FUJI ELECTRIC

FUJI INVERTERS

INSTRUCTION MANUAL

FRENIC5000G5/P5

200V, 400V Series

Fuji Electric Co.,Ltd.

INR-HF 5758a-E

Contents

Introduction

Before installing or operating the inverter, read this manual carefully to ensure maximum performance.

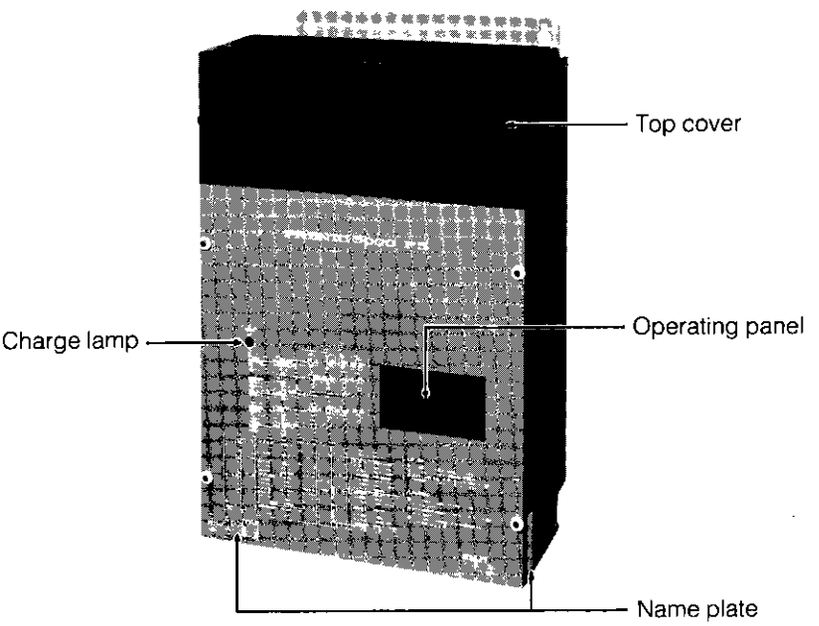
Visual inspection of the inverter upon receipt

Upon receipt of the inverter, carefully inspect that it is as specified when ordering, referring to the rating plate on the front cover. If, by any chance, depression in the cover, damage to the parts, missing parts are found, please contact FUJI.

FRN030P5-2	← Inverter type
SOURCE 200V 50Hz 200/220/230V 60Hz	← Input power source
OUTPUT kW A	← Output rating
SERIAL	← Serial number
Fuji Electric Co., Ltd JAPAN	

Name Plate

Construction



Installation

1) Environment

The construction of inverter enclosure is fundamentally enclosed-type. However, the wiring portion have an opening. Therefore, it is not totally-enclosed type. So be sure to install inverters in an indoor panel. Avoid operating at locations where highly hygroscopic dusts and dirts are present. Or troubles result. When used at locations where corrosive gases are present the service life of the electronic parts and printed ciruit boards can be greatly reduced. In these cases have the panels enclosed or select clean locations. Or have the panel air-purged with clean air. When used in a enclosed panel pay due attention to the temperature rise. Avoid operations at locations at locations where vibrations are experienced frequently.
Can out periodical inspection for screws for tightness. The vibration must not exceed 0.5 G.
Do not use these inverters at locations where inflammable gases can be expected since they are not of explosionproof construction.

2) Altitude

Pay due attention to the operations over 1000m above sea level since the insulation and cooling are effected by air.

3) Ambient temperature

The reference values range from −10°C to +40°C. When installed inside the switch board operations at the temperatures between −10°C and +50°C are possible in case the inverter front panel is removed. When used at the temperatures exceeding the permissible range malfunctions and reduction in service life result. Take note of the temperature rise inside the panel due to the exposure to the direct sunlight or the heating element placed in the vicinity, or poor ventilation. The unit m e installed at least 12cm away from the wall or other unit.

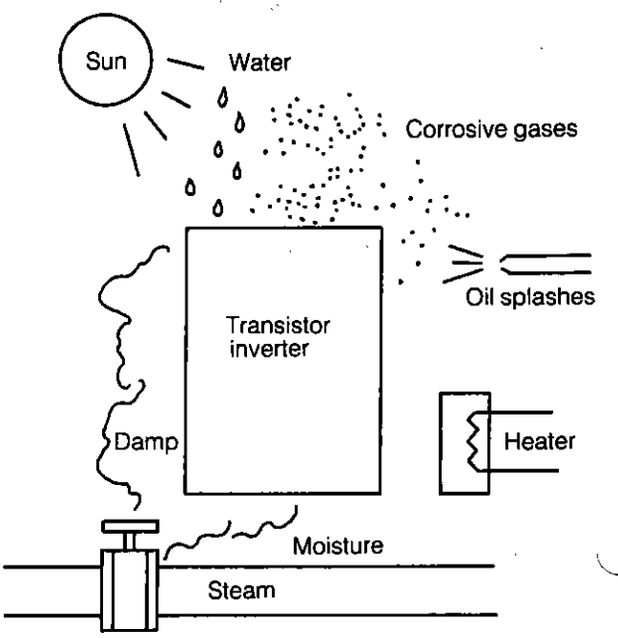
4) Humidity

The reference value of the relative humidity is 90% or less. High humidity results in decreases in insulation resistance and corrosion of metallic parts. Morever, ever when the humidity is favorable troubles result in case sudden changes in temperature cause dewfall.

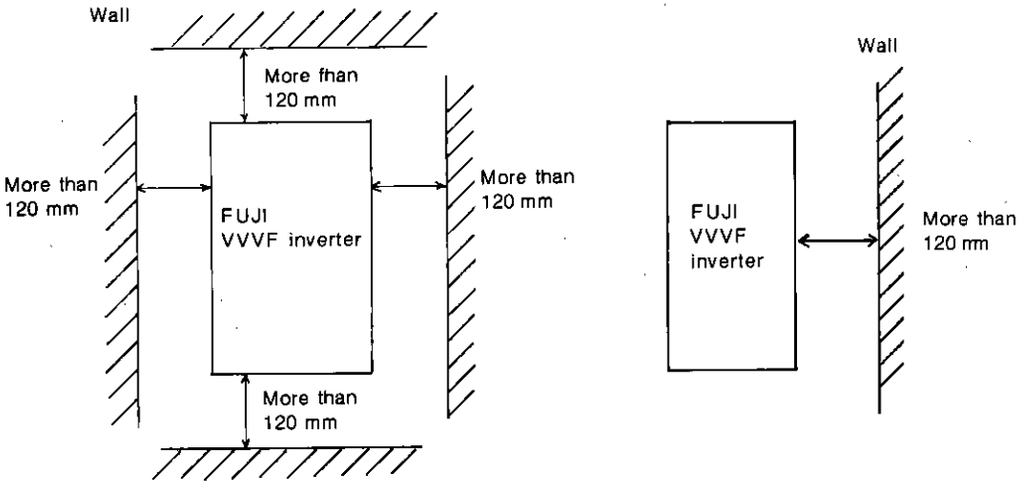
5) Noise

FRENIC5000 series comprises a variety of electronic parts including CPU and ROM. Install the unit so that it is far away from the noise source.

■ **Atmosphers to be avoided**

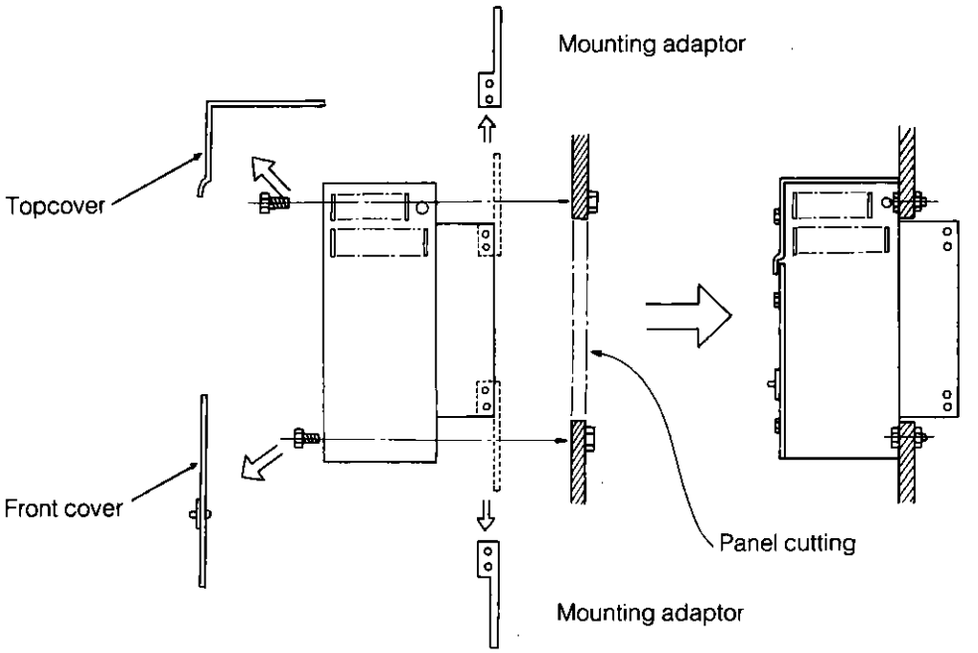


- **Installation space**



•Switchboard installation

The cooling fan unit of FRENIC5000G5 and P5 inverters can be installed in the outside of the switchboard panel. Approx. 60% of the total amount of heat generated by the inverter, is dispersed directly to the outside air. This permits these inverters to be installed even in totally-enclosed type switchboards.



Notes:

① In this system, when installing the inverter in the switchboard. Remove the mounting adaptor on the rear of the inverter.

② In this case, the inverter cooling fan is extruded outside the switchboard. Thus, when operating in locations where cotton fibers and dusts can be expected, take a note of the inverter overheating.

Application notices

Coupling with motors

• Torque characteristics and temperature rises

1. The motor starting torque in operations using the inverter greatly differs from that when connected to a commercial power supply. Please select the most suitable inverter based on the load factor of the coupled machine.
2. The temperature rise for general purpose motors operating on inverters is expected to be slightly higher than when connected to a commercial power supply.
3. When a motor is continuously run at low speeds the cooling effect for the motor will decrease. Either reduce the output or select motor with larger capacities.
4. When requiring constant torque running at low speeds select special motors.

• Vibration

When the motor is operated independently through the inverter the noise is negligible. However, when it is coupled with load machines vibration may occur.

The reason include:—

1. That the resonance results from the natural vibration including the load machine.
2. The vibration due to the imbalance in the rotor including the coupled machine.
   When the vibration occurs due to those reasons mentioned above be sure to use tyre couplings or vibrationproof rubbers.
3. When the 2-pole motor is run at over 60Hz an abnormal vibration may be expected.

• Noise

1. When the inverter is used to run standard motors the noise can be larger than that when connected to a commercial power supply. Adjust through the carrier frequency control. To reduce the noise further, use special motors or install a reactor (optional) between the inverter and motor for noise level reduction. This permits a reduction of 3 to 5 dB.
2. High-speed running at over 60Hz can result in louder air sound.

Special purpose motors applications

1. Explosion-proof motors
   Inverters are not explosion-proofed. Be sure that inverters are installed in safe locations.
2. Submersible motors and submergible pumps.
   The rated current for these motors is larger than standard motors. Determine the capacity of inverter so that these motors can be run on the inverters rated current or less.
3. Geared motors
   When oil-lubrication type gear boxes are used the continuous running at low speeds will result in poor oil lubrication.
4. Brake motors
   Provide a separate power supply circuit for the brake from the inverter input. Make a schematic so that the brake will operate after the main circuit of the inverter is turned off.
5. Synchronous motors
   These motors can be run independently. However, their starting current and rated current are larger than standard motors. Therefore, select these depending on rated current instead of mere output (kVA) of the inverter. In addition, when carrying out a group control of synchronous motors take care that the step-out does not occur.
6. Single-phase motors
   General purpose inverters are normally used to run 3-phase motors. They are not suitable for operating single-phase motors.

Related equipment

1. FAB's (MCCB's)
   Install FAB's on the input side of inverter.
2. Magnetic contactors
   1) When a contactor is installed in the output of the inverter take care that the ON-OFF operation is carried out while the inverter and motor are not operating.
   2) When using the regenerative brake take care that the magnetic contactor of the inverter input is not deenergized when shutting off the inverter.
3. Thermal overload relay
   Inverters are provided with an electronic OL function. However, be sure to install thermistors in the motor windins.
   The electronic thermal overload relay provides protection for one standard motor (4P). When an inverter is used to drive two or more motors, install a conventional thermal overload relay in each motor circuit.
4. Capacitor for power factor improvement
   The power factor will not be improved even when a capacitor is installed in either input or output of the inverter.
5. AC reactors
   When voltage spikes can be expected to occur at the power supply for the inverter, install an AC reactor on the line side. These voltage spikes may result in damage to the diode rectifier.
6. Radio interference suppressing reactor
   Install the reactor on the line side of the inverter at locations where the radio wave is weak.
7. Spark killers
   The following protective actions shall be taken for surges.
   1) Install a noise filter.
   2) Connect the spark killer to the contactor, relay or timer.
   3) Use shielded and twisted wires for the control circuit.
8. Wiring distance
   When controlling the inverter from a distance take care that the maximum wiring distance is 20 meters. Use twisted shielded wires. Never ground these shielded wires.
9. Megger tests
   Never carry out meggering for the inverter. When carrying out megger tests for power supply circuits or motors be sure to disconnect the wires at the inverter terminals. Or inverter troubles can be expected.
10. Power factor correcting DC reactors
    Correct inverter power factor so that it will be between 0.8 and 0.9.

Wiring

1) Function and use of terminals

The symbols and functions of FRENIC5000G5, P5 inverters are given in the following table. These terminals combine a main and control terminals. Determine the wire size for the power supply and motor output circuit depending on the motor capacity and the distance of the cable.
Also determine the wire size for the braking circuit depending on the current rating.
When using shield wires in wiring of the control circuit be sure to conform to the pertinent instructions.

