

PRESSURE-RESISTANT, EXPLOSION-PROOF MOTOR DRIVING INVERTER FR-B, B3

INSTRUCTION MANUAL (BASIC)

FR-B-750 to 75K(200V), FR-B-750 to 110K(400V)

FR-B3-(N)(H) 400 to 37K (A700 SPECIFICATIONS)

Thank you for choosing this Mitsubishi pressure-resistant, explosion-proof motor driving inverter. This Instruction Manual (basic) is intended for users who "just want to run the inverter". If you are going to utilize functions and performance, refer to the *Instruction Manual (applied)* [IB-0600272ENG]. The *Instruction Manual (applied)* is separately available from where you purchased the inverter or your Mitsubishi sales representative.

Be sure to perform offline auto tuning in the motor running mode and operate with the advanced magnetic flux vector control when using the FR-B3 series.

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This instruction manual (basic) provides handling information and precautions for use of the equipment. Please forward this instruction manual (basic) to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this instruction manual (basic) and appended documents carefully and can use the equipment correctly. Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions. In this instruction manual (basic), the safety instruction levels are classified into "WARNING" and "CAUTION".

WARNING Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

CAUTION Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that even the **CAUTION** level may lead to a serious consequence according to conditions. Please follow strictly the instructions of both levels because they are important to personnel safety.

1. Electric Shock Prevention

WARNING

- While power is on or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, check to make sure that the operation panel indicator is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power off and it is dangerous.
- This inverter must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards) Use a neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard.
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.
- Perform setting dial and key operations with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
- Do not replace the cooling fan while power is on. It is dangerous to replace the cooling fan while power is on.
- Do not touch the printed circuit board with wet hands. You may get an electric shock.
- When measuring the main circuit capacitor capacity, the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

2. Fire Prevention

CAUTION

- Install the inverter on a nonflammable wall without holes (so that nobody can touch the inverter heatsink on the rear side, etc.). Mounting it to or near flammable material can cause a fire.
- If the inverter has become faulty, switch off the inverter power. A continuous flow of large current could cause a fire.
- When using a brake resistor, make up a sequence that will turn off power when an alarm signal is output. Otherwise, the brake resistor may excessively overheat due to damage of the brake transistor and such, causing a fire.
- Do not connect a resistor directly to the DC terminals P/+, N/-. This could cause a fire.

3. Injury Prevention

CAUTION

- Apply only the voltage specified in the instruction manual to each terminal. Otherwise, burst, damage, etc. may occur.
- Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc. Otherwise, burst, damage, etc. may occur.
- While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

4. Additional Instructions
Also note the following points to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and installation

CAUTION

- Since the inverter is non-explosion-proof, always install it in a non-hazardous place.
- Do not stack the inverter boxes higher than the number recommended.
- Ensure that installation position and material can withstand the weight of the inverter. Install according to the information in the instruction manual.
- Do not install or operate the inverter if it is damaged or has parts missing. This can result in breakdowns.
- When carrying the inverter, do not hold it by the front cover or setting dial; it may fall off or fail.
- Do not stand or rest heavy objects on the product.
- Check the inverter mounting orientation is correct.
- Prevent other conductive bodies such as screws and metal fragments or other flammable substance such as oil from entering the inverter.
- As the inverter is a precision instrument, do not drop or subject it to impact.
- Use the inverter under the following environmental conditions. Otherwise, the inverter may be damaged.

Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90% RH or less (non-condensing)
	Storage temperature	-20°C to +65°C *1
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude, vibration	Maximum 1000m above sea level for standard operation. 5.9m/s ² or less at 10 to 55Hz (directions of X, Y, Z axes)

*1 Temperature applicable for a short time, e.g. in transit.

(2) Wiring

CAUTION

- Do not install a power factor correction capacitor or surge suppressor/radio noise filter (capacitor type filter) on the inverter output side. The device on the inverter output side may be overheated or burn out.
- The connection orientation of the output cables U, V, W to the motor will affect the direction of rotation of the motor.


(3) Test operation and adjustment

CAUTION

- For the FR-B3 series, operate with Advanced magnetic flux vector control after performing offline auto tuning.
- Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

(4) Operation

WARNING

- Since this inverter is used in combination with the Mitsubishi inverter-driven, pressure-resistant, explosion-proof motor, note the driven motor used with the inverter.
- Note that this inverter cannot be used with the Mitsubishi increased-safety, explosion-proof motor.
- When you have chosen the retry function, stay away from the equipment as it will restart suddenly after an alarm stop.
- Since pressing  key may not stop output depending on the function setting status (refer to page 81), provide a circuit and switch separately to make an emergency stop (power off, mechanical brake operation for emergency stop, etc).
- Make sure that the start signal is off before resetting the inverter alarm. A failure to do so may restart the motor suddenly.
- The load used should be a three-phase induction motor only. Connection of any other electrical equipment to the inverter output may damage the inverter as well as equipment.
- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the inverter.

CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter. Otherwise, the life of the inverter decreases.
- Use a noise filter to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- Take measures to suppress harmonics. Otherwise power supply harmonics from the inverter may heat/damage the power factor correction capacitor and generator.
- When parameter clear or all clear is performed, reset the required parameters before starting operations. Each parameter returns to the initial value.
- The inverter can be easily set for high-speed operation. Before changing its setting, fully examine the performances of the motor and machine.
- In addition to the inverter's holding function, install a holding device to ensure safety.
- Before running an inverter which had been stored for a long period, always perform inspection and test operation.
- For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

(5) Emergency stop

CAUTION

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.
- When the breaker on the inverter input side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.
- When the protective function is activated, take the corresponding corrective action, then reset the inverter, and resume operation.

(6) Maintenance, inspection and parts replacement

CAUTION

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.

(7) Disposing of the inverter

CAUTION

- Treat as industrial waste.

General instructions

Many of the diagrams and drawings in this instruction manual (basic) show the inverter without a cover, or partially open. Never run the inverter in this status. Always replace the cover and follow this instruction manual (basic) when operating the inverter.

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<Abbreviations>

DU: Operation panel (FR-DU07)

PU: Operation panel(FR-DU07) and parameter unit (FR-PU04, FR-PU07)

Inverter: Mitsubishi, pressure-resistant, explosion-proof motor driving inverter FR-B, B3 series

FR-B,B3: Mitsubishi, pressure-resistant, explosion-proof motor driving inverter FR-B, B3 series

Pr.: Parameter Number

PU operation: Operation using the PU (FR-DU07/FR-PU04/FR-PU07)

External operation: Operation using the control circuit signals

Combined operation: Combined operation using the PU (FR-DU07/FR-PU04/FR-PU07) and external operation

Explosion proof motor: XE-(N)E, XF-(N)E, XF-TH, XF-(N)ECA-1,2


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Harmonic suppression guideline

All models of general-purpose inverters used by specific consumers are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". (For further details, refer to  Instruction Manual (applied).)

1 PRODUCT CHECKING AND PARTS IDENTIFICATION

Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

· Inverter Type

FR - B - 3700

FR - B3 - N H - 3700

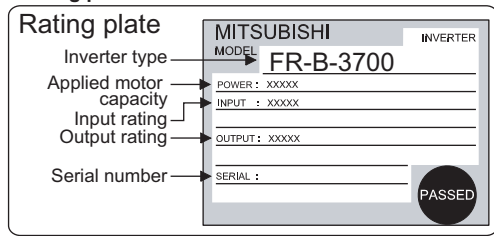
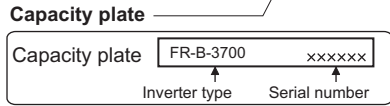
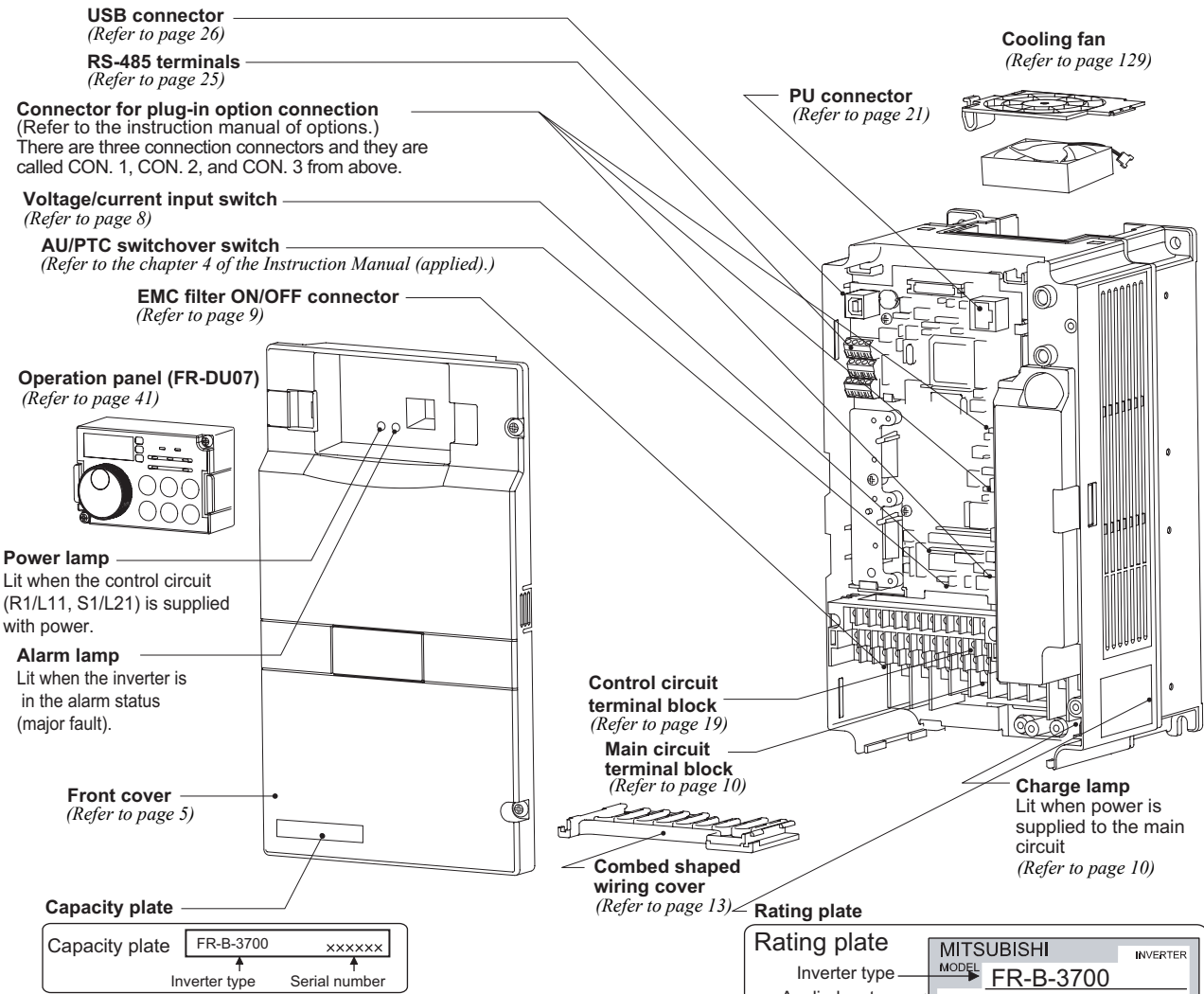
Symbol	Inverter Capacity
750 to 3700	Indicate capacity(W)
5.5K to 110K	Indicate capacity(kW)

