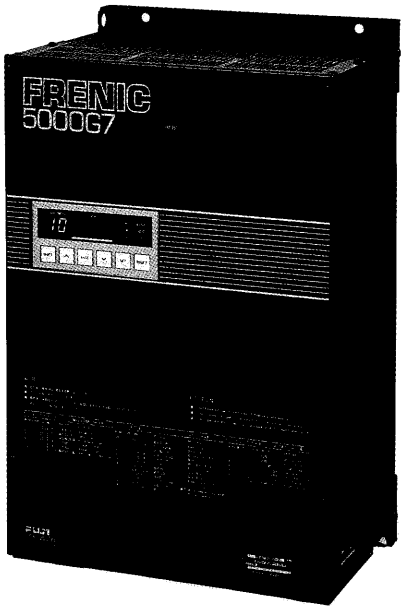
FUJI ELECTRIC

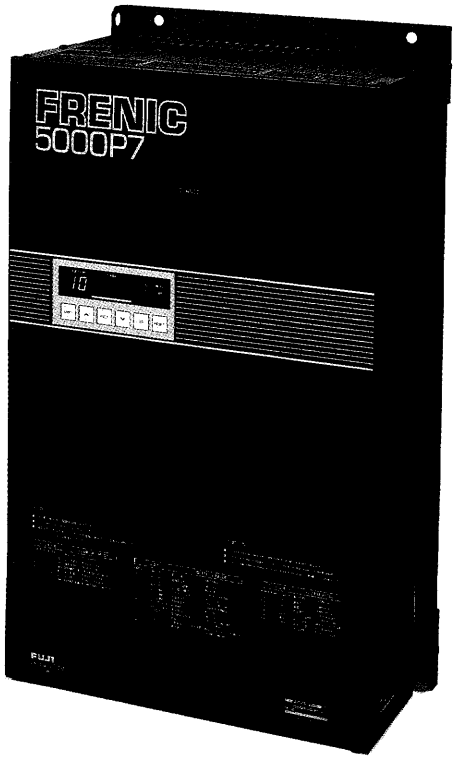
FUJI INVERTER

FRENIC5000G7 · FRENIC5000P7

INSTRUCTION MANUAL

200V 3.7～90kW (G7 SERIES)
30～110kW (P7 SERIES)
400V 3.7～220kW (G7 SERIES)
30～280kW (P7 SERIES)





Fuji Electric Co.,Ltd.

INR-HF 50399-E

Preface

Thank you for your purchase of Fuji Inverter FRENIC 5000G7/P7.
Please note that the proper use in accordance with this manual can ensure your expectation on performance, the incorrect handing will result in improper operation causing the reduced service life and damages. Therefore, be sure to read through this manual before the actual use. On the other hand, when the equipment incorporating this inverter is due to be shipped, you are requested to promptly supply this manual to your customers without fail.

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FUJI INVERTERS
FRENIC5000G7/P7
Data Protection

■ Manufacturer use function

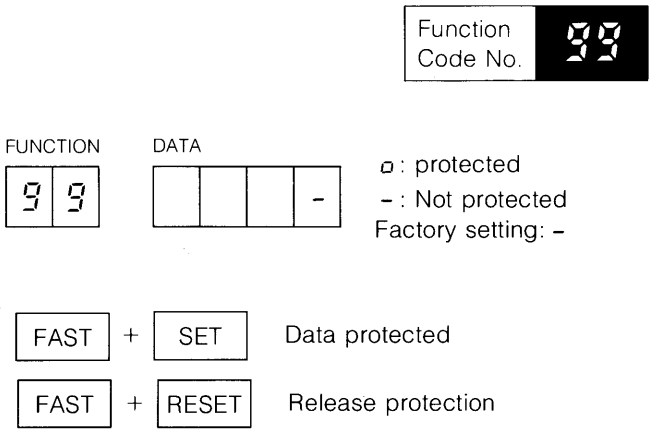
Parameter settings can be protected so that they cannot be changed or lost accidentally. Protected data cannot be changed without first cancelling the data protection function.

■ Data protection and protection release

Data for Function Codes 10 to 79 can be protected. The data protection function can be operated in the following two ways:

1. Select Function Code 99 using the SHIFT and UP or DOWN keys. Use the SHIFT key to set the unit to Data setting Mode. If the data is protected, ▫ is displayed . If not, - is displayed. Pressing the UP key displays ▫ and disables a data change. Pressing the DOWN key displays - and enables a data change.
2. While holding down the FAST key, press the SET key to protect the data or the RESET key to release data protection. The monitor displays ▫ when the data cannot be changed (protected) or - when it can be changed (not protected).
   The current display is held for five seconds after the FAST or SET key is released and then returns to the previous display.

Note: In the Fault Monitoring Mode or while the data display is blinking the protection function cannot be selected.



PRECAUTIONS

WARNING—HAZARD OF ELECTRICAL SHOCK:

Disconnect incoming power before working on this control.

All motor bases and inverter enclosure housings should be grounded in accordance with the electrical standard.

WARNING—HAZARD OF MOTOR OVERSPEED:

The maximum frequency is 400Hz, which is equivalent to 12000r/min of high speed rotation in 4-pole motor. The incorrect setting may result in a catastrophic failure for the machine.

CAUTION: Do not connect power supply voltage that exceeds the standard specification voltage permissible fluctuation. If excessive voltage is applied to the inverter, damage to the internal elements will result.

CAUTION: Do not connect power source to the output terminals (U, V, W).

CAUTION: If the P-N terminals are short-circuited or connected a braking resistor directly without a bracking unit, damage to the inverter will result. Do not fail to match the terminal symbols P and N between inverter and braking unit.

CAUTION: Do not connect AC power source voltage to the control circuit terminals (except for 30A, 30B, 30C, AX1, AX2).

CAUTION: Connect the inverter to a power source which capacity is less than 10 times of inverter capacity or 500kVA. If the power sourse capacity is larger than these, install a Line side AC reactor (ACR - - - option) on the line side of the inverter.

CAUTION: Do not connect a power factor correcting capacitor to the output side of the inverter.

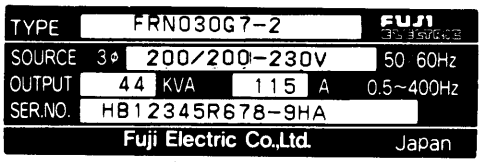
CAUTION: If the inverter protective function is activated, consult Section 10 "Troubleshooting", and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.

CAUTION: Do not conduct megger tests between the inverter terminals or control circuit terminals.

1. Check after Delivery

After unpacking, perform the checking described as follows.

(1) Check the name plate on the cover to confirm that the product delivered is what you have ordered.



←Inverter type
←Rated input AC voltage / frequency
←Rated output current / output frequency range
←Manufacturer's serial number

Fig. 1-1 Name plate

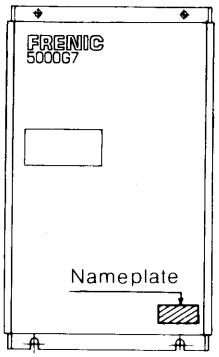


Fig. 1-2 Name plate position

Inverter type

FRN 030 G7 – 2

→ Power supply voltage: 2 → 200V type, 4 → 400V type
→ Series name: G7 or P7
→ Standard applicable motor output: 030 → 30kW, 220 → 220kW
→ Product type: FRENIC5000

(2) Check that there should be no faults such as damages and detachment in the parts and concaves on the cover. If some have been found, the user is requested to promptly contact the supplier or the nearest Fuji sale office.

2. Carriage and Storage

In the case of carrying and temporary storing after the delivery, the following cautions should be taken.

2-1 Carriage

(1) For carrying, careful handing is required to avoid dropping, etc.
(2) Since carrying by means of holding the terminals or the top cover may result in damages and dropping, be sure to hold the body.
(3) The ambient temperature range at carrying (during transportation) should be within −25℃ ~ +65℃.

2-2 Storage

(1) Ambient temperature
The ambient temp. range in storage is within −25℃ ~ +65℃.
(2) Packing
No packing condition in storage, where the inverter is exposed to rust, dust and damage, is undersirable.
Packing is necessary in storage.
(3) Place
Avoid leaving the inverter directly on such as the concrete floor and put it on a rack. Avoid also the place which gets the sun light.
(4) Humidity
Don't storage in humid environments.
(5) Corrosive gases
Don't storage in the atomosphere which contains corrosive gases such as sulfurized gas, ammonia gas, and chlorine gas.

2-3 Neglect after Installation

In some cases, the inverter is left intact for a long time after completing the installation. Particulary when it is delivered in the conditions where the construction work is going on, it will be subject to the exposure of water and dust. In such case, take temporary protective measures until the operation starts.

3. Construction

(1) 200V series: Inverters up to FRN055G7/P7-2, 400V series: Inverters up to FRN110G7/P7-4

There are two types of cooling methods depending on the installation method, "inverter cooled inside switchboard" and "inverter cooled outside switchboard". Fig. 3-2 shows a installation method for "inverter cooled inside switchboard", and Fig. 3-3 shows that for "inverter cooled outside switchboard" where a cooling fan is installed outside the unit. In the external cooling method, approx. 60% of the total amount of heat generated in the inverter is discharged outside the unit, facilitating cooling in the unit to achieve an economical unit design. However, because the cooling fan is installed outside the unit. take care to keep it clean in a dusty environment due to thread wastes.

The unit has a two method applicable structure to meet each case by switching an attachment leg position, as shown in Fig. 3-1. If you require "inverter cooled outside switchboard", please move the mounting adapters to the specified positions.

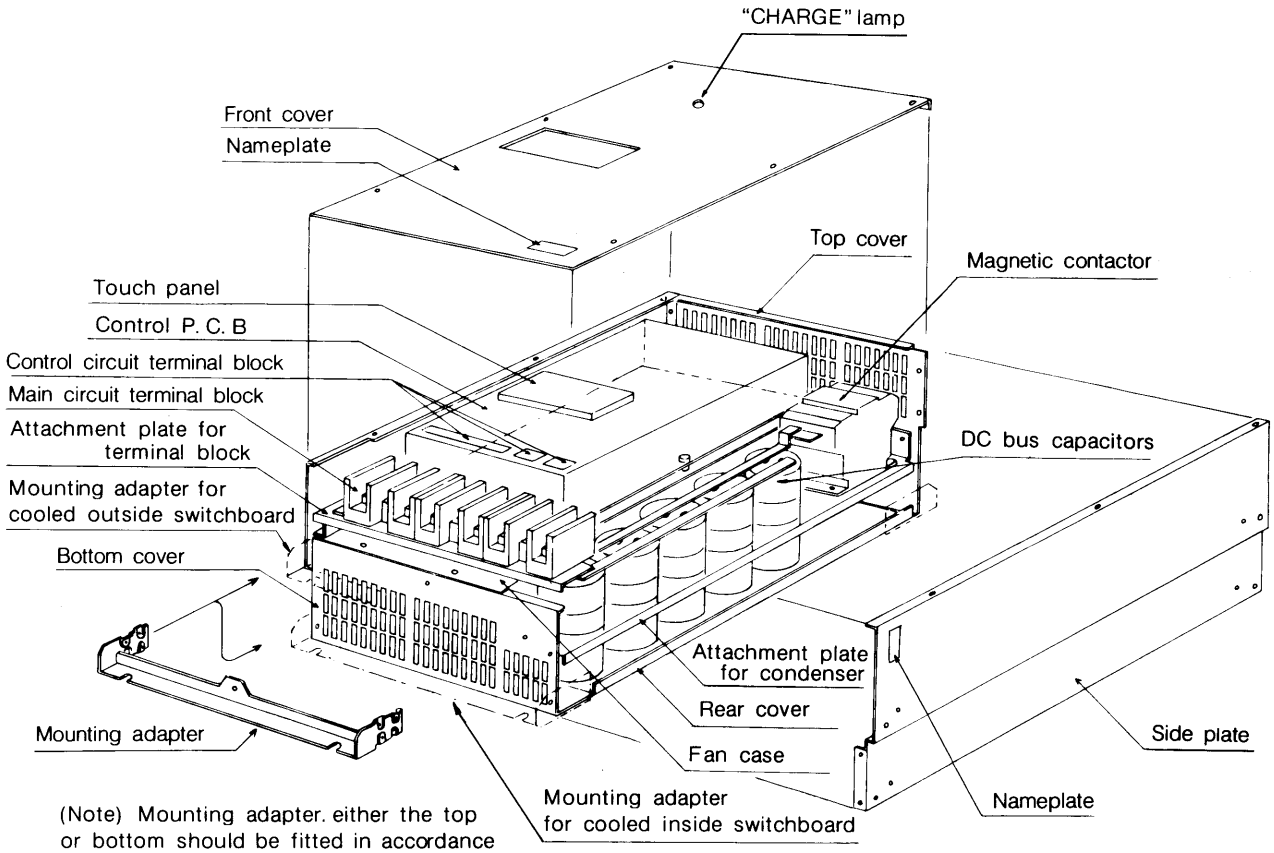


Fig. 3-1 Construction of FRENIC 5000G7/P7 series (1)

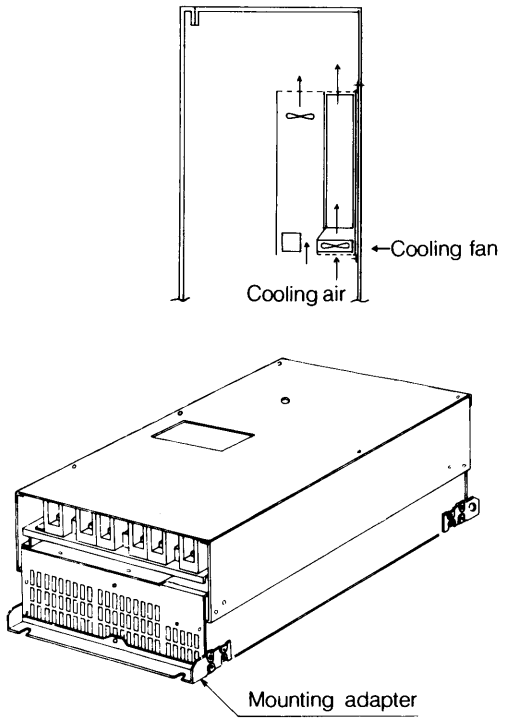


Fig. 3-2 Inverter cooled inside switchboard

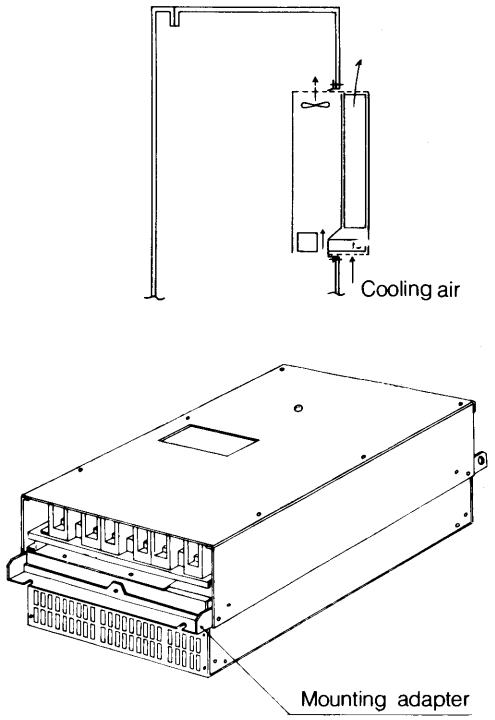


Fig. 3-3 Inverter cooled outside switchboard

(2) 200Vseries: Inverters more than FRN055G7/ P7-2, 400V series: Inverters more than FRN110 G7/ P7-4

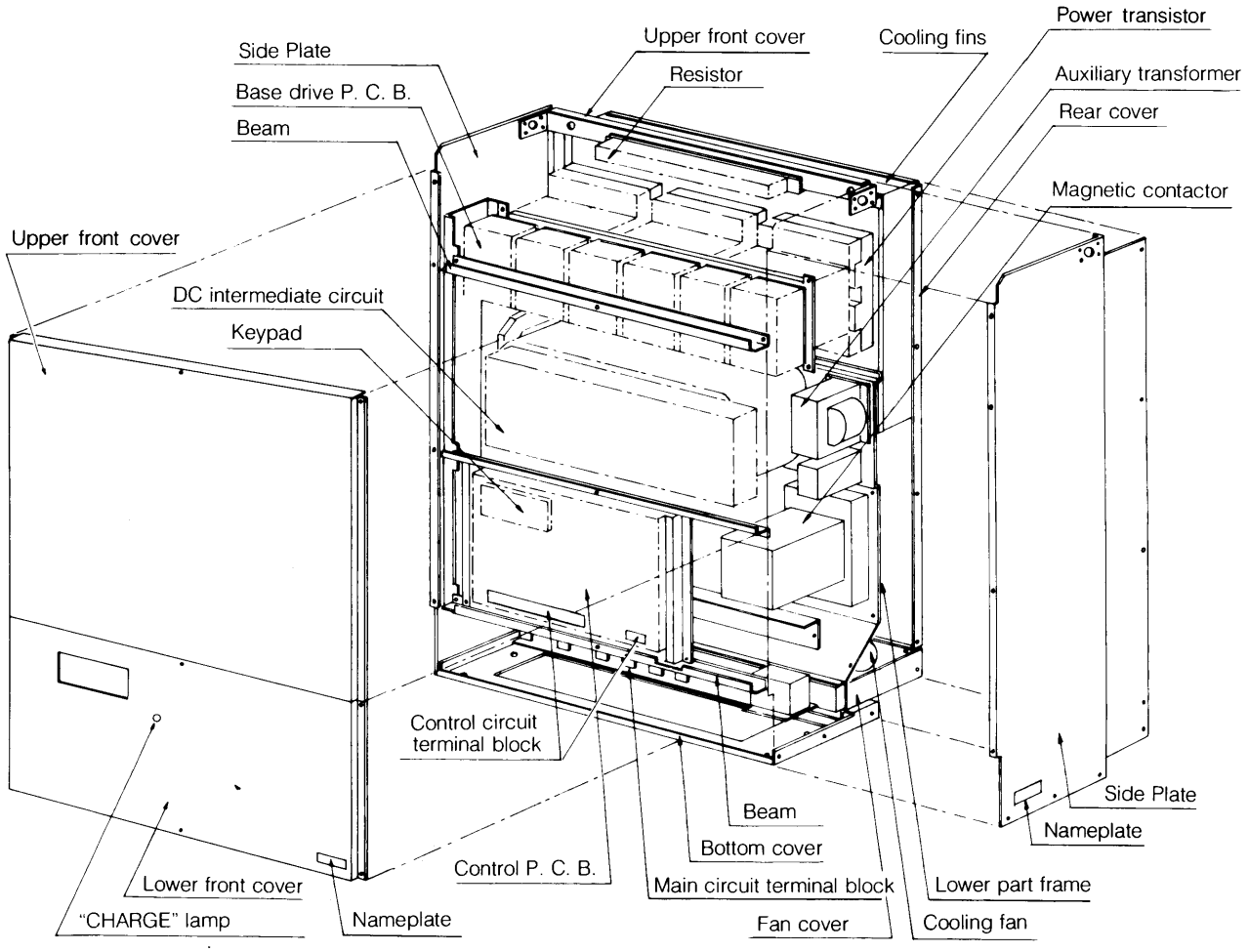


Fig. 3-4 Construction of FRENIC 5000 G7/ P7 series (2)

4. Installation

4-1 Environment for Use

The environments where the inverter is used are extensively various, and can affect greatly its performance and service life.
FRENIC 5000G7/P7 series are designed for the use in the environment conditions described in Table 4-1.
Particulary, in the case of being incorporated into machines, etc., provide sufficient vibration proofing measures.

Table 4-1 Environmental conditions for the use

Ambient temp.	−10~50℃	Nocondensing and nonicing due to a sharpe change in temperature
Relative humidity	20~90%RH	
Altitude	Not more than 1000m	
Atomosphere	The amount of dust and oily dust contained is small. There should be no corrosive gases, no inflammable gases, no oilmist, no vapor, no water drops, and no sun light contained much salt.	
Vibration	Not more than 0.5G	

4-2 Direction and Space

(1) Installation direction

NOTE: Install the inverter in the perpendicular direction against the ground. If the inverter is installed opposite, it should be over-heated.

(2) Space

NOTE: The inverter generates heat with the generating of loss. In order to discharge the heat, a cooling fan is built in to cool by means of forced feed cooling. Sufficient spacing should be provided to reduce obstacles to ventilation and effects on the surrounding, as shown in Fig. 4-2.

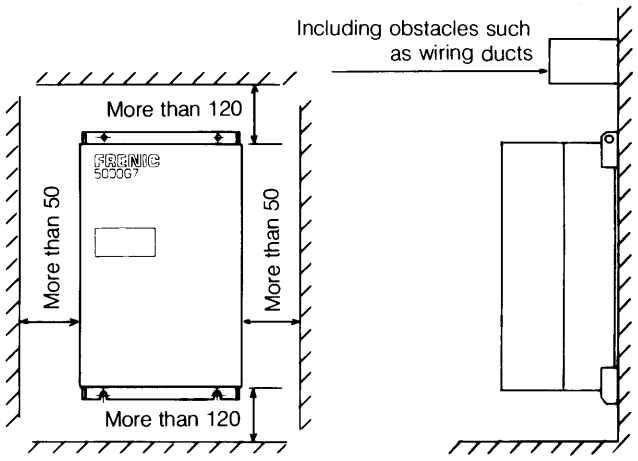


Fig. 4-2 Space around Inverter

4-3 Caution on Installing inside a Switchboad

CAUTION: Because the ambient temperature greatly affects inverter life and reliability, do not install the inverter in any location that exceeds the allowable temperatures.

(1) The temperature inside the switchboard should be kept at not more than 50℃.
(2) Considering an increase in temperature inside switchboard, do not store in a small sealed box nor fill the space surrounding the inverter with parts, heat generators, etc.

NOTE: When installing a cooling (ventilation) fan to the switchboard, make a design so that the air for cooling can pass through the heat generating part.

The improper installation positions of Inverter and Fan may result in preventing the temperature surrounding the inverter from reducing to the specified value, even if the fan which has the required cooling capability has been installed.

NOTE: In the case of installing more than one inverters in the switchboard, arrange them horizontally, as shown in Fig. 4-3 (a).
When the vertical arrangement (upper and lower) is inevitable, provide a partition board between inverters to give no effect at all of the heat from the lower inverter to the upper one.

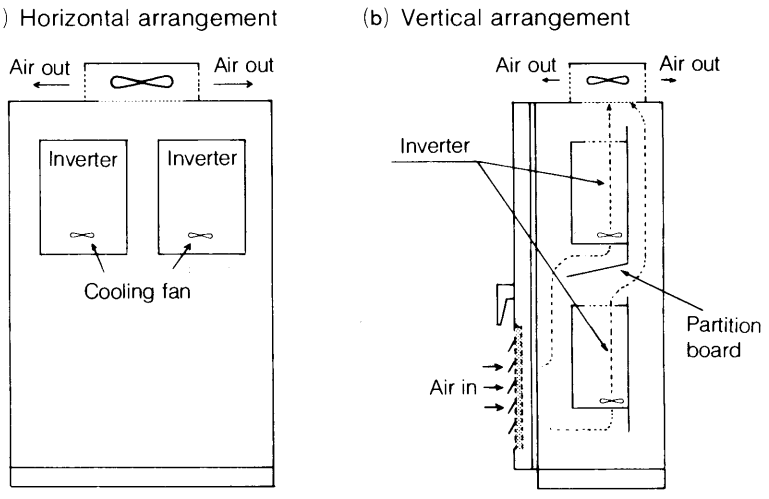


Fig. 4-3 Inverter arrangements in a switchboad

5. Connection and Wiring

Connections should be carefully implemented in accordance with the following procedures. After completing the connections, be sure to confirm that each wiring has been properly provided. Note that the incorrect connections may cause damages the inverter as well as its improper operation.

5-1 Terminal position and Connections at Shipment.

Under the top cover, the main circuit terminals and control circuit terminals are arranged at the bottom part of the Inverter. At the time of shipment, P1-P (except ① to ③ shown as below) and CM-THR are connected with short-circuit conductors.

NOTE: In the following inverters connect the DC reactor to P1-P, otherwise inverter does not operate.
① Inverters of 75kW and above [G7 series 200V/ 400V]
② Inverters of 75kW and above [P7 series 200V]
③ Inverters of 90kW and above [P7 series 400V]

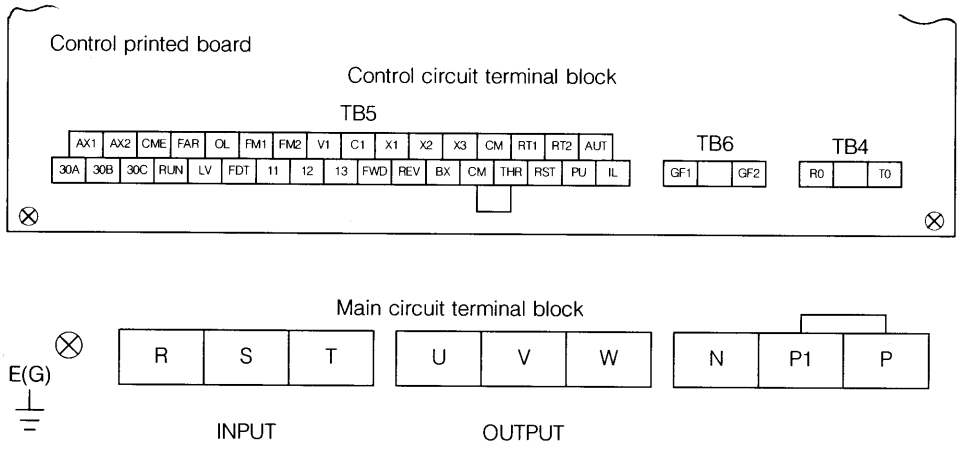


Fig. 5-1 Terminal positions and connections at Shipment

5-2 Main circuit

CAUTION: Be sure that the power supply is never connected to the U, V, W terminals or the P, P1, N terminals.

(1) Connection for Power supply
Do not fail to connect a breaker for wiring (MCCB) between the three-phase circuit power supply and the main circuit terminals (R, S, T). The phase order matching is not required for the connection. Also, connect Magnetic contactor (MC) to cut off the power supply when the inverter protective function actuates, to prevent faults from expanding.
If the MC is turned on and off by a run and stop command, the interval of switching should be less than once an hour. Otherwise, the inrush currents will reduce the service life of the internal components. When the inverter is turned on and off more than once, keep the MC on, run and stop by FWD or REV.

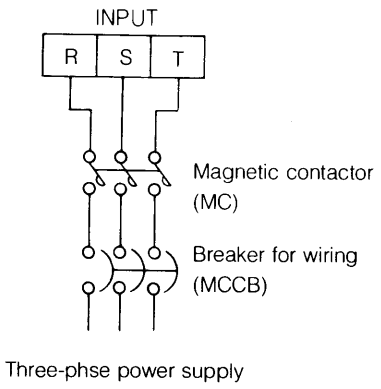


Fig. 5-2-1 connection for Power supply

(2) Connection for the Output side
① Cut off the power supply before connectig the output wire. When the connection has been made while the power supply is ON, a voltage may be impressed between the output terminals, even though the inverter is in a stopping state.

NOTE: When the inverter output terminals (U, V, W) have been connected as shown in Fig. 5-2-2. Forward command will bring the motor in the counterclockwise rotation viewed from the drive side (at Japanese standard motor). When the rotation is reverse, switch two phases among phases U, V, W.

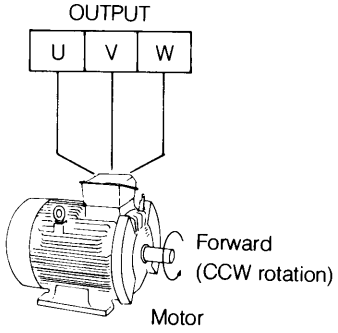


Fig. 5-2-2 connection for Electric motor

② Do not connect the power supply to terminals U, V, W
A voltage externally impressed will damage the inverter. For this reason, when the commercial switching operation is performed, as shown in Fig. 5-2-3, be sure to install Magnetic contactor (MC-2) and to provide electrical or mechanical interlock to prevent turning on MC-2 in the operation using the commercial power supply.

③ The connection for capacitor is not allowed; otherwise, an inverter and a capacitor will be overheated due to harmonics resulting damaging them.

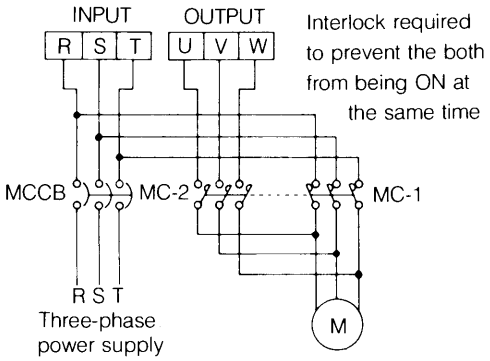


Fig. 5-2-3 Interlock for Commercial switching operation

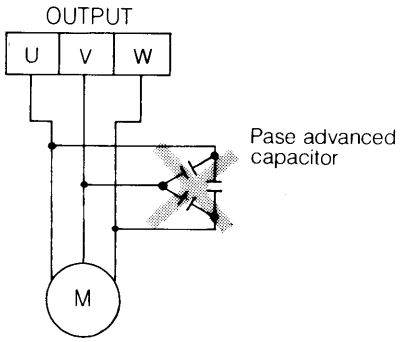


Fig. 5-2-4 Prohibited connection for Capcitor

(3) Connection for DC reactor for Power factor improvement
In the case of connecting DC reactor to Inverter which is not equipped as the standard (supplied outside the unit), detach a short-circuit conductor between terminals P1-P connected at shipment, and then connect to those terminals.
As to find the location of a short-circuit conductor, look round a port for conductor-connection in the unit (inside) where the conductor is connected.

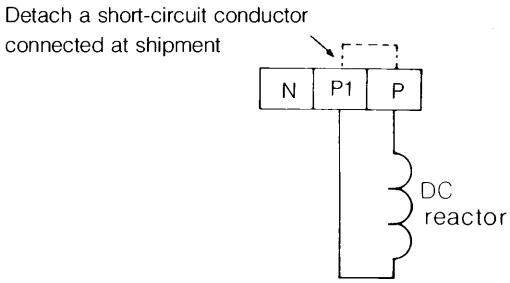


Fig. 5-2-5 Connection for DC reactor

(4) Connection for Grounding terminal

WARNING-HAZARD OF ELECTRICAL SHOCK: All motor bases and inverter enclosure housings should be grounded in accordance with the electrical standard.

It is necessary to provide the grounding in order to be protected against an electric shock due to an electric leakage and to reduce effects of a noise. Preferably, the grounding should be provided for its exclusive use.
If it is not possible to have an exclusive grounding, then the alternative one is a common grounding to connect to a ground wire for other equipment at the ground point.
Avoid the grounding where the ground wire is used in common with other equipment. The size of a wire needs to be thick, and the distance should be short.

