kPa
Vibration	3 mm : from 2 to less than 9 Hz , 1 m/s : from 9 to less than 20 Hz , 1 m/s : from 20 to less than 55 Hz , 1 m/s : from 55 to less than 200 Hz

Table 2-1-2 Output current reduction rate based on altitude

Altitude	Output current reduction rate
up to 1000 m	1.00
1000-1500m	0.97
1500-2000m	0.95
2000-2500m	0.91
2500-3000m	0.88

2-2 Installation Method

- Securely fasten the product in an upright position on a solid structure such that FRENIC5000H11S is facing the front. Do not turn the product upside down or install in a horizontal position.
- As heat is generated during inverter operation, the spaces shown in Fig. 2-2-1 are required to ensure sufficient cooling. As heat radiates upward, do not install the product beneath a device sensitive to heat.
- As the heat sink may reach a temperature of 90°C during inverter operation, ensure that the material surrounding the product can withstand this temperature.

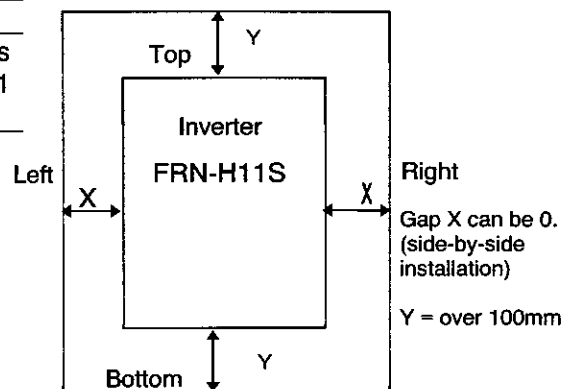


Fig. 2-2-1

⚠ WARNING Install this product on nonflammable material such as metal. Fire may result.

- When installing this product in a control panel, consider ventilation to prevent ambient temperature of the inverter from exceeding the specified value. Do not install the product in an area from which heat cannot be sufficiently released.
- If two or more inverters must be installed in the same device or control panel, arrange the units horizontally to minimize the effect of heat. If two or more inverters must be installed vertically, place an insulated plate between the inverters to minimize the effect of heat.
- When shipped from the factory, inverters are internal cooling type inside panel. An inverter can be converted to an external cooling type simply by adding an optional mounting adapter. In an external cooling system, a heat sink radiating about 70% of total inverter heat (total loss) can be placed outside the device or control panel. Ensure that heat sink surfaces are kept free of foreign matter (lint, moist dust particles etc.).

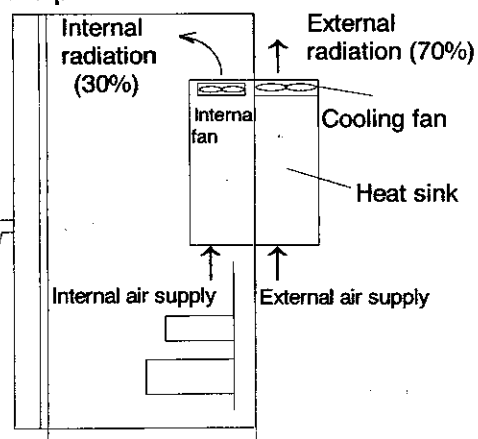


Fig.2-2-2 External cooling system

⚠ WARNING

- In case of external cooling system, cover the inverter rear side in order not to touch the main capacitor and braking resistor. **Electric shock may result.**
- Ensure that the inverter and heat sink surfaces are kept free of foreign matter such as lint, paper dust, small chips of wood or metal, and dust. **Fire or accident may result.**

⑦ Remove the ventilation cover if the ambient temperature exceeds 40°C or "1" is set at the function H07.

(1) Removing the ventilating covers

One ventilating cover is mounted on top of the inverter and two or three are mounted at the bottom. Remove the surface cover, then remove ventilating covers by popping out the cover inserts as shown in Fig. 2-2-3.

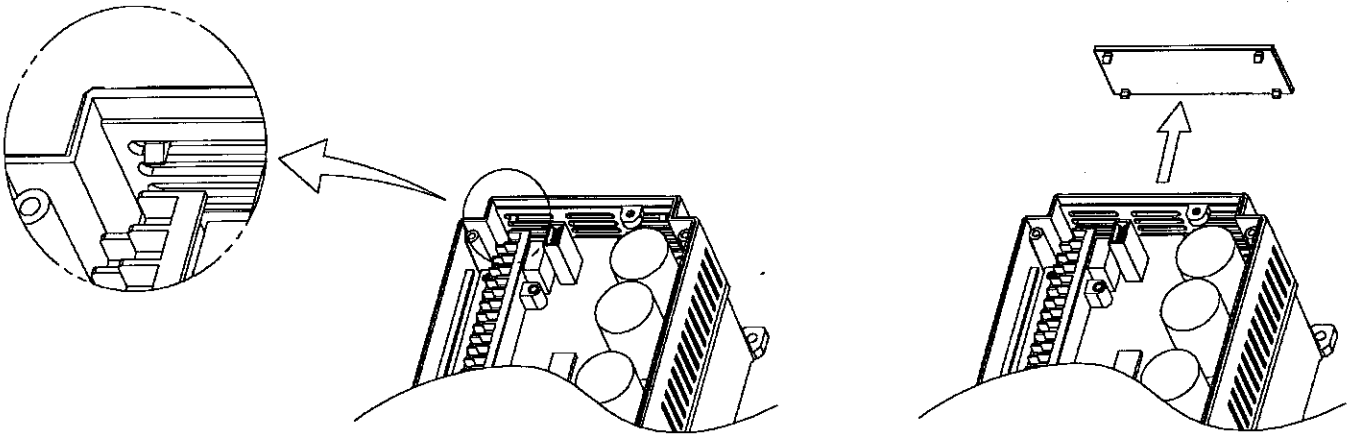


Fig. 2-2-3 Removing the ventilating cover

2-3 Connection

Remove the surface cover before connecting the terminal blocks as follows.

2-3-1 Basic connection

- ① Always connect power to the L1/R, L2/S, and L3/T main circuit power terminals of the inverter. Connecting power to another terminal will damage the inverter. Check that the power voltage is within the maximum allowable voltage marked on the nameplate, etc.
- ② Always ground the ground terminal to prevent disasters such as fire or electric shock and to minimize noise.
- ③ Use a reliable crimp terminal for connection between a terminal and a cable.
- ④ After terminating the connection (wiring), confirm the following:
 - a. Confirm that the connection is correct.
 - b. Confirm that all necessary connections have been made.
 - c. Confirm that there is no short-circuit or ground fault between terminals and cables.

⑤ Connection modification after power-on

The smoothing capacitor in the direct current portion of the main circuit cannot be discharged immediately after the power is turned off. To ensure safety, use a multimeter to check that the voltage of the direct current (DC) is lowered to the safety range (25V DC or less) after the charge lamp goes off. Also, confirm that the voltage is zero before short-circuiting. The residual voltage (electric charge) may cause sparks.

⚠ WARNING

- Always connect a ground wire.
Electric shock or fire may result.
- Ensure that a licensed specialist performs all wiring works.
- Confirm that the power is turned off (open) before commencing wiring operations.
Electrical shock may result.

■ Basic connection diagram

① S W 1 (Sink side) Factory shipment state

FRN15H11S, FRN18. 5H11S

FRN2. 2H11S~FRN7. 5H11S

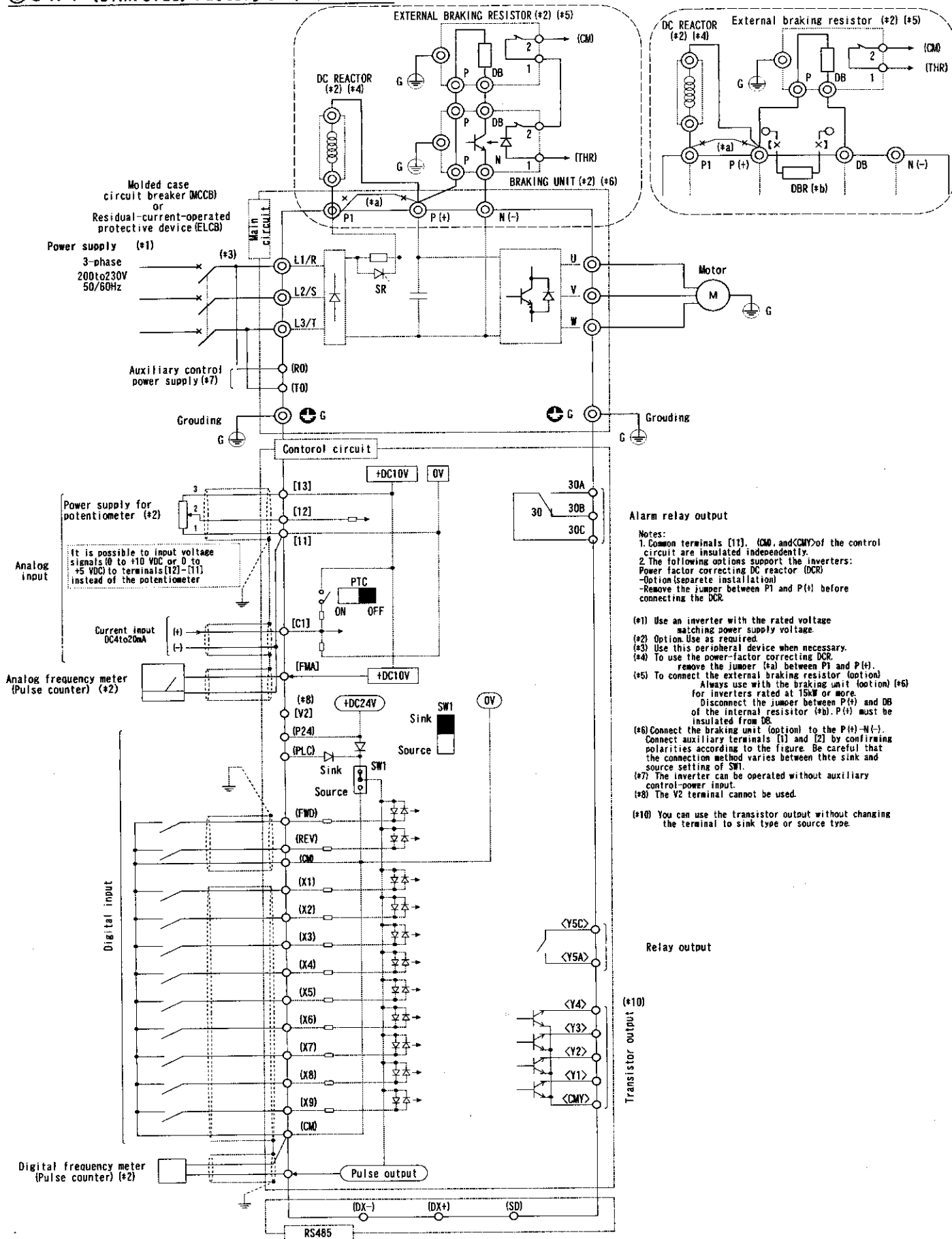


Fig. 2-3-1

② SW 1 (Source side)

FRN15H11S, FRN18. 5H11S

FRN2. 2H11S~FRN7. 5H11S

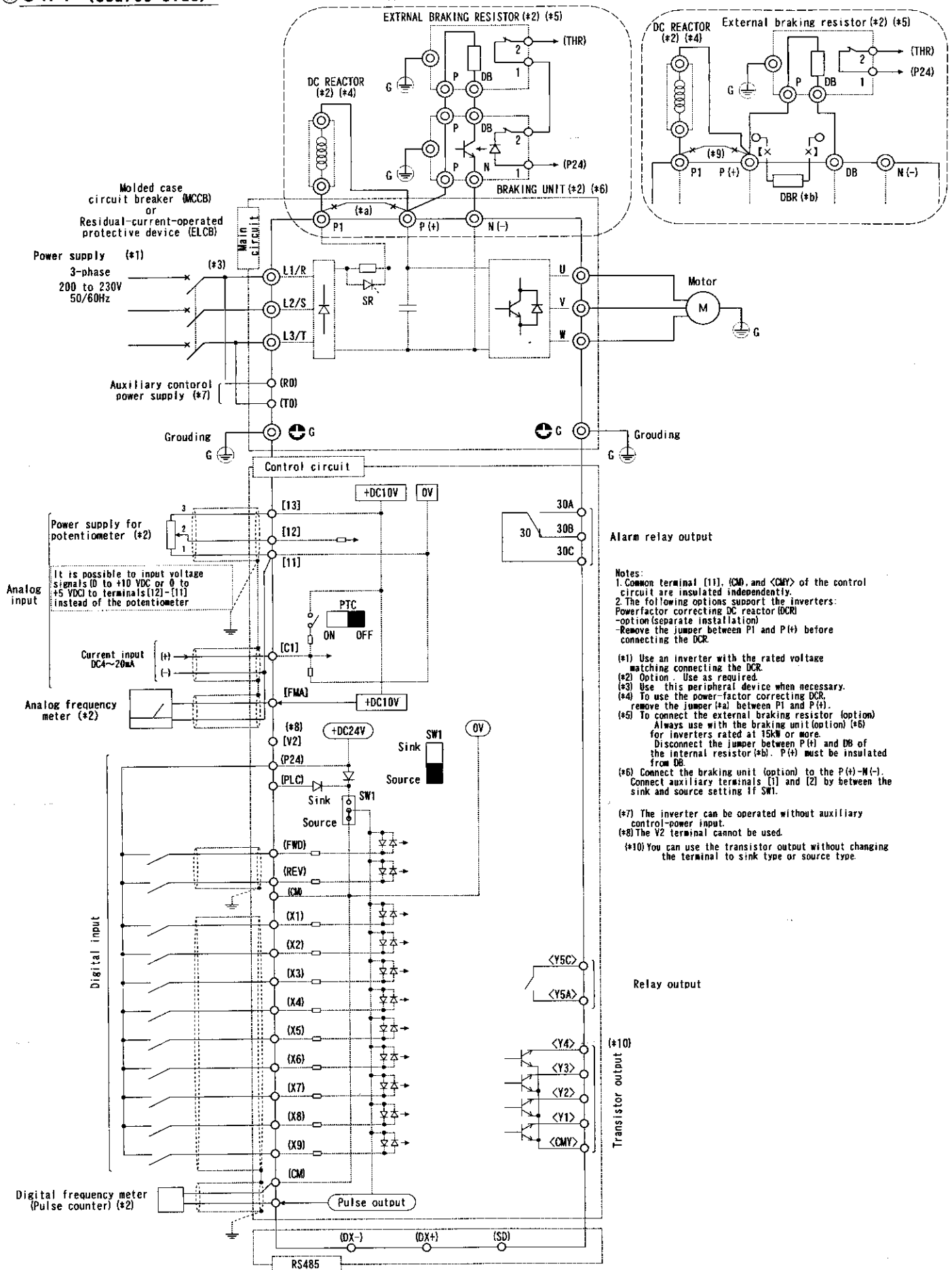


Fig. 2-3-2

2-3-2 Connecting the main circuit and ground terminals

Table 2-3-1 Functions of main circuit terminals and ground terminals

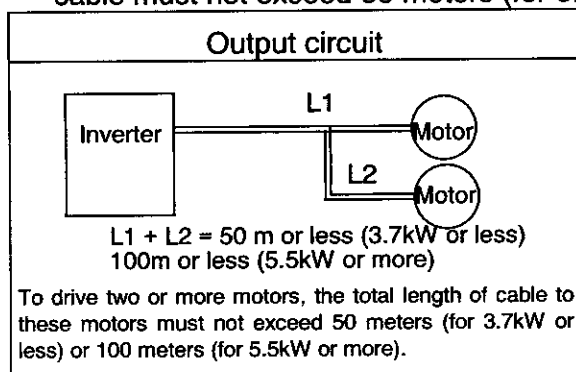
Symbol	Terminal name	Description
L1/R,L2/S,L3/T	Main circuit power terminal	Connects a 3-phase power supply.
U,V,W	Inverter output terminal	Connects a 3-phase motor.
R0,T0	Auxiliary control power input terminal	Connects a backup AC power supply to the control circuit. (Not supported for inverter of 0.75kW or less)
P1,P(+)	DC reactor connecting terminal	Connects the optional power-factor correcting DC reactor.
P(+),DB	External braking resistor connecting terminal	Connects the optional external braking resistor. (For inverter of 7.5kW or less)
P(+),N(-)	DC link circuit terminal	Supplies DC link circuit voltage to the external braking unit (option) or power regeneration unit (option).
• G	Inverter ground terminal	Grounds the inverter chassis (case) to the earth.

(1) Main circuit power terminals (L1/R, L2/S, L3/T)

- ① Connect these terminals to the power supply via a molded-case circuit breaker or earth-leakage circuit breaker for circuit (wiring) protection. Phase-sequence matching is unnecessary.
- ② To ensure safety, a magnetic contactor should be connected to disconnect the inverter from the power supply when the inverter protective function activates.
- ③ Use control circuit terminal FWD/REV or the RUN/STOP key on the keypad panel to start or stop the inverter. The main circuit power should be used to start or stop the inverter only if absolutely necessary and then should not be used more than once every hour.
- ④ Do not connect these terminals to a single-phase power supply.

(2) Inverter output terminal (U, V, W)

- ① Connect these terminals to a 3-phase motor in the correct phase-sequence. If the direction of motor rotation is incorrect, exchange any two of the U, V, and W phases.
- ② Do not connect a phase-advance capacitor or surge absorber to inverter output.
- ③ If the cable from the inverter to the motor is very long, a high-frequency current may be generated by stray capacitance between the cables and result in an overcurrent trip of the inverter, an increase in leakage current, or a reduction in current indication precision. To prevent this, the cable must not exceed 50 meters (for 3.7kW or less) or 100 meters (for 5.5kW or more).



(3) Auxiliary control-power input terminals (R0 and T0)

The inverter operates even if power is not provided to these terminals.

If a protective circuit operates and the magnetic contactor on the inverter power side is opened (off), the inverter control circuit power, the alarm output (30A, B, and C), and the keypad panel display goes off. To prevent this, the same AC power as the main circuit AC power must be supplied (as auxiliary control power) to the auxiliary control-power input terminals (R0 and T0).

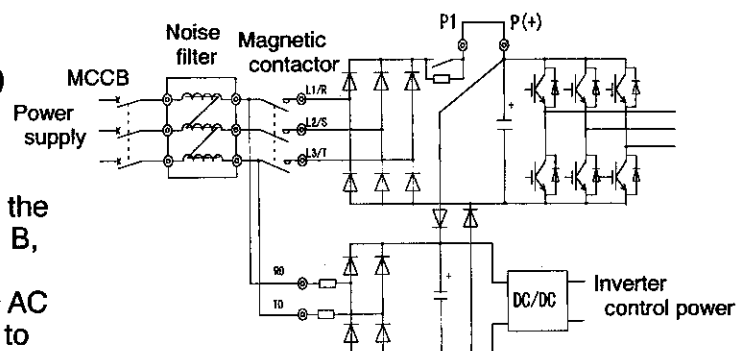


Fig.2-3-3 Connecting the auxiliary control-power input terminals

① To ensure effective noise reduction when using a radio noise filter, the output power from the filter must go to the auxiliary control-power input terminals. If these terminals are connected to the input side of the filter, the noise reduction effect deteriorates.

(4) DC reactor connecting terminals (P1 and P(+))

- ① Before connecting a power-factor correcting DC reactor (optional) to these terminals, remove the factory-installed jumper.
- ② If a DC reactor is not used, do not remove the jumper.

(5) External braking-resistor connecting terminals (P(+) and DB)
(H11S: 7.5kW or less)

For the H11S of 7.5kW or less, a built-in braking resistor is connected to terminals P(+) and DB. If this braking resistor does not provide sufficient thermal capacity (e.g., in highly repetitive operation or heavy inertia load operation), an external braking resistor (option) must be mounted to improve braking performance.

- ① Remove the built-in braking resistor from terminals P(+) and DB. Insulate the resistor-removed terminals with adhesive insulation tape, etc.
- ② Connect terminals P(+) and DB of the external braking resistor to terminals P(+) and DB of the inverter.
- ③ The wiring (cables twisted or otherwise) should not exceed 5 meters.

(6) DC link circuit terminals (P(+) and N(-))

The H11S inverter of 15kW or more does not contain a drive circuit for the braking resistor. To improve braking performance, an external braking unit (option) and an external braking resistor (option) must be installed.

- ① Connect terminals P(+) and N(-) of the braking unit to terminals P(+) and N(-) of the inverter. The wiring (cables twisted or otherwise) should not exceed 5 meters.
- ② Connect terminals P(+) and DB of the braking resistor to terminals P(+) and DB of the braking unit.

The wiring (cables twisted or otherwise) should not exceed 10 meters. When terminals P(+) and N(-) of the inverter are not used, leave terminals open. If P(+) is connected to N(-) or the braking resistor is connected directly, the resistor will break.

- ③ Auxiliary contacts 1 and 2 of the braking unit have polarity. To connect the power regeneration unit, refer to the "Power Regeneration Unit Instruction Manual".

(7) Inverter ground terminal

To ensure safety and noise reduction, always ground the inverter ground terminal. Also, metal frames of electrical equipment must be grounded as specified in the Electric Facility Technical Standard.

The connection procedure is as follows:

- ① Ground metal frames to a ground terminal (Ground resistance: 100Ω or less).
- ② Use a suitable cable (short and thick) to connect the inverter system to the ground terminal.

(8) Function for switching digital input terminals between sink type and source type

The input method of digital input terminals (FWD, REV, X1 to X9) can be switched to the source type or the sink type using the switch (SW1) on the control board. Table 2-3-3 and Figure 2-3-7 show the method of setting the terminal type.

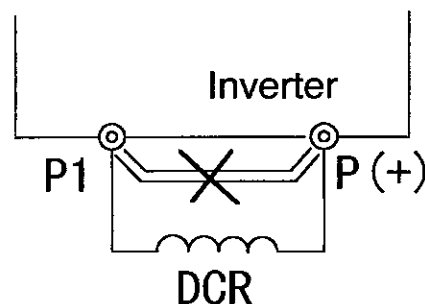


Fig. 2-3-4

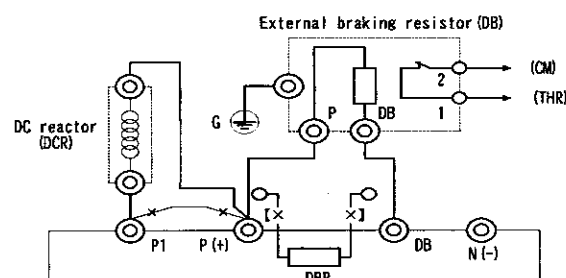


Fig. 2-3-5 Connection
(H11S : 7.5kW or less)

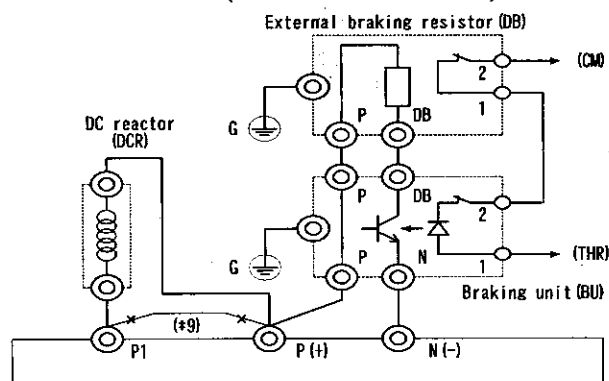


Fig. 2-3-6 Connection
(H11S : When SW1 (sink side) is selected for
H11S of 15kW or over)

Table 2-3-3 Setting switch 1(SW 1)

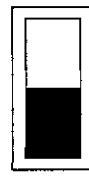
Input type	Setting short terminal
Sink type (default)	Set for sink side.
Source type	Set for source side.



Sink

Source

Sink type (default)



Sink

Source

Source type

Fig2-3-7 Setting switch (SW 1)


The input terminals are set to the sink type by default.

[Connection method]

The following table (2-3-4) shows the circuit diagrams for sink type and source type.

Table2-3-4. Connection method

Power supply	Type	Connection (※ Example input terminal: FWD)
Internal	Sink type	
External	Sink type	
Internal	Source type	
External	Source type	

 CAUTION	<p>Check that the number of phases and rated voltage of this product match those of the AC power supply.</p> <p>Do not connect the AC power supply to the output terminals (U, V, W).</p> <p>Injury may result.</p> <p>Do not connect a braking resistor directly to the DC terminals (P[+] and N[-]).</p> <p>Fire may result.</p>
--	--

2-3-3 Connecting the control terminals

Table 2-3-5 lists the functions of the control circuit terminals. A control circuit terminal should be connected according to the setting of its functions.

Table 2-3-5

TABLE E-9

Classification	Terminal symbol	Terminal name	Function	Remarks																							
Analog input	13	Potentiometer power supply	Used for +10 Vdc power supply for frequency setting POT (variable resistor of 1 to 5 k Ω)	Max 10mA																							
	12	POT voltage input	Set the frequency according to the power source data given through an external analog input. • 0 to +10 Vdc/0 to 100% (0 to +5 Vdc/0 to 100%) • Reversible operation using positive and negative signals 0 to +/-10 Vdc/0 to +/-100% (0 to +5 Vdc/0 to 100%) (However, the setting resolution of 0 to +/-10 Vdc is multiplied by two.) • Reverse operation: +10 to 0 Vdc/0 to 100% (Switched by digital input signal or function code.)	• Input impedance 22 k Ω • Up to 15 Vdc can be input. However, voltages larger than 10 V is considered to be 10 V.																							
	C1	Frequency setting current input	Set the frequency according to the power source data given through an external analog input. • 4 to 20 mAdc/0 to 100% • Reverse operation: 20 to 4 mAdc/0 to 100% (Switched by digital input signal or function code.)																								
		PTC thermistor	Connects a PTC thermistor for the protection of the motor.																								
	V2	Voltage input 2	Cannot be used.																								
	11	Analog common	Common terminal for analog input signals	Isolated from CMY and CM																							
Digital input	FWD	Forward operation /stop command	Used for forward operation (when FWD-CM is on) or deceleration and stop (when FWD-CM is off).	If both signals are input simultaneously, the inverter decelerates and stops.																							
	REV	Reverse operation /stop command	Used for forward operation (when REV-CM is on) or deceleration and stop (when REV-CM is off).																								
	X1	Digital input1	You can set the functions such as external coast-to-stop command, external alarm, error reset, multistep frequency selection, and motor selection signal as the terminal functions from X1 to X9. For details, refer to the method of setting terminal function codes E01 to E09 described in 5-2 Function Explanation.																								
	X2	Digital input2																									
	X3	Digital input3																									
	X4	Digital input4																									
	X5	Digital input5																									
	X6	Digital input6																									
	X7	Digital input7																									
	X8	Digital input8																									
	X9	Digital input9																									
			<table><tr><th colspan="2">Item</th><th>min.</th><th>typ.</th><th>max.</th></tr><tr><td rowspan="2">Operating voltage</td><td>ON level</td><td>0V</td><td>-</td><td>2V</td></tr><tr><td>OFF level</td><td>22V</td><td>24V</td><td>27V</td></tr><tr><td colspan="2">Operating current at ON level</td><td>-</td><td>3.2mA</td><td>4.5mA</td></tr><tr><td colspan="2">Allowable leakage current at OFF level</td><td>-</td><td>-</td><td>0.5mA</td></tr></table>		Item		min.	typ.	max.	Operating voltage	ON level	0V	-	2V	OFF level	22V	24V	27V	Operating current at ON level		-	3.2mA	4.5mA	Allowable leakage current at OFF level		-	-
	Item		min.	typ.	max.																						
Operating voltage	ON level	0V	-	2V																							
	OFF level	22V	24V	27V																							
Operating current at ON level		-	3.2mA	4.5mA																							
Allowable leakage current at OFF level		-	-	0.5mA																							

Classification	Terminal symbol	Terminal name	Function	Remarks
Digital input	PLC	PLC signal power supply	Connects the output signal power supply of the PLC.	
	P24	24 Vdc power supply	Terminal for 24 Vdc power supply. (+24 V, max. 100 mA)	
	CM	Digital common	Common terminal for digital input signals	Isolated from terminals CMY and 11.
Analog output	FMA (11)	Analog monitor (Analog common)	Outputs the monitor signals using the analog DC voltages from 0 to +10V DC. Outputs a DC voltage corresponding to one selected from the following items. Output frequency Output current Output voltage DC link circuit voltage	The maximum allowable current consumption of the connected meter is 2 mA. • Up to two analog voltmeters can be connected (Input impedance: 10 k Ω)
Pulse output	FMP (CM)	Frequency monitor (pulse waveform output) (Digital common)	Outputs the monitor signal depending on the pulse voltage. Outputs a DC voltage corresponding to one selected from the following items. Output frequency Output current Output voltage DC link circuit voltage	The maximum allowable current consumption of the connected meter is 2 mA. • Up to two analog voltmeters can be connected. (Input impedance : 10 k Ω)
Transistor output	Y1	Transistor output 1	The signals generated by the inverter such as the inverter running signal, frequency equivalence signal, and overload early warning signal are sent as transistor output to the desired ports. For details, refer to the method of setting terminal function codes E20 to E23 described in 5-2 Function Explanation.	Can use the transistor output without changing the terminal to sink type or source type.
	Y2	Transistor output 2		
	Y3	Transistor output 3		
	Y4	Transistor output 4		
	CMY	Transistor output common	Common terminal for transistor output signal. Insulates terminals CM and 11.	
Contact output	30A,30 B,30C	Batch alarm output	Contact rating: AC250V, 0.3A, $\cos \phi = 0.3$ You can choose the relay excitation timing from either excitation at alarm occurrence or excitation during normal operation.	
	Y5A,Y5 C	Relay output multi-purpose signal	• The signal can be selected similarly to terminals Y1 through Y4. (Contact capacity: 250 VAC, 0.3 A, $\cos \phi = 0.3$) • The signal can be used to open or close an electromagnetic contactor installed in the input of the main power supply. • The contact rating is the same with that required for batch alarm output.	
Communication	DX+,D X-	RS485 communication input	• Terminal for I/O signals used in RS485 communication • Up to 31 inverters can be connected by means of multi-drop connection.	
	SD	Terminal connected with the shielding wire of the communication cable	Connect the shielding wire of the communication cable with this terminal. The terminal, however, is not connected with the main grounding wire.	

(1) Analog input terminals (13, 12, V2, C1, and 11)

- ① These terminals receive weak analog signals that may be affected by external noise. The cables must be as short as possible (20 meters or less), must be shielded, and must be grounded in principle. If the cables are affected by external induction noise, the shielding effect may be improved by connecting the shield to terminal [11].

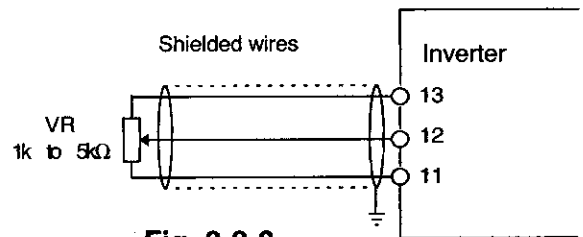


Fig. 2-3-8

- ② If contacts must be connected to these circuits, twin (bifurcated type) contacts for handling weak signals must be used. A contact must not be connected to terminal [11].

- ③ If an external analog signal output device is connected to these terminals, it may cause malfunction as a result of inverter noise. To prevent malfunction, connect a ferrite core or capacitor to the external analog signal output device.

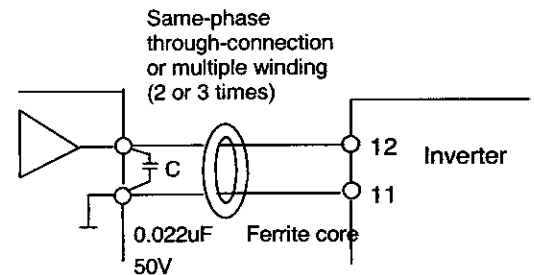


Fig. 2-3-9 Example of noise prevention

(2) Digital input terminals (FWD, REV, X1 to X9 and CM)

- ① Digital input terminals (e.g., FWD, REV, X1 to X9) are generally turned on or off by connecting or disconnecting the line to or from the CM terminal. If Digital input terminals are turned on or off by switching the open collector output of PLC using an external power supply, a resulting bypass circuit may cause the inverter to malfunction.

To prevent a malfunction, connect the PLC terminal as shown in Fig. 2-3-10

- ② When using a contact input, a relay having highly reliable contact must be used.

Example: Fuji Electric Control Relay : HH54PW

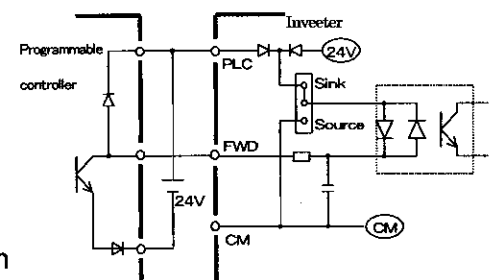


Fig. 2-3-10

Connection for External power supply

(3) Transistor output terminals (Y1 to Y4, CMY)

- ① To connect a control relay, connect a surge absorbing diode to both ends of its exciting coil.

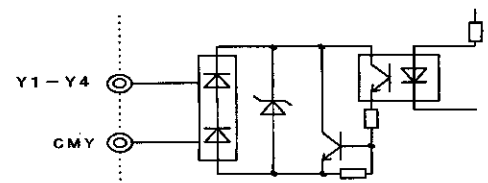


Fig. 2-3-11

Circuit of Transistor output

(4) Others

- ① To prevent a malfunction as a result of noise, control terminal cables must be placed as far as possible from the main circuit cables.
- ② The control cables inside the inverter must be secured to prevent direct contact with live section (e.g., main-circuit terminal block) of the main circuit.

<p>⚠ WARNING</p>	<p>Control lines generally do not have enhanced insulation. If the insulation of a control line is damaged, the control signals may be exposed to high voltage in the main circuit. The Low Voltage Directive in Europe also restricts the exposure to high voltage.</p> <p>Electric shock may result</p>
<p>⚠ CAUTION</p>	<p>The inverter, motor, and cables generate noise. Check that the ambient sensors and devices do not cause malfunction.</p> <p>Accident may result.</p>

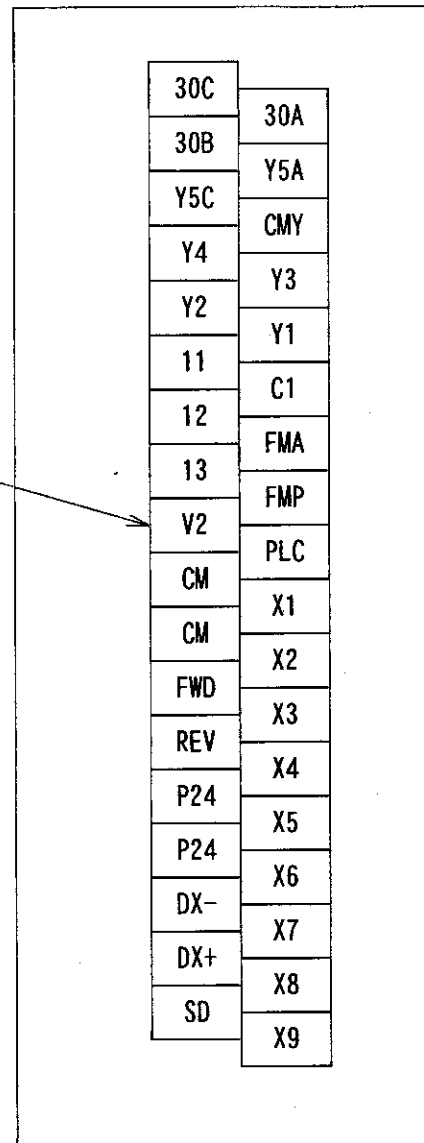
2-3-4 Terminal arrangement

(1) Main circuit terminals

<div>FRN2.2 to 3.7H11S-2</div> <div><div>R0T0</div><div>Screw size M3.5</div></div> <div><div>L1RL2SL3TDBP1P(+)N(-)UVW</div><div><div>*G</div><div>Screw size M4</div><div>*G</div></div></div>	<div>FRN5.5 to 7.5H11S-2</div> <div><div>R0T0</div><div>Screw size M3.5</div></div> <div><div>L1RL2SL3TDBP1P(+)N(-)UVW</div><div><div>*G</div><div>Screw size M5</div><div>*G</div></div></div>
<div>FRN15 to 18.5H11S-2</div> <div><div>R0T0</div><div>Screw size M3.5</div></div> <div><div>L1RL2SL3TDBP1P(+)N(-)UVW</div><div><div>*G</div><div>Screw size M6</div><div>*G</div></div></div>	

(2) Control terminal

Caution:
V2 terminal is not usable.
Do not connect any signal
cable to V2 terminal.
(If connected, the motor
rotates at the maximum
frequency, causing hazards.)



Control terminal connection method

Cable:

Use the cable AWG:16-18 for the control terminal. When using the cable after removing insulation at the end, ensure that the cutting length is 6mm.

When using a crimped terminal, select a vinyl-insulated bar type terminal.

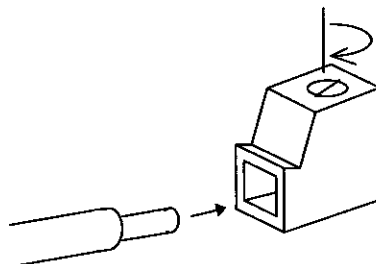
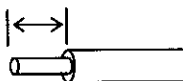
Connection method:

Insert the cable into the metal block on the terminal base and tighten the screw to fix it.

[Cable size]

AWG : 16-18

6 (mm)



Wiring connecting on the control
terminal side

2-3-5 Applicable equipment and wire size for main circuit

Voltage	Application Motor [kW]	Inverter type	Fuse/MCCB current rating [A]		Tightening torque [N*m]				Recommended wire size [mm2]								
			With DCR	Without DCR	L1/R, L2/S, L3/T U, V, W P1, P(+), DB, N(-)	G	R0, T0	Control	L1/R, L2/S L3/T		G	U, V, W	R0, T0	P1, P(+)	P(+), DB, N(-)	Control	
									With DCR	Without DCR							
3phase 200V	2.2	FRN2.2H11S-2	10	20	1.8	1.2	0.5	~	0.6	2	2	2	2	2	2	2	0.2 to 0.75
	3.7	FRN3.7H11S-2	20	30							3.5						
	5.5	FRN5.5H11S-2	30	50	3.5					5.5	3.5	3.5	2	5.5			
	7.5	FRN7.5H11S-2	40	75						8		8		14			
	15	FRN15H11S-2	75	125	5.8					8	22	8	14	22			
	18.5	FRN18.5H11S-2	100	150						14	38	14	22				


Note: The type of wire is 70°C 600V Grade heat-resistant polyvinyl chloride insulated wires (PVC).
The above-mentioned wire size are the recommended size under the condition of the ambient temperature 50°C or lower.

3. Operation

3-1 Inspection and Preparation before Operation

Check the following before operation:

- ① Check that the connection is correct.
In particular, check that the power supply is not connected to any of the U, V, and W output terminals and that the ground terminal is securely grounded.
- ② Check for short-circuits and ground faults between the terminals and live sections.
- ③ Check for loose terminals, connectors, or screws.
- ④ Check that the motor is separated from mechanical equipment.
- ⑤ Turn off switches before turning power to ensure that the inverter will not start or operate abnormally at power-on.
- ⑥ Check the following after power-on:
 - a. Check that no alarm message is displayed on the keypad panel (see Figure 3-1-2).
 - b. Check that the fan inside the inverter is rotating.