Symbol	Noise
None	Standard
N	Low noise

Symbol	Voltage Class
None	200V Class
H	400V Class

Symbol	Voltage Class
750 to 3700	Indicate capacity(W)
5.5K to 37K	Indicate capacity(kW)

As the name of the FR-B series does not include a symbol indicating voltage class, check the voltage class with the input rating on the rating plate.



• Accessory

- DC reactor supplied (75K or more)
- Eyebolt for hanging the inverter (30K or more)

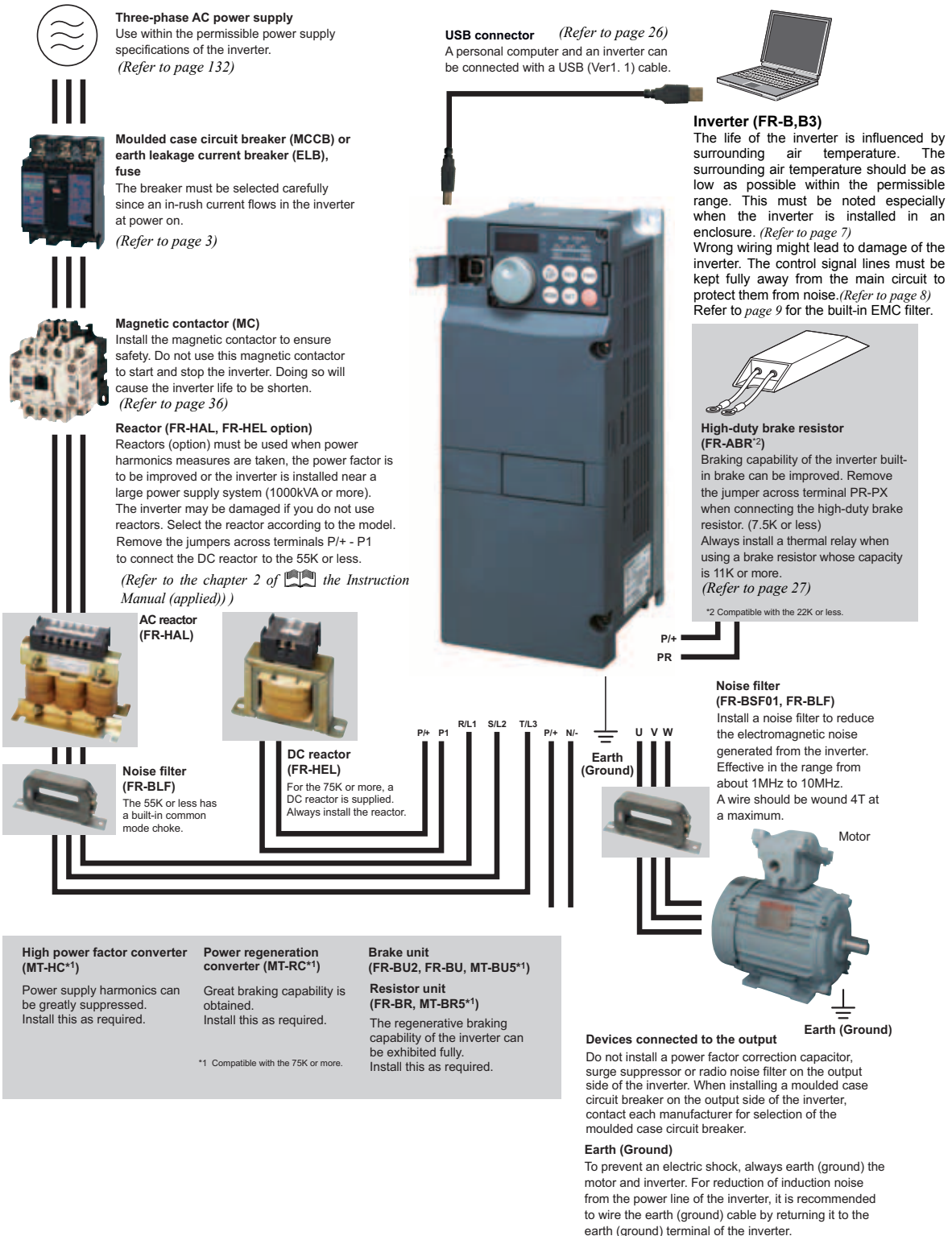
Capacity	Eyebolt size	Number
30K	M8	2
37K to 110K	M10	2



REMARKS

For removal and reinstallation of covers, refer to page 5.

2 INSTALLATION AND WIRING



CAUTION

- Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the inverter output side. This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices are connected, immediately remove them.
- Electromagnetic wave interference
The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, set the EMC filter valid to minimize interference.
(Refer to the chapter 2 of the Instruction Manual (applied).)
- Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.

2.1 Peripheral devices

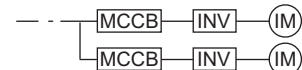
Check the inverter type of the inverter you purchased. Appropriate peripheral devices must be selected according to the capacity. Refer to the following list and prepare appropriate peripheral devices:

200V class

Motor Output (kW) ^{*1}	Applicable Inverter Type		Breaker Selection ^{*2}		Input Side Magnetic Contactor ^{*3}	
			Reactor connection		Reactor connection	
	FR-B	FR-B3	without	with	without	with
0.4	FR-B-750	FR-B3-(N)400	30AF 5A	30AF 5A	S-N10	S-N10
0.75	FR-B-750	FR-B3-(N)750	30AF 10A	30AF 10A	S-N10	S-N10
1.5	FR-B-1500	FR-B3-(N)1500	30AF 15A	30AF 15A	S-N10	S-N10
2.2	FR-B-2200	FR-B3-(N)2200	30AF 20A	30AF 15A	S-N10	S-N10
3.7	FR-B-3700	FR-B3-(N)3700	30AF 30A	30AF 30A	S-N20, N21	S-N10
5.5	FR-B-5.5K	FR-B3-(N)5.5K	50AF 50A	50AF 40A	S-N25	S-N20, N21
7.5	FR-B-7.5K	FR-B3-(N)7.5K	100AF 60A	50AF 50A	S-N25	S-N25
11	FR-B-11K	FR-B3-(N)11K	100AF 75A	100AF 75A	S-N35	S-N35
15	FR-B-15K	FR-B3-(N)15K	225AF 125A	100AF 100A	S-N50	S-N50
18.5	—	FR-B3-(N)18.5K	225AF 150A	225AF 125A	S-N65	S-N50
22	FR-B-22K	FR-B3-(N)22K	225AF 175A	225AF 150A	S-N80	S-N65
30	FR-B-30K	FR-B3-(N)30K	225AF 225A	225AF 175A	S-N95	S-N80
37	FR-B-37K	FR-B3-(N)37K	400AF 250A	225AF 225A	S-N150	S-N125
45	FR-B-45K	—	400AF 300A	400AF 300A	S-N180	S-N150
55	FR-B-55K	—	400AF 400A	400AF 350A	S-N220	S-N180
75	FR-B-75K	—	—	400AF 400A	—	S-N300

*1 Selections for use of the Mitsubishi explosion-proof motor with power supply voltage of 200VAC 50Hz.

*2 Select the MCCB according to the power supply capacity. Install one MCCB per inverter.