(a) Grounding for a exclusive use (Good)
(b) Grounding for a common use (Possible)
(c) Grounding for use with a common ground wire

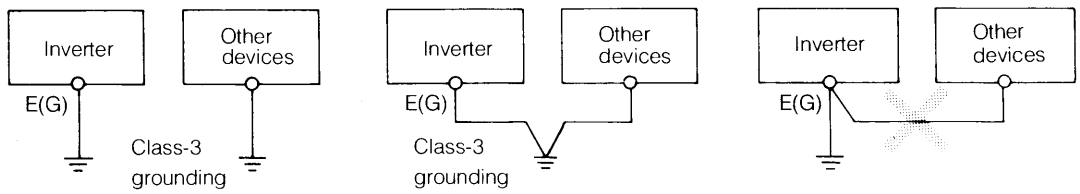


Fig. 5-2-6 Possible connections of the ground wire

5-3 Control circuit

Provide the wiring in accordance with the following diagram and description. The function of each terminal should be referred to "Terminal, 11-4"

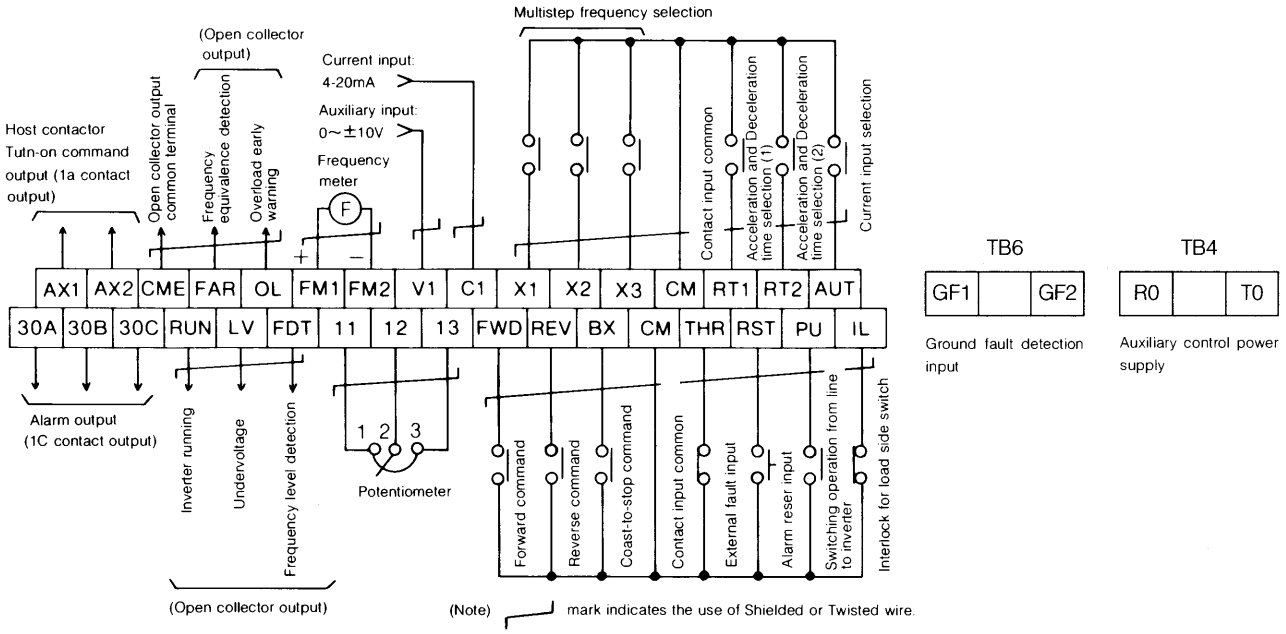
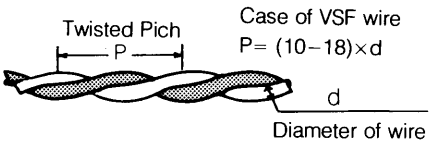


Fig. 5-3-1 Connection for Control circuit terminals

(1) Wiring for Control circuit terminals

NOTE: For the wiring control circuit terminals, use a shielded or twisted vinylwire, and keep the distance not less than 100mm away from the main circuit. However, if wire-crossing is inevitable, wire each to cross at the right angle. For the longer wiring route, a twisted-shielded wire is recommended.



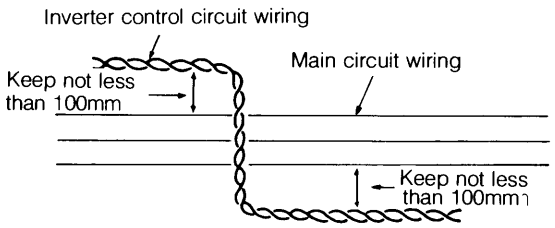


Fig. 5-3-2 Wiring for inverter control circuit

(2) Connection for Control power supply auxiliary input terminal
The control power within the inverter is usually supplied from DC intermediate circuit.
When the protective circuit actuates, if a magnetic contactor of the power supply side is turned off, that will result in cutting off the control power of the inverter, and therefore the fault display and the collective alarm output signal cannot be held. When a continuous actuation of the protective circuit is required, connect with Aux. Control power supply terminal R0 and T0 as Fig. 5-3-4.

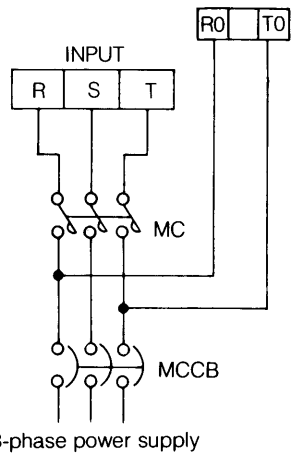


Fig. 5-3-4 Connection for Control power supply

(3) Connection for Frequency setting/ Monitoring terminals

For the input voltage polarity of each of Frequency setter connecting terminal (12) and Voltage input auxiliary terminal (V1), both (+) and (−) are applicable. When a frequency setter is used, the polarity can be switched by means of switch SW1 on the printed board (See Fig. 5-3-6 for the installed location).

Note that the polarity at shipment is set at (+).

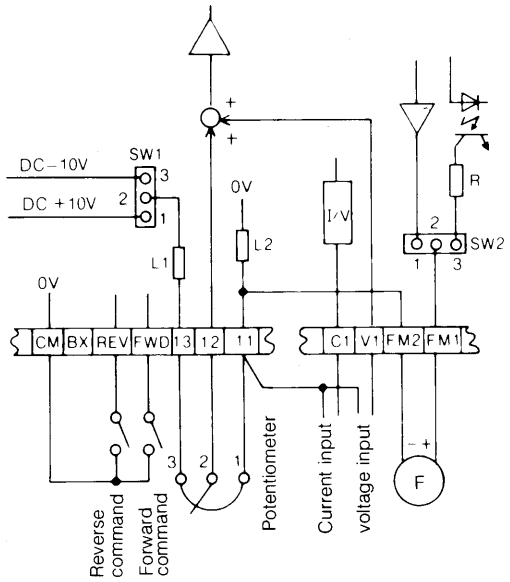


Fig. 5-3-5 Connection for Frequency setting terminal and for Monitoring terminal

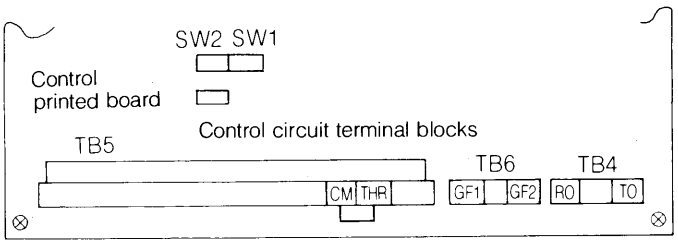


Fig. 5-3-6 Position of switch SW1 and SW2

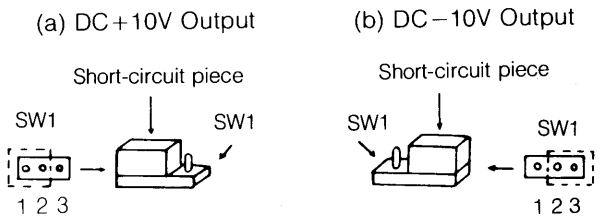


Fig. 5-3-7 Switching of SW1

(4) Connection for Current input selection terminal

NOTE: Without switching of external frequency signals, it is possible by switching ON-OFF between AUT-CM that switching Voltage signals from Frequency setter and Voltage auxiliary input terminal with Current signals.

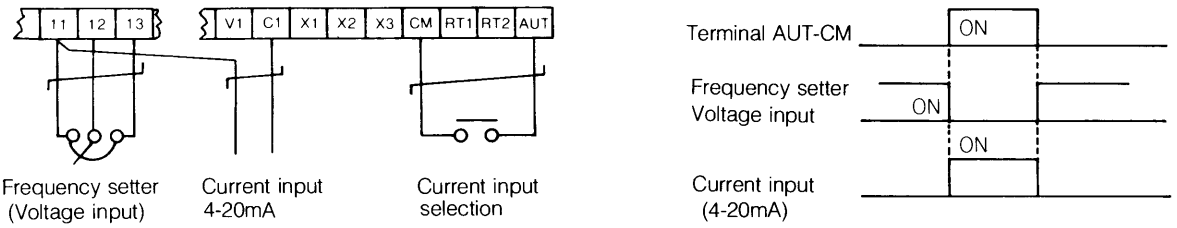


Fig. 5-3-8 Switching of Frequency set signals

(5) Connection for Frequency meter terminal

Although output frequency is digital-displayed, when the external display such as a display on the inverter panel is required, connect a meter to terminals for the frequency meter (FM1, FM2). Instruments, either analog or digital types, can be connected. Set SW2 in accordance with the instrument used, as shown in Fig.5-3-9. The setting at shipment is for analog instrument.

NOTE: The frequency meter (FM1, FM2) circuits are designed for meter. Because this circuit has filter, the response time of output is approximately 3sec.

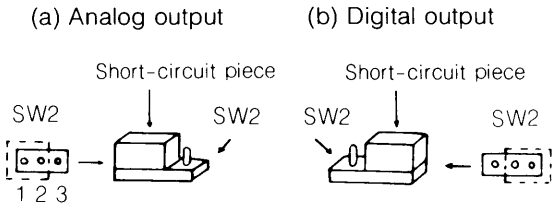
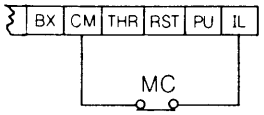


Fig. 5-3-9 Switching of SW2

(6) Connection for Output interlock terminal
When the magnetic contactor (MC) is used on the inverter output side, Connect NC (Normally closed) contacts of MC between IL-CM.
For using this terminal, the inverter is able to restart after Power failure. When the power failure occurs and IL-CM is closed, the output frequency is memorized and the inverter stops. When the power is reapplied (IL-CM is opened), the first inverter output frequency is the memorized frequency at the power failure. The frequency is reduced at the predetermined rate until catching the motor speed. After catching the motor, the inverter accelerates or decelerates to the reference frequency at this time.



ON between IL-CM: Inverter stops

OFF between IL-CM: Inverter restarts

Fig. 5-3-10 Connection for Output interlock terminal

(7) Connection for Alarm reset switch
To operate alarm reset from the other place than the inverter (the inverter panel, etc.), connect a self-reset switch to RST terminal, as shown in Fig.5-3-11. Note that the application of this terminal allows a parallel operation to be performed with the reset key of Touch panel. Therefore, careless operations at setting parameters and retrieving faults may result in inputting a reset signal, careful operations are required.

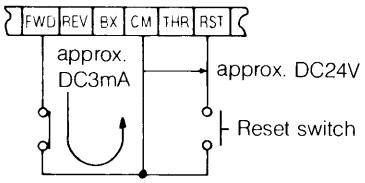


Fig. 5-3-11 Voltage and Current of Contact input terminal

(8) Contacts to be connected to Frequency setting/ Contact input terminals
In this circuit, voltage and current such as those shown in Fig. 5-3-11 are impressed.
Due to micro current, the contacts to connected should be highly reliable contacts for micro signals, e.g.: Fuji control relay: HH54PW, etc.

(9) Contact capacity for Contact output
The capacity is: AC250V 0.3A (COS ϕ =0/3)
In case of switching a large capacity magnetic switch, use a relay which has a large capacity of contact as shown in Fig. 5-3-12.

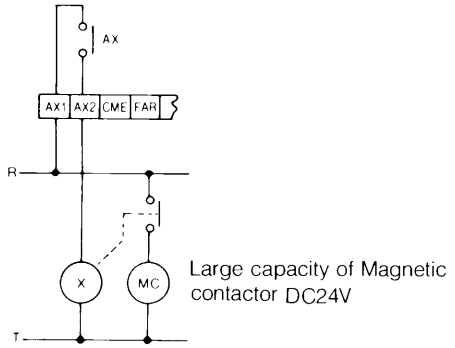


Fig. 5-3-12 Amplification of Contact capacity

(10) Connection of Open collectorer output terminals
For the use of these output signals, it is recommended to use a relay output unit (MCA II -RY). If not, the electrical specifications for open collector are: DC27V max. 50mA max.

CAUTION: Be careful to protect it from damage due to surge voltage and not to mistake power supply polarity.

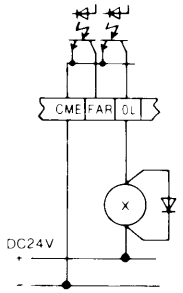


Fig. 5-3-13 Connection for Open collector output terminals

(11) Connection for Surge absorber

CAUTION: Connect a surge absorber directly to the both ends of the coil which is a the causing source. The wiring should be as short as possible, 20cm at longest.

When a magnetic coil circuit such as a magnetic contactor, control relay, and solenoid valve, opens and closes, the current will sharply fluctuate resulting in generating a surge voltage (noise). In some cases, this surge voltage may cause to misoperate the electric circuits of Inverter and the peripheral equipment.

Table 5-3-1 Application of Surge absober
(Circuit voltage: Not more than 250V)

Equipment		CR filter or Diode
Magnetic contactor	DC	S2-A-O or the equivalent
(Main circuit)	AC	Diode or S2-A-O
Auxiliary relay	DC	S1-B-O or the equivalent
	AC	Diode or S2-B-O
Solenoid braking	DC	S2-A-O
Braking clutch	AC	Dode

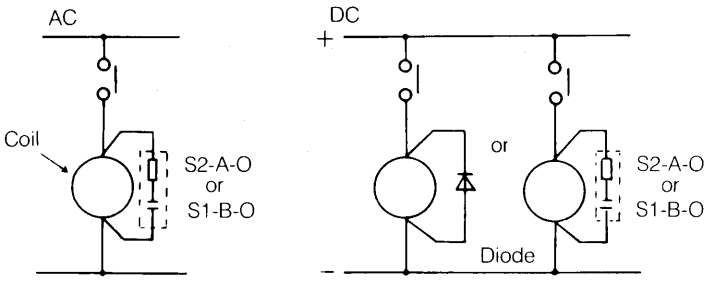


Fig. 5-3-14 Connection for surge voltage

- Specifications of S1-B-O and S2-A-O
  : Refer to "12. OPTION" (Page.64)
- Capacity of Diode (when the current of the operating coil is no more than 1A)
  ERB44-06C 600A 1A (Surge 30A/10ms) (Product of Fuji Electric) Coil

5-4 Braking circuit

CAUTION: If the P-N terminals are short-circuited or connected a braking resistor directly without a braking unit, damage to the inverter will result. Do not fail to match terminal symbols P and N between inverter and braking unit.

① As shown in Fig. 5-4-1 the number of braking units and braking resistors in the combination differs in the type of unit. Connect them as the instruction of the Table 12 (2) Braking unit and Braking resistor specifications (Page 63, 64).

NOTE: Detach the short-circuit conductors connected between THR-CM at shipment, and connect thermal contacts in series so that both the braking unit and the braking resistor will be OFF at overheating. If not connect, the braking circuit will not operate.

(a) **Braking unit** ×1
Braking resistor ×1

(b) **Braking unit** ×1
Braking resistor ×2

(c) **Braking unit** ×2
Braking resistor ×2

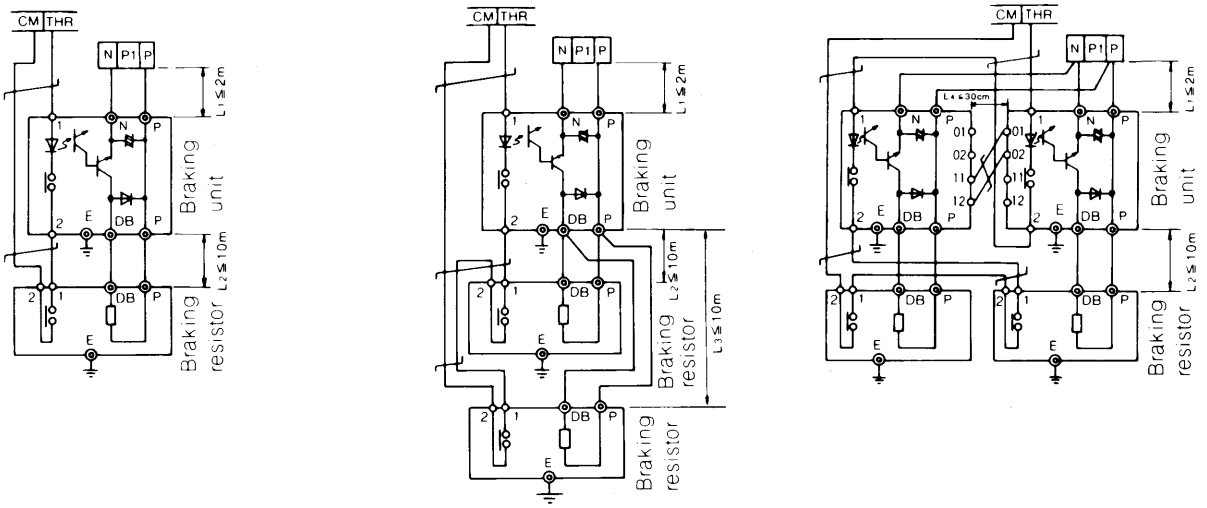


Fig. 5-4-1 Connection for Braking unit and for Braking resistor

② When 2 braking units are used, set Switch SW1 on the printed board of a braking unit as shown in Fig. 5-4-2 (a). The setting at shipment is (b) in the figure.

(a) Braking unit where terminals I1, I2 are connected (b) Braking unit where terminals O1, O2 are connected

Fig. 5-4-2 Switching of SW1

6. Touch panel

6-1 Function and Configuration of Touch panel

The setting/ display apparatus installed on the front panel of Inverter is called Touch panel, which is used for the data display and the parameter setting and modification. Inverter is operated with the parameters set by this touch panel and with the external operation/ control commands. The flow of this actuation is shown in Fig. 6-1-1.

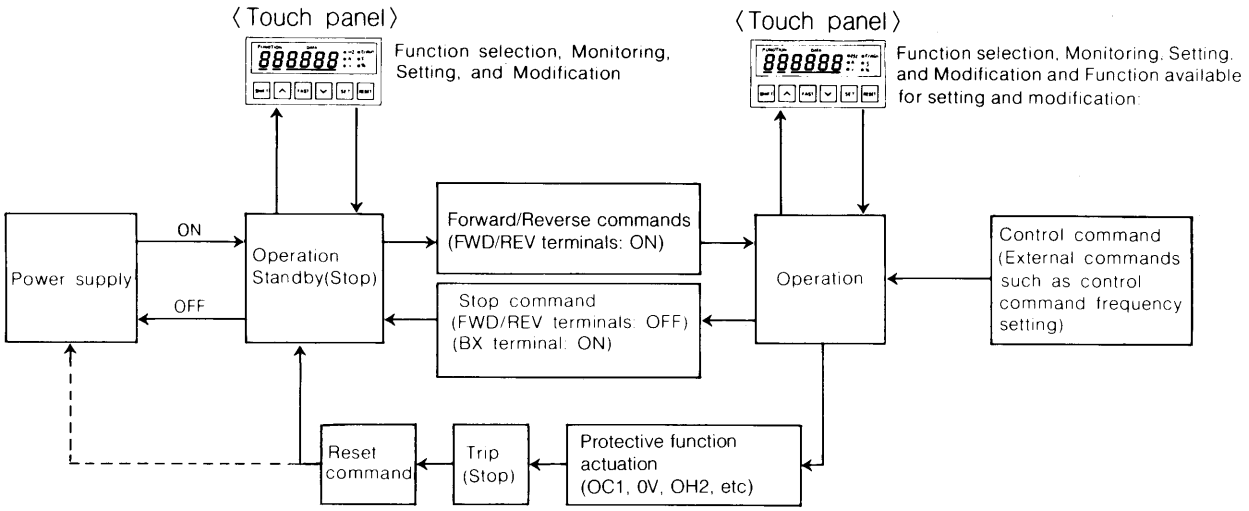


Fig.6-1-1 Basic actuation of FRENIC 5000 G7/ P7 series

Table 6-1-1 Functions of Keypad

Function		Description
Operation monitoring		Monitor the operation states of Inverter
Parameter setting	Basic parameter	Set data required for operation
	Auxiliary parameter Correcting parameter	Set data required for control Adjust output signals to match with instruments externally installed
Set data protection		Protect set data against careless operations
Fault display and retrieval		Display and Retrieval the class of Fault and the operation state at fault
Reset		Data reset at parameter setting, Set error display reset, reset to return to operation monitoring mode after completing the setting, and fault reset

Table 6-1-2 Display characters

Number	Displayed character	Number	Displayed character	Letter	Displayed character	Letter	Displayed character	Letter	Displayed character
0	0	5	5	A	A	F	F	U	U
1	1	6	6	B	b	H	H	V	U
2	2	7	7	C	C	L	L	ACTIVE	o
3	3	8	8	D	d	O	O	INACTIVE	-
4	4	9	9	E	E	R	r		

Function selection indicator

Display the selected digits at function selection. But, in the data display retrieval mode and the parameter setting mode (when shifted the sellected function to the data display), the both two digits will go out.

Function display indicator

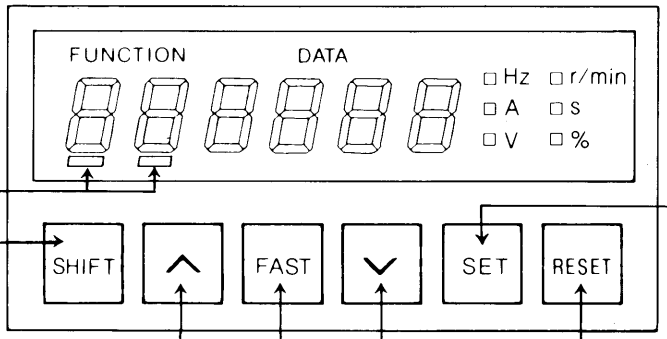
Display, in two digits, a selected function in number (Code).

Data display indicator

Display operation data each type of parameter setting data and fault states.

Unit indicator

THE LED on the left of each unit symbol corresponding to the contents of a data display.



Set key

Used to enter set data into the memory at parameter setting.

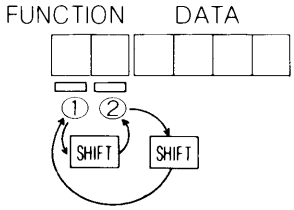
- When a new data has been set, the data will flicker. Pressing [SET] will enter the data into the memory, and then the flicker will stop.
- Note that the data which once have been entered (stored) in the inverter do not disapper even after turning off the power supply.

Shift key

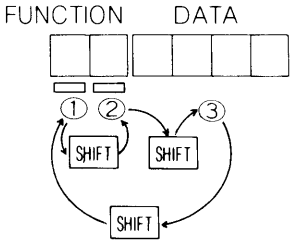
Used to set and retrieve of functions and data. And select Parameter setting mode.

■ Selection order

- Function: 00 to 05, 08 to 0b, F1 to F3, F5 to F7



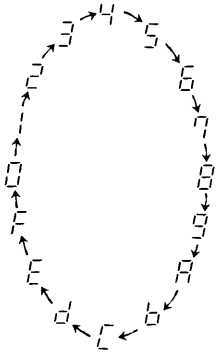
- Other functions



■ When the data on the data display is flickering, you can not change the selection by pressing [SHIFT].
Try the operation after stopping the flicker by pressing [SET] or [RESET].

Up key

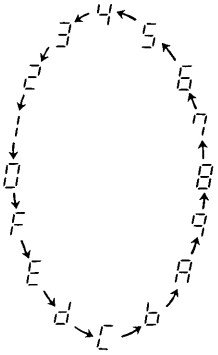
The digit selected with the [SHIFT] key changes as indicated by the arrow in the figure below.



- Values which do not represent an inverter function are skipped.
- When parameter data setting, values are set limits of lower.

Down key

The digit selected with the [SHIFT] key changes as indicated by the arrow in the figure below.



- Values which do not represent an inverter function are skipped.
- When parameter data setting, values are set limits of upper.

Fast key

The speed at parameter setting can be increased with combinations of [∧] [∨].

■ Moderate speed can be achieved by pressing [FAST] one time, and high speed by pressing it two times, while pressing [∧] or [∨]. Release [∧] or [∨] to clear the moderate and high speed settings.

[∧] or [∨] ⇨ Low speed
[∧] or [∨] + [FAST] ⇨ Moderate speed
[∧] or [∨] + [FAST] + [FAST] ⇨ High speed

Reset key

Used as follows:

■ Parameter setting mode

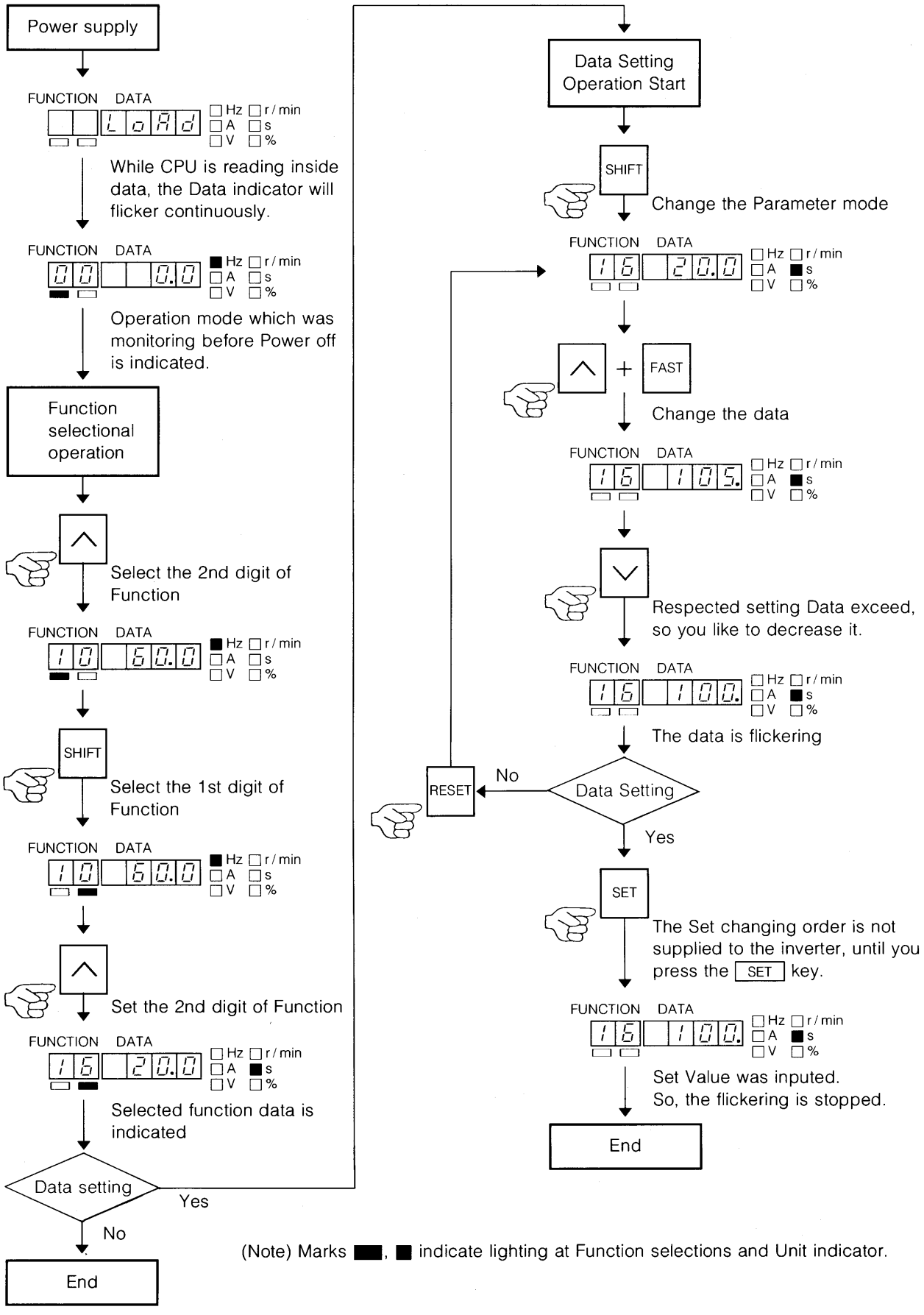
- Reset of Set data
  Press [RESET] prior to [SET] in parameter setting mode, and the set data will be cleared so that you can return to the original data.
- Reset of Set error display
  Press it after inverter stopping when "Err" has been displayed due to the incorrect setting, and the set data will be cleared so that you can return to the data preceding the setting.
- Return to operation monitoring mode after completing the setting.
  You can return to the function for operation monitoring which had been selected and displayed before setting parameter.

■ Fault monitoring mode

- Fault reset
  Turn off the run command and press [RESET] after solving the problems, and the pretective function actuating will be cleared so that you can return to the function mode selected before the fault occurred.

6-2 Basic operational procedure of Touch Panel

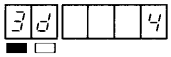
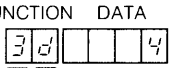
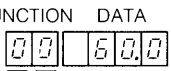
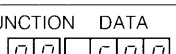
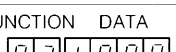
After few seconds from applying power, touch panel indicates the monitor function which was monitoring before power being turned off, and it is able to select the function and set the data.



(Note) Marks ■, ■ indicate lighting at Function selections and Unit indicator.