■ Terminal arrangement

• Control circuit terminals

30A	30B	30C	AX1	AX2	11	12	13	C1	V1	M1	M2	FWD	REV	BX	JOG	RST	CM	THR	OP

• Main circuit terminals

200V series

G5: 30 to 75kW, P5: 30 to 75kW

R	S	T	U	V	W	DB1	DB2	DC2	R0	T0		E

G5: 90kW, P5: 90 to 110kW

R0	T0	E	DB1		DB2	DC1	DC2	U	V	W
								R	S	T

400V series

G5: 30 to 55kW, P5: 30 to 75kW

R	S	T	U	V	W	DB1	DB2		DC1	DC2		R0	T0		E

G5: 75 to 220kW, P5: 90 to 280kW

R0	T0	E	DB1		DB2	DC1	DC2	U	V	W
								R	S	T

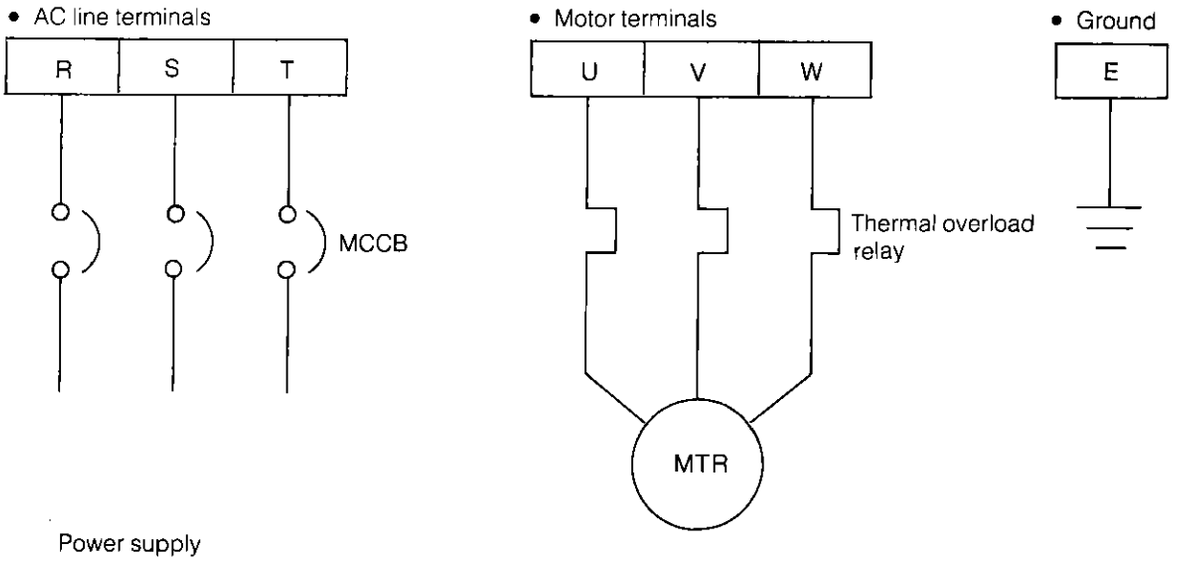
■ Function and use of terminals

Terminals	Symbols	Fig:No.	Description
Main circuit terminals	R, S, T	1	Three-phase input AC line terminals
	U, V, W		Three-phase output terminals (motor terminals)
	DB1, DB2	3	Braking unit terminals
	DC1 (DB2), DC2	3,4	Power-factor correcting reactor terminals •200V series : DB2, DC2 (DC1, DC2 at 200V series 90, 110kW) •400V series : DC1, DC2
	R0, T0	2	Auxiliary power supply terminal
	E	1	Ground terminal
Speed setting terminals	11, 12, 13	6	Frequency control terminals (potentiometer 1kΩ)
	V1, 11		Frequency control terminals process input signal 0 to + 10V DC
	C1, 11		Frequency control terminals process input signal 4 to 20mA
Meter terminals	M1, M2	5	Frequency meter terminals M1: (+), M2: (—) 10VDC 1mA 10KΩ
Operation select terminals	FWD, CM	5	Forward command signal
	REV, CM		Reverse command signal
	BX, CM		Coast-to-stop signal
	JOG, CM		Jogging operation command signal
	RST, CM		External remote reset terminal (ON for reset)
	OP, CM		Option terminal
	AX1, AX2		Inverter running output signal (N.O. 250V 3A)
Protective function terminals	30A, 30B, 30C	5	External indication of fault (1Formc 250VAC, 3A)
	THR, CM	3	External fault input signal (when open circuited, motor coast-to-stop results.)

Note: AX1, AX2 contacts: These relay contacts are closed while FWD (REV) command signal is ON and the transistor base circuit is OFF. (1Hz or less) BX: When BX and CM are shorted, motor coast-to-stop results. (Used in connection with a mechanical brake on the motor.)

2) Wiring practices

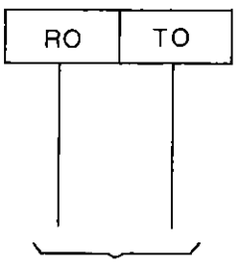
Main circuit



Power supply
3-phase
- 200V 50/60Hz, 200V, 230V 60Hz
- 380V, 400V 50/60Hz
  440V, 460V 60Hz

Fig. 1

- **Auxiliary control power supply terminals**



Note:
This auxiliary control power supply has the same values the line voltage.

Auxiliary control power supply (For backup of the display message)

Fig. 2

■ **Braking Unit and braking resistor terminals**

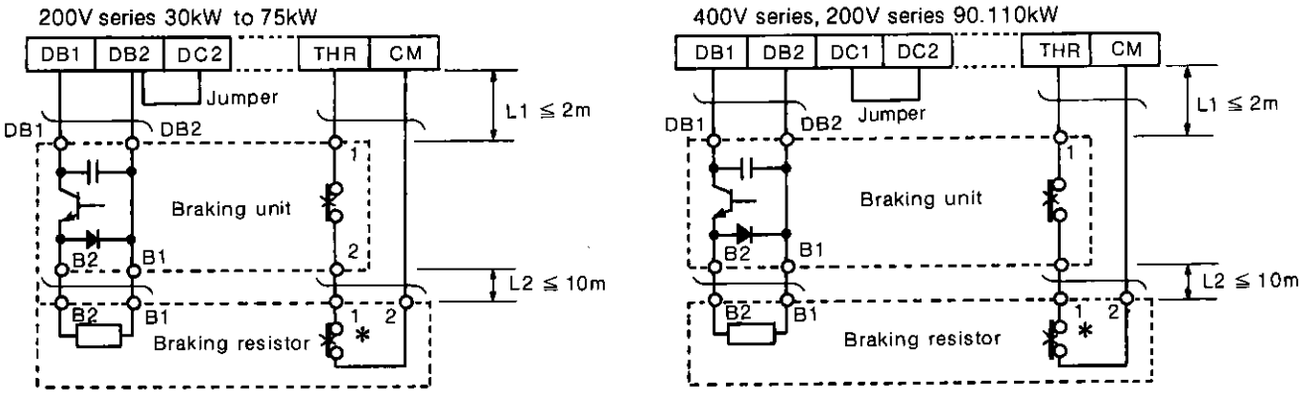
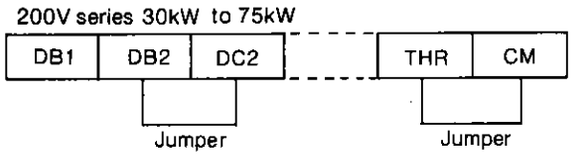
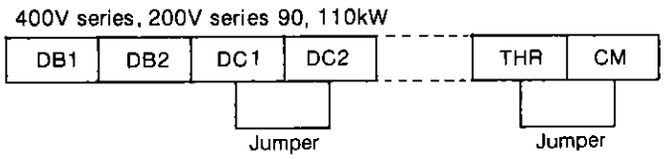


Fig. 3

Notes:

①Factory connection





- When not using the braking resistor, connect the THR-CM by a jumper wiring. When the THR-CM is open, the inverter does not operate.

② The Wiring distance between (L1) the inverter unit and braking unit must be 2 meters or less.
The wiring distance (L2) between the braking unit and braking resistor must be 10 meters or less.

③ When wire connecting the inverter unit and the braking unit, be sure to connect terminals having the identical symbol. (Connect DB1 to DB1 and DB2 to DB2.)
Note that wrong connections may damage the braking unit.

④ BU220-4 braking unit is forced air cooling type. Connect a power supply of 200V 50/60Hz or 220, 230V 60hz to the cooling fan power supply terminals R and T.

⑤ For the braking resistor to combine braking units BU132-4 and BU220-4, please contact FUJI (see page 30).

- Power factor Correcting DC reactor terminals

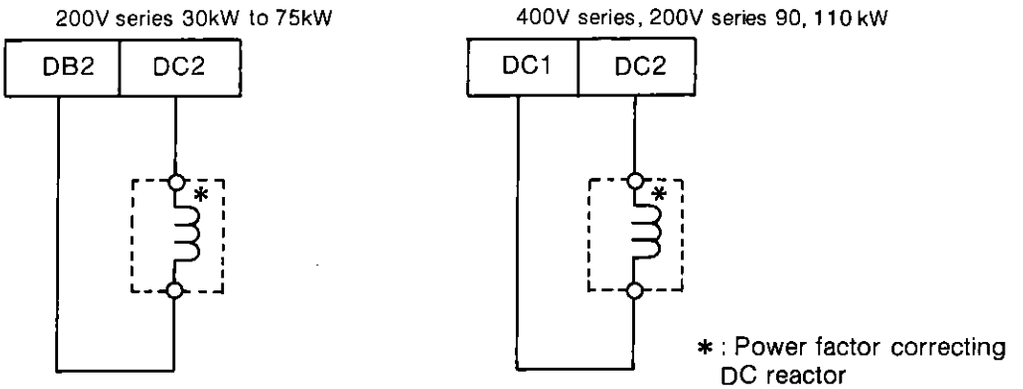
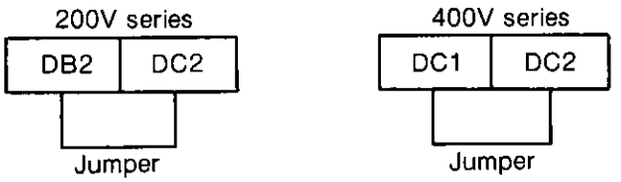


Fig. 4

Notes:

- Factory connection



- 400 volts inverters of 75kW and above (G5 series), 90kW and above (P5 series) are provided with a power factor correcting DC reactor. As to the 200 volts inverters, this reactor is provided for 75kW and above.
  When installing inverters, be sure to connect this reactor.

Control terminals

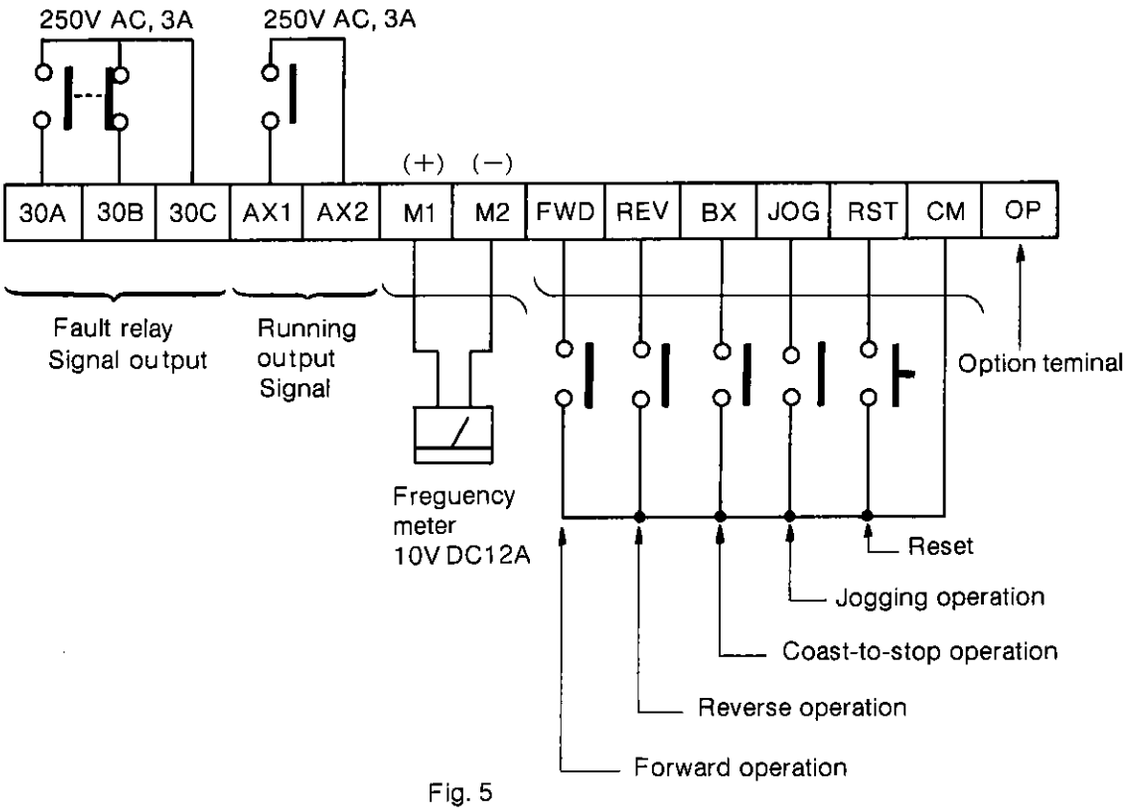


Fig. 5

Freguency Setting terminals

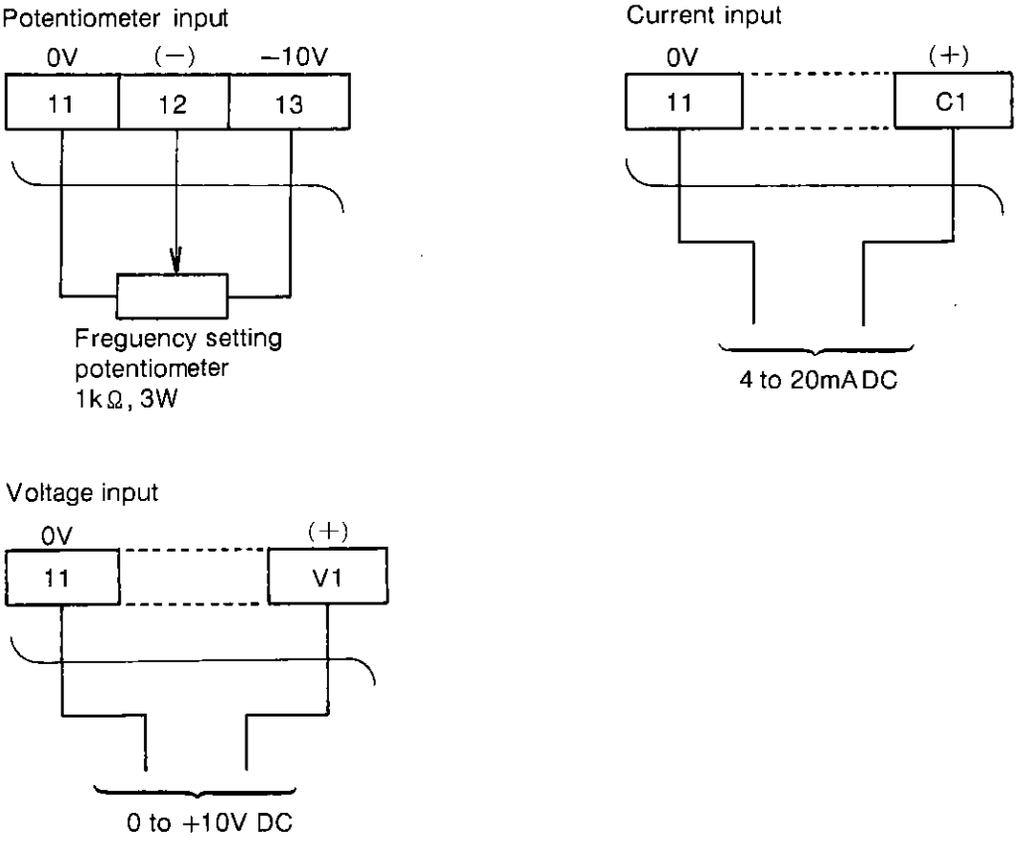
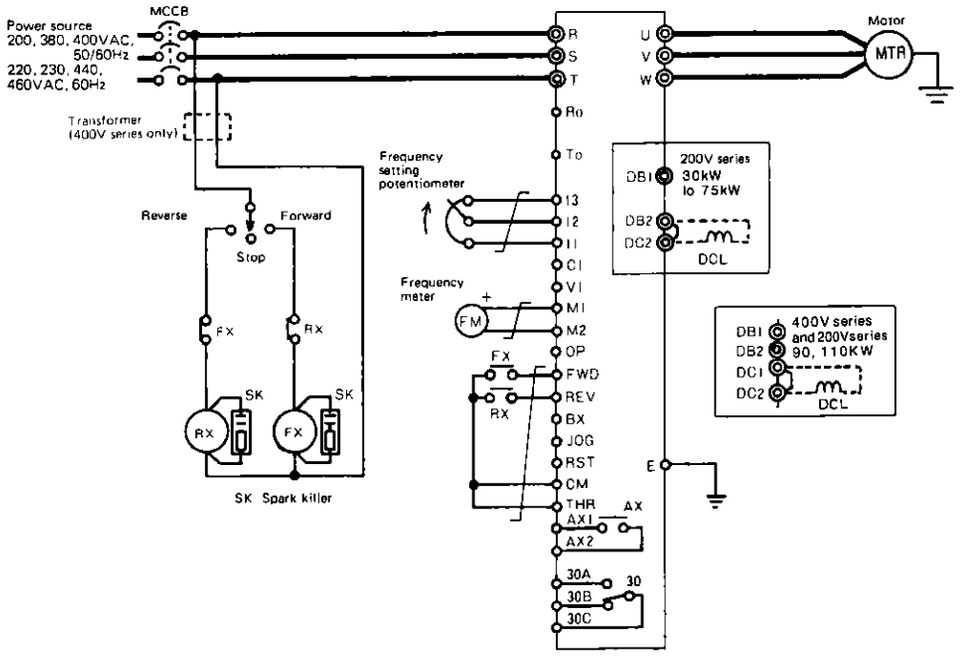