*3 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times. When using the MC for emergency stop during motor driving, select the MC with class AC-3 rated current for the motor rated current.

CAUTION

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter type and cable and reactor according to the motor output.
- When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.

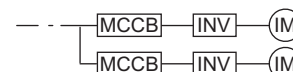


400V class

Motor Output (kW) ^{*1}	Applicable Inverter Type		Breaker Selection ^{*2}		Input Side Magnetic Contactor ^{*3}	
			Reactor connection		Reactor connection	
	FR-B	FR-B3	without	with	without	with
0.4	FR-B-750	FR-B3-(N)H400	30AF 5A	30AF 5A	S-N10	S-N10
0.75		FR-B3-(N)H750	30AF 5A	30AF 5A	S-N10	S-N10
1.5	FR-B-1500	FR-B3-(N)H1500	30AF 10A	30AF 10A	S-N10	S-N10
2.2	FR-B-2200	FR-B3-(N)H2200	30AF 10A	30AF 10A	S-N10	S-N10
3.7	FR-B-3700	FR-B3-(N)H3700	30AF 20A	30AF 15A	S-N10	S-N10
5.5	FR-B-7.5K	FR-B3-(N)H5.5K	30AF 30A	30AF 20A	S-N20, N21	S-N11, N12
7.5	FR-B-7.5K	FR-B3-(N)H7.5K	30AF 30A	30AF 30A	S-N20, N21	S-N20, N21
11	FR-B-15K	FR-B3-(N)H11K	50AF 50A	50AF 40A	S-N20, N21	S-N20, N21
15	FR-B-15K	FR-B3-(N)H15K	100AF 60A	50AF 50A	S-N25	S-N20, N21
18.5	—	FR-B3-(N)H18.5K	100AF 75A	100AF 60A	S-N25	S-N25
22	FR-B-22K	FR-B3-(N)H22K	100AF 100A	100AF 75A	S-N35	S-N25
30	FR-B-37K	FR-B3-(N)H30K	225AF 125A	100AF 100A	S-N50	S-N50
37	FR-B-37K	FR-B3-(N)H37K	225AF 150A	225AF 125A	S-N65	S-N50
45	FR-B-55K	—	225AF 175A	225AF 150A	S-N80	S-N65
55	FR-B-55K	—	225AF 200A	225AF 175A	S-N80	S-N80
75	FR-B-75K	—	—	225AF 225A	—	S-N95
90	FR-B-90K	—	—	225AF 225A	—	S-N150
110	FR-B-110K	—	—	225AF 225A	—	S-N180

*1 Selections for use of the Mitsubishi explosion-proof motor with power supply voltage of 400VAC 50Hz.

*2 Select the MCCB according to the power supply capacity. Install one MCCB per inverter.



*3 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times. When using the MC for emergency stop during motor driving, select the MC with class AC-3 rated current for the motor rated current.

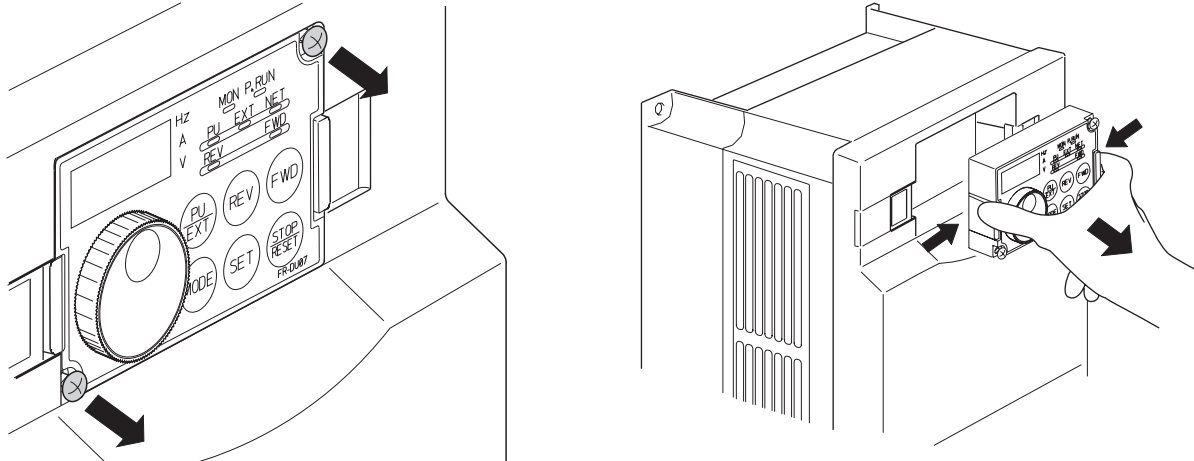
CAUTION

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter type and cable and reactor according to the motor output.
- When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.

2.2 Method of removal and reinstallation of the front cover

•Removal of the operation panel

- 1) Loosen the two screws on the operation panel.
(These screws cannot be removed.)
- 2) Push the left and right hooks of the operation panel and pull the operation panel toward you to remove.

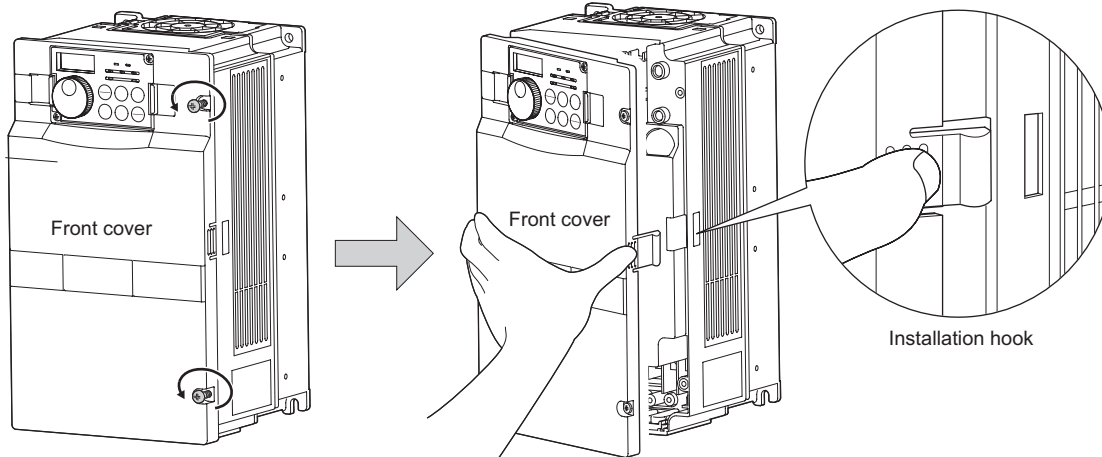


When reinstalling the operation panel, insert it straight to reinstall securely and tighten the fixed screws of the operation panel.

22K or less

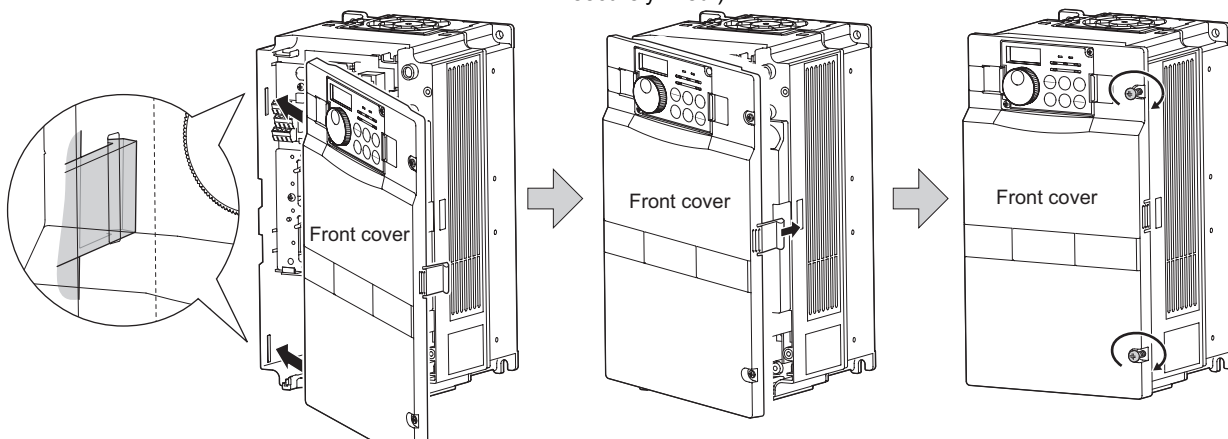
•Removal

- 1) Loosen the installation screws of the front cover.
- 2) Pull the front cover toward you to remove by pushing an installation hook using left fixed hooks as supports.