6-3 Function selection and displayed data retrieval

(1) Function selection

procedure	Examples of Operation and display Case to swich a mode from Set value display mode for the number of poles of motor (Function: 3d) to monitoring mode for Synchronous speed (Function: 02)		
	Operation	Display	Description
———	——	FUNCTION DATA  □Hz □r/min □A □s □V □%	Display Function and Data for the number of poles of motor. (Display ex.: In case of 4-pole motor)
Press SHIFT and confirm the light of the function selection indicator ①. Then, the 2nd digit of Function will be selected.	Press SHIFT two times	FUNCTION DATA  ① □Hz □r/min □A □s □V □%	Switch the lighting position of Function selection indicator to select the 2nd digit of Function.
Press ∧ or ∨ to set the code of the 2nd digit of Function required. At this time, the code of the 1st digit of Function will be set at 0.	Press ∨ three times	FUNCTION DATA  ■Hz □r/min □A □s □V □%	Change the display at the 1st digit of Function to 0 as well as that at the 2nd to 0 to display an output frequency at the data display. (Display ex.: When output frequency is 60Hz)
Pressing SHIFT one time will put out the function selection indicator ① and light ②, and then the 1st digit of Function will be selected.	Press SHIFT one time	FUNCTION DATA  ①② ■Hz □r/min □A □s □V □%	Switch the lighting position of Function selection indicator, allowing the setting of the 1st digit of Function.
Press ∧ or ∨ to set the code of the 1st digit of Function. The function data set will be displayed in the data display, and its unit indicator.	Press ∧ two times	FUNCTION DATA  □Hz ■r/min □A □s □V □%	Change the display at the 1st digit of Function to 2 to display a synchorous speed.

(Note 1) Marks ■■, ■ indicate lighting at Function selection indicators and Unit indicator.

(Note 2) Without the following cases, these displays will continue until a new function data is set.

① RESET operation after completing the parameter setting or changing.

② After completing the setting or release operating of "Function 99 setting data protection"

③ RESET operation at occuring an fault and after retrieving of contents of fault, operating conditions at the fault, and contents of Past failures.

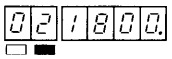
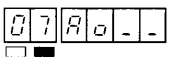
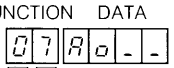
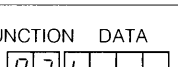
Details should be referred to "6-4", "6-5", (Page 17 ~ 21)

(2) Display examples

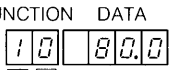
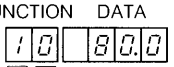
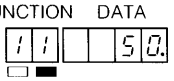
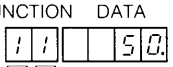
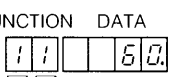
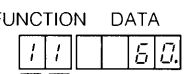
Display item	FUNCTION		DATA				Unit display
	2nd digit	1st digit	4th digit	3rd digit	2nd digit	1st digit	
Frequency (When output frequency is 60Hz)	0	0		6	0.	0	■Hz
Current (When output current is 100A)	0	3		1	0	0.	■A
Voltage (When output voltage is 400V)	0	4		4	0	0.	■V
Speed (When machine speed is 1750r/min)	0	5	1	7	5	0.	■r/min
Time (When acceleration time is set at 10s.)	1	6		1	0.	0	■s
Percentage (When torque limit is set at 120%)	3	3		1	0	0.	■%
Code (When torque boost is set at "3")	1	9	C	-	-	3	
Selection (When automatic and energy conservation operations are set "to be specified")	1	A				o	
Factor (When frequency monitoring factor is set at "50")	4	0			5	0	
No. of poles (When the number of poles of motor is set at "4")	3	d				4	
State (When the state of input terminal is "In forward operation")	0	6	A	o	-	-	
Fault (When the 4th digit 1 indicates the first fault in overcurrent at deceralating)	F	0	1.	0	C	2	
Setting error (When the setting of the lower limit of frequency exceeds that of the upper limit frequency)			E	r	r	1	
Setting error (When a parameter which can not be set during operation has been set)			E	r	r	2	

(Note) Mark ■ indicates lighting on Unit indicator.

(2) Monitoring for display data (input and output signal)

Procedure	Examples of Operation and display Case to confirm whether open collector output terminal FAR has been output		
	Operation	Display	Description
———	——	FUNCTION DATA  □Hz ■r/min □A □s □V □%	Example continued from (1)
Press [SHIFT], [∧] or [∨] to select the Function required. The contents of *A* shown in the function column will be displayed in the data display.	Press [∧] five times	FUNCTION DATA  □Hz □r/min □A □s □V □%	Select the output signal check function to display each state of AX, OL, LV. (*o* : Output signal received, - : No output signal received)
Pressing [SHIFT] will put out the function selection indicator ②, it will change to Data retrieval mode. At the same time, it will allowed the retrieval for the data display.	Press [SHIFT] one time	FUNCTION DATA  ② □Hz □r/min □A □s □V □%	Put out the function selection indicators to switch to data retrieval mode. No changes in other displays.
Press [∧], and the contents of *b* will be displayed in symbol. Under the selection of Function *05*, pressing [∧] in turn will display each contents of *C*, *d*, *E* in order.	Press [∧] one times	FUNCTION DATA  FAR signal is displayed at this digit. □Hz □r/min □A □s □V □%	Switch the display contents to the confirmation state of each of RUN, FAR, FDT to display the state of RUN output signal required at the 2nd digit on the data display.

6-4 Parameter setting

Procedure	Examples of Operation and display. Case to modify the setting of base frequency 50Hz to 60Hz:		
	Operation	Display	Description
Press [SHIFT] to select the 2nd digit of Function. and press [∧] or [∨] to set the 2nd digit of required function.	Setting procedures Set the 2nd digit of Function	FUNCTION DATA  ■Hz □r/min □A □s □V □%	Display *0* at the 1st digit at the same of setting */* at the 2nd digit, and also display the max. frequency on the data display. (Display ex.: When the max. frequency is 80Hz)
Press [SHIFT] to set the 1st digit of Function.	Press [SHIFT] one time	FUNCTION DATA  ■Hz □r/min □A □s □V □%	Change the lighting position on Function selection indicator to select the 1st digit of Function.
Press [∧] or [∨] to set the 1st digit of Function required.	Press [∧] one time	FUNCTION DATA  ■Hz □r/min □A □s □V □%	Change the display at the 1st digit of Function to */* to display the current set base frequency.
When [SHIFT] is pressed, the function will shifts to parameter setting mode.	Press [SHIFT] one time	FUNCTION DATA  ■Hz □r/min □A □s □V □%	Put out Function selection indicator to switch to parameter setting mode.
Operate with the combinations of [∧], [∨], [FAST] to set data, Confirm the set data. At the time,the data is flickering. For revising data,use [∧], [∨], [FAST] to reset it.	Keep pressing [∧] and release it when the display shows 60	FUNCTION DATA  Flicker ■Hz □r/min □A □s □V □%	Confirm the set data flickering on the data display
Press [SET] to determine the entry, and the flicker of the set data will stop, and then the inverter will operate with data set. Press [RESET] to stop in the middle of the operation. When selecting other function, press [SHIFT] to switch to function selection mode.	Press [SET]	FUNCTION DATA  Flicker stops ■Hz □r/min □A □s □V □%	Stop flickering to enter the data into the memory

WARNING - HAZARD OF MOTOR OVERSPEED:
The maximum frequency is 400Hz, which is equivalent to 12000r / min of high speed rotation in 4-pole motor. In such condition, the incorrenct setting may result in a catastrophic failure for the machine.In order to prevent this, 14: High limiter of output frequency upper limit is provided. Set the upper value with this function to carry out safety operation.

CAUTION: When the DC braking function is used, large value setting for 21 : DC braking voltage and 22: DC braking time will cause heating of motor. The setting appropriate for the capability of motor is required.

NOTE: Set the parameter during inverter stopping.
If you set the parameter during inverter operation, the data display will display the error code.
Few parameter can be set during inverter operation. Details should be referred to "Functions table 11-3" (Page 33, 34)
"Inverter stopping" means to the states as follows.
ⓐ State changed function display of operation mode from LoAd display after power has supplied.
ⓑ Stop state after providing stop commands. (FWD, REV-CM: OFF)
ⓒ State provided free run command.
ⓓ After turning off fault display.

NOTE: Press [SET] (data memorying) certainly, after parameter setting. Otherwise, this setting will get to invalidity.

NOTE: The priority order in the case where the inter-harmony among parameters on output frequency: 10 , 13 , 14 , 15 , 18 ,and 23 ~ 29 can not be made is shown as follow:
1st order 14 : Output frequency high limiter
2nd order 15 : Output frequency low limiter
3rd order 23 ~ 29 : Multistep frequency selection
4th order 10 : Max. frequency 13 : Bias frequency, 18 : Frequency setting gain

NOTE: For the use of the following parameters, note that 14: Output frequency high limiter and 15 : Output frequency low limiter are not applicable to them.
20 : DC braking start frequency 37: Starting frequency

NOTE: When torque limit acceleration and deceleration are extermely frequency performed, depending on the repeating frequency, the limit may exceed the capabilites of motor and of Inverter. Therefore, some measures, such as to reduce the setting level of torque limit, need to be taken. In such cases, if there is any unclear matter, please consult us.

NOTE: For setting 40: Digital frequency monitor coefficient and 50 : Analog frequency meter calibration, switch, in advance, the output selector switch for frequency meter (SW2), as shown in Fig. 5-3-9.

NOTE: The functions having Active (o) or Inactive (-) are also set by using [^] or [v] .
[^] : Active (o), [v] : Inactive (-)

NOTE: If the following operations are done, the data indicator displays setting error.
But , the inverter continues to run by the data before setting. In these cases, after stopping the inverter and pushing the [RESET], set the data once more.

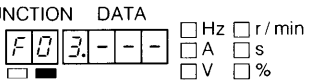
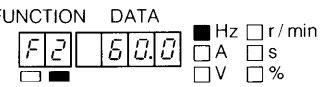
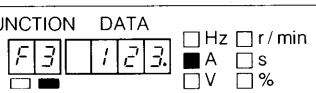
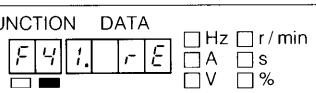
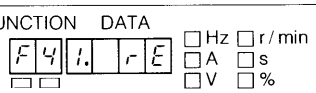
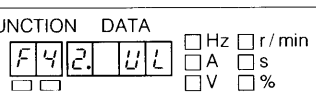
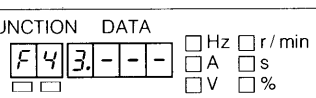
6-5 Fault display and retrieval

(1) Display and retrieval of fault contents

Procedures	Example of operation and display Case, at braking using braking unit and braking resistor in the option, where the protective function has actuated by detecting overvoltage and heating of the braking resistor at braking:		
	Operation	Display	Description
When a fault has occurred, the mode will be switched from other monitoring mode to fault monitoring mode, F0, the fault order 1 ,and its class will be displayed in code, and then the function selection indicator ② will light.	——	FUNCTION DATA F0 1. 0U □Hz □r/min □A □s □V □% ② Flicker	Switch automatically to fault monitoring mode. The class of the first fault is displayed, and the code will flicker. (Display ex.: When the first detected fault was overvoltage)
The details of the fault need to be retrieved since it may be complex. First, press [SHIFT] to switch to faultdetail retrieval mode. At this time, the function selection indicator ② will turn off.	Press [SHIFT] one time	FUNCTION DATA F0 1. 0U □Hz □r/min □A □s □V □% ② Flicker	Put out the function selection indicator to switch fault retrieval mode. No changes in other displays.
Press [^], and the 2nd fault details (order 2 and class in code) will be displayed.	Press [^] one time	FUNCTION DATA F0 2.0H 2 □Hz □r/min □A □s □V □% Flicker	Display 2 at the first digit on the data display, and the class of the 2nd fault in code, which will start flickering. (Display ex.: When the second fault was overheating of a braking resistor)
Press [^] again, and similarly the 3rd fault details will be displayed. For the rest, repeat this operation until no class of fault appears.	Press [^] one time	FUNCTION DATA F0 3. - - - □Hz □r/min □A □s □V □%	No display on the data indicator since there is no 3rd fault.

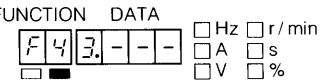
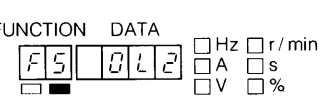
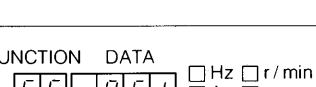
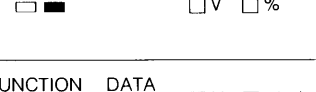
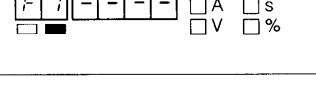
The confirmation of fault has been completed at this stage.
When the confirmation on the operation data at fault and the fault history are not required, press [RESET] after solving the problems. By doing so, the protective function actuating will be cleared, and the monitoring operation mode on the indicator will switch to that preceding the occurrence of the fault to get the operation ready.
When you confirm on the operation data at fault and fault-history, operate as following.

(2) Retrieval of operation data at fault

Procedures	Example of operation and display		
	Operation	Display	Description
Press [SHIFT] to select the 1st digit of Function.	Press [SHIFT] two times		Example continued from (1) Select the first digit of Function
Press [^] to select F1, and output frequency will be displayed. Similary, press [^] in turn, and: F2: Set frequency , F3: Output current, and F4:Operation state will be displayed.	Press [^] one time		Display Output frequency at fault (Display ex.: When output frequency was 25.5Hz)
	Press [^] one time		Display set frequency at fault (Display ex.:When set frequency was 60Hz)
	Press [^] one time		Display output current at fault (Display ex.: When output current was 123A)
	Press [^] one time		Display, in code, operation state at fault (Display ex.: When the rotation was reverse)
When F4 has been displayed, press [SHIFT] to switch to operation state retrieval mode.	Press [SHIFT] one time		Switch to operation state retrieval mode. The function selection indicator will go out. No changes in other displays.
Press [^], and the state at operation will be displayed in code, Press [^] in turn until no display will appear.	Press [^] one time		Change the contents of the display (Display ex.: When voltage limit was actuating)
	Press [^] one time		No displays. The operation state retrieval has been completed.

When the retrieval on the fault history is not required, press [RESET]. By doing so, the protective function actuating will be cleared, and the monitoring operation mode on the indicator will switch to that preceding the occurrence of fault to get the operation ready.
When you retrieve the fault history, operate as following.

(3) Fault history retrieval

Procedures	Example of operation and display		
	Operation	Display	Description
Press [SHIFT] to select the 1st digit of Function.	Press [SHIFT] two times		Example continued from (1) Select the first digit of Function.
When F5 is selected by press [^] ,only the fault which was the first display at the last occurrence of fault will be displayed in code. The 2nd and following faults retrieved will not be displayed.	Press [^] one time		Display the class of the fault which was the first display when the last fault occurred (Display ex.: When electronic thermal was actuating)
When F6 and F7 are selected by Press [^] , the fault at the time back one time and two times respectively.	Press [^] one time		Display the class of the fault which was the first display at the time preceding the last occurrence (Display ex.: When overcurrent protective function was actuating at accelerating)
At this stage, the retrieval for fault mode has been completed. Press [RESET] after solving the problems and turning off the run command. By doing so, the protective function actuating will be cleared, and the monitoring mode on the indicator will switch to that preceding the occurrence of the fault to get the operation ready.	Press [^] one time		Display the class of the fault which was the fast display at the time back two times since the last occurrence (Display ex.: When fault data has not been input.)
	Press [RESET]		Complete fault monitoring operation, and display the parameters which had been monitorerd before the fault occurred. (Display ex.: When monitoring out put frequency)

NOTE:

① **The 2nd digit of Function cannot be modified during fault display. On the other hand, the 1st digit can be selected for fault-detail retrieval.**

② **Reset command can be input by using [RESET] or alarm reset input terminal.**

③ **When reset command is input, the erasing of the data display at fault and the moving-up of a fault history will be executed.**
Note that the second and following faults have not been stored in the memory.
It is recommended to record these datas in view of the future operation and maintenance.

④ **Retrieval when no fault has occurred**
Set the code (number) of an item to be retrieved with [SHIFT], [∧] and [∨].For Functions F0 - F4 ,however, because there are no fault inputs, the displays are: ---- on the data indicator, and F1 ,F2: ■ Hz, and F3: ■ A lighting on the unit indicator, while F0 and F4 do not light. When F5 - F7 have been selected, each of fault histories will be displayed on the data display.

⑤ **When fault mode has been selected in the state of no faults to retrieve such as a fault history and then [RESET] is pressed, the mode will not execute the moving-up of the fault history.**
When the control power supply is turned off during fault display, fault output signal will not be held.
Furthermore, note that, after the control power supply has been turned off, if it is turned on again without eliminating the cause of the fault, that will be detected as a new fault.

⑥ **To reset inverter turn off all start signals (FWD, REV), and press [RESET] key.**

7. Trial operation

7-1 Preparation for operation

Don't fail to check the following items before trial operation.

① Is the input AC power supply complied with the ratings?
200V series: 3-phase 3-line, 200V/ 50Hz, 200 to 230V/ 60Hz
400V series: 3-phase 3-line, 400 to 420V/ 50Hz, 380 to 400V/ 50Hz, 400 to 460V/ 60Hz

② Are the input and output of the main circuit connected in good order?
(Input source faling under R, S and T, Electric motor, U, V, and W)

③ Is the wiring of the main circuit and control circuit not in contact with the earthing or other terminals or not short-circuitted?

④ Is the panel mixed or attached with such foreign matters as metals and electric wire chips?

⑤ Are screws, connectors, terminals, etc. not loose?

⑥ Confirmation of the operation of the external sequence circuit

7-2 Trial operation

For safety's sake, disconnect the couplings and belts with which motors and machinery are connected to allow independent operation by motors. When operating with it directly connected with the machine, be careful not to cause danger.

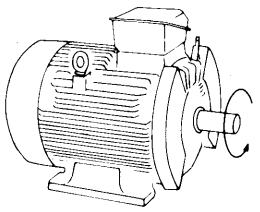
① Set all operating switches to OFF.

② Set the frequency setter to the minimum value.

③ Put the wiring breaker (MCCB) to work
(control circuits and sequence circuits will be turned active), size up the situation for a while, and check to see if cooling fan is rotating normally and if nothing is found in the control circuit, sequence circuit, etc. (heating, fume, abnormal smell, etc.)
In this case, make sure that the "CHARGE" lamp of the front panel is on.

④ When (MCCB) is put to work, the data display part of the touch panel will display LoAd and flicker for a while.
This is because CPU is doing the reading action of the internal data.
After LoAd disappeared, it will set the parameter to check to see if the set data meet the specification.
How to check it is referred to in "6. Touch Panel. (Page 13 ~ 21)"

⑤ Give a forward or reverse command.
Check to see if the motor begins to rotate with the frequency setter turned righward a little.
Make sure that the rotating direction is correct in such condition.
The turning direction of the motor is counterclockwise looking from the driving side (shaft end) of the motor by the forward turning command.
When reversing the turning direction, set the operation signal to the reversing turning command. If forward and reverse turning commands should be put at the same time, the motor will come to a stop, for which care should be exercised.



forward turn (counterclockwise)

Fig. 8-2-1 forward turning direction of motor

forward turn (counterclockwise)

⑥ Rise the frequency setter gradually and check to see if the inverter output frequency reaches the maximum frequency of the motor.
The maximum frequency of the inverter has been set to 60Hz at shipment.
⑦ After confirmation has been finished, stop it once, set the frequency setter a little higher, and check to see if acceleration and deceleration is made smoothly.
With this, the trial operation comes to an end.
Make operation with the load combined.
If the setting should be changed as a result of the trial operation, follow the procedures described in "6. Touch Panel."

8. Operation

Make operation in accordance with the following procedures.
For the items not included absent in the following procedures though it is carried in the procedures of the trial operation, it is allowed to add procedures depending upon the circumstances.
(1) Put the power (MCCB) to work.
(2) Confirmation of "CHARGE" lamp of the front panel going on.
(3) When data are required to be changed, follow the procedures described in "6. Touch Panel"
(4) When a forward or reverse turning command is inputted, the motor will be operated at the setting frequency: provided. It will not be operated when the set frequency has been set below the starting frequency.
(5) When changing the contents of the display or data changeable of the setting in course of operation, follow the procedures described in "6. Touch Panel"
(6) Set the forward or reverse turning command terminal to "OFF", and the motor will be decelerated to stop.
Unless re-operation takes place immediately, stop the motor for safety and set the power to "OFF".

9. Maintenance and inspection

The inverter is composed of many parts.
Unless those parts operate properly, they will not develop their performance fully.
It is necessary to make good maintenance and inspection to prevent failure in the inverter beforehand and to keep on operation of good reliability.
Inspection methods should be refferred to "Inspection List 14" (page 66).

9-1 Cautions in course of maintenance and inspection

CAUTION: Do not conduct any inspections until disconnecting the power supply and the "CHARGE" lamp on the inverter has gone out.

9-2 Daily inspection

(1) Don't remove the cover, and check to see from outside if abnormal sound, smell, and damage are not perceived in accordance with the inspection items.
(2) Whenever abnormal phenomenon should be found, make sure of its place and extent without delay.
(3) Check the contents of the abnormality. If the operation is allowed to be kept on, record the abnormal details for referential data in case of a periodic inspection.

9-3 Periodic inspection

Remove the covers and check to see if nothing is found abnormal visually or by touch from the outside in accordance with the inspection list items. Don't fail to observe "Item No. 9-1 Cautions for Maintenance and Inspection." "inspection list 14." (page 66)

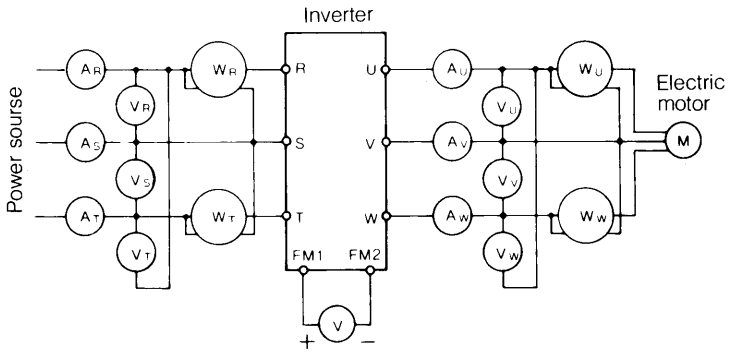
9-4 Periodic exchange of parts

Usually the life time of electrolytic capacitors are approximately five years and that of cooling fans are approximately three years, but the life times is different from this number of years in according to environment and working time per one day.
Please exchange these parts before occuring the troubles.

9-5 Measurement of main circuit electric capacity

Since the voltage and current of the input and output circuits of the inverter include harmonic wave, it is necessary to select the measuring instrument type.
When a measuring instrument for commercial frequency, measure it with the measuring instrument shown in Fig. 9-5.
For reference, the power factor will cause big errors by measuring a power factor meter because it will be subjected to change in the harmonic wave current and output frequency.
When the power factor is required, measure the voltage, current, and electric power and calculate it from the following equation.

$$\text{Power factor} = \frac{\text{Power(kW)}}{\sqrt{3} \times \text{Voltage(V)} \times \text{Current(A)}} \times 100\%$$



item	Input side measuring instrument (power side)			Output side measuring instrument (motor side)			Output frequency (Terminal FM1, FM2)
	Voltage wave form / Current wave form			Voltage wave form / Current wave form			
Name of measuring instrument	Amperemeter $A_{R,S,T}$	Voltmeter $V_{R,S,T}$	Wattmeter $W_{R,S,T}$	Amperemeter $A_{U,V,W}$	Voltmeter $V_{U,V,W}$	Wattmeter $W_{U,V,W}$	DC Voltmeter V
Kind of measuring instrument	Moving-iron type	Rectifier type or moving-iron type	Electrodyna-mometer type	Moving-iron type	Rectifier type	Electrodyna-mometer type	Movable coil type
Symbol of measuring instrument							

Fig. 9-5 Measurement of main circuit and measuring instrument

9-6 Confirmation of insulation

Insulation test has been made before delivery from the works.
It shall not be made as much as possible.
In an unavoidable case, follow the instructions below.
Wrong testing may damage the inverter, for which full attention must be paid.

CAUTION: Do not conduct megger tests between the inverter terminals or control circuit terminals.

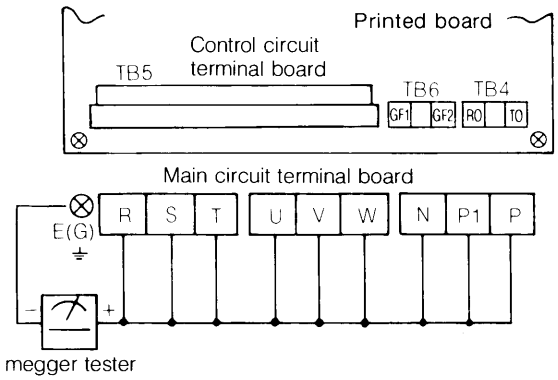


Fig. 9-6 How to megger test

(1) Main circuit
Make megger test (insulation resistance test) by using the following megger tester.
400V series: DC 500V megger
200V series: DC 250V megger
① Remove the external connections of all terminals (including control circuit terminals) of the inverter, clean each component, and connect all main circuit terminals with common wires as shown in Fig. 9-6.
② Make megger test only between main circuit common line and ground (grounding terminal GND (PE)).
③ If the megger pointer indicates 5MΩ and over, it proves normal.

(2) Control circuit
Remove the external connection of the control circuit terminal for earth conductivity test.
Use a high resistance range tester for the tester. Neither megger nor buzzer shall be used.

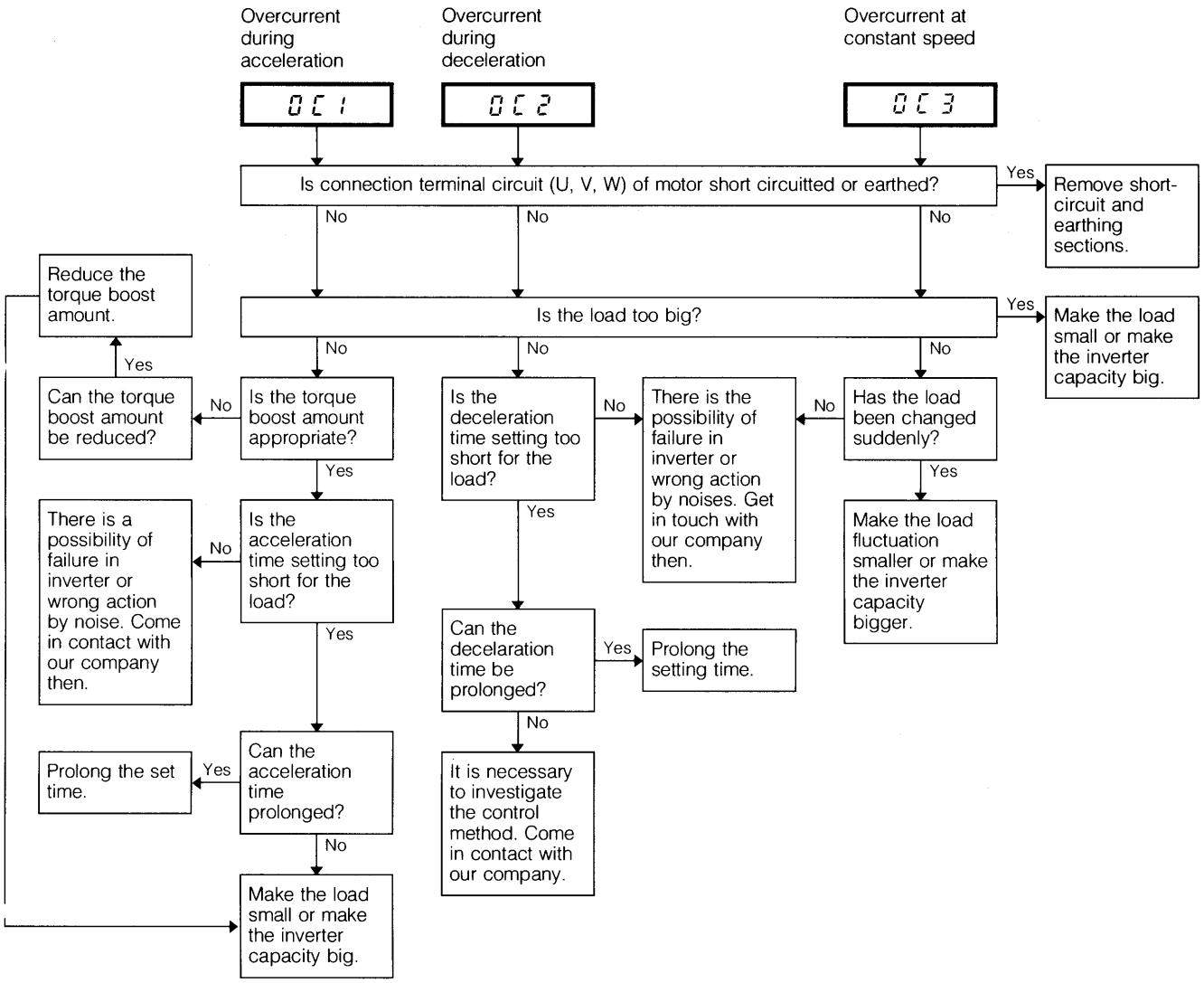
(3) Cautions for testing of external main circuits and sequence control circuits
When making a pressure test and megger test of external circuits, remove all terminals of the inverter so that the inverter may not be applied with the test voltage.

10. Troubleshooting

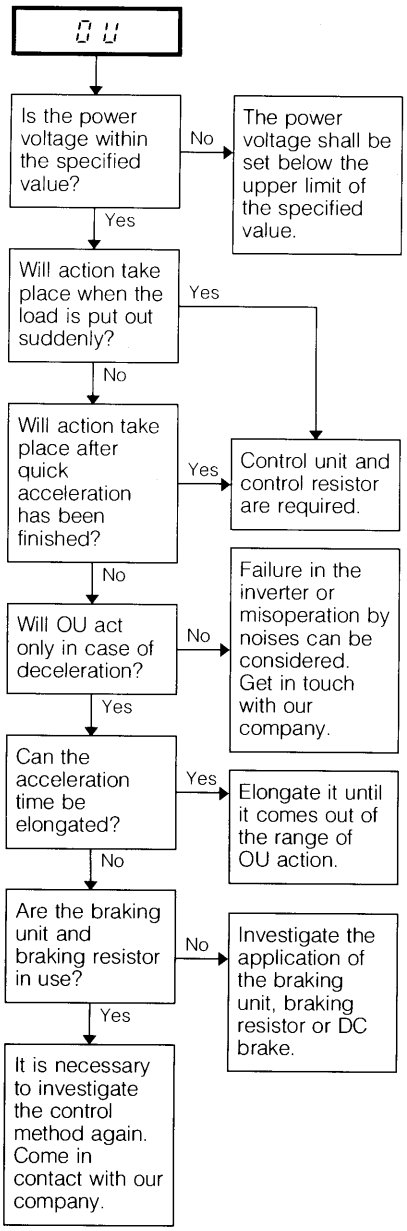
If the function of the inverter is lost by a failure or if an abnormal phenomenon occurred, refer to the following diagnosis and its cause must be pursued for remedy.
If it will not fall under the following explanation, if the inverter is damaged, and if its part was broken, or in case of trouble, please communicate the matter to the agent you bought it or your nearest Fuji sales office.