 WARNING	<p>Be sure to put on the surface cover before turning on the power (close). Never remove the cover while the power is applied to the inverter.</p> <p>To ensure safety, do not operate switches with wet hands.</p> <p>Electric shock may result</p>
---	---

3-2 Operation Method

There are various methods of operation. Select a method of operation according to operating purpose and specifications by referring to Section 4-2, "Operating the Keypad Panel," and Chapter 5, "Explanation of Functions." Table 3-2-1 lists general operation methods

3-3 Trial Run

Upon confirming that inspection results are normal (see Section 3-1), proceed with a trial run. The initial operation mode (set at factory) is using the keypad panel.

- ① Turn power on and confirm that frequency display 0.00 Hz is blinking on the LED monitor.
- ② Set the frequency to about 5Hz using **Δ** key.
- ③ To start the run, press **FWD** key (for forward rotation) or **REV** key (for reverse rotation). To stop, press **STOP** key.
- ④ Check the following items :
 - a. Is the rotating direction correct ?
 - b. Is the rotation smooth? (no buzzing or abnormal vibration)
 - c. Is acceleration and deceleration smooth?
 If no abnormality is detected, increase the frequency and check the above items again.

If the results of the trial run are normal, start a formal run.

- Notes:** - If an error is detected in the inverter or motor, immediately stop the operation and attempt to determine the cause of error referring to Chapter 7, "Troubleshooting."
- As voltage is still applied to the main circuit terminals (L1/R, L2/S, L3/T) and auxiliary control-power terminals (R0, T0) even when the output from the inverter is terminated, do not touch the terminals. The smoothing capacitor in the inverter is being charged after the power is turned off and it is not discharged immediately. Before touching an electric circuit, confirm that the charge lamp is off or a multimeter is indicating a low voltage at the terminals.

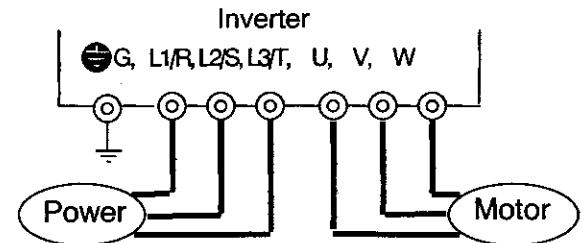


Fig. 3-1-1 Inverter connection



Fig. 3-1-2

Display on keypad panel at power-on

Table 3-2-1 General operation methods

Operation command	Frequency setting	Operation command
Operation using keypad panel	Keys on keypad panel Δ V	FWD REV STOP
Operation using external signal terminals	Δ V Freq. Setting POT(VR), analog voltage, analog current	Contact input (switch) Terminals FWD-CM and REV-CM

3-4 Motor switching function

This function allows the converter to switch the motor to be controlled among five motors and to operate the motor in the control method set to each motor.

Since the motor operation-related functions can be set to each motor, motor control is possible in five patterns simply by switching the motor.

The function codes for each motor are shown below:

[Setting items and function codes]

Function name	Function code				
	Motor1	Motor2	Motor3	Motor4	Motor5
Maximum frequency	F 0 3	P 0 4	P 2 1	A 0 1	A 1 8
Base frequency	F 0 4	P 0 5	P 2 2	A 0 2	A 1 9
First frequency	F 0 5	P 0 6	P 2 3	A 0 3	A 2 0
First voltage	F 0 6	P 0 7	P 2 4	A 0 4	A 2 1
Rated voltage	F 0 7	P 0 8	P 2 5	A 0 5	A 2 2
Maximum voltage	F 0 8	P 0 9	P 2 6	A 0 6	A 2 3
Acceleration time	F 0 9	P 1 0	P 2 7	A 0 7	A 2 4
Deceleration time	F 1 0	P 1 1	P 2 8	A 0 8	A 2 5
Torque boost	F 1 1	P 1 2	P 2 9	A 0 9	A 2 6
Electronic thermal (Select)	F 1 2	P 1 3	P 3 0	A 1 0	A 2 7
Electronic thermal (Level)	F 1 3	P 1 4	P 3 1	A 1 1	A 2 8
Electronic thermal (Thermal time constant)	F 1 4	P 1 5	P 3 2	A 1 2	A 2 9
Frequency limiter (High)	F 1 5	P 1 6	P 3 3	A 1 3	A 3 0
Starting frequency	F 1 6	P 1 7	P 3 4	A 1 4	A 3 1
FAR function (Hysteresis)	F 1 7	P 1 8	P 3 5	A 1 5	A 3 2
OL function (Level)	F 1 8	P 1 9	P 3 6	A 1 6	A 3 3
OL function (timer)	F 2 0	P 2 0	P 3 7	A 1 7	A 3 4

3-5 Data copy function

Using the KEYPAD panel, you can copy all the set function data to the other inverter except the following function data. Refer to "5. Function Selection" for the operation procedure.

[Function data that cannot be copied]

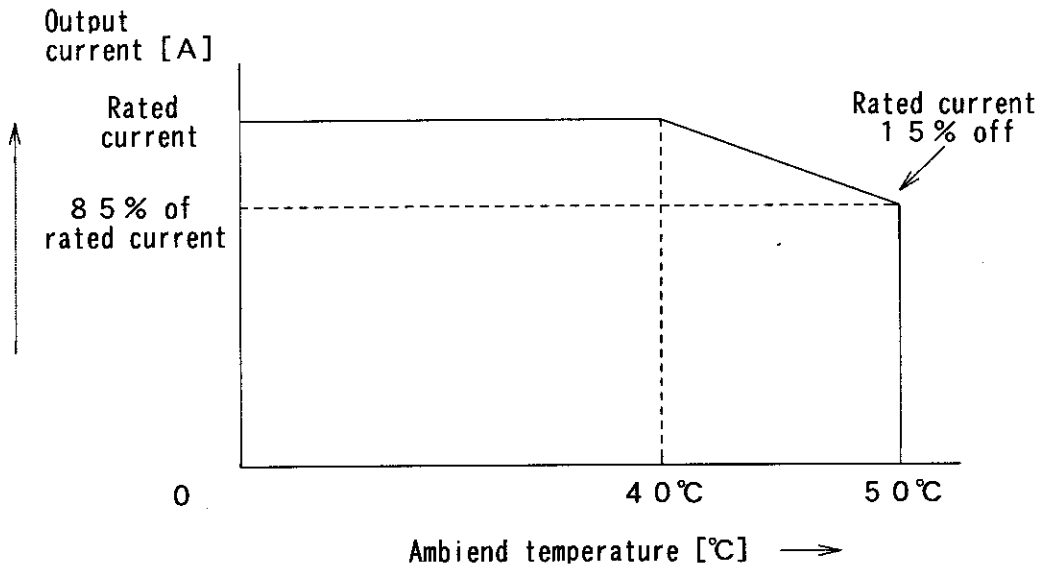
Function code	Function name
F00	Data protection
F21	Electronic thermal overload relay (for braking resistor)
H03	Data initializing
H31	RS485 settings (station address)

3-6 Caution in operation

Rated output current at working ambient temperature

Decrease the rated current by referring to the figure below when the working ambient temperature exceeds 40°C.

If the working ambient temperature is 50°C, the rated current should be reduced to 85% (15% less than the normal rated current).



4. Keypad Panel

The keypad panel has various functions for specifying operations such as keypad operation (frequency setting, run/stop command), confirming and changing function data, confirming status, and copying.

Review the use of each function before commencing running.

The keypad panel can also be removed or inserted during running. However, if the keypad panel is removed during a keypad panel operation (e.g., run/stop, frequency setting), the inverter stops and outputs an alarm.

4-1 Appearance of Keypad Panel



LED monitor:

Four-digit 7-segment display

Used to display various items of monitored data such as setting frequency, output frequency and alarm code.

Auxiliary information indication for LED monitor:

Selected units or multiple of the monitored data (on the LED monitor) are displayed on the top line of the LCD monitor. The ▲ symbol indicates selected units or multiple number. The symbol ▼ indicates there is an upper screen not currently displayed.

LCD monitor:

Used to display such various items of information as operation status and function data. An operation guide message, which can be scrolled, is displayed at the bottom of the LCD monitor.

Indication on LCD monitor:

Displays one of the following operation status:

FWD: Forward operation REV: Reverse

STOP: Stop

Displays the selected operation mode:

REM: Terminal block LOC: Keypad panel

COMM: Communication terminal

JOG: Jogging mode

The symbol ▼ indicates there is a lower screen not currently displayed.

RUN LED :

Indicates that an operation command was input by pressing the FWD or REV key.

operation

Control keys (valid during keypad panel operation):

Used for inverter run and stop

FWD : Forward operation command

REV : Reverse operation command

STOP : Stop command

Operation keys:

Used for screen switching, data change, frequency setting, etc.

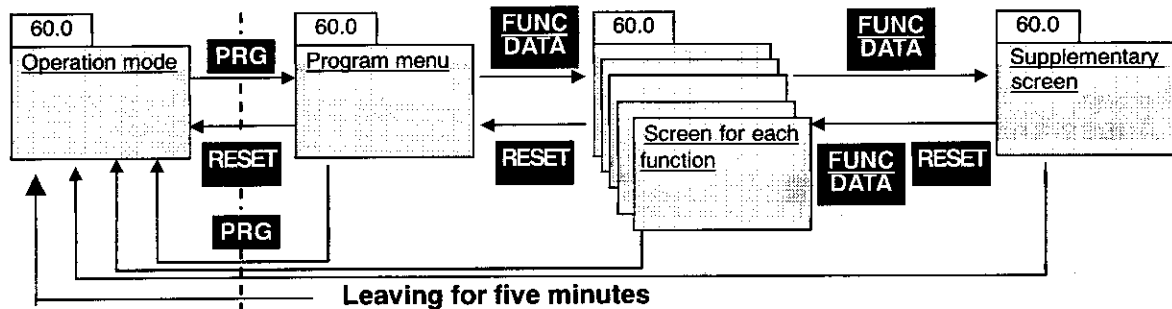
Table 4-1-1 Functions of operation keys

Operation key	Main function
PRG	Used to switch the current screen to the menu screen or switch to the initial screen in the operation/trip mode.
FUNC DATA	Used to switch the LED monitor or to determine the entered frequency, function code, or data.
▲ , ▼	Used to change data, move the cursor up or down, or scroll the screen
SHIFT	Used to move the cursor horizontally at data change. When this key is pressed with the up or down key, the cursor moves to the next function block.
RESET	Used to cancel current input data and switch the displayed screen. If an alarm occurs, this key is used to reset the trip status (valid only when the alarm mode initial screen is displayed).
STOP + ▲	Used to switch normal operation mode to jogging operation mode or vice versa. The selected mode is displayed on the LCD monitor.
STOP + RESET	Switches operation mode (from keypad panel operation mode to terminal block operation mode or reverse). When these keys are operated, function F02 data is also switched from 0 to 1 or from 1 to 0. The selected mode is displayed on the LCD indicator.

4-2 Keypad Panel Operation System (LCD screen, Level Structure)

4-2-1 Normal operation

The keypad panel operation system (screen transition, level structure) is structured as follows:
However, the LCD screen returns to Operation mode when Program menu screen is left for five minutes.



4-2-2 Alarm occurrence

If an alarm is activated, operation is changed from normal keypad panel operation to an alarm mode operation. The alarm mode screen appears and alarm information is displayed.

The program menu, function screens, and supplementary screens remain unchanged as during normal operation, though the switching method from program menu to alarm mode is limited to **PRG**.

However, the LCD screen returns to Alarm mode when Program menu screen is left for five minutes.

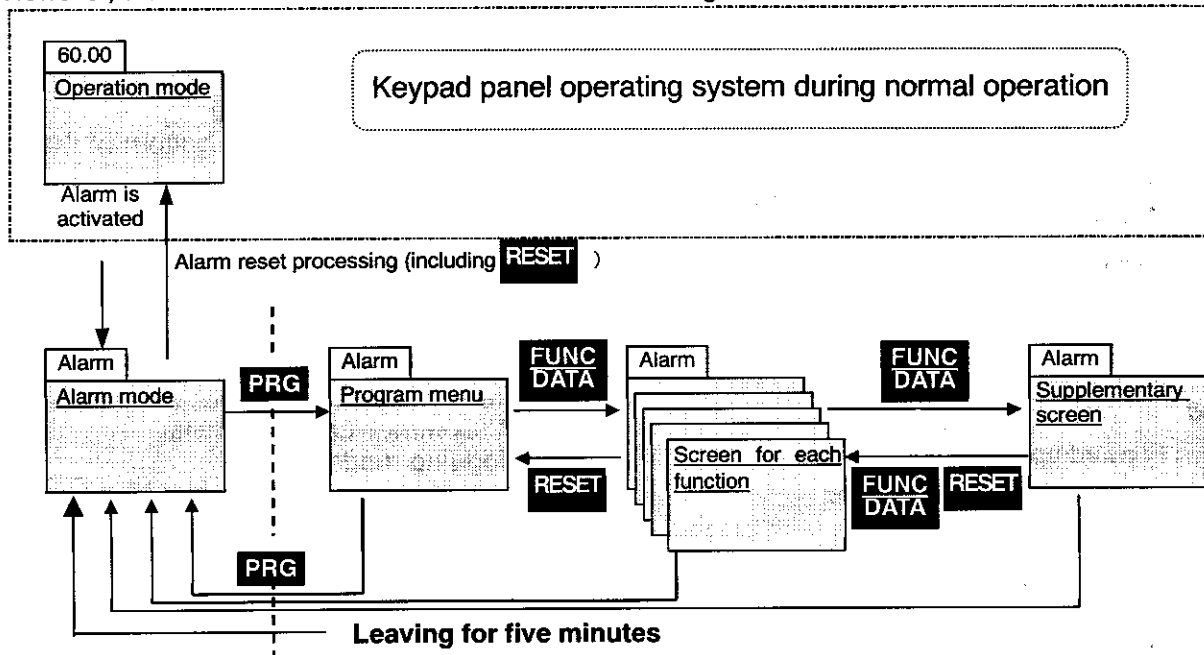


Table 4-2-1 Overview of contents displayed for each level

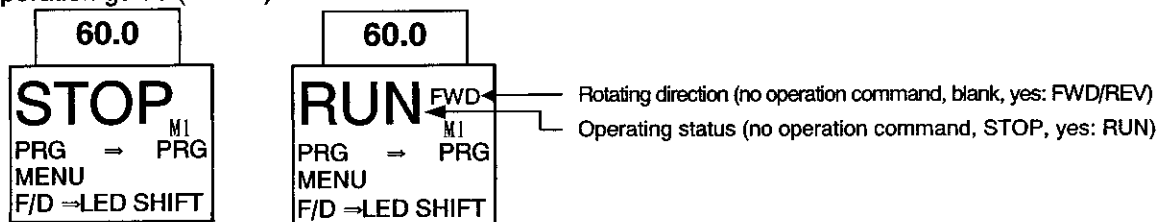
N o.	Level name	Content																														
1	Operating mode	This screen is for normal operation. Frequency setting by keypad panel and the LED monitor switching are possible only when this screen is displayed.																														
2	Program menu	<p>Each function of the keypad panel is displayed in menu form and can be selected. Selecting the desired function from the list and pressing FUNC DATA displays the screen of the selected function. The following functions are available as keypad panel functions (menus).</p> <table> <tr> <th>No.</th><th>Menu name</th><th>Outline</th></tr> <tr> <td>1</td><td>DATA SET</td><td>The code and name of the function are displayed. Selecting a function displays a data setting screen for checking, or modifying data.</td></tr> <tr> <td>2</td><td>DATA CHECK</td><td>The code and name of the function are displayed. Select a function to display a screen for checking data. Modifying data is possible as described above by going to the data setting screen.</td></tr> <tr> <td>3</td><td>OPR MNTR</td><td>Can check various data on the operating status.</td></tr> <tr> <td>4</td><td>I/O CHECK</td><td>Can check the status of analog and digital input/output for the inverter and options as an I/O checker.</td></tr> <tr> <td>5</td><td>MAINTENANC</td><td>Can check inverter status, life expectancy, communication error status, and ROM version information as maintenance information.</td></tr> <tr> <td>6</td><td>LOAD FCTR</td><td>Can measure maximum and average current and average breaking force in load rate measurement.</td></tr> <tr> <td>7</td><td>ALM INF</td><td>Can check the operating status and input/output status at the latest alarm occurrence.</td></tr> <tr> <td>8</td><td>ALM CAUSE</td><td>Can check the latest alarm or simultaneously occurred alarms and alarm history. Selecting the alarm and pressing FUNC DATA, displays the contents of alarm as troubleshooting.</td></tr> <tr> <td>9</td><td>DATA COPY</td><td>Places the function of one inverter in memory for copying to another inverter.</td></tr> </table>	No.	Menu name	Outline	1	DATA SET	The code and name of the function are displayed. Selecting a function displays a data setting screen for checking, or modifying data.	2	DATA CHECK	The code and name of the function are displayed. Select a function to display a screen for checking data. Modifying data is possible as described above by going to the data setting screen.	3	OPR MNTR	Can check various data on the operating status.	4	I/O CHECK	Can check the status of analog and digital input/output for the inverter and options as an I/O checker.	5	MAINTENANC	Can check inverter status, life expectancy, communication error status, and ROM version information as maintenance information.	6	LOAD FCTR	Can measure maximum and average current and average breaking force in load rate measurement.	7	ALM INF	Can check the operating status and input/output status at the latest alarm occurrence.	8	ALM CAUSE	Can check the latest alarm or simultaneously occurred alarms and alarm history. Selecting the alarm and pressing FUNC DATA , displays the contents of alarm as troubleshooting.	9	DATA COPY	Places the function of one inverter in memory for copying to another inverter.
No.	Menu name	Outline																														
1	DATA SET	The code and name of the function are displayed. Selecting a function displays a data setting screen for checking, or modifying data.																														
2	DATA CHECK	The code and name of the function are displayed. Select a function to display a screen for checking data. Modifying data is possible as described above by going to the data setting screen.																														
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7	ALM INF	Can check the operating status and input/output status at the latest alarm occurrence.																														
8	ALM CAUSE	Can check the latest alarm or simultaneously occurred alarms and alarm history. Selecting the alarm and pressing FUNC DATA , displays the contents of alarm as troubleshooting.																														
9	DATA COPY	Places the function of one inverter in memory for copying to another inverter.																														
3	Screen for each function	The function screen selected on the program menu appears, hence completing the function.																														
4	Supplementary screen	Functions not completed (e.g., modifying function data, displaying alarm factors) on individual function screens are displayed on the supplementary screen.																														

4-3 Operating Keypad Panel

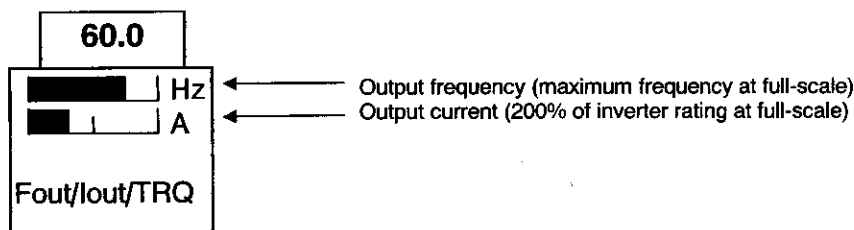
4-3-1 Operation Mode

The screen for normal inverter operation includes a screen for displaying inverter operating status and an operation guide and a screen for graphically displaying the operating status in the form of a bar graph. Switching between both screens is possible using the E45 function.

1) Operation guide (E45=0)



2) Bar graph (E45=1)



4-3-2 Setting digital frequency

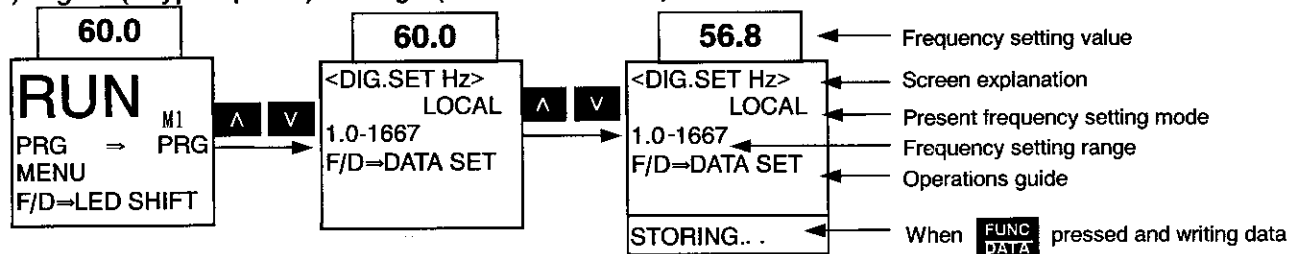
On the operation mode screen, press **▲** or **▼** to display the set frequency on the LED. Data is initially incremented and decremented in the smallest possible unit. Holding down **▲** or **▼** increases or decreases the speed of increment or decrement. The digit to change data can be selected using **SHIFT >>** and then data can be set directly. To save the frequency settings, press **FUNC DATA**. Press **RESET** and **PRG** to return to the operation mode.

[Method of saving the frequency setting with keypad panel]

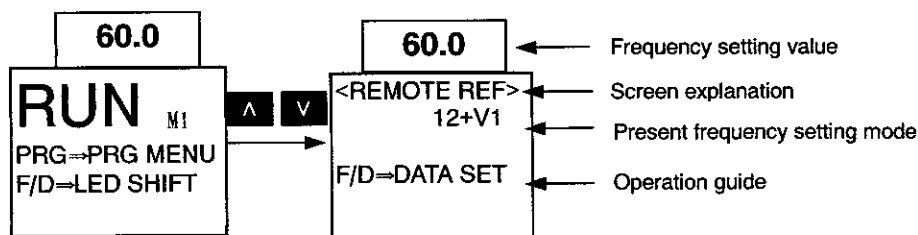
If keypad panel settings are not selected, the present frequency setting mode appears on the LCD.

The frequency of keypad panel is initial set to 0.00Hz. To save the frequency setting, the inverter memorizes the frequency setting by pressing **FUNC DATA** in about five seconds when LED is high-speed and blinks. When five seconds are exceeded, the inverter does not memorize the frequency setting even if **FUNC DATA** is pressed.

1) Digital (keypad panel) settings (F01=0 or C30=0)



2) Other than digital setting



4-3-3 Switching the LED monitor

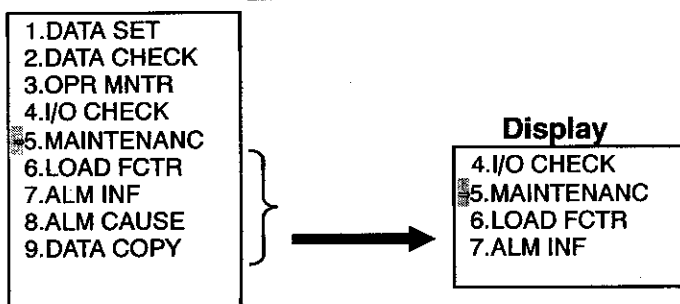
On the normal operation, press **FUNC DATA** to switch to LED monitor display.

When power is turned on, the monitor contents set by the function (E43) are displayed on the LED.

E43	When stopping		When running (E44 = 0,1)	Unit	Remarks
	(E44 = 0)	(E44 = 1)			
0	Setting frequency	Output frequency	Hz		
1	Setting frequency				
2	Output current		A		
3	Output voltage (specified value)		V		
4	Synchronous speed setting value	Synchronous speed	r/min.		For 4 digits or more, the last digits are cut, with x10, x100 marked on the indicator.
5	Line speed setting value	Line speed	m/min.		
6	Load rotation speed setting value	Load rotation speed	r/min.		

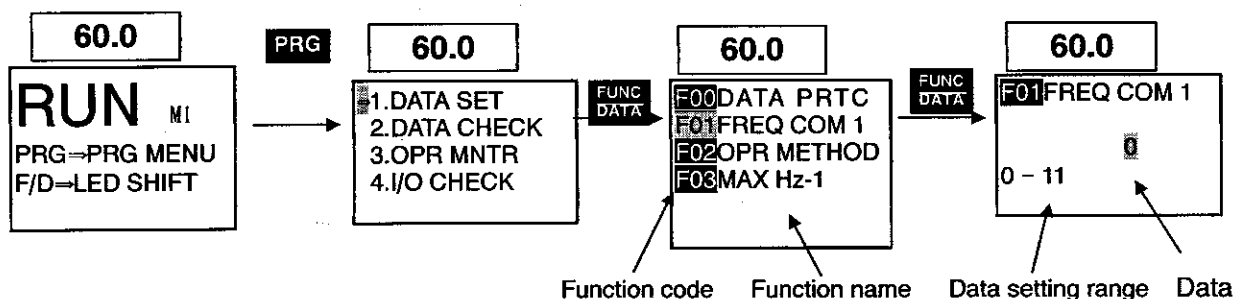
4-3-4 Menu screen

The "Program menu" screen is shown below. Only four items can be displayed simultaneously. Move the cursor with **▲** or **▼** to select an item, then press **FUNC DATA** to display the next screen.



4-3-5 Setting function data

On the "program menu" screen, select "1. Data Set" then the "Function Select" screen appears with function codes and names on it. Select the desired function.

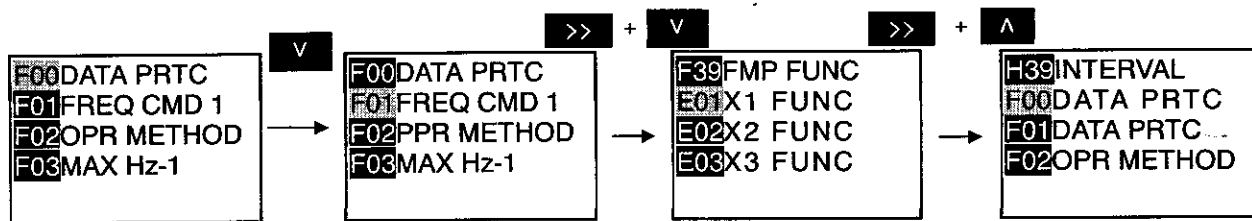


The function code consists of alphanumeric characters. Unique alphabetical letters are assigned for each function group.

Table 4-3-1

Function code	Function	Remarks
F00 – F39	Fundamental Functions	
E01 – E47	Extension Terminal Functions	
C01 – C33	Control Functions of Frequency	
P01 – P37	Motor Parameters ^{2,3}	
A01 – A34	Motor Parameters ^{4,5}	
H03 – H39	High Performance Functions	
o01 – o29	Optional Functions	Can be selected only with an option connected

To scroll "Function Select" screen rapidly, use **>>** + **^** or **>>** + **v** to move the screen in a unit grouped by alphabet.



Select the desired function and press **FUNC DATA** to switch to the "data setting" screen.

On the "data setting" screen, the data values on the LCD can be increased or decreased in the smallest possible unit by pressing **^** or **v**. Holding down **^** or **v** expands the rate of change, thereby enabling values to be modified more rapidly. Otherwise, select the digit to be modified using **>>** then set data directly. When data is modified, the value before modification will be displayed at the same

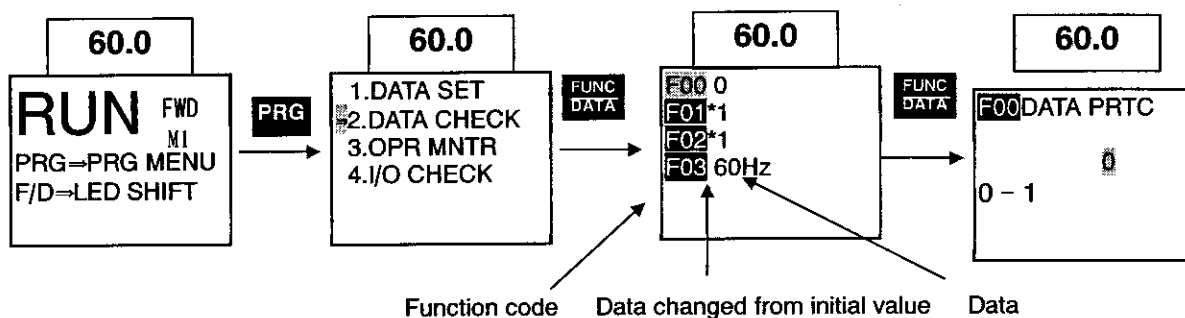
time for reference purpose. To save the data, press **FUNC DATA**. Pressing **RESET** cancels the changes made and returns to the "Function Select" screen. The modified data will be effective in inverter operation after the data is saved by **FUNC DATA**. The inverter operation does not change only if data is modified. When data setting is disabled in the case of "Data protected" or "Data setting invalid during inverter running," make necessary changes. Data cannot be modified for the following reasons:

Table 4-3-2

Display	Reason for no modification	Release method
LINK ACTIVE	Currently writing from RS-485/link option to Function is being made.	Send a cancel command of function writing from RS-485. Stops a "Write" operation from the link
NO SIGNAL(WE)	The edit enabling command function is selected using a general-purpose input terminal.	Among functions E01 to E09, turn the terminal of data 19 (edit enabling command selection) ON.
DATA PRTCTD	Data protection is selected for function F00.	Change function F00 to 0.
INV RUNNING	An attempt is made to change a function that cannot be changed during inverter operation.	Stop inverter operation.
FWD/REV ON	An attempt is made to change a function that cannot be changed with the FWD/REV command on.	Turn FWD/REV command off.

4-3-6 Checking function data

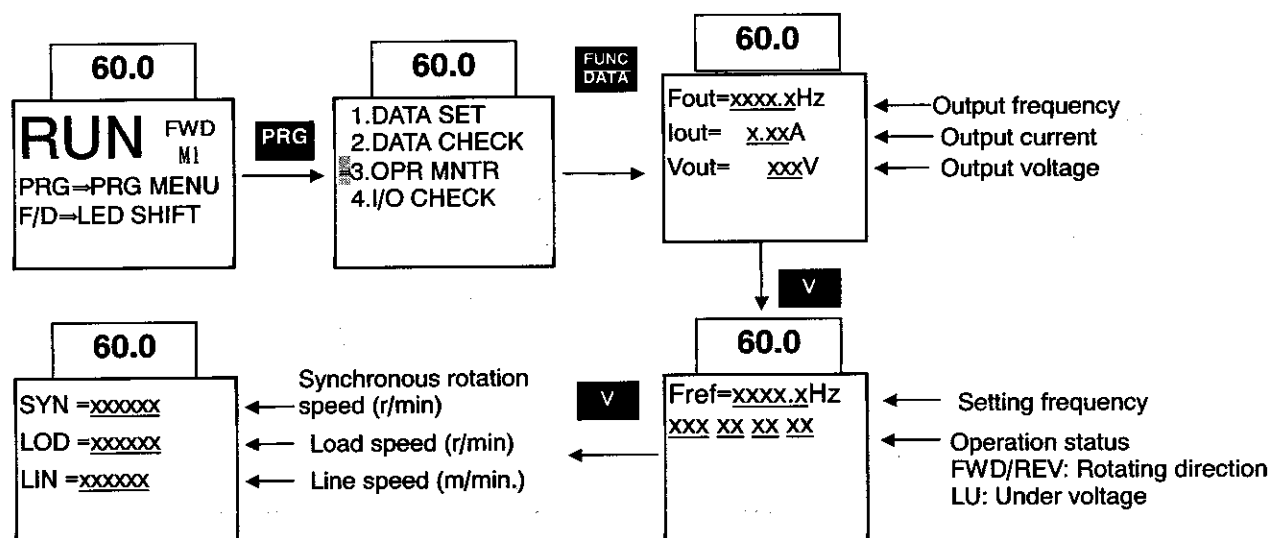
On the "Program menu" screen, select "2. DATA CHECK". The "Function Select" screen then appears with function codes and names.



Select the desired function and press **FUNC DATA** to check the function data. By pressing **FUNC DATA**, the screen switches to the "Data setting" screen, to modify data.

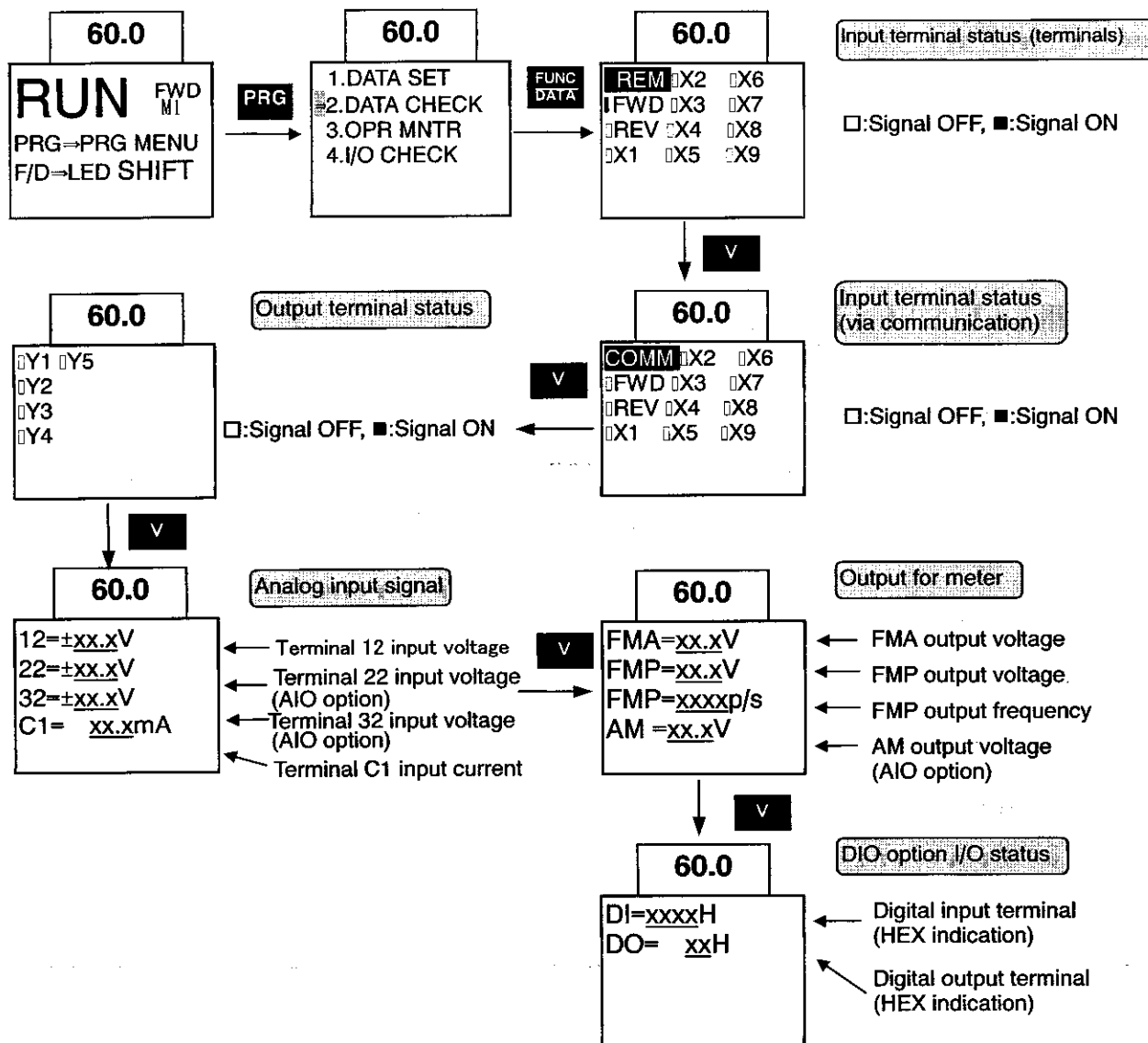
4-3-7 Monitoring operating status

On the "Program menu" screen, select "3. OPR MNTR" to display the present operating status of inverter. Use **▲** and **▼** to switch between the four operation monitor screens.



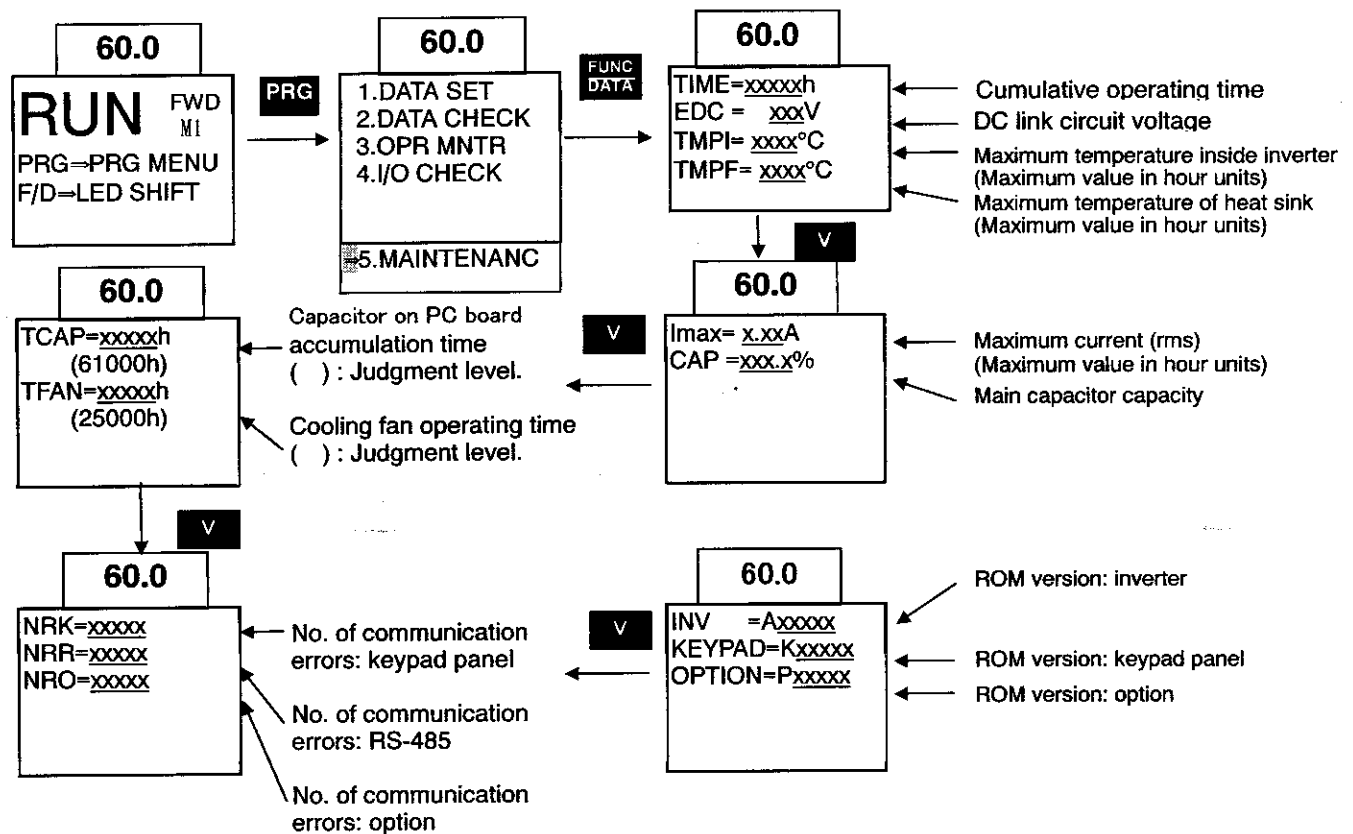
4-3-8 I/O check

On the "Program menu" screen, select "4. I/O Check" to display analog and digital input/output signal status for the inverter and options. Use **▲** and **▼** to switch between the seven screens of data.