Fig. 6

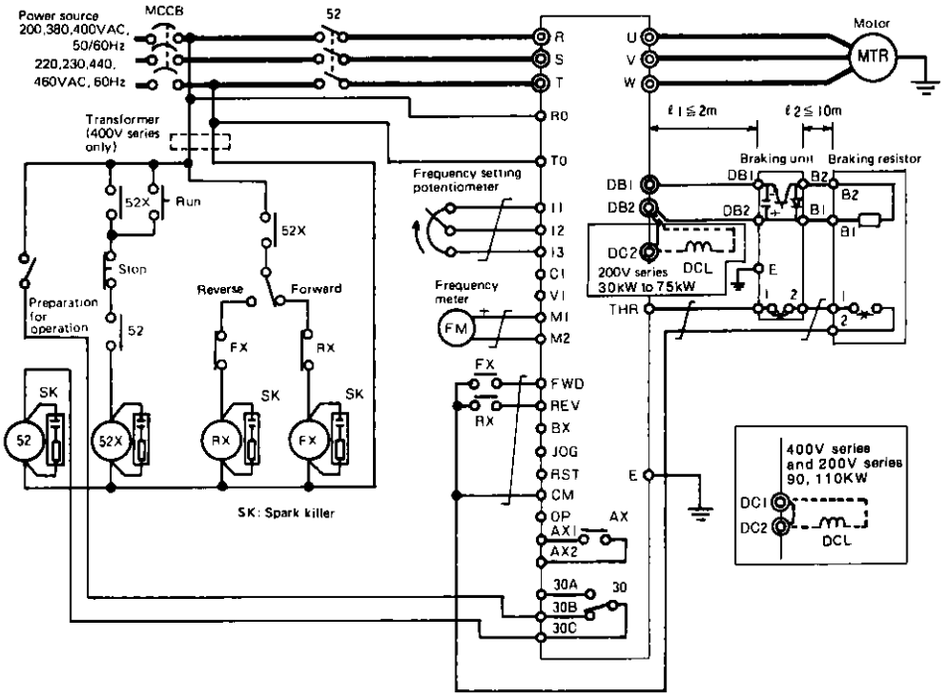
3) Wiring example

■ Reversing operation



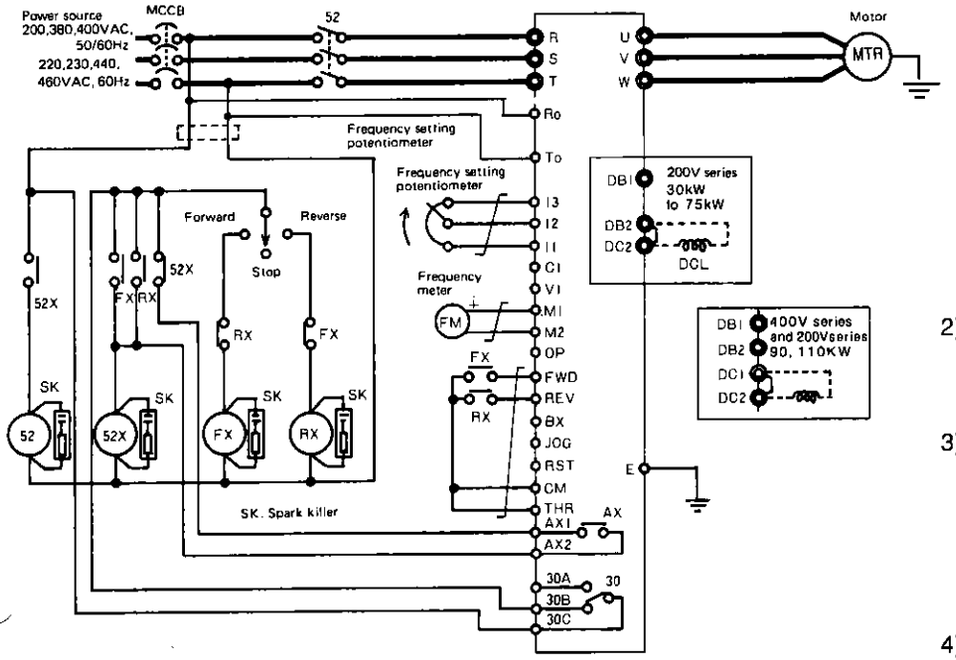
Read carefully the "Precaution for wiring" at page 13.

■ Dynamic braking operation

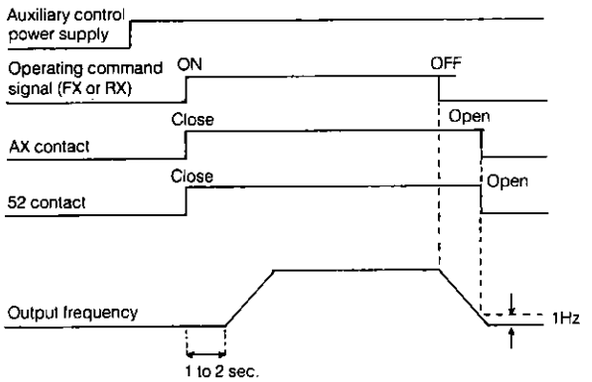


- Be sure to use the braking resistor and braking unit (Transistor switch unit) together. When operating the inverter by connecting the braking resistor only, the resistor may overheat so as to cause damage to the inverter.
- When using the dynamic braking, the main power supply should be interrupted when troubles occur by using the terminal 30B and 30C.
- Read carefully the "Precaution for wiring" at page 13.

■Main circuit control (1)

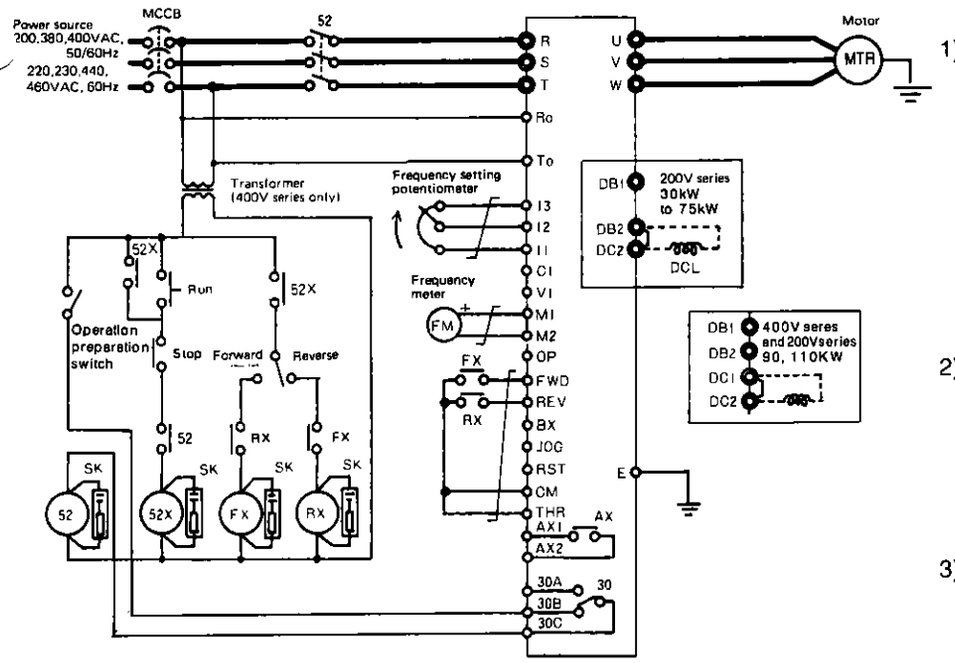


1) In inverter operation, when the FWD (REV) switch is turned on, 52 is closed and an operating command signal is inputted simultaneously. When the input voltage is established, the inverter operation starts and AX is ON. To stop the inverter operation, turn off the FWD (REV) switch. Thus, the inverter decelerates and, when the output frequency is 1Hz or less, 52 is deenergized.
2) The inverter operation starts after one or two second delay even if an operating command signal (FX or RX) is inputted.
3) When carrying out the RUN/STOP operation once or more per hour, do not close/open the 52 contactor every time. Change to the schematic in which the inverter input power supply is continued (See the diagram below).
4) Read carefully the "Wiring precautions" at page 13.
5) AX relay



This relay is a normally closed contact.
It closes when
① the control power is live
② and an FX (or RX) operating command signal is inputted.
It is open when the output frequency decreases to 1Hz or less.
Rating: 250V AC 3A.

■ Main circuit control (2)

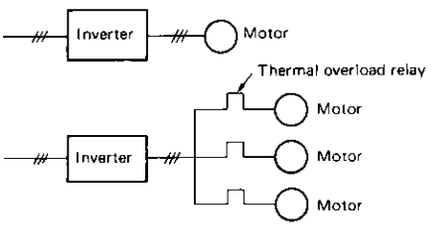


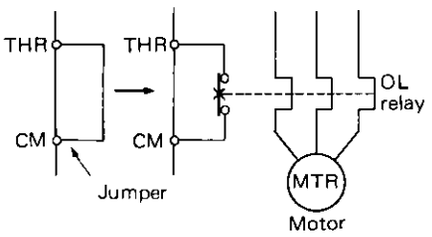
1) In inverter operation, when the operation preparation switch is turned on, 52 is energized (30 is inactive). Then, when an FX (RX) operating command signal is inputted, the inverter operation starts. When the sequence is reversed i.e., when the FX (RX) is turned ON first, and then, 52 is closed, au LU failure (undervoltage) results.
2) To stop inverter operation, open the FX or RX. When the motor has come to a stand still, turn off the operation preparation swithc. If the operation preparation switch is turned off during inverter deceleration, an LU failure (undervoltage) results.
3) Read carefully the "Wiring precautions" at page 13.

4) Precautions for wiring

- **Main circuit**

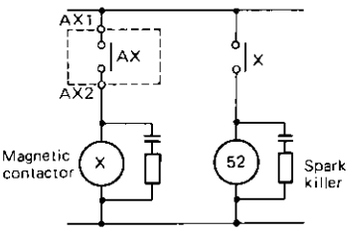
1. √ : Wires should be twisted and shielded.
2. Separate the wiring for the main circuit from the control circuit.
3. Wire sizes
   Choose all power siring sizes depending on the inverter kVA and the maximum output capacity of the motor. Select those wires which can be used with the motor maximum rated output current, referring to table "D&C equipment" on page 32.
4. Grounding wire
   The grounding wire is especially useful for reducing the radiated electrical noise. Ground the inverter chassis and motor frame. However, do not ground the other wirings.
5. Thermal overload relay
   The electronic thermal overload relay provides protection for one standard motor (4P). When an inverter is used to drive two or more motors, install a conventional thermal overload relay in each motor circuit.
   Note:
   *: Use FUJI SG or EG-A series which are medium sensitivity type with shock wave resistance for the inverter. Do not use high sensitivity type ELCG's (10 to 100mA). Since the leakage current of the inverter system is larger, an ELCB may trip.
6. D & C equipment
   When using MCCB's, ELCB's*, magnetic contactors, thermal OL relays. Relays and fuses for the inverter, select them referring to the "D & C equipment" table on page 32.
7. Do not connect the capacitor for power factor correcting to the inverter output terminal.
8. When wiring or checking the inside of the inverter, turn off the MCCB on the line side and be sure the charge lamp has gone out. Do not carry out wiring or checking while the charge lamp is lit, since the capacitor is still charged.
9. Do not carry out the meggering test and dielectric test on the inverter unit. This may result in the damage to the PCB.





- **Control circuit**

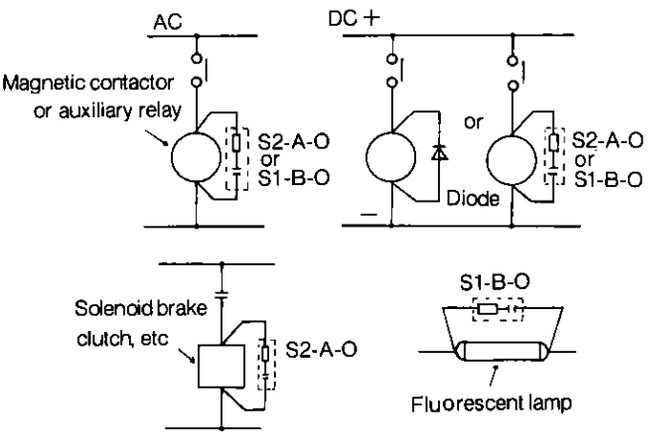
1. Never use the same conduit when carrying out the control wining and power wining. Be sure to separate them. This is essential in order to prevent radiated electrical noise.
2. Arrange the cable layout so that the length of control wining is minimized. When the wining is long in excess noise interference can be expected which may result in the inverter fault.
3. Use the bifurcated contact having stable contact characteristics as the control relay connected to inverter terminals (FWD, REV). The circuit current is 15V, 5mA. Be sure to use FUJI HH54PW.
4. The contact capacity of AX (inverter ON signal contact) and 30 (alarm contact) is 3A (cos • = 1) 250V AC. (0.3A: cos • = 0.3)
   When requiring to control large capacity contactors, use an auxiliary relay as follows.