10-1 Diagnosis and remedy in case protection function made action indication

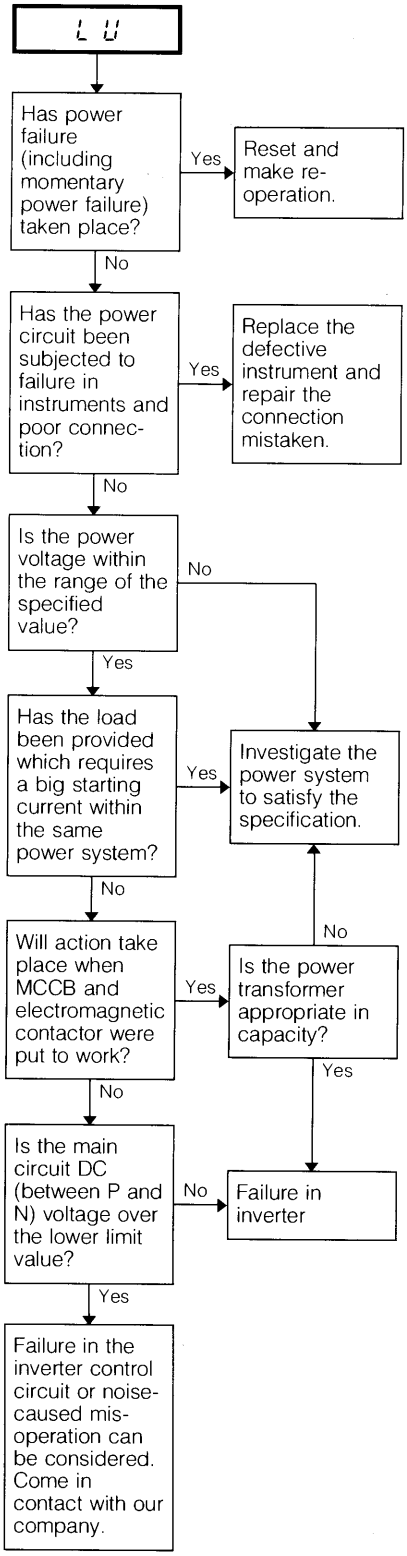
(1) Overcurrent



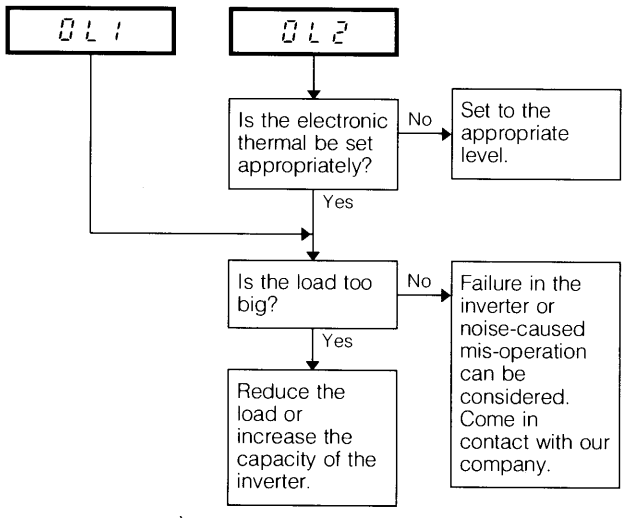
(2) Overvoltage



(3) Under-voltage



(4) Overload

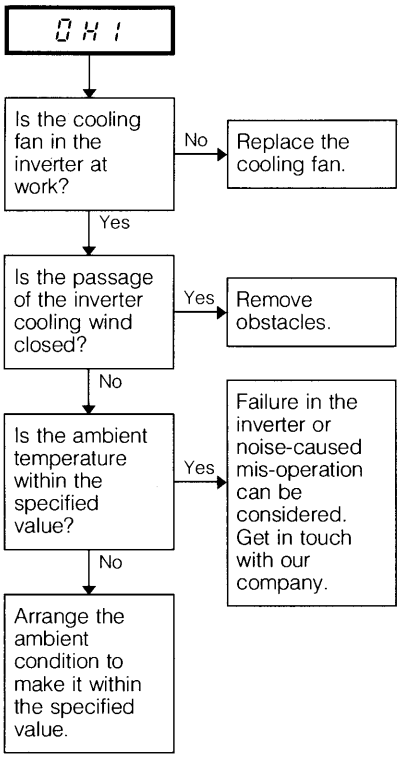


(note) OL1: Overload protection of inverter unit
(protection of main circuit equipment of Unit)
OL2: Overload protection of motor
(protection by electronic thermal)

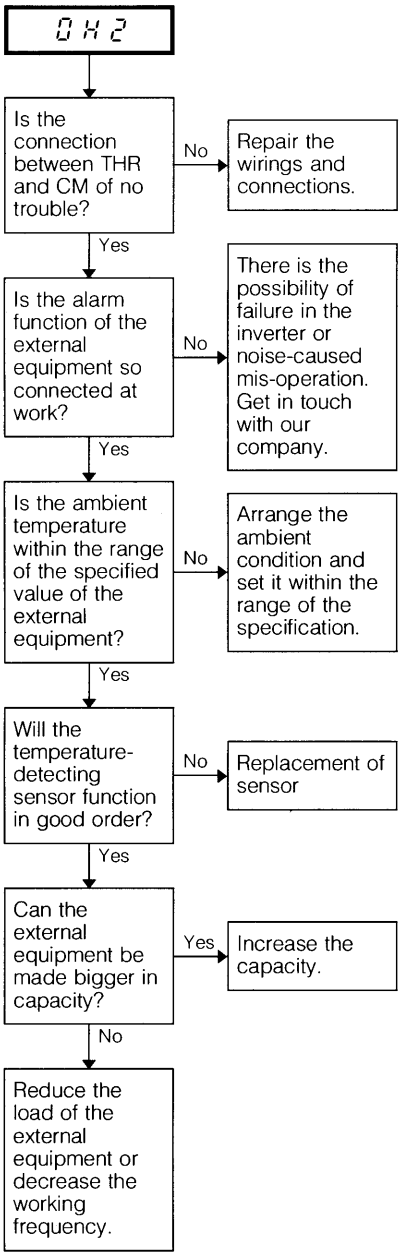
(Note 1) When the DC bus capacitor is discharged by power failure and the control power of the inverter is reduced, automatic resetting will take place.
When the function 43 is selected, no resetting is required.
After the power is restored, automatic restart will begin.

(Note 2) Undervoltage will detect the main circuit DC voltage of the inverter, and display and alarm will take place.
When the voltage comes over the following range, display and alarm will take place.
*200v series: DC 200V
*400v series: DC 400V

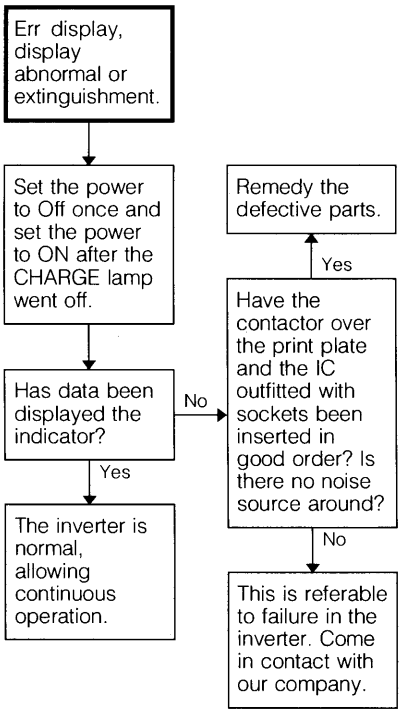
(5) Inverter overheat



(6) External failure and miss operation

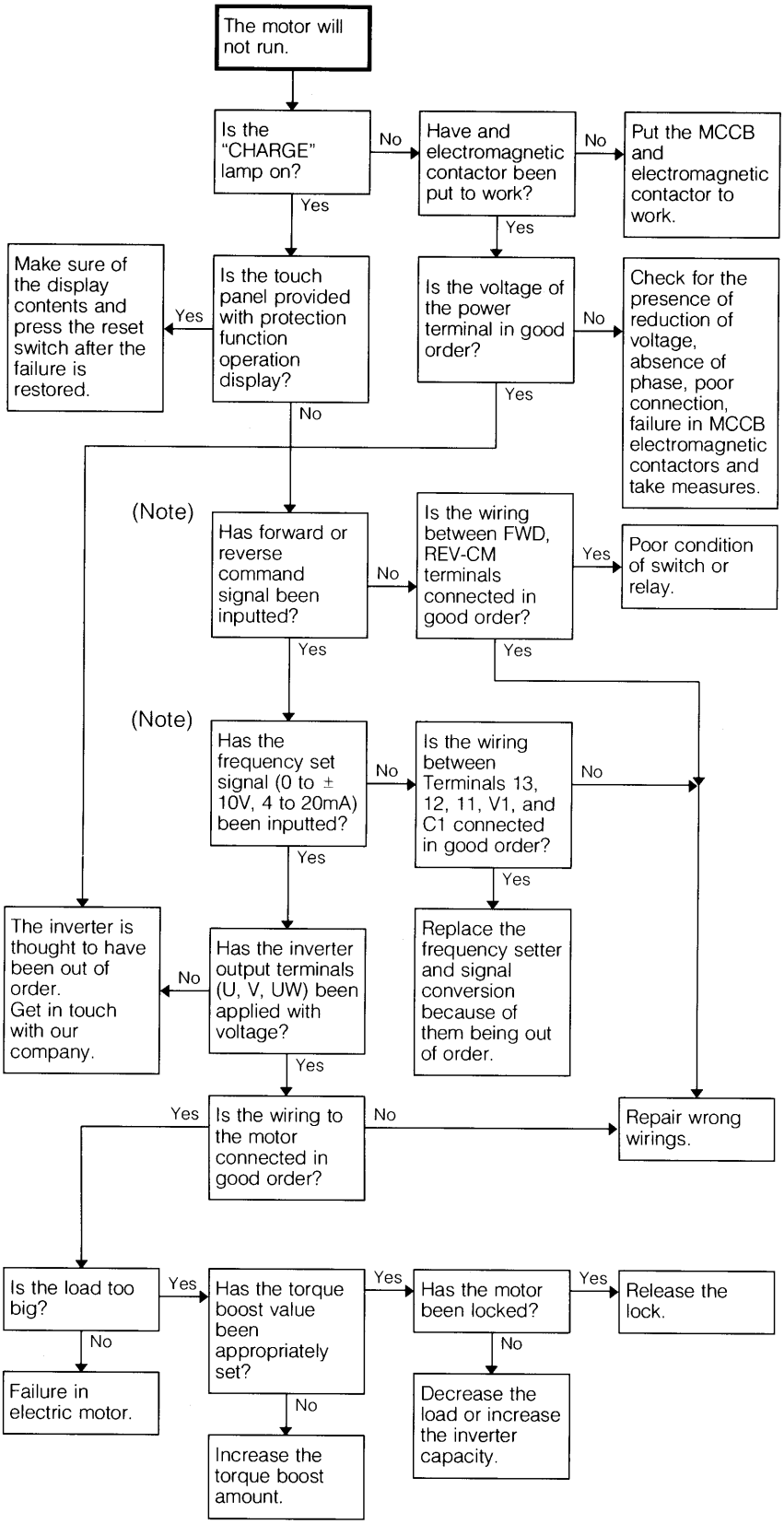


(7) CPU abnormal



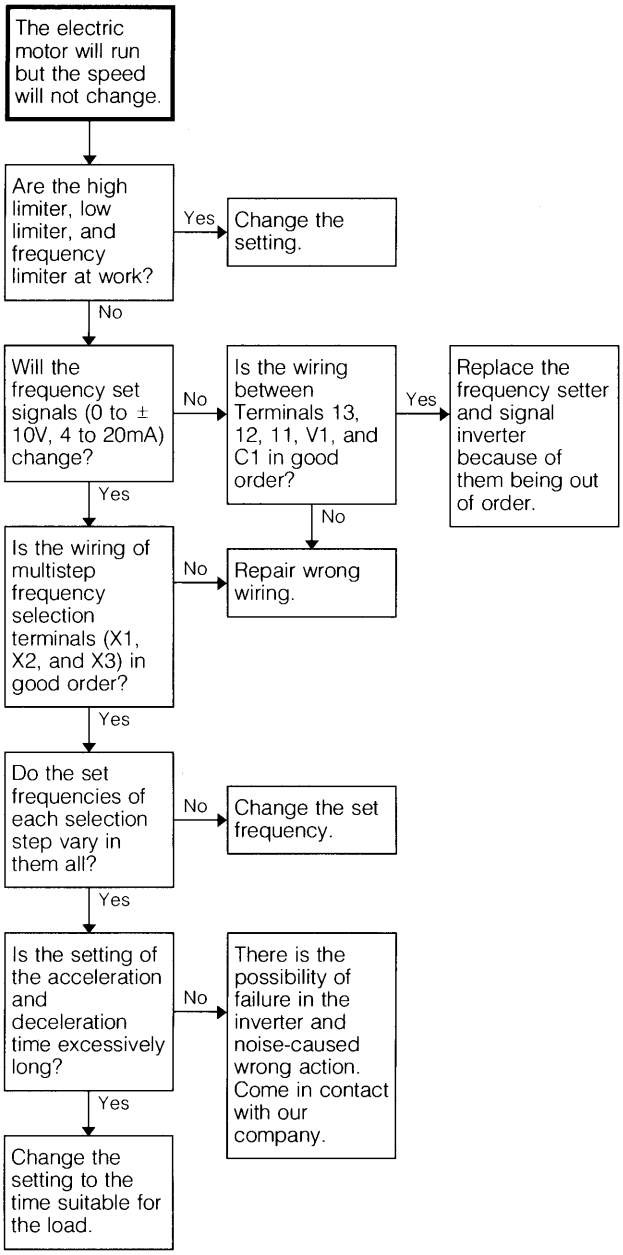
10-2 Diagnosis and remedy for abnormal phenomena

(1) Motor will not run.

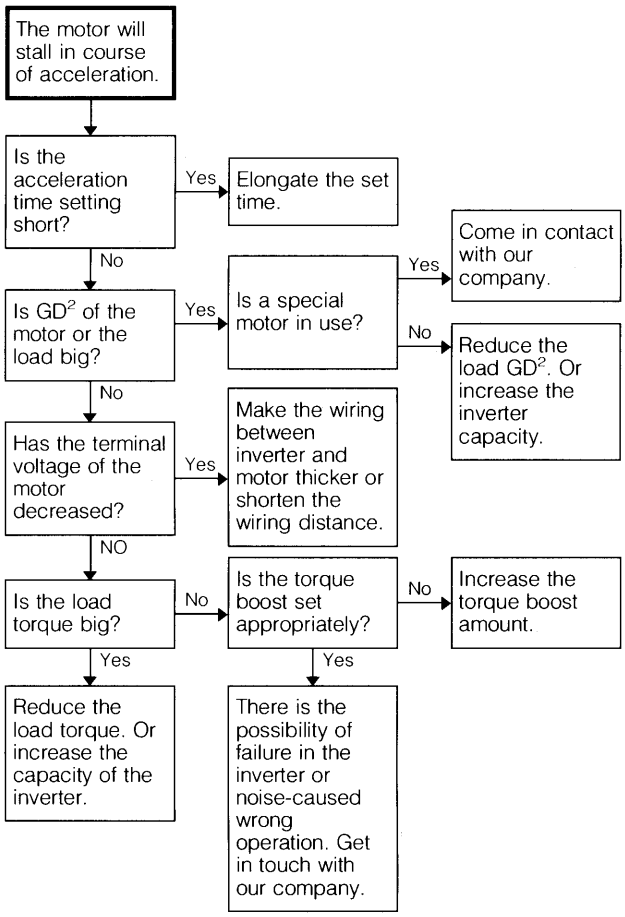


(Note)
Presence of forward and reverse commands and frequency set signal can be checked easily with the operation monitor function of 05 selected. (Refer to Item No. 11-3, Operation Monitor page36)

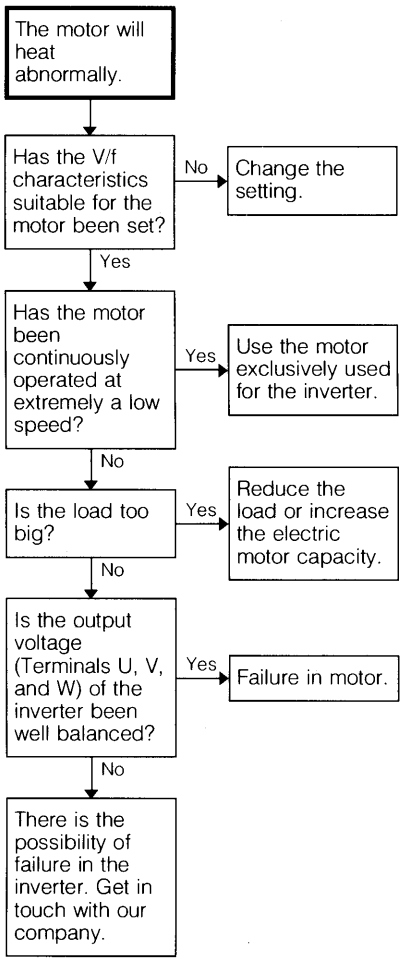
(2) Motor will run but speed will not change.



(3) Motor will stall in course of acceleration.



(4) Motor will heat abnormally



11. Inverter specification

11-1 Standard specification

(1) Individual specification

① FRENIC 5000G7 series

Voltage		200V series				400V series			
Applicable motor output [kW]		Inverter type	Rated capacity [kVA]	Rated output current [A]	Outbreak loss [kW]	Inverter type	Rated capacity [kVA]	Rated output current [A]	Outbreak loss [kW]
3.7		FRN003G7-2	6	17	0.19	FRN003G7-4	7	9	0.19
5.5		FRN005G7-2	10	25	0.28	FRN005G7-4	10	13	0.28
7.5		FRN007G7-2	13	33	0.37	FRN007G7-4	13	17	0.35
11		FRN011G7-2	18	46	0.50	FRN011G7-4	18	24	0.49
15		FRN015G7-2	22	59	0.70	FRN015G7-4	24	31	0.65
18.5		FRN018G7-2	28	74	0.85	FRN018G7-4	30	39	0.75
22		FRN022G7-2	33	87	1.0	FRN022G7-4	34	45	0.90
30		FRN030G7-2	44	115	1.3	FRN030G7-4	46	60	1.2
37		FRN037G7-2	55	145	1.6	FRN037G7-4	57	75	1.4
45		FRN045G7-2	69	180	2.0	FRN045G7-4	69	91	1.7
55		FRN055G7-2	82	215	2.3	FRN055G7-4	85	112	1.9
75		FRN075G7-2	108	283	3.1	FRN075G7-4	114	150	2.6
90		FRN090G7-2	132	346	3.7	FRN090G7-4	134	176	3.0
110		—	—	—	—	FRN110G7-4	160	210	3.3
132		—	—	—	—	FRN132G7-4	193	253	4.1
160		—	—	—	—	FRN160G7-4	232	304	5.0
200		—	—	—	—	FRN200G7-4	287	377	6.0
220		—	—	—	—	FRN220G7-4	316	415	6.8
Output Ratings	Rated output voltage (Note 1)	3-phase 3-wire system, 200 to 230V				3-phase 3-wire system, 380 to 460V			
	Rated output frequency (Note 2)	50 to 400Hz							
	Overload current rating	150%, for one minute (inverse time characteristics)							
Power	Rated input AC voltage	3-phase 3-wire system 200V/ 50Hz, 200-230V/ 60Hz				3-phase 3-wire 380-400V/ 50Hz (Note 3) 400-420V/50Hz 400-460V/ 60Hz			
	Allowable variation	Voltage: +10 to −15%, Imbalance: less than 3% (Note 4), Frequency: ±5%							

② FRENIC 5000P7 series

Voltage		200V series				400V series			
Applicable motor output [kW]		Inverter type	Rated capacity [kVA]	Rated output current [A]	Outbreak loss [kW]	Inverter type	Rated capacity [kVA]	Rated output current [A]	Outbreak loss [kW]
30		FRN030P7-2	44	115	1.3	FRN030P7-4	46	60	1.2
37		FRN037P7-2	55	145	1.6	FRN037P7-4	57	75	1.4
45		FRN045P7-2	69	180	2.0	FRN045P7-4	69	91	1.7
55		FRN055P7-2	82	215	2.3	FRN055P7-4	85	112	1.9
75		FRN075P7-2	108	283	3.1	FRN075P7-4	114	150	2.6
90		FRN090P7-2	132	346	3.7	FRN090P7-4	134	176	3.0
110		FRN110P7-2	158	415	4.4	FRN110P7-4	160	210	3.3
132		—	—	—	—	FRN132P7-4	193	253	4.1
160		—	—	—	—	FRN160P7-4	232	304	5.0
200		—	—	—	—	FRN200P7-4	287	377	6.0
220		—	—	—	—	FRN220P7-4	316	415	6.8
280		—	—	—	—	FRN280P7-4	400	520	8.2
Output Ratings	Rated output voltage (Note 1)	3-phase 3-wire system, 200 to 230V				3-phase 3-wire system, 380 to 460V			
	Rated output frequency (Note 2)	50 to 400Hz							
	Overload current rating	120%, for one minute (inverse time characteristics)							
Power	Rated input AC voltage	3-phase 3-wire system 200V/ 50Hz, 200-230V/ 60Hz				3-phase 3-wire 380-400V/ 50Hz (Note 3) 400-420V/50Hz 400-460V/ 60Hz			
	Allowable variation	Voltage: +10 to −15%, Imbalance: less than 3% (Note 4), Frequency: ±5%							

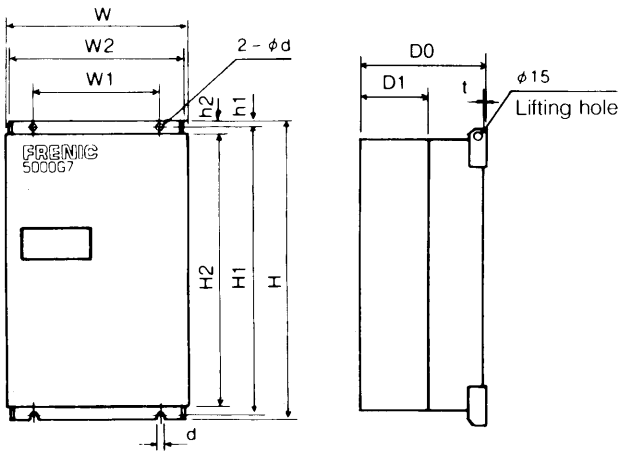
(2) Common specification

Item			Specification		
Control	Control system		Sinusoidal PWM with flux control		
	Output frequency		0.5 to 400Hz (starting frequency 0.5 to 5.0Hz adjustable)		
	Frequency stability		Analog setting	±0.2% of maximum frequency (25±10℃)	
			Digital setting	±0.01% of maximum frequency (−10℃ to +50℃)	
	Frequency resolution		Analog setting	±0.1% of maximum frequency	
			Digital setting	±0.1Hz (Option: 0.01Hz)	
	Voltage/ frequency characteristics (V/ f)		200V series	Voltage: 160 to 230V, Frequency: 50 to 400Hz	Available for continuous adjustment independently for both voltage and frequency
			400V series	Voltage: 320 to 460V, Frequency: 50 to 400Hz	
	Torque boost		21 selectable patterns and automatic energy saving mode		
	Acc/ Dec. time		Acceleration and deceleration time: 0.2 to 3600sec: linear: 4 patterns setting available; Non-linear acceleration and deceleration: 2 patterns setting avilable		
	Braking torque		Standard	Regenerative brake: 10 to 15%, DC braking: Starting frequency 0.0 to 60Hz, Time: 0 to 10 seconds, Voltage: 0 to 10%	
			Option	Dynamic brake: 100% (duty cycle 5%ED)	
	Standard functions		Torque limit control, automatic acceleration and deceleration, slip compensation control, current limiting, multistep frequency, up-down control, restart after instantaneous power failure, back up sequence from line to inverter, reversing operation with signal polarity, high or low limiter, bias frequency, and jump frequency		
Protection			Stall prevention, overcurrent, overvoltage, undervoltage (Note 6), instantaneous power failure, inverter overheat, inverter overload, motor overload (electronic thermal action), external failure (external thermal action, etc.), CPU error, output short circuit, ground fault for inverter protection (Option), and incoming surge		
Operation	Frequency setting input		Potentionmeter or voltage input: DC 0 to ±10V (DC 0 to ±5V), Current input: DC 4 to 20mA		
	Input signal		Forward and stop command, reverse and stop command, 3-wire control, current signal input selection, multistep frequency selection, up-down control, acc/ dec time selection, coast-to-stop command, switching operation from line to inverter, interlock for load side switch, external alarm input, alarm reset input, and ground fault input		
	External output signal		Relay output:	Power-side electromagnetic contactor command (NO), alarm (SPDT)	
			Open collector output:	Refer to "Auxiliary parameter setting, Function 45 (Page 49)"	
Indication	Frequency meter output signal		Analog: DC 0 to +10V, Pulse frequency: (6 to 100)×output frequency		
	Touch panel LED indication	Running	Output frequency, reference frequency, motor synchronous speed, output current, output voltage, machine speed, and input and output signal check		
		Setting	Function codes and data code indication (Refer to Function List.)		
		Fault	OC : Overcurrent during Acc., OC2: Overcurrent during dec., OC3: Overcurrent during running at constant speed, OC : Overvoltage, LU : Undervoltage, OL1 :Inverter overload, OH1 : Inverter overheat, OL2: Motor overload, OH2: External failure, Err0: CPU error and failure (8 points such as output frequency, etc.), failure history (three failure indications in past), etc.		
	Charge lamp (LED indication)		DC intermediate circuit voltage		
Environment	Installation location		Indoors, altitude of 1000m and less, Do not install in a dusty location or expose to corrosive gases or direct sunlight.		
	Ambient temperature		−10 to 50℃		
	Humidity		20 to 90% RH (Non-condensing)		
	Vibration		0.5G and less (conforming to JIS c 0911)		
	Temperature during transportation		−25～+65℃		
	Mounting		Panel mounting, external cooling type		
Protection system			Protection case attached unit (IP00: JEM1030, provided that if the applicable electric motor falls under 200 series, the unit of 75kW and less will be held optional and if the motor does under 400V series, the unit of 132kW and less will be held optional too, thus available for IP20.).		
Cooling system			Forced air-cooling		
Option			Ground fault detection unit for inverter protection (Note 7), relay output unit, touch panel extension cable set, Braking unit, Braking resistor, radio noise reducing zero-phase reactor, line side AC reactor, power factor improvement DC reactor, noise reducing AC reactor, frequency setter, frequency meter, and surge absorver		

(Note 1) The rated capacity falls under 220V for the 200V series and 440V for 400V ones in the rated output voltage.
(Note 2) Output voltage cannot exceed the power supply voltage.
(Note 3) Change the tap of auxiliary transformer when changing the power supply voltage from 380V to other voltages, and vice versa.
(Note 4) Use a line side AC reactor when imbalance in power supply voltage exceeds 3%.
Power supply voltage imbalance rate (%)=[Maximum voltage (V)]/ 3-phase mean voltage (V)×100
(Note 5) Following units are provided with DC reactors for power factor improvement as the standard outfitting (supplied other than units).
(1) G7 series: Inverter of 75kW and over (2) P7 series 200V series: Inverter of 75kW and over (3) P7 series 400V series: Inverter of 90kW and over
(Note 6) Even if the power is put out, operation can be kept on at 15ms or so at full load condition. (In case of light load operation, the operating time will be extended much more.) When the main circuit DC voltage comes below the under-voltage level, the inverter will stop the output without delay to hold tripped condition. However, when the control power of the inverter should come down, automatic resetting will take place.
(Note 7) The ground fault detection unit as an option is protect the inverter itself. Protection for human accident, fire, external equipment, etc. shall be provided with the leakage protecting device described separately.

11-2 Outline dimentions

Fig. A Inverter cooled inside switchboard



Panel drilling

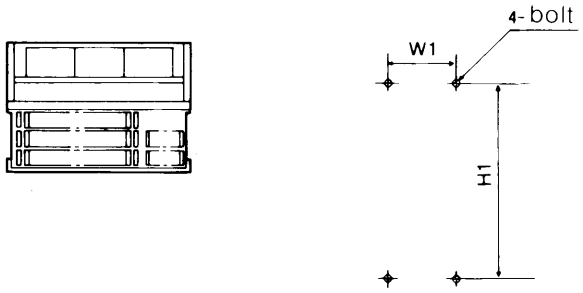
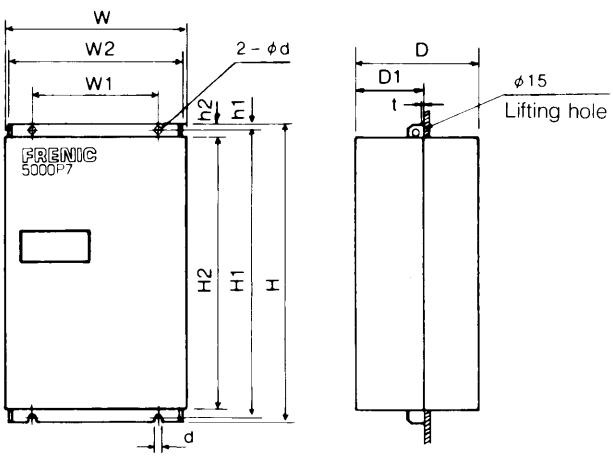
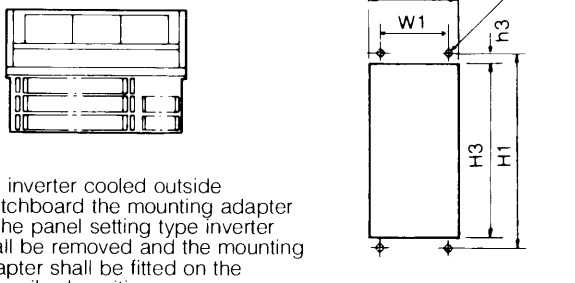


Fig. B Inverter cooled outside switchboard

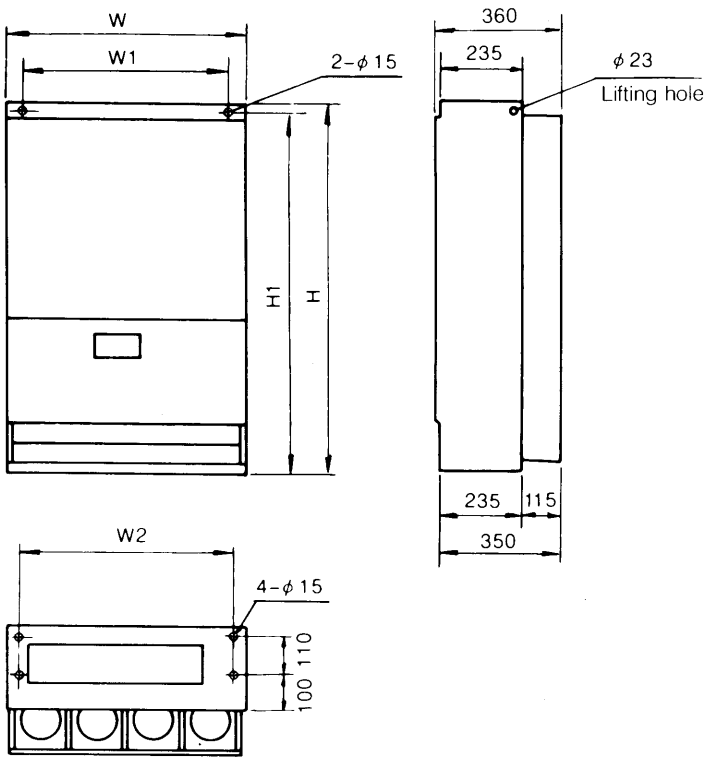


Panel cutting

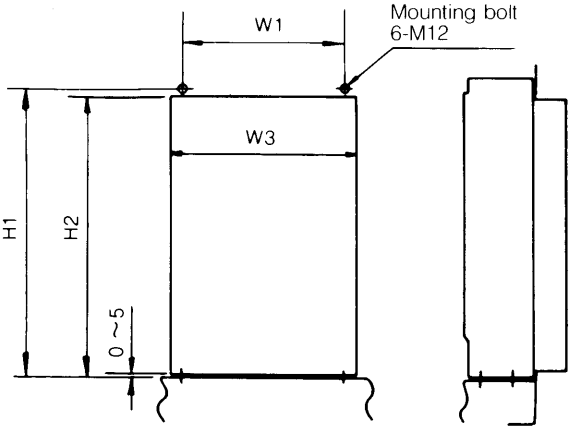


(Note) For inverter cooled outside switchboard the mounting adapter of the panel setting type inverter shall be removed and the mounting adapter shall be fitted on the prescribed position.