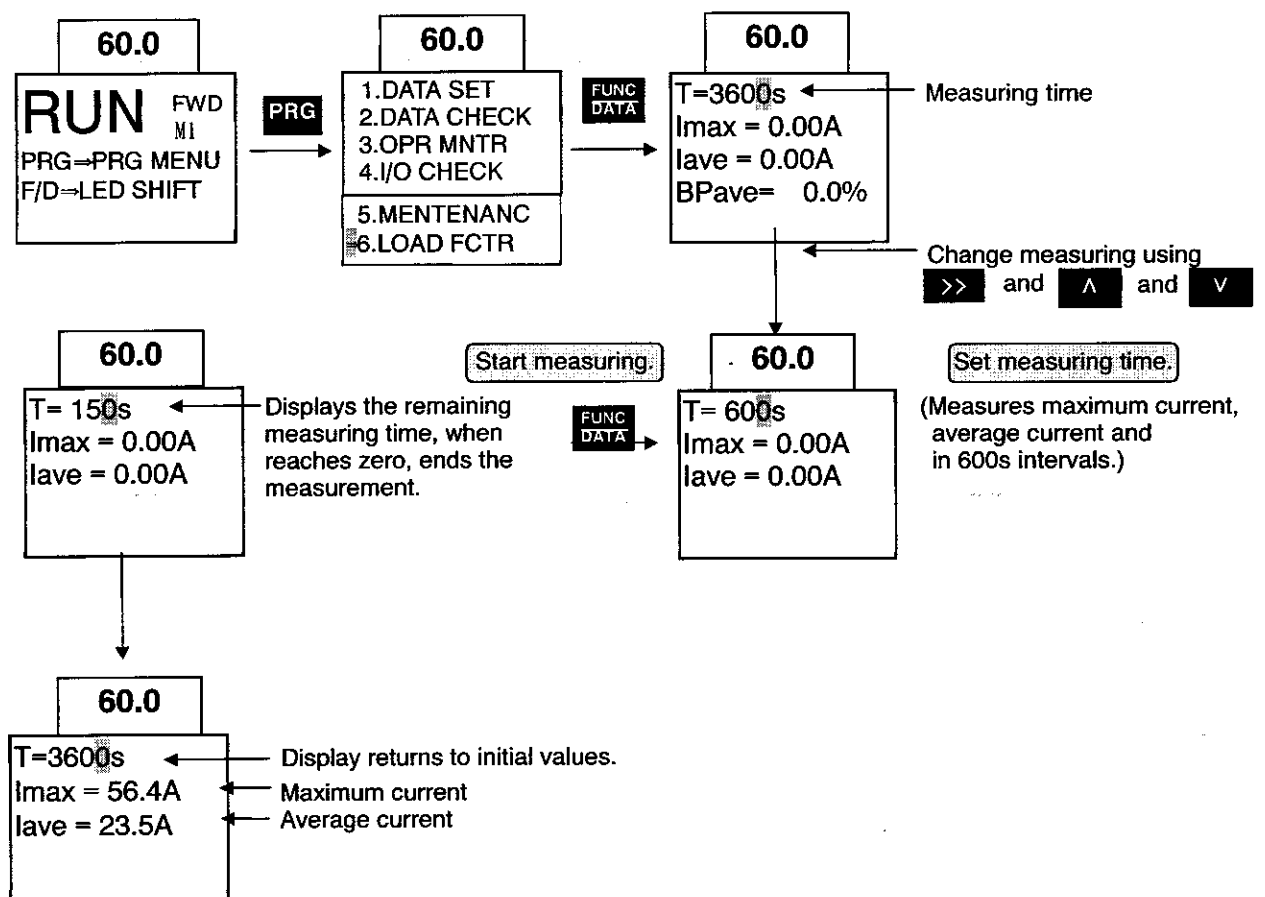
4-3-9 Maintenance information

On the "Program menu" screen, select **"5. Maintenance"** to display information necessary for maintenance and inspection. Use **▲** and **▼** to switch between the five screens of data.



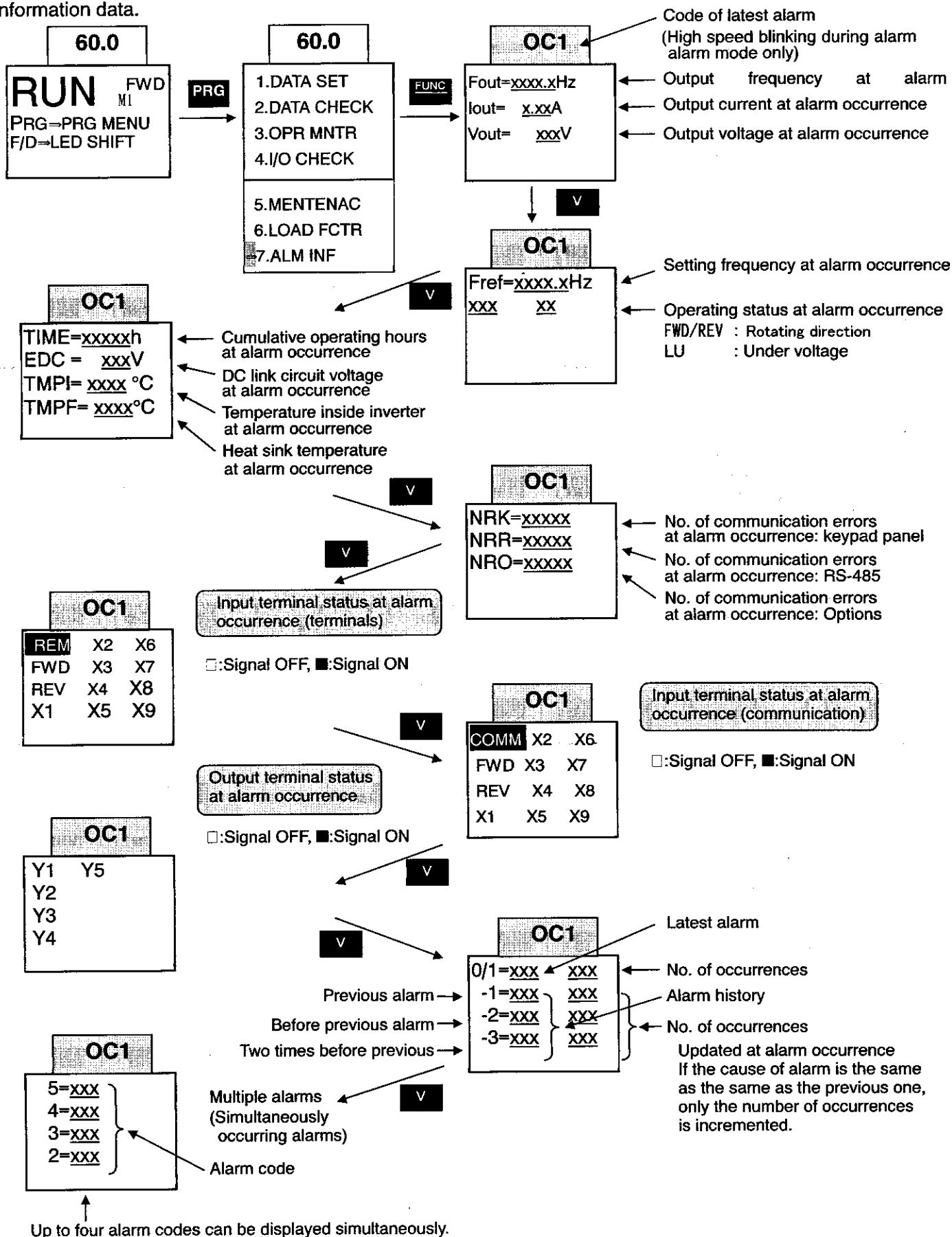
4-3-10 Load rate measurement

On the "Program menu" screen, select **"6. Load Rate Measurement"**. On the "Load rate measurement" screen, the maximum current, average current, and average breaking power during the set measuring time are measured and displayed.



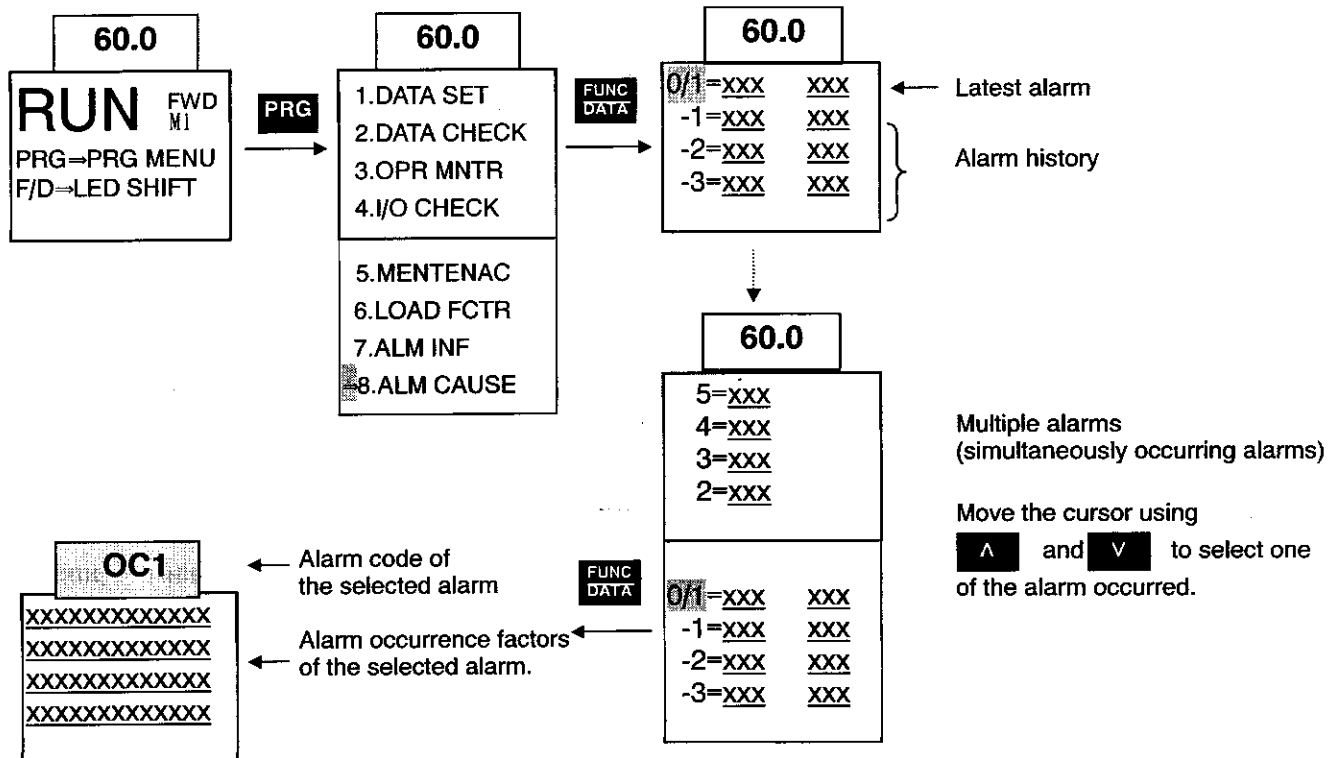
4-3-11 Alarm information

On the "Program menu" screen, select "7. Alarm Information". Various operating data when the latest alarm occurred is displayed.   to switch between the nine screens of alarm information data.



4-3-12 Alarm history and factors

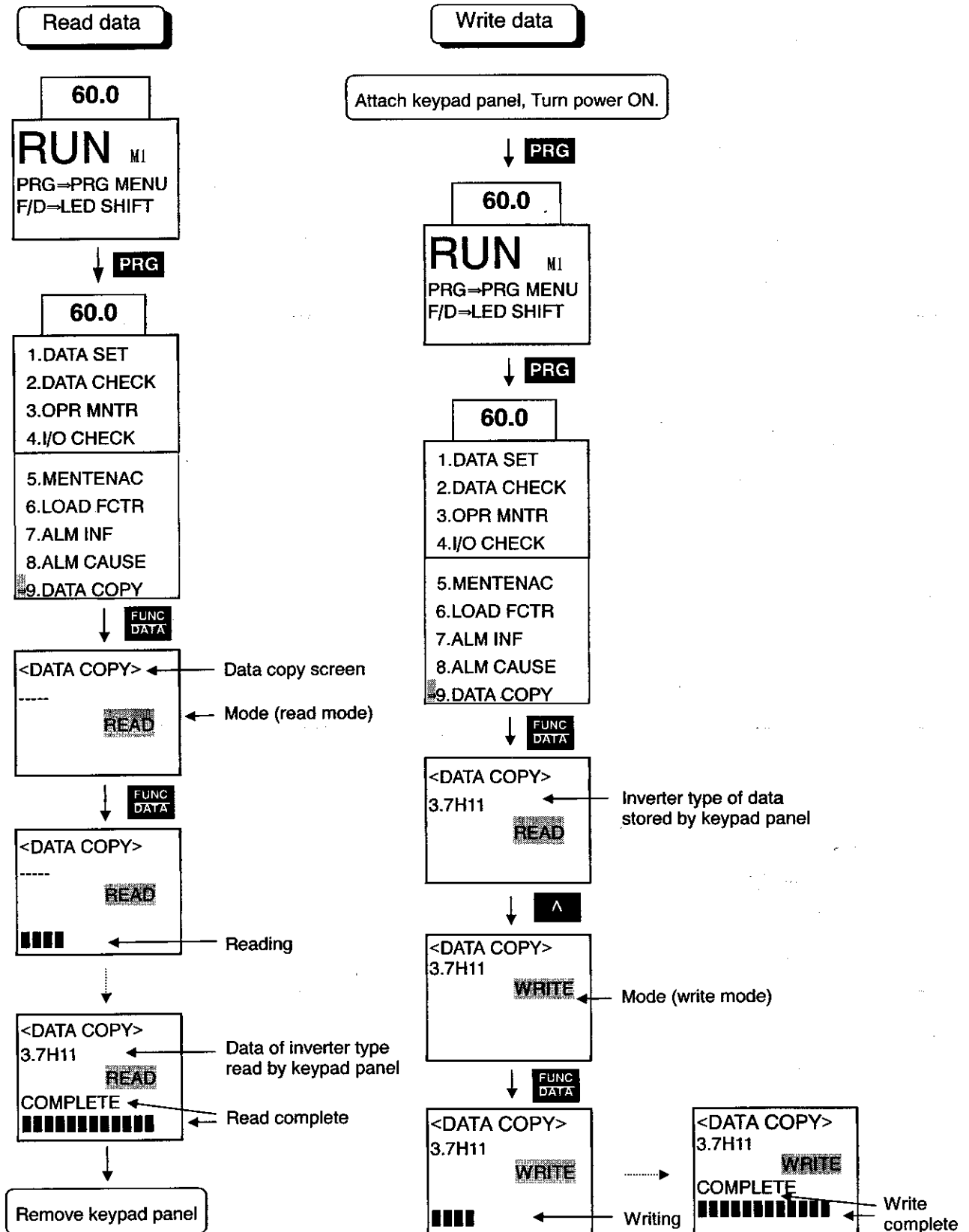
On the "Program menu" screen, select "8. Alarm Factors" to display the alarm history.
Press **FUNC DATA** to display troubleshooting information for the alarm selected.



4-3-13 Data copy

On the "Program menu" screen, select **"9. Data Copy"** to display the data copy read screen. A copy operation is then performed in the following order ; reading inverter function data, removing the keypad panel, attaching the keypad panel to another inverter, and writing the data to the inverter.

The "verify" feature also makes it possible to compare and check differences in the data stored in the keypad panel and the data stored in the inverter.



Data check
(verify)

60.0

RUN M1
PRG=PRG MENU
F/D=LED SHIFT



PRG

60.0

1.DATA SET
2. DATA CHECK
3.OPR MNTR
4.I/O CHECK

5.MAINTENANC
6.LOAD FCTR
7.ALM INF
8.ALM INF
9.DATA COPY



FUNC
DATA

<DATA COPY>
3.7H11
READ

Inverter type of data
stored in the keypad
panel



^

<DATA COPY>
3.7H11
WRITE



^

<DATA COPY>
3.7H11
VERIFY

Mode (data check)



FUNC
DATA

<DATA COPY>
3.7H11
VERIFY
■■■■

Data check in progress



<DATA COPY>
3.7H11
VERIFY
COMPLETE
■■■■■■■■■■

Data check complete

Error processing

1) Change disabled during operation

If a write operation is attempted during an inverter operation, or vice versa, the error message below will appear.

After stopping the inverter and pressing

RESET

, retry the write operation.

<DATA COPY>
3.7H11
WRITE
INV RUNNING

2) Memory error

The following error appears if data writing is attempted before saving the data read from the KEYPAD panel memory (no data is written). The error also occurs when the inverter type data (capacity, model, voltage series, etc.) read in the data reading mode differs from the inverter type where the data is to be written. To enable data writing in such a case, press the

FUNC
DATA

<DATA COPY>
3.7H11
WRITE
MEMORY ERROR



FUNC
DATA

<DATA COPY>
3.7H11
WRITE
■■■■

Data check in progress



COPY

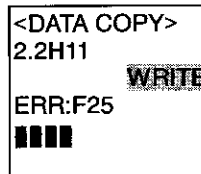
<DATA COPY>
3.7H11
WRITE
COMPLETE
■■■■■■■■■■

Data check complete

3) Verify error

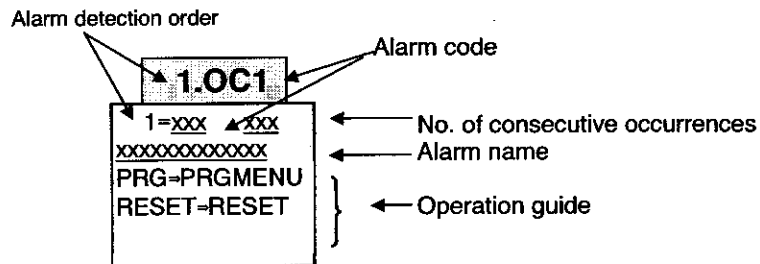
During a data check (verify) operation, if data stored in the keypad panel differs from data stored in the inverter, the following error message is displayed to indicate the function No. The data check is suspended.

continue the data check and check for other mismatching data, press **FUNC DATA**. To stop the data check and switch to another operation, press **RESET**.



4-3-14 Alarm mode

If an alarm occurs, the "Alarm screen" indicating the alarm contents is displayed. Use **^** and **v** to display alarm history and multiple alarms (if more than two alarms occur simultaneously).



Alarm detection order

Operation method	LED display	LCD display	Description
<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">^</div> <div style="border: 1px solid black; padding: 2px 5px; margin-right: 5px;">v</div> <div style="display: flex; flex-direction: column; align-items: center; width: 10px;"> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100%; border-top: 1px solid black; margin-bottom: 5px;"></div> </div> </div>	5.	5	No. 5 alarm
	4.	4	No. 4 alarm
	3.	3	No. 3 alarm
	2.	2	No. 2 alarm
	1.	1	No. 1 alarm (more than two alarms occurred)
	Blank	0	Latest alarm (only one alarm occurred/alarm released)
	Blank	-1	Previous alarm history
	Blank	-2	Alarm history before previous alarm
	Blank	-3	Alarm history two times before previous alarm

Alarm code: See Table 6-1-1

5. Function select
5-1 Function select list
F: Fundamental Functions

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
F00	Data protection	F00 DATA PRTC	0, 1	-	-	0	no		5-5
F01	Frequency command 1	F01 FREQ CMD 1	0 to 10	-	-	0	no		5-5
F02	Operation method	F02 OPR METHOD	0 to 1	-	-	0	no		5-6
F03	Maximum frequency 1	F03 MAX Hz-1	H11S: 50 to 1667Hz	Hz	1	1667	no		5-7,8
F04	Base frequency 1	F04 BASE Hz-1	H11S: 25 to 1667Hz	Hz	1	1667	no		5-7,8
F05	First frequency1	F05 FIRST_Hz1	H11S: 25 to 1667Hz	Hz	1	1667	no		5-7,8
F06	First voltage1 (at first frequency 1)	F06 FIRST_V1	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	0	no		5-7,8
F07	Rated voltage 1 (at base frequency 1)	F07 RATED_V-1	0V: A voltage proportional to the source voltage is output. 50 to 240V: AVR operation	V	1	200	no		5-7,8,9
F08	Maximum voltage 1 (at maximum frequency 1)	F08 MAX_V-1	50 to 240 V	V	1	200	no		5-7,8,9
F09	Acceleration time 1	F09 ACC_TIME1	1.0 to 3600s	s	0.01	40.00	yes		5-9
F10	Deceleration time 1	F10 DEC_TIME1	1.0 to 3600s	s	0.01	40.00	yes		5-9
F11	Torque boost 1	F11 TRQ_BOOST1	2.0 to 20.0 For constant torque load	-	0.1	2.0	yes		5-9,10
F12	Electronic (Select)	F12 ELCTRN_OL1	0,1	-	-	1	yes		5-10
F13	thermal (Level)	F13 OL_LEVEL1	1.0 to 100A	A	0.01	Rated inverter current	yes		5-10
F14	over relay 1 (Thermal time constant)	F14 TIME_CNST1	0.1 to 300.0 s	s	0.1	5.0	yes		5-10
F15	Frequency limiter (High1)	F15 H_LIMITER1	0 to 1667Hz	Hz	1	1667	yes		5-10
F16	Starting frequency 1	F16 START_Hz1	1.0 to 100.0Hz	Hz	0.1	1.0	no		5-11
F17	FAR function (Hysteresis)	F17 FAR_HYSTR	0.0 to 10.0 Hz	Hz	0.1	2.5	yes		5-11
F18	OL1 function (Level)	F18 OL1_LEVEL	1.00 to 100 A	A	0.01	Rated inverter current	yes		5-11
F20	signal 1 (timer)	F20 OL1_TIMER	0.0 to 60.0s	s	0.1	0.0	yes		5-11
F21	Electronic thermal overload relay (for braking resistor)	F21 DBR_OL	[Up to 7.5 kW] 0,1,2 [15 kW and above] 0	--	-	1	yes		5-11
F22	Frequency limiter (Low)	F22 L_LIMITER	0 to 1667Hz	Hz	1	0	yes		5-11
F23	Starting frequency (Holding time)	F23 HOLDING_t	0.0 to 10 s	s	0.1	0.0	no		5-11
F24	OL1 function (Mode select)	F24 OL_WARNING	0,1	-	-	1	yes		5-12
F25	Stop frequency	F25 STOP_Hz	1.0 to 6.0 Hz	Hz	0.1	1.0	no		5-12
F26	Gain (for freq set signal)	F26 FREQ_GAIN	0.0 to 200.0 %	%	0.1	100.0	yes		5-12
F27	Bias frequency	F27 FREQ_BIAS	-1667 to +1667 Hz	Hz	1	0	yes		5-13
F30	Restart mode after momentary power failure	F30 RESTART	0,1,2,3,4,5	-	-	1	no		5-14,15
F31	DC brake (Starting freq.)	F31 DC_BRK_Hz	1.0 to 60.0 Hz	Hz	0.1	1.0	yes		5-16
F33	(Braking level)	F33 DC_BRK_LVL	0 to 100%	%	1	0	yes		5-16
F34	(Braking time)	F34 DC_BRK_t	0.0s, 0.1 to 30.0s	s	0.1	0.0	yes		5-16
F35	FMA (Voltage adjust)	F35 FMA_V-ADJ	0 to 200%	%	1	100	yes		5-16
F36	(Function)	F36 FMA_FUNC	0,1,2,3	-	-	0	yes		5-16
F37	FMP (Pulse rate)	F37 FMP_PULSES	300~6000p/s(Pulse rate at 100%)	p/s	1	1440	yes		5-16
F38	(Voltage adjust)	F38 FMP_V_ADJ	0%, 1 to 200%	%	1	0	yes		5-16
F39	(Function)	F39 FMP_FUNC	0,1,2,3	-	-	0	yes		5-17

E:Extension Terminal Functions

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
E01	X1 terminal function	E01 X1 FUNC	0 to 25	-	-	0	no		5-18,19,20
E02	X2 terminal function	E02 X2 FUNC				1	no		5-18,19,20
E03	X3 terminal function	E03 X3 FUNC				2	no		5-18,19,20
E04	X4 terminal function	E04 X4 FUNC				5	no		5-18,19,20
E05	X5 terminal function	E05 X5 FUNC				17	no		5-18,19,20
E06	X6 terminal function	E06 X6 FUNC				18	no		5-18,19,20
E07	X7 terminal function	E07 X7 FUNC				19	no		5-18,19,20
E08	X8 terminal function	E08 X8 FUNC				20	no		5-18,19,20
E09	X9 terminal function	E09 X9 FUNC				21	no		5-18,19,20
E10	Motor switch selection	E10 MTR_SELECT	1 to 9	-	-	1	no		5-20,21,22
E11	30RY operation mode	E11 30RY_MODE	0,1	-	-	0	no		5-22
E20	Y1 terminal function	E20 Y1 FUNC	0 to 27	-	-	0	no		5-22,23,24
E21	Y2 terminal function	E21 Y2 FUNC				1	no		5-22,23,24
E22	Y3 terminal function	E22 Y3 FUNC				2	no		5-22,23,24
E23	Y4 terminal function	E23 Y4 FUNC				5	no		5-22,23,24
E24	Y5A, Y5C terminal func. (RY output)	E24 Y5 FUNC				9	no		5-22,23,24
E25	Y5 RY operation mode	E25 Y5RY_MODE	0,1	-	-	0	no		5-24
E31	FDT 1 function signal (Level)	E31 FDT1_LEVEL	H11S: 0 to 1667Hz	Hz	1	60	yes		5-24
E32	(Hysteresis)	E32 FDT_HYSTR	0.0 to 30.0Hz	Hz	0.1	1.0	yes		5-24
E40	Display coefficient A	E40 COEF A	-999.00 to 999.00	-	0.01	0.01	yes		5-24
E41	Display coefficient B	E41 COEF B	-999.00 to 999.00	-	0.01	0.00	yes		5-24
E42	LED Display filter	E42 DISPLAY_FL	0.0 to 5.0s	s	0.1	0.5	yes		5-24
E43	LED Monitor (Function)	E43 LED_MNTR	0 to 6	-	-	0	yes		5-25
E44	(Display at STOP mode)	E44 LED_MNTR2	0, 1	-	-	0	yes		5-25
E45	LCD Monitor (Function)	E45 LCD_MNTR	0, 1	-	-	0	yes		5-25
E46	(Language)	E46 LANGUAGE	0 to 1	-	-	0	yes		5-25
E47	(Contrast)	E47 CONTRAST	0(dim) to 10(clear)	-	-	5	yes		5-25

C:Control Functions of Frequency

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
C01	Jump frequency 1	C01 JUMP_Hz 1	0 to 1667Hz	Hz	1	0	yes		5-26
C02	Jump frequency 2	C02 JUMP_Hz 2	0 to 1667Hz	Hz	1	0	yes		5-26
C03	Jump frequency 3	C03 JUMP_Hz 3	0 to 1667Hz	Hz	1	0	yes		5-26
C04	Jump frequency (Hysteresis)	C04 JUMP_HYSTR	0 to 30Hz	Hz	1	3	yes		5-26
C05	Multistep (Freq. 1)	C05 MULTI_Hz-1	0 to 1667Hz	Hz	0.1	0.0	yes		5-26
C06	frequency (Freq. 2)	C06 MULTI_Hz-2				0.0	yes		5-26
C07	setting (Freq. 3)	C07 MULTI_Hz-3				0.0	yes		5-26
C08	(Freq. 4)	C08 MULTI_Hz-4				0.0	yes		5-26
C09	(Freq. 5)	C09 MULTI_Hz-5				0.0	yes		5-26
C10	(Freq. 6)	C10 MULTI_Hz-6				0.0	yes		5-26
C11	(Freq. 7)	C11 MULTI_Hz-7				0.0	yes		5-26
C20	Jog frequency	C20 JOG_Hz	0 to 1667Hz	Hz	0.1	5.0	yes		5-27
C28	Analog input resolution setting	C28 RESOLUTION	0 to 20 Hz 0: Inactive, 1 to 20 :Active	Hz	1	0	yes		5-27
C30	Frequency setting 2	C30 FREQ_CMD 2	0 to 10	-	-	2	no		5-27
C31	Bias gain (Terminal [12])	C31 OFFSET_12	-5.0 to +5.0 %	%	0.1	0.0	yes		
C32	(Terminal [C1])	C32 OFFSET_C1	-5.0 to +5.0 %	%	0.1	0.0	yes		
C33	Analog setting signal filter	C33 REF_FILTER	0.0 to 5.0 %	s	0.01	0.05	yes		5-27

P:Motor Parameters

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
P01	Motor 1 (Number of pole)	P01 M-POLES	2 to 14	pole	2	2	no		5-28
P02	(Capacity)	P02 M-CAP	0.01 to 45.00kW	kW	0.01	Nominal applied	no		5-28
P03	(Rated current)	P03 M-IL	0.00 to 2000A	A	0.01	Nominal applied	no		5-28
P04	Maximum frequency 2	P04 MAX_Hz-2	H11S: 50 to 1667Hz	Hz	1	1300	no		5-28
P05	Base frequency 2	P05 BASE_Hz-2	H11S: 25 to 1667Hz	Hz	1	1300	no		5-28
P06	First frequency 2	P06 FIRST_Hz2	H11S: 25 to 1667Hz	Hz	1	1667	no		5-28
P07	First voltage 2 (for first frequency 2)	P07 FIRST_V2	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	0	no		5-28
P08	Rated voltage 2 (for base frequency 2)	P08 RATED_V-2	0V: Break V/F is not used. 50 to 240V: AVR operation	V	1	200	no		5-28
P09	Maximum voltage 2 (for maximum frequency 2)	P09 MAX_V-2	50 to 240V: AVR operation	V	1	200	no		5-28
P10	Acceleration time 2	P10 ACC_TIME2	1.0 to 3600 s	s	0.01	30.00	yes		5-28,29
P11	Deceleration time 2	P11 DEC_TIME2	1.0 to 3600s	s	0.01	30.00	yes		5-28,29
P12	Torque boost 2	P12 TRQ_BOOST2	2.0 to 20.0 For constant torque load	-	0.1	2.0	yes		5-29
P13	Electronic (Select)	P13 ELCTRNL_OL2	0,1	-	-	1	yes		5-29
P14	thermal (Level)	P14 OL_LEVEL2	1.0 to 100A	A	0.01	Rated inverter current	yes		5-29
P15	over relay 2 (Thermal time constant)	P15 TIME_CNST2	0.1 to 300.0 s	s	0.1	5.0	yes		5-29
P16	Frequency limiter (High2)	P16 H_LIMITER2	0 to 1667Hz	Hz	1	1300	yes		5-30
P17	Starting frequency 2	P17 START_Hz2	1.0 to 100.0Hz	Hz	0.1	1.0	no		5-30
P18	FAR function: (Hysteresis)	P18 FAR_HYSTR2	0.0 to 10.0 Hz	Hz	0.1	2.5	yes		5-30

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
P19	OL2 function (Level)	P19 OL2_LEVEL	1.00 to 100 A	A	0.01	Rated inverter current	yes		5-30
P20	signal 2 (timer)	P20 OL2_TIMER	0.0 to 60.0s	s	0.1	0.0	yes		5-30
P21	Maximum frequency 3	P21 MAX_Hz-3	H11S: 50 to 1667Hz	Hz	1	1200	no		5-30,31
P22	Base frequency 3	P22 BASE_Hz-3	H11S: 25 to 1667Hz	Hz	1	1200	no		5-30,31
P23	First frequency 3	P23 FIRST_Hz3	H11S: 25 to 1667Hz	Hz	1	1667	no		5-30,31
P24	First voltage 3 (for first frequency 3)	P24 FIRST_V3	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	0	no		5-30,31
P25	Rated voltage 3 (for base frequency 3)	P25 RATED_V-3	0V: Break V/F is not used. 50 to 240V: AVR operation	V	1	200	no		5-30,31
P26	Maximum voltage 3 (for maximum frequency 3)	P26 MAX_V-3	50 to 240V: AVR operation	V	1	200	no		5-30,31
P27	Acceleration time 3	P27 ACC_TIME3	1.0 to 3600 s	s	0.01	25.00	yes		5-31
P28	Deceleration time 3	P28 DEC_TIME3	1.0 to 3600s	s	0.01	25.00	yes		5-31
P29	Torque boost 3	P29 TRQ_BOOST3	2.0 to 20.0 For constant torque load	-	0.1	2.0	yes		5-31
P30	Electronic (Select)	P30 ELCTRN_OL3	0,1	-	-	1	yes		5-32
P31	thermal (Level)	P31 OL_LEVEL3	1.0 to 100A	A	0.01	Rated inverter current	yes		5-32
P32	over relay 3 (Thermal time constant)	P32 TIME_CNST3	0.1 to 300.0 s	s	0.1	5.0	yes		5-32
P33	Frequency limiter (High2)	P33 H_LIMITER3	0 to 1667Hz	Hz	1	1200	yes		5-32
P34	Staring frequency 3	P34 START_Hz3	1.0 to 100.0Hz	Hz	0.1	1.0	no		5-33
P35	FAR function (Hysteresis)	P35 FAR_HYSTR3	0.0 to 10.0 Hz	Hz	0.1	2.5	yes		5-33
P36	OL3 function (Level)	P36 OL3_LEVEL	1.00 to 100 A	A	0.01	Rated inverter current	yes		5-33
P37	signal 3 (timer)	P37 OL3_TIMER	0.0 to 60.0s	s	0.1	0.0	yes		5-33

A:Alternative Motor Parameters

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting -18.5kW	Change during op	User Set value	remark
A01	Maximum frequency 4	A01 MAX_Hz-4	H11S: 50 to 1667Hz	Hz	1	1000	no		5-34
A02	Base frequency 4	A02 BASE_Hz-4	H11S: 25 to 1667Hz	Hz	1	1000	no		5-34
A03	First frequency 4	A03 FIRST_Hz4	H11S: 25 to 1667Hz	Hz	1	1667	no		5-34
A05	First voltage 4 (for first frequency 4)	A04 FIRST_V4	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	0	no		5-34
A05	Rated voltage 4 (for base frequency 4)	A05 RATED_V-4	0V: Break V/F is not used. 50 to 240V: AVR operation	V	1	200	no		5-34
A06	Maximum voltage 4 (for maximum frequency 4)	A06 MAX_V-4	50 to 240V: AVR operation	V	1	200	no		5-34
A07	Acceleration time 4	A07 ACC_TIME4	1.0 to 3600 s	s	0.01	20.00	yes		5-34,35
A08	Deceleration time 4	A08 DEC_TIME4	1.0 to 3600s	s	0.01	20.00	yes		5-34,35
A09	Torque boost 4	A09 TRQ_BOOST4	2.0 to 20.0 For constant torque load	-	0.1	2.0	yes		5-35
A10	Electronic (Select)	A10 ELCTRN_OL4	0,1	-	-	1	yes		5-35
A11	thermal (Level)	A11 OL_LEVEL4	1.0 to 100A	A	0.01	Rated inverter current	yes		5-35
A12	over relay 4 (Thermal time constant)	A12 TIME_CNST4	0.1 to 300.0 s	s	0.1	5.0	yes		5-35
A13	Frequency limiter (High4)	A13 H_LIMITER4	0 to 1667Hz	Hz	1	1000	yes		5-36
A14	Staring frequency 4	A14 START_Hz4	1.0 to 100.0Hz	Hz	0.1	1.0	no		5-36
A15	FAR function (Hysteresis)	A15 FAR_HYSTR4	0.0 to 10.0 Hz	Hz	0.1	2.5	yes		5-36
A16	OL1 function (Level)	A16 OL4_LEVEL	1.00 to 100 A	A	0.01	Rated inverter current	yes		5-36
A17	signal 4 (timer)	A17 OL4_TIMER	0.0 to 60.0s	s	0.1	0.0	yes		5-36
A18	Maximum frequency 5	A18 MAX_Hz5	H11S: 50 to 1667Hz	Hz	1	500	no		5-36
A19	Base frequency 5	A19 BASE_Hz-5	H11S: 25 to 1667Hz	Hz	1	500	no		5-37
A20	First frequency 5	A20 FIRST_Hz5	H11S: 25 to 1667Hz	Hz	1	1667	no		5-37
A21	First voltage 5 (for first frequency 5)	A21 FIRST_V5	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	0	no		5-37
A22	Rated voltage 5 (for base frequency 5)	A22 RATED_V-5	0V: Break V/F is not used. 10 to 240V: AVR operation	V	1	200	no		5-37
A23	Maximum voltage 5 (for maximum frequency 5)	A23 MAX_V-5	50 to 240V: AVR operation	V	1	200	no		5-37
A24	Acceleration time 5	A24 ACC_TIME5	1.0 to 3600 s	s	0.01	10.00	yes		5-37
A25	Deceleration time 5	A25 DEC_TIME5	1.0 to 3600s	s	0.01	10.00	yes		5-37
A26	Torque boost 5	A26 TRQ_BOOST5	2.0 to 20.0 For constant torque load	-	0.1	2.0	yes		5-38
A27	Electronic (Select)	A27 ELCTRN_OL5	0,1	-	-	1	yes		5-38
A28	thermal (Level)	A28 OL_LEVEL5	1.0 to 100A	A	0.01	Rated inverter current	yes		5-38
A29	over relay 5 (Thermal time constant)	A29 TIME_CNST5	0.1 to 300.0 s	s	0.1	5.0	yes		5-38
A30	Frequency limiter (High5)	A30 H_LIMITER5	0 to 1667Hz	Hz	1	500	yes		5-38
A31	Staring frequency 5	A31 START_Hz5	1.0 to 100.0Hz	Hz	0.1	1.0	no		5-39
A32	FAR function (Hysteresis)	A32 FAR_HYSTR5	0.0 to 10.0 Hz	Hz	0.1	2.5	yes		5-39
A33	OL1 function (Level)	A33 OL5_LEVEL	1.00 to 100 A	A	0.01	Rated inverter current	yes		5-39
A34	signal 5 (timer)	A34 OL5_TIMER	0.0 to 60.0s	s	0.1	0.0	yes		5-39

H:High Performance Functions

Func No.	NAME	LCD Display	Setting range	Unit	Min. Unit	Factory setting	Change during op	User Set value	remark
H03	Data initializing	H03 DATA_INIT	0, 1	-	-	0	no		5-40
H04	Auto-reset (Times)	H04 AUTO_RESET	0, 1 to 10 times	times	1	0	yes		5-40
H05	(Reset interval)	H05 RESET_INT	2 to 20s	s	1	5	yes		5-40
H06	Fan stop operation	H06 FAN_STOP	0, 1	-	-	0	yes		5-40
H07	PWM switch	H07 PWM_SELECT	0, 1	-	-	0	no		5-41
H08	Rev. phase sequence lock	H08 REV_LOCK	0, 1	-	-	0	no		5-41
H11	DEC mode	H11 DEC_MODE	0, 1	-	-	0	yes		5-41
H13	Auto-restart (Restart time)	H13 RESTART_t	0.1 to 10.0s	s	0.1	0.5	no		5-41
H14	(Freq. fall rate)	H14 FALL_RATE	0.00 to 100.00Hz/s	Hz/s	0.01	10.00	yes		5-41
H15	(Holding DC voltage)	H15 HOLD_V	200 to 300V	V	1	235V	yes		5-41
H16	OPR command selfhold time)	H16 SELFHOLD_t	0.0 to 30.0s, 999	s	0.1	999	no		5-41
H26	PTC thermistor (Mode select	H26 PTC_MODE	0, 1	-	-	0	yes		5-42
H27	(level)	H27 PTC_LEVEL	0.00 to 5.00V	V	0.01	1.60	yes		5-42
H30	Serial link (unction select)	H30 LINK_FUNC	0, 1, 2, 3	-	-	0	yes		5-42
H31	RS485 (Address)	H31 485ADDRES	1 to 31	-	1	1	no		5-42
H32	Mode select on no response error)	H32 MODE_ON ER	0, 1, 2, 3	-	-	0	yes		5-42
H33	(Timer)	H33 TIMER	0.0 to 60.0s	s	0.1	2.0	yes		5-43
H34	(Baud rate)	H34 BAUD_RATE	0, 1, 2, 3, 4	-	-	1	yes		5-43
H35	(Data length)	H35 LENGTH	0, 1	-	-	0	yes		5-43
H36	(Parity check)	H36 PARITY	0, 1, 2	-	-	0	yes		5-43
H37	(Stop bits)	H37 STOP BITS	0(2bit), 1(1bit)	-	-	0	yes		5-43
H38	No response error detection time)	H38 NO_RES_t	0(No detection), 1 to 60s	s	1	0	yes		5-43
H39	(Response interval)	H39 INTERVAL	0.00 to 1.00s	s	0.01	0.01	yes		5-43

5-2 Function Explanation

F: Fundamental function

F00

Data protection

◆ Setting can be made so that a set value cannot be changed by keypad panel operation.