•Reinstallation

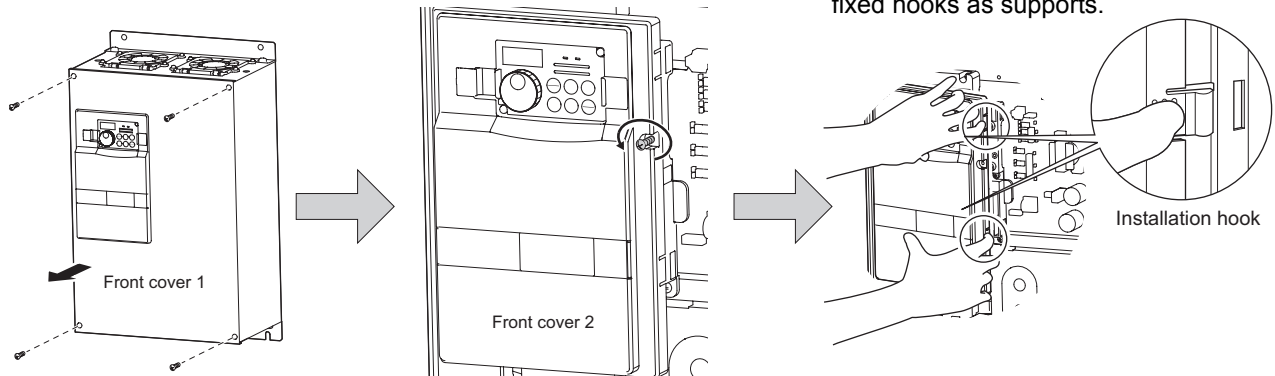
- 1) Insert the two fixed hooks on the left side of the front cover into the sockets of the inverter.
- 2) Using the fixed hooks as supports, securely press the front cover against the inverter.
(Although installation can be done with the operation panel mounted, make sure that a connector is securely fixed.)
- 3) Tighten the installation screws and fix the front cover.



30K or more

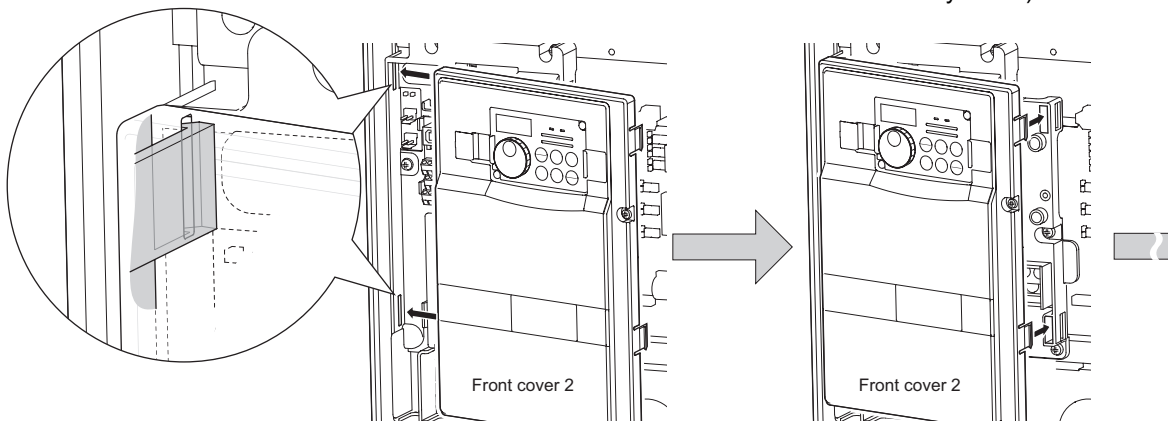
•Removal

- 1) Remove installation screws on the front cover 1 to remove the front cover 1.
- 2) Loosen the installation screws of the front cover 2.
- 3) Pull the front cover 2 toward you to remove by pushing an installation hook on the right side using left fixed hooks as supports.

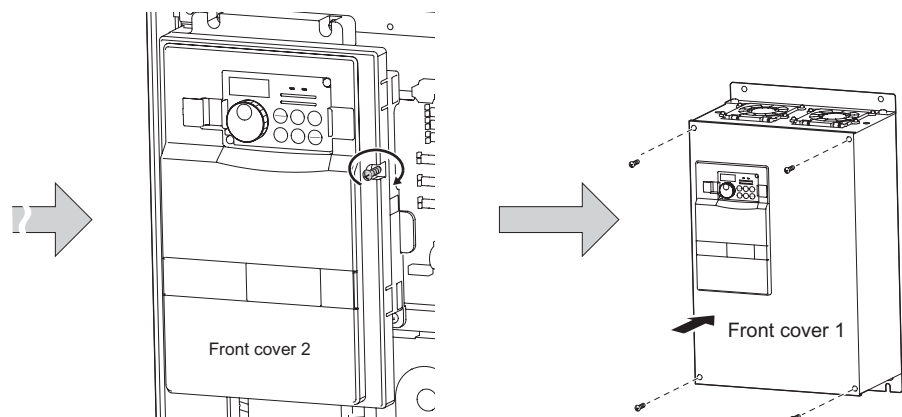


•Reinstallation

- 1) Insert the two fixed hooks on the left side of the front cover 2 into the sockets of the inverter.
- 2) Using the fixed hooks as supports, securely press the front cover 2 against the inverter. (Although installation can be done with the operation panel mounted, make sure that a connector is securely fixed.)



- 3) Fix the front cover 2 with the installation screws.
- 4) Fix the front cover 1 with the installation screws.



REMARKS

- For the FR-B-55K(200V class) or more, the front cover 1 is separated into two parts.

CAUTION

1. Fully make sure that the front cover has been reinstalled securely. Always tighten the installation screws of the front cover.
2. The same serial number is printed on the capacity plate of the front cover and the rating plate of the inverter. Before reinstalling the front cover, check the serial numbers to ensure that the cover removed is reinstalled to the inverter from where it was removed.

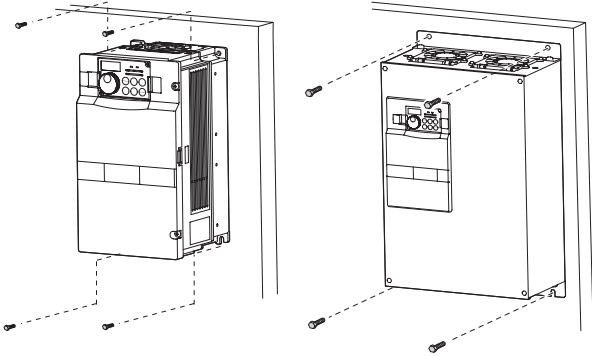
2.3 Installation of the inverter and instructions

As the inverter does not have an explosion proof structure, install it in a non-hazardous place.

• Installation of the Inverter

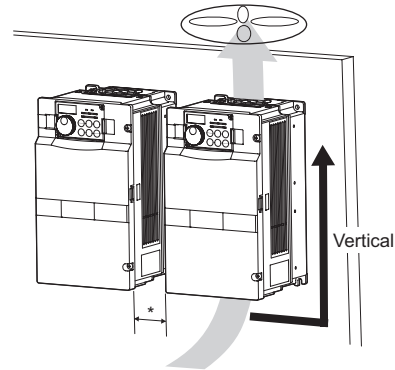
Enclosure surface mounting
22K or less

30K or more



CAUTION

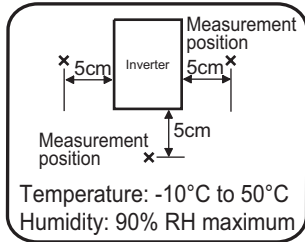
- When encasing multiple inverters, install them in parallel as a cooling measure.
- Install the inverter vertically.



* Refer to the clearances below.

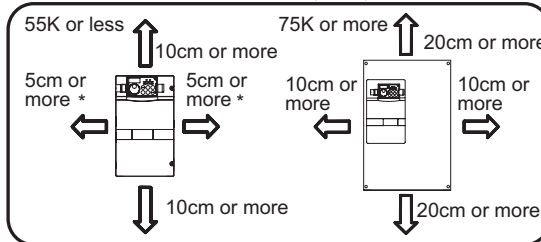
• Install the inverter under the following conditions.

Surrounding air temperature and humidity

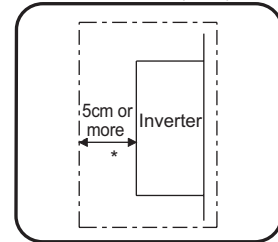


Leave enough clearances and take cooling measures.

Clearances (Front)



Clearances (Side)