Fig.C Commen-use type



Panel cutting



200V series

Applicable motor [kW]	Inverter type		Fig.	Dimensions [mm]																Maunting bolt	Weight [kg]
	G7 series	P7 series		W	W1	W2	W3	H	H1	H2	H3	h1	h2	h3	D	D0	D1	t	d		
3.7	FRN003G7-2	——	A,B	255	155	253	246	440	425	403	410	10	21	7.5	242	245	140	2	7	M6	14
5.5	FRN005G7-2	——																			
7.5	FRN007G7-2	——																			16
11	FRN011G7-2	——		280	180	278	271	480	465	443	450										20
15	FRN015G7-2	——		320	220	318	311		460	434	442	12	25	9					10	M8	24
18.5	FRN018G7-2	——						520	500	474	482										27
22	FRN022G7-2	——		340	240	338	331	550	530	504	512										30
30	FRN030G7-2	FRN030P7-2																			
37	FRN037G7-2	FRN037P7-2		375	275	373	366	615	596	570	578										40
45	——	FRN045P7-2		390	290	387	381	700	675	640	650	15	30	12.5					12	M10	45
	FRN045G7-2	——						800	775	740	750										53
55	FRN055G7-2	FRN055P7-2																			
75	FRN075G7-2	FRN075P7-2		540	440	537	530	750	720	685	695	18	35	12.5	257	260	140	3.2	15	M12	70
90	FRN090G7-2	FRN090P7-2	C	850	750	780	830	880	855	845	—	—	—	—	—	—	—	—	—		130
110	——	FRN110P7-2																			

400V series

Applicable motor [kW]	Inverter type		Fig.	Dimensions [mm]																Maunting bolt	Weight [kg]
	G7 series	P7 series		W	W1	W2	W3	H	H1	H2	H3	h1	h2	h3	D	D0	D1	t	d		
3.7	FRN003G7-4	——	A,B	280	180	278	271	440	425	403	410	10	21	7.5	242	245	140	2	7	M6	18
5.5	FRN005G7-4	——																			20
7.5	FRN007G7-4	——																			
11	FRN011G7-4	——						480	465	443	450										22
15	FRN015G7-4	——		320	220	318	311	520	500	474	482	12	25	9					10	M8	27
18.5	FRN018G7-4	——																			
22	FRN022G7-4	——																			
30	FRN030G7-4	FRN030P7-4		340	240	338	331	550	530	504	512										30
37	——	FRN037P7-4																			32
	FRN037G7-4	——		375	275	373	366	615	596	570	578										35
45	FRN045G7-4	FRN045P7-4						675	656	630	638										43
55	FRN055G7-4	FRN055P7-4																			
75	——	FRN075P7-4		390	290	387	381	800	775	740	750	15	30	12.5	257	260			12	M10	56
	FRN075G7-4	——		530	430	527	520	880	850	815	825	18	35	12.5	312	315	175	3.2	15	M12	85
90	FRN090G7-4	FRN090P7-4																			
110	FRN110G7-4	FRN110P7-4																			95
132	——	FRN132P7-4						1050	1020	985	995				327	330	190				100
	FRN132G7-4	——																			105
160	FRN160G7-4	FRN160P7-4	C	680	580	610	660	1050	1025	1015	—	—	—	—	—	—	—	—	—		135
200	——	FRN200P7-4																			
	FRN200G7-4	——		850	750	780	830														170
220	FRN220G7-4	FRN220P7-4																			
280	——	FRN280P7-4																			

FUNCTION TABLE

Function				Data			
	Code	Name of function	Symbol	Setting range	Display	Minimum unit	Factory setting
Display	00	Output frequency		Indicate operating condition	Hz	0.1Hz	—
	01	Reference frequency (Preset frequency)			Hz	0.1Hz	—
	02	Motor synchronus speed			r/min	1r/min *1	—
	03	Output current			A	1A	—
	04	Output voltage			V	2V (1V) *2	—
	05	Machine speed			r/min	1r/min	—
	06	Input-signal status (checking)			—	—	—
	07	Output-signal status (checking)			—	—	—
	08	Torque limiting level for driving			%	1%	—
	09	Torque limiting level for braking			%	1%	—
	0A	Torque calculation value			%	1%	—
	0b	For option PC board					—
Fundamental parameter	10	Maximum frequency	F_{MAX}	50.0-400.0	Hz	0.1Hz	50.0Hz
	11	Base frequency	F_{BASE}	50-400	Hz	1Hz	50Hz
	12	Maximum output voltage	V_{MAX}	320-460 (160-230) *2	V	1V	380 (220)V *2
	13	Bias frequency		0-400	Hz	1Hz	0Hz
	14	High limiter	F_{HL}	0-400	Hz	1Hz	50Hz
	15	Low limiter	F_{LL}	0-400	Hz	1Hz	0Hz
	16	Acceleration time 1	ACC1	0.2-3,600	s	0.1s *3	20.0s
	17	Deceleration time 1	DEC1	0.2-3,600	s	0.1s *3	20.0s
	18	Gain for frequency setting signal	GAIN	0-200.0	%	0.1%	105.0%
	19	Torque boost		C-0 to C-20	—	—	C-3
	1A	Autmatic energy-saving operation		Active/ inactive	—	—	Inactive
	1b	Electronic thermal overload relay		0 (not in use), 50-105	%	1%	105%
Auxiliary parameter	20	DC brake starting frequency	F_{DCB}	0.0-60.0	Hz	0.1Hz	0.0Hz
	21	DC brake voltage	V_{DCB}	0.0-10.0	%	0.1%	0.0%
	22	DC braking time	T_{DCB}	0.0-10.0	s	0.1s	0.0s
	23	Multistep frequency setting 1	MSS1	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	24	Multistep frequency setting 2	MSS2	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	25	Multistep frequency setting 3	MSS3	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	26	Multistep frequency setting 4	MSS4	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	27	Multistep frequency setting 5	MSS5	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	28	Multistep frequency setting 6	MSS6	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	29	Multistep frequency setting 7	MSS7	0.0, 0.5-400.0	Hz	0.1Hz	0.0Hz
	2A	Acceleration time 2	ACC2	0.2-3,600	s	0.1s *3	100s
	2b	Deceleration time 2	DEC2	0.2-3,600	s	0.1s *3	100s
	2C	Acceleration time 3	ACC3	0.2-3,600	s	0.1s *3	100s
	2d	Deceleration time 3	DEC3	0.2-3,600	s	0.1s *3	100s
	2E	Acceleration time 4	ACC4	0.2-3,600	s	0.1s *3	100s
	2F	Deceleration time 4	DEC4	0.2-3,600	s	0.1s *3	100s
	30	Accel./decel.pattern		C--0, C--1, C--2	—	—	C--0
	31	Motor noise reduction		C--1, C--2, C--3, C--4	—	—	C--1
	32	Overload early warning signal	OL	50-105	%	1%	105%
	33	Torque limiter (Driving mode)	T_{DL}	-,20-180 (20-150) *4	%	1%	150 (120) % *4
	34	Torque limiter (Braking mode)	T_{BL}	0,20-180 (20-150) *4	%	1%	100%
	35	Frequency level detection	FDT	1-400	Hz	1Hz	30Hz
	36	Frequency equivalence detection range	FAR	0.5-5.0	Hz	0.1Hz	2.5Hz
	37	Starting frequency	F_{STA}	0.5-5.0	Hz	0.1Hz	0.5Hz
	38	Starting frequency holding time	T_{HOLD}	0.0-10.0	s	0.1s	0.2s
	39	Jump frequency 1	JUMP1	0.0, 0.5-400	Hz	0.1Hz	0.0Hz
	3A	Jump frequency 2	JUMP2	0.0, 0.5-400	Hz	0.1Hz	0.0Hz
	3b	Jump frequency 3	JUMP3	0.0, 0.5-400	Hz	0.1Hz	0.0Hz
	3C	Jump frequency range		(±)0.0-5.0	Hz	0.1Hz	0.0Hz
	3d	Number of motor poles	POLE	2,4,6,8,10,12	pole	2	4
	3E	Machine speed conversion coefficient		0.1-10.0	—	0.1	1.0

Function				Data			
	Code	Name of function	Symbol	Setting range	Display	Minimum unit	Factory setting
Auxiliary parameter	40	Digital frequency monitor coefficient		6-100	—	1	30
	41	FWD/ REV command hold (3-wire control)		Active/ inactive	—	—	Inactive
	42	UP/ DOWN control		Active/ inactive	—	—	Inactive
	43	Restart after instantaneous power failure		Active/ inactive	—	—	Inactive
	44	Undervoltage alarm		Active/ inactive	—	—	Active
	45	Output signal code selection	SLIP	0,1,2	—	—	0
	46	Slip compensation control		0.0-2.5	Hz	0.1Hz	0.0Hz
	47	Reversing operation with signal polarity		Active/ inactive	—	—	Inactive
	50	Analog frequency meter calibration		70.0-105.0	%	0.1%	100.0%
	51	Analog ammeter calibration *7		50.0-200.0	%	0.1%	100.0%
	52	Correction of motor primary resistance		50-200	%	1%	100%
	60 61 62 63 64 65 66 67 68 69 6A 70 71 72 73 74 75 76 77 78 79	For option PC board		See the instruction manual of the option PC board. When the option PC board does not installed, the inverter indicates '----'.			
	99	Manufacturer use function			—	—	Inactive
Fault Indication	F0	Faults display			—	—	
	F1	Output frequency	When the first fault occurred		Hz	0.1Hz	
	F2	Reference frequency			Hz	0.1Hz	
	F3	Output current			A	1A	
	F4	Operation mode			—	—	
	F5	Fault memory 1			—	—	
	F6	Fault memory 2			—	—	
	F7	Fault memory 3			—	—	

REMARKS
*1: When the displayed value exceeds 9999 rpm, the minimum unit becomes 10 rpm. (12000 → 1200)
*2: The values in brakets indicate 200V series.
*3: When the setting values exceed 100sec, the minimum setting unit becomes 1sec.
*4: 20-180% for G7, 20-150% for P7.
*5: When a function is active or inactive, "□" or " - " is displayed respectively.
*6: The functions marked can be set during inverter operation.
*7: Option PC board is necessary.

OPERATION DATA (MONITOR)

0 0	Output frequency

This function displays an inverter output frequency [Hz].

0 1	Reference frequency (Preset frequency)

This function displays the reference frequncy set by a frequency setting potentiometer, a voltage signal input from V1 terminal, a current signal input from C1 terminal, multistep frequency setting 1 to 7 or Up-down control.

0 2	Motor synchronous speed.

This function displays the motor synchronous speed [r / min]calculated by the following formula.

$$\text{Motor synchronous speed} = \frac{120 \times \text{output frequency}}{\text{number of motor poles}} \text{ [r / min]}$$

- For displaying the motor synchronous speed correctly, set 3d (number of motor poles) correctly.
- Because the inverter display is only 4-digit, when the speed is higher than 9999 r/min, the display range is autmatically switched to 1/ 10 mode, and the decimal point disappears.
  Example: 1200 r/min → 1200. 12000 r/min → 1200

0 3	Output current

This function displays an effective value of inverter output current. Its accuracy is ±10%. When a correct output current is needed, use an ammeter.

0 4	Output voltage

This function displays an effective value of inverter output voltage. The display indicates a reference value.

0 5	Machine speed

This function displays the rotating speed of driven machine, The indicated value is calculated by the following formula,

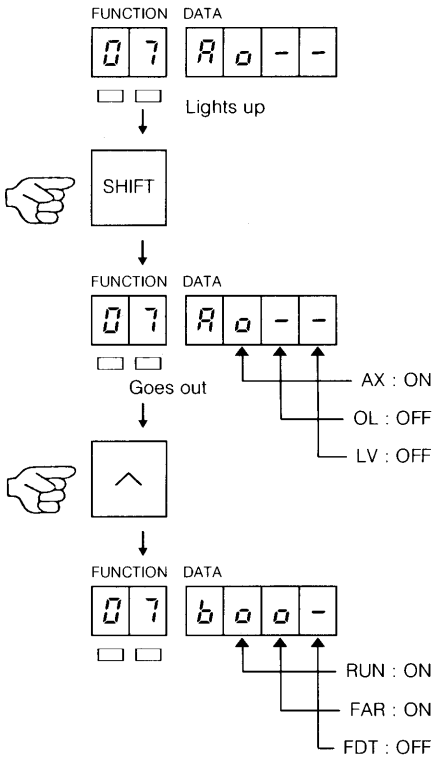
Machine speed [r / min] = Motor synchronous speed [r / min] × machine speed conversion coefficient

- The setting of Function 3E (auxiliary parameter), machine speed conversion coefficient (gear ratio, etc.), is required.
- Because the inverter display is only 4-digit, when the speed is higher than 9999 r/min, the display range is autmatically switched to 1/ 10 mode, and the decimal point disappears.
  Example: 1200 r/min → 1200. 12000 r/min → 1200

06 Input signal status

07 Output signal status

For an input/output signal check, use the UP/DOWN key to select function code 06 or 07 and press the SHIFT key.
The two LED lamps go out and data setting mode is set.
The input/output signal can be checked in this mode.
Check the signal by referring to the table and example.
The symbol "o" represents signal presence, and "-" signal absence.
Sequence checks can be made easily during operation.



FUNCTION DATA

Digit 4	Digit 3	Digit 2	Digit 1

Function code	Function	Data display			
		4-digit	3-digit	2-digit	1-digit
06	Input signal check	A	FWD	REV	BX
		b		THR	RST
		C	X1	X2	X3
		d	RT1	RT2	AUT
		E		IL	PU
07	Output signal check	A	AX	OL	LV
		b	RUN	FAR	FDT

08 Torque limiting level for driving

This function displays torque limiting level for driving [%] which is set on function 33.

09 Torque limiting level for braking

This function displays torque limiting level for braking [%] which is set on function 34.

0A Torque calculation value

This function displays torque calculation value [%] of operating motor which is calculated from the inverter output voltage, current and the motor primary resistance.

BASIC PARAMETER DATA SETTING

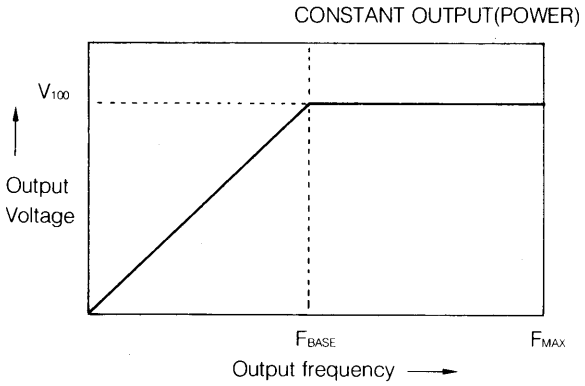
■ V/F Pattern setting

Function Code No. 10 11 12

These functions allow V/F pattern adjustment in order to tailor the maximum frequency, base frequency, and rated output voltage according to the rating of the motor and the application. Select a function code using the SHIFT and UP/DOWN keys. Shift the pointer to DATA SETTING MODE. Data has been set previously at the factory.
Change it with the UP/DOWN keys only when necessary and press the SET keys to store it.

Note: Data value blinks when changed using the UP/DOWN keys. Press the SET key to stop blinking. New value is now set.

FUNCTION	DATA	
10	60.0	F_{MAX} 50.0-400.0Hz
11	50.0	F_{BASE} 50-400Hz
12	400.0	V_{100} 320-460V (160-230V)



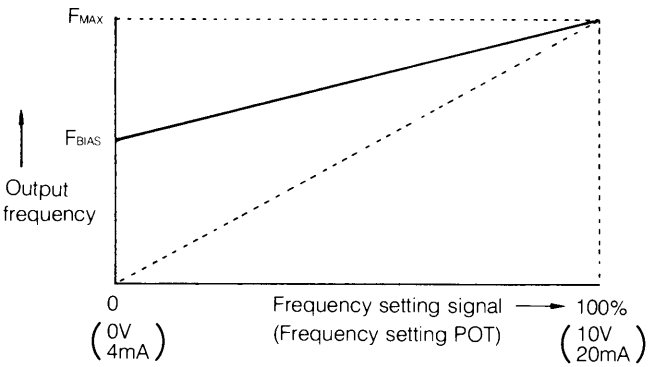
■ Bias setting

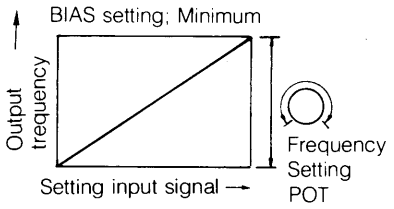
Function Code No. 13

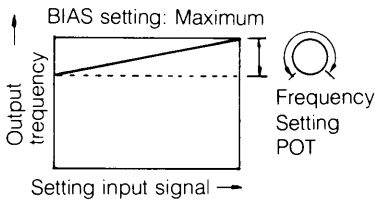
This function provides speed control using a process control signal (0 to 10VDC, 4 to 20 mA) or a frequency setting POT. The adjustable range is from 0 to 100% (F_{MAX}). When set at 100% an output frequency of 100% results even if the input signal is zero. However, when starting it begins with 0.5Hz irrespective of the setting.
Fine adjustment is possible if the bias is set at a high value.

FUNCTION	DATA	
13	0.0	F_{BIAS} 0-400

Note: The starting frequency is adjustable between 0Hz and 5Hz by setting the function code 37 (page 46).







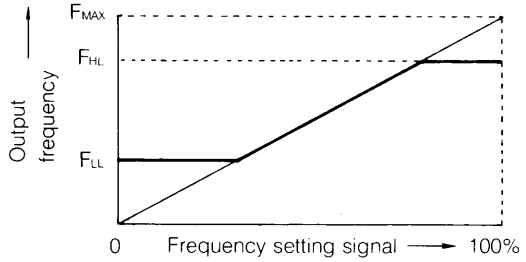
■ High or llow limiter

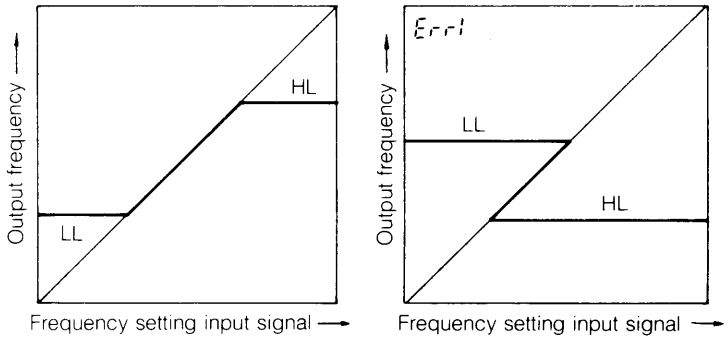
Function Code No. 14 15

These functions limit the output frequency to prevent the overspeed and underspeed operation of the motor.
For instance, the low limiter is used for control of the cooling water pump. This function is suitable for control in which the cooling water level is kept at the lowest allowable level even when the process signal is zero volt.

FUNCTION 14 DATA 120.0 — F_{HL} 0-400Hz

FUNCTION 15 DATA 0.0 — F_{LL} 0-400Hz





Note: When the setting value for HL is smaller than that for LL, the low limit value is ignored. At this time, "Err1" is displayed.

■ Acceleration and deceleration time

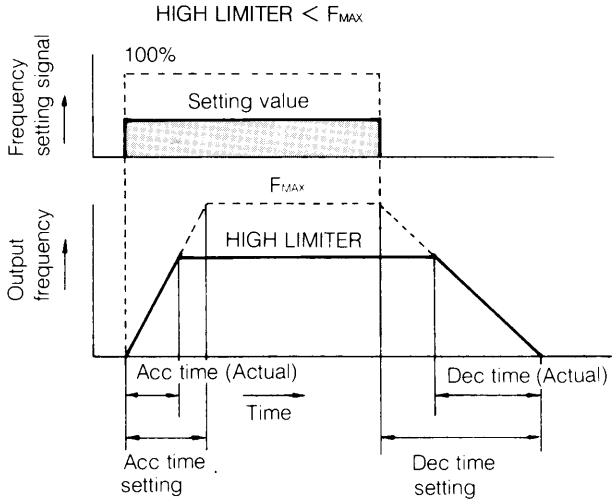
Function Code No. 16 17

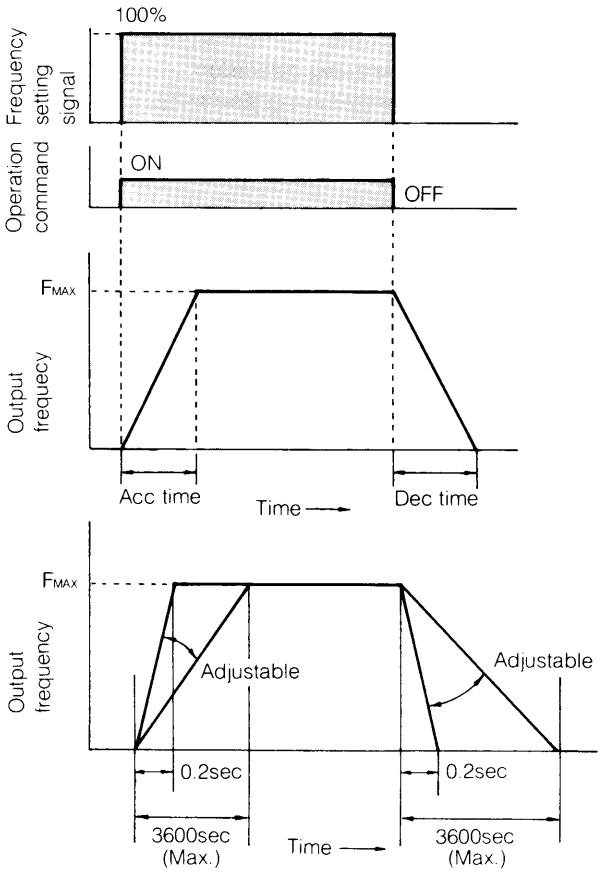
These functions set the acceleration and deceleration times. The acceleration time is the time it takes for the output frequency to incease from zero to F_{MAX}, and the deceleration time is the time it takes for the output frequency to decrease from F_{MAX} to zero. The time setting range is from 0.2 to 3600sec.

FUNCTION 16 DATA 20.0 — ACC1 0.2-3600sec.

FUNCTION 17 DATA 20.0 — DEC1 0.2-3600sec

Note: When the setting values exceed 100 sec, the minimum setting units becomes 1 sec.



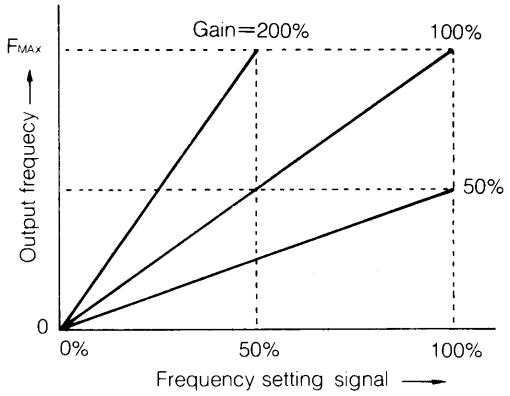


■ Gain for frequency setting signal

Function Code No. 18

This gain adjustment function is used for compensation when the input signal voltage is below 10V The adjustable range of the gain is from 0 to 200%. For example, if the frequency setting gain is set at 200%, the range from 0 to F_{MAX} can be controlled by compensation even when the input signal level is 5V DC.

FUNCTION	DATA	
18	105.0	GAIN 0-200.0%

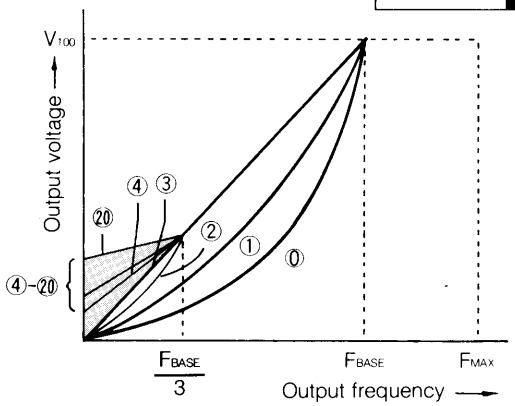


■ Torque boost

Function Code No. 19

This function boosts torque during low-speed operation. A torque boost pattern can be selected from 21 types according to the load and/or motor requirements. Patterns ⓪ and ① are suitable for variable torque loads such as a fan or a pump. When the pattern is ④ or higher, the voltage is increased and the torque is boosted in the range up to $F_{BASE}/3$.

FUNCTION	DATA	
19	C--3	Torque boost 0-20

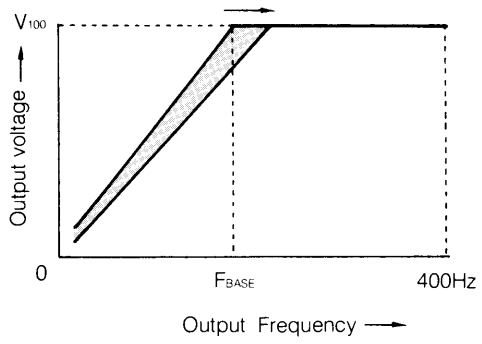


■ Automatic energy-saving operation

Function Code No. 1A

This function is for energy-saving operation. Energy is saved by reducing the voltage according to the load current.

FUNCTION	DATA	
1A	----	Active: o Inactive: -



■ Electronic thermal overload relay

Function Code No. 1b

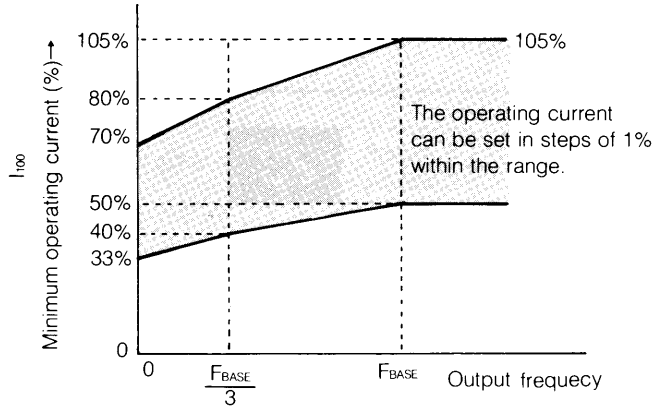
The inverter has a built-in electronic thermal overload relay. No external overload relay is necessary when a single motor (4-pole) is connected to a single inverter and the function is set according to the motor characteristics. Generally, the cooling effect of a motor is not sufficient during low-speed operation. The electronic thermal overload relay provides corrected characteristics.

For several motors connected to a single inverter, external thermal overload relays are needed for each motor feeder for individual protection.

For multiple motor applications,data code should be set to 0 (zero).

FUNCTION	DATA	
1b	105	0 (Inactive) 50-105%

Fig.1 Minimum operating current characteristics



• Setting the electronic thermal overload relay

The setting current is obtained by using the following formula.

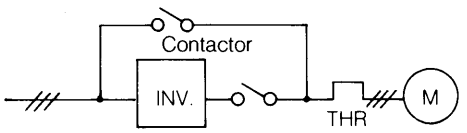
$$I_{100}(\%) \leqq \frac{\text{Motor rated current}}{\text{Inverter rated current}} \times 100\%$$

Example: Motor full load current: 56A
Inverter rated current: 91A
(FRN045G7-4)

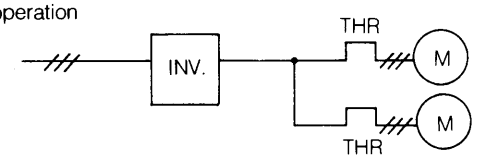
$$I_{100}(\%) = \frac{56}{91} \times 100(\%) = 61(\%)$$

Data code should be set 61.

• Line operation ⟷ Inverter operation



• Group operation



3-element heater

Fig. 2 Inverter current characteristics

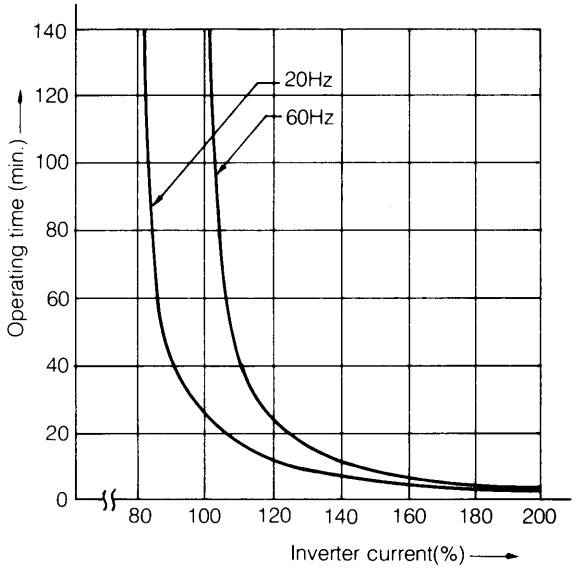
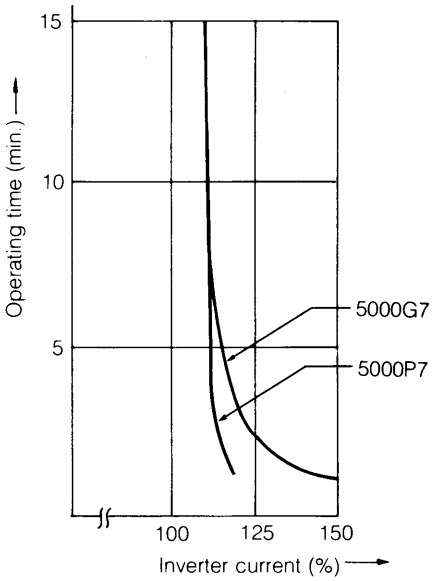


Fig.3 Inverter overload



Note.