F 0 0 D A T A P R T C

Set value 0: The data can be changed.
1: The data cannot be changed.

[Setting procedure]

0 to 1: Press the **STOP** and **Δ** keys simultaneously to change the value from 0 to 1, then press the **FUNC DATA** to validate the change.

1 to 0: Press the **STOP** and **▽** keys simultaneously to change the value from 1 to 0, then press the **FUNC DATA** key to validate the change.

F01

Frequency command 1

◆ This function selects the frequency setting method.

Related functions:
E01 to E09
(Set values 10, 11)
C30

F 0 1 F R E Q C M D 1

0: Setting by keypad panel operation (**Δ** **▽** key)

1: Setting by voltage input (terminal [12] (0 to +10V))

2: Setting by current input (terminal [C1] (4 to 20mA)).

3: Setting by voltage input + current input (terminal [12] + terminal [C1] (-10 to +10V + 4 to 20mA)).

4: Reversible operation with polarity (terminal [12] (-10 to +10V))

5: Reversible operation with polarity (terminal [12] + [V1] (Option) (-10 to +10V))

6: Inverse mode operation (terminal [12] (+10V to 0))

7: Inverse mode operation (terminal [C1] (20 to 4mA))

8: Setting by UP/DOWN control mode 1 (initial value = 0) (terminals [UP] and [DOWN])

9: Setting by UP/DOWN control mode 2 (initial value = last final value) (terminals [UP] and [DOWN])

See the function explanation of E01 to E09 for details.

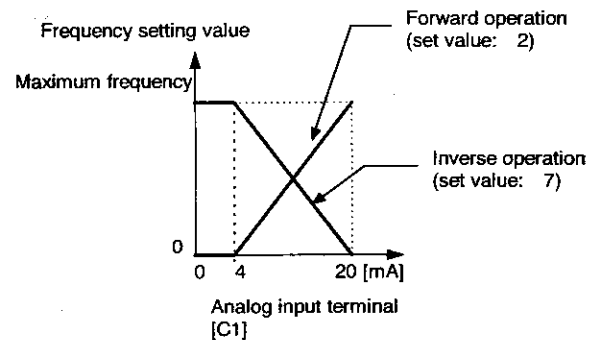
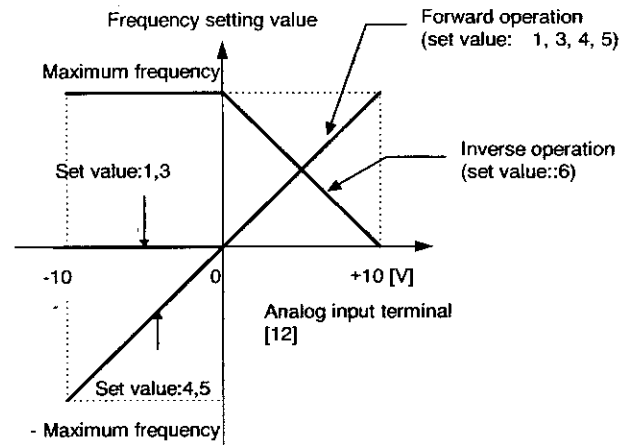
10. DIO option (OPC-G11S-DIO)

*For details, see the instruction manual on OPC-G11S-DIO.

Related functions:
E01 to E09
(Set value 13)

Related functions:
E01 to E09
(Set value 10, 11)

Forward / Inverse operation



F02

Operation method

◆ This function sets the operation command input method.

F 0 2 O P R M E T H O D

Set value 0: Key pad operation

(**FWD** **REV** **STOP** keys).

Press the **FWD** for forward operation.

Press the **REV** for reverse operation.

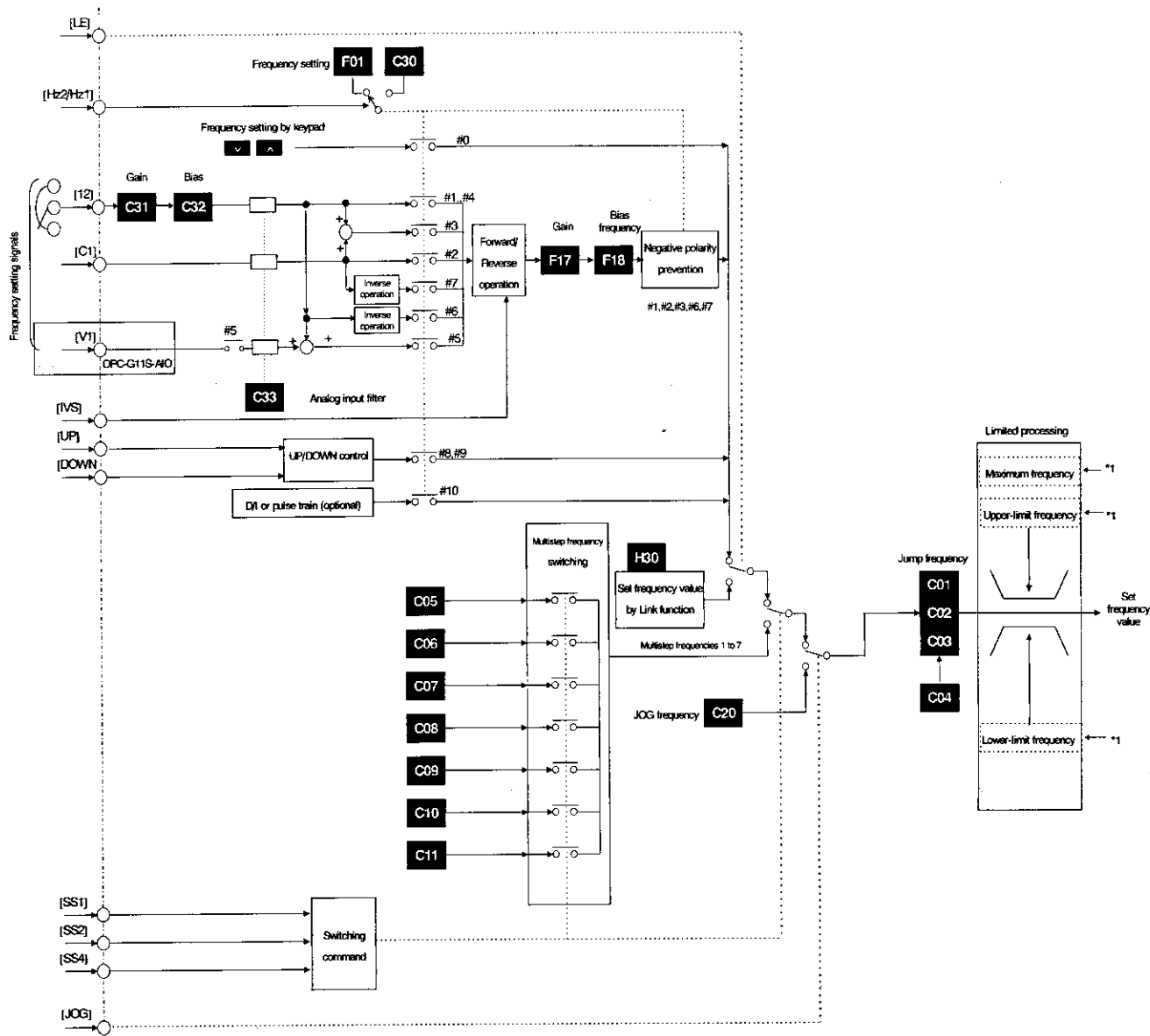
Press the **STOP** for deceleration to a stop.

Input from terminals [FWD] and [REV] is ignored.

1: Operation by external input (terminals [FWD] and [REV]).

* This function can only be changed when terminals FWD and REV are open.

- REMOTE/LOCAL switching from the keypad panel automatically changes the set value of this function.



Frequency setting block diagram

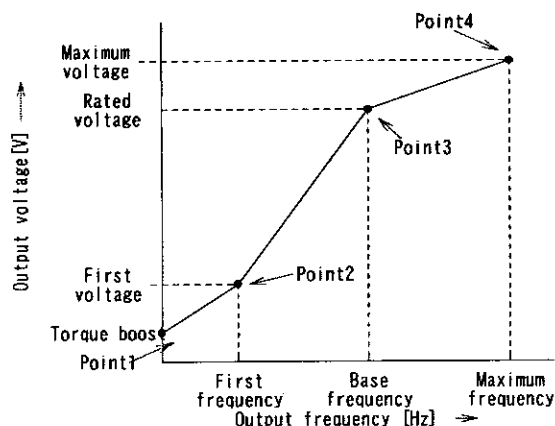
*1: Data changes by the selected motor.

Motor No.	Motor1	Motor2	Motor3	Motor4	Motor5
Maximum frequency	F03	P04	P21	A01	A18
Frequency Limiter (High)	F15	P16	P33	A13	A30
Frequency Limiter (Low)	F22	F22	F22	F22	F22

F03	Maximum frequency 1
F04	Base frequency 1
F05	First Frequency 1
F06	First voltage 1
F07	Rated voltage 1
F08	Maximum voltage 1

◆Setting V/f function

The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used. Arbitrary V/f can be set by setting the points 1 to 4 as shown in the figure below.



[Combination of the points]

Point 1: Torque boost

Point 2: First frequency + First voltage

Point 3: Base frequency + Rated voltage

Point 4: Maximum output frequency + Maximum output voltage

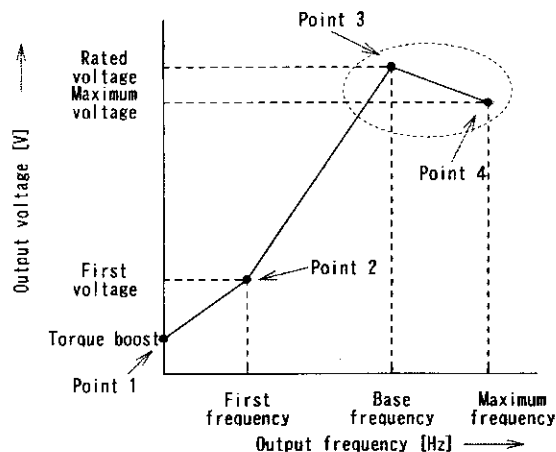
The V/f function can be individually set to each motor. The table below shows the function codes for each motor.

Name	Function code				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
Maximum frequency	F 0 3	P 0 4	P 2 1	A 0 1	A 1 8
Base frequency	F 0 4	P 0 5	P 2 2	A 0 2	A 1 9
First frequency	F 0 5	P 0 6	P 2 3	A 0 3	A 2 0
First voltage	F 0 6	P 0 7	P 2 4	A 0 4	A 2 1
Rated voltage	F 0 7	P 0 8	P 2 5	A 0 5	A 2 2
Maximum voltage	F 0 8	P 0 9	P 2 6	A 0 6	A 2 3
Torque boost	F 1 1	P 1 2	P 2 9	A 0 9	A 2 6

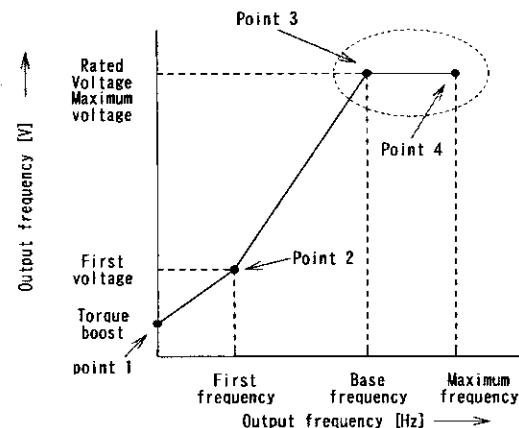
Note:

When the rated voltage is set in larger value than the maximum voltage, the rated voltage becomes the same value as the maximum voltage.

Setting



Operation



[Setting First V/f function]

The First V/f function is set at the point 2.

The First voltage is set invalid (0V) by default.

Setting range

0V : the First V/f not used.

10 to 240V : AVR operation

The First function is enabled or disabled under the following conditions;

First V/f function valid conditions:

- 1) The First voltage is set in the values other than 0V. (Factory setting)
- 2) The set First frequency is smaller than the set base frequency.

Both of the above conditions 1) and 2) should be satisfied.

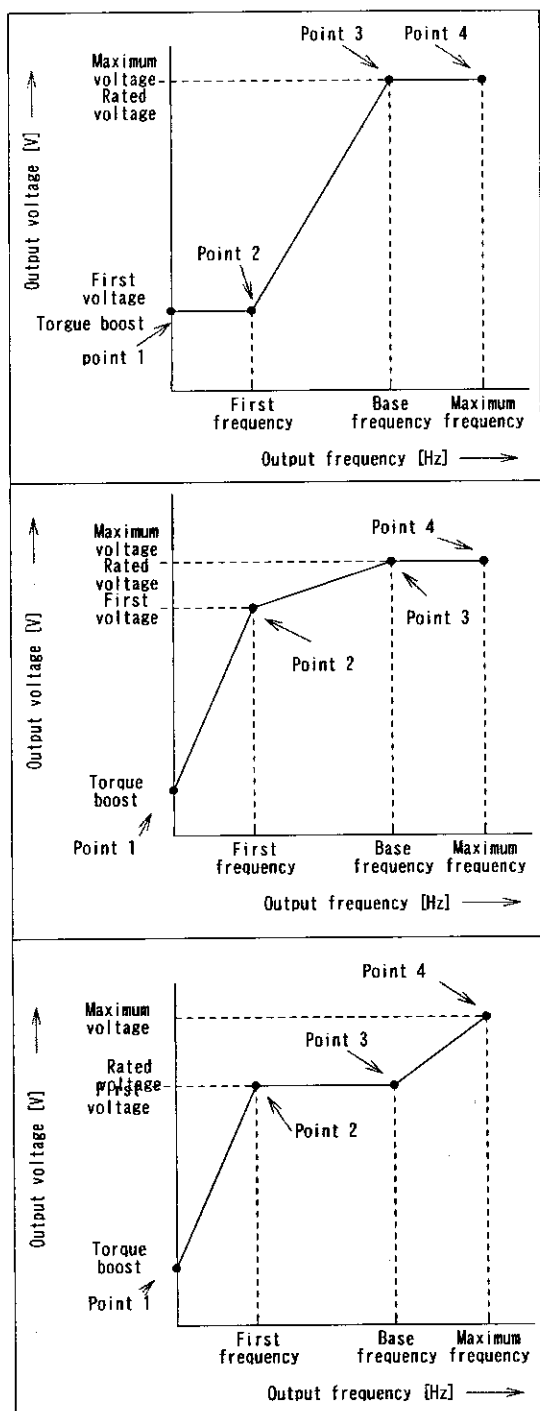
First V/f function invalid conditions:

- 1) The First voltage is set to 0V (Factory setting).
- 2) The First frequency is equal to and larger than the base frequency.

Either of the above conditions 1) and 2) should be satisfied.

If the First v/f function is invalid, setting point 1, 3, and 4 determines the V/f.

The First V/f function (point 2) enable the setting shown in the figure below.



◆ This function sets the maximum output frequency for motor 1.

F 0 3 M A X H z - 1

Setting range : 50 to 1667 Hz

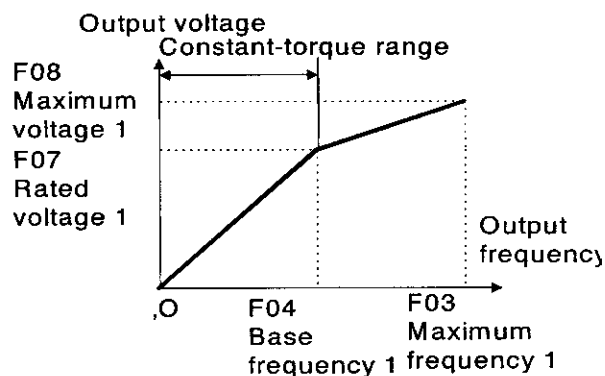
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

◆ This function sets the maximum frequency in the constant-torque range of motor 1 or the output frequency at the rated voltage. Match the rating of the motor.

Setting range : 25 to 1667 Hz

F 0 4 B A S E H z - 1

Note: When the set value of base frequency 1 is higher than that of maximum frequency 1, the output voltage does not increase to the rated voltage because the maximum frequency limits the output frequency.



◆ Setting the First frequency of motor 1.

F 0 5 F I R S T H z 1

Setting range 25 to 1667Hz

Set the frequency within the range below the base frequency.

◆ Setting the voltage at the First frequency of motor 1. (frequency set with F05.)

Setting range : 0, 10 to 240V

F 0 6 F I R S T V 1

Setting the voltage to 0V will stop the voltage adjustment function. This means the First V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

◆ This function sets the rated value of the voltage output to motor 1. Note that a voltage higher than the supply (input) voltage cannot be output.

F 0 7 R A T E D V - 1

Setting range : 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 1 exceeds maximum output voltage 1, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

◆ This function sets the maximum value of the voltage output to motor 1. Note that a voltage higher than the supply (input) voltage cannot be output.

F 0 8 M A X V - 1

Setting range : 50 to 240V

F09	Acceleration time 1
F10	Deceleration time 1

◆ This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

F 0 9 A C C T I M E 1
F 1 0 D E C T I M E 1

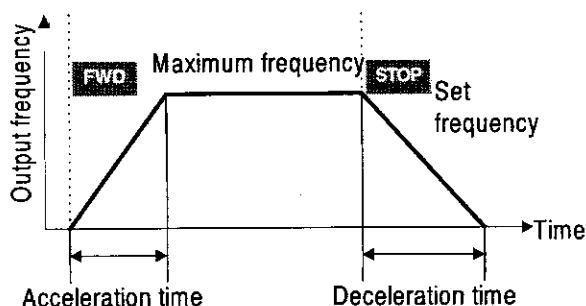
Setting range Acceleration time 1: 1.0 to 3,600 seconds
Deceleration time 1: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

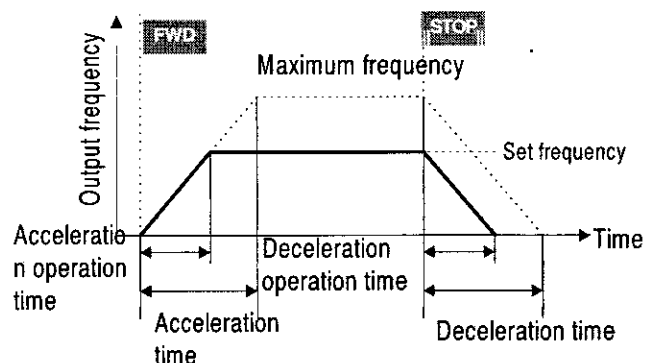
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency / maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

F11 Torque boost 1

◆ Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

◆ When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

F 1 1 T R Q B O O S T 1

Torque boost setting range: 2.0 to 20.0

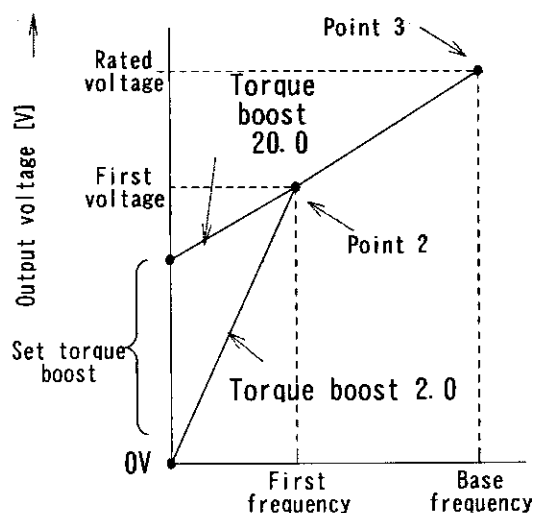
Note:

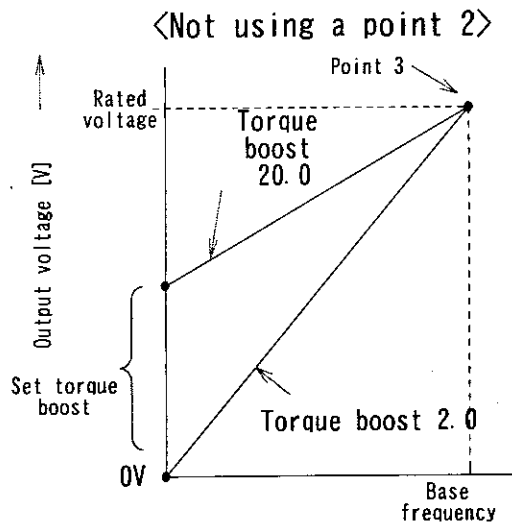
If the set torque boost is excessively large, the motor will be over-excited, resulting in the flow of overcurrent. Therefore, set the torque boost value suitable for the motor used.

With change of torque boost, the First V/f will also change as shown below:

◆ Torque characteristics

<Using a point 2>





◆Output voltage indicated by the set value for the torque boost.
Calculate the output voltage that corresponds to the torque boost set value by the following formula:

$$(\text{Torque boost set value} - 2.0) \times 1675 \times \text{Set rated voltage}$$

$$\text{Output voltage} = \frac{\quad}{131,072}$$

Remarks:

When the torque boost set value is 2.0, the output voltage becomes 0V.

F12 Electric thermal O/L relay for motor1(selection)

F13 Electric thermal O/L relay for motor1(level)

F14 Electric thermal O/L relay for motor1
(Thermal time constant)

The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by F14 (thermal time constant).

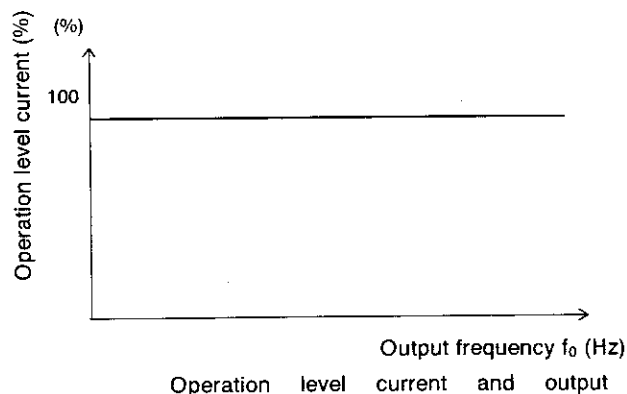
◆This function specifies whether to operate the electric thermal O/L relay.

F13 E L C T R N O L 1

Set value 0: Inactive
1: Active

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.

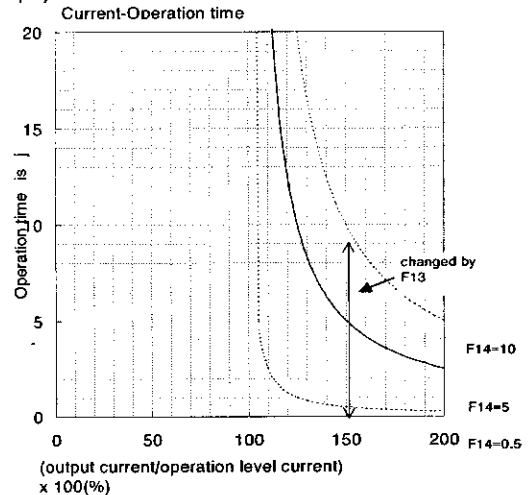
F11 O L L E V E L 1



◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

F14 T I M E C N S T 1

The setting range: 0.1 to 300.0 seconds (in 0.1 seconds steps).

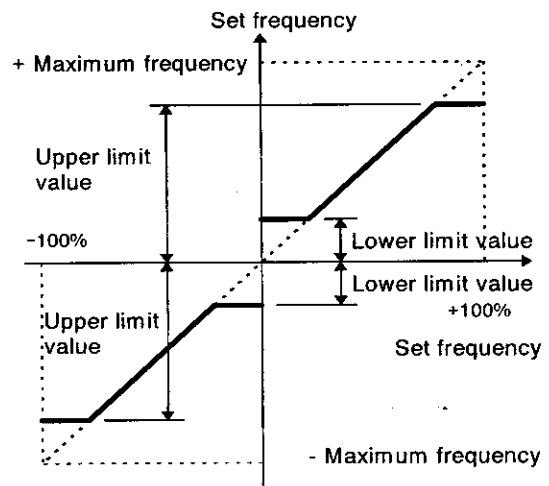


F15 Frequency limiter (High)

◆This function sets the upper limits for the setting frequency.

F15 H L I M I T E R 1

Setting range: 0 to 1667 Hz



※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

※When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

F16 Starting frequency1(frequency)

- ◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.
- ◆Frequency : This function sets the frequency at startup.

F 1 6 S T A R T H z 1

Setting range: 0.1 to 100Hz

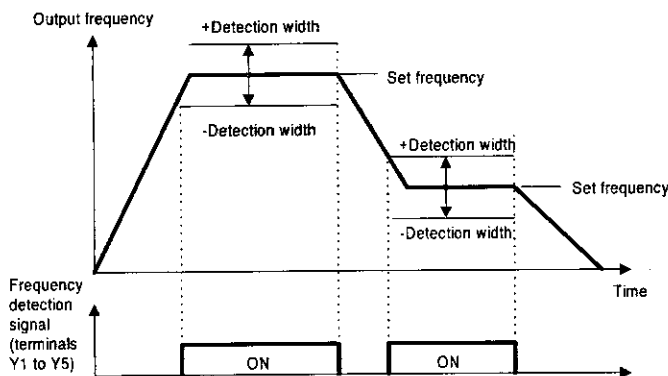
F17 Frequency arrival1(FAR)(detection width)

- ◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to $\pm 10\text{Hz}$ the setting frequency.

F 1 7 F A R H Y S T R

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].

**F18 OL1 function signal (Level)**

- ◆This function determines the operation level of the electric thermal O/L relay or output current.

F 1 8 O L 1 L E V E L

Setting range 1.00 to 100A

The operation release level is 90% of the set value.

F20 OL1 function signal(Timer)

- ◆This function is used when "1"(Output limit) is set at "F24 Overload early warning (operation selection)".

F 2 0 O L 1 T I M E R

setting range : 0.0 to 60.0 seconds

- ◆Set the time from when the operation level is attained until the overload early warning function is activated.

F21 Electric thermal O/L relay (for braking resistor)

- ◆This function controls the frequent use and continuous operating time of the braking resistor to prevent the resistor from overheating.

F 2 1 D B R O L

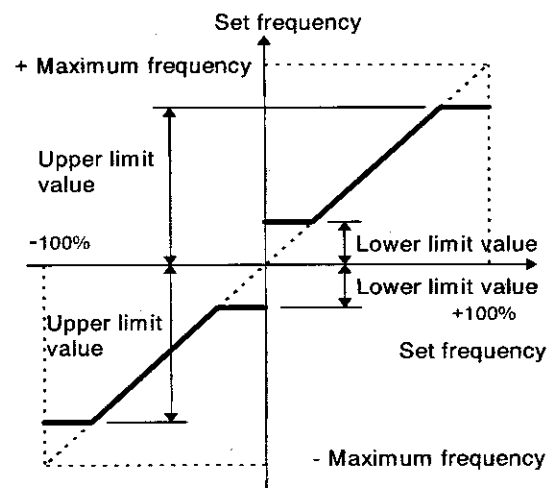
Inverter capacity	Operation
7.5kW or less	0:Inactive 1:Active(built-in braking resistor) 2:Active(external braking resistor)
11kW or more	0: Inactive

F22 Frequency limiter(Low)

- ◆This function sets the lower limits for the setting frequency of all motor.

F 2 2 L L I M I T E R

Setting range: 0 to 1667Hz



- ※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

- ※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

F23 Start frequency (Holding time)

- ◆Holding time: This function sets the holding time during which the start frequency is sustained at startup.

F 2 3 H O L D I N G t

Set values: 0.1 to 10.0 seconds

- *The holding time does not apply at the time of switching between forward and reverse.

- *The holding time is not included in the acceleration time.

- *The holding time also applies when pattern operation (C21) is selected. The holding time is included in the timer value.

F24

OL1 function signal (mode select)

◆Overload warning kind can be selected between the warning based on electric thermal characteristics and the warning based on the output current.

F 2 4 O L 1 W A R N I N G

Setting range 0: Electronic thermal O/L relay
1: Output current

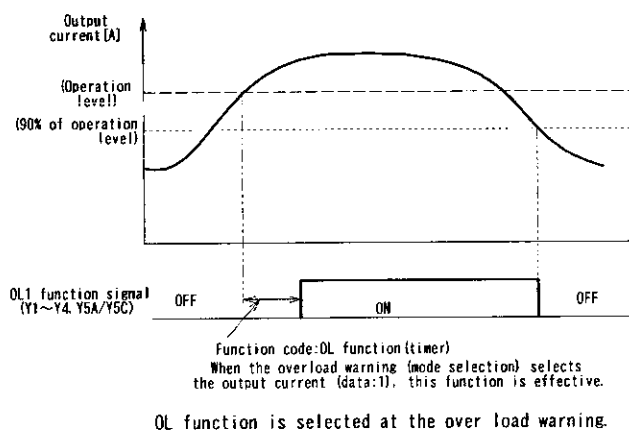
Set value	Function	Description
0	Electronic thermal O/L relay	Overload early warning by the electronic thermal O/L relay (having inverse-time characteristics) that reacts to the output current. The operation selection and thermal time constant for the inverse-time characteristics are the same as those set for the electric thermal O/L relay for protecting the motor (F13 and F14).
1	Output current	The inverter issues an overload early warning if the output current exceeds the preset current value for the present duration.

The function signal (level and timer) can be individually set to each motor. The table below shows the setting codes for each motor.

Name	Function code				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
Function signal (Level)	F18	P19	P36	A16	A33
Function signal (Timer)	F20	P20	P37	A17	A34

The overload warning signal can be allocated to the transistor output terminals Y1 to Y4 or the contact output terminals Y5A and Y5C.

The figure below shows the overload warning action.



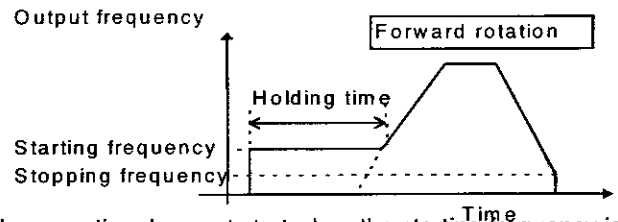
F25

Stop frequency

◆This function sets the frequency of stop.

F 2 5 S T O P H z

Setting range 0.0 to 6.0Hz



The operation does not start when the starting frequency is less than the stopping frequency or when the setting frequency is less than the stopping frequency.

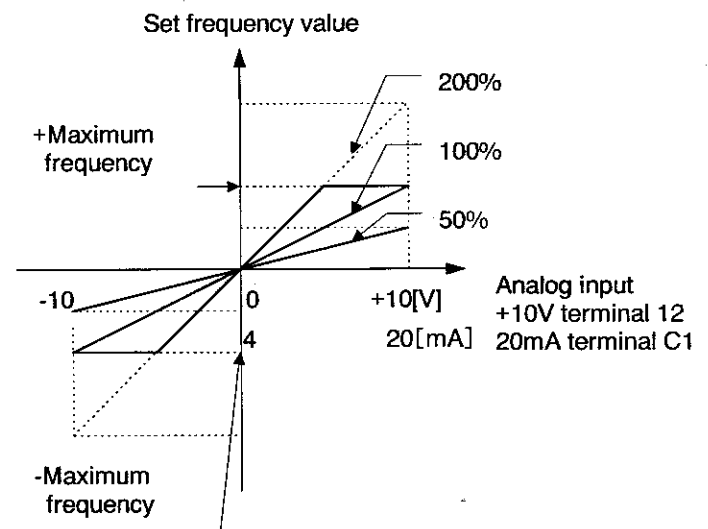
F26

Gain

◆This function sets the rate of the set frequency value to analog input.

F 2 6 F R E Q G A I N

Setting range 0.0 to 200.0%
Operation follows the figure below.



F27

Bias frequency

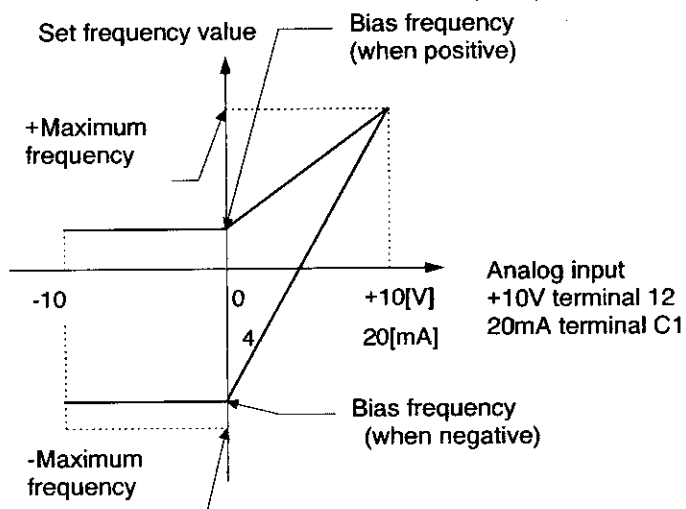
◆ This function adds a bias frequency to the set frequency value to analog input.

F 2 7 F R E Q B I A S

Setting range -1667Hz to +1667Hz

The operation follows the figure below.

When the bias frequency is higher than the maximum frequency or lower than the - maximum frequency, it is limited to the maximum or - maximum frequency.



F30**Restart mode after momentary power failure (operation selection)**

◆ This function selects operation if momentary power failure occurs.

The function for detecting power failure and activating protective operation (i.e., alarm output, alarm display, inverter output cutoff) for undervoltage can be selected. The automatic restart function (for automatically restarting a coasting motor without stopping) when the supply voltage is recovered can also be selected.

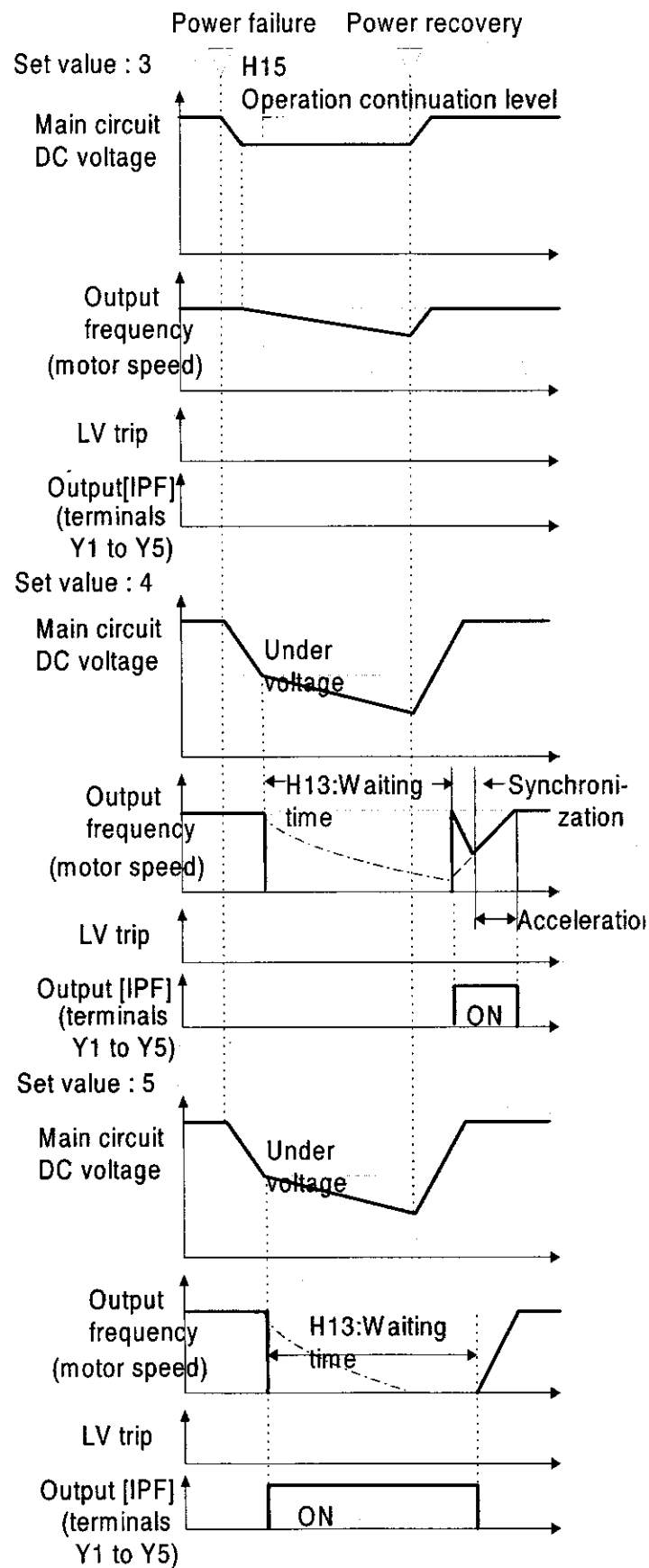
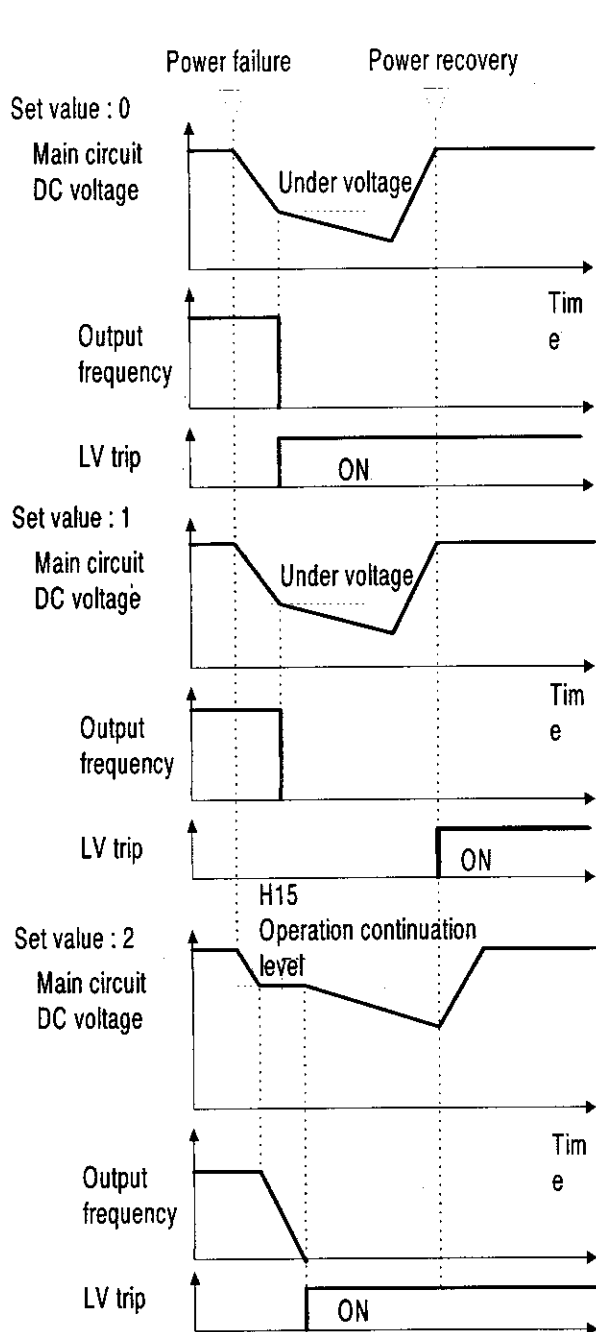
F 3 0 R E S T A R T

Setting range: 0 to 5

The following table lists the function details.