5. Spark killers
   Connect a CR filter (for AC circuit) or a diode (for DC circuit) in parallel with the coil of the magnetic contactors or relays so as to prevent noise interference.
   Applying the CR filters and diodes (circuit voltage 250V or less)
   ① CR filter capacity
   S2-A-O C: 0.2 μF 500VDC, R: 500Ω
   (OKAYA DENKI SANGYO)
   S1-B-O C: 0.1 μF 500VDC, R: 200Ω
   (OKAYA DENKI SANGYO)
   ② Diode capacity (in case operating coil current 1 A or less)
   ERB240-06C 600V 1A (surge 45 A/10 mS)

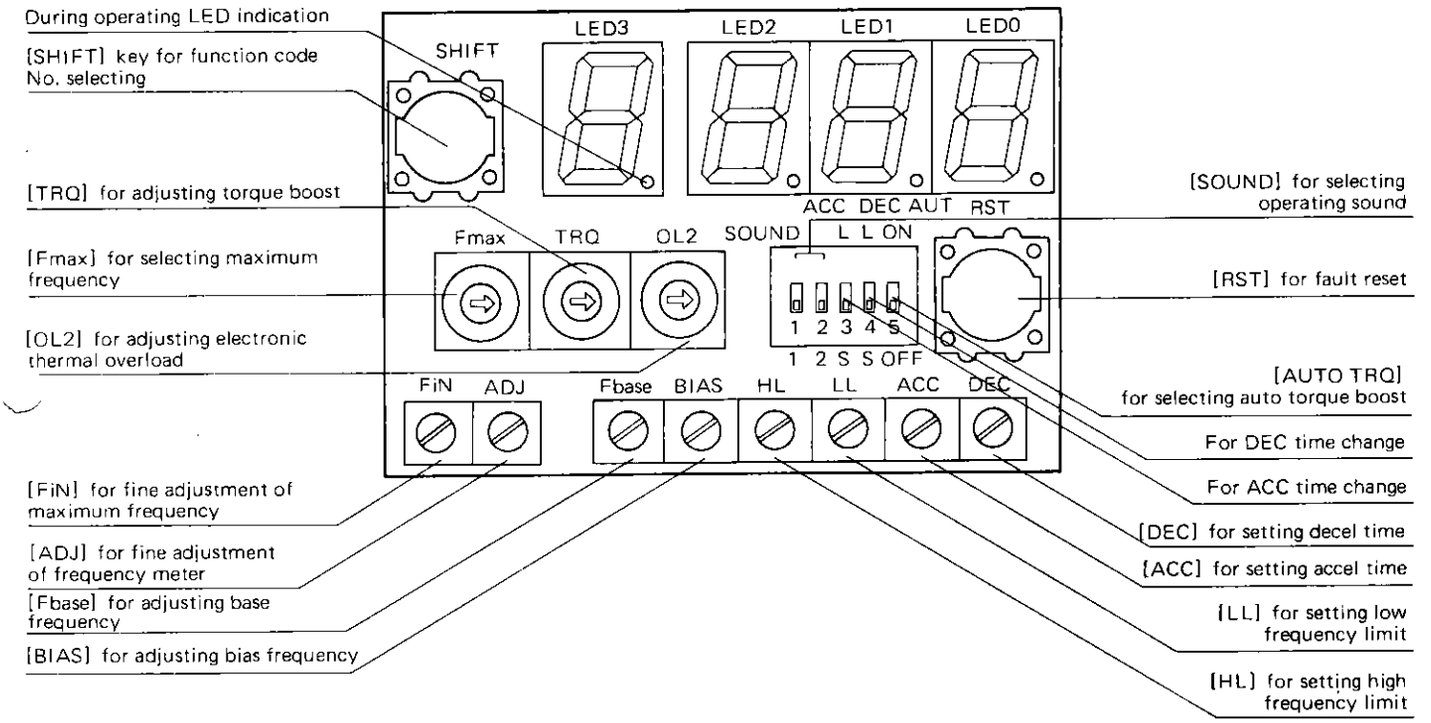
Eguipment		CR filter or diode
Magnetic conttor (Main circuit)	AC	S2-A-O or equivalent
	DC	Diode or S2-A-O
Auxiliary relay	AC	S1-B-O or equivalent
	DC	Diode or S1-B-O
Flourescent lamp		S1-B-O
Solenoid,brake clutch	AC	S2-A-O
	DC	Diode

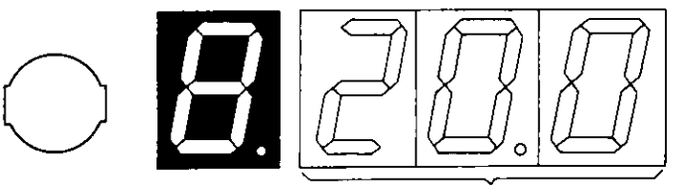
Wiring example



Operating panel

To set and adjust the operating conditions, carry out via the operating panel positioned in front of the inverter.
The setting value can be checked through the digital display comprising the 4-digit 7-segment LED's. This digital display indicates the function code No., actual frequency, setting output frequency, base frequency, gias, and accel/decel time. It is automatically changed to OC, OL or LU display when a fault occurs.
Note:
The readjustment of the operating panel can be carried out by the users. However, other setting devices on the PCB are adjusted at FUJI factory. It requiring readjustment, contact FUJI.



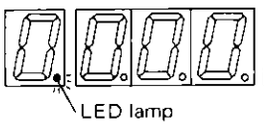


Operation procedure

When the wiring has been completed, check the wiring connections and carry out the operation as follows.

> Warning
> Never connect the power supply to the terminals (U, V, and W).
> This may cause damage to the inverter.

1) Switch on the power supply breaker.
2) The charge lamp will light up and the LED indicator lamp will flicker.



is displayed.

3) Set the output frequency by using a POT (Variable resistor).
4) Operation can be carried out when a FWD or REV command signal is applied. (Over 0.5Hz)
5) The output frequency will be displayed on the digital display during inverter operation.
   When requiring to check each setting value, change the function code by pressing the SHIFT button. (Approx. one minute later, the display will be automatically returned to the function code No. 0 output frequency).
6) The motor reduces its speed depending on the deceleration time and comes to a stop, when either an FWD or REV signal is not applied.
7) When requiring the readjustment as the result of the operation, please see the next paragraph "Setting procedure".

Setting procedure

When setting please do as follows.

① Press the SHIFT button and the function code is displayed on the LED 3. Select an appropreate function code number.

② The setting value is displayed on LED 2, LED 1 and LED 0. Check the value for correctness.

③ When requiring to change the setting value, change the DIP switch or adjustment knob to an appropreate position.

④ When the function code "E" is displayed, this means that the setting is incorrect. Please readjust the setting.
When the setting is corrected, the display will be returned automatically to the function "0" (output frequency).
To check the setting value, press the SHIFT key again to select the function code.
This completes the setting.

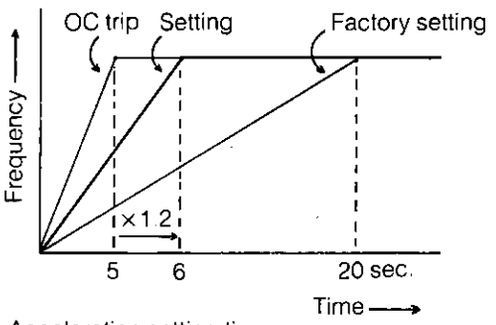
Notes:

1) The displays (LED 3, LED 2, LED 1, and LED 0) will be returned to the function code No. "0" approx. one minute after the SHIFT button is released.

2) The setting value for BIAS, HL and LL can be changed during the inverter operation.
For other functions (Fmax, Fbase, ACC, DEC, TRQ or OL2), the setting value can be changed during the inverter operation.
However, the new setting value is useful after the inverter is stopped. Check that the operation can be carried out correctly by the new setting value.

- **Settings the acceleration and deceleration times**
The ACCEL and DECEL times are set at 20 sec respectively when shipped from FUJI factory.
When requiring to set the accel/decel time to the shortest value, carry out the following procedure.
① Couple the load with the motor.
② Find out the minimum accel/decel time in which no OC trip occurs. Set the accel/decel time to 20% longer than this time, taking load GD^2 into consideration.

Example) Minimum acceleration time setting



Acceleration setting time
= OC trip position × 1.2
= 5 sec. × 1.2
= 6 sec.

Description of functions

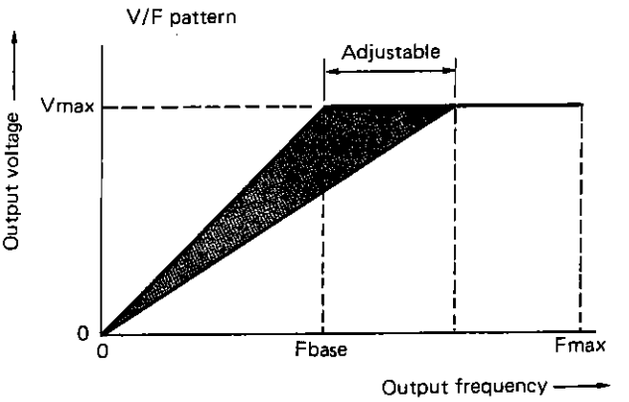
■ Digital display

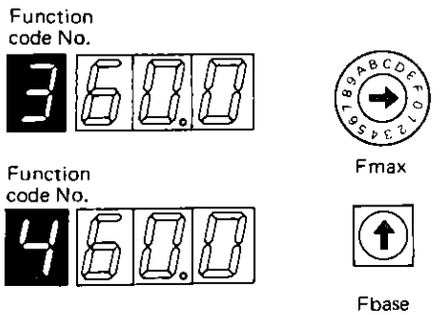
These inverters incorporate a 4-digit, 7-segment digital display feature, which displays the function code No. and setting data (Hz, sec).
To set, push the SHIFT button and select the function code No. For the code No. and setting data please refer to the table.

Function	LED 3	LED 2	LED 1	LED 0	Display message (The unit is not displayed.)		Description	Factory setting
Operation	0.		0. to 24	0	Output frequency		Stopping state	
Setting	2.	2	0. to 24	0	Setting frequency	1.0 to 240Hz	Set the external frequency setting device (POT).	
	3.				Maximum frequency	1.0 to 240Hz	Select the maximum frequency by a DIP rotary switch (Fmax)	60.0
	4.				Base frequency	50 to 120Hz	Set the Fbase frequency by an adjustable knob (Fbase).	60.0
	5.				Bias frequency	1.0 to 240Hz	Set the BIAS frequency by an adjustable knob (BIAS).	0.0
	6.				High limit frequency	1.0 to 240hz	Set the HL frequency by an adjustable knob (HL).	60.0
	7.				Low limit frequency	1.0 to 240Hz	Set the LL frequency by an adjustable knob (LL).	0.0
	8.				Acceleration time	0.2 to 200sec.	Set the acceleration time by an adjustable knob (ACC).	20.0
	9.				Deceleration time	0.2 to 200sec.	Set the deceleration time by an adjustable knob (DEC).	20.0
	A.				DC braking forque	0.0 to 100%	When the OPC II-02 is used.	
	b.				Jogging frequency	1.0 to 16Hz	When the OPC II-02 is used.	
Incorrect setting	E.	r	r	1	High/Low frequency setting error		When the upper limit value is set to lower than the lower limit value.	
	E.	r	r	2	Fmax switch incorrect setting		When (Fmax) switch is set at C, D, E, and F notch. In this setting, no operation can be carried out.	

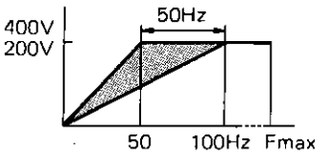
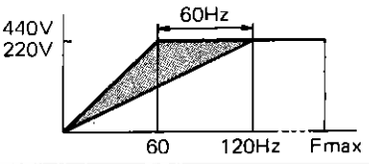
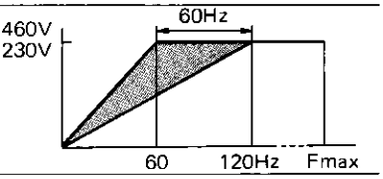
■ V/F ratio

The V/F ratio is available in 12 patterns as shown in the table. The "Fmax" is set by a DIP rotary switch and the "Fbase" by an adjustable knob. The "Fbase" is used to determine the base frequency. The adjustable range varies depending on Vmax (Volts) which is divided into three groups.
To set, press the "SHIFT" button and select a code No.
Fmax (Hz): Code No. 3
Fbase (Hz): Code No. 4
Set the Fmax and Fbase respectively while viewing the digital display.





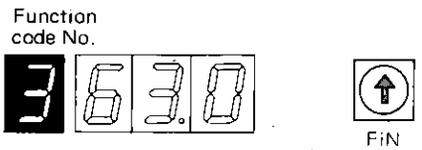
■ Fmax, Fbase, Output voltage

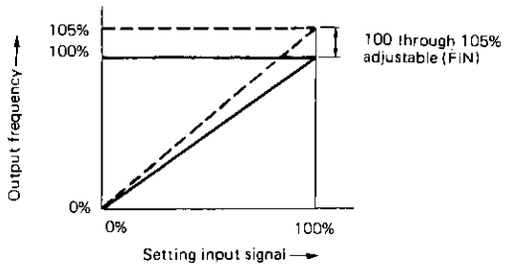
Notch No. for Fmax	Fmax (Hz)	Fbase (Hz)*	Vmax (V)		Pattern
0	50	50 – 100	200	400	
1	100				
2	150				
3	200				
4	60	60 – 120	220	440	
5	120				
6	180				
7	240				
8	60	60 – 120	230	460	
9	120				
A	180				
B	240				
C	When a notch from C through F is selected, "Err2" is displayed and the malfunction results.				
D					
E					
F					

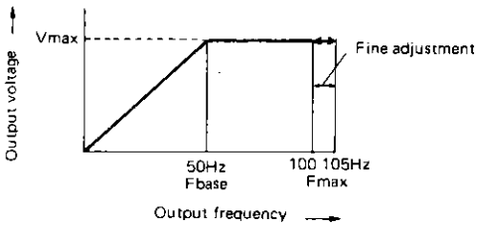
Note: *: Base frequency: This signifies the maximum output in the constant torque range. (50 or 60Hz in general purpose inverters)

■ Fine adjustment of maximum frequency

Inverters in this series, are provided with a "FiN" adjustment knob for V/F patterns. When the Fmax is set at 100%, the fine adjustment can be set at 100 through 105%. To set, select the code No. 3 by a SHIFT button and adjust by the "FiN".

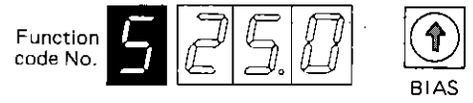


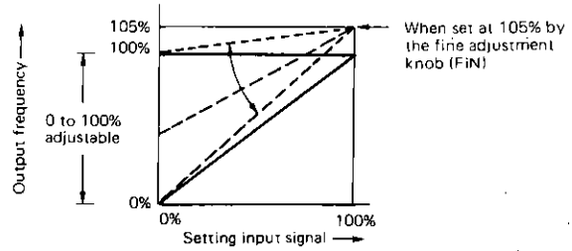


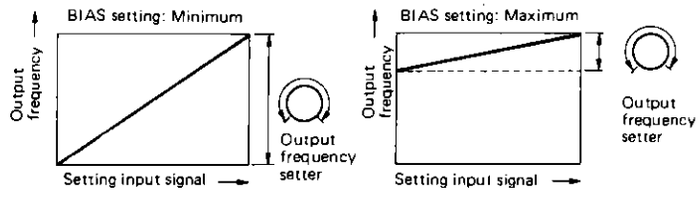


■ Bias setting

This function provides a speed control using the process control signal (0 to 10VDC, 4 to 20mA).
The adjustable range is from 0 to 100% (Fmax). When set at 100%, an output frequency of 100% results even if the input frequency is zero. However, when starting it begins with 1Hz irrespective of setting value.
The fine adjustment function permits a control as shown in the diagram. When the whole span of the speed control potentiometer is used, a highly accurate control can be carried out.
To set, select the code No. 5 by the "SHIFT" button and input the bias frequency by using the bias adjustment knob according to the digital display.



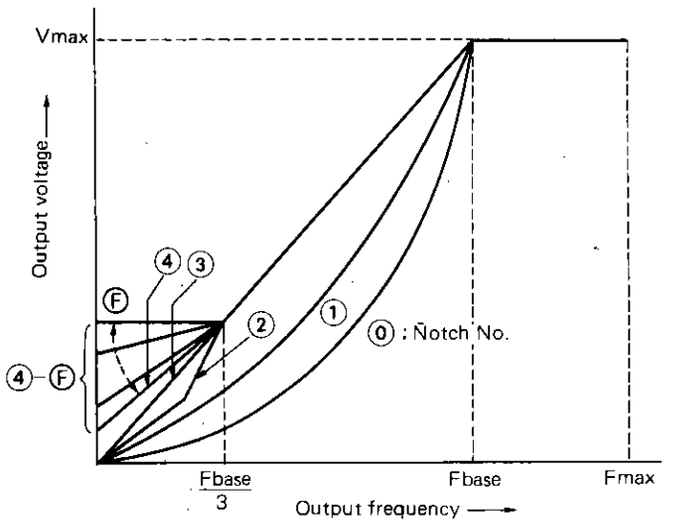




■ Torque boost

The V/F ratio pattern can be changed by the "TRQ" DIP rotary switch (torque boost) depending on load torque characteristics.
Thus, patterns can be selected so that they meet the requirements of constant torque or variable torque loads, ensuring a highly efficient motor operation.
In addition, when starting, select the notch ④ or above to increase the torque.
To set, use the "TRQ" switch. (This is not expressed on the digital display.)