These electronic thermal overload relays meet the requirements of 4-pole standard motors.

Therefore, under the following conditions, use a conventional overload relay in place of the electronic type.

1. When used with motors other than 4-pole type.
2. When used with special motors (non-standard motors).
3. When used for a group operation (in which two or more motors are run by using a single inverter).
4. When frequent starting can be expected.

(4) AUXILIARY PARAMETER SETTING FUNCTION

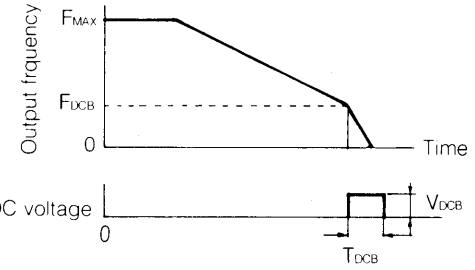
■ DC braking

These functions are used for DC braking to stop the motor. If the braking time exceeds 10sec., the motor enters the coast-to-stop state.

DC braking start frequency F_{DCB} : 0.0 to 60Hz
DC braking voltage frequency V_{DCB} : 0 to 10%
DC braking time T_{DCB} : 0 to 10sec
Braking duty : 5% ED or less

FUNCTION	DATA	
20	0.0	F_{DCB} 0.0 to 60Hz
21	10.0	V_{DCB} 0 to 10.0%

Function Code No. 20 21 22

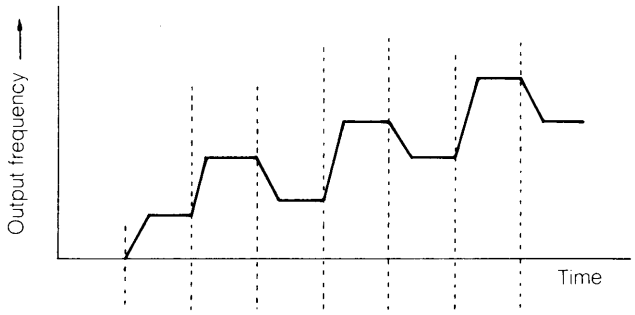


FUNCTION	DATA	
22	0.5	T_{DCB} 0 to 10.0sec

■ Multistep frequency setting

Seven different frequencies can be set by turning on and off the external contact signals (at X1-CM, X2-CM, X3-CM terminal groups). The frequency setting range for each step is from 0.5 to 400Hz. The ramp time for each step is determined by the acceleration and deceleration time settings.

Function Code No. 23 TO 29



Terminals		MSS1	MSS2	MSS3	MSS4	MSS5	MSS6	MSS7
X1-CM	○	●	○	●	○	●	○	●
X2-CM	○	○	●	●	○	○	●	●
X3-CM	○	○	○	○	●	●	●	●

● : ON
○ : OFF

■ Multi-frequency setting

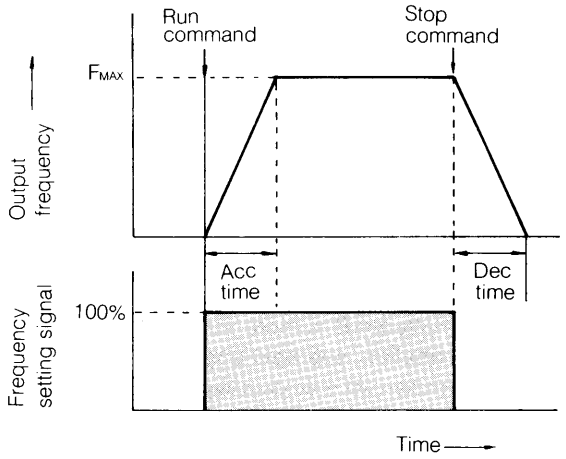
FUNCTION	DATA	
23	5.0	MSS1 0.0, 0.5 to 400.0Hz
24	10.0	MSS2 0.0, 0.5 to 400.0Hz
25	20.0	MSS3 0.0, 0.5 to 400.0Hz
26	30.0	MSS4 0.0, 0.5 to 400.0Hz
27	40.0	MSS5 0.0, 0.5 to 400.0Hz
28	50.0	MSS6 0.0, 0.5 to 400.0Hz
29	60.0	MSS7 0.0, 0.5 to 400.0Hz

■ Acceleration/deceleration time setting

The time of acceleration from 0 to F_{MAX} and the time of deceleration from F_{MAX} to 0 can be set from 0.2 to 3600sec. Four different acceleration and deceleration times (including acceleration time 1 and deceleration time 1) can be set by combinations of external control signals (at RT1-CM and RT2-CM terminal groups).

Function Code No.			
	2A	2C	2E
	2b	2d	2F

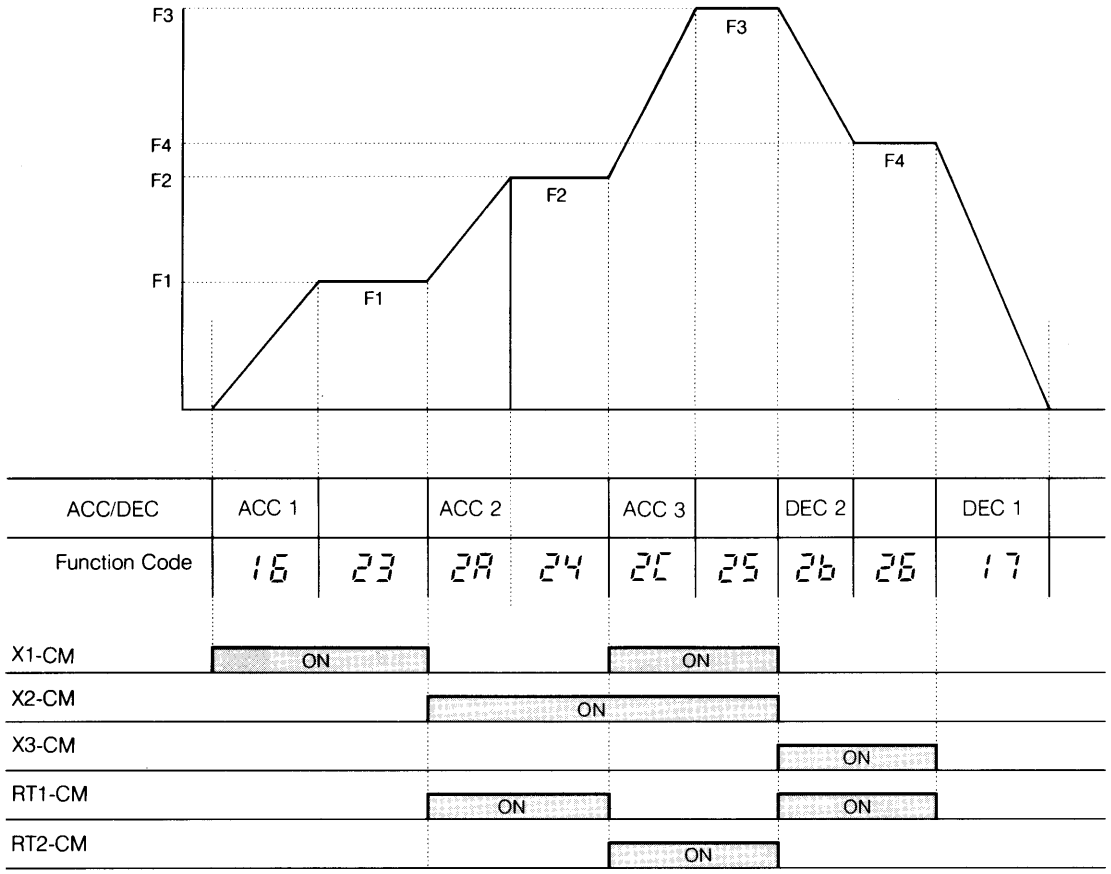
FUNCTION	DATA	
2A	100.0	ACC2 0.2-3600sec
2b	100.0	DEC2 0.2-3600sec
2C	100.0	ACC3 0.2-3600sec
2d	100.0	DEC3 0.2-3600sec
2E	100.0	ACC4 0.2-3600sec
2F	100.0	DEC4 0.2-3600sec



Treminals	ACC/DEC1	ACC/DEC2	ACC/DEC3	ACC/DEC4
RT1-CM	○	●	○	●
RT2-CM	○	○	●	●

● : ON ○ : OFF

Multistep frequency control (example)



■ Accelereation and deceleration pattern

Function Code No. 30

This function allows selection of non-linear acceleration and deceleration. Pattern A is suitable for machine loads where quick changes in accelertion and deceleration are undesirable. Patteren B is more suitabe for fan and blower.

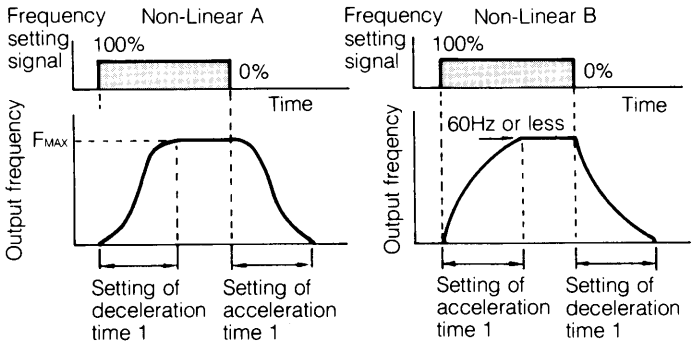
• Further information: see next page

Note: 1) Linear pattern will override pattern B if F_{MAX} is greater than 60Hz.

2) This function cannot be used in the event the multistep frequency selection is made

Pattern	Setting
Linear ACC/DEC.	C--0
Non-Linear A	C--1
Non-Linear B	C--2

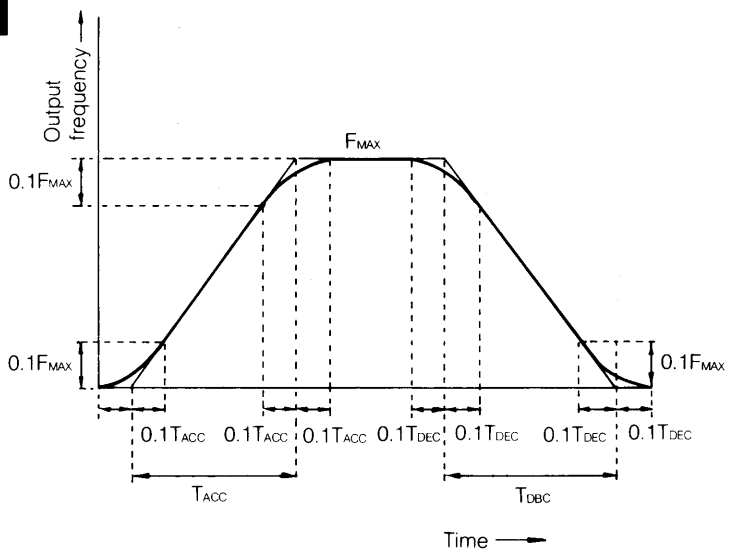
FUNCTION 30 DATA C--0 0, 1, 2



The gradient of non-linear acceleration and deceleration is obtained with following methods.

Non-linear pattern A

- T_{ACC} : Preset acceleration time
- T_{DEC} : Preset deceleration time
- The actual time from the start of acceleration / deceleration to the time when the reference frequency is reached is 1.2 times the preset acceleration/deceleration time.
- If the change width of the frequency setting is less than 20% of the maximum frequency (F_{MAX}), the acceleration/deceleration pattern may be linear.



Non-linear pattern B

- Non-linear pattern B consists of four line segments each for acceleration and deceleration.

$$T_1 = T_{ACC} \times \frac{29}{109 + \alpha} \qquad T_5 = T_{DEC} \times \frac{\beta}{335 + \beta}$$

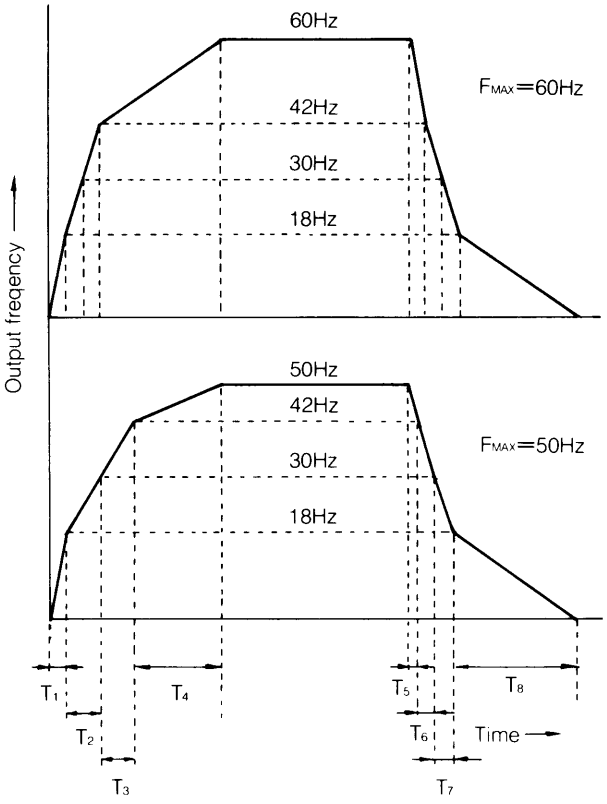
$$T_2 = T_{ACC} \times \frac{33}{109 + \alpha} \qquad T_6 = T_{DEC} \times \frac{33}{335 + \beta}$$

$$T_3 = T_{ACC} \times \frac{47}{109 + \alpha} \qquad T_7 = T_{DEC} \times \frac{47}{335 + \beta}$$

$$T_4 = T_{ACC} \times \frac{\alpha}{109 + \alpha} \qquad T_8 = T_{DEC} \times \frac{255}{335 + \beta}$$

Where

$$\alpha = 255 \times \frac{F_{MAX} - 42}{18} \qquad \beta = 29 \times \frac{F_{MAX} - 42}{18}$$



■ Motor noise reduction

Noise is reduced by changing the modulation degree of the sawtootn carrier frequency modulation control system.

Function Code No. 31

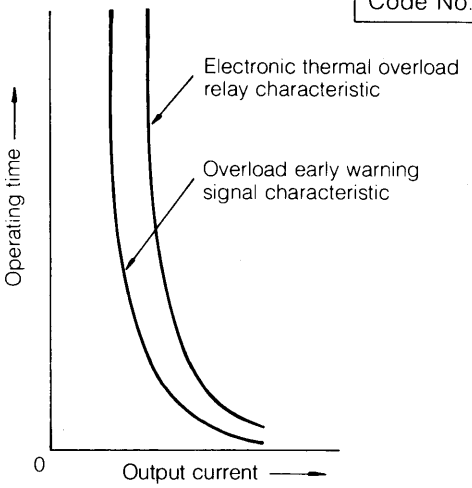
FUNCTION	DATA	
3 1	C - - 1	1, 2, 3, 4

■ Overload early warning signal

Early warning signals are given if the inverter output current exceeds the overload alarm level for a certain period of time. This is an open-collector output. If the optional relay unit is used, this signal can be used as a contact output.
If 0 is set, this function is inactive.

Function Code No. 32

FUNCTION	DATA	
3 2	1 0 5	0, 50 to 105%



■ Torque Limiter(driving and braking)

Torque limiting operation is based on calculations derived from the output voltage and current detection. This function enables automatic acceleration and deceleration, excellent recovery characteristics during impact load at constant speed running, and smooth inverter recovery after an instantaneous power failure.

Automatic acceleration and deceleration control

Even if acceleration and deceleration times shorter than those required by the load inertia, G7/P7 inverters will automatically extend proper acceleration and deceleration times, while maintaining the torque limiting level.

Torque limiting level setting range

Driving: – and 20 to 180%(150% for P7 series)
Braking: 0 and 20 to 180%(150% for P7 series)
Note: If "–" is set during driving mode, this function is not active.

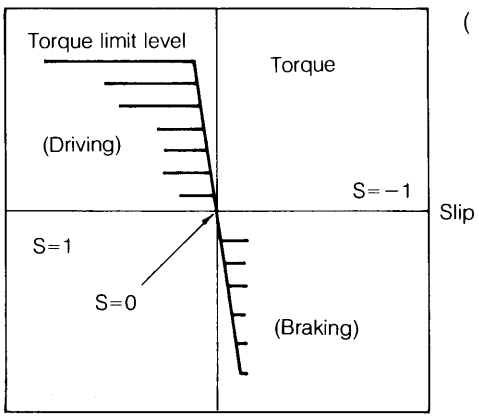
Automatic deceleration control

Even if a braking resistor is not used, the function provides faster deceleration and stopping than the normal set time without overvoltage trip.

Function Code No. 33 34

FUNCTION	DATA	
3 3	1 5 0	–, 20 to 180% (120) Driving
FUNCTION	DATA	
3 4	1 0 0	0, 20 to 180% (150) Braking

( ):P7 series



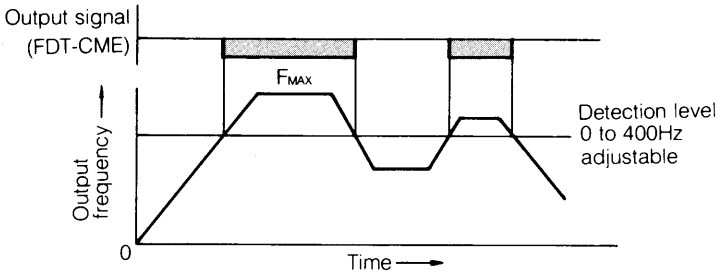
Note: The data setting for function code 34 is 100%, assuming that a braking resistor is connected. If no braking resistor is connected, setting should be changed to 0 or 20%. If left at 100%, an overvoltage trip will occur during deceleration.

■ Frequency level detection (FDT)

This signal is active (on) when the output frequency exceeds the detection level. This is an open-collector output. If the optional relay unit is used, this signal can de used as a contact output.
Refer to terminal specification (Page 57).

Function Code No. 35

FUNCTION	DATA	
35	30	FDT 1 to 400Hz

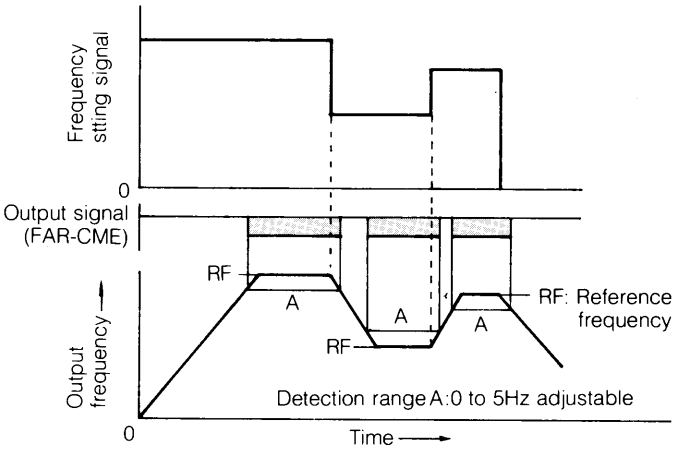


■ Frequency equivalence detection range (FAR)

This signal is active (on) when the output frequency reaches the reference frequency.
This is an open-collector output. If the optional relay unit is used, this signal can be used as a contact output.
Refer to terminal specification (Page 57).

Function Code No. 36

FUNCTION	DATA	
36	2.5	FAR 0.5 to 5.0Hz

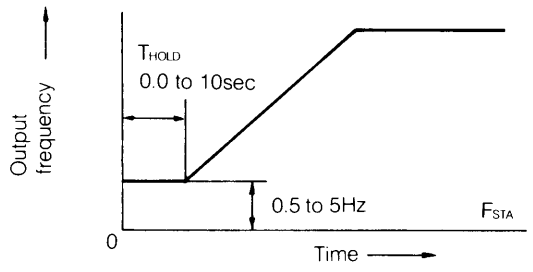


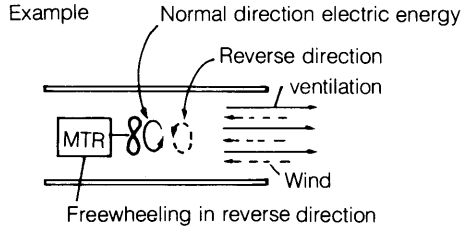
■ Starting frequency holding time

The starting frequency F_{STA} suitable for the starting torque characteristics of the load and the start frequency's holding time T_{HOLD} can be set. The existence of starting frequency holding time permits a rotating start of a motor freewheeling in the reverse direction.
(These settings are invalid during deceleration or forward ⟷ reverse operation)

Function Code No. 37 38

FUNCTION	DATA	
37	0.5	F_{STA} 0.5 to 5.0Hz
38	0.0	T_{HOLD} 0.0 to 10.0SEC

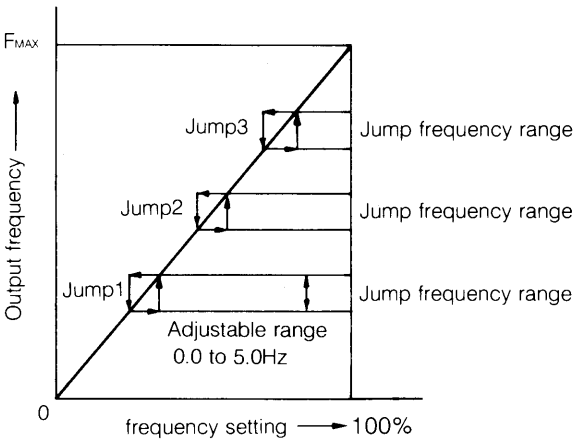




■ Jump frequency jump1 jump2 jump3
■ Jump frequency range

Function Code No.	39	3A	3b	3C

These functions are used to avoid continuous operation at mechanical resonance points.
Three jump frequencies can be set. Jump frequencies are not active during acceleration and deceleration or if the multistep frequency settings are used.
The jump frequency range is adjustable between 0.0 to 5.0Hz.



FUNCTION	DATA	
39	0.0	JUMP1 0.0, 0.5 to 400.0Hz
3A	0.0	JUMP2 0.0, 0.5 to 400.0Hz
3b	0.0	JUMP3 0.0, 0.5 to 400.0Hz
3C	2.0	0.0 to 5.0Hz

■ Number of motor poles
■ Machine speed conversion coefficient

Function Code No.	3d	3E

These parameter functions are set to monitor the synchronous speed of the motor and the machine speed.

FUNCTION	DATA	
3d	4	Poles 2, 4, 6, 8, 10, 12
3E	1.0	Machine speed conversion coeffcient 0.1 to 10.0

Machine speed=(Motor synchronous speed of motor) × (Machine speed conversion coefficient)

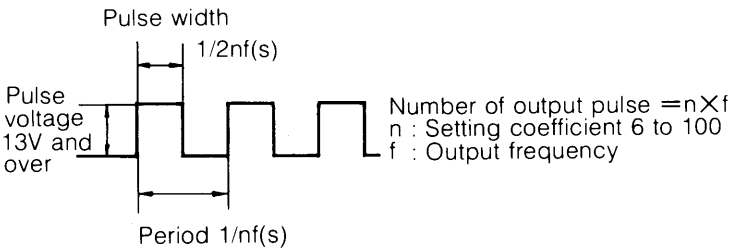
■ Frequency monitors

Function Code No.	40	50

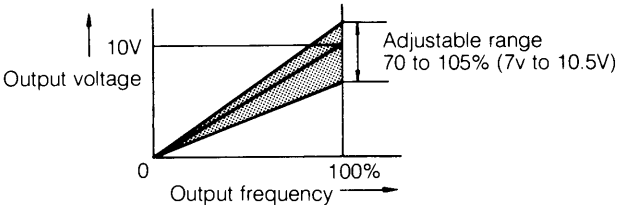
The external output frequency meter can be calibrated.
Pulse output or analog output can be selected with the internal switch (SW2) of the inverter.

FUNCTION	DATA	
40	30	Digital frequency monitor coefficient 6 to 100
50	100.0	Analog frequency meter calibration 70.0 to 105.0%

• Pulse output



• Analog output

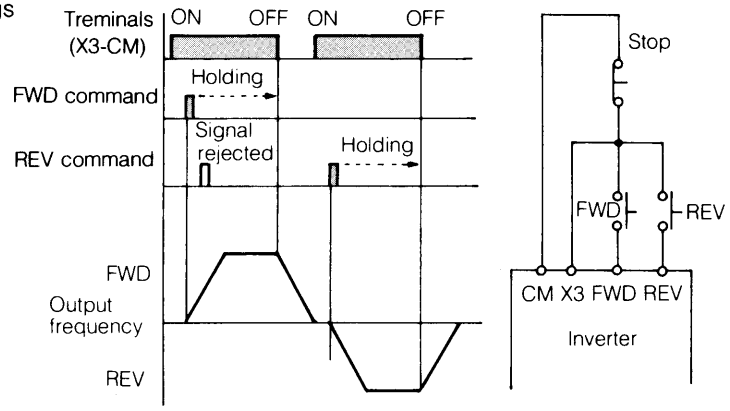


■ FWD/REV Command hold (3-wire control)

This function enables control by a momentary (50ms minimum) RUN/STOP command (FWD and REV command). The self-hold circuit can be omitted to simplify the circuit. When the function is selected, multistep frequency settings from 1 to 3 can be used, but those from 4 to 7 cannot.

Function Code No. 41

FUNCTION 41 DATA ---- Active: o Inactive: -

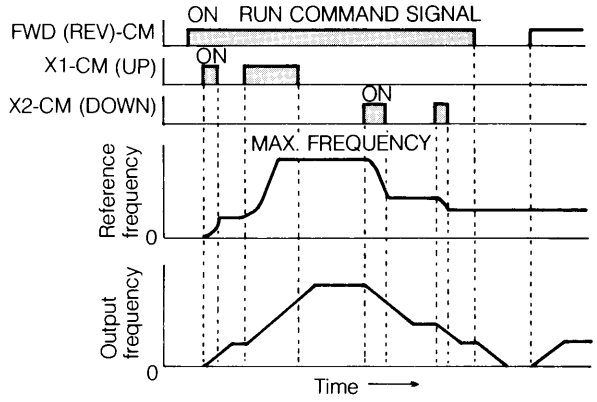


■ Up-down control

The frequency setting can be increased and decreased using the X1-CM and X2-CM terminal groups. This function is similar in operation to that of a motor driven potentiometer. The setting is retained even if the power supply is turned off. When operation is restarted, the frequency automatically increases to the set value.

Function Code No. 42

FUNCTION 42 DATA ---- Active: o Inactive: -



Note: 1) When this control function is selected, multistep, frequency setting 4 can de used. but the other 6 settings cannot.
2) Multistep frequency setting, FWD/REV command hold, and up-down control cannot be used simultaneously because the same terminals are used for these functions.
3) If up-down control is selected, operarion by the external voltage or current signal for frequency setting cannot be used.
4) If the Up and Down commands are input together, the Down command has priority.

Function Code					Teminal X1	Teminal X2	Teminal X3
23 to 25	26	27 to 29	41	42			
○	○	○	–	–	Multistep frequency setting		
–	○	–	–	○	UP-DOWN control		Multistep frequency setting 4
○	–	–	○	–	Multistep frequency setting 0 to 3		FWD/REV command hold
–	–	–	○	○	UP-DOWN control		FWD/REV command hold

○: Active –: Inactive

■ Restart after instantaneous power failure

Function Code No. 43

This function specifies whether the inverter is to be restarted automatically when power is restored after an instantaneous power failure. If automatic restart is selected, the inverter is restarted after power recovery under the following conditions:

1) The power failure duration is within the allowable time. (3-wire control)
2) The RUN command is input.

FUNCTION 43 DATA ___o

Active: o
Inactive: -

■ Undervoltage alarm

Function Code No. 44

If the DC intermediate circuit voltage drops to the under-voltage level, the inverter output is turned off. This function specifies whether an alarm signal is to be transmitted when this voltage drop occurs.
Selecting this function locks the inverter in a fault monitoring mode when an undervoltage occurs. The restart function(43) has priority over this function.

FUNCTION 44 DATA ___o

Active: o
Inactive: -

Setting	Inverter	Self-hold	Alarm display	Alarm signal
o	Stopped	on	on	on
-	Stopped	off	on	off

■ Output signal code selection (Open-collector)

Function Code No. 45

The RUN, FAR, FDT, OL,and LV terminals are used to output faults and operation monitoring signals. The output mode can be selected with this function. Three modes, 0, 1, and 2, can be selected. If mode 1 or 2 is selected, signals are output in a bit pattern.

FUNCTION 45 DATA ___0

0, 1, 2

Table(a) Output signal selection

Terminals	Setting		
	0	1	2
RUN	Inverter running	Individual fault output	Combinations of operation monitor and individual fault signals
FAR	Frequency equivalence detection		
FDT	Frequency level detection		
OL	Overload early warning	Overload early warning	
LV	Undervoltage alarm	Undervoltage alarm	

Individual fault output when "1" is set at Table (a).

Individual fault / Terminal symbol	OC Overcurrent	OU Overvoltage	LU Undervoltage	OL1 Inverter overload	OL2 Motor overload	OH1 Inverter overheat	OH2 External alarm	No fault
RUN	○	○	○	●	●	●	●	○
FAR	○	●	●	○	○	●	●	○
FDT	●	○	●	○	●	○	●	○

Note: ● : ON; ○ : OFF

Operation monitor output when"2" is set at Table (a) (while inverter is running)

Operation monitor				Terminal symbol				
Operating	Frequency equivalence detection (FAR)	Frequency level detection (FDT)	Overload early warning	LV	OL	FDT	FAR	RUN
□	□	□	□	○	○	○	○	○
■	□	□	□	○	●	○	●	○
■	□	■	□	●	●	○	●	○
■	■	□	□	○	○	●	●	○
■	■	■	□	●	○	●	●	○
■	□	□	■	○	●	●	●	○
■	□	■	■	●	●	●	●	○
■	■	□	■	○	○	○	○	●
■	■	■	■	●	○	○	○	●

Note: ■ : monitor signal available; □ : no monitor signal; ● : ON; ○ : OFF

Individual fault output when "2" is set at Table (a). (when inverter is tripped)

Individual fault	Terminal symbol				
	LV	OL	FDT	FAR	RUN
No falt	○	○	○	○	○
OC1 Acceleration overcurrent	●	○	○	○	○
OC2 Deceleration overcurrent	○	●	○	○	○
OC3 Constant-speed overcurrent	●	●	○	○	○
OU Overvoltage	○	○	●	○	○
LU Undervoltage	●	○	●	○	○
OL1 Inverter overload	○	●	●	○	○
OL2 Motor overload	●	●	●	○	○
OH1 Inverter overheat	○	○	○	●	○
OH2 External alarm	●	○	○	●	○

Note: ■ : ON; ■ : OFF

■ Slip compensation control

This function compensates for variations in speed caused by load fluctuations. The amount of slip frequency compensation is from 0.0 to 2.5Hz for the reted slip.