Set value	Function name	Operation at power failure	Operation at power recovery	
0	Inactive (intermediate inverter trip)	If undervoltage is detected, the protective function is activated and output stops.	Inverter is not restarted.	Inputting the protective function reset command and operation command restarts operation.
1	Inactive (inverter trip at recovery)	If undervoltage is detected, the protective function is not activated, but output stops.	The protective function is activated, but operation is not restarted.	
2	Inactive (inverter trip after deceleration to a stop at power failure)	When the operation continuation level (H15) is reached, deceleration to a stop occurs. The DC voltage of the main circuit sharpens the deceleration slope so that the undervoltage protective function is not activated. The inverter collects the inertia energy of the load and control the motor until it stops, then the undervoltage protective function is activated. If the amount of inertia energy from the load is small, and the undervoltage level is achieved during deceleration, the undervoltage protective function is then activated.	The protective function is activated, and operation is not restarted	
3	Active (operation continued, for high-inertia loads)	When the operation continuation level is achieved, energy is collected from the inertia amount of the load to extend the operation continuation time. If undervoltage is detected, the protective function is not activated, but output stops.	Operation is automatically restarted. For power recovery during operation continuation, rotation accelerates directly to the original frequency. If undervoltage is detected, operation automatically restarts with the frequency at that time.	
4	Active (restart with the frequency at power failure)	If undervoltage is detected, the protective function is not activated, but output stops.	Operation is automatically restarted with the frequency at power failure.	
5	Active (restart with the start frequency, for low-inertia loads)	If undervoltage is detected, the protective function is not activated, but output stops.	Operation is automatically restarted with the frequency set by F23, "Starting frequency."	

Function codes H13 to H16 are provided to control a restarting operation after momentary power failure. These functions should be understood and used.



Note : Dotted-dashed lines indicate motor speed.

F31	DC brake (starting frequency)
F33	DC brake (braking level)
F34	DC brake (braking time)

◆ **Starting frequency** : This function sets the frequency with which to start a DC injection brake to decelerate the motor to a stop.

F 3 1 D C B R K H z

Setting range 0 to 60Hz

◆ **Operation level** : This function sets the output current level when a DC injection brake is applied. Set a percentage of inverter rated output current in 1% steps.

F 3 3 D C B R K L V L

Setting range : 0 to 100%

◆ **Time** : This function sets the time of a DC injection brake operation.

F 3 4 D C B R K t

Setting range : 0.0 Inactive
0.1 to 30.0 seconds

CAUTION

Do not use the inverter brake function for mechanical holding.
Injury may result.

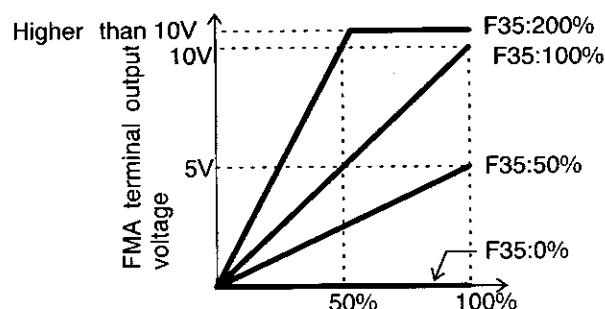
F35	FMA (voltage adjustment)
F36	FMA (function)

◆ **Monitor data** (e.g., output frequency, output current) can be output to terminal FMA as a DC voltage. The amplitude of the output can also be adjusted.

◆ This function adjusts the voltage value of the monitor item selected in F36 when the monitor amount is 100%. A value from 0 to 200 (%) can be set in 1% steps.

F 3 5 F M A V - A D J

Setting range: 0 to 200%



◆ This function selects the monitor item to be output to terminal FMA.

F 3 6 F M A F U N C

Set value	Monitor item	Definition of 100% monitor amount
0	Output frequency 1	Maximum output frequency
1	Output current	Rated output current of inverter x 2
2	Output voltage	250V
3	DC link circuit voltage	500V

F37	FMP (pulse rate)
F38	FMP (voltage adjustment)
F39	FMP (function)

Monitor data (e.g., output frequency, output current) can be output to terminal FMP as pulse voltage. Monitor data can also be sent to an analog meter as average voltage. When sending data to a digital counter or other instrument as pulse output, set the pulse rate in F37 to any value and the voltage in F38 to 0%.

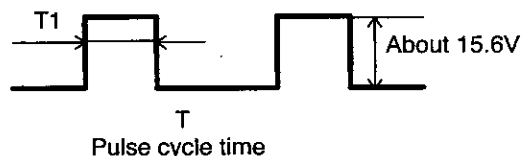
When data is sent to an analog meter or other instrument as average voltage, the voltage value set in F38 determines the average voltage and the pulse rate in F37 is fixed to 2670 (p/s).

◆ This function sets the pulse frequency of the monitor item

F 3 7 F M P P U L S E S

selected in F39 within a range of 300 to 6000 (p/s) in 1 p/s steps.

Setting range 300 to 6,000 p/s



$$\text{Pulse frequency (p/s)} = 1/T$$

$$\text{Duty (\%)} = T1/T \times 100$$

$$\text{Average voltage (V)} = 15.6 \times T1/T$$

F 3 8 F M P V - A D J

◆ This function sets the average voltage of pulse output to terminal FMP.

Setting range

0%:

The pulse frequency varies depending on the monitor amount of the monitor item selected in F39. (The maximum value is the value set in F37.)

1 to 200%: Pulse frequency is fixed at 2,670 p/s. The average voltage of the monitor item selected in F39 when the monitor amount is 100% is adjusted in the 1 to 200% range (1% steps). (The pulse duty varies.)

◆This function selects the monitor item to be output to terminal FMP.

F	3	9	F	M	P		F	U	N	C		
---	---	---	---	---	---	--	---	---	---	---	--	--

The set value and monitor items are the same as those of F36.

E:Extension Terminal Functions

E01

X1 Terminal function

E09

X9 Terminal function

◆ Each function of digital input terminals X1 to X9 can be set as codes.

E	0	1	X	1	F	U	N	C		
E	0	2	X	2	F	U	N	C		
E	0	3	X	3	F	U	N	C		
E	0	4	X	4	F	U	N	C		
E	0	5	X	5	F	U	N	C		
E	0	6	X	6	F	U	N	C		
E	0	7	X	7	F	U	N	C		
E	0	8	X	8	F	U	N	C		
E	0	9	X	9	F	U	N	C		

Set value	Function
0,1,2	Multistep frequency selection (1 to 7 steps) [SS1],[SS2],[SS4]
3	Self-hold selection [HLD]
4	Coast-to-stop command [BX]
5	Alarm reset [RST]
6	External alarm [THR]
7	Jogging [JOG]
8	Frequency setting 2/frequency setting 1 [Hz2/Hz1]
9	DC injection brake command [DCBRK]
10	UP command [UP]
11	DOWN command [DOWN]
12	Edit permission command (data change permission) [WE-KP]
13	Forward/inverse switching (terminals 12 and C1) [IVS]
14	Interlock (52-2) [IL]
15	Link operation selection (Standard:RS485) [LE]
16	Universal DI [U-DI]
17	Motor selection signal (M1)
18	Motor selection signal (M2)
19	Motor selection signal (M3)
20	Motor selection signal (M4)
21	Motor selection signal (M5)
22	Motor selection signal Bitt0 (Least significant bit) (MBCD[0])
23	Motor selection signal Bitt1 (MBCD[1])
24	Motor selection signal Bitt2 (Most significant bit) (MBCD[2])
25	Motor selection signal Parity bit (MBCD[P])

Note: Data numbers which are not set in the functions from E01 to E09, are assumed to be inactive.

Multistep frequency selection

The frequency can be switched to a preset frequency in function codes C05 to C11 by switching the external digital input signal. Assign values 0 to 2 to the target digital input terminal. The combination of input signals determines the frequency.

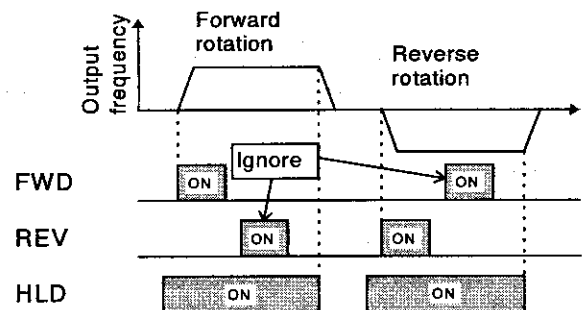
Combination of set value input signals			Frequency selected
2 [SS4]	1 [SS2]	0 [SS1]	
off	off	off	Assigned by F01 or C30
off	off	on	C05 MULTI Hz-1
off	on	off	C06 MULTI Hz-2
off	on	on	C07 MULTI Hz-3
on	off	off	C08 MULTI Hz-4
on	off	on	C09 MULTI Hz-5
on	on	off	C10 MULTI Hz-6
on	on	on	C11 MULTI Hz-7

Setting range
0.0 to 1667Hz

Related function
C05 to C11

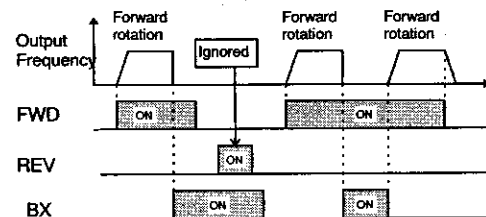
Self-hold selection [HLD]

This selection is used for 3-wire operation. The FWD or REV signal is self-held when HLD-CM is on, and the self-hold is cleared when HLD-CM is turned off. To use this HLD terminal function, assign 6 to the target digital input terminal.



Coast-to-stop command [BX]

When BX and CM are connected, inverter output is cut off immediately and the motor starts to coast-to-stop. An alarm signal is neither output nor self-held. If BX and CM are disconnected when the operation command (FWD or REV) is on, operation starts at the start frequency. To use this BX terminal function, assign value "4" to the target digital input terminal.



Alarm reset [RST]

When an inverter trip occurs, connecting RST and CM clears the alarm output (for any fault); disconnecting them clears trip indication and restarts operation. To use this RST terminal function, assign value "5" to the target digital input terminal.

External fault [THR]

Disconnecting THR and CM during operation cuts off inverter output (i.e., motor starts to coast-to-stop) and outputs alarm OH2, which is self-held internally and cleared by RST input. This function is used to protect an external brake resistor and other components from overheating. To use this THR terminal function, assign value "6" to the target digital input terminal. ON input is assumed when this terminal function is not set.

Jogging operation [JOG]

This function is used for jogging (inching) operation to position a work piece. When JOG and CM are connected, the operation is performed with the jogging frequency set in function code C20 while the operation command (FWD-CM or REV-CM) is on. To use this JOG terminal function, assign value "7" to the target digital input terminal.

Frequency setting 2/frequency setting 1

This function switches the frequency setting method set in function codes F01 and C30 by an external digital input signal.

Set value input signal	Frequency setting method selected
8	
off	F01 FREQ CMD1
on	C30 FREQ CMD2

DC brake command

When the external digital input signal is on, DC injection braking starts when the inverter's output frequency drops below the frequency preset in function code F31 after the operation command goes off. (The operation command goes off when the **STOP** key is pressed at keypad panel operation and when both terminals FWD and REV go on or off at terminal block operation.) The DC injection braking continues while the digital input signal is on. In this case, the longer time of the following is selected:

- The time set in function code F34.
- The time which the input signal is set on.

Set value input signal	Operation selected
9	
off	No DC injection brake command is given.
on	A DC injection brake command is given.

UP command [UP]/DOWN command [DOWN]

When an operation command is input (on), the output frequency can be increased or decreased by an external digital input signal.

The change ranges from 0 to maximum frequency. Operation in the opposite direction of the operation command is not allowed.

Combination of set value input signals		Function selected (when operation command is on)
11	10	
off	off	Holds the output frequency.
off	on	Increases the output frequency according to the acceleration time .
on	off	Decreases the output frequency according to the deceleration time .
on	on	Holds the output frequency.

There are the two types of UP/DOWN operations as shown below. Set the desired type by setting the frequency (F01 or C30).

Frequency setting (F01 or C30)	Initial value at power input on	Operation command reentry during deceleration
8 (UP/DOWN1)	0Hz	Operates at the frequency at reentry. Frequency FWD <input type="checkbox"/> ON <input type="checkbox"/> OFF <input type="checkbox"/>
9 (UP/DOWN2)	Previous frequency	Returns to the frequency before deceleration Frequency FWD <input type="checkbox"/> ON <input type="checkbox"/> OFF <input type="checkbox"/>

Wire enable for KEYPAD [WE-KP]

This function allows the data to be changed only when an external signal is being input, thereby making it difficult to change the data.

12	Function selected
off	Inhibit data changes.
on	Allow data changes.

Note:

If a terminal is set to value 12, the data becomes **unable to be changed**. To change the data, turn on the terminal and change the terminal setting to another number.

Inverse mode changeover [IVS]

The analog input (terminals 12 and C1) can be switched between forward and inverse operations by an external digital input signal.

Set value input signal	Function selected	Related function F01
13		
off	Forward operation when forward operation is set and vice versa	
on	Inverse operation when forward operation is set and vice versa	

Interlock signal(52-2) [IL]

When a contactor is installed on the output side of the inverter, the contactor opens at the time of a momentary power failure, which hinders the reduction of the DC circuit voltage and may prevent the detection of a power failure and the correct restart operation when power is recovered. The restart operation at momentary power failure can be performed effectively with power failure information provided by an external digital input signal.

Set value input signal	Function
14	
off	No momentary power failure detection operation by digital input
on	Momentary power failure detection operation by digital input

Link enable (RS485 standard, BUS)[LE]

Frequency and operation commands from the link can be enabled or disabled by switching the external digital input signal. Select the command source in H30, "Link function." Assign value "15" to the target digital input terminal and enable or disable commands in this input signal state.

Set value input signal	Function selected
15	
off	Link command disabled.
on	Link command enabled.

Universal DI [U-DI]

Assigning value "16" to a digital input terminal renders the terminal a universal DI terminal. The ON/OFF state of signal input to this terminal can be checked through the RS485.

This input terminal is only used to check for an incoming input signal through communication and does not affect inverter operation.,

Settings when shipped from the factory

Digital input	Setting at factory shipment	
	Set value	Description
Terminal X1	0	Multistep frequency selection (SS1)
Terminal X2	1	Multistep frequency selection (SS2)
Terminal X3	2	Multistep frequency selection (SS4)
Terminal X4	5	Alarm reset (RST)
Terminal X5	17	Motor selection signal (M1)
Terminal X6	18	Motor selection signal (M2)
Terminal X7	19	Motor selection signal (M3)
Terminal X8	20	Motor selection signal (M4)
Terminal X9	21	Motor selection signal (M5)

E10

Motor selection

- ◆ The motor can be switched in either of the following methods:

Switching on the keypad panel ... Selecting a motor by entering a motor number on the keypad panel.

Switching on the terminal base ... Selecting a motor from outside using the digital input signals (terminal X1 to X9)

E 1 0 M T R S E L C T

Setting range

- 1 Switching on the keypad panel : Motor1 is selected.
- 2 Switching on the keypad panel : Motor2 is selected.
- 3 Switching on the keypad panel : Motor3 is selected.
- 4 Switching on the keypad panel : Motor4 is selected.
- 5 Switching on the keypad panel : Motor5 is selected.
- 6 Switching on the terminal base : Bit selection
- 7 Switching on the terminal base : Binary code selection (no parity function)
- 8 Switching on the terminal base : Binary code selection (even parity function)
- 9 Switching on the terminal base : Binary code selection (odd parity function)

The selected motor number is displayed on the LCD screen of the keypad panel. Be sure to confirm the motor number on the screen when the motor is switched.

⚠ WARNING

Securely check the motor number. If you mistake the motor number, an unexpected motor starts operation.
Injury may result.

[Switching on the keypad panel]

Setting a value between 1 and 5 automatically selects the motor switching method on the keypad panel. Select a required motor number to switch the inverter control to the corresponding motor.

[Switching on the terminal base]

Setting a value between 6 and 9 automatically selects the motor switching method on the terminal base. In this switching method, the motor is switched by a digital input from the external device. This switching method is effective only when the inverter is stopped; i.e., motor switchover is impossible during inverter operation.

Switching on the terminal base is classified into bit selection (set value 6) and binary code selection (set value 7,8 and 9). Motor switching method by bit selection and binary code selection is explained below.

1. Bit selection (set value 6)

A digital input (from terminal X1 to X9) corresponds to each motor.

Setting data at the terminals X1 to X9 (function codes E01 to E09).

Set value Content

- 17 Motor selection (bit code) Motor 1
- 18 Motor selection (bit code) Motor 2
- 19 Motor selection (bit code) Motor 3
- 20 Motor selection (bit code) Motor 4
- 21 Motor selection (bit code) Motor 5

[Setting example]

If a number 21 is set at E01 (terminal X1), the motor 5 is selected with the digital input 1 (X1 - CM) turned ON.

Function setting by digital input (X1 to X9) from the host controller.

Digital input allocation function	ON/OFF setting				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
selecting Motor 1 (M1)	ON	OFF	OFF	OFF	OFF
selecting Motor 2 (M2)	OFF	ON	OFF	OFF	OFF
selecting Motor 3 (M3)	OFF	OFF	ON	OFF	OFF
selecting Motor 4 (M4)	OFF	OFF	OFF	ON	OFF
selecting Motor 5 (M5)	OFF	OFF	OFF	OFF	ON

Caution:

1. When the bit selection (set value 6) is set, it is impossible to set the values 22 to 25 (motor selection by binary code) for the function codes E01 to E09.
2. There is no need set data for selecting all the motors (M1) to (M5). Allocate data to the necessary number of the motors.
3. The LCD monitor screen displays an error code "ErL" (Motor switching error), if two or more motors are selected while the inverter is stopped. Motor selection error (ErL) can be output to the transistor (terminals Y1 to Y4).
The inverter gets back to normal by selecting only one motor under this condition. If you issue an operation command while "ErL" is lit, the inverter trips with the output stopped. The error display remains "ErL".
4. This above alarm is output when the inverter is operated, if no motor is selected from (M1) to (M5) or no signal is sent to a terminal from X1 to X9 although a motor has been selected. In that case, the LCD monitor screen displays an error code "ErL"(Motor switching error).

2. Binary code selection

The binary code selection is a method of selecting a motor by entering a motor number converted into a binary code to a digital input (terminals X1 to X9).

Setting the terminals X1 to X9 (function code E01 to E09)

Set value Content

22	Bit0 (Least significant bit) (MBCD[0])
23	Bit1 (MBCD[1])
24	Bit2 (Most significant bit) (MBCD[2])
25	Parity bit (MBCD[P])

Function setting by digital inputs (X1 to X9) from the host controller.

The method of entering a binary code corresponding to the motor number is explained here by taking an example where set values are allocated as follows.

Example:

Function code	set value
E01 (terminal X1)	22
E02 (terminal X2)	23
E03 (terminal X3)	24
E04 (terminal X4)	25

When a number 7 (no parity function) is selected by the motor switching selection(E10).

Because the parity function is not used here, a number 25 (motor selection parity bit) need not be allocated at a terminal from X1 to X9 (E01 to E09). The input to the terminal X4 in invalid in the above example.

Digital input allocation function	ON/OFF setting				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
Terminal X1 (MBCD[0])	ON	OFF	ON	OFF	ON
Terminal X2 (MBCD[1])	OFF	ON	ON	OFF	OFF
Terminal X3 (MBCD[2])	OFF	OFF	OFF	ON	ON
Terminal X4 (MBCD[P])	-	-	-	-	-

When a number 8 (even parity function) is selected by the

motor switching selection (E10).

Digital input allocation function	ON/OFF setting				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
Terminal X1 (MBCD[0])	ON	OFF	ON	OFF	ON
Terminal X2 (MBCD[1])	OFF	ON	ON	OFF	OFF
Terminal X3 (MBCD[2])	OFF	OFF	OFF	ON	ON
Terminal X4 (MBCD[P])	ON	ON	OFF	ON	OFF

When a number 9 (odd parity function) is selected by the motor switching selection (E10).

Digital input allocation function	ON/OFF setting				
	Motor 1	Motor 2	Motor 3	Motor 4	Motor 5
Terminal X1 (MBCD[0])	ON	OFF	ON	OFF	ON
Terminal X2 (MBCD[1])	OFF	ON	ON	OFF	OFF
Terminal X3 (MBCD[2])	OFF	OFF	OFF	ON	ON
Terminal X4 (MBCD[P])	OFF	OFF	ON	OFF	ON

Caution:

1. When the binary code selection (set values 7,8 and 9) is set, it is impossible to set the values 17 to 21 (motor selection by each bit) at the function code E01 to E09.
2. There is no need to set data for selecting all the motors (MBCD[0]) to (MBCD[2]). Set only the required number of motors.
3. The LCD monitor screen displays an error code "ErL" (Motor switching error) when binary code 0 or 6 or more is selected while the inverter is stopped. Motor selection warning "ErL" can be output to the transistor terminals Y1 to Y4.
4. The above alarm is output. If there is no setting for motor selection (MBCD[0]) to (MBCD[2]) or there is no input to the terminals X1 to X9 although a motor has been selected. In that case, the LCD monitor screen displays an error code "ErL"(motor switching error).

The inverter gets back to normal by setting binary code to any of 1 to 5 in this condition. If you issue an operation command while "ErL" is lit, the inverter trips with the output stopped. The error display remains "ErL".

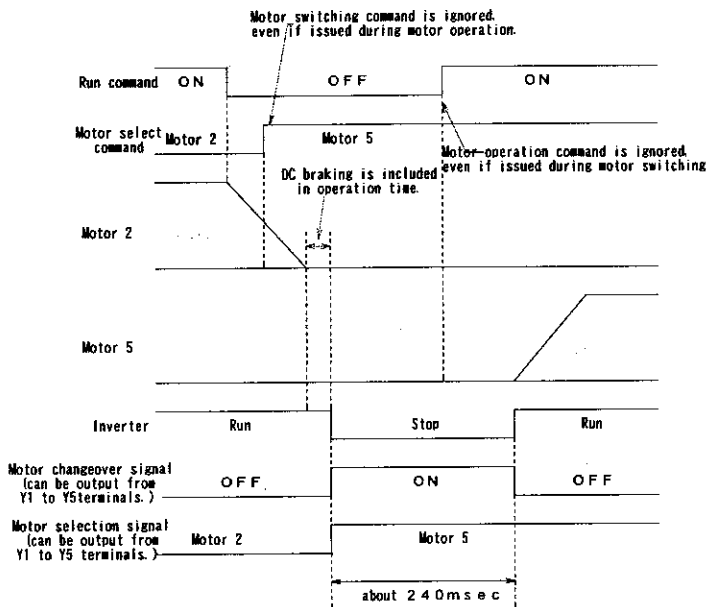
Press **RESET** key or enter a RST command from the terminal block to get the inverter back to normal.

[Motor switching sequence]

The delay time (about 240ms) is set in FRN-H11S series to prohibit motor operation until the motor is completely switched. It will take about 240ms to switch a motor connected with the inverter through an electromagnetic contactor. The delay time is determined based on such assumption. Determine the signal output timing from the host controller by considering this delay time.

Remarks:

The motor switching signal can be output while the operation is prohibited (for delay time) by setting a number 19 (a signal indicating that motor switching is in progress) in terminals Y1 to Y5 (E20 to E24).



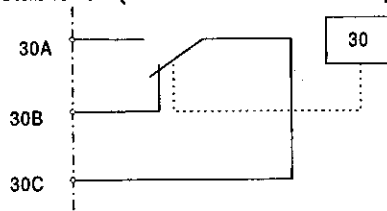
E11 30Ry operation mode

◆ This function specifies whether to activate (excite) the alarm output relay (30Ry) for any fault at normal or alarm status.

E 1 1 3 0 R Y M O D E

Set value	Operation
0	At normal 30A - 30C: OFF, 30B - 30C: ON At abnormal 30A - 30C: ON, 30B - 30C: OFF
1	At normal 30A - 30C: ON, 30B - 30C: OFF At abnormal 30A - 30C: OFF, 30B - 30C: ON

◆ When the set value is 1, contacts 30A and 30C are connected when the inverter control voltage is established (about one second after power on).



E20

Y1 Terminal function

E24

Y5A and Y5C Terminals function

◆ Some control and monitor signals can be selected and output from terminals [Y1] to [Y5]. Terminals [Y1] to [Y4] use transistor output; terminals [Y5A] and [Y5C] use relay contacts.

E 2 0	Y 1	F U N C		
E 2 1	Y 2	F U N C		
E 2 2	Y 3	F U N C		
E 2 3	Y 4	F U N C		
E 2 4	Y 5	F U N C		

Set value	Output signal
0	Inverter running [RUN]
1	Frequency equivalence signal [FAR]
2	Frequency level detection [FDT1]
3	Undervoltage detection signal [LV]
4	Restarting-after momentary power failure [IPF]
5	Overload early warning [OL1]
6	KEYPAD operation mode [KP]
7	Inverter stopping [STP]
8	Ready output [RDY]
9	Terminal AX function [AX]
10	Alarm indication1 [AL1]
11	Alarm indication2 [AL2]
12	Alarm indication4 [AL4]
13	Alarm indication8 [AL8]
14	Fan operation signal [FAN]
15	Retry function operating [TRY]
16	Universal DO [U-DO] *
17	Overheat early warning [OH]
18	Motor selection error signal [ERL]
19	Motor changeover signal [MCHG]
20	Motor 1 selection signal [M1SEL]
21	Motor 2 selection signal [M2SEL]
22	Motor 3 selection signal [M3SEL]
23	Motor 4 selection signal [M4SEL]
24	Motor 5 selection signal [M5SEL]
25	Binary signal 1 for selecting motor [MB1]
26	Binary signal 2 for selecting motor [MB2]
27	Binary signal 4 for selecting motor [MB4]

Note: For output signals marked *, refer to instruction manuals for RS-485 communication.

Inverter running [RUN]

"Running" means that the inverter is outputting a frequency. "RUN" signal is output as when there is output speed (frequency). When the DC injection brake function is active, "RUN" signal is off.

Frequency equivalence signal [FAR]

See the explanation of function code F17 (frequency arrival [detection width]).

Frequency level detection [FDT1]

See the explanation of function codes E31 and E32 (frequency detection).

Undervoltage detection signal [LV]

If the undervoltage protective function activates, i.e. when the main circuit DC voltage falls below the undervoltage detection level, an ON signal is output. The signal goes off when the voltage recovers and increases above the detection level. The ON signal is retained while the undervoltage protective function is activating.

Undervoltage detection level: 200V

Restart after momentary power failure [IPF]

Following a momentary power failure, this function reports the start of the restart mode, the occurrence of an automatic pull-in, and the completion of the recovery operation.

Following a momentary power failure, an ON signal is output when power is recovered and a synchronization (pull-in) operation is performed. The signal goes off when the frequency (before power failure) is recovered. For 0Hz restart at power recovery, no signal is output because synchronization ends when power is recovered. The frequency is not recovered to the frequency before the power failure occurrence.

Overload early warning [OL1]

Before the motor stops by the trip operation of an electronic thermal O/L relay, this function outputs an ON signal when the load reaches the overload early warning level.

For setting procedure, see "F18 OL1 function signal (Level)", and "E24 Overload early warning (operation selection)."

Note: This function is effective for each motor.

You can choose the method judging overload early warning between overload early warning by electronic thermal relay and that by output current.

Keypad operation mode [KP]

An ON signal is output when operation command keys (**FWD** , **REV** and **STOP**) on the keypad panel can be used (i.e., 0 set in "F02 Operation") to issue operation and stop commands.

Inverter stopping [STP]

This function outputs an inverted signal to Running (RUN) to indicate zero speed. An ON signal is output when the DC injection brake function is operating.

Ready output [RDY]

This function outputs an ON signal when the inverter is ready to operate. The inverter is ready to operate when the main circuit and control circuit power is established and the inverter protective function is not activating. About one second is required from power-on to ready for operation in normal condition.

Terminal AX function [AX]

When an operation (forward or reverse) command is entered, this function outputs an ON signal. When a stop command is entered, the signal goes off after inverter output stops. When a coast-to-stop command is entered and the inverter protective function operates, the signal goes off immediately.

Alarm indication [AL1] [AL2] [AL4]

This function reports the operating status of the inverter protective function.

Alarm detail (inverter protective function)	Output terminal			
	AL1	AL2	AL4	AL8
Overcurrent, ground fault, fuse blown	on	off	off	off
Overvoltage	off	on	off	off
Undervoltage shortage, input phase failure	on	on	off	off
Motors 1 to 5 overload	off	off	on	off
Inverter overload	on	off	on	off
Heat sink overheating, inverter inside overheating	off	on	on	off
External alarm input, braking resistor overheating	on	on	on	off
Memory error, CPU error	off	off	off	on
Keypad panel communication error, option communication error	on	off	off	on
Option error	off	on	off	on
Output wiring error	off	off	on	on
RS-485 communication error	on	off	on	on
Motor selection error	on	on	off	on

In normal operation terminals do not output a signal.

Fan operating signal [FAN]

When used with "H06 Cooling fan ON/OFF control," this function outputs a signal while the cooling fan is operating.

Retry function operating [TRY]

When a value of 1 or larger is set to "H04 Retry perating," the signal is output while retry operation is activating when the inverter protective function is activated.

Universal DO [U-DO]

Assigning value "16" to a transistor output terminal renders the terminal a universal DO terminal. This function enables ON/OFF through the RS485. This function serves only to turn on and off the transistor output through communication and is not related to inverter operation.

Overheat early warning [OH]

This function outputs a early warning signal when heat sink temperature is (overheat detection level - 10°C) or higher.

Motor selection error [ErL]

This inverter issues this error signal when several motors are selected at the same the time, no motor is selected, no input is given to terminals X1 to X9, or the specified binary code is out of the selection range. The error is also displayed in the LCD monitor screen.

Motor changeover signal [MCHG]

When the inverter receives a motor changeover signal from a terminal selected among the terminals X1 to X9, the inverter outputs the signal for switching the electromagnetic contactors of the motors. The changeover time present in the inverter is about 240ms. The inverter, however, does not output the changeover signal while the motor is operating or the DC braking resistor is operating. In this case, wait until the motor stops before re-inputting the changeover signal.

Motor selection signal [M1SEL, M2SEL, M3SEL, M4SEL, M5SEL]

This signal is issued when the motor selected by a preset value is reselected by input from any of the terminals X1 to X9.

Binary signal for selecting motors [MB1, MB2, MB4]

This signal is issued as a 3-bit binary code when the motor selected by a preset value is reselected by input from any of the terminals X1 to X9. [MB1] corresponds to LSB and [MB4] corresponds to MSB.

Settings when shipped from the factory

Digital input	Setting at factory shipment	
	Set value	Description
Terminal Y1	0	Operating [RUN]
Terminal Y2	1	Frequency arrival [FAR]
Terminal Y3	2	Frequency detection [FDT1]
Terminal Y4	5	Overload early warning [OL1]
Terminal Y5	9	Terminal AX function [AX]

E25 Y5 Ry operation mode

◆ This function specifies whether to excite the Y5 relay at "ON signal mode" or "OFF signal mode".

E 2 5 Y 5 R Y M O D E

Set value	Operation
0	At "OFF signal mode" Y5A - Y5C: OFF At "ON signal mode" Y5A - Y5C: ON
1	At "OFF signal mode" Y5A - Y5C: ON At "ON signal mode" Y5A - Y5C: OFF

◆ When the set value is 1, contacts Y5A and Y5C are connected when the inverter control voltage is established (about one second after power on).

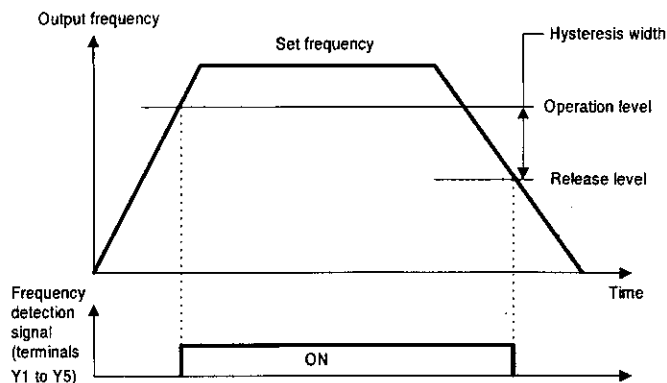
E31 Frequency detection1 (operation level)

E32 Frequency detection (hysteresis width)

◆ This function determines the operation (detection) level of the output frequency and hysteresis width for operation release. When the output frequency exceeds the set operation level, an ON signal can be selected and output from terminals [Y1] to [Y5].

E 3 1 F D T 1 L E V E L
E 3 2 F D T H Y S T R

Setting range (Operation level) : 0 to 1667Hz
(Hysteresis width) : 0.0 to 30.0 Hz



E40 Display coefficient A

E41 Display coefficient B

◆ These coefficients are conversion coefficients which are used to determine the load and line speed and the target value and feedback amount (process amount) of the PID controller displayed on the LED monitor.

E 4 0 C O E F A
E 4 1 C O E F B

Setting range

Display coefficient A: -999.00 to 0.00 to +999.00

Display coefficient B: -999.00 to 0.00 to +999.00

◆ Load and line speed

Use the display coefficient A.

Displayed value = output frequency x (0.01 to 200.00)
Although the setting range is ± 999.00 , the effective value range of display data is 0.01 to 200.00. Therefore, values smaller or larger than this range are limited to a minimum value of 0.01 or a maximum value of 200.00.

E42 LED Display filter

◆ Among data in "E43 LED monitor (Function)," some data need not be displayed instantaneously when the data changes. For such data, a flickering suppression filter can be used.

E 4 2 D I S P L A Y F L

Setting range: 0.0 to 5.0 seconds

◆ Monitored items in "E43 LED monitor (Function)"

Set value	Display item
3	Output current
4	Output voltage

E43

LED monitor (Function)

E44

LED monitor (display at STOP mode)

◆The data during inverter operation, during stopping, at frequency setting, and at PID setting is displayed on the LED.

◆Display during running and stopping

During running, the items selected in "E43 LED monitor (Function)," are displayed. In "E44 LED monitor (display at stop mode)," specify whether to display some items out of the set values or whether to display the same items as during running.

E	4	3	L	E	D		M	N	T	R		
E	4	4	L	E	D		M	N	T	R	2	

Value set to E43	E44=0		E44=1	
	At stopping	During running	At stopping	During running
0	Set frequency value (Hz)	Output frequency (Hz)		
1	Set frequency value (Hz)			
2	Output current (A)			
3	Output voltage (command value) (V)			
4	Motor synchronous speed set value (r/min)	Motor synchronous speed (r/min)		
5	Line speed set value (m/min.)	Line speed (m/min.)		
6	Load shaft speed set value (r/min)	Load shaft speed (r/min)		

◆Display at frequency setting

When a set frequency is checked or changed by the keypad panel, the set value shown below is displayed.

Select the display item by using "E43 LED monitor (Function)." This display is not affected by "E44 LED monitor (display at stop mode)."

Value set to E43	Frequency setting
0,1,2,3	Set value of frequency (Hz)
4	Set value of synchronous speed (r/min)
5	Set value of line speed (m/min.)
6	Set value of load speed (r/min)

E45

LCD monitor (Function)

◆This function selects the item to be displayed on the LCD monitor in the operation mode.

E 4 5 L C D M N T R

Set value	Display item
0	Operation status, rotating direction, operation guide
1	Output frequency (before slip compensation), output current, calculated torque value in bar graph

Set value: 0


During running

60.0
RUN ^{FWD}
 M1
 PRG=PRG MENU
 F/D=LED SHIFT

When stopping

60.0
STOP ^{M1}
 PRG=PRG MENU
 F/D=LED SHIFT

Set value: 1

60.0

 Hz
 A
 Fout/Iout

Full-scale value of bar graph

Display item	Full-scale
Output frequency	Maximum frequency
Output current	200% of inverter rated value

Note: The scale cannot be adjusted.

◆This function selects the language for data display on the LCD monitor.

E46

Language

Set value	Language displayed
0	Japanese
1	English

Note: English language is used for all LCD screens in this manual. For other languages, refer to the relevant instruction manual.

◆This function adjusts the LCD contrast. Increase the set value to raise contrast and decrease to lower contrast.

E 4 7 C O N T R A S T

Set value	0,1,2.....8,9,10
Screen	Low ← → High

C. Control Functions of Frequency

C01	Jump frequency 1
C02	Jump frequency 2
C03	Jump frequency 3
C04	Jump frequency (Hysteresis)

- ◆ This function makes the set frequency jump so that the inverter's output frequency does not match the mechanical resonance point of the load.
 - ◆ Up to three jump points can be set.
 - ◆ This function is ineffective when jump frequencies 1 to 3 are set to 0Hz.
 - ◆ A jump does not occur during acceleration or deceleration.
- When a jump frequency setting range overlaps another range, both ranges are added to determine the actual jump area.

C	0	1	J	U	M	P	H	z	1
C	0	2	J	U	M	P	H	z	2
C	0	3	J	U	M	P	H	z	3

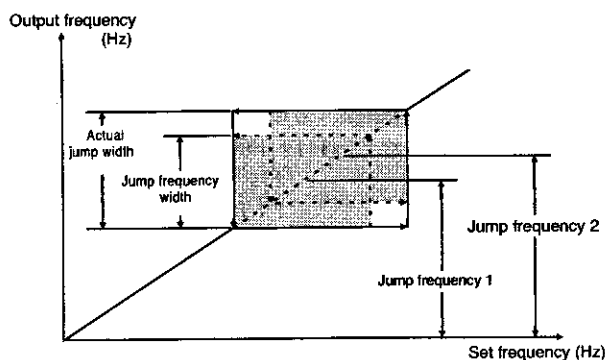
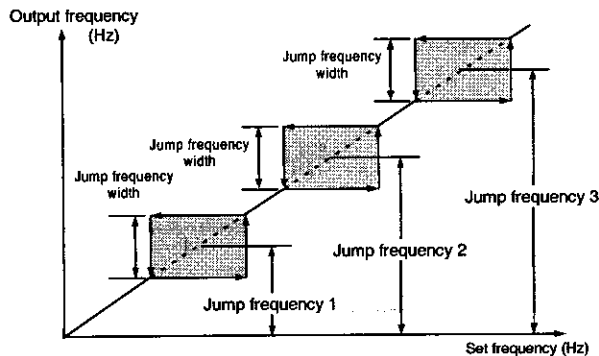
Set value

0 to 1667Hz (P11S: 0 to 120Hz)
In 1Hz steps (min.)

C	0	4	J	U	M	P	H	Y	S	T	R
---	---	---	---	---	---	---	---	---	---	---	---

Set value

0 to 30Hz
In 1Hz steps (min.)



C05	Multistep frequency 1
C11	Multistep frequency 7

- ◆ The motor speed can be changed in a maximum of 8 steps by combining the multistep frequencies (from C05 to C11) with the terminal functions (from E01 to E09). Use the multistep frequencies when operating the motor by changing the motor speed in several steps.
- ◆ The multistep frequencies 1 to 7 can be switched by turning on and off terminal functions SS1, SS2, and SS4. (See E01 to E09 for terminal function definitions.)
- ◆ OFF input is assumed for any undefined terminal of SS1, SS2, and SS4.

Note:

The multistep frequencies override the frequencies set by F01 or C30.

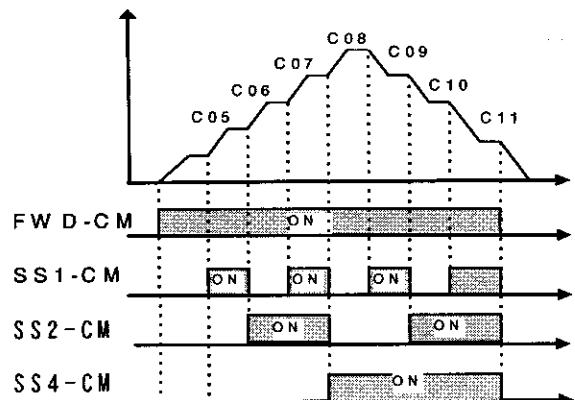
C	0	5	M	U	L	T	I	H	z	-	1
C	0	6	M	U	L	T	I	H	z	-	2
C	0	7	M	U	L	T	I	H	z	-	3
C	0	8	M	U	L	T	I	H	z	-	4
C	0	9	M	U	L	T	I	H	z	-	5
C	1	0	M	U	L	T	I	H	z	-	6
C	1	1	M	U	L	T	I	H	z	-	7

Related functions
E01 to E09
(Set value: 0 to 3)

Set value

0 to 1667Hz
In 0.1Hz steps (min.)