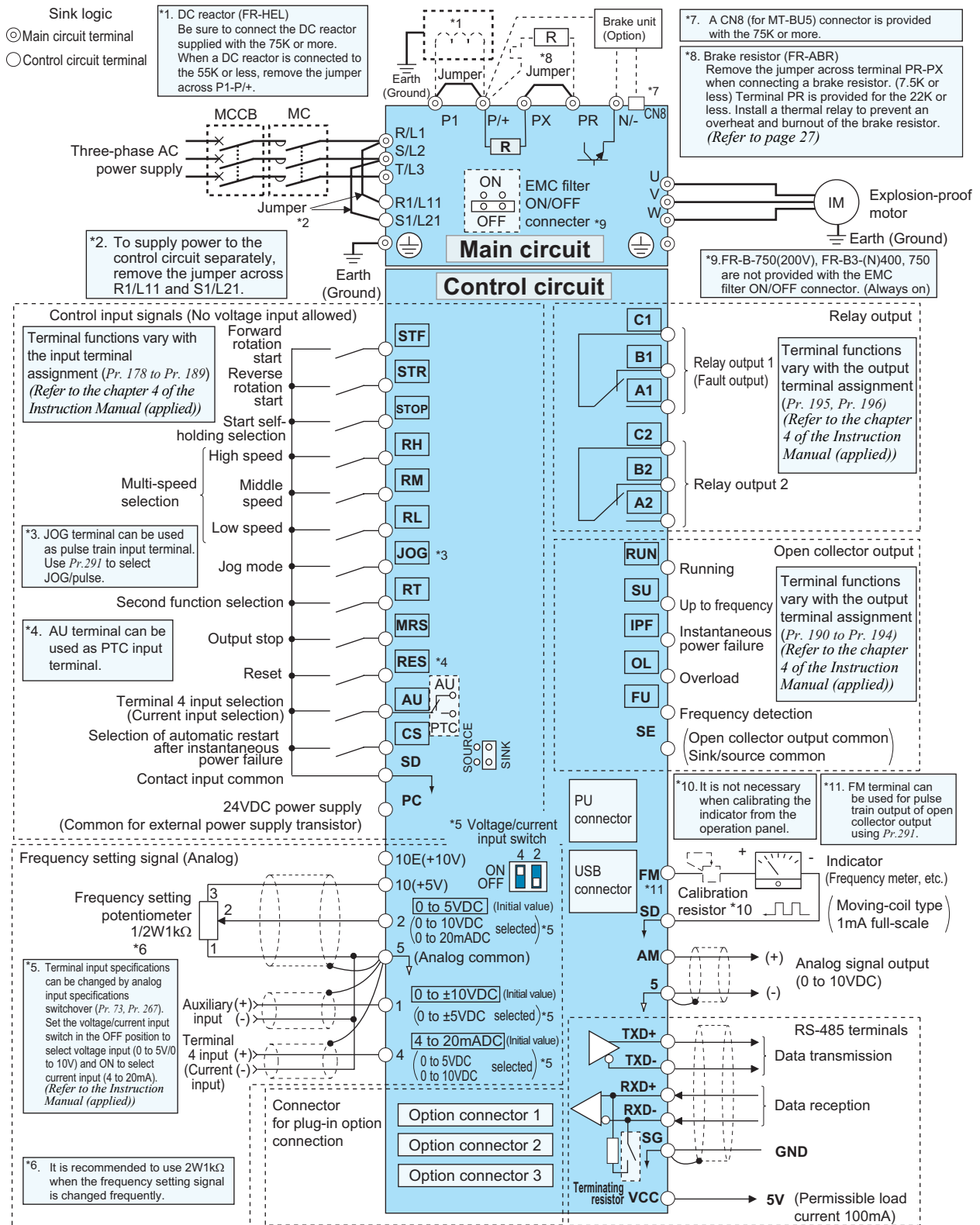


• The inverter consists of precision mechanical and electronic parts. Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.

 Direct sunlight	 Vibration (5.9m/s ² or less at 10 to 55Hz (directions of X, Y, Z axes))	 High temperature, high humidity	 Horizontal placement
 Vertical mounting (When installing two or more inverters, install them in parallel.)	 Transportation by holding the front cover	 Oil mist, flammable gas, corrosive gas, fluff, dust, etc.	 Mounting to flammable material

2.4 Wiring

2.4.1 Terminal connection diagram



CAUTION

- It is mandatory to use the Mitsubishi pressure-resistant, explosion-proof motor with the inverter which has been approved for combination by the Labor Ministry's explosion-proof certification. Therefore, always use the Mitsubishi pressure-resistant, explosion-proof motor in combination with its approved driving inverter.
- To prevent a malfunction due to noise, keep the signal cables more than 10cm away from the power cables. Also separate the main circuit wire of the input side and the output side.
- After wiring, wire offcuts must not be left in the inverter. Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean.
- When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch in right position. Operation with a wrong setting may cause a fault, failure or malfunction.

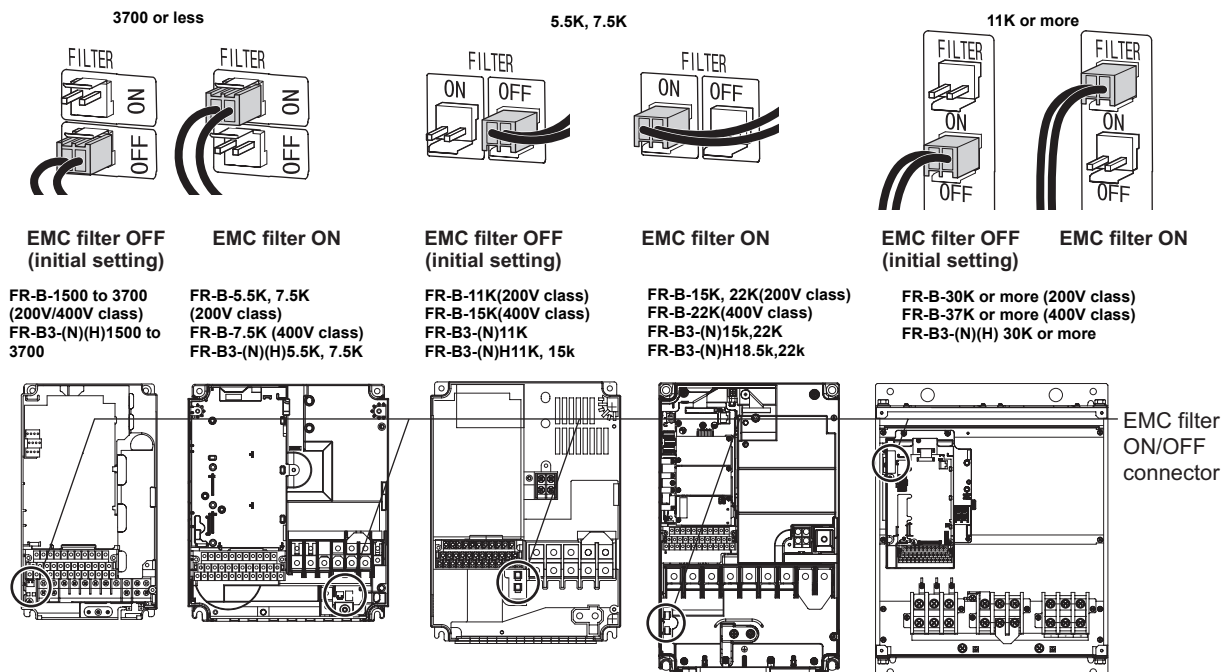
2.4.2 EMC filter

This inverter is equipped with a built-in EMC filter (capacitive filter) and common mode choke.

The EMC filter is effective for reduction of air-propagated noise on the input side of the inverter.

The EMC filter is disabled (OFF) in the initial setting. To enable it, fit the EMC filter ON/OFF connector to the ON position.

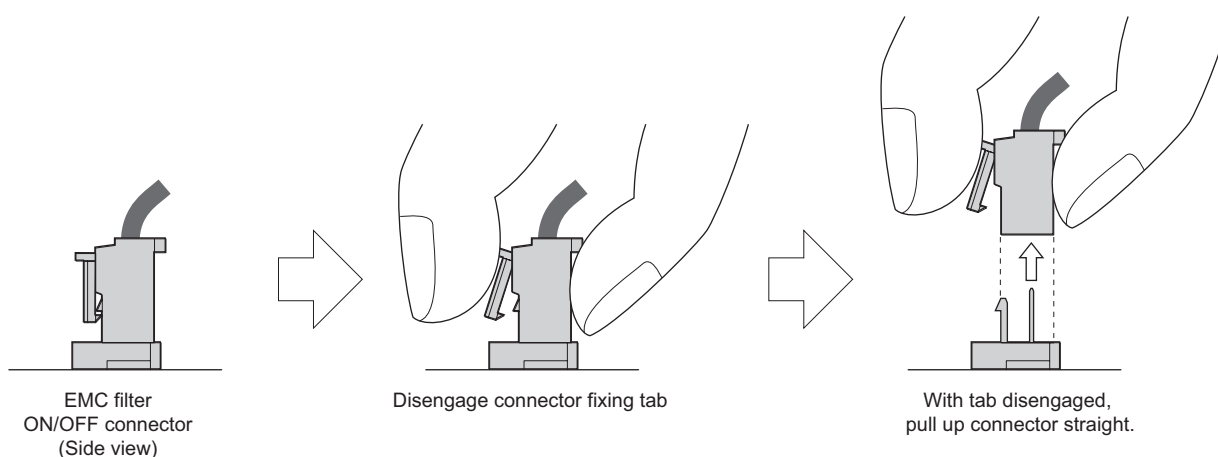
The input side common mode choke, built-in the 55K or less inverter, is always valid regardless of on/off of the EMC filter connector.



The FR-B-750(200V class), FR-B3-(N)400, (N)750 are not provided with the EMC filter ON/OFF connector. (The EMC filter is always valid.)

<How to disconnect the connector>

- Before removing a front cover, check to make sure that the indication of the inverter operation panel is off, wait for at least 10 minutes after the power supply has been switched off, and check that there are no residual voltage using a tester or the like. (Refer to page 5.)
- When disconnecting the connector, push the fixing tab and pull the connector straight without pulling the cable or forcibly pulling the connector with the tab fixed. When installing the connector, also engage the fixing tab securely. If it is difficult to disconnect the connector, use a pair of long-nose pliers, etc.



CAUTION

- Fit the connector to either ON or OFF.
- Enabling (turning on) the EMC filter increase leakage current. (Refer to the chapter 3 of the Instruction Manual (applied))

WARNING

While power is on or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.