Function Code No. 46

FUNCTION	DATA	
46	0.0	Slip frequency 0.0 to 2.5Hz

■ Reversing operation with signal polarity

This function enables the direction of motor rotation to be changed according to the polarity (+,−) of the frequency setting voltage.

To operate the inverter with an external frequency setting potentiometer, turn on the switch between terminals FWD and CM. Apply a positive voltage (+10V DC) to terminal V1 to turn the motor in the forward direction, or apply negative voltage to the terminal to turn it in the reverse direction.

It the switch between terminals REV and CM is on, a positive voltage applied to terminal V1 turns the motor in the reverse direction and a negative voltage to the terminal turns it in the forward direction.

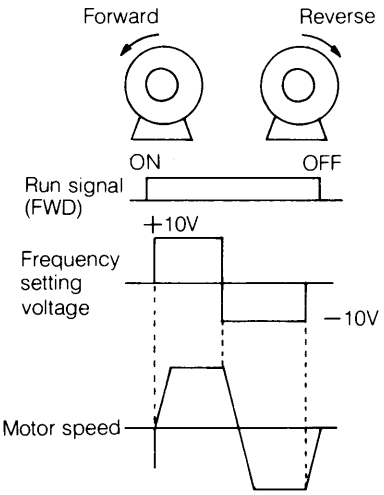
This means that the motor rotation direction can be changed only by changing the polarity of the setting voltage.

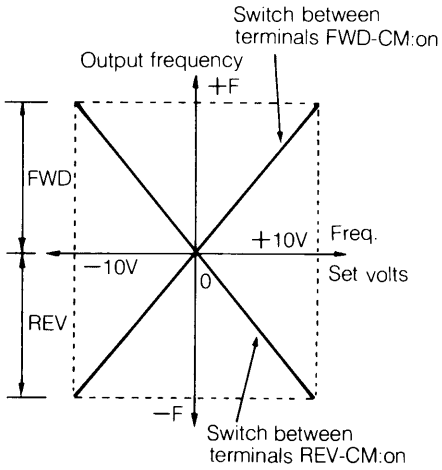
Note: When the multistep frequency setting function is used, Function code 47 is invalid.

Function Code No. 47

FUNCTION	DATA	
47	−	Active: o Inactive: −

Switch between terminals FWD-CM:on
Output frequency +F +10V Freq. Set volts FWD −10V 0
REV −F Switch between ferminals REV-CM:on
FWD





AUXILIARY PARAMETER SETTING (Appendix)

■ Analog ammeter calibration (option)

Function Code No. 51

When an analog I/O card (OPC Ⅱ-AIO) is used, an analog ammeter can be connected and output current measured.
Function code 51 is used for ammeter calibration (10VDC).
Adjustment can be made from 50.0% to 200.0%.
OPC Ⅱ-AIO is mounted inside the inverter.

FUNCTION	DATA	
5 1	1 0 0.0	Analog ammeter calibration 50-200%

■ Correction of motor primary resistance

Function Code No. 52

Function code 52 data need not to be changed when FUJI's standard motors are used.
The use of low-frequency operation of motors made by other manufactures requires that the function code 52 data be modified. The acceptable error range for torque calculation will be shortened and trip-free control enabled. Calculate the setting value as it follows:

$$\text{Setting value} = \frac{\text{Primary coil resistance of motor used}}{\text{Primary coil resistance of FUJI's standard 3-phase motor. (See the table)}} \times 100(\%)$$

Adjustment range: 50 to 200%

FUNCTION	DATA	
5 2	1 0 0.0	Correction of motor primary resistance

The table on the right shows primary resistances for FUJI's standard motors. FRENIC5000G7/P7 is designed based on these data.

Primary resistance for FUJI's standard motor

Motor capacity (kW)	200V series		400V series	
	Type *	R1(Ω)	Type *	R1(Ω)
30	30P7 / 30G7	0.0285	30P7 / 30G7	0.1141
37	37P7 / 37G7	0.0245	37P7 / 37G7	0.0979
45	45P7 / 45G7	0.0187	45P7 / 45G7	0.0748
55	55P7 / 55G7	0.0145	55P7 / 55G7	0.0579
75	75P7 / 75G7	0.0098	75P7 / 75G7	0.0391
90	90P7 / 90G7	0.0078	90P7 / 90G7	0.0311
110	110P7	0.0060	110P7 / 110G7	0.0241
132			132P7 / 132G7	0.0191
160			160P7 / 160G7	0.0150
200			200P7 / 200G7	0.0113
220			220P7 / 220G7	0.0100
280			280P7	0.0074

* Abbreviation

■ Manufacturer use function

Function Code No. 99

Function code: 99
Function code 99 is used for manufactures of machines in which FUJI's inverters are used. This code is not used for ordinary users.

FAILURE MESSAGE

■ Fault display

The fault display function performs three functions.
1) Displays present faults
2) Displays the operation status when the fault occurs.
3) Displays a record of immediately previous 3 faults.

If a fault occurs, the fault monitoring mode is set automatically.

F0 Faults display *
F1 Output frequency *
F2 Reference frequency *
F3 Output current *
F4 Operation mode *
F5 Fault memory 1
F6 Fault memory 2
F7 Fault memory 3
* mark: when the first fault occured

Function	Data				Message
F0	1. to 7.	0	C	1	Overcurrent during acceleration
		0	C	2	Overcurrent during deceleration
		0	C	3	Overcurrent during constant speed running
			0	U	Overvoltage
			L	U	Undervoltage
		0	H	1	Inverter overheating
		0	H	2	External fault
		0	L	1	Inverter overload
		0	L	2	Motor overload
—	E	r	r	0	CPU error
	E	r	r	d	Memory errpr
F1		6	0.	0	Output frequency
F2		6	0.	0	Reference frequency
F3	1	0	0.	0	Output current
F4	1. to 4.		F	0	Forward rotation
			r	E	Reverse rotation
			C	L	Current limit
			U	L	Voltage limit
			U	U	Undervoltage limit
F5					1st order fault (1st prior event)
F6					1st order fault (2nd prior event)
F7					1st order fault (3rd prior event)

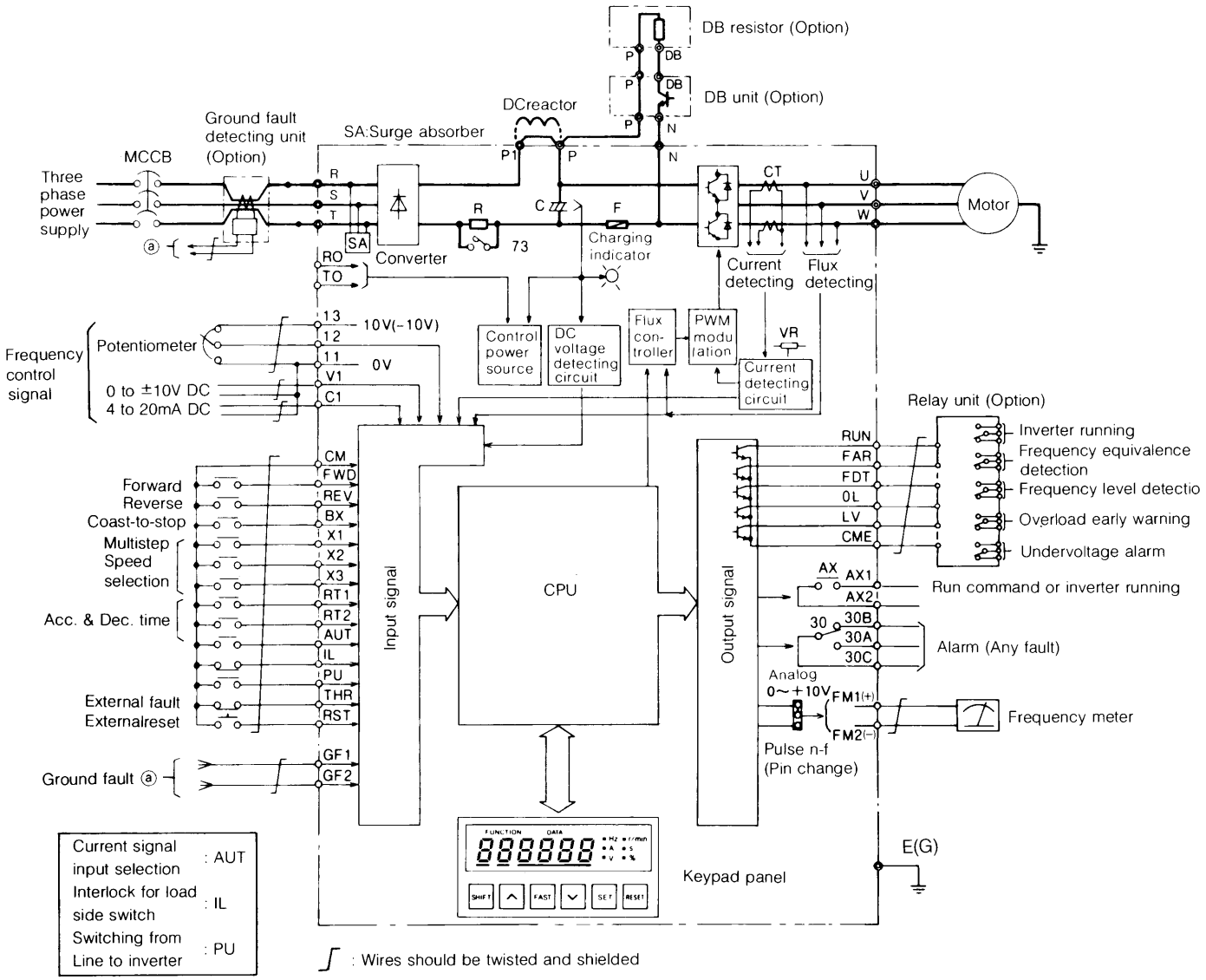
Notes: 1) Function code F0 is not displayed at cpu error or memory error.
2) Data of F1 to F3 shown here is examples.

■ Protection functions

Display	Function	Description
-	Stall prevention	The accceleration time is automatically extended to avoid an overcurrent trip due to quick acceleration. The deceleration time is also automatically extended to avoid an overcurrent or an overvoltage trip due to quick deceleration.
CL	Current limiting	Inverter output current is automatically limited if it reaches the limit level.
-	Instantaneous power failure	When the power failure occurs, the motor is driven fifteen milliseconds at full load. (Running time will be longer on light load).
LU	Undervoltage protection	• When the DC intermediate circuit voltage drops to the undervoltage level, the inverter immediately shuts down and holds the trip status. • If power failure continues and the control voltage in the inverter is lost, and the inverter will de reset automatically.
OC1 OC2 OC3	Overcurrent protection (Short-circuit and Ground fault)	If the inverter output current reaches the overcurrent protection level, the inverter immediately shuts down. and holds the trip status. The overcurrent trip indication is divided into 3 types. OC1 : Overcurrent detection during acceleration OC2 : Overcurrent detection during deceleration OC3 : Overcurrent detection during running at constant-speed The inverter can de protected from ground fault by adding an optional ground fault detection unit. Since the ground fault detection unit protects the inverter, an earth leakage circuit breaker (ELCB) must be used to prevent injury or accident.
OU	Overvoltage protection	If the DC intermediate circuit voltage reaches the overvoltage protection level, the inverter immediately shuts down.
-	Input surge protection	The inverter can be protected from 5kV standard impact wave voltage which will invade from the main circuit power.
OL1	Inverter overload protection	If the load exceeds the overload capacity (inverse-time characterisic) of the inverter, the inverter immediately shuts down.
OH1	Inverter overheating protection	If the heat sink of the inverter overheats or the temperature inside the inverter exceeds the limit, the inverter immediately shuts down.
OL2	Motor overload protection (Electronic thermal overload relay)	When only one motor is driven, the motor can be protected from an overload without an external thermal overload relay. Since the electronic thermal overload relay is designed with consideration also given to the low cooling effect in the low-speed range, this protection works over a wide range. When driving several motors, attach a thermal overload relay to each motor for protection.
OH2	External fault protection	If the thermostat of the braking unit or braking resistor (options) or the external thermal overload relay for motor protection is active, the inverter immediately shuts down.
Err0	CPU error protection	If a CPU error occurs inside the inverter, the inverter shuts down.
Err4	Memory error protection	If a memory error occurs inside the inverter, the inverter shuts down.

11-4 Terminals

(1) Composition of main circuit and terminals



(2) Terminal Function

① Main circut

Symbol	Terminal	Description
R, S, T	Main circuit (Input)	Connect a three-phase power supply.
U, V, W	Inverter output	Connect a three-phase motor
P, N	Braking unit connection	Connect the braking unit (option). The braking resistor must be connected via the breaking unit.
P, P1	DC reactor connection	Connect a DC reactor for power-factor correcting (option). (See page 30)
G(G)	Ground terminal	Ground terminal for the inverter chassis (housing) (Be sure to ground the chassis to prevent electrical shock and to reduce radio interference noise.)

② Control circuit

Type	Symbol	Terminal	Description	
Control power supply	R0, T0	Auxiliary control power supply	Connect a single-phase AC power supply to back up the control circuit power supply	
Frequency setting and monitoring	11	Frequency control common	Frequency setting signal terminal (common reference voltage for terminals 12, 13, V1, and C1)	
	13	Frequency control power supply	Use this terminal for the frequency setting POT: +10V DC, 1kΩ. −10V DC can also be output by changing the internal pin connection. (The output is set to +10V DC at the factory.)	
	12	Frequency control input terminal	0V to ±10V DC, input resistance: 22kΩ Maximum output frequency at ±10V DC	The frequency based on the sum of setting signals 12 and V1 is output. When the input voltage is 0V to ±5V DC, select and set Function code 18.
	V1	Voltage process signal	0V to ±10V DC, input resistance: 22kΩ Minimum output frequency at ±10V DC	
	C1	Current process signal	4mA to 20mA DC, input resistance: 250Ω Minimum output frequency at 4mA and maximum output frequency at 20mA C1: +, 11: −	
	FM1, FM2	Frequency meter connection	0 V to 10 V DC (maximum frequency at 10V) Two voltmeters each having an internal resistance of 10kΩ, can be connected. Pulse signals can be output by changing the internal setting pins (SW2). FM1: +, FM2: −	
Contact input	CM	Contact input common	Common terminal for contact input signals	
	AUT	Current input selection	Specify an input signal when both voltage and current signals are available for frequency setting. AUT-CM ON: current input, OFF: voltage and frequency setting POT inputs	
	FWD	Forward operation or stop command	FWD-CM ON: forward, OFF: stop	The motor stops when both FWD and REV are on or off together.
	REV	Reverse operation or stop command	REV-CM ON: reverse, OFF: stop	
	X1, X2, X3	Multistep frequency selection	Up to 8 frequencies can be set by turning on and off the external contact signals.	
	X1, X2	Up-down control	Function of terminals X1 and X2 changes by making Function code 42 active. X1-CM ON: UP (frequency increase), X2-CM ON: DOWN (frequency decrease)	
	X3	FWD/REV command hold	Function of terminal X3 changes by making Function code 41 active. X3-CM ON: Self-holds FWD or REV momentary signals input (pulse width: 50 ms or more)	
	RT1, RT2	Acc./dec. time selection 2, 3, or 4	The 4 acceleration or deceleration times can be selected by turning on and off the external contact signals.	
	BX	Coast-to-stop command	BX-CM ON: Instantaneous stop of inverter output with no alarm signals. Since the self-hold function does not work, turning off BX will restore the inverter if FWD or REV are still on.	
	PU	Switching operation from line to inverter	The inverter is ready when the terminals PU and CM are shorted. Turning off the switch after the specified time changes over from line to inverter operation.	
	IL	Interlock for load side switch	If a switch is installed between the inverter and the motor, the auxiliary contact (NC contact) is connected.	
	THR	External fault input	If the connection between terminals THR and CM is opened, the inverter output is turned off and a motor coast-to-stop results. (OH2 trip) This input signal is self-held internally.	
	RST	Alarm reset	If the terminals RST and CM are shorted while the inverter is tripped, the protection function is cancelled.	

Control circuit (Cont'd)

Type	Symbol	Terminal	Description	
Open-collector output	CME	Open-collector output common	This is the common terminal for open-collector outputs.	Open-collector output 50mA max. 27V max. These terminals can also output individual faults. For details, refer to page 49 and 50.
	RUN	Inverter running	An on signal is output between RUN and CME at and above the starting frequency. This signal is turned off when the inverter is not operating, the motor coasts-to-stop or during DC braking.	
	FAR	Frequency equivalence detection	When the output frequency is in the range of the reference frequency ±△fHz, an on signal is output between FAR and CME. (△f: 0.5 to 5Hz variable)	
	FDT	Frequency level detection	An on signal is output between FDT and CME when the output frequency is higher than the preset detection level. The signal is turned off when the output frequency is below the detection level.	
	OL	Overload early warning	An on signal is output between OL and CME when the output current is larger than the preset overload alarm level. The signal is turned off when it is smaller. (Adjustment range: 50% to 105%)	
	LV	Undervoltage	An on signal is output between LV and CME when the inverter output is turned off due to undervoltage. This signal is not output for about 1.5sec. after power-up in order for power supplies to stabilize.	
Contact output	AX1, AX2	Run command or inverter running	This signal is used to open or close the contactor on the power supply side. Aux. power supply (R0-T0) required.	Contact capacity: 250V AC, 0.3A ($\cos\phi = 0.3$)
	30A, 30B, 30C	Alarm output (Any fault)	An signal is output when the protection functions of the inverter are active and when the inverter tripps. (Contact: 1SPDT, 30A-30C: on the inverter trips)	
Protection	GF1,GF2	Ground fault detection input	This is the input terminal for the ground fault detection unit (option) to protect the inverter.	

(3) Terminal arrangement and size of terminal screw

① Terminal arrangement figures

Fig. A

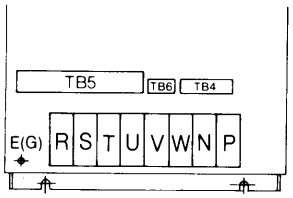


Fig. B

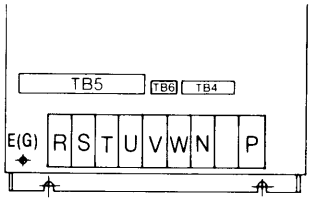


Fig. C

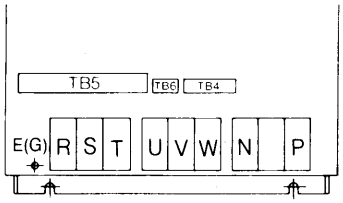


Fig. D

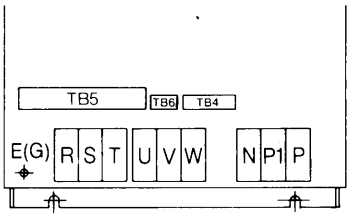


Fig. E

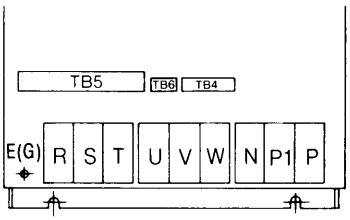


Fig. F

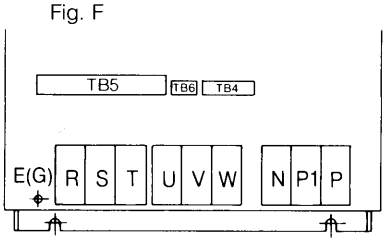


Fig. G

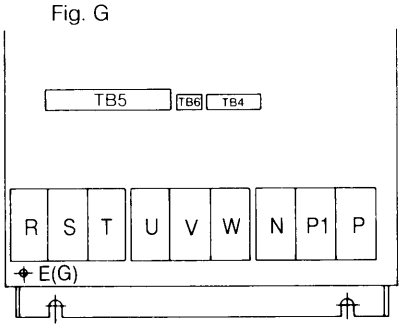


Fig. H

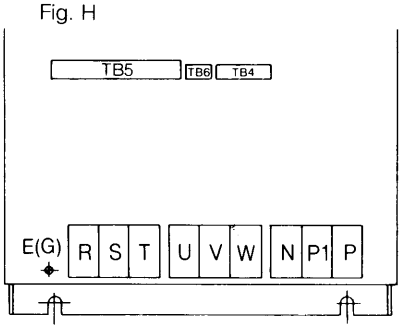


Fig. J

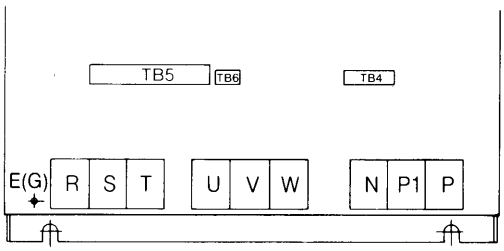


Fig. K

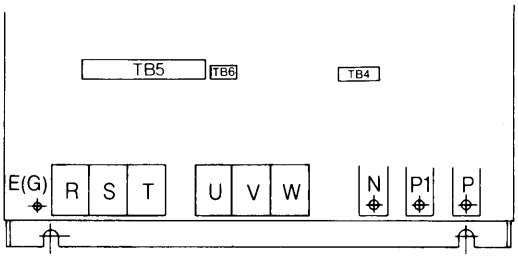


Fig. L

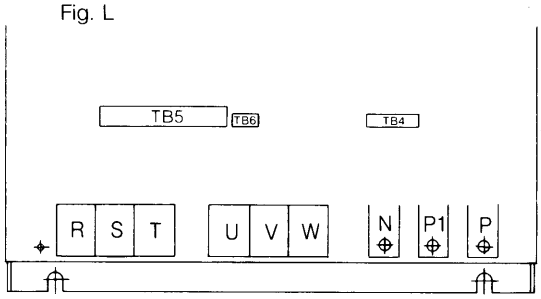


Fig. M

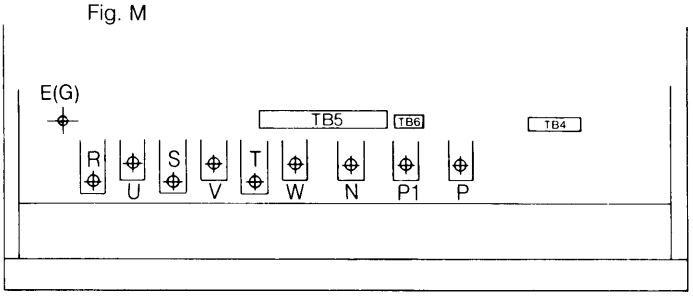
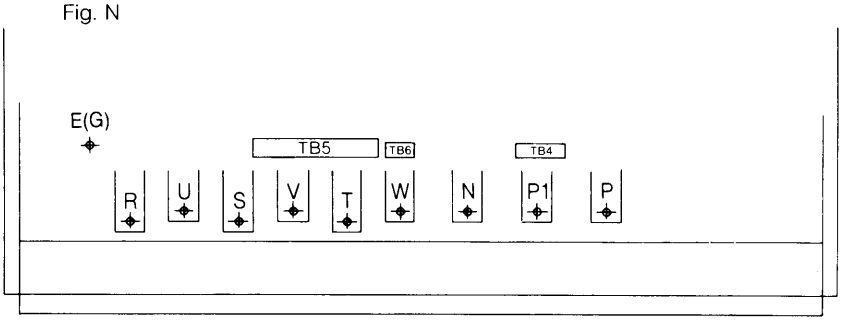
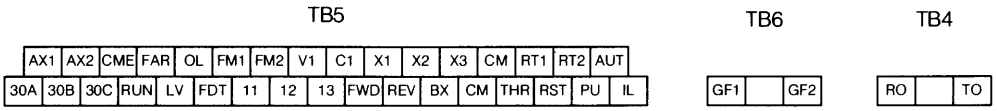


Fig. N



② Arrangement figure of control circuit terminals



③ Table of terminal arrangements and terminal screw sizes

Voltage	Applicable motor output [kW]	Inverter type	Figure	Screw size						
				Main circuit terminals				Control circuit terminals		
				L1, L2, L3	U, V, W	(+), P1, (−)	GND (PE)	TB4	TB5	TB6
200V Series	3.7	FRN003G7-2	A	M4	M4	M4	M4	M4	M3	M3
	5.5	FRN005G7-2	B	M5	M5	M5	M5			
	7.5	FRN007G7-2								
	11	FRN011G7-2								
	15	FRN015G7-2	C	M6	M6	M6	M6			
	18.5	FRN018G7-2		M8	M8	M8				
	22	FRN022G7-2	E							
	30	FRN030G7/P7-2								
	37	FRN037G7/P7-2	F				M8			
	45	FRN045G7/P7-2	G	M10	M10	M10				
	55	FRN055G7/P7-2								
	75	FRN075G7/P7-2	K			φ11				
	90	FRN090G7/P7-2	M	φ13	φ13	φ13	M10			
	110	FRN110P7-2								
400V Series	3.7	FRN003G7-4	A	M4	M4	M4	M4			
	5.5	FRN005G7-4								
	7.5	FRN007G7-4								
	11	FRN011G7-4	B	M5	M5	M5	M5			
	15	FRN015G7-4								
	18.5	FRN018G7-4	C	M6	M6	M6	M6			
	22	FRN022G7-4								
	30	FRN030G7/P7-4	D							
	37	FRN037P7-4	E	M8	M8	M8				
		FRN037G7-4	F				M8			
	45	FRN045G7/P7-4								
	55	FRN055G7/P7-4								
	75	FRN075P7-4	H							
		FRN075G7-4	J	M10	M10	M10				
	90	FRN090G7/P7-4								
	110	FRN110G7/P7-4								
	132	FRN132G7/P7-4	L			φ11				
	160	FRN160G7/P7-4	M	φ13	φ13	φ13	M10			
	200	FRN200P7-4								
		FRN200G7-4	N							
	220	FRN220G7/P7-4								
	280	FRN280P7-4								

12. Options

(1) Reactors

① Line side AC reactors

Fig. A

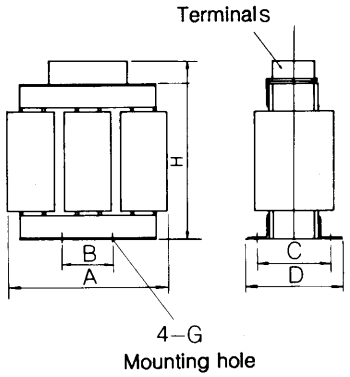


Fig. B

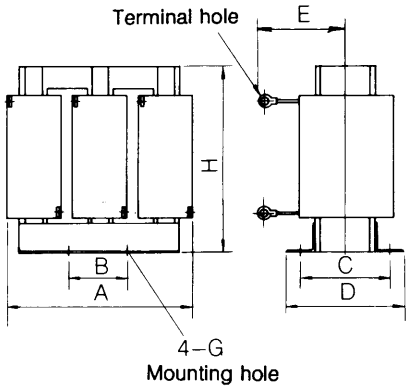
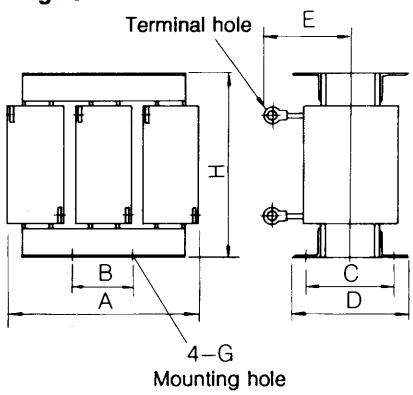


Fig. C



Voltage	Applicable motor output [kW]	Inverter type	Reactor type	Figure	Dimensions [mm]								Power loss [W]	Weight [kg]
					A	B	C	D	E	G	H	Terminal hole diameter		
200V Series	3.7	FRN003G7-2	ACR-5.5	A	185	60	80	100	—	7×10	157	M5	10.1	6
	5.5	FRN005G7-2											18.8	
	7.5	FRN007G7-2	ACR2-7.5	B	120	65	80	96	98	6×10	93	6.4	17.2	4
	11	FRN011G7-2	ACR2-15	B	180	60	75	96	102	7×11	115	8.4	20.2	6
	15	FRN015G7-2											33.3	
	18.5	FRN018G7-2	ACR2-18.5	B	180	60	75	96	102	7×11	115	8.4	31.4	6.5
	22	FRN022G7-2	ACR2-22	B	180	60	75	96	102	7×11	170	8.4	39.3	8
	30	FRN030G7/P7-2	ACR2-37	B	190	60	90	120	170	7×11	190	8.4	28.6	11
	37	FRN037G7/P7-2											40.8	
	45	FRN045G7/P7-2	ACR2-55	C	190	60	90	120	200	7×10	190	13	47.1	12
	55	FRN055G7/P7-2											66.1	
	75	FRN075G7/P7-2	ACR2-75	C	250	100	90	120	200	9×14	250	13	55.1	25
	90	FRN090G7/P7-2	ACR2-90	C	285	190	120	158	190	12×20	210	13	61.5	26
	110	FRN110P7-2	ACR2-110	C	280	150	110	138	200	10×20	270	13	83.4	30
400V Series	3.7	FRN003G7-4	ACR4-5.5	B	120	65	70	90	98	6×10	93	6.4	7.6	3
	5.5	FRN005G7-4											14.3	
	7.5	FRN007G7-4	ACR4-7.5	B	120	65	80	96	98	6×10	93	6.4	12.8	4
	11	FRN011G7-4	ACR4-22	B	180	60	75	96	102	7×10	170	6.4	10.9	8
	15	FRN015G7-4											18.5	
	18.5	FRN018G7-4											26.9	
	22	FRN022G7-4											35.8	
	30	FRN030G7/P7-4	ACR4-37	B	190	60	90	120	170	7×10	190	8.4	38.9	11
	37	FRN037G7/P7-4											55.7	
	45	FRN045G7/P7-4	ACR4-55	C	190	60	90	120	200	7×10	190	10.5	50.2	12
	55	FRN055G7/P7-4											70.7	
	75	FRN075G7/P7-4	ACR4-75	C	190	60	90	126	197	7×10	190	11	65.3/89.1	12
	90	FRN090G7/P7-4	ACR4-110	C	250	100	105	136	202	9.5×18	245	13	42.2	24
	110	FRN110G7/P7-4											60.3	
	132	FRN132G7/P7-4	ACR4-132	C	250	100	115	146	210	9.5×18	250	13	119	32
	160	FRN160G7/P7-4	ACR4-220	C	320	120	110	150	240	12×20	300	13	56.4	40
	200	FRN200G7/P7-4											90.4	
	220	FRN220G7/P7-4											107	
	280	FRN280P7-4	ACR4-280	C	380	130	110	150	260	12×20	300	13	108	52