Output frequency (Hz)



C20**JOG frequency**

◆This function sets the frequency for jogging operation of motor, which is different from the normal operation.

C 2 0 J O G H z

Setting range 0.00 to 1667 Hz

◆Starting with the jogging frequency is combined with jogging select signal input from the keypad panel or control terminal. For details, see the explanations of "E01 Terminal X1," to "E09 Terminal X9."

C28**Setting analog input resolution**

◆This function is used to set the resolution applied to the analog inputs for setting the frequency (voltage input and current input).

C 2 8 R E S O L U T I O N

Setting range 0.1 to 20Hz

The resolution can be set in increments of 1Hz.

C30**Frequency command 2**

◆This function selects the frequency setting method.

C 3 0 F R E Q C M D 2

Related functions
E01 to E09
(Set value:11)
F01

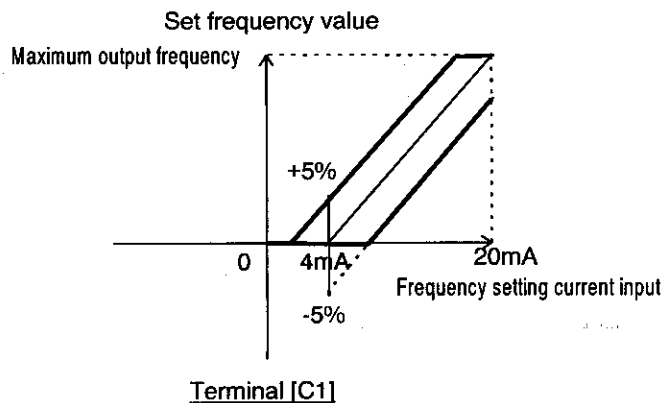
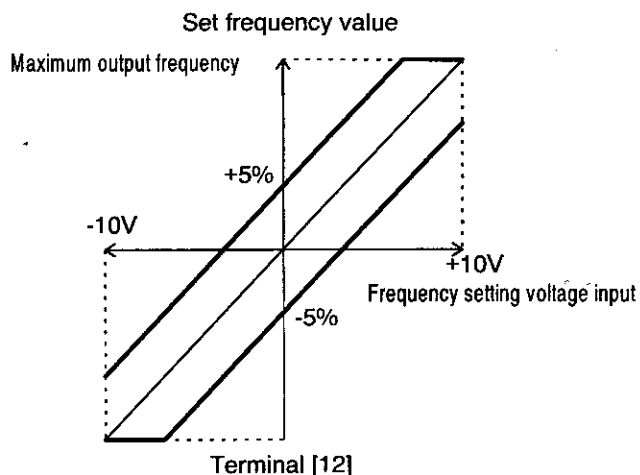
For the setting method, see the explanation for F01.

C31**Offset (terminal[12])****C32****Offset (terminal[C1])**

◆This function sets the offset of the analog input (terminals [12] and [C1]).

C 3 1 O F F S E T 1 2
C 3 2 O F F S E T C 1

The setting range is -5.0 to +5.0% (in 0.1% steps) of the maximum output frequency.

**C33****Analog setting signal filter**

◆Analog signals input from control terminal 12 or C1 may contain noise, which renders control unstable. This function adjusts the time constant of the input filter to remove the effects of noise.

C 3 3 R E F F I L T E R

Setting range: 0.00 to 5.00 seconds

◆An set value too large delays control response though stabilizing control. A set value too small speeds up control response but renders control unstable.

If the optimum value is not known, change the setting when control is unstable or response is delayed.

Note:

The set value is commonly applied to terminals 12 and C1.

Motor 2,3 (P: Motor Parameters)

P01

Number of motor poles

◆This function sets the number of poles of motor to be driven. If this setting is not made, an incorrect motor speed (synchronous speed) is displayed on the LED.

P 0 1 M P O L E S

Set values: 2, 4, 6, 8, 10, 12, 14

P02

Motor (capacity)

◆The nominal applied motor capacity is set at the factory. The setting should be changed when driving a motor with a different capacity.

P 0 2 M - C A P

Setting range: 0.01 to 45kW

P03

Motor (Rated current)

◆This function sets the rated current value of motor 2.

P 0 3 M - I r

Setting range: 0.00 to 2,000A

P04

Maximum frequency 2

P05

Base frequency 2

P06

First frequency 2

P07

First voltage 2

P08

Rated voltage 2

P09

Maximum voltage 2

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

◆This function sets the maximum output frequency for the motor 2.

P 0 4 M A X H z - 2

Setting range 50 to 1667 Hz

Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

◆This function sets the maximum output frequency in the constant-torque range of motor2 or the output frequency at the rated voltage. Match the rating of the motor.

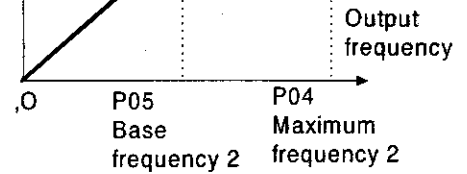
P 0 5 B A S E H z - 2

Setting range 25 to 1667Hz

Note: When the set value of base frequency 2 is higher than that of maximum frequency 2, the output voltage does not increase of the rated voltage, because the maximum frequency limits the output frequency.

Output voltage
Constant-torque range

P09
Maximum
voltage 2
P08
Rated
voltage 2



◆Setting the first frequency of motor 2.

P 0 6 F I R S T H z 2

Setting range 25 to 1667Hz

Set the frequency within the range below the base frequency.

◆Setting the voltage at the segment frequency (frequency set with P06) of motor2..

P 0 7 F I R S T V - 2

Setting range 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

◆This function sets the rated value of voltage output to motor 2. Note that a voltage higher than the supply (input) voltage cannot be output.

P 0 8 R A T E D V - 2

Setting range 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 2 exceeds maximum output voltage 2, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

P 0 9 M A X V - 2

◆This function sets the maximum value of the voltage output for motor 2. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range 0, 50 to 240V

P10

Acceleration time 2

P11

Deceleration time 2

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

P 1 0 A C C T I M E 2
P 1 1 D E C T I M E 2

Setting range Acceleration time 2: 1.0 to 3,600 seconds

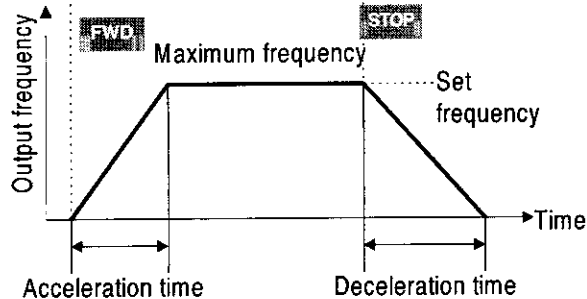
Deceleration time 2: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

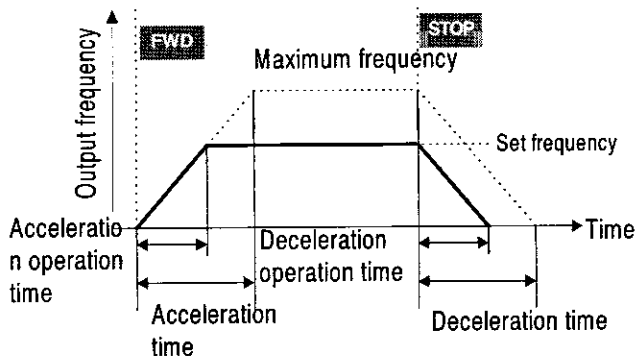
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency / maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

P12

Torque boost 2

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

P 1 2 T R Q B O O S T 2

Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

P13

Electronic thermal O/L relay for motor 2 (Selection)

P14

Electronic thermal O/L relay for motor 2 (Level)

P15

Electronic thermal O/L relay for motor 2 (Thermal time constant)

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by P15 (thermal time constant).

◆This function specifies whether to operate the electric thermal O/L relay.

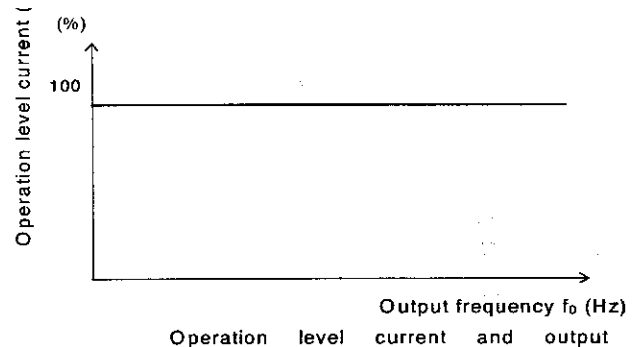
P 1 3 E L C T R N O L 2

Set value 0: Inactive

1: Active

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.

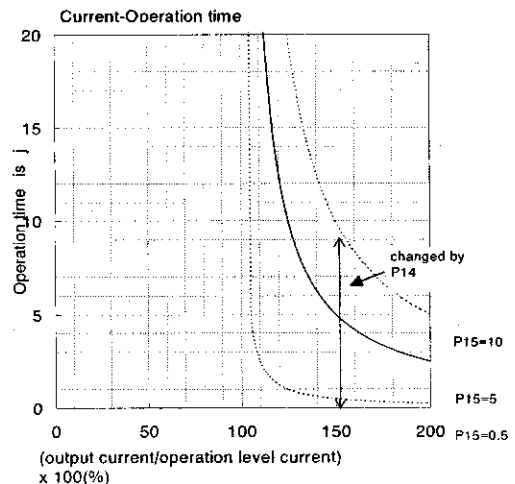
P 1 4 O L L E V E L 2



◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

P 1 5 T I M E C N S T 2

The setting range is 0.1 to 300.0 seconds (in 0.1 seconds steps).

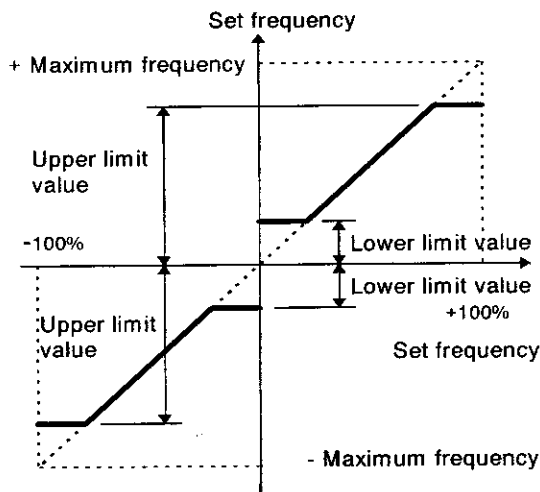


P16**Frequency limiter (High2)**

◆This function sets the upper limits for the setting frequency.

P 1 6 H L I M I T E R 2

Setting range: 0 to 1667 Hz



※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

※When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

P17**Starting frequency 2 (frequency)**

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency : This function sets the frequency at startup.

P 1 7 S T A R T H z 2

Setting range: 0.1 to 100Hz

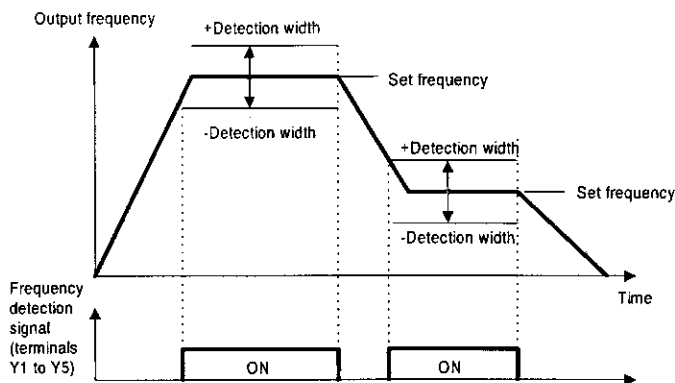
P18**Frequency arrival 2(FAR) (detection width)**

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

P 1 8 F A R H Y S T R 2

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].

**P19****OL2 function signal (level)**

◆This function determines the operation level of the electric thermal O/L relay or output current.

P 1 9 O L 2 L E V E L

Setting range 1.00 to 100A

The operation release level is 90% of the set value.

P20**OL2 function signal (Timer)**

◆This function is used when "1"(Output limit) is set at "F24 Overload early warning (operation selection)".

P 2 0 O L 2 T I M E R

setting range : 0.0 to 60.0 seconds

◆Set the time from when the operation level is attained until the overload early warning function is activated.

P21**Maximum frequency 3****P22****Base frequency 3****P23****First frequency 3****P24****First voltage 3****P25****Rated voltage 3****P26****Maximum voltage 3**

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

◆This function sets the maximum output frequency for the motor 3

P 2 1 M A X H z - 3

Setting range 50 to 1667 Hz

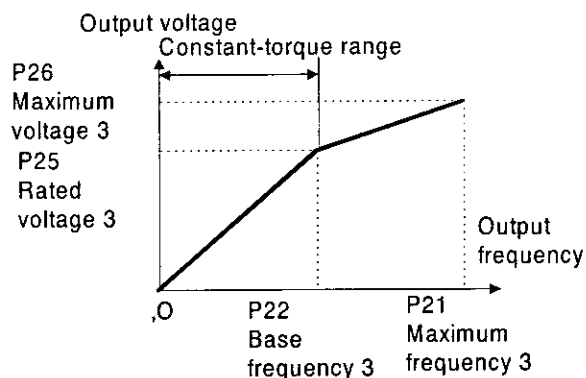
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

P 2 2 B A S E H z - 3

◆This function sets the maximum output frequency in the constant-torque range of motor3 or the output frequency at the rated output voltage. Match the rating of the motor.

Setting range 25 to 1667Hz

Note: When the set value of base frequency 3 is higher than that of maximum output frequency 3, the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



◆Setting the first frequency of motor 3.

P 2 3 F I R S T H z 3

Setting range 25 to 1667Hz

Set the frequency within the range below the base frequency.

◆Setting the voltage at the first frequency (frequency set with P23) of motor 3.

P 2 4 F I R S T V 3

Setting range 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

◆This function sets the rated value of voltage output to motor 3. Note that a voltage higher than the supply (input) voltage cannot be output.

P 2 5 R A T E D V - 3

Setting range 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 3 exceeds maximum output voltage 3, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

◆This function sets the maximum value of the voltage output to motor 3. Note that a voltage higher than the supply (input) voltage cannot be output.

P 2 6 M A X V - 3

Setting range 0, 50 to 240V

P27 Acceleration time 3

P28 Deceleration time 3

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

P 2 7 A C C T I M E 3
P 2 8 D E C T I M E 3

Setting range Acceleration time 3: 1.0 to 3,600 seconds

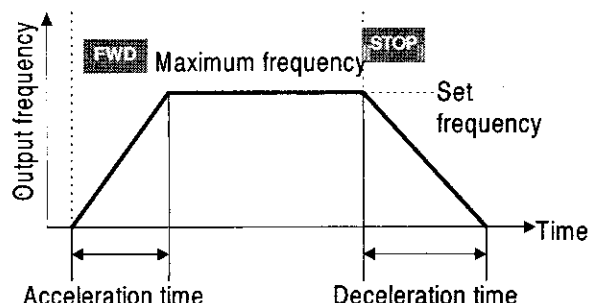
Deceleration time 3: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

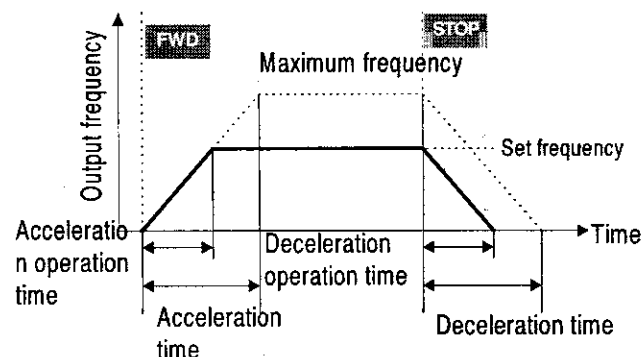
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency / maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

P29 Torque boost 3

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

P 2 9 T R Q B O O S T 3

Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

P30 Electronic thermal O/L relay for motor 3 (Selection)

P31 Electronic thermal O/L relay for motor 3 (Level)

P32 Electronic thermal O/L relay for motor3 (Thermal time constant)

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by P32 (thermal time constant).

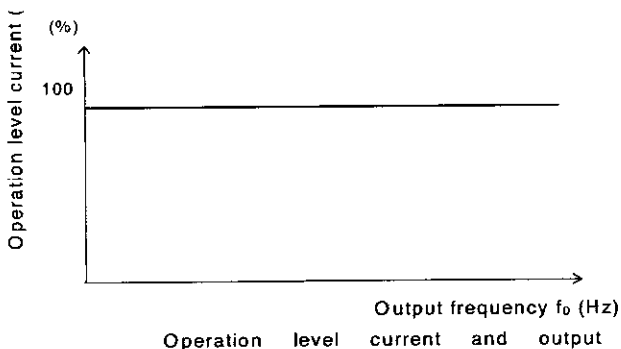
◆This function specifies whether to operate the electric thermal O/L relay.

P 3 0 E L C T R N O L 3

Set value 0: Inactive
1: Active

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.

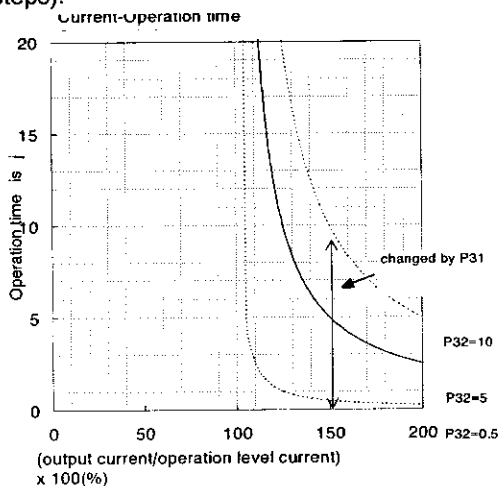
P 3 1 O L L E V E L 3



◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

P 3 2 T I M E C N S T 3

The setting range is 0.1 to 300.0 seconds (in 0.1 seconds steps).

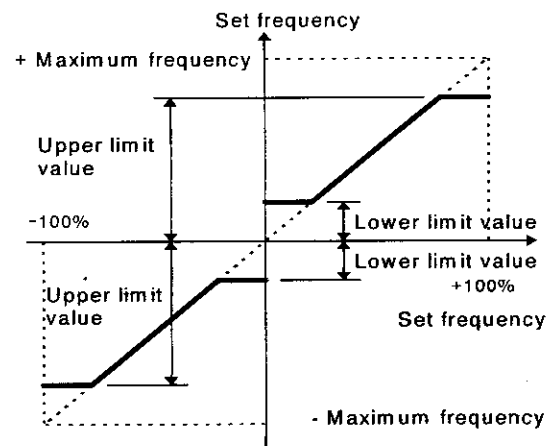


P33 Frequency limiter (High3)

◆This function sets the upper limits for the setting frequency.

P 3 3 H L I M I T E R 3

Setting range: 0 to 1667 Hz



※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

※When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

P34 Starting frequency 3 (frequency)

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency :This function sets the frequency at startup.

P 3 4 S T A R T H z 3

Setting range: 0.1 to 100Hz

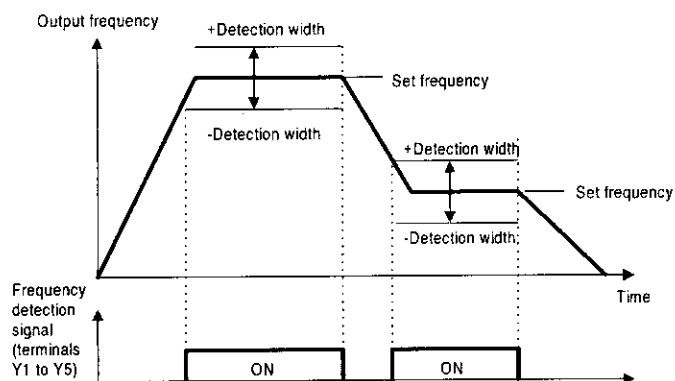
P35 Frequency arrival 3(FAR) (detection width)

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

P 3 5 F A R H Y S T R 3

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



P36

OL3 function signal (level)

◆ This function determines the operation level of the electric thermal O/L relay or output current.

P 3 6 O L 3 L E V E L

Setting range 1.00 to 100A

The operation release level is 90% of the set value.

P37

OL3 function signal (Timer)

◆ This function is used when "1" (Output limit) is set at "F24 Overload early warning (operation selection)".

P 3 7 O L 3 T I M E R

setting range : 0.0 to 60.0 seconds

◆ Set the time from when the operation level is attained until the overload early warning function is activated.

Motor 4,5 (A: Alternative Motor Parameters)

A01	Maximum frequency 4
A02	Base frequency 4
A03	First frequency 4
A04	First voltage 4
A05	Rated voltage 4
A06	Maximum voltage 4

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

◆This function sets the maximum output frequency for the motor 4.

A 0 1 M A X H z - 4

Setting range 50 to 1667 Hz

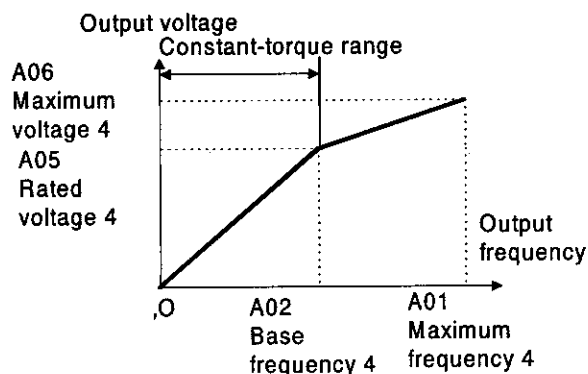
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

◆This function sets the maximum output frequency in the constant-torque range of motor 4 or the output frequency at the rated voltage. Match the rating of the motor.

A 0 2 B A S E H z - 4

Setting range 25 to 1667 Hz

Note: When the set value of base frequency 4 is higher than that of maximum frequency 4, the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



◆Setting the first frequency of motor 4.

Setting range 25 to 1667Hz

A 0 3 F I R S T H z 4

Set the frequency within the range below the base frequency.

A 0 4 F I R S T V 4

◆Setting the voltage at the first frequency (frequency set with A03) of motor 4.

Setting range 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

◆This function sets the rated value of voltage output to motor 4. Note that a voltage higher than the supply (input) voltage cannot be output.

A 0 5 R A T E D V - 4

Setting range 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 4 exceeds maximum output voltage 4, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

◆This function sets the maximum value of the voltage output to motor 4. Note that a voltage higher than the supply (input) voltage cannot be output.

A 0 6 M A X V - 4

Setting range 0, 50 to 240V

A07 Acceleration time 4

A08 Deceleration time 4

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

A 0 7 A C C T I M E 4
A 0 8 D E C T I M E 4

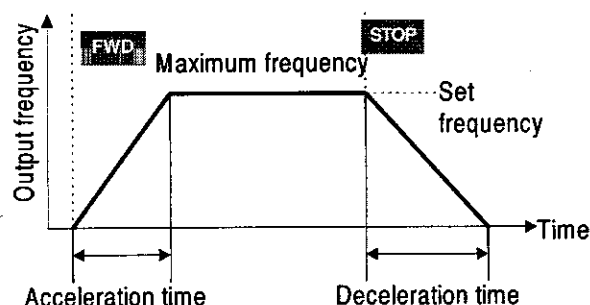
Setting range Acceleration time 4: 1.0 to 3,600 seconds
Deceleration time 4: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

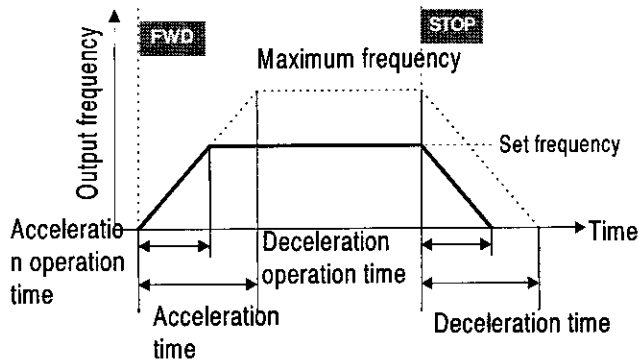
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency/maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

A09

Torque boost 4

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

A 0 9 T R Q B O O S T 4

Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

A10

Electronic thermal O/L relay for motor 4 (Selection)

A11

Electronic thermal O/L relay for motor 4 (Level)

A12

Electronic thermal O/L relay for motor 4 (Thermal time constant)

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by A12 (thermal time constant).

◆The function specifies whether to operate the electric thermal O/L relay.

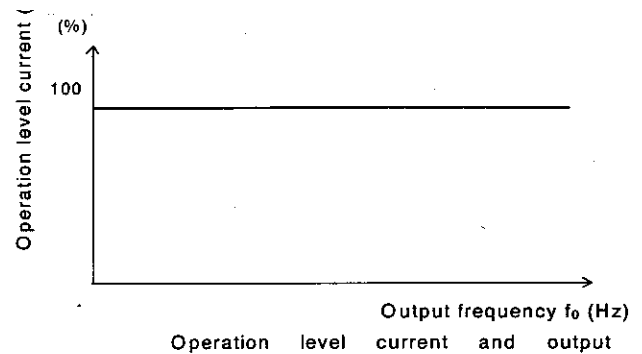
A 1 0 E L C T R N O L 4

Set value 0: Inactive

1: Active

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.

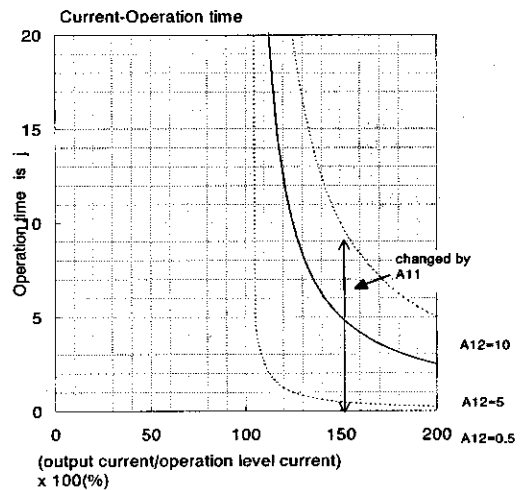
A 1 1 O L L E V E L 4



◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

A 1 2 T I M E C N S T 4

The setting range is 0.1 to 300.0 seconds (in 0.1 seconds steps).

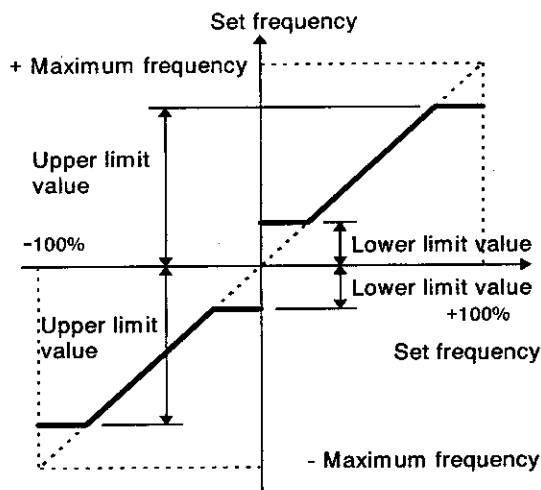


A13**Frequency limiter (High4)**

◆This function sets the upper limits for the setting frequency.

A 1 3 H L I M I T E R 4

Setting range: 0 to 1667 Hz



※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

※When the lower limit value is set, the inverter operates the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

A14**Starting frequency 4 (frequency)**

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency : This function sets the frequency at startup.

A 1 4 S T A R T H z 4

Setting range: 0.1 to 100Hz

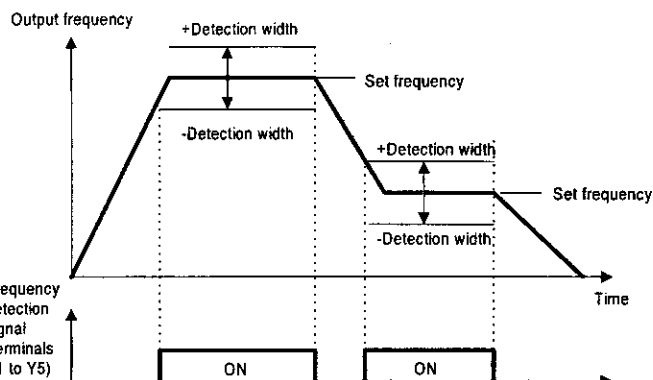
A15**Frequency arrival 4(FAR) (detection width)**

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

A 1 5 F A R H Y S T R 4

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].

**A16****OL4 function signal (level)**

◆This function determines the operation level of the electric thermal O/L relay or output current.

A 1 6 O L 4 L E V E L

Setting range 1.00 to 100A

The operation release level is 90% of the set value.

A17**OL4 function signal (Timer)**

◆This function is used when "1" (Output limit) is set at "F24 Overload early warning (operation selection)".

setting range : 0.0 to 60.0 seconds

A 1 7 O L 4 T I M E R

◆Set the time from when the operation level is attained until the overload early warning function is activated.

A18**Maximum frequency 5****A19****Base frequency 5****A20****First frequency 5****A21****First voltage 5****A22****Rated voltage 5****A23****Maximum voltage 5**

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

◆This function sets the maximum output frequency in the motor 5.

A 1 8 M A X H z - 5

Setting range 50 to 1667 Hz

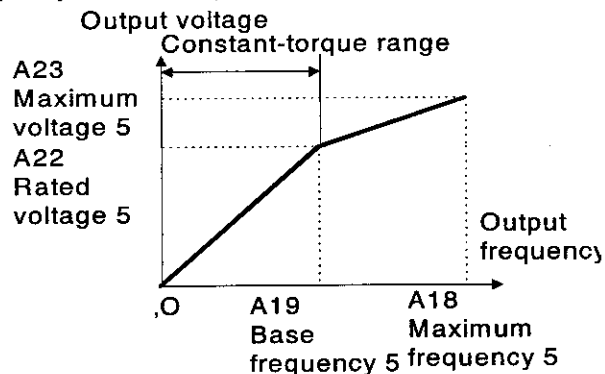
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

◆ This function sets the maximum output frequency in the constant-torque range of motor 5 or the output frequency at the rated voltage. Match the rating of the motor.

A 1 9 B A S E H z - 5

Setting range 25 to 1667 Hz

Note: When the set value of base frequency 5 is higher than that of maximum frequency 5, the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



◆ Setting the first frequency of motor 5.

A 2 0 F I R S T H z 5

Setting range 25 to 1667Hz

Set the frequency within the range below the base frequency.

◆ Setting the voltage at the first frequency (frequency set with A20) of motor 5.

A 2 1 F I R S T V 5

Setting range 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

◆ This function sets the rated value of voltage output to motor 5. Note that a voltage higher than the supply (input) voltage cannot be output.

A 2 2 R A T E D V - 5

Setting range 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 5 exceeds maximum output voltage 5, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

◆ This function sets the maximum value of the voltage output for motor 5. Note that a voltage higher than the supply (input) voltage cannot be output.

A 2 3 M A X V - 5

Setting range 0, 50 to 240V

A24

Acceleration time 5

A25

Deceleration time 5

◆ This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

A 2 4 A C C T I M E 5
A 2 5 D E C T I M E 5

Setting range Acceleration time 5: 1.0 to 3,600 seconds

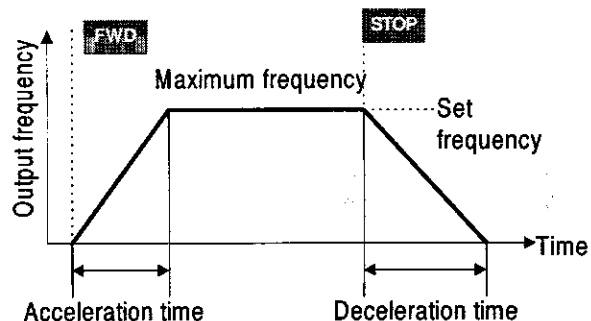
Deceleration time 5: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

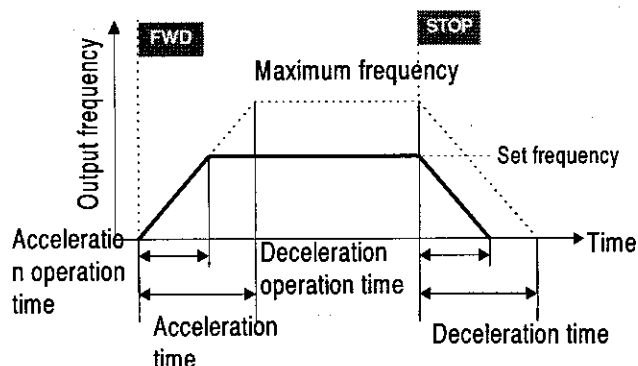
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency / maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

A26

Torque boost 5

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

A 2 6 T R Q B O O S T 5

Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

A27

Electronic thermal O/L relay for motor 5 (Selection)

A28

Electronic thermal O/L relay for motor 5 (Level)

A29

Electronic thermal O/L relay for motor 5 (Thermal time constant)

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by A29 (thermal time constant).

◆The function specifies whether to operate the electric thermal O/L relay.

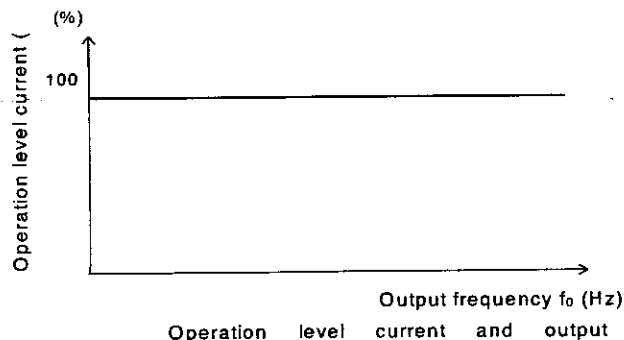
A 2 7 E L C T R N O L 5

Set value 0: Inactive

1: Active

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.

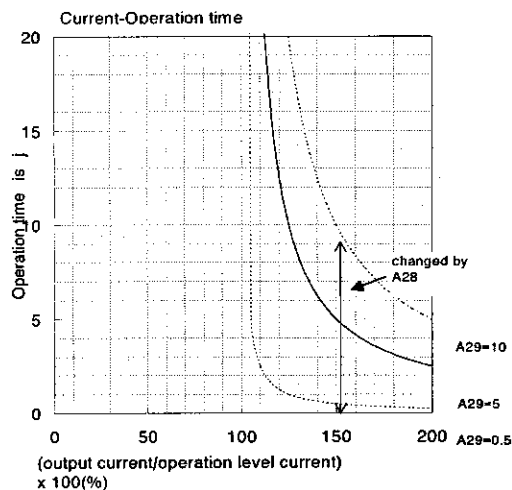
A 2 8 O L L E V E L 5



◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

A 2 9 T I M E C N S T 5

The setting range is 0.1 to 300.0 seconds (in 0.1 seconds steps).



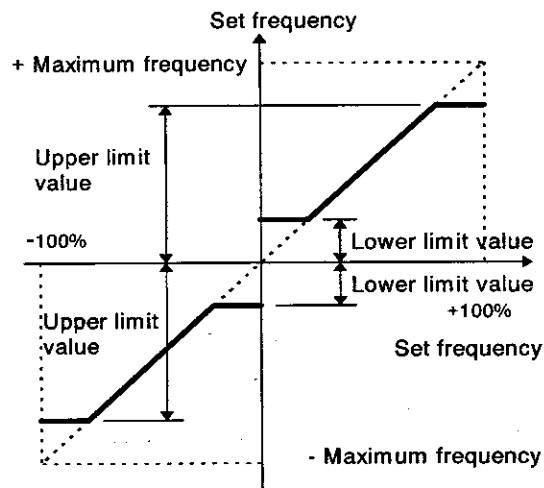
A30

Frequency limiter (High5)

◆This function sets the upper limits for the setting frequency.

Setting range: 0 to 1667 Hz

A 3 0 H L I M I T E R 5



※The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

※If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

※When the lower limit value is set, the inverter operates the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

A31 Starting frequency 5 (frequency)

- ◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.
- ◆Frequency : This function sets the frequency at startup.

A 3 1 S T A R T H z 5

Setting range: 0.1 to 100Hz

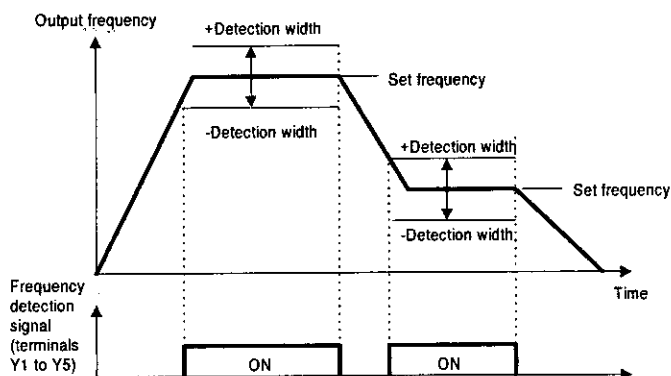
A32 Frequency arrival 5(FAR) (detection width)

- ◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

A 3 2 F A R H Y S T R 5

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].

**A33 OL5 function signal (level)**

- ◆This function determines the operation level of the electric thermal O/L relay or output current.

A 3 3 O L 5 L E V E L

Setting range 1.00 to 100A

The operation release level is 90% of the set value.

A34 OL5 function signal (Timer)

- ◆This function is used when "1" (Output limit) is set at "F24 Overload early warning (operation selection)".

A 3 4 O L 5 T I M E R

setting range : 0.0 to 60.0 seconds

- ◆Set the time from when the operation level is attained until the overload early warning function is activated.

6. Protective Operation

6-1 List of Protective Operations

In the event of an abnormality in the inverter, the protective function will activate immediately to trip the inverter, display the alarm name on the LED monitor, and the motor coasts-to-a stop. For alarm contents, see Table 6-1-1.