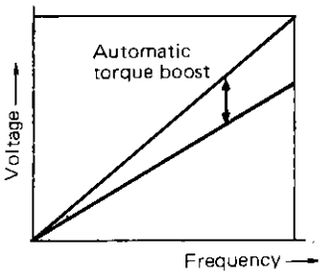
TRQ
DIP rotary switch



Note: Circled letters indicate the notch of the TRQ switch.

■ Automatic torque boost

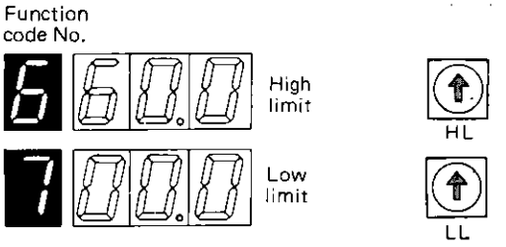
This function is used to adjust the boost value automatically depending on load fluctuation, thus ensuring an energy efficient operation.
To set, switch on the "AUTO TRQ" DIP switch.
This makes inverters highly suitable for energy saving operation of fans and pumps.

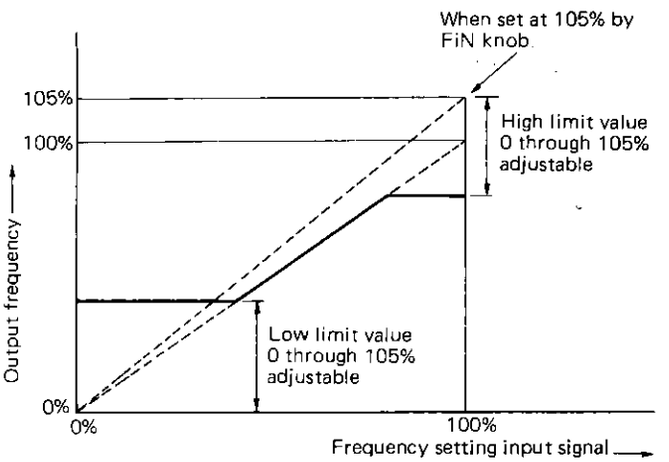


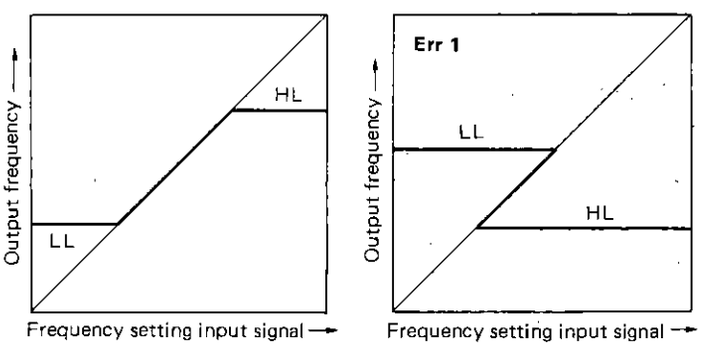
Auto TRQ
No. 5 DIP switch

■ High or low limiter

This function is used to limit the output frequency to a certain width (0 to 105%) so as to prevent motor overspeeds or underspeeds.
For instance, the low limiter is used for the pump control of the cooling water. This function is suitable for a control in which the cooling water level is kept at the lowest allowable level even when the process signal is zero volt.
Limiters are available in the High (HL) or the Low (LL) which can be set within a range from 0 to 105%.
To set, press the "SHIFT" button and select the code No.
Code No. 6: High limit
Code No. 7: Low limit
Then, set by either an HL or an LL adjustment knob according to the display.



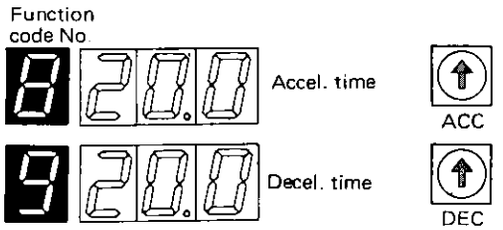


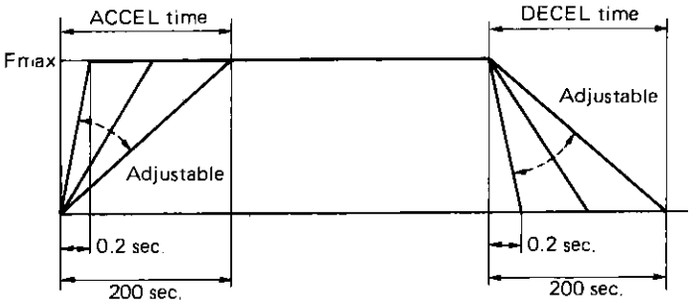


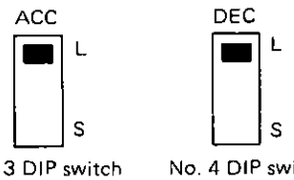
Note: When the setting value for the HL value is smaller than that for the LL value, the low limit value is ignored.
At this time "Err1" is displayed.

■ Acceleration/deceleration time

In normal inverter operations the motor follows up the output frequency so that the speed control is carried out. This function provides a ramp time control of the output frequency at the time of motor running. The motor speed is controlled depending on set ramp time. The adjustable time range is between 0.2 and 200 seconds. It is also available in an option range "2 to 2000 sec".
When the ramp time is set at an extremely short time, a large power is required which may lead to an "OC" or an "OV" trip.
To set, switch the S/L time DIP switch either to S(0.2 to 20 sec) or L(2 to 200 sec) position. Then, select the code No. by using a "SHIFT" button.
To set, turn the adjustable knob while viewing the digital display.
Both acceleration and deceleration times are set at 20.0 sec when shipped from FUJI factory.







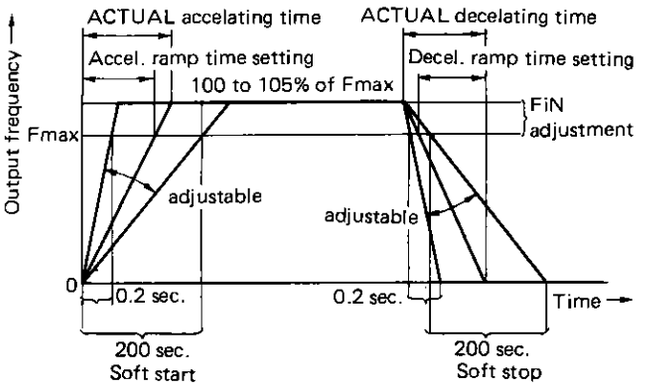
No. 3 DIP switch No. 4 DIP switch

• Setting the acceleration and deceleration times [ACC] [DEC]

(1) The acceleration and deceleration times can be set independently.
(2) A variable range (S or L) can be selected independently.

Famp time switch position	Acceleration, deceleration time ( ): Option
S	0.2 to 20.0 sec. (2 to 200 sec.)
L	2 to 200 sec. (20 to 2000 sec.)

(3) The acceleration and deceleration times indicate the time elapsed until the maximum frequency is reached from zero and vice versa.
(4) The variable ranges can be set continuously by using a ACC (DEC) adjustment knob.
(5) The set acceleration and deceleration times can be read through the LED digital display.
(6) Besides the linear acceleration and deceleration patterns, 15 different polygonal line patterns are available. (Options)
However, in this case, the acceleration and deceleration patterns are identical.
(7) For long time service bracketed, replace ROM.
However, in this case, the display indicates 1/10 real time.



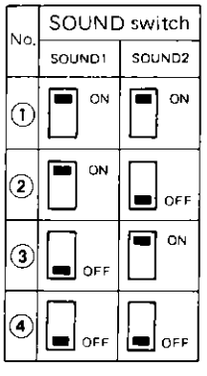
Warning:
When the ACC or DEC setting is changed during inverter operation, a new set value appears on the display, but actual operations are carried out with the original value. The new set value becomes effective after the inverter stops.

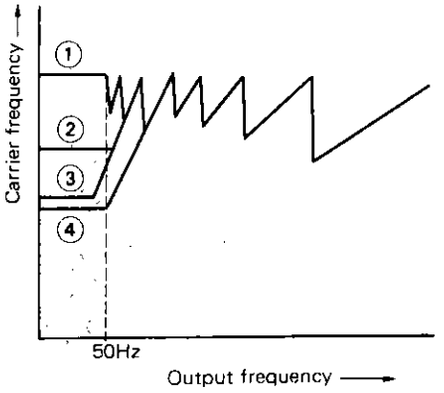
■ Operating sound selector

When a motor is coupled with a machine a natural noise and vibration can be expected.
In inverter operation, a high noise level can be expected normally. FRENIC5000 series inverters have a function to reduce the operating sound by changing the carrier frequency for the transistor switching control.
Four different combinations of the sound DIP switches are available as shown in the diagram.
Select one so that the noise is negligible.

• Adjustment

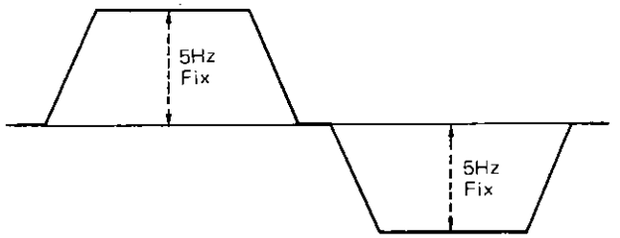
Four different operating sound tones are available through combination of sound DIP switches SOUND1 and SOUND2.





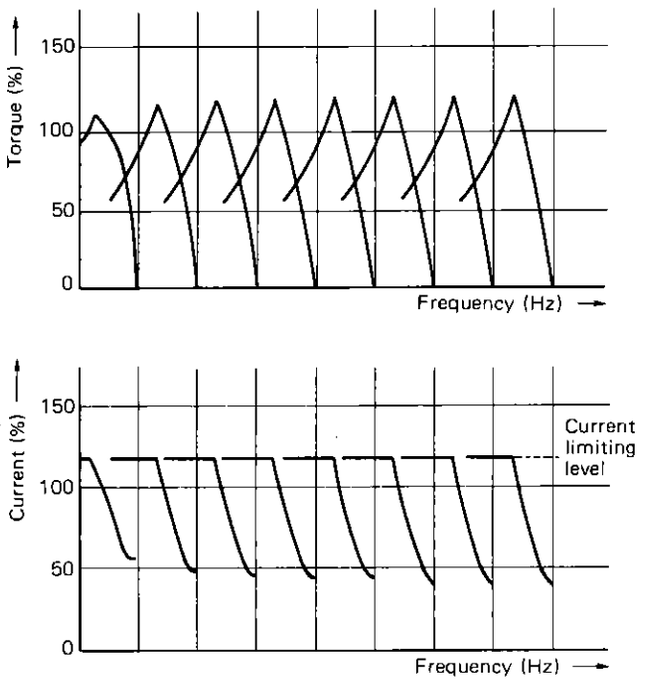
■ Jogging operation

Standard type FRENIC5000 series inverters have a jogging operation feature. It is fixed at 5Hz.
1 to 16Hz type options are also available.



■ Current limiting

Inverters in FRENIC5000 series incorporate a current limiting function which detects the output currents continuously so as to suppress it when it reaches the current limiting level.
For instance, when an extremely short acceleration time is set a large power is required and a large current flows.
In this case, this limiting function operates so that the operation is continued while the output current is suppressed. Thus, the OC trip is prevented, so permitting a smooth speed up.



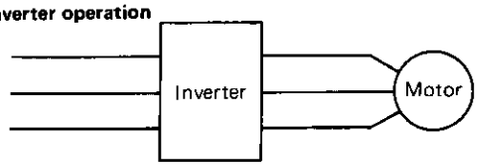
■ Electronic thermal overload protection

FUJI inverters have the following overcurrent protective devices which provide more than adequate protection.

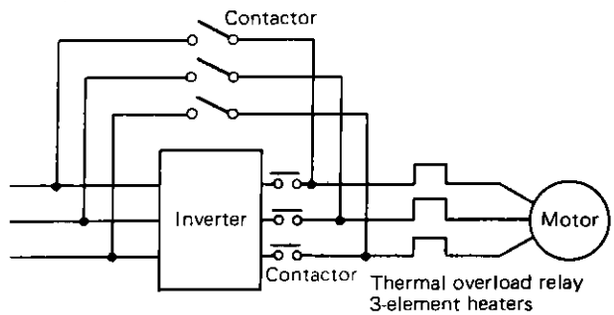
1. OC: Overcurrent—inverter protection against destractive overcurrents
2. OL1: Overload—inverter protection G5 150% (P5 120%) 1 minute
3. OL2: Electronic thermal overload relay—motor protection
4. OH2: Thermal overload relay (External)—option-motor protection

The electronic thermal overload relay has similar characteristics to conventional thermal overload relays. (Please refer to the characteristics curve of OL2.)
For 4-pole standard motors, electronic OL relays provide an adequate protection without the use of thermal overload relays. However, standard motors are not designed to carry out continuous operation at low speeds, which is led to a reduction in the cooling effect. Therefore, when designing the electronic OL relay, due attention has been given to this problem of reduced cooling.

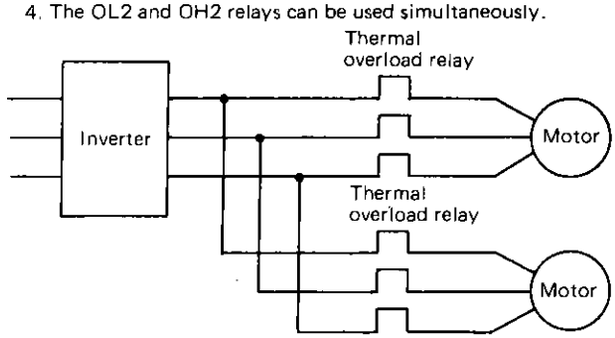
Inverter operation



Line operation ⟷ Inverter operation

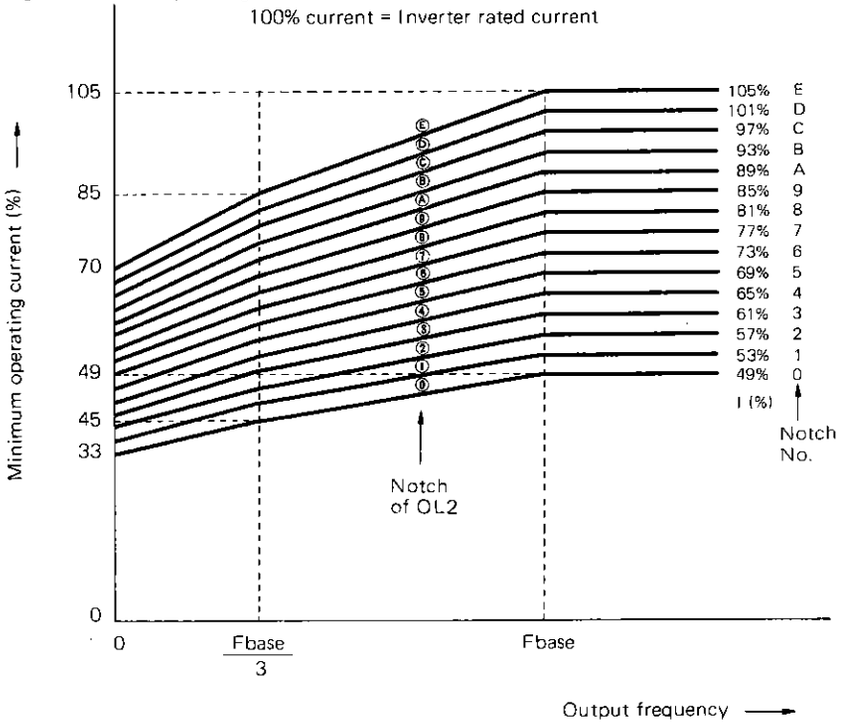


Notes: 1. When operating at frequencies less than 10Hz, please install a thermal overload relay.
2. When operating two or more motors by a single inverter, please connect a thermal overload relay to each motor circuit.
3. When not needing the OL2 protection, set the DIP rotary switch at the F notch to revert to the unprotected state.
4. The OL2 and OH2 relays can be used simultaneously.