② Power factor correcting DC reactors

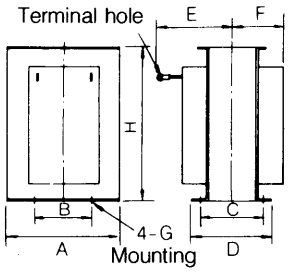


Fig. A

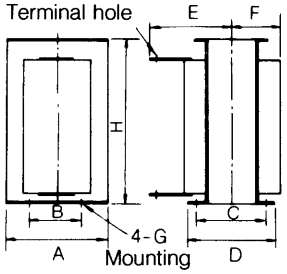


Fig. B

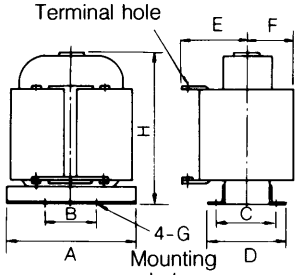


Fig. C

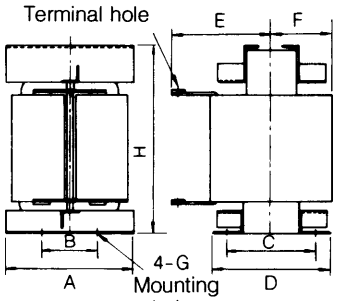


Fig. D

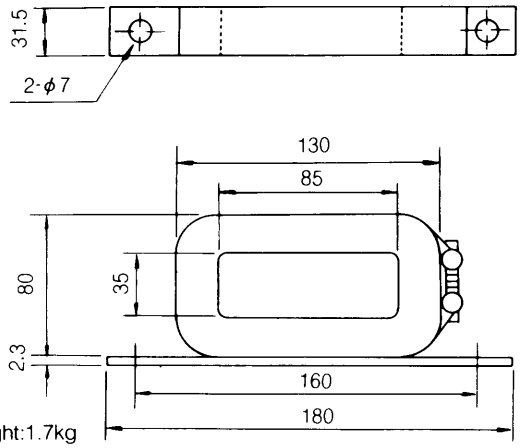
Voltage	Applicable motor output [kW]	Inverter type	Reactor type	Figure	Dimensions [mm]									Power loss [W]	Weight [kg]
					A	B	C	D	E	F	G	H	Terminal hole diameter		
200V Series	22	FRN022G7-2	DCR2-22	A	155	75	90	116	105	70	9×15	210	10.5	45.5	14
	30	FRN030G7/P7-2	DCR2-30	A	146	75	100	126	130	70	9×15	210	10.5	50.1	16
	37	FRN037G7/P7-2	DCR2-37	B	156	80	100	126	110	70	9×15	260	10	60.4	19
	45	FRN045G7/P7-2	DCR2-45	B	156	80	110	136	130	75	9×15	260	10	71.0	23
	55	FRN055G7/P7-2	DCR2-55	B	170	85	110	136	130	75	9×15	300	10	84.4	28
	75	FRN075G7/P7-2	DCR2-75	C	200	80	95	126	180	75	10×16	240	12	91.0	19
	90	FRN090G7/P7-2	DCR2-90	D	180	100	100	131	150	75	10×15	275	15	116	22
	110	FRN110P7-2	DCR2-110	D	200	100	120	141	150	80	10×15	290	15	176	25
400V Series	30	FRN030G7/P7-4	DCR4-30	A	150	75	85	111	155	70	9×15	210	8.4	46.2	14
	37	FRN037G7/P7-4	DCR4-37	A	146	75	100	126	155	70	9×15	210	8.4	37.7	17
	45	FRN045G7/P7-4	DCR4-45	A	146	75	115	141	180	75	9×15	210	10.5	42.8	21
	55	FRN055G7/P7-4	DCR4-55	A	146	75	130	156	190	85	9×15	210	10.5	48.4	25
	75	FRN075G7/P7-4	DCR4-75	D	200	70	120	151	160	80	10×16	250	10.5	68.0	25
	90	FRN090G7/P7-4	DCR4-90	D	220	70	140	171	165	85	10×16	280	13	68.0	32
	110	FRN110G7/P7-4	DCR4-110	D	220	70	150	181	170	95	10×16	290	13	83.0	36
	132	FRN132G7/P7-4	DCR4-132	D	190	80	146	177	180	90	11	360	13	81.3	40
	160	FRN160G7/P7-4	DCR4-160	D	220	90	140	171	200	90	12×20	350	12	92.9	45
	200	FRN200G7/P7-4	DCR4-200	D	230	100	140	181	180	110	12×20	310	15	112	50
	220	FRN220G7/P7-4	DCR4-220	D	230	100	150	201	180	110	12×20	320	15	118	50
	280	FRN280P7-4	DCR4-280	D	230	100	160	211	180	110	12×20	340	15	170	58

Note: The following inverters are provided as standard with separately supplied a power factor correcting DC reactor.
① Inverter of 75kW and above (G7 series 200/400V class)
② Inverter of 75kW and above (P7 series 200V class)
③ Inverter of 90kW and above (P7 series 400V class)
When installing inverters, be sure to connect this reactor.

③ Radio frequency interference (RFI) suppressing reactor

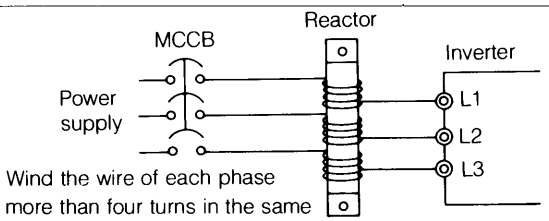
Dimensions

Type:ACL-10A unit[mm]

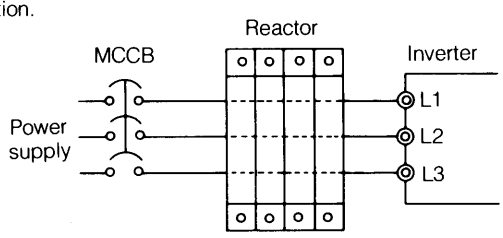


Weight:1.7kg

How to use



Wind the wire of each phase more than four turns in the same direction.



If the wire is too thick to wind, stack four reactors and run the wires through them.

④ Noise suppressing AC reactor

Fig. A

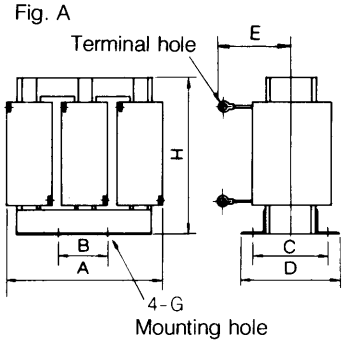


Fig. B

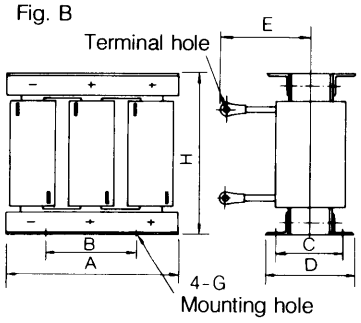
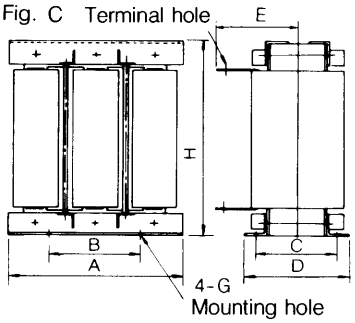


Fig. C



Voltage	Applicable motor output [kW]	Inverter type	Reactor type	Figure	Dimensions [mm]								Power loss [W]	Weight [kg]
					A	B	C	D	E	G	H	Terminal hole diameter		
200V Series	3.7	FRN003G7-2	NR2-5.5	A	185	60	90	116	158	7×11	190	6.4	67.6	12
	5.5	FRN005G7-2											73.6	
	7.5	FRN007G7-2	NR2-15	A	240	100	105	126	163	10×16	250	8.4	87.4	25
	11	FRN011G7-2											98.7	
	15	FRN015G7-2											112	
	18.5	FRN018G7-2	NR2-22	A	235	100	115	146	173	10×16	250	8.4	142	35
	22	FRN022G7-2											153	
	30	FRN030G7/P7-2	NR2-55	B	320	120	110	150	230	12×20	300	10.5	197	55
	37	FRN037G7/P7-2											207	
	45	FRN045G7/P7-2											221	
	55	FRN055G7/P7-2											239	
	75	FRN075G7/P7-2	NR2-75	B	300	150	115	156	200	12×20	310	13	196	53
	90	FRN090G7/P7-2	NR2-90	B	360	180	140	188	220	12×20	350	10.5	276	85
	110	FRN110P7-2	NR2-110	B	390	200	150	198	200	12×24	360	13	354	95
400V Series	3.7	FRN003G7-4	NR4-7.5	A	220	75	85	111	85.5	7×11	180	5.3	49.1	13
	5.5	FRN005G7-4											59.5	
	7.5	FRN007G7-4											72.0	
	11	FRN011G7-4	NR4-11	A	240	100	115	146	113	10×16	215	6.4	97.3	20
	15	FRN015G7-4	NR4-15	A	260	100	115	146	123	10×16	215	6.4	95.0	25
	18.5	FRN018G7-4	NR4-18.5	A	260	100	125	156	138	10×16	215	6.4	116	28
	22	FRN022G7-4	NR4-22	A	260	100	130	161	140.5	10×16	220	8.4	104	32
	30	FRN030G7/P7-4	NR4-30	B	240	160	120	156	150	12×20	280	8.4	139	32
	37	FRN037G7/P7-4	NR4-37	B	250	160	120	156	150	12×20	290	8.4	154	38
	45	FRN045G7/P7-4	NR4-45	B	270	180	120	156	160	12×20	300	8.4	176	42
	55	FRN055G7/P7-4	NR4-55	B	300	180	130	156	182	12×20	300	8.4	195	53
	75	FRN075G7/P7-4	NR4-75	B	350	180	130	178	190	12×20	340	10.5	237	68
	90	FRN090G7/P7-4	NR4-90	B	360	180	140	188	200	12×20	350	10.5	255	80
	110	FRN110G7/P7-4	NR4-110	B	380	200	150	198	200	12×20	360	13	281	95
	132	FRN132G7/P7-4	NR4-132	C	380	200	180	233	180	15×24	430	15	389	120
	160	FRN160G7/P7-4	NR4-160	C	400	200	200	256	170	15×24	460	15	377	150
	200	FRN200G7/P7-4	NR4-200	C	350	200	210	273	190	15×24	500	15	456	180
	220	FRN220G7/P7-4	NR4-220	C	350	200	225	288	200	15×24	550	15	527	200
	280	FRN280P7-4	NR4-280	C	450	300	200	268	275	15×20	470	13	711	165

(2) Braking unit (transistor switch) and resistors

Please refer to page 12 for connection

Voltage	200V Series							400V Series						
Applicable motor output [kW]	Inverter type	Braking unit		Braking resistor				Inverter type	Braking unit		Braking resistor			
		Type	QT.	Type	QT.	Capacity [kW]	Resistance [Ω]		Type	QT.	Type	QT.	Capacity [kW]	Resistance [Ω]
3.7	FRN003G7-2	BU007-2A	1	DBH003-2A	1	0.6	30	FRN003G7-4	BU007-4A	1	DBH003-4A	1	0.6	120
5.5	FRN005G7-2			DBH007-2A	1	1.2	12	FRN005G7-4			DBH007-4A	1	1.2	50
7.5	FRN007G7-2							FRN007G7-4						
11	FRN011G7-2	BU015-2A	1	DBH015-2A	1	2.4	8.0	FRN011G7-4	BU015-A4	1	DBH015-4A	1	2.4	30
15	FRN015G7-2							FRN015G7-4						
18.5	FRN018G7-2	BU030-2A	1	DBH022-2A	1	3.0	5.0	FRN018G7-4	BU037-4A	1	DBH022-4A	1	3.0	20
22	FRN022G7-2							FRN022G7-4						
30	FRN030G7/P7-2			DBH030-2A	1	3.6	4.0	FRN030G7/P7-4			DBH030-4A	1	3.6	15
37	FRN037G7/P7-2	BU055-2A	1	DBH037-2A	1	4.8	3.0	FRN037G7/P7-4			DBH037-4A	1	4.8	12
45	FRN045G7/P7-2			DBH045-2A	1	6.0	2.5	FRN045G7/P7-4	BU055-4A	1	DBH045-4A	1	6.0	10
55	FRN055G7/P7-2			DBH055-2A	1	7.2	2.0	FRN055G7/P7-4			DBH055-4A	1	7.2	7.5
75	FRN075G7/P7-2	BU075-2A	1	DBH037-2A	2	9.6	1.5	FRN075G7/P7-4	BU110-4A	1	DBH037-4A	2	9.6	6.0
90	FRN090G7/P7-2	BU055-2A	2	DBH045-2A	2	12.0	1.25	FRN090G7/P7-4			DBH045-4A	2	12.0	5.0
110	FRN110P7-2			DBH055-2A	2	14.4	1.0	FRN110G7/P7-4			DBH055-4A	2	14.4	3.75
132	—	—	—	—	—	—	—	FRN132G7/P7-4	BU132-4A	1				
160	—	—	—	—	—	—	—	FRN160G7/P7-4	BU110-4A	2				
200	—	—	—	—	—	—	—	FRN200G7/P7-4						
220	—	—	—	—	—	—	—	FRN220G7/P7-4						
280	—	—	—	—	—	—	—	FRN280P7-4	BU132-4A	2				

Common specification

Braking torque [%]	100
Braking duty [%ED]	5 (allowable duration: 5sec.) *2
Protective function	If the braking unit or resistor overheats, braking unit transistors are shut down and the inverter protective function is active.
Ambient temperature	−10 to +50℃
Painted color	Braking mat: Munsell 5Y3/0.5 half-polish Braking resistor: Munsell N1,2 half-polish

*1 Total value, not for one resistor. *2 Continuous durable time of braking unit: 60 sec.

① Braking unit

Fig. A

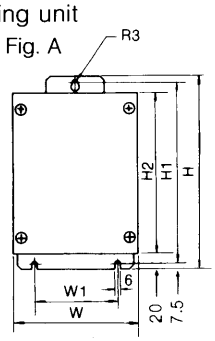
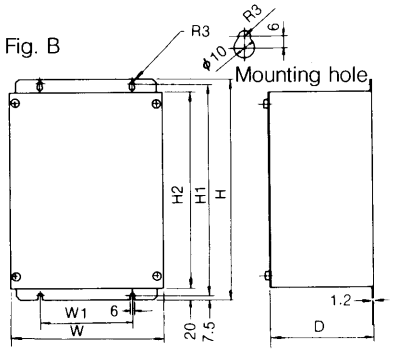


Fig. B



Voltage	Type	Figure	Dimensions [mm]						Terminal arrangement screw size			Weight [kg]
			W	W1	H	H1	H2	D	Figure	P, N, DB	1,2,E,(I1,I2,01,02)	
200V Series	BU007-2A	A	150	100	220	205	180	130	C	M4	M4	4
	BU015-2A											
	BU030-2A		150	100	240	225	200	150	D	M5		5
	BU055-2A	B	230	130	240	225	200	170	E	M6		7
	BU075-2A		250	150	370	355	330	170	D	M8		11
400V Series	BU007-4A	A	160	100	280	265	240	130	C	M4	M4	5
	BU015-4A											
	BU037-4A	B	180	100	280	265	240	160	D	M5		6
	BU055-4A		230	130	280	265	240	160				6
	BU110-4A		250	150	400	385	360	170	E	M6		12
	BU132-4A								F	M8		

Fig. C Terminal arrangement

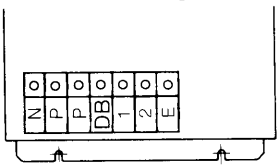


Fig. D

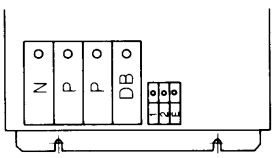


Fig. E

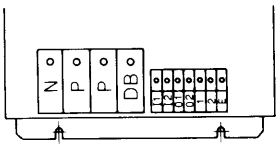
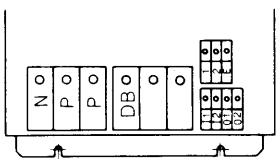
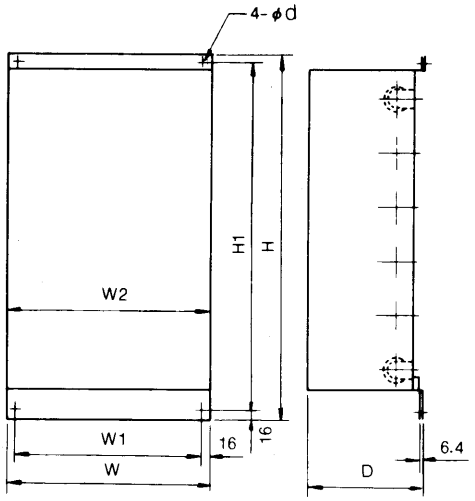


Fig. F



2. Braking resistor



Voltage	Type	Dimensions [mm]							Terminal arrangement and screw size			Weight [kg]
		W	W1	W2	H	H1	D	d	Figure	P, DB	1, 2, E	
200V Series	DBH003-2A	330	298	330	242	210	140	8	A	M4	M4	4
	DBH007-2A	400	368	400	280	248		10				6
	DBH015-2A				480	448						9
	DBH022-2A				660	628			B	M5		11
	DBH030-2A											
	DBH037-2A						240					15
	DBH045-2A									M6		20
	DBH055-2A			405	750	718						25
400V Series	DBH003-4A	350	318	350	280	248	140	8	A	M4	M4	5
	DBH007-4A	420	388	420	390	358		10				9
	DBH015-4A											
	DBH030-4A				660	628						11
	DBH037-4A											15
	DBH045-4A						240		B	M5		20
	DBH055-4A			425	750	718						25

Fig. A

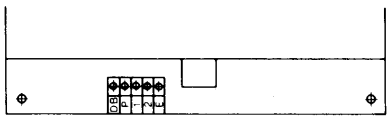
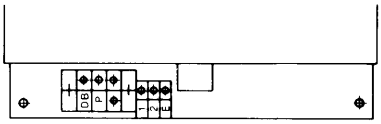
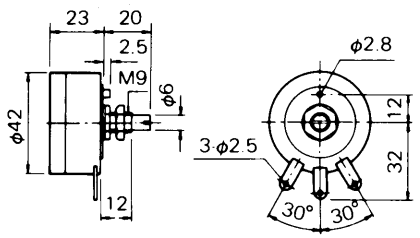


Fig. B

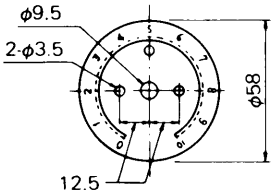


(3) Parts of control circuit

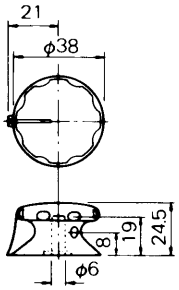
① Potentiometer for frequency control
Type: WAR3W-1kΩ(3W)B-characteristics



Scale plate Type: 60P

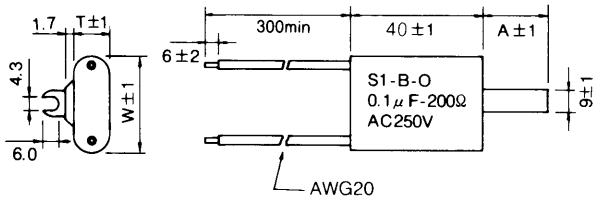


Knob Type: 40N



Note: Scale plate and knob are sold separately from POT itself.

② Surge absorber (Noise suppressor)
S1-B-0, S2-A-0



Type	Use with	Capacitance (F)	Resistance (Ω)	Dimensions, mm			
				W	H	T	A
S-1-B-0	Control relay or timer	0.1	200 (1/2W)	17.5	40	9.1	20.0
S-2-A-0	Magnetic contactor	0.2	500 (1/2W)	27.5	40	10.4	30.0

Circuit voltage: less than 250V (Products of Okatani electric Industries)

13. Distribution & Control equipment

Voltage	Applicable motor output	Inverter type	AC Line Side (R,S,T)						Inverter output side (U,V,W)	DC reactor (P1,P)	Braking unit (P,N)	Ground (E(G))
			Without AC reactor			With AC reactor						
			MCCB ( ): Interrupting capacity	Magnetic contactor	Wire [mm²]	MCCB	Magnetic contactor	Wire [mm²]	Wire [mm²]	Wire [mm²]	Wire [mm²]	Wire [mm²]
200V Series	3.7	FRN003G7-2	EA53B/30 (5)	SC-2N	3.5×2 (5.5)	EA53B/20	SC-5-1	5.5 (5.5)	3.5 (2.0)	—	3.5 (3.5)	5.5
	5.5	FRN005G7-2	EA53B/50 (5)	SC-2SN	14 (5.5)	EA53B/30	SC-1N		5.5 (2.0)			
	7.5	FRN007G7-2	EA63B/60 (5)	SC-3N	8×2 (14)	EA53B/40	SC-2N	8 (5.5)	8 (3.5)			
	11	FRN011G7-2	EA103B/75 (25)	SC-4N	14×2 (22)	EA63B/60	SC-3N	14 (14)	14 (5.5)		5.5 (3.5)	
	15	FRN015G7-2	EA103B/100 (25)	SC-5N	38 (22)	EA103B/75		14×2 (22)	22 (14)			
	18.5	FRN018G7-2	EA203B/125 (25)	SC-6N	60 (38)	EA103B/100	SC-5N	38 (22)	38 (14)		8 (5.5)	14
	22	FRN022G7-2	EA203B/150 (25)			EA203B/125	SC-6N	60 (38)	38 (22)	60 (22)		
	30	FRN030G7/P7-2	EA203B/175 (25)	SC-8N	38×2 (60)	EA203B/150	SC-7N	38×2 (38)	60 (38)	38×2 (38)		
	37	FRN037G7/P7-2	EA203B/200 (25)	SC-10N	60×2 (60)	EA203B/175	SC-8N	38×2 (60)	38×2 (38)	38×2 (60)	14 (5.5)	
	45	FRN045G7/P7-2	EA403A/250 (35)	SC-11N	60×2 (100)	EA203B/225	SC-10N	60×2 (60)	38×2 (60)	60×2 (60)	22 (8)	22
	55	FRN055G7/P7-2	EA403A/300 (35)		100×2 (100)	EA403A/250	SC-11N	100×2 (100)	60×2 (60)	100×2 (100)	22 (14)	
	75	FRN075G7/P7-2				EA403A/300			100×2 (100)	150×2 (150)	38 (14)	
	90	FRN090G7/P7-2	EA403A/350 (35)	SC-12N	150×2 (150)	EA403A/350	SC-12N	150×2 (150)	150×2 (150)	150×2 (200)	22×2 (14×2)	
	110	FRN110P7-2	EA603A/500 (42)	SC-14N	150×2 (200)	EA603A/500		150×2 (200)	150×2 (200)	250×2 (250)		38
400V Series	3.7	FRN003G7-4	EA53B/20 (2.5)	SC-5-1	3.5 (3.5)	EA53B/15	SC-05	3.5 (3.5)	2.0 (2.0)	—	3.5 (3.5)	5.5
	5.5	FRN005G7-4	EA53B/30 (2.5)	SC-1N			SC-5-1		2.0 (2.0)			
	7.5	FRN007G7-4		SC-2N	5.5 (3.5)	EA53B/20	SC-1N		3.5 (2.0)			
	11	FRN011G7-4	EA53B/40 (2.5)	SC-2SN	8 (5.5)	EA53B/30	SC-2N	5.5 (3.5)	5.5 (2.0)			
	15	FRN015G7-4	EA53B/50 (2.5)		14 (5.5)	EA53B/40	SC-2SN	14 (5.5)	8 (3.5)			
	18.5	FRN018G7-4	EA63B/60 (2.5)	SC-3N	22 (14)	EA53B/50			14 (5.5)			
	22	FRN022G7-4	EA103B/75 (10)			EA63B/60	SC-3N	14 (14)				
	30	FRN030G7/P7-4	EA103B/100 (10)	SC-5N	14×2 (22)	EA103B/75	SC-4N	14×2 (14)	22 (14)	14×2 (14)		
	37	FRN037G7/P7-4	EA203B/125 (15)	SC-6N	60 (22)	EA103B/100	SC-5N	38 (22)	38 (14)	38 (22)	5.5 (3.5)	14
	45	FRN045G7/P7-4	EA203B/150 (15)	SC-7N	60 (38)	EA203B/125	SC-6N	60 (22)	38 (22)	60 (22)	8 (3.5)	
	55	FRN055G7/P7-4			38×2 (38)	EA203B/150	SC-7N	60 (38)	60 (22)	60 (38)	14 (5.5)	
	75	FRN075G7-4						38×2 (38)	38×2 (38)	38×2 (60)		
		FRN075P7-4	EA203B/200 (15)	SC-10N	60×2 (60)	EA203B/175	SC-8N	38×2 (60)				
	90	FRN090G7/P7-4		SC-8N					38×2 (60)	60×2 (60)	22 (8)	
	110	FRN110G7/P7-4	EA203B/225 (15)	SC-10N		EA203B/225	SC-10N	60×2 (60)	60×2 (60)	100×2 (100)	22 (14)	
	132	FRN132G7/P7-4	EA403K/300 (22)	SC-11N	100×2 (100)	EA403A/250	SC-11N	100×2 (100)	100×2 (100)		38 (22)	22
	160	FRN160G7/P7-4	EA403A/400 (22)	SC-12N		EA403A/300	SC-12N			150×2 (150)	22×2 (8×2)	
	200	FRN200G7/P7-4			150×2 (150)	EA403A/400		150×2 (150)	150×2 (150)	200×2 (200)	22×2 (14×2)	
	220	FRN220G7/P7-4	EA603A/500 (30)		150×2 (200)			150×2 (200)	150×2 (200)	200×2 (250)		38
	280	FRN280P7-4	EA603A/600 (30)	SC-14N	250×2 (250)	EA603A/600	SC-14N	250×2 (250)	250×2 (250)	325×2 (150×2)	38×2 (22×2)	

Note: 1. The above data is based on Fuji Electric's general-purpose motors. (4-Pole)
2. When using an E series molded case circuit breaker or an SG series earth leakage circuit breaker, match the rated currents.
3. Wire sizes are based on 600V PVC.
Numerals in ( ) fall under WL1 electric wire, i.e.
Furukawa Denko-made 600V leading wire or FSLC, i.e. Furukawa Denko-made panel wiring electric wire.
4. Wire sizes for P, N (Braking) circuit are based on that braking duty is 5%ED.

14. Inspection list

Inspection spot	Inspection item		Description	Inspection frequency or circle			Inspection method	Criteria
				Daily	Periodicaily			
					Annually	Every two years		
General	Ambient situation		Confirmation of ambient temperature, humidity, dust, harmful gas, oil mist, etc.	○			Reter to "ItemNo. 4 Installation".	Table 4-1 of Item No. 4-1 shall be satisfied.
	Equipment in general		Any abnormal vibration and noise	○			Visually and auditorily	Nothing shall be found abnormal.
	Power voltage		Are main circuit and control voltages normal?	○			Measurement of voltages between phases R, S, T of main power input terminal	200V series: 200V/50Hz, 200~230V/60Hz 400V series: 400~420V/50Hz, 380~400/50Hz,. 400~460/60Hz
Main circuit	General		(1) Megger check (between main circuit terminal and grounding terminal) (2) Is tightened part not lose? (3) Is each part not overheated? (4) Cleaning		○ ○ ○	○	(1) Refer to "Item No. 9-6. Confirmation of Insulation." (2) Make tightening. (3) Visually (4) If dust is found, absorb it by means of an electric cleaner.	(1) Be at 5MΩ and over. (2) & (3) Nothing shall be found abnormal.
	Connecting conductor		(1) Is conductor not deformed? (2) Are electric wires and covers not damaged and deteriorated (crack discoloration, etc.)?		○ ○		(1) & (2) Visually	(1) & (2) Nothing shall be found abnormal.
	Transformer reactor		Are no abnormal smell and noises perceived?	○			Visually, auditorily, and by smelling.	Nothing shall be found abnormal.
	Terminal board		Not damaged?		○		Visually	Nothing shall be found abnormal.
	Plain condenser		(1) Is no liquid leaking? (2) Is safety valve not projecting and not swelling? (3) Measurement of electrostatic capacity	○ ○	 ○		(1) & (2) Visually (3) By means of electrostatic capacity measuring instrument	(1) & (2) Nothing shall be found abnormal. (3) 85% and over of rated capacity.
	Relay contactor		(1) Is no chattering preceived in couse of operation? (2) Is contact not found rough?		○ ○		(1) Auditorilyy (2) Visually	(1) & (2) Nothing shall be found abnormal.
	Resistor		(1) Is resistor insulation not cracked? (2) Confirmation of presence of disconnection		○ ○		(1) Visually (2) Measurement with a tester with one-side connection removed	(1) Nothing shall be found abnormal. (2) Be within an error of not over about ±10% of the indicated resistance.
Control circuit and Protection circuit	Action check		(1) Confirmation of balance of output voltages in each phase in inverter unit operation. (2) After sequence protection test, nothing abnormal shall be found in protection and display circuits.		○ ○		(1) Measure voltages between phases U, V, and W of inverter output terminals. (2) Short-circuit simulatedly between input terminal and common one of inverter control contact.	(1) Variation of voltages between terminals shall be less than 2% of the output voltage. (2) Check the action of the external sequence. It shall be found nothing abnormal.
	Parts check	General	(1) Are no abnormal smell and discoloration found? (2) Is no striking rust found?		○		(1) & (2) Visually	(1) & (2) Nothing shall be found abnormal.
		Condenser	Are no liquid leakage and deformation left alone?	○			Visually	Nothing shall be found abnormal.
Cooling system	Cooling fan		(1) Are no abnormal vibration and noise perceived? (2) Is there no looseness in connections?	○	 ○		(1) Visually and auditorily. Set the power to OFF and turn it by hand. (2) Tighten it.	(1) Smooth rotation and no abnormal noise shall be observed. (2) Nothing abnormal shall be found.
Display	Display		(1) Is the lamp not burnt? (2) Cleaning	○	○		(1) Check to see if the panel lamp is on with the panel-fitted lamp test switch operated. (2) Clean it with waste cloths, etc.	(1) Check for its lighting.
	Meter		Is the indicated value normal?	○			Record the meter-indicated value of the panel.	Control values and prescribed values shall be satisfied.

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