Table 6-6-1 List of alarm displays and protective functions

Alarm Name	Keypad panel display		Contents of operation	
	LED	LCD		
Over current protection	OC1	OC DURING ACC	During acceleration	If the inverter output current momentarily exceeds the overcurrent detection level due to an overcurrent in the motor, or a short-circuit or a ground fault in the output circuit, the protective function is activated. If a ground fault occurs in an inverter rated at 22kW or less, the inverter is protected by the overcurrent protection.
	OC2	OC DURING DEC	During deceleration	
	OC3	OC AT SET SPD	Running at constant speed	
Overvoltage protection	OU1	OV DURING ACC	During acceleration	If the DC link circuit voltage of the main circuit exceeds the overvoltage detection level (400V DC) due to an increase in the regenerating current from the motor, the output is shut down. However, protection against inadvertent overvoltage apply (e.g., high-voltage line) may not be provided.
	OU2	OV DURING DEC	During deceleration	
	OU3	OV AT SET SPD	Running at constant speed	
Undervoltage protection	LU	UNDERVOLTAGE	If the DC link circuit voltage of the main circuit falls below the undervoltage detection level (200V DC) due to a lowered power supply, the output is shut down. If function code F30 (Restart after momentary power failure) is selected, an alarm is not displayed. In addition, if the supply voltage falls to a level unable to maintain control power, an alarm may not be displayed.	
Overheating of heat sink	OH1	FIN OVERHEAT	If the temperature of the heat sink rises due to a cooling fan failure, etc., the protective function is activated.	
External alarm	OH2	EXT ALARM	If the external alarm contacts of the braking unit, braking resistor, or external thermal O/L relay are connected to the control circuit terminals (THR), the contacts will be actuated according to contact signals. When the PTC thermal protection is activated, the drive also stops indicating this alarm.	
Inverter internal overheating	OH3	HIGH AMB TEMP	If the temperature inside the inverter rises due to poor ventilation, etc., the protective function is activated.	
Overheating of braking resistor	dbH	DBR OVERHEAT	If electronic thermal O/L relay (for braking resistor) function code F21 is selected, the protective function is activated to prevent the resistor from burning due to overheating following frequent use of the braking resistor.	
Motor overload	OL1	MOTOR1 OL	The protective function is activated if the motor current exceeds the preset level, when an electronic thermal O/L relay between 1 and 5 is selected.	
Inverter overload	OLU	INVERTER OL	If the output current exceeds the rated overload current, the protective function is activated to provide thermal protection against semiconductor element overheating in the inverter main circuit.	
Memory error	Er1	MEMORY ERROR	If a memory error occurs, such as missing or invalid data, the protective function is activated.	
Keypad panel communication error	Er2	KEYPD COM ERR	If a communication error or interrupt between the keypad panel and control circuit is detected, the protective function is activated.	
CPU error	Er3	CPU ERROR	If an CPU error occurs due to noise, etc., the protective function is activated.	
Option error	Er4	OPTN COM ERR	Error when using an optional unit	
	Er5	OPTION ERROR		
RS485 communication error	Er8	RS485 COM ERR	If an error occurs when using RS-485, the protective function is activated.	
Motor changeover error	ErL	M SELECT ERR	Activated if you operate the inverter by selecting a wrong motor number or parity code.	

6-2 Alarm Reset

To release the trip status, enter the reset command by pressing the **RESET** key on the keypad panel or inputting signal from the terminal (RST) of the control terminals after removing the cause of the trip. Since the reset command is an edge operation, input a command such as !!OFF-ON-OFF!! as shown in Fig.6-2-1.

When releasing the trip status, set the operation command to OFF. If the operation command is set to ON, inverter will start operation after resetting.

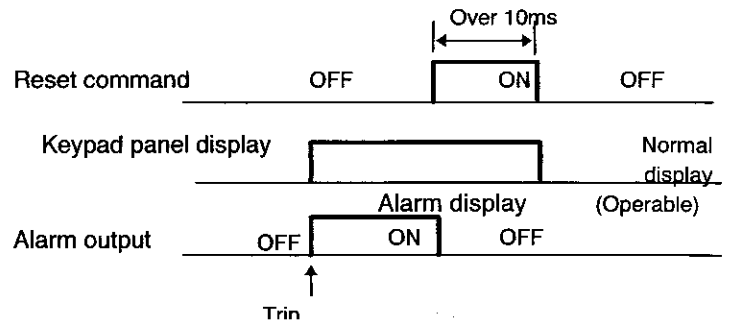


Fig. 6-2-1

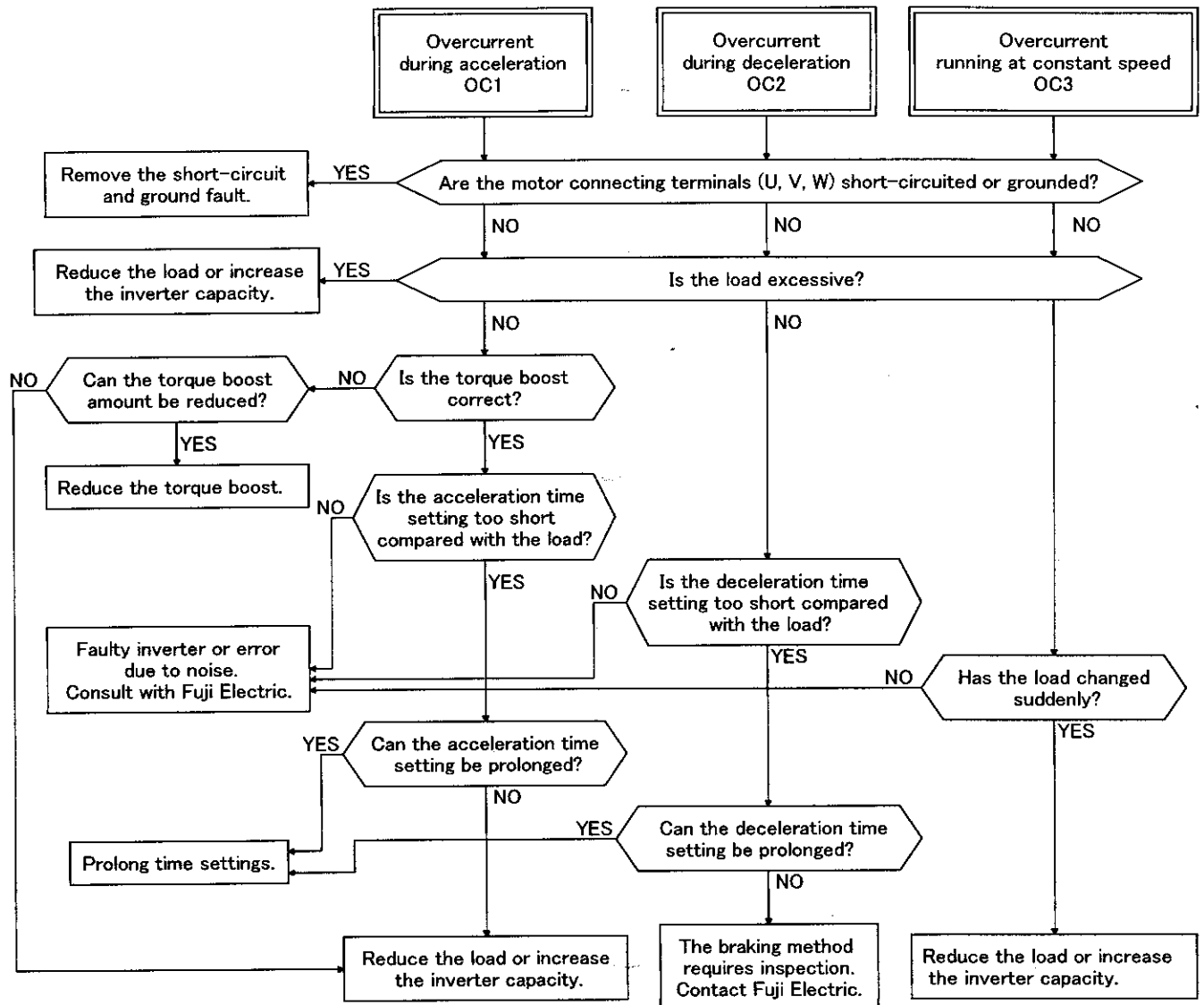
WARNING

If the alarm reset is activated with the operation signal ON, the inverter will restart suddenly, which may be dangerous. To ensure safety, disable the operating signal when releasing the trip status. **as accident may result.**

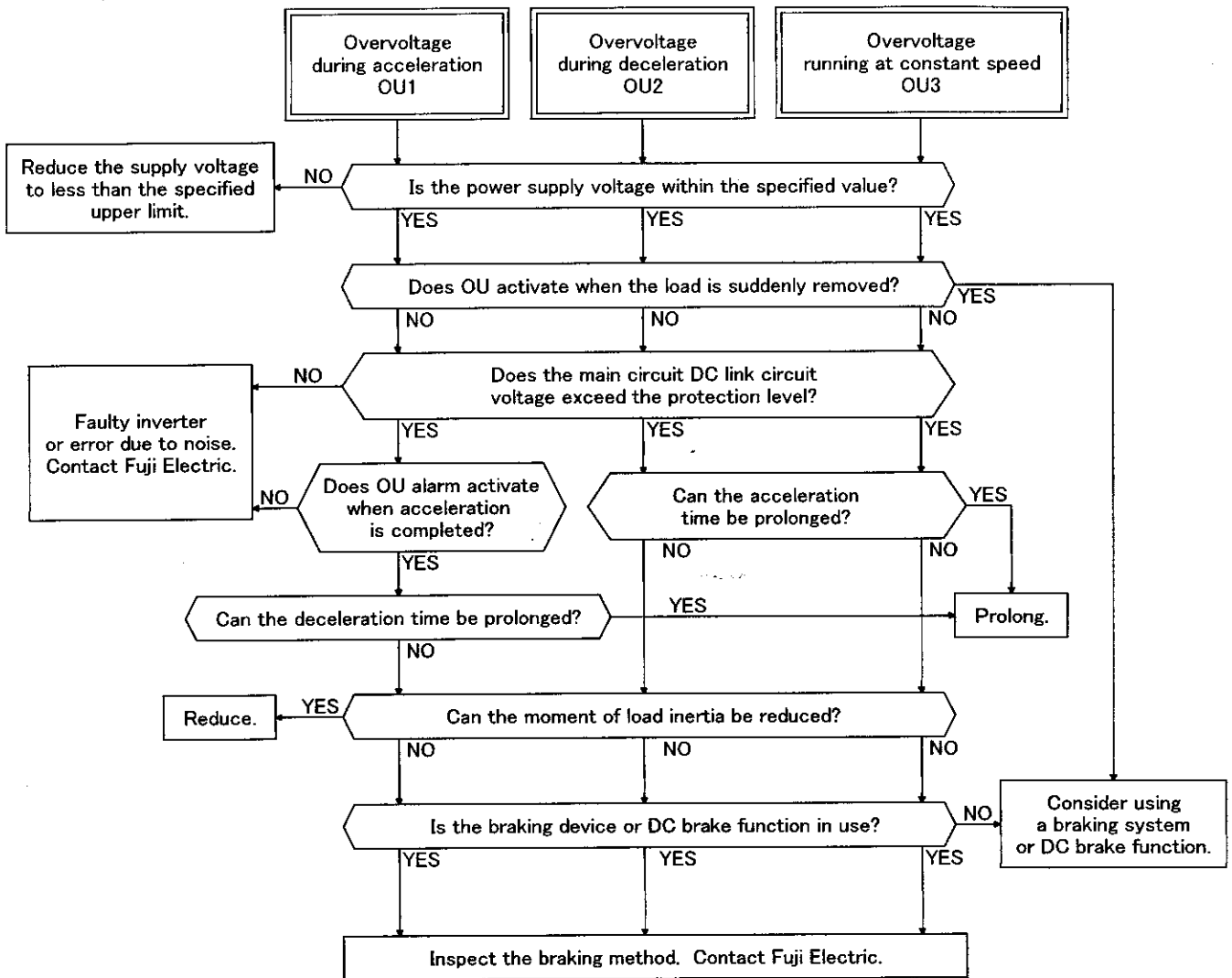
7. Trouble shooting

7.1 Protective function activation

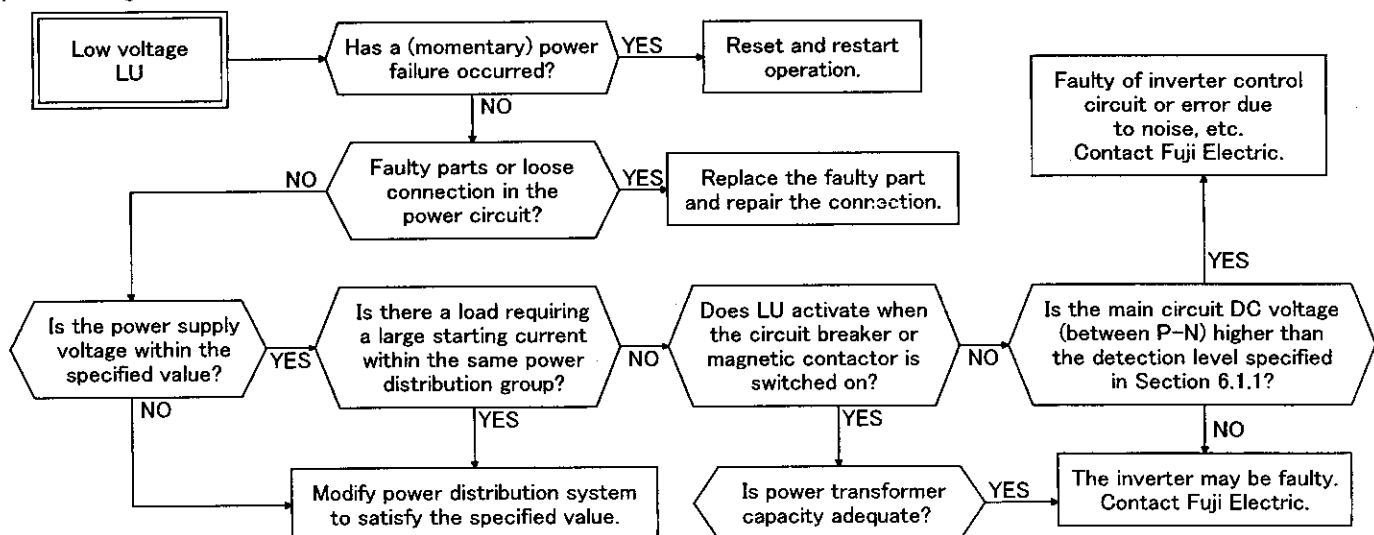
(1) Overcurrent



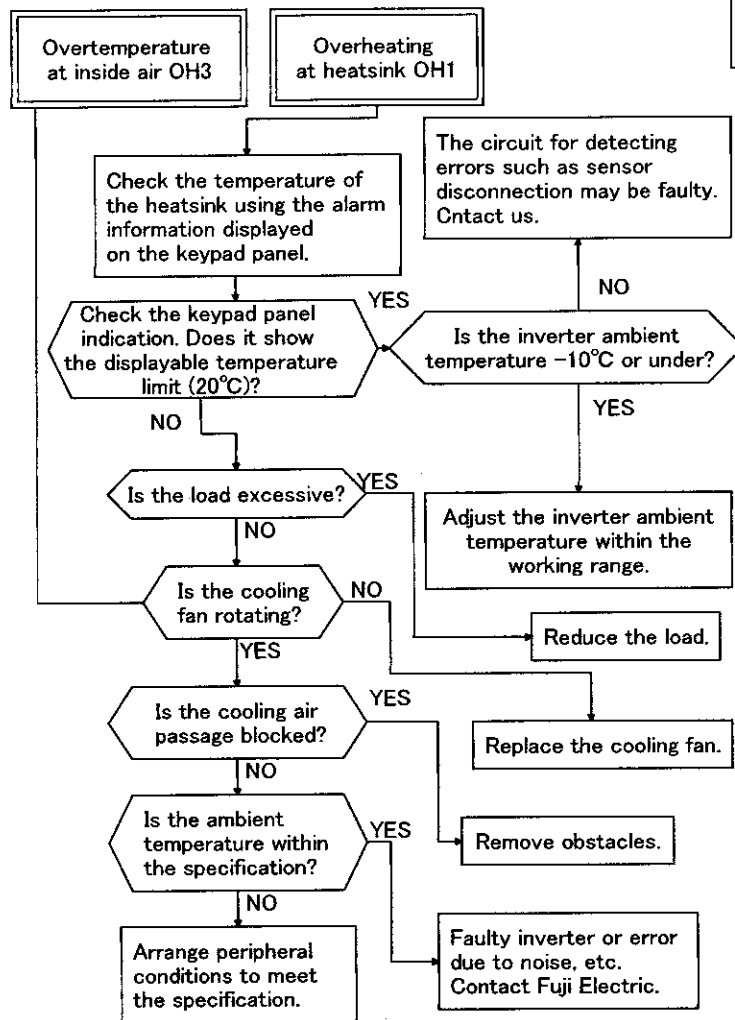
(2) Overvoltage



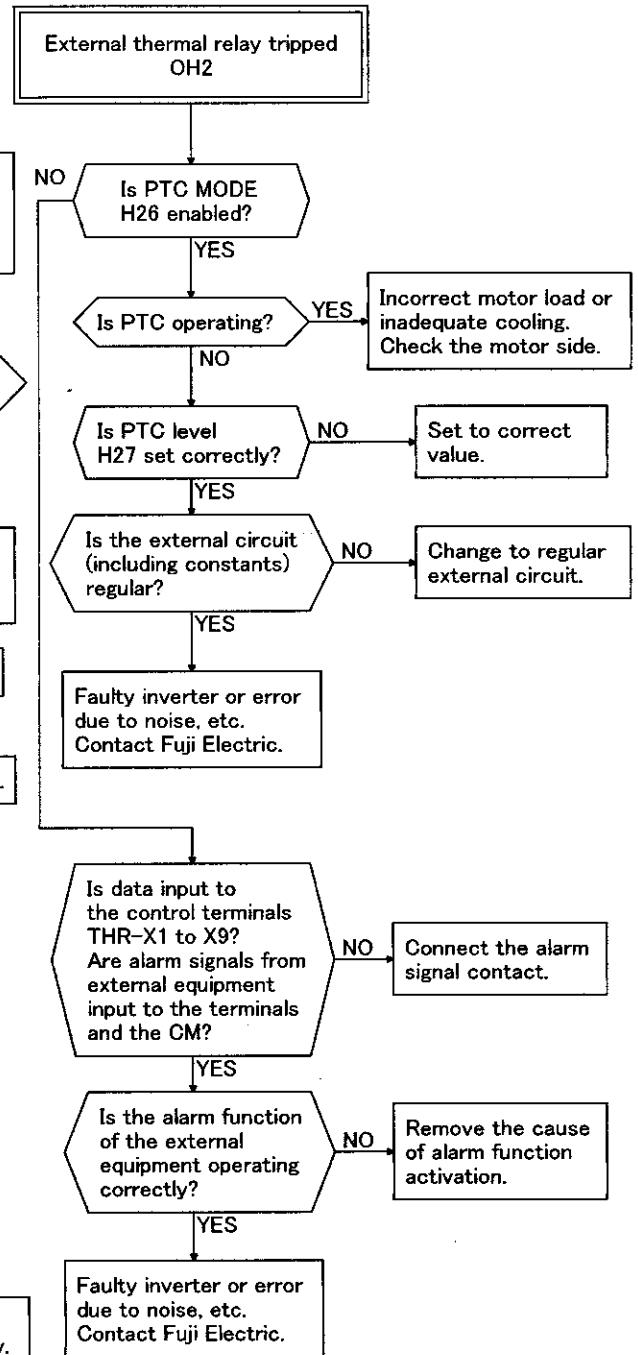
(3) Low voltage



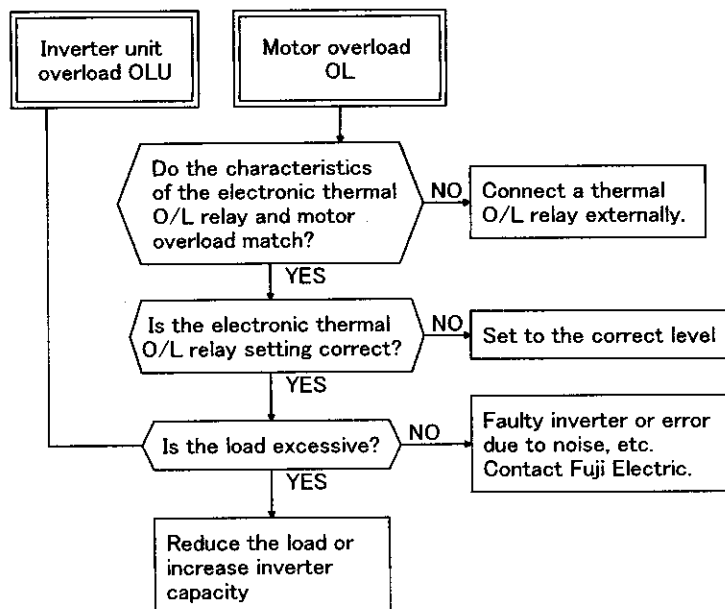
(4) Overtemperature at inside air and overheating at heatsink.



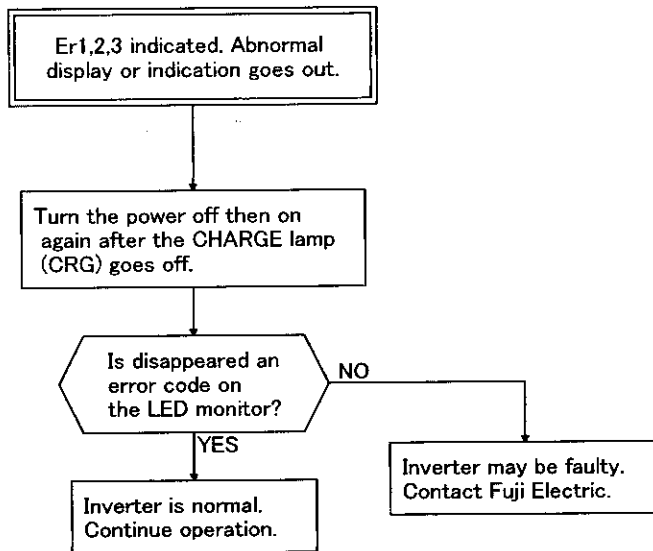
(5) External thermal relay tripped



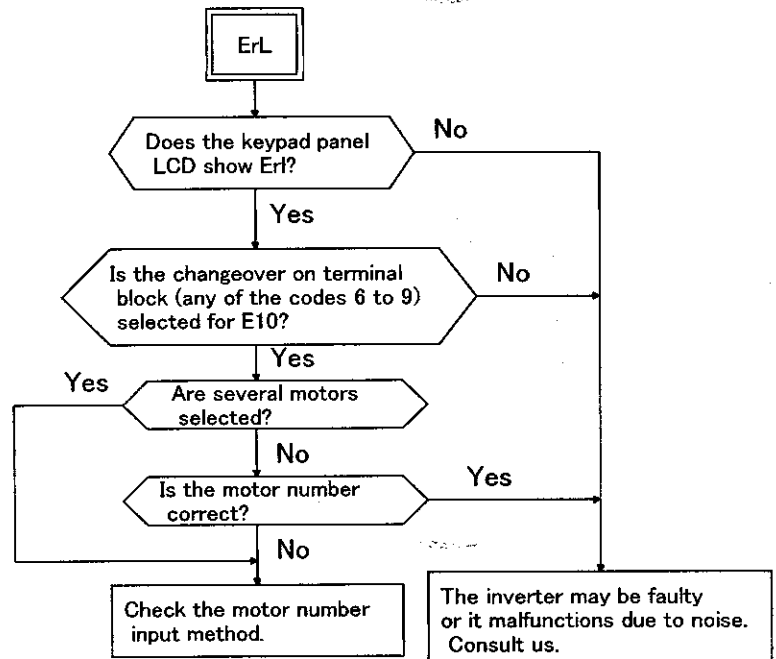
(6) Inverter unit overload and motor overload



- (7) Memory error Er1,
Keypad panel communication error Er2,
CPU error Er3

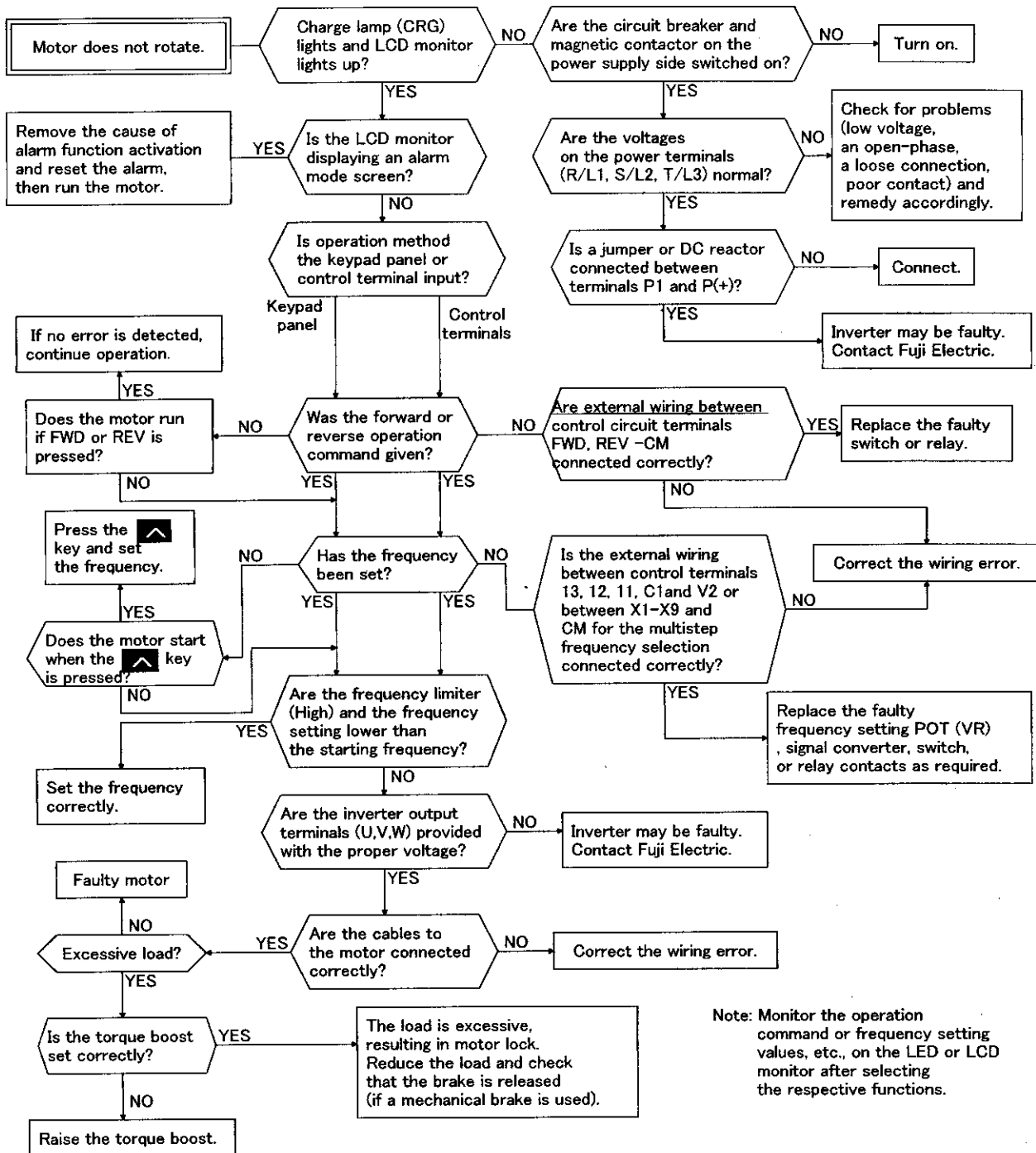


- (8) Motor changeover error



7-2 Abnormal motor rotation

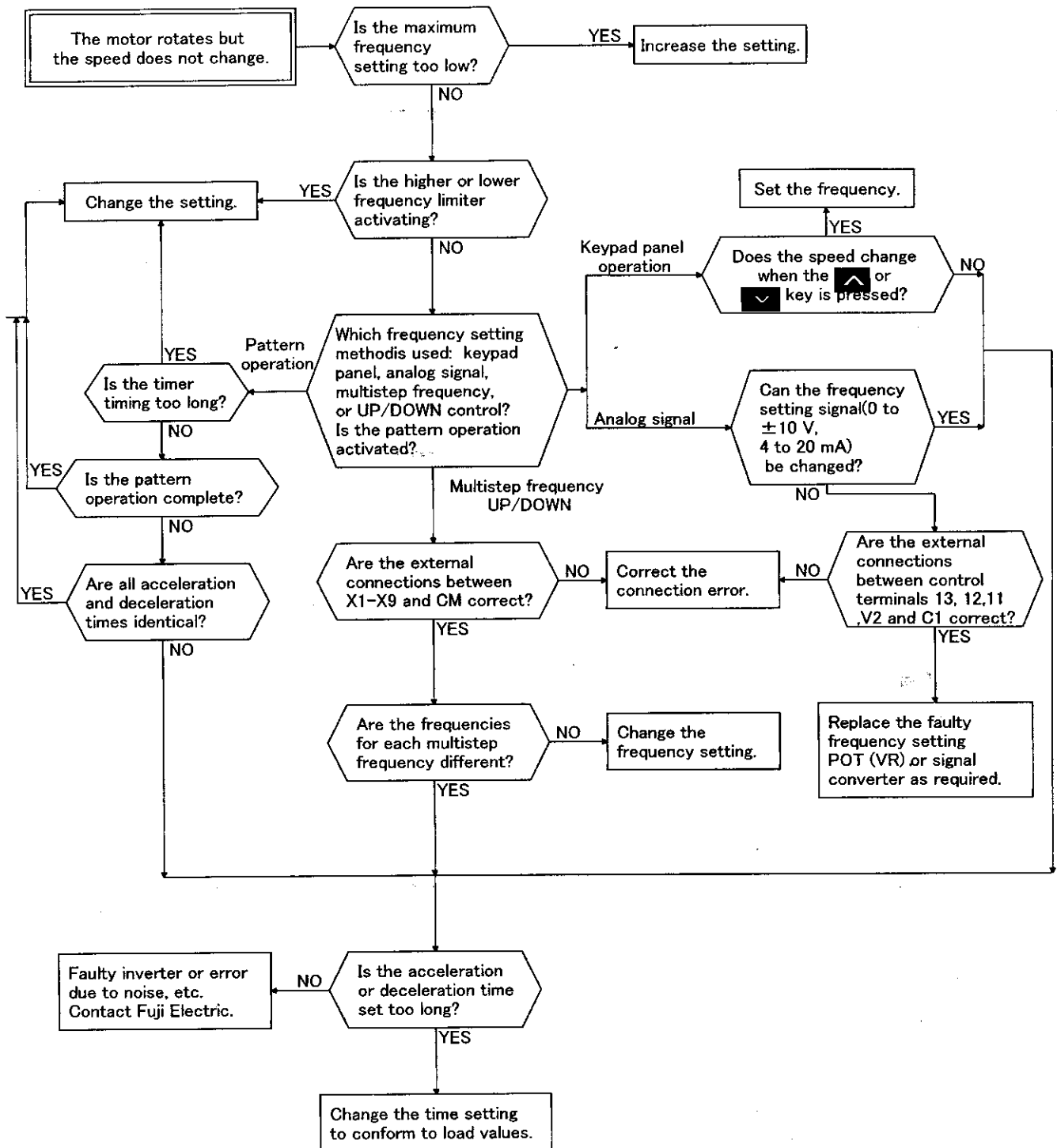
(1) If motor does not rotate



The motor does not rotate if the following commands are issued.

- An operation command is issued while the coast-to-stop or DC braking command is output
- A reverse operation command is issued with the "H08 Rev. phase sequence lock" value set to 1.

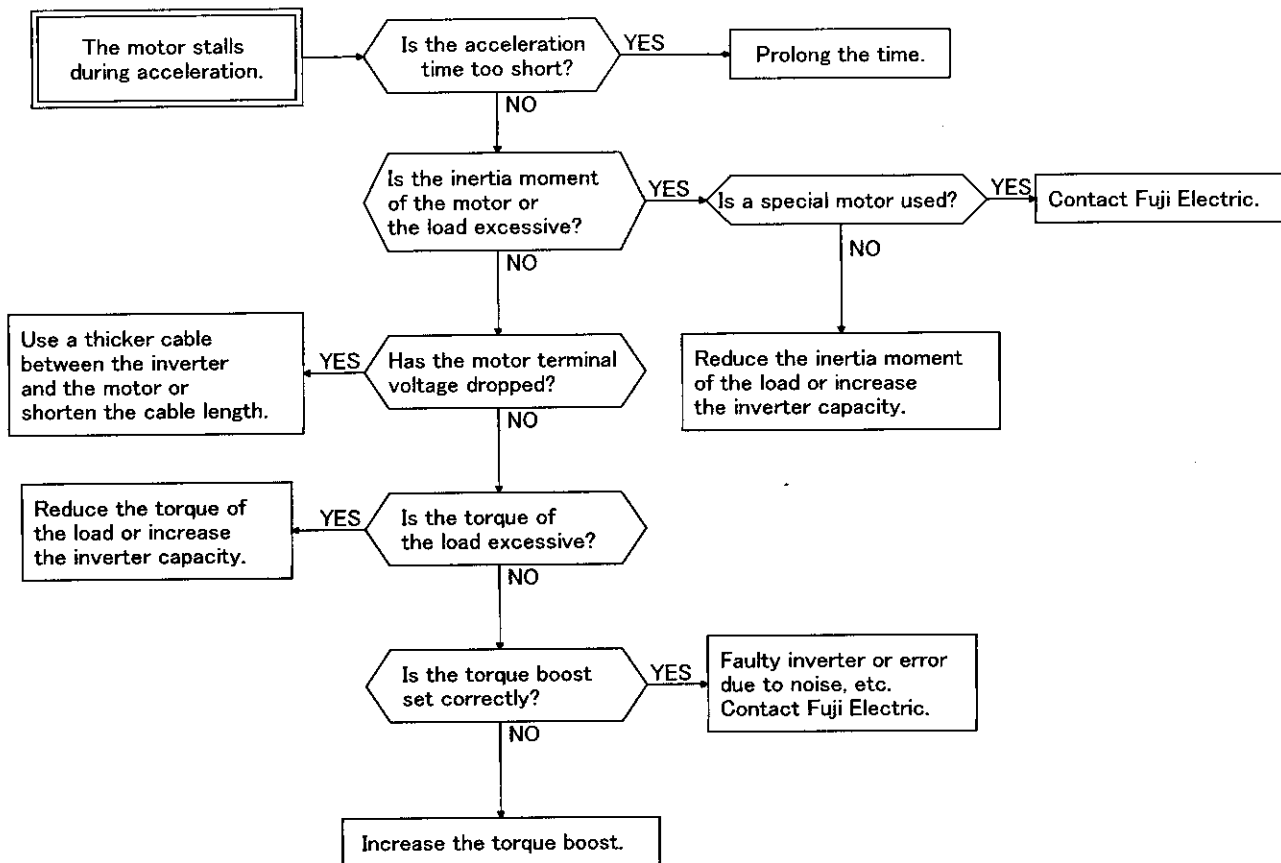
(2) If the motor rotates but the speed does not change



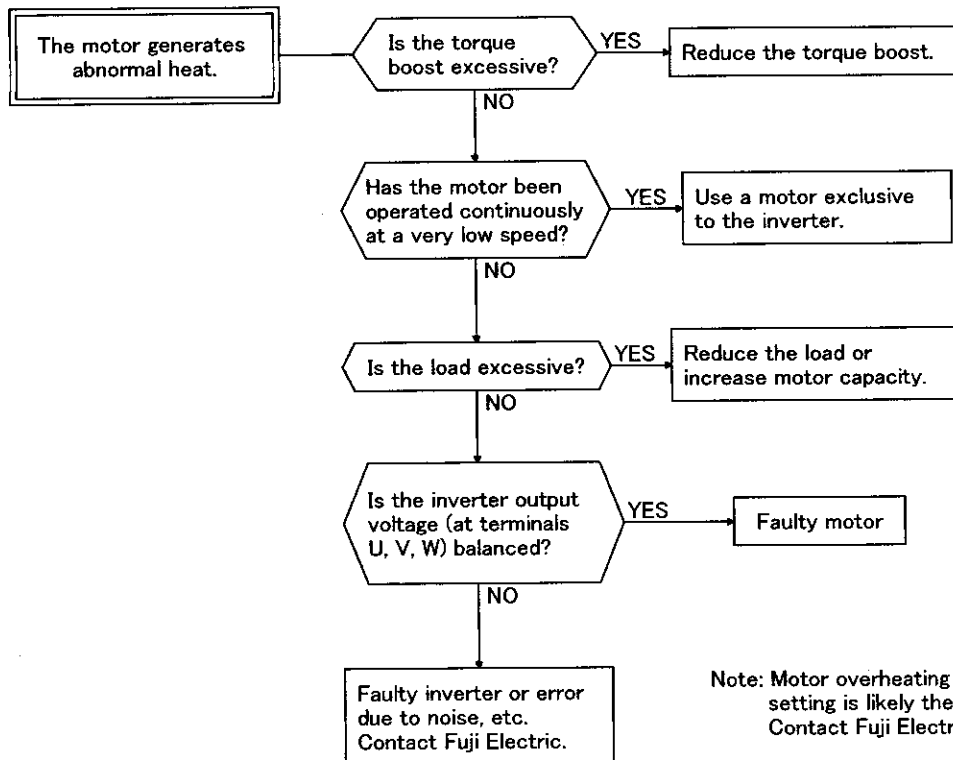
In the following cases, changing the motor speed is also restricted:

- Signals are input from control terminals both 12 and C1 when “F01 Frequency command 1” and “C30 Frequency command 2” are set to 3, and there is no significant change in the added value
- The load is excessive, and the torque limiting and current limiting functions are activated

(3) If the motor stalls during acceleration



(4) If the motor generates abnormal heat



Note: Motor overheating following a higher frequency setting is likely the result of current waveform. Contact Fuji Electric.

8. Maintenance and Inspection

Proceed with daily inspection and periodic inspection to prevent malfunction and ensure long-term reliability. Note the following:

8-1 Daily Inspection

During operation, a visual inspection for abnormal operation is completed externally without removing the covers

The inspections usually cover the following:

- (1) The performance (satisfying the standard specification) is as expected.
- (2) The environment satisfies standard specifications.
- (3) The keypad panel display is normal.
- (4) There are no abnormal sounds, vibrations, or odors.
- (5) There are no indications of overheating or no discoloration.

8-2 Periodical Inspection

Periodic inspections must be completed after stopping operations, cutting off the power source, and removing the surface cover.

Note that after turning off the power, the smoothing capacitors in the DC section in the main circuit take time to discharge. To prevent electric shock, confirm using a multimeter that the voltage has dropped below the safety value (25 V DC or below) after the charge lamp (CRG) goes off.


 WARNING	<ul style="list-style-type: none"> • Start the inspection at least five minutes after turning off the power supply (Check that the charge lamp (CRG) goes off, and that the voltage is 25V DC or less between terminals P(+) and N(-). Electric shock may result. • Only authorized personnel should perform maintenance and component replacement operations. (Remove metal jewelry such as watches and rings.) (Use insulated tools.)) • Never modify the inverter. Electric shock or injury may result.
---	--

Table 8-2-1 Periodical inspection list

Check parts		Check items	How to inspect	Evaluation Criteria
Environment		1) Check the ambient temperature, humidity, vibration, atmosphere (dust, gas, oil mist, water drops). 2) Is the area surrounding the equipment clear of foreign objects.	1) Conduct visual inspection and use the meter. 2) Visual inspection	1) The specified standard value must be satisfied. 2) The area is clear.
Keypad panel		1) Is the display hard to read? 2) Are the characters complete?	1),2) Visual inspection	1),2) The display can be read and is not abnormal.
Structure such as a frame or cover		1) Is there abnormal sound or vibration? 2) Are nuts or bolts loose? 3) Is there deformation or damage? 4) Is there discoloration as a result of overheating? 5) Are there stains or dust?	1) Visual and aural inspection 2) Tighten. 3),4),5) Visual inspection	1), 2), 3), 4), 5) Not abnormal
Main circuit	Common	1) Are there loose or missing nuts or bolts? 2) Are there deformation, cracks, damage, and discoloration due to overheating or deterioration in the equipment and insulation? 3) Are there stains and dust?	1) Tighten. 2),3) Visual inspection	1), 2), 3) Not abnormal Note: Discoloration of the bus bar does not indicate a problem.