■ Electronic overload relay

Fig. 1 Minimum operating current characteristics



• Setting the electronic thermal overload relay

A DIP rotary switch for OL2 is used to set an operating current.
The setting current is obtained by using the following formula.

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

K: 1.0 (50Hz)
1.1 (60Hz)

Select a notch from I(%) to OL2.

Example: Motor full load current: 56A
Motor rated current: 66A
(FRN045G5-4)

$$I(\%) = \frac{56}{66} \times 100(\%) = 85(\%)$$

Set at "9" notch OL2 referring to curves of Fig. 1.

Note:
These electronic thermal overload relays meet the requirements of 4-pole standard motors.
Therefore, when using under following conditions, use conventional overload relays instead of these electronic units.

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 used when frequent starting can be expected.
5. When used to operate at 10Hz or less.

Fig. 2 Inverse time characteristics

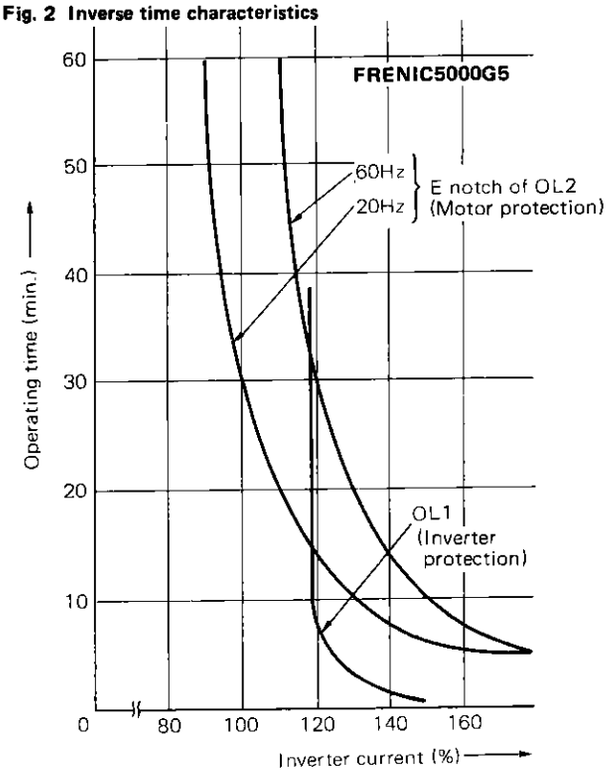
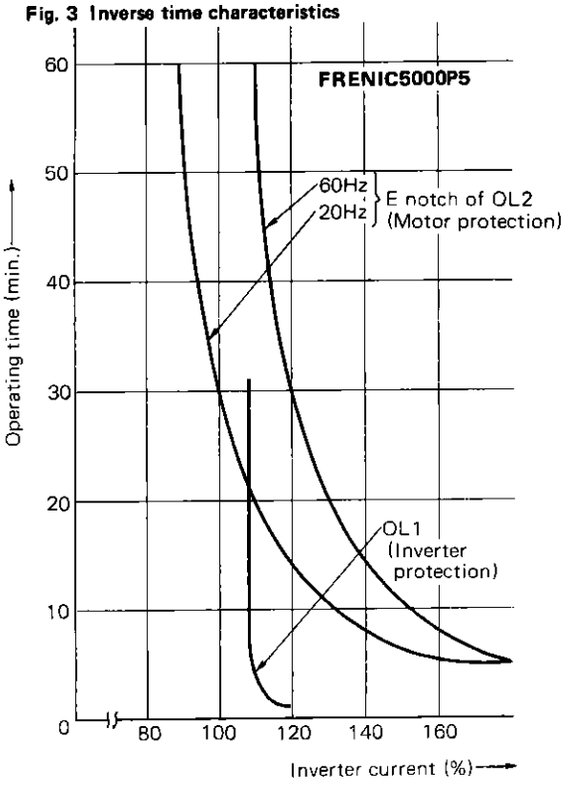


Fig. 3 Inverse time characteristics



■ Protection

Protective function	Description	Segment displayed	Motor
Stall prevention	Motor speed is controlled so as to vary depending on inverter output frequency. However, when an abrupt acceleration is carried out sooner than the minimum motor acceleration time, an overcurrent results. To suppress this, the acceleration time is automatically extended, thus, preventing overcurrent trip. When an abrupt deceleration is carried out a high regenerative voltage results which lead to overvoltage or overcurrent. To suppress this, the deceleration time is automatically extended so as to prevent overcurrent or overvoltage trip. (Variation of output frequency is minimized.)	–	–
Overcurrent protection	When inverter output current reaches the overcurrent protection level, inverter stops instantaneously. When transistor on the output side of inverter is damaged, the fuse blows in the DC intermediate circuit to prevent secondary faults from occuring.	OC	Coast-to-stop
Overvoltage protection	When the inverter DC intermediate circuit voltage reaches the overvoltage protection level the inverter stops instantaneously.	OU	Coast-to-stop
Inverter overload	The overcurrent protection is designed for destructive overcurrents. The overload protection is for sustained overcurrent. When an overload exceeds the inverter overload capacity (150% (G5) or 120% (P5) of rated current) for over one minute, inverter stops instantaneously.	OL1	Coast-to-stop
Inverter heatsink overheating	When inverter heatsink overheating occurs, inverter stops instantaneously.	OH1	Coast-to-stop
Motor overload (Electronic thermal overload)	When driving one motor, electronic overload protection can be provided without external thermal overload relay. When driving two or more motors by using one inverter, install a thermal overload relay in each motor circuit.	OL2	Coast-to-stop
External fault	When the thermostat switch for detecting DB resistor (option) overheating or thermal overload relay (external) for motor protection, operate, the inverter stops instantaneously.	OH2	Coast-to-stop
Instantaneous power failure	Operation can be continued on full load even when 15ms power failure occurs. (With light load, operating time can be further extended.) When power failure is prolonged so as to exceed 15ms, the inverter may stop.	LU	Coast-to-stop
Undervoltage	When the DC intermediate circuit power supply drops below undervoltage level, the inverter stops immediately.	LU	Coast-to-stop
CPU fault	When CPU mulfunction occurs, inverter stops instantaneous	7-segment LED decimal indicator stops flickering.	

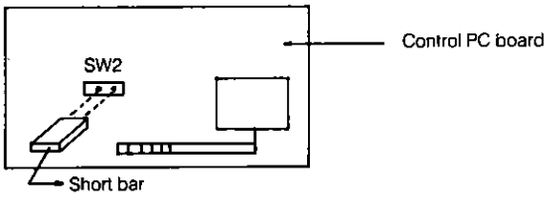
■ Automatic restarting function when LV (undervoltage) occurs

When an undervoltage is detected during inverter operation, the error message LU is displayed and the motor coasts to a stop. In normal operation, restarting is carried out by pressing the RESET button and applying the operating command signal. However, FRENIC5000 series can also provide automatic restarting function.
To use this function, withdraw a short bar on the SW2 terminal. (See figure below.) Under this state, when an undervoltage occurs, a message is displayed and the motor coasts to a stop. However, no fault signal (30A, 30B, and 30C) is outputted. When the voltage return to the normality, automatic restart is carried out.
Note:
When the OPC II-01 is used, automatic restarting after instantaneous power failure can be csrried out irrespective of the state of SW2.

■ Operation at undervoltage

SWZ condition	OPC II-01 (Option)	Undervoltage			Return to normal voltage	
		LED display	Fault signal	Motor	Reset	Inverter
Short bar is connected. SW2	Not used	LU	Outputted	Coast-to-stop	Manual (Pressing of RESET button)	Restart with frequencies 0 through setting value*
	Used	—	—	Coast-to-stop	Automated (Automatic restarting after the voltage has returned to the normal potential)	Automatic restarting operation after instantaneous power failure)
Short bar is not connected. SW2	Not used	LU	—	Coast-to-stop	Automated (Automatic restarting after the voltage has returned to the normal potential)	Restart with frequencies 0 through setting value*
	Used	—	—	Coast-to-stop		Automatic restarting operation after instantaneous power failure)

Note: *: When motor coasts to a stop, OC or OU may occur.



Rechecking (Error message)

When a fault occurs, the display message is automatically changed from operation mode to fault mode and the inverter stops.
To check the fault when it occurs, press the SHIFT button and they are displayed in order of the occurance of fault. Thus, whenever a fault occurs, check the contents of the function code 1 through 7.

When pressing the SHIFT button again so as the to display the function code 8 and after, you can check the operating coditions when the fault occurs.
These data are stored until the RESET button is pressed. Be sure the causes of the filure are written down before the RESET button is pressed. When resetting can be carried out, the operation mode results.

■ Error message

Condition	LED 3	LED 2	LED 1	LED 0	Indication
Failure		0	C		Overcurrent
	1o	0	U		Overvoltage
		L	U		Undervoltage
	1	0	L	1	Inverter overload
		0	H	1	Fin, PCB overheating
	To	0	L	2	Electronic thermal overload
		0	H	2	External fault
					CPU failure*

Condition	LED 3	LED 2	LED 1	LED 0	Indication
Memory data	Bo		0o	0	Output frequency (Hz)
	9o		1		Setting frequency (Hz)
	Ro	2	4	0	Output current (%)
		F	0		Forward operation
	bo	r	E		Reverse operation
	Co	C	L		Current limiting
	do	U	L		Voltage limiting
	Eo	U	U		Undervoltage limiting

Note:
*: LED 3 decimal indicator stops flickering.

Trouble shooting

When a fault occurs, the message is displayed and the motor coasts to a stop. Check the causes of the fault referring to the following Troubleshooting Table. Remove the cause of the fault and press the RESET button.

Fault message*		Operating conditions when fault occurs (Function code No.:8 thru E)	Causes of fault	Remedy
First (fault)	Second (fault)			
0C		Output frequency (8)< Setting frequency (9)	Acceleration time is too short.	Make the acceleration time longer.
0C		Output frequency (8)> Setting frequency (9)	Deceleration time is too short.	Make the deceleration time longer.
0C	LU	Function code E is displayed as " U U ".	• An instantaneous power failure has occured. • Voltage drop has occured.	Check the power supply voltage.
0C	0U	Output frequency (8)> Setting frequency (9)	Deceleration time is too short.	Make the deceleration time longer.
0U		Output frequency (8)> Setting frequency (9)	Deceration time is too short.	Make the deceleration time longer.
0H1			• Inverter ambient temperature is high. • Cooling fan stops.	• Ventilate inside the panel. • Replace the cooling fan if required.
0L1		Output current (A)>100%	• Inverter is overloaded. • Acceleration/deceleration operation is carried out too frequently.	• Reduce the load. • Change the operation mode.
0L2			• Motor is overloaded. • Cooling fan stops.	• Reduce the load. • Replace the cooling fan if required.
LU			• Undervoltage. • Open phase on the line side.	• Check the power supply voltage. • Repair.
0H2			• External thermal overload relay (for control resistor or motor) operates. • acceleration/deceleration operation is carried out too frequently.	• Change the operating mode. • Reduce the load.
When fault message is not displayed.		Motor does not run.	Main circuit power supply is not inputted. Power supply voltage is too low. CPU operation indicator loam does not flicker nor lit.	Turn on the MCCB's and magnetic contactors. Check the power supply voltage. Turn the power supply off, wait a minutes, and reapply it. If the fault is not removed, please contact FUJI.
			Load is too heavy.	Reduce the load.

Notes:

- When the cause of the fault is not found in the table, please contact FUJI.

*: ① Select the function code No. 1 and the first fault is displayed.
② Select the function code No. 2 and the second fault is displayed.
(When the SHIFT button is pressed, the display is changed from ① to ②.

Maintenance

The routine maintenance and inspection are essential to reliable operation of the inverter. In inspections, the following precautions shall be taken.

1. Routine Inspection

1) Check if the cooling fan operates normally.
2) check for overheating, abnormal sounds and odor.
3) Check the ambient temperature and relative humidity of the installation of the inverter.
4) Check the vibration.
   If abnormality is found check further in details.

2. Periodic inspections

The periodic inspections shall be carried out every 6 months or yearly.

1) Be sure to turn off the power supply.
2) The smoothing capacitor does not discharge immediately after the power supply has been turned off. When carrying out inspections be sure to turn off the power supply and wait for a few minutes until the charge lamp (CHARGE) has gone out.
3) When connecting or disconnecting a connector be sure to do while holding the housing. Never pull the wires.
4) Check items (See table below)

Check items

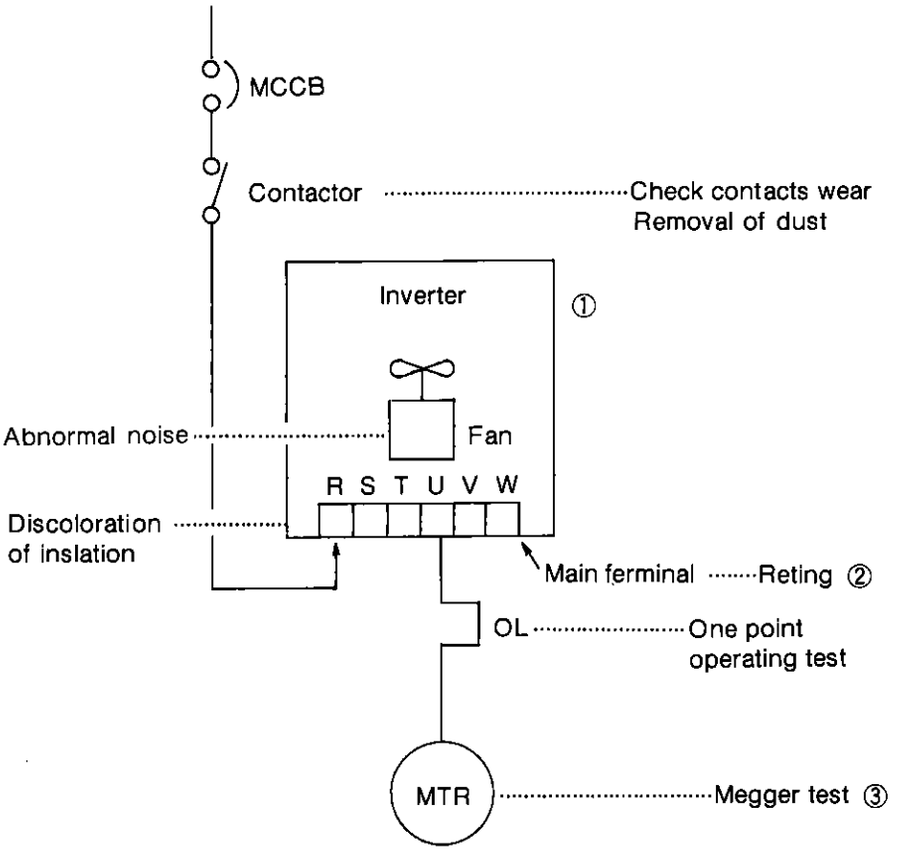
No.	Check item	Contents	Remedy
1	Contactor Relay	•Check the contacts for wear. •Check the operation.	Replace.
2	Transistor Diode Smoothing capacitor printed circuit board	•Discoloration, nasty smells •Check if wire or metallic chips are entrapped inside the unit.	Replace defective parts.
3	Cooling fan	•Check if it runs soundly when switched on. •Check the bearing for abnormal sound.	Replace if required.
4	Terminal Connector	Check the tightness.	Tighten if required.
5	Thermal overload relay	Operation test	
6	Motor	Megger *	

Note: * Without inverter unit

Remarks

When the parts are dusty clean using the compressed air without hurting the parts. However, use a vacuum cleaner to clean those locations where conductive dusts or other fines stay.