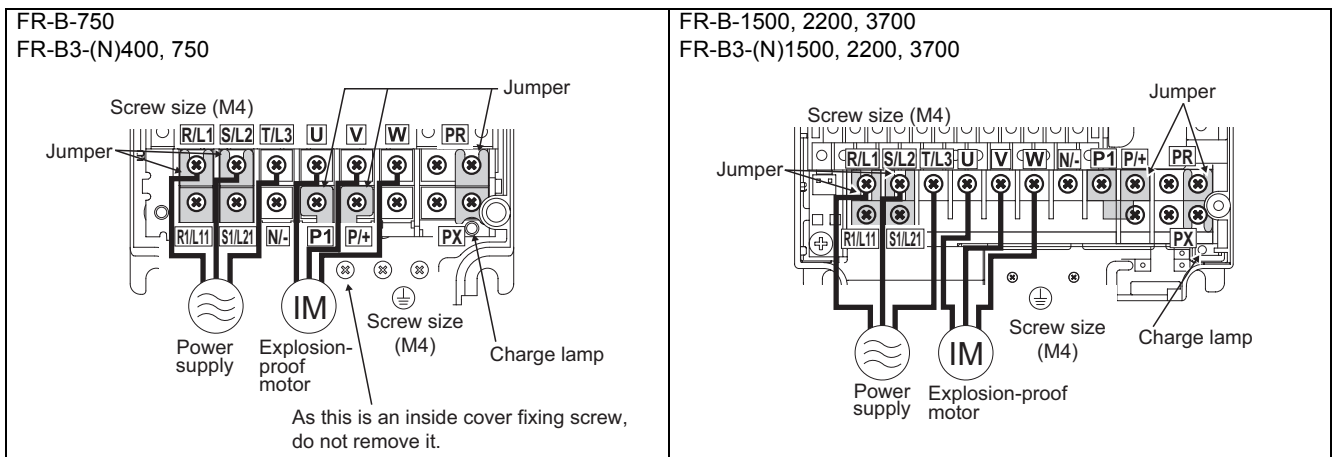
2.4.3 Specification of main circuit terminal

Terminal Symbol	Terminal Name	Description												
R/L1, S/L2, T/L3	AC power input	Connect to the commercial power supply. Keep these terminals open when using the high power factor converter (MT-HC)*1.												
U, V, W	Inverter output	Connect a pressure-resistant, explosion-proof motor.												
R1/L11, S1/L21	Power supply for control circuit	<p>Connected to the AC power supply terminals R/L1 and S/L2. To retain the fault display and fault output or when using the high power factor converter (MT-HC)*1, remove the jumpers from terminals R/L1-R1/L11 and S/L2-S1/L21 and apply external power to these terminals. Do not turn off the power supply for control circuit (R1/L11, S1/L21) with the main circuit power (R/L1, S/L2, T/L3) on. Doing so may damage the inverter. The circuit should be configured so that the main circuit power (R/L1, S/L2, T/L3) is also turned off when the power supply for control circuit (R1/L11, S1/L21) is off.</p> <table border="1"> <thead> <tr> <th></th> <th>11K or less</th> <th>15K</th> <th>18.5K or more</th> </tr> </thead> <tbody> <tr> <td>200V class</td> <td>60VA</td> <td>80VA</td> <td>80VA</td> </tr> <tr> <td>400V class</td> <td>60VA</td> <td>60VA</td> <td>80VA</td> </tr> </tbody> </table>		11K or less	15K	18.5K or more	200V class	60VA	80VA	80VA	400V class	60VA	60VA	80VA
	11K or less	15K	18.5K or more											
200V class	60VA	80VA	80VA											
400V class	60VA	60VA	80VA											
P/+, PR	Brake resistor connection (22K or less)	Remove the jumper from terminals PR-PX (7.5K or less) and connect an optional brake resistor (FR-ABR) across terminals P/+ - PR. For the 22K or less, connecting the resistor further provides regenerative braking power.												
P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2, FR-BU and MT-BU5*1), high power factor converter (MT-HC)*1 or power regeneration converter (MT-RC)*1.												
P/+, P1	DC reactor connection	For the 55K or less, remove the jumper across terminals P/+ - P1 and connect the DC reactor. (For the 75K or more, a DC reactor is supplied as standard.)												
PR, PX	Built-in brake circuit connection	When the jumper is connected across terminals PX-PR (initial status), the built-in brake circuit is valid. (Provided for the 7.5K or less.)												
	Earth (ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded).												

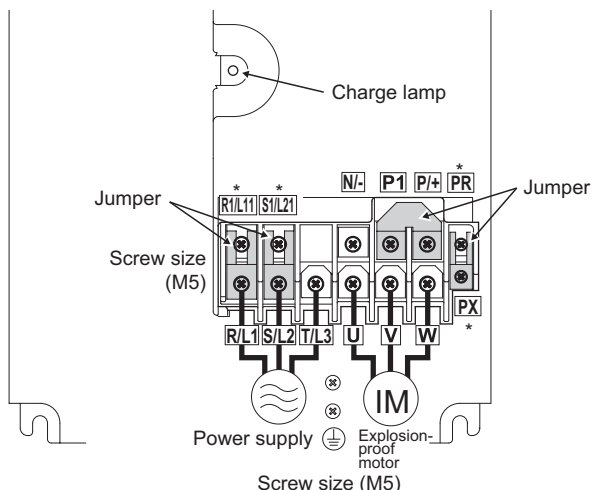
*1 Supports capacities of the FR-B-75K or more.

2.4.4 Terminal arrangement of the main circuit terminal, power supply and the motor wiring.

200V class

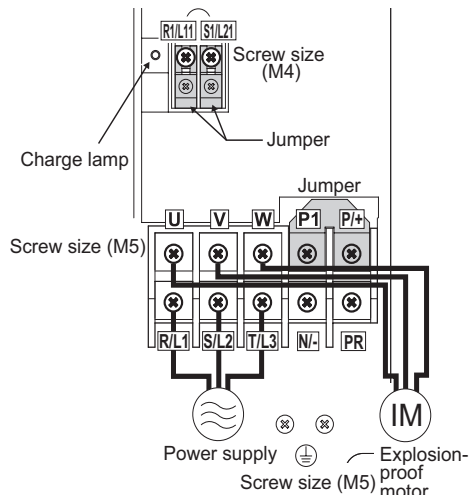


FR-B-5.5K, 7.5K
FR-B3-(N)5.5K, 7.5K

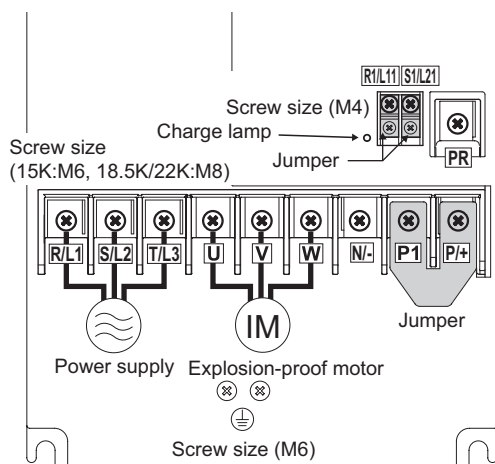


* Screw size of terminal R1/L11, S1/L21, P1, and PX is M4.