Check parts		Check items	How to inspect	Evaluation Criteria
Main circuit	Conductor and wire	1) Is there discoloration or distortion of a conductor due to overheating? 2) Are there cracks, crazing or discoloration of the cable sheath?	1),2) Visual inspection	1), 2) Not abnormal
	Terminal block	Is there damage?	Visual inspection	Not abnormal
	Smoothing capacitor	1) Is there electrolyte leakage, discoloration, crazing, or swelling of the case? 2) Is the safety valve not protruding or are valves protruding too far? 3) Measure the capacitance if necessary.	1), 2) Visual inspection 3) * Estimate life expectancy from maintenance information and from measurements using capacitance measuring equipment.	1), 2) Not abnormal 3) Capacitance \geq initial value x 0.85
	Resistor	1) Is there unusual odor or damage to the insulation by overheating? 2) Is there an open circuit?	1) Visual and olfactory inspection 2) Conduct a visual inspection or use a multimeter by removing the connection on one side.	1) Not abnormal 2) Less than about $\pm 10\%$ of the indicated resistance value
	Transformer and reactor	Is there abnormal buzzing or an unpleasant smell?	Aural, olfactory, and visual inspection	Not abnormal
	Magnetic conductor and relay	1) Is there rattling during operation? 2) Are the contacts rough?	1) Aural inspection 2) Visual inspection	1),2)Not abnormal
Control circuit	Control board PC and connector	1) Are there any loose screws or connectors? 2) Is there an unusual odor or discoloration? 3) Are there cracks, damage, deformation, or excessive rust? 4) Is there electrolyte leakage or damage to the capacitor?	1) Tighten. 2) Visual and olfactory inspection 3) Visual inspection 4) * Estimate life expectancy by visual inspection and maintenance information	1),2),3),4)Not abnormal
Cooling system	Cooling fan	1) Is there abnormal sound or vibration? 2) Are nuts or bolts loose? 3) Is there discoloration due to overheating?	1) Aural and visual inspection. Turn manually (confirm the power is off). 2) Tighten. 3) Visual inspection 4) * Estimate life expectancy by maintenance information	1) The fan must rotate smoothly. 2), 3) Not abnormal
	Ventilation	Is there foreign matter on the heat sink or intake and exhaust ports?	Visual inspection	Not abnormal

Note: If equipment is stained, wipe with a clean cloth. Vacuum the dust.

***Estimation of life expectancy based on maintenance information**

The maintenance information is stored in the inverter keypad panel and indicates the electrostatic capacitance of the main circuit capacitors and the life expectancy of the electrolytic capacitors on the control PC board and of the cooling fans.. Use this data as the basis to estimate the life expectancy of parts.

1) Determination of the capacitance of the main circuit capacitors

This inverter is equipped with a function to automatically indicate the capacitance of the capacitors installed in the main circuit when powering up the inverter again after disconnecting the power according to the prescribed conditions.

The initial capacitance values are set in the inverter when shipped from the factory, and the decrease ratio (%) to those values can be displayed.

Use this function as follows:

(1) Remove any optional cards from the inverter. Also disconnect the DC bus connections to the main circuit P(+) and N(-) terminals from the braking unit or other inverters if connected. The existing power-factor correcting reactor (DC reactor) need not be disconnected.

A power supply introduced to the auxiliary input terminals (R0, T0) that provides control power should be isolated.

(2) Disable all the digital inputs (FWD, REV, X1-X9) on the control terminals. Also disconnect RS485 communication if used.

Turn on the main power supply. Confirm that the cooling fan is rotating and that the inverter is not operating. (There is no problem if the "OH2 External thermal relay tripped" trip function is activated due to the digital input terminal setting off.)

(3) Turn the main power off.

(4) Turn on the main power again after verifying that the charge lamp is completely off.

(5) Open the maintenance information on the keypad panel and confirm the capacitance values of the built-in capacitors.

2) Life expectancy of the control PC board

The actual capacitance of a capacitor is not measured in this case. However, the integrated operating hours of the control power supply multiplied by the life expectancy coefficient defined by the temperature inside the inverter will be displayed. Hence, the hours displayed may not agree with the actual operating hours depending on the operational environment.

Since the integrated hours are counted by unit hours, power input for less than one hour will be disregarded.

3) Life expectancy of cooling fan

The integrated operating hours of the cooling fan are displayed. Since the integrated hours are counted by unit hours, power input for less than one hour will be disregarded.

The displayed value should be considered as a rough estimate because the actual life of a cooling fan is influenced significantly by the temperature.

Table 8-2-2 Rough estimate of life expectancy using maintenance information

Parts	Level of judgment
Capacitor in main circuit	85% or less of the initial value
Electrolytic capacitor on control PC board	61,000 hours
Cooling fan	40,000 hours (3.7 kW or less), 25,000 hours (Over 5.5 kW) (*1)

*1 Estimated life expectancy of a ventilation-fan at inverter ambient temperature of 40°C

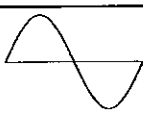
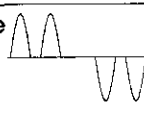
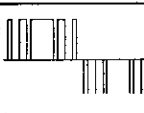
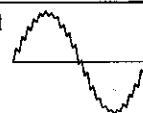
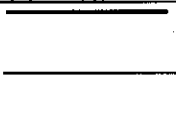







8-3 Measurement of Main Circuit Electrical Quantity

The indicated values depend on the type of meter because the harmonic component is included in the voltage and current of the main circuit power (input) and the output (motor) side of the inverter. When measuring with a meter for commercial power frequency use, use the meters shown in Table 8-3-1.

The power-factor cannot be measured using power-factor meters currently available on the market, which measure the phase difference between voltage and current. When power-factors must be measured, measure the power, voltage, and current on the input side and output side, then calculate the power-factor using the following formula:

$$\text{Power - factor} = \frac{\text{Power}[W]}{\sqrt{3} \times \text{Voltage}[V] \times \text{Current}[A]} \times 100[\%]$$

Table 8-3-1 Meters for measuring main circuit

Item	Input (power supply) side			Output (motor) side			DC link circuit voltage (P(+) - N(-))
	Voltage 	Current 		Voltage 	Current 		
Meter name	Ammeter A _{R,S,T}	Voltmeter V _{R,S,T}	Powermeter W _{R,S,T}	Ammeter A _{U,V,W}	Voltmeter V _{U,V,W}	Powermeter W _{U,V,W}	DC voltmeter V
Meter type	Moving-iron type	Rectifier or moving-iron type	Digital power meter	Digital power meter	Digital power meter	Digital power meter	Moving-coil type
Symbol							

Note: When measuring the output voltage using a rectifier type meter, an error may occur.

Use a digital AC power meter to ensure accuracy.

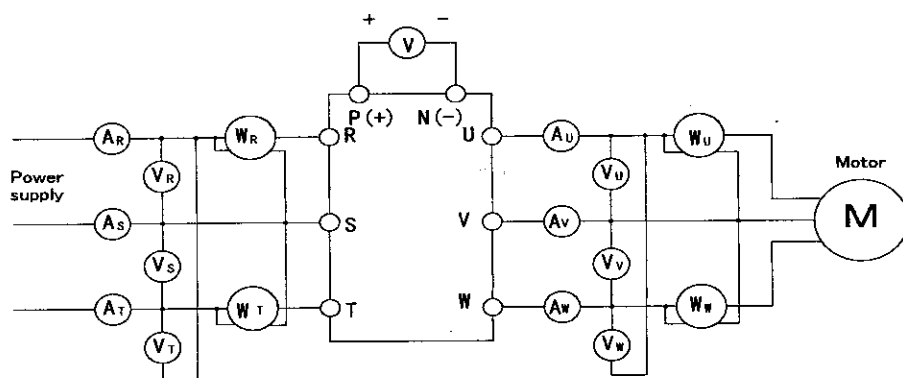


Fig 8-3-1 Connection of the meters

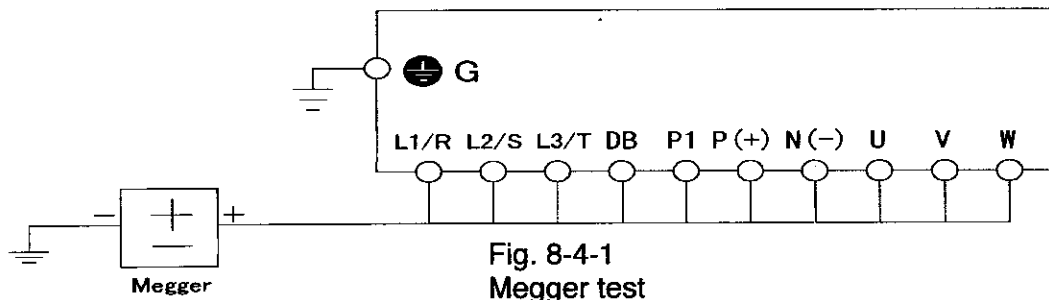
8-4 Insulation Test

Avoid testing an inverter with a megger because an insulation test is completed at the factory. If a megger test must be completed, proceed as described below. Use of an incorrect testing method may result in product damage.

If the specifications for the dielectric strength test are not followed, the inverter may be damaged. If a dielectric strength test must be completed, contact your local distributor or nearest Fuji Electric sales office.

(1) Megger test for the main circuit

- ① Use a 500V DC type megger and isolate the main power before commencing measurement.
- ② If the test voltage is connected to the control circuit, remove all connection cables to the control circuit.
- ③ Connect the main circuit terminals using common cables as shown in Fig. 8-4-1.
- ④ Execute the megger test only between the common cables connected to the main circuit and the ground (terminal \oplus G).
- ⑤ A megger indicating $5M\Omega$ or more is normal. (This is the value measured with an inverter only.)



(2) Insulation test in the control circuit

A megger test and a dielectric strength test must not be performed in the control circuit. Prepare a high resistance range multimeter for the control circuit.

- ① Remove all external cables from the control circuit terminals.
- ② Conduct a continuity test between grounds. A result of $1M\Omega$ or more is normal.

(3) Exterior main circuit and sequence control circuit

Remove all cables from inverter terminals to ensure the test voltage is not applied to the inverter.

8-5 Parts Replacement

The life expectancy of a part depends on the type of part, the environment, and usage conditions. Parts should be replaced as shown in Table 8-5-1.

Table 8-5-1 Part replacement

Part name	Standard period for replacement	Comments
Cooling fan	3 years	Exchange for a new part.
Smoothing capacitor	5 years	Exchange for a new part (determine after checking).
Electrolytic capacitor on the PC board	7 years	Exchange for a new PC board (determine after checking).
Fuse	10 years	Exchange for a new part.
Other parts	—	Determine after checking.

8-6 Inquiries about Products and Product Guarantee

(1) Inquiries

If there is damage, a fault in the product, or questions concerning the product, contact your local distributor or nearest Fuji Electric sales office:

- a) Inverter type
- b) Serial No. (equipment serial number)
- c) Purchase date
- d) Inquiry details (e.g., damaged part, extent of damage, questions, status of fault)

(2) Product guarantee

The product guarantee term is one year after purchase or 18 months from the year and month of manufacture on the nameplate, whichever expires first.

However, the guarantee will not apply in the following cases, even if the guarantee term has not expired:

- ① Damage was caused by incorrect use or inappropriate repair and modification.
- ② The product was used outside the standard specified range.
- ③ Damage was caused by dropping the product after purchasing or damage during transportation.
- ④ Damage was caused by an earthquake, fire, flooding, lightning, abnormal voltage or other natural calamities and secondary disasters.

9. Specifications
9-1 Standard Specifications
Three-phase 200V series

Type		2.2	3.7	5.5	7.5	15	18.5	
Output ratings	Rated output capacity (*1)	3.8	4.9	9.5	12	20	26	
	Voltage [V] (*2)	3-phase, 200 to 230V (with break voltage-per-frequency ratio control function)						
	Frequency [Hz]	1.0~1667Hz						
	Rated current [A] (*8) Value in 0 is with H07 (PWM switch) set at 1	10 (9.0)	13 (11)	25 (22)	33 (29)	55 (50)	70 (65)	
	Overload capability	125% of rated inverter output current for 1 min.						
Input power supply	Phases, voltage, frequency	3-phase, 200 to 230V, 50/60 Hz						
	Voltage/frequency variations	Voltage: +10% to -15% (Imbalance rate between phases (*3): 2% or less), Frequency: +5 to -5%						
	Momentary voltage dip capability (*4)	Operation will continue with 165V or more. If voltage drops below 165V, operation will continue for up to 15 ms. If "Continuous operation" is selected, the output frequency will be lowered to withstand the load until normal voltage is resumed.						
	Rated input current [A] (*5)	With DC reactor	8.3	14.0	19.7	26.9	54.0	66.2
		Without DC reactor	16.1	25.5	40.8	52.6	98.5	117
Required power supply capacity [kVA] (*6)	2.9 4.9 6.9 9.4 19.0 23.0							
Output frequency	Adjustment	Max. frequency	Variable setting between 50 and 1667 Hz					
		Base frequency	Variable setting between 25 and 1667 Hz					
		First frequency	Variable setting between 25 and 1667 Hz					
		Starting frequency	Variable setting between 1.0 and 100 Hz, Continuation time: 0.0 to 10.0 s					
	Accuracy		Analog setting: ±0.2% (25 ±10 ° C) or less of max. output frequency Digital setting: ±0.15% (-10 to +50 ° C) or less of max. output frequency					
	Setting resolution		Analog setting: 1/3000 of max. output frequency (example: upon setting at 0.33Hz/1000Hz) Keypad panel setting: 0.1 Hz (999.9 Hz or less), 1 Hz (1000 Hz or over) Link setting: Can be selected from two types; • 0.1 Hz (fixed) or 1/20000 of max. output frequency (example: upon setting at 0.05Hz/1000Hz)					
	Voltage/frequency characteristic		The output voltage setting at the base frequency and that at the maximum output frequency can be individually set between 50 and 240V (with AVR control) The output voltage setting at the break frequency is 0 (No setting for broken lines) or 10 to 240V/25 to 1667Hz.					
	Torque boost		Manual setting, setting code: 2.0 to 20.0 (Code 2.0 is equivalent to 0V)					
Braking	Standard	Braking torque	100% or more				About 20% (*7)	
		Braking time [s]	5				No limit	
		Braking duty cycle [%ED]	3	2	3	2	No limit	
	Option	Braking torque	150% or more				100% or more	
		Braking time [s]	30	20	10			8
		Braking duty cycle [%ED]	7	5				
	DC braking		Braking starting frequency: 0.1 to 60.0 Hz, Braking time: 0.0 to 30.0s, Braking action level: 0 to 100%. Each value can be variably set.					
Protective structure		IP40 enclosure						
Cooling method		Fan cooled						
Mass [kg]		3.8	3.8	6.1	6.1	10	10.5	

(*1) : Indicated capacities are at the rated output voltage 220V. The rated capacity will be lowered if the supply voltage is lowered.

(*2) : An output voltage exceeding the supply voltage cannot be generated.

(*3) : If the imbalance between phases exceeds 2%, use a DC reactor (DCR).

$$\text{Imbalance rate between phases} = \frac{(\text{Max. Voltage}[V] - \text{Min. Voltage}[V])}{3 - \text{phase average voltage}[V]} \times 67[\%] \text{ (Complying with IEC 61800-3 (5.2.3))}$$

(*4) : Test was conducted under the standard load conditions stipulated by the JEMA committee (at the load equivalent to 85% of the nominal applied motor).

(*5) : Values are calculated under conditions defined by us.

(*6) : Calculation is made in the following equation. Required power supply capacity [kVA] = $\sqrt{3} \times 200V \times \text{Rated input current (with DC reactor)}$

(*7) : The braking torque varies according to the motor loss.

(*8) : Indicates the rated current at an ambient temperature of 40 ° C. If the ambient temperature is 50 ° C, the rated current decreases by 15%. See 9-3.

9-2. Common specifications

Item		Specification
Control	Control method	Sinusoidal wave PWM method; voltage per frequency ratio control
	Operation method	Key operation: Run by FWD or REV key (forward/reverse operation), stop by STOP key
		External signal (digital input) : Forward/stop command, reverse/stop command, coast-to-stop command, etc.
		Link operation: Operation by RS485 (standard)
	Frequency setting	• Key operation: Setting by Δ , ∇ keys
		• External potentiometer: External freq. setting POT (VR) (1 to 5k Ω)
		• Analog input: External voltage/current input
		(1) 0 to +10 Vdc \rightarrow +10 to 0 Vdc (terminal 12)
		(2) 0 to +10 Vdc (0 to +5 Vdc) (terminal 12)
		(3) 4 to 20 mAdc \rightarrow 20 to 4 mAdc (terminal C1)
		(4) 4 to 20 mAdc (terminal C1)
		(5) FWD/REV operation by polarity of analog signal
		(6) 0 to +/-10 Vdc (0 to +/-5 Vdc) (terminal 12)
		(7) Switching to reverse operation by digital input signal (IVS)
	Jogging operation	• UP/DOWN control: Frequency increases (UP signal) or decreases (DOWN signal) as long as the digital input signal is turned on.
		• Multistep frequency selection: Up to 8 steps are selectable.
		• Digital signal: Max. 16-bit signal can be used for setting with optional digital interface card DIO.
		• Link operation: Operation by RS485 (standard)
	Operation status signal	• Operation by FWD or REV key or digital input signals (FWD, REV)
		• Transistor output (4 signals) : Running, frequency arrival, frequency detection, overload detection, under-voltage stop, etc.
		• Relay output (2 signals) : Multi-purpose relay output signals, alarm output (for any fault), etc.
		• Analog output (1 signal) : Output frequency, output current, output voltage, etc.
		• Pulse output (1 signal) : Output frequency, output current, output voltage, etc.
	Accelerating/decelerating tim	• 1.0 to 3600 s
		• Can be set for each motor (Up to five motor).

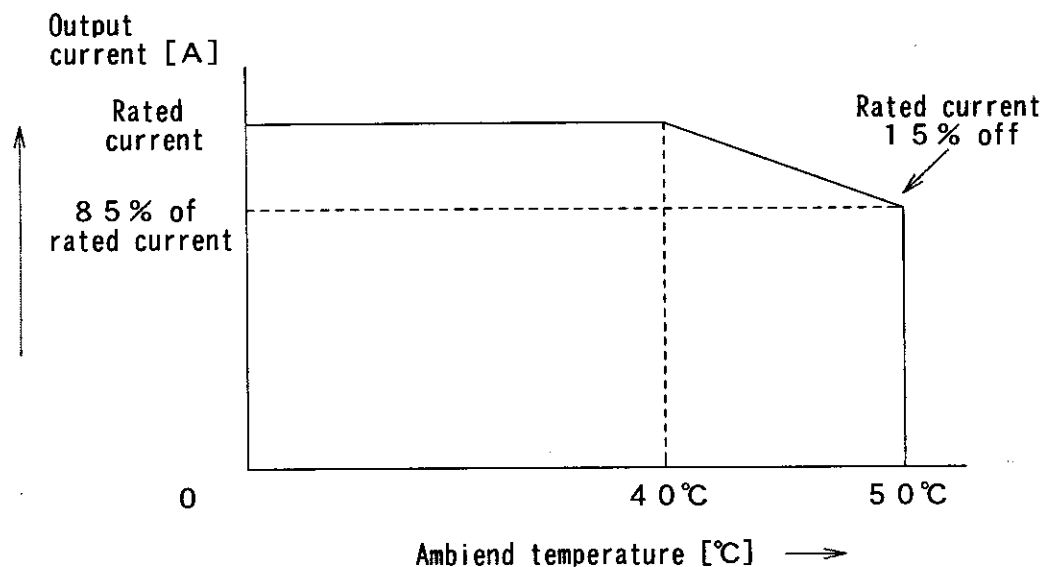
Item		Specification	
Control	Frequency limiter	The upper and lower frequency limits can be set. Upper or lower frequency limit: 0 to 1667 Hz • The upper frequency limit can be set independently according to the motor by combining digital input signals (motor 1 to 5 selection signal). • The lower frequency limit is a common setting for motors 1 through 5.	
	Bias frequency	• The bias frequency can be set. -1667 Hz to +1667 Hz	
	Gain (frequency setting signal)	• The relationship in the proportion between the analog input and the output frequency can be set. Example) For voltage input signals ranging from 0 to +10 Vdc, set the gain at 100% to obtain 10 Vdc at the maximum frequency. For voltage input signals ranging from 0 to +5 Vdc, set the gain at 200% to obtain 5 Vdc at the maximum frequency.	
	Jump frequency	The operation point (3 signals) and the jump width (0 to 30 Hz) common to one signal can be set.	
	Restart after momentary power failure	The inverter is restarted without stopping the motor upon momentary power failure. If "Continued operation" is selected, the inverter decreases the frequency while maintaining the output, to minimize speed reduction.	
	First to fifth motor setting	One inverter is usable to control five motors by switching them.	
	Cooling fan ON/OFF control	• The internal temperature of the inverter is detected and the cooling fan is stopped at low temperatures.	
		• A signal indicating the ON/OFF state of the cooling fan is output.	
	Universal DI	Existence of an arbitrary external digital signal to a set terminal is sent to the host controller.	
Indication	Universal DO	The command signal issued by the host controller is output.	
	Screen display	LED screen	LCD screen
	During operation	The following items can be displayed according to function setting. - Output frequency - Set frequency - Output current - Output voltage - Motor synchronous speed - Line speed - Load rotation speed	- Bar graph, - Output frequency, - Output current - Tester function Digital input/output signals, transistor output signals, (I/O check) analog input/output signals, and magnitude of the pulse output signal are displayed without a tester.
	During stoppage	The setting value or output value is displayed.	- Maintenance information - Cooling fin temperature - Run hours - Main circuit capacitor life - Run hours of cooling fan - Life of control PC board The language displayed on the LCD screen can be selected. Standard type, - Japanese - English

Indication	Screen display	LED screen	LCD screen
	When tripping	<p>The cause of tripping is displayed using "codes."</p> <ul style="list-style-type: none"> - OC1 (Overcurrent during acceleration) - OC2 (Overcurrent during deceleration) - OC3 (Overcurrent during constant speed operation) - OU1 (Overvoltage during acceleration) - OU2 (Overvoltage during deceleration) - OU3 (Voltage during constant speed operation) - LU (Under-voltage) - OH1 (Overheated cooling fin) - OH2 (External alarm) - OH3 (Air temperature inside unit) - dBH (DB resistance thermal relay) - OL1 (Overloaded motor 1 to 5) - OLU (Overloaded inverter) - Er1 (Memory error) - Er2 (Keypad panel communication error) - Er3 (CPU error) - Er4 (Option communication error) - Er5 (Option error) - Er8 (RS485 communication error) - ErL (Motor switching error) 	<p>Detail data immediately before tripping is displayed.</p> <ul style="list-style-type: none"> - Output frequency, - Transistor output terminal status - Output current, - Alarm history - Output voltage, - Alarms occurring simultaneously - Frequency setting - Operation status <ul style="list-style-type: none"> 1: FWD/REV 3: LU (voltage limit / under-voltage) - Integrated operation hours - DC link circuit voltage - Air temperature inside unit - Cooling fin temperature - Communication error frequency (keypad panel) - Communication error frequency (RS485) - Communication error frequency (option) - Digital input terminal status (remote) - Digital input terminal status (communication)
	During operation or when tripping	<ul style="list-style-type: none"> - Alarm history: The cause (code) of tripping of past four alarms is kept and displayed. - The detail data of the cause of tripping of the latest alarm is kept and displayed. 	
	Charge lamp	Lights up if there is residual voltage in the capacitor of the main circuit.	
	Overload protection	An electronic thermal relay function and internal temperature detection protect the inverter.	
	Overvoltage protection	The overvoltage applied to the DC link circuit in a braking cycle is detected to stop the inverter.	
	Surge voltage protection	The inverter is protected against the surge voltage intruding between the power cables of the main circuit and ground.	
	Under-voltage protection	A voltage drop in the DC link circuit is detected to stop the inverter.	
	Overheat protection	The inverter is protected against an overheat detected at the cooling fin of the inverter.	
Protection	Short circuit protection	The inverter is protected against an overcurrent caused by a short circuit in the output.	
	Ground fault protection	The inverter is protected against an overcurrent caused by ground fault in the output.	
	Motor protection (overload forecast)	<ul style="list-style-type: none"> - The electronic thermal overload relay function setting stops the inverter to protect the motor. - To switch and operate first through fifth motors, the electronic thermal relay of each motor can be set. - Before stopping the inverter, a forecast signal can be output at a level defined in advance. When switching and operating the first through fifth motors, the overload forecast level for each motor can be set. 	
	Braking resistor protection	<ul style="list-style-type: none"> - 7.5 kW or less: Protected by internal function of inverter. - 15 kW or more: A thermal relay installed to the resistor detects and stops discharging electricity. 	

Item		Specification								
Protection	Stall prevention	Functions during acceleration, deceleration or constant speed operation if the output current exceeds the limit, avoiding tripping.								
	PTC Thermistor protection	A PTC thermistor can protect the motor.								
	Retry function	The inverter automatically resets itself to restart operation after it has tripped to stop. Retry is not made in the FUS, OH2, LU, EF or various Er tripping cases.								
Environment	Installation location	The inverter must be installed indoors, and kept away from corrosive or flammable gases, dust and direct sunlight.								
	Ambient temperature	-10 to +50 ° C (The ventilating cover must be removed at temperatures exceeding 40 ° C.)								
	Relative humidity	5 to 95% RH (without dew)								
	Altitude	<table><tr><th>Altitude [m]</th><th>Output</th></tr><tr><td>1,000 or less</td><td>None</td></tr><tr><td>1,001~2,000</td><td>Reduced</td></tr><tr><td>2,001~3,000</td><td>Reduced</td></tr></table>	Altitude [m]	Output	1,000 or less	None	1,001~2,000	Reduced	2,001~3,000	Reduced
	Altitude [m]	Output								
	1,000 or less	None								
	1,001~2,000	Reduced								
2,001~3,000	Reduced									
Vibration	3 mm at from 2 to 9 Hz, 9.8 m/s ² at from 2 to less than 20 Hz, 2 m/s ² at from 20 to less than 55 Hz, 1 m/s ² at from 20 to less than 55 Hz									
Storage	Ambient temperature	-25~+65°C								
	Relative humidity	5 to 95% RH (without dew)								

9-3 Rated output current derating

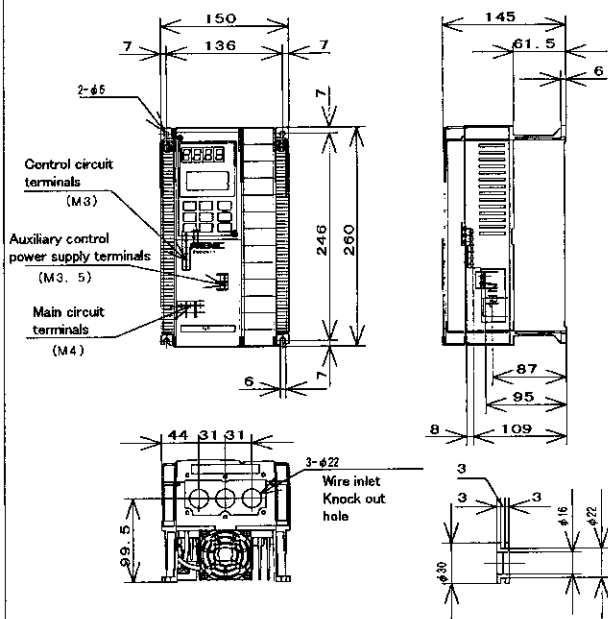
Derate the rated output current following the figure when the ambient temperature exceeds 40°C. The rated output current is derated to 85%(at50°C)



9-4 Outline Dimensions

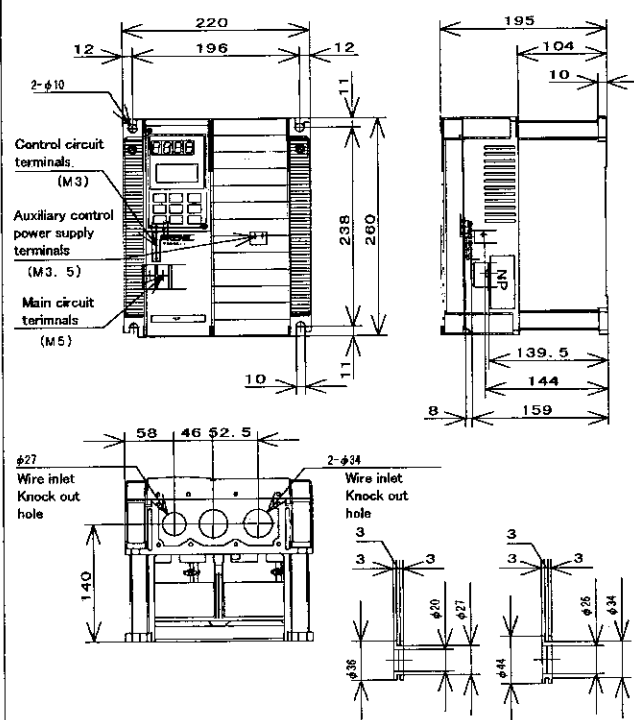
■ Outline Dimensions

Fig.1



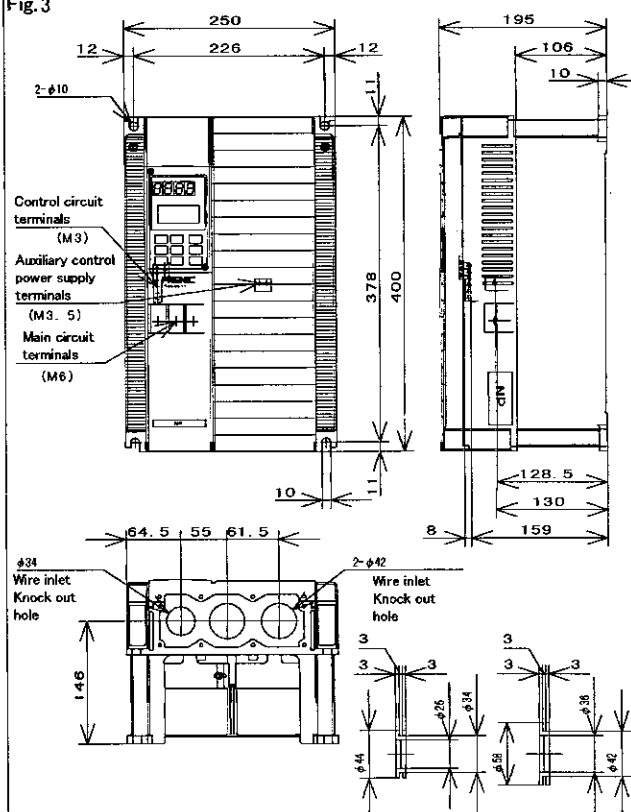
FRN2. 2H11S-2 ~ FRN3. 7H11S-2

Fig.2



FRN5. 5H11S-2 ~ FRN7. 5H11S-2

Fig.3



FRN15H11S-2 ~ FRN18. 5H11S-2

9-5 RS485 Communication

When connected to host equipment such as a personal computer or PLC, the inverter can be monitored or made to operate, stop or change the program by receiving commands from the host. For details concerning communication, refer to technical documentation.

Table 9-4-1 Transmission specifications

Item	Specifications
Applicable model	Fuji Electric general-purpose inverter 11 series
Physical level	EIA RS485
Maximum length of cable	500m
Number of units connected	One host and 31 inverters (Station No. 1 to 31)
Transmission speed	19200,9600,4800,2400,1200 [BPS]
Synchronization method	Start-stop transmission (Asynchronous)
Transmission form (data exchange method)	Half-duplex method
Transmission protocol	Polling/selecting, broadcast
Character system	ASCII 7bit
Character length	8bit ,7bit
Stop bit length	1bit ,2bit
Frame length	16-byte fixed for general transmission; 8- or 12-byte for high-speed transmission
Parity	even , odd , none
Error check method	Check sum

Application motor [kW]	Inverter type	Fuse/MCCB current rating [A]		Tightening torque [N*m]				Recommended wire size [mm2]															
		With DCR	Without DCR	L1/R,L2/S/L 3/T U,V,W	G	R0,T0	Control	L1/R,L2/SL3/T		G	U,V,W	R0	P1,P(+)	P(+),DB	Contr								
								With DCR	Without DCR														
3phase 200V svstem	0.2 FRN0.2G11S-2	5	5	1.2	-	1.2	0.7	2	2	2	2	2	2	2	0.2 to 0.75								
	0.4 FRN0.4G11S-2	5	5																				
	0.75 FRN0.75G11S-2	5	10																				
	1.5 FRN1.5G11S-2	10	15	1.8	2			2	2	2	2		2	2		2							
	2.2 FRN2.2G11S-2	10	20																				
	3.7 FRN3.7G11S-2	20	30																				
	5.5 FRN5.5P11S-2	30	40	3.5	2			2	2	2	2		2	2		2							
	5.5 FRN5.5G11S-2	40	60														3.5	3.5	3.5	3.5	3.5	3.5	3.5
	7.5 FRN7.5P11S-2																						
	7.5 FRN7.5G11S-2	50	100	3.5	8			3.5	5.5	5.5	5.5		5.5	5.5									
	11 FRN11P11S-2																						
	11 FRN11G11S-2	75	125	5.8	14			5.5	8	8	8		8	8									
	15 FRN15P11S-2																						
	15 FRN15G11S-2	100	150	5.8	22			8	8	8	8		8	8									
	18.5 FRN18.5P11S-2																						
18.5 FRN18.5G11S-2	100	175	5.8	38	14	14	14	14	14	14													
22 FRN22P11S-2																							
22 FRN22G11S-2																							
3phase 400V svstem	0.4 FRN0.4G11S-4	5	5	1.2	-	1.2	0.7	2	2	2	2	2	2	2	0.2 to 0.75								
	0.75 FRN0.75G11S-4	5	5																				
	1.5 FRN1.5G11S-4	5	10																				
	2.2 FRN2.2G11S-4	10	15	1.8	2			2	2	2	2		2	2		2							
	3.7 FRN3.7G11S-4	10	15																				
	5.5 FRN5.5P11S-4	15	20																				
	5.5 FRN5.5G11S-4	20	30	3.5	2			2	2	2	2		2	2		2							
	7.5 FRN7.5P11S-4																						
	7.5 FRN7.5G11S-4	30	40														3.5	3.5	3.5	3.5	3.5	3.5	3.5
	11 FRN11P11S-4																						
	11 FRN11G11S-4	40	50	5.8	8			3.5	3.5	3.5	3.5		3.5	3.5		3.5							
	15 FRN15P11S-4																						
	15 FRN15G11S-4	40	60		5.8			14	5.5	5.5	5.5		5.5	5.5		5.5							
	18.5 FRN18.5P11S-4																						
	18.5 FRN18.5G11S-4	50	75		5.8			38	14	14	14		14	14		14							
	22 FRN22P11S-4																						
	22 FRN22G11S-4																						

Application motor [kW]	Inverter type	Fuse/MCCB current rating [A]		Tightening torque [N*m]				Recommended wire size [mm2]							
		With DCR	Without DCR	L1/R,L2/S,L3/T U,V,W P1,P(+),DB,N(-)	G	R0,T0	Control	L1/R,L2/SL3/T (G)		U,V,W	R0,T0	P1,P(+)	P(+),DB,N(-)	Control	
								With DCR	Without DCR						
3phase 400V	0.4 FRN0.4G11S-4	5	5	1.2		-	1.2 0.7	2.5 (2.5)	2.5 (2.5)	2.5	2.5	2.5	2.5	0.2 to 0.75	
	0.75 FRN0.75G11S-4	5	5												
	1.5 FRN1.5G11S-4	5	10												
	2.2 FRN2.2G11S-4	10	15	1.8											
	3.7 FRN3.7G11S-4	10	15												
	5.5 FRN5.5P11S-4	15	20												
	5.5 FRN5.5G11S-4														
	7.5 FRN7.5P11S-4	20	30	3.5					6 (6)						
	7.5 FRN7.5G11S-4														
	11 FRN11P11S-4	30	40					6 (6)	10 (10)	4		4			
	11 FRN11G11S-4							6	6						
	15 FRN15P11S-4	40	50												
	15 FRN15G11S-4			5.8											
	18.5 FRN18.5P11S-4	40	60					10 (10)	16 (16)	10		10			
	18.5 FRN18.5G11S-4							25 (16)							
	22 FRN22P11S-4	50	75												
	22 FRN22G11S-4														
	30 FRN30P11S-4	75	100					16 (10)	50 (25)	25	2.5 to 6	25	2.5		
	30 FRN30G11S-4							25 (16)	70 (35)	35		35			
	37 FRN37P11S-4	100	125	13.5				35 (25)	70 (35)	50		50			
	37 FRN37G11S-4							50 (25)	35X2 (35)	70		70	4		
	45 FRN45P11S-4	100	150					35X2	-	35X2		50X2	6		
	45 FRN45G11S-4							95(50)		95					
	55 FRN55P11S-4	125	175					50X2	-	50X2		70X2	10		
	55 FRN55G11S-4							(50)							
	75 FRN75P11S-4	175	-					70X2	-	70X2		95X2			
	75 FRN75G11S-4							70X2	-	95X2		120X2			
	90 FRN90P11S-4	200	-					120X2	-	120X2		150X2	16		
	90 FRN90G11S-4							(70)							
	110 FRN110P11S-4	225	-	27	13.5			150X2	-	185X2		185X2	25		
	110 FRN110G11S-4							(150)							
132 FRN132P11S-4	300	-				185X2	-	185X2	185X2	50					
132 FRN132G11S-4						(185)									
160 FRN160P11S-4	350	-				240X2	-	300X2	300X2						
160 FRN160G11S-4															
200 FRN200P11S-4	400	-	48	27											
200 FRN200G11S-4															
220 FRN220P11S-4	500	-													
220 FRN220G11S-4															
280 FRN280P11S-4	600	-													

	Application motor [kW]	Inverter type	Fuse/MCCB current rating [A]		Tightening torque [N*m]				Recommended wire size [mm2]																					
			With DCR	Without DCR	L1/R, L2/S, L3/T U, V, W P1, P(+), DB, N(-)	⊕ G	R0, T0	Control	L1/R, L2/SL3/T (⊕ G)		U, V, W	R0, T0	P1, P(+)	P(+), DB, N(-)	Control															
									With DCR	Without DCR																				
3phase 200V system	0.2	FRN0.2G11S-2	5	5	1.2				2.5 (2.5)	2.5 (2.5)	2.5	2.5	2.5	2.5	0.2 to 0.75															
	0.4	FRN0.4G11S-2	5	5																										
	0.75	FRN0.75G11S-2	5	10																										
	1.5	FRN1.5G11S-2	10	15	1.8				6(6)	10(10)	4	2.5	4																	
	2.2	FRN2.2G11S-2	10	15																										
	3.7	FRN3.7G11S-2	20	30																										
	5.5	FRN5.5P11S-2	30	40	3.5				10 (10)	16 (16)	6	2.5	10																	
	5.5	FRN5.5G11S-2	40	60																										
	7.5	FRN7.5P11S-2																												
	7.5	FRN7.5G11S-2	50	100	5.8				25 (16)	35 (16)	16	2.5	35																	
	11	FRN11P11S-2																												
	11	FRN11G11S-2	75	125																										
	15	FRN15P11S-2		100	150																									
	15	FRN15G11S-2	100		175																									
	18.5	FRN18.5P11S-2		13.5				1.2	0.7	25 (16)	50 (25)	25	2.5 to 6	25		3.5														
	18.5	FRN18.5G11S-2	100															175												
	22	FRN22P11S-2																125	225											
	22	FRN22G11S-2	150																300					25 (16)	70 (35)	35	2.5	50	70	
	30	FRN30P11S-2																												
	30	FRN30G11S-2	175															350					35 (25)	70 (35)	50	2.5 to 6	70	4		
	37	FRN37P11S-2																												
	37	FRN37G11S-2	225															400					50 (25)	35X2 (35)	70		50X2	6		
	45	FRN45P11S-2																												
	45	FRN45G11S-2																-					35X2	-	35X2		70X2	10		
	55	FRN55P11S-2																												
	55	FRN55G11S-2		-					95(50)	-	95		70X2	10																
	75	FRN75P11S-2																												
	75	FRN75G11S-2		-					50X2 (50)	-	50X2		95X2																	
	90	FRN90P11S-2																												
	90	FRN90G11S-2		-					70X2 (70)	-	70X2																			
	110	FRN110P11S-2																												
				-																										