Daily inspection **Periodic inspection**



WARNING

1) The charge (CHARGE) lamp will remain lit for some time after the AC power has been interrupted. While this lamp is lit, high voltage is still present on the filter capacitors. Be sure to wait for this lamp to extinguish before working on any part of the power circuits in the control.
2) Misconnection of the input power source to the inverter output terminals U, V, W will damage the inverter.
3) Do not use a megger on any control circuit and use only a 500V DC maximum output from the megger if the motor leads are checked, while connected to the inverter, or damage will result.

FUJI INVERTERS
FRENIC5000G5, P5
Selection guide

Standard type
44-400kVA

FRENIC5000P5

200 Volts

Applicable motor output kW (HP)	Inverter output at 230V (kVA)	Output current (A)	Type
30 (40)	44	115	FRN030G5-2
37 (50)	55	145	FRN037G5-2
45 (60)	67	175	FRN045G5-2
55 (75)	84	220	FRN055G5-2
75 (100)	104	274	FRN075G5-2*1
90 (12)	132	346	FRN090G5-2*1
110 (150)	—	—	—
132 (180)	—	—	—
160 (220)	—	—	—
200 (270)	—	—	—
220 (300)	—	—	—
280 (375)	—	—	—

Notes:
*1: 400 volts inverters of 75 kW and above (G5 series), 90 kW and above (P5 series) are provided with a power factor correcting DC reactor. As to the 200 volts inverters, this reactor is provided for 75kW. and above
*2: Non standard.

Input ratings	Power supply	3-phase 200V 50/60Hz, 220, 230V 60Hz
	Allowable variation	Voltage: +10% −15%, Frequency: ±5%, Imbalance in power supply: 3% or less
Output ratings	Output voltage	3-phase 200, 220, 230V (same as input voltage)
	Output frequency	50Hz, 60Hz, 100Hz, 120Hz, 150hz, 180Hz, 200Hz and 240Hz
	frequency stability	±0.5% of maximum frequency (at 25°C ±10°C)
	Overload capacity	150% for 1 minute (Inverse time characteristics)
Control specifications	Control system	Sinusoidal wave PWM with flux control
	Frequency control range	1 to 240Hz (Control range: 1:50 through 1:240)
	Analog frequency setting inputs	0 to −10V DC, 0 to +10V DC, 4 to 20mA DC Provided with high and low limiters and built-in bias setter
	Frequency resolution	0.05% of maximum frequency (0.03Hz step with acceleration or deceleration)
	V/F ratio and torque boost	V/F ratio: 12-pattern selectable modes Torque boost: 16 selectable modes with automatic torque boost
	Acceleration/deceleration time	0.2 to 200 sec. (Independently adjustable acceleration and deceleration.)
	Auxiliary function	Jogging (5Hz fixed), High and Low frequency limit, Bias setting
	Operating sound selection	4-pattern selectable modes (Carrier frequency control)
Protection	Stall prevention	When the motor current reaches the maximum limit on acceleration or deceleration the frequency change is suppressed, so preventing overcurrent or overvoltage trip.
	Instantaneous power failure	The inverter operates through a power interruption of 15 msec or less. If the failure is longer than 15 msec the inverter shuts down.
	External output signal	Fault alarm signal (1 Form C, 250VAC 3A)
	Inverter trip and error message	Overvoltage (OU) Undervoltage (LU), Overcurrent (OC), Inverter heat sink overheating (OH1), External thermal OL relay trip (OH2), DB resistor overheating (OH2), Inverter overload (OL1), Electronic thermal OL trip (OL2), High/Low limiter setting error (Err1), F max. switch setting error (Err2), CPU error.
	Surge or radio interference suppression	Provided with Z-trap for surge suppression and radio interference filter.
Indication	7-segment digital display	Autual frequency, CPU normal operation, Setting frequency, Maximunm frequency, Base frequency, Bias frequency, High and low limit frequency, Acceleration/deceleration time, Function code No.
Condition	Installation location	Indoor not more than 1000m above sea level. Do not install in a dusty location or expose to corrosive gases or direct rays of the sun.
	Ambient temperature, humidity	−10°C to +40°C (−10°C to 50°C: when mounted inside the switchboard) 90% RH or less (non-condensing)
	Cooling system	Forced air-cooling type
Plug-in type option PC boards		• OPCII-01 (Inverter restart after instantaneous power failure, Backup operation) • OPCII-02 (1 to 16Hz adjustable jogging operation, DC dynamic braking, Analog type ammeter output, Stall prevention, Polygonal line accel/decel speed control) • OPCII-03 (Remote digital display)
Application		Machine tools, Conveyers, Winders, Grinding machines (Constant torque and constant output loads)

FRENIC5000G5			FRENIC5000P5					
400 Volts			200 Volts				400 Volts		
Inverter output at 460V (kVA)	Output current (A)	Type	Applicable motor output kW (HP)	Inverter output at 230V (kVA)	Output current (A)	Type	Inverter output at 460V (kVA)	Output current (A)	Type
44	58	FRN030G5-4	30 (40)	44	115	FRN030P5-2	44	58	FRN030P5-4
56	73	FRN037G5-4	37 (50)	53	140	FRN037P5-2	56	73	FRN037P5-4
66	87	FRN045G5-4	45 (60)	67	175	FRN045P5-2	66	87	FRN045P5-4
84	110	FRN055G5-4	55 (75)	78	205	FRN055P5-2	84	110	FRN055P5-4
104	137	FRN075G5-4*1	75 (100)	104	274	FRN075P5-2*1	104	137	FRN075P5-4
132	173	FRN090G5-4*1	90 (120)	132	346	FRN090P5-2*1	132	173	FRN090P5-4*1
153	201	FRN110G5-4*1	110 (150)	153	402	FRN110P5-2*1	153	201	FRN110P5-4*1
175	230	FRN132G5-4*1	132 (180)	—	—	—	175	230	FRN132P5-4*1
221	290	FRN160G5-4*1	160 (220)	—	—	—	221	290	FRN160P5-4*1
282	370	FRN200G5-4*1	200 (270)	—	—	—	282	370	FRN200P5-4*1
335	440	FRN220G5-4*1	220 (300)	—	—	—	335	440	FRN220P5-4*1
—	—	—	280 (375)	—	—	—	400	520	FRN280P5-4*1
3-phase 380*2, 400V 50/60Hz 440, 460V 60Hz			3-phase 200V 50/60Hz, 220, 230V 60Hz				3-phase 380*2, 400V 50/60Hz 440, 460V 60Hz		
			As mentioned on the left						
3-phase 380, 400, 460V (same as input voltage)			3-phase 200, 220, 230V (same as input voltage)				3-phase 380,*2 400, 440, 460V (same as input voltage)		
			As mentioned on the left						
			As mentioned on the left						
			120% for 1 minute (Inverse time characteristics)						
			As mentioned on the left						
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			As mentioned on the left						
			Fans, Blowers, Pumps (Variable torque loads)						

Dimensions, mm

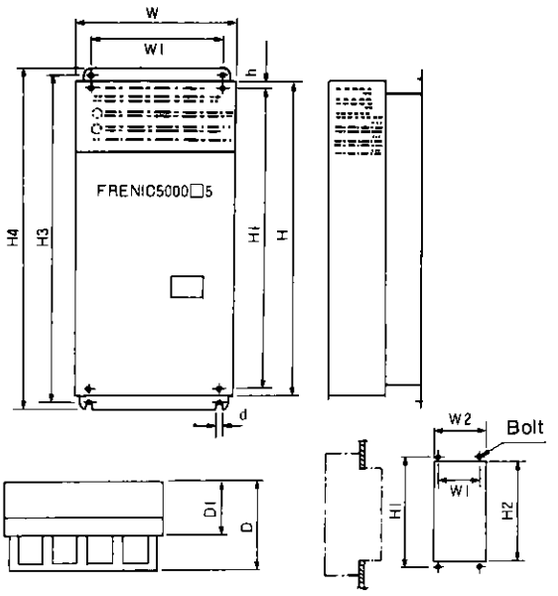
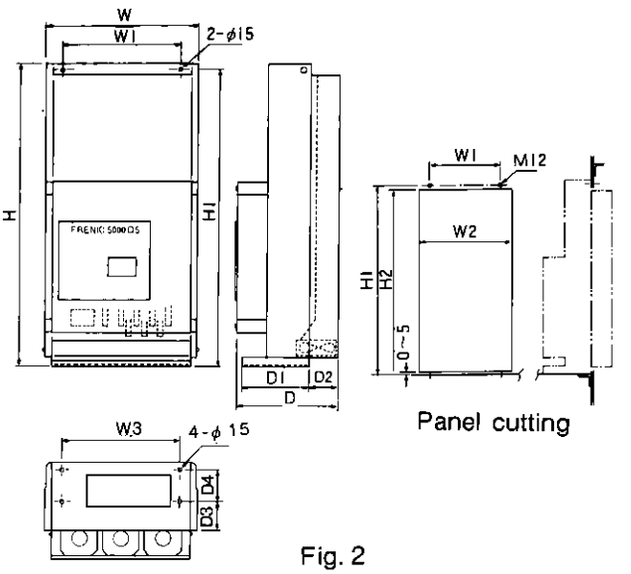


Fig. 1 Panel cutting



Panel cutting

Fig. 2

200 Volts series (Fig. 1)

G5	P5	W	W1	W2	H	H1	H2	H3	H4	h	D	D1	d	Bolt	Weight (kg)
—	FRN030P5-2	380	300	365	560	540	520	580	600	12	245	145	10	M8	40
FRN030G5-2 FRN037G5-2	FRN037P5-2 FRN045P5-2	450	360	435	700	670	640	730	760	18	260	160	15	M12	55
FRN045G5-2 FRN055G5-2	FRN055P5-2	450	360	435	900	870	840	930	960	18	260	160	15	M12	70
FRN075G5-2	FRN075P5-2	650	520	625	750	720	690	780	810	18	260	170	15	M12	85

400 Volts series (Fig. 1)

G5	P5	W	W1	W2	H	H1	H2	H3	H4	h	D	D1	d	Bolt	Weight (kg)
FRN030G5-4	FRN030P5-4 FRN037P5-4	350	270	335	550	530	510	570	590	12	315	215	10	M8	40
FRN037G5-4 FRN045G5-4	FRN045P5-4 FRN055P5-4	450	360	435	700	670	640	730	760	18	315	215	15	M12	55
FRN055G5-4	FRN075P5-4	500	400	475	800	770	740	830	860	18	325	215	15	M12	70

400 Volts series and 200 Volts series (Fig. 2)

G5	P5	W	W1	W2	W3	H	H1	H2	D	D1	D2	D3	D4	Weight (kg)
FRN075G5-4 FRN090G5-4 FRN110G5-4	FRN090P5-4 FRN110P5-4 FRN132P5-4	580	450	550	490	1150	1125	1110	380	240	112	95	120	120
FRN132G5-4 FRN160G5-4	FRN160P5-4 FRN200P5-4	730	600	700	640	1150	1125	1110	380	268	112	110	120	160
FRN200G5-4 FRN220G5-4	FRN220P5-4 FRN280P5-4	880	750	850	790	1150	1125	1110	380	268	112	110	120	200
FRN090G5-2	FRN090P5-2 FRN110P5-2	880	750	850	790	1000	975	960	380	268	112	110	120	170

■ Braking unit and braking resistor

● Braking unit (Transistor switch unit)

Fig. A

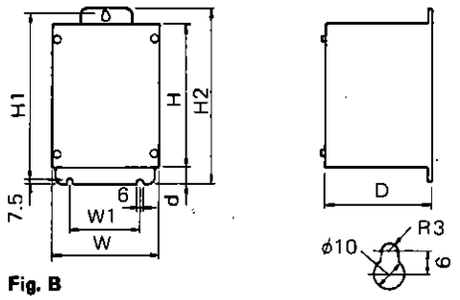
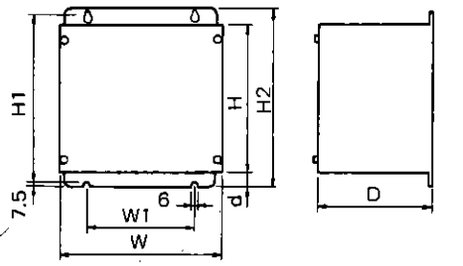


Fig. B



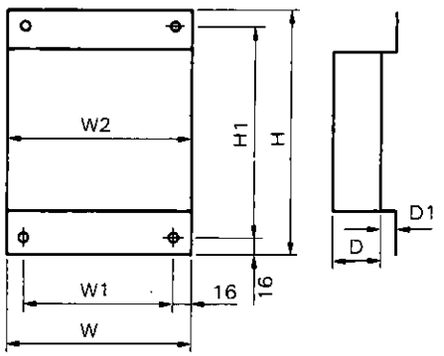
200 Volts

Type	Motor output kW	(HP)	Dimensions, mm W	W1	H	H1	H2	D	d	Fig. No.
BU030-2	30	(40)	150	100	200	225	240	150	20	A
BU055-2	37 45 55	(50) (60) (75)	230	130	200	225	240	170	20	B
BU075-2	75	(100)	250	150	330	335	370	170	40	B

400 Volts

Type	Motor output kW	(HP)	Dimensions, mm W	W1	H	H1	H2	D	d	Fig. No.
BU037-4	30 37	(40) (50)	180	100	240	265	280	160	20	B
BU055-4	45 55	(60) (75)	230	130	240	265	280	160	20	B
BU110-4	75 90 110	(100) (120) (150)	250	150	360	385	400	170	40	B
BU132-4	132	(180)	250	150	360	385	400	170	40	B
BU220-4	160 200 220	(220) (270) (300)	250	150	410	435	450	170	60	B

● Braking resistor



200 Volts

Type	Dimensions, mm W	W1	W2	H	H1	D	D1	Mounting screw	Net weight (kg)
DBH030-2	400	368	–	660	628	140	6.4	M8	11
DBH037-2	400	368	–	660	628	240	6.4	M8	15
DBH045-2	400	368	–	660	628	240	6.4	M8	20
DBH055-2	400	368	405	750	718	240	6.4	M8	25

400 Volts

Type	Dimensions, mm W	W1	W2	H	H1	D	D1	Mounting screw	Net weight (kg)
DBH030-4	420	388	–	660	628	140	6.4	M8	11
DBH037-4	420	388	–	660	628	240	6.4	M8	15
DBH045-4	420	388	–	660	628	240	6.4	M8	20
DBH055-4	420	388	425	750	718	240	6.4	M8	25