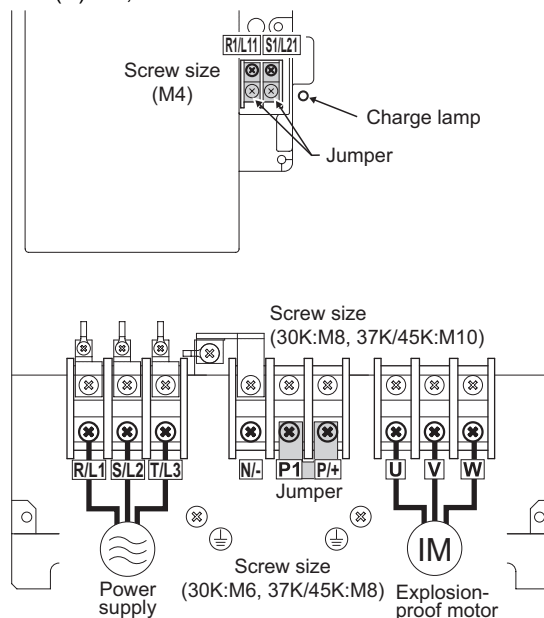
FR-B-11K
FR-B3-(N)11K



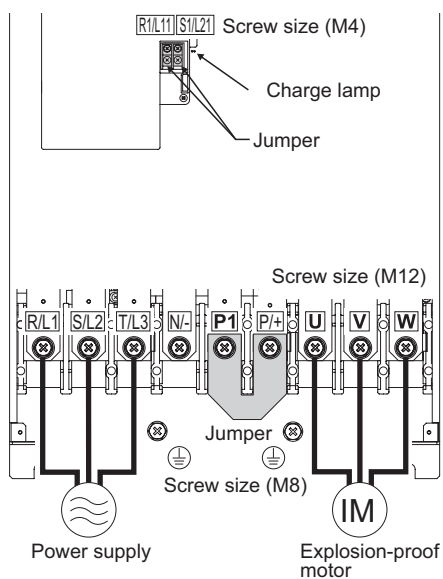
FR-B-15K, 22K
FR-B3-(N)15K, 18.5K, 22K



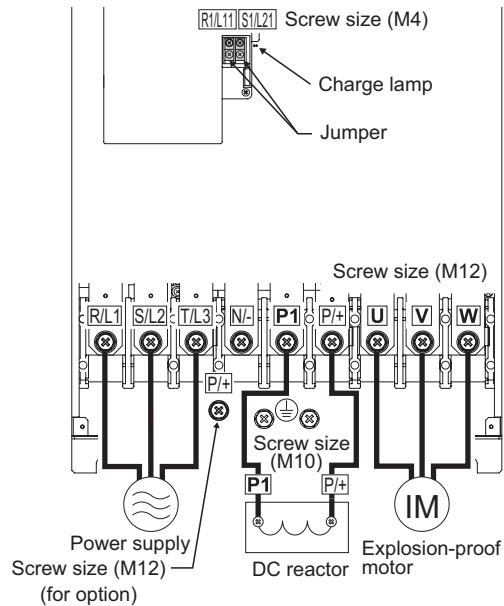
FR-B-30K, 37K, 45K
FR-B3-(N)30K, 37K



FR-B-55K

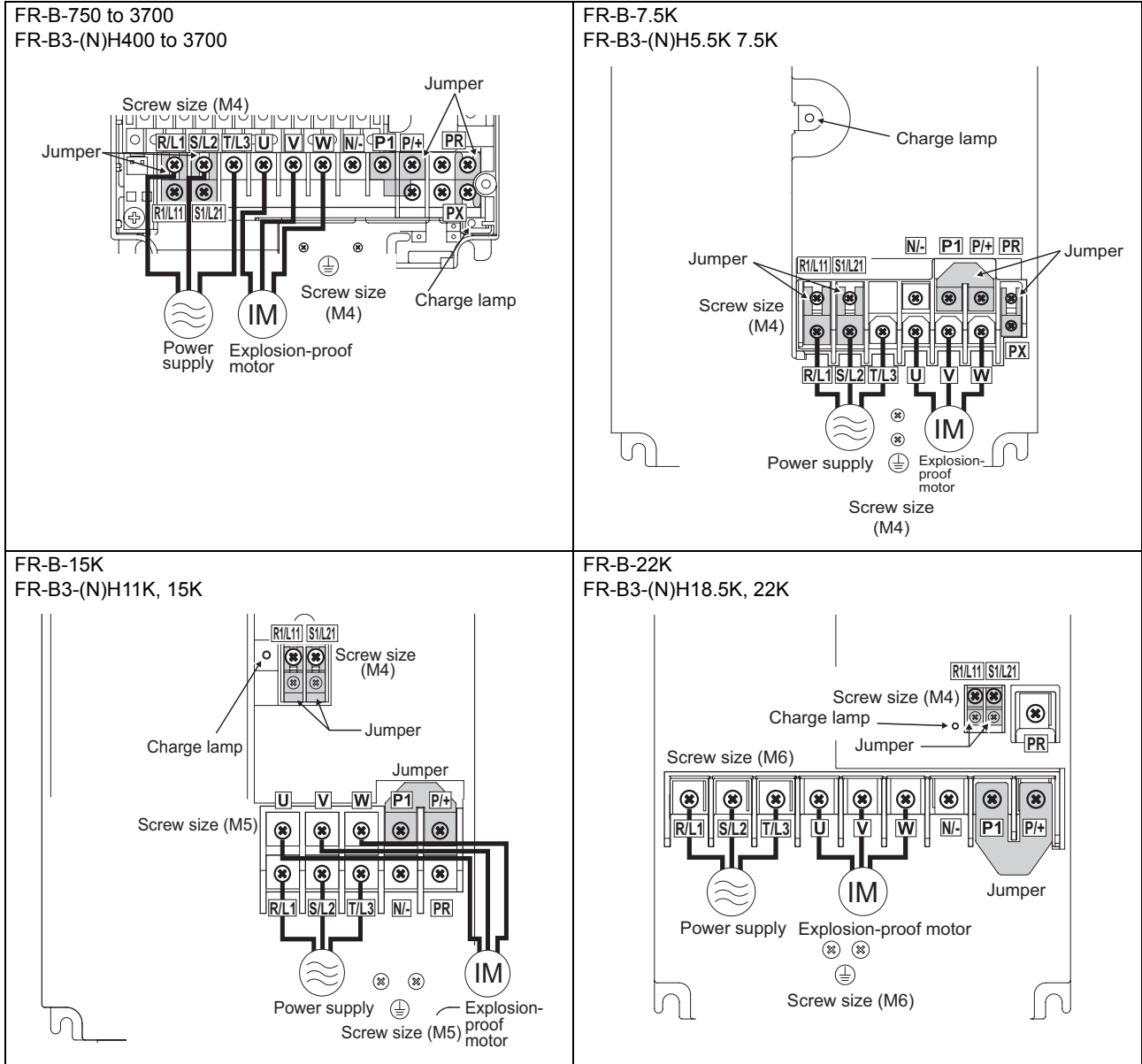


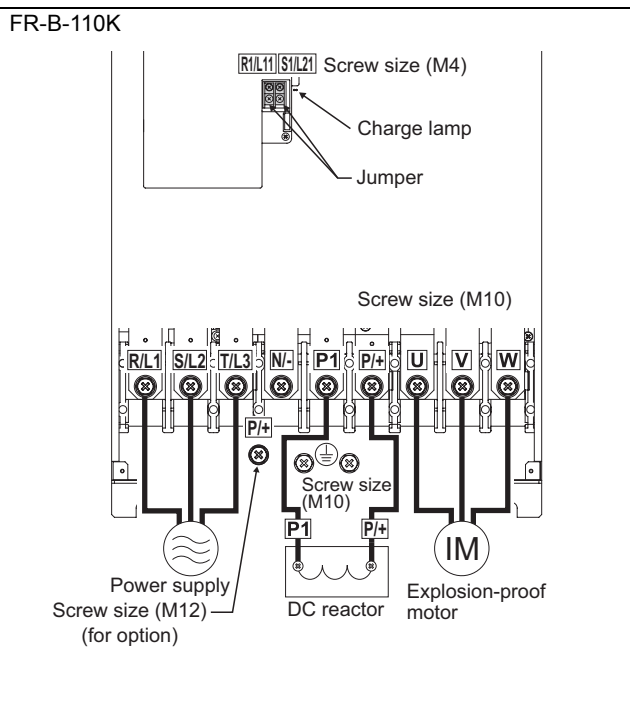
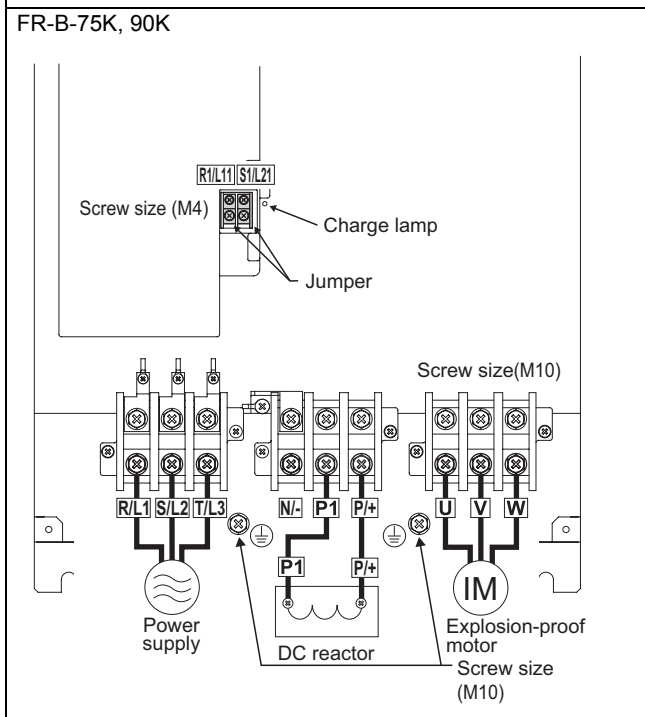
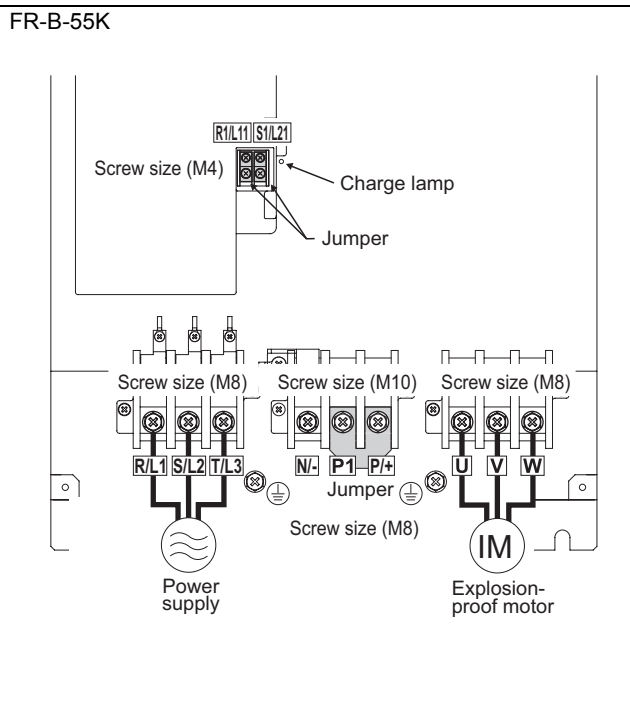
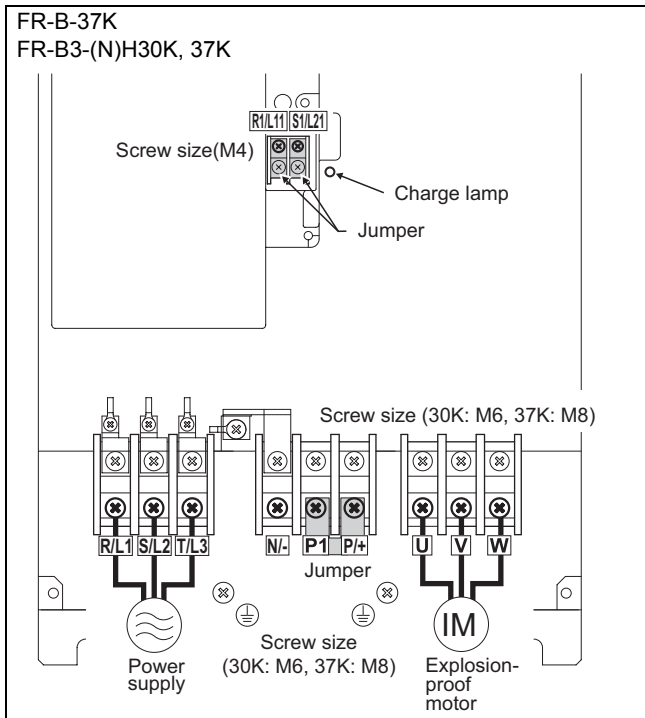
FR-B-75K