200 Volts

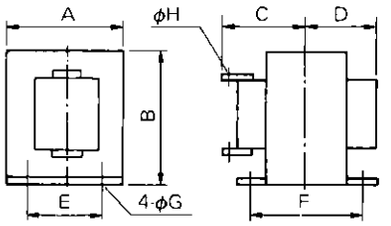
Type	Resistor kW	Ω	Motor output kW	Allowable braking torque(%)	Allowable braking time factor (%)	Allowable continuous braking time	Applicable braking unit	Fig. No.	Allowable continuous braking time	Applicable inverter kVA	Type
DBH030-2	3.6	4.0	30	100	5	5 sec.	BU030-2	A	60 sec.	30	FRN030G5, P5-2
DBH037-2	4.8	3.0	37	100	5	5 sec.	BU055-2	B	60 sec.	37	FRN037G5, P5-2
DBH045-2	6.0	2.5	45	100	5	5 sec.	BU055-2	B	60 sec.	45	FRN045G5, P5-2
DBH055-2	7.2	2.0	55	100	5	5 sec.	BU055-2	B	60 sec.	55	FRN055G5, P5-2
DBH037-2x2	9.6	1.5	75	100	5	5 sec.	BU075-2	B	60 sec.	75	FRN075G5, P5-2

400 Volts

Type	Resistor kW	Ω	Motor output kW	Allowable braking torque(%)	Allowable braking time factor (%)	Allowable continuous braking time	Applicable braking unit	Fig. No.	Allowable continuous braking time	Applicable inverter kVA	Type
DBH030-4	3.6	15.0	30	100	5	5 sec.	BU037-4	B	60 sec.	30	FRN030G5, P5-4
DBH037-4	4.8	12.0	37	100	5	5 sec.	BU037-4	B	60 sec.	37	FRN037G5, P5-4
DBH045-4	6.0	10.0	45	100	5	5 sec.	BU055-4	B	60 sec.	45	FRN045G5, P5-4
DBH055-4	7.2	7.5	55	100	5	5 sec.	BU055-4	B	60 sec.	55	FRN055G5, P5-4
DBH037-4x2	9.6	6.0	75	100	5	5 sec.	BU110-4	B	60 sec.	75	FRN075G5, P5-4
DBH045-4x2	12.0	5.0	90	100	5	5 sec.	BU110-4	B	60 sec.	90	FRN090G5, P5-4
DBH055-4x2	14.4	3.75	110	100	5	5 sec.	BU110-4	B	60 sec.	110	FRN110G5, P5-4
For braking resistor, please contact FUJI.	18.0	3.33	132	100	5	5 sec.	BU132-4	B	60 sec.	132	FRN132G5, P5-4
	21.6	2.5	160	100	5	5 sec.	BU220-4	B	60 sec.	160	FRN160G5, P5-4
	28.8	1.88	200	100	5	5 sec.	BU220-4	B	60 sec.	200	FRN200G5, P5-4
	28.8	1.88	220	100	5	5 sec.	BU220-4	B	60 sec.	220	FRN220G5, P5-4

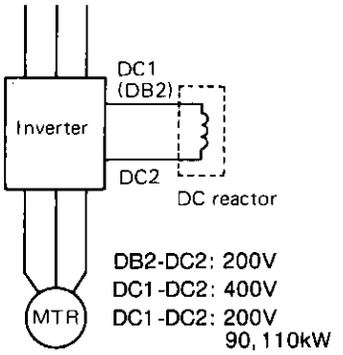
■ Dimensions, mm

● Power factor correcting DC reactors



The power factor can be improved to be approx. 0.9 by using these reactors.

Note: 400 volts inverters of 75kW and above (G5 series), 90kW and above (P5 series) are provided with a power factor correcting DC reactor. As to the 200 volts inverters, this reactor is provided for 75kW and above.
When installing inverters, be sure to connect this reactor.



200 Volts

Motor output kW	(HP)	Reactor type	Dimensions, mm A	B	C	D	E	F	G	H	Weight (kg)
30	(40)	DCR2-30	146	210	130	70	75	100	9×15	10.5	16
37	(50)	DCR2-37	156	260	110	70	80	100	9×15	10	19
45	(60)	DCR2-45	156	260	130	75	80	110	9×15	10	23
55	(75)	DCR2-55	170	300	130	75	80	110	9×15	10	28
75	(100)	DCR2-75	200	240	180	75	80	95	9×15	12	19
90	(120)	DCR2-90	180	275	150	75	100	100	10×16	15	22
110	(150)	DCR2-110	200	290	150	80	100	120	10×16	15	25

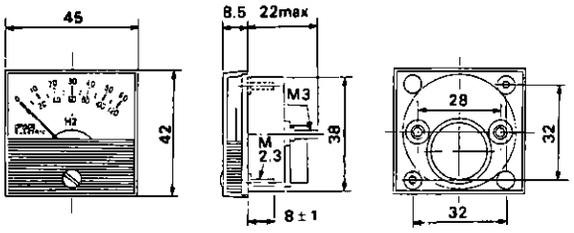
400 Volts

Motor output kW	(HP)	Reactor type	Dimensions, mm A	B	C	D	E	F	G	H	Weight (kg)
30	(40)	DCR4-30	150	210	155	70	75	85	9×15	8.4	14
37	(50)	DCR4-37	146	210	155	70	75	100	9×15	8.4	17
45	(60)	DCR4-45	146	210	180	75	75	115	9×15	10.5	21
55	(75)	DCR4-55	146	210	190	85	75	130	9×15	10.5	25
75	(100)	DCR4-75	200	250	160	80	70	120	10×16	10.5	25
90	(120)	DCR4-90	220	280	165	85	70	140	10×16	13	32
110	(150)	DCR4-110	220	290	170	95	70	150	10×16	13	36
132	(180)	DCR4-132	190	360	180	90	80	146	11	13	40
160	(220)	DCR4-160	220	350	200	90	90	140	12×20	12	45
200	(270)	DCR4-200	230	310	180	110	100	140	12×20	15	50
220	(300)	DCR4-220	230	320	180	110	100	150	12×20	15	50
280	(375)	DCR4-280	230	340	180	110	100	160	12×20	15	58

■ Dimensions, mm

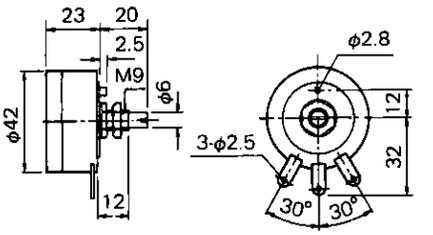
● Frequency meters

Type: TRM-45, 10VDC, 1mA



● Potentiometer for frequency control

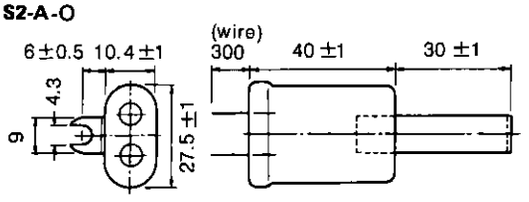
Type: WAR3W-1kΩ(3W) B-characteristics



● Spark killer

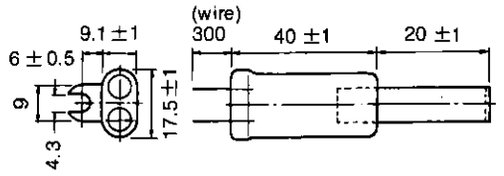
Use with magnetic contactor

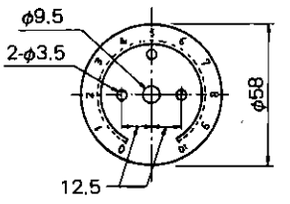
Type: S2-A-O

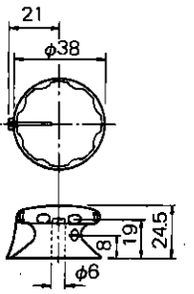


Use with control relay or timer

Type: S1-B-O







■ Distribution & Control equipment

200 Volts

Motor output (kW)	Applicable wire size (mm²)				FAB (MCCB)	ELCB	Magnetic contactor	Thermal overload relay	Fuse (A)		Spark killer
	Main circuit	Alarm circuit	Control circuit	Ground					Fuse-link	FNH type	
30	50 (22)	1.25	0.5	2	SA203K/150 (25kA)	EGa203A/150 (18kA)	SC-6N	TR-6N (85–125)	150	150	S2-A-0 S1-B-0
37	60 (30)				SA203K/200 (25kA)	EGa203A/200 (18kA)	SC-7N	TR-10NH (110–160)	200	200	
45	100 (50)				SA203K/225 (25kA)	EGa203A/225 (18kA)	SC-8N	TR-10NH (125–185)	250	250	
55	60x2 (60)				SA403A/300 (42kA)	EGa403A/300 (35kA)	SC-10N	TR-10NH (160–240)	300	300	
75	100x2 (150)				SA403K/350 (42kA)	EGa403A/350 (35kA)	SC-12N	TR-12NH (240–360)	400	400	S2-A-0 S1-B-0
90	150x2 (150)				SA403K/400 (42kA)	EGa403A/400 (35kA)	SC-12N	TR-12NH (300–450)	500	500	
110	200x2 (200)				SA603H/500 (85kA)	EGa603A/500 (42kA)	SC-14N	TR-12NH (300–450)	500	500	

400 Volts

Motor output (kW)	Applicable wire size (mm²)				FAB (MCCB)	ELCB	Magnetic contactor	Thermal overload relay	Fuse (A)		Spark killer
	Main circuit	Alarm circuit	Control circuit	Ground					Fuse-link	FNH type	
30*	22 (14)	1.25	0.5	2	SA103K/75 (10kA)	EG103A/75 (5kA)	SC-3N	TR-3N (45–67)	75	–	S2-A-0 S1-B-0
30**	22 (14)				SA103K/100 (10kA)	EG103A/100 (5kA)	SC-3N	TR-3N (45–67)	100	100	
37	30 (14)				SA103K/100 (10kA)	EG103A/100 (5kA)	SC-4N	TR-6N (54–80)	100	100	
45	38 (22)				SA103K/100 (10kA)	EG103A/100 (5kA)	SC-5N	TR-6N (65–95)	100	100	
55	50 (22)				SA203K/125 (14kA)	EGa203A/125 (10kA)	SC-6N	TR-6N (85–125)	125	150	
75	60 (30)				SA203K/200 (14kA)	EGa203A/200 (10kA)	SC-7N	TR-10NH (110–160)	200	200	
90	100 (50)				SA203K/225 (14kA)	EGa203A/225 (10kA)	SC-8N	TR-10NH (125–185)	250	250	
110	60x2 (60)				SA403K/250 (30kA)	EG403A/250 (22kA)	SC-10N	TR-10NH (160–240)	300	300	
132	80x2 (80)				SA403K/300 (30kA)	EG403A/300 (22kA)	SC-11N	TR-12NH (200–300)	300	300	
160	100x2 (100)				SA403K/400 (30kA)	EG403A/400 (22kA)	SC-12N	TR-12NH (200–300)	400	400	
200	150x2 (150)				SA603H/500 (42kA)	EG603A/500 (42kA)	SC-12N	TR-12NH (240–360)	500/–	500	
220	200x2 (200)				SA603H/500 (42kA)	EG603A/500 (42kA)	SC-14N	TR-12NH (300–400)	500/–	500	
280	Cu bar 6x50				SA603H/600 (42kA)	EG603A/600 (42kA)	SC-14N	TR-14NH (400–600)	600/–	600	

Note: *: FRENIC5000P5 **: FRENIC5000G5

■Plug-in type option PC board (OPC II series)

Three types of plug-in type option PC boards (OPC II-01, OPC II-02 and OPC II-03) are available for exclusive FRENIC5000 series use.

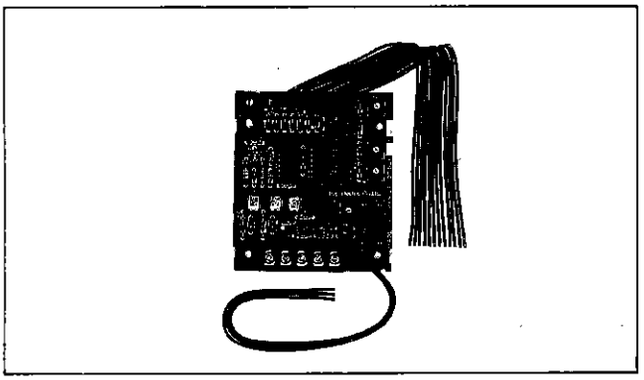
When using these PC boards, inverters can provide a special function. (See the table on the right.;

The mounting position of the PC board varies depending on type. Mounting position is as shown in the figure below.

Notes:

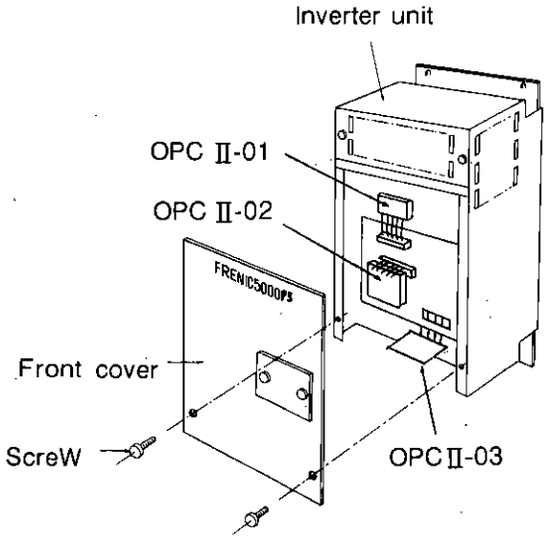
- These three types of PC board can be used simultaneously.
- For further information please see the instruction manual.

■ Plug-in type option PC boards



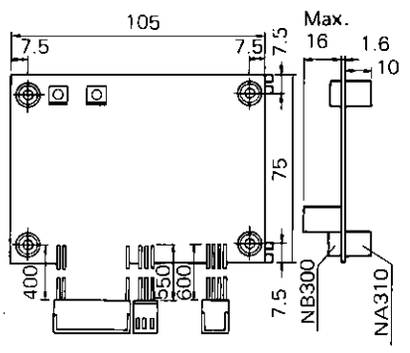
Plug-in type option PC board

Type	Description
OPCII-01	1. Inverter restart after instantaneous power failure 2. Backup operation (line power and inverter switching)
OPCII-02	1. DC dynamic braking 2. Polygonal line accel/decel speed control 3. 1 to 16Hz adjustable jogging operation 4. Analog type ammeter output 5. Stall prevention
OPCII-03	Remote digital display

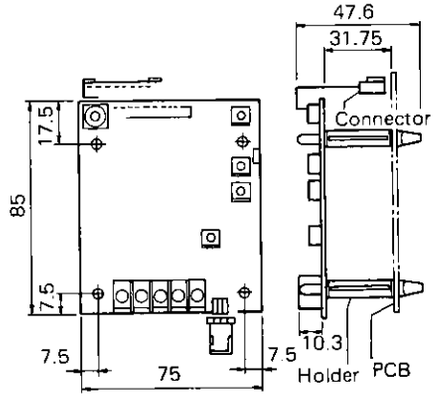


■ Dimensions, mm

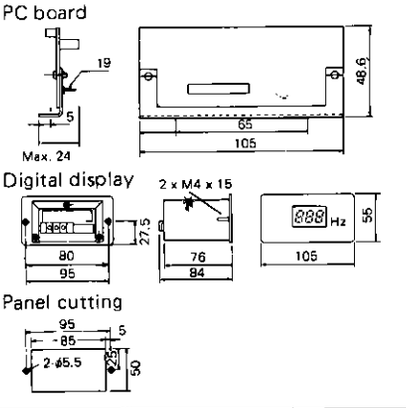
OPCII-01



OPCII-02



OPCII-03



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