400V class





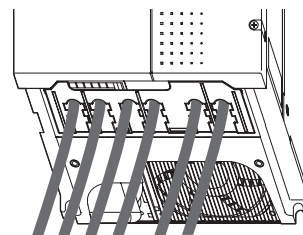
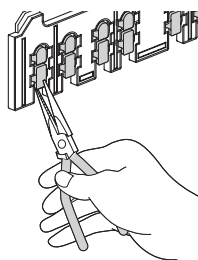
CAUTION

- The power supply cables must be connected to R/L1, S/L2, T/L3. (Phase sequence needs not to be matched.) Never connect the power cable to the U, V, W of the inverter. Doing so will damage the inverter.
- Connect the motor to U, V, W. At this time, turning on the forward rotation switch (signal) rotates the motor in the counterclockwise direction when viewed from the motor shaft.

- Handling of the wiring cover
(FR-B-15K, 22K(200V), FR-B-22K(400V),
FR-B3-(N)15K, 18.5K, 22K, FR-B3-(N)H 18.5K, 22K)
For the hook of the wiring cover, cut off the necessary parts using a pair of long-nose pliers etc.

CAUTION

Cut off the same number of lugs as wires. If parts where no wire is put through has been cut off (10mm or more), protective structure (JEM1030) becomes an open type (IP00).





(1) Cable sizes etc., of the main control circuit terminals and earth (ground) terminals

Select the recommended cable size to ensure that a voltage drop will be 2% max.

If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.

The following table indicates a selection example for the wiring length of 20m.

200V class (when input power supply is 220V)

Applicable Inverter Type		Terminal Screw Size *2	Tightening Torque N·m	Crimping Terminal		Cable Sizes			
						HIV, etc. (mm ²) *1			
FR-B	FR-B3			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+ , P1	Earth (Ground) cable
FR-B-750 to 2200	FR-B3-(N)400 to 2200	M4	1.5	2-4	2-4	2	2	2	2
FR-B-3700	FR-B3-(N)3700	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5
FR-B-5.5K	FR-B3-(N)5.5K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	5.5
FR-B-7.5K	FR-B3-(N)7.5K	M5	2.5	14-5	8-5	14	8	14	14
FR-B-11K	FR-B3-(N)11K	M5	2.5	14-5	14-5	14	14	14	14
FR-B-15K	FR-B3-(N)15K	M6	4.4	22-6	22-6	22	22	22	14
-	FR-B3-(N)18.5K	M8(M6)	7.8	38-8	38-8	38	38	38	22
FR-B-22K	FR-B3-(N)22K	M8(M6)	7.8	38-8	38-8	38	38	38	22
FR-B-30K	FR-B3-(N)30K	M8(M6)	7.8	60-8	60-8	60	60	60	38
FR-B-37K	FR-B3-(N)37K	M10(M8)	14.7	80-10	80-10	80	80	80	38
FR-B-45K	-	M10(M8)	14.7	100-10	100-10	100	100	100	60
FR-B-55K	-	M12(M8)	24.5	100-12	100-12	100	100	100	60
FR-B-75K	-	M12(M10)	24.5	150-12	150-12	125	125	125	38

*1 For the 55K or less, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 50°C or less and the wiring distance is 20m or less.

For the 75K or more, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 50°C or less and wiring is performed in an enclosure.

*2 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, PR, PX, P/+, N/-, P1, and a screw for earthing (grounding). A screw for earthing (grounding) of the 18.5K or more is indicated in parentheses.

400V class (when input power supply is 440V)

Applicable Inverter Type		Terminal Screw Size *2	Tightening Torque N·m	Crimping Terminal		Cable Sizes			
						HIV, etc. (mm ²) *1			
FR-B	FR-B3			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earth (Ground) Cable
FR-B-750 to 3700	FR-B3-(N)H400 to 3700	M4	1.5	2-4	2-4	2	2	2	2
-	FR-B3-(N)H5.5K	M4	1.5	2-4	2-4	2	2	3.5	3.5
FR-B-7.5K	FR-B3-(N)H7.5K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5
-	FR-B3-(N)H11K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	8
FR-B-15K	FR-B3-(N)H15K	M5	2.5	8-5	8-5	8	8	8	8
-	FR-B3-(N)H18.5K	M6	4.4	14-6	8-6	14	8	14	14
FR-B-22K	FR-B3-(N)H22K	M6	4.4	14-6	14-6	14	14	22	14
-	FR-B3-(N)H30K	M6	4.4	22-6	22-6	22	22	22	14
FR-B-37K	FR-B3-(N)H37K	M8	7.8	22-8	22-8	22	22	22	14
FR-B-55K	-	M8(M10)	7.8	60-8	60-8	60	60	60	22
FR-B-75K	-	M10	14.7	60-10	60-10	60	60	60	38
FR-B-90K	-	M10	14.7	60-10	60-10	60	60	80	38
FR-B-110K	-	M10(M12)	14.7	80-10	80-10	80	80	80	38

*1 For the 55K or less, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 50°C or less and the wiring distance is 20m or less.

For the 75K or more, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 50°C or less and wiring is performed in an enclosure.

*2 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, PR, PX, P/+, N/-, P1, and a screw for earthing (grounding). Screw size for P/+, N/-, P1 in 55K model are indicated in parentheses.

A screw for P/+ for option connection of the 110K is indicated in parentheses.

The line voltage drop can be calculated by the following formula:

$$\text{line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance [m}\Omega\text{/m]} \times \text{wiring distance [m]} \times \text{current [A]}}{1000}$$

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

CAUTION

- Tighten the terminal screw to the specified torque.
A screw that has been tighten too loosely can cause a short circuit or malfunction.
 - A screw that has been tighten too tightly can cause a short circuit or malfunction due to the unit breakage.
 - Use crimping terminals with insulation sleeve to wire the power supply and motor.
-



(2) Notes on earthing (grounding)

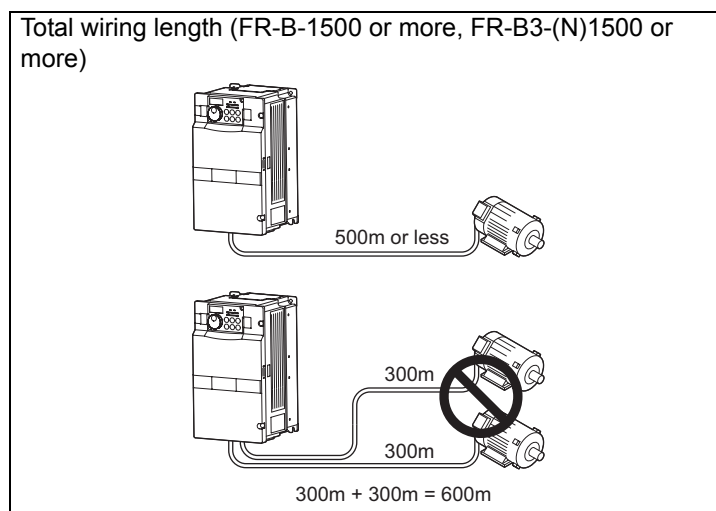
- Leakage currents flow in the inverter. To prevent an electric shock, the inverter and motor must be earthed (grounded). This inverter must be earthed (grounded). Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards)
Use a neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard.
- Use the dedicated earth (ground) terminal to earth (ground) the inverter.
(Do not use the screw in the casing, chassis, etc.)
- Use the thickest possible earth (ground) cable. Use the cable whose size is equal to or greater than that indicated in *page 14, 15*, and minimize the cable length. The earthing (grounding) point should be as near as possible to the inverter.

(3) Total wiring length

The overall wiring length for connection of a motor should be within the value in the table below.
(An explosion-proof test is not performed for the multiple motor connection.)

	FR-B3-(N)400	FR-B-750 FR-B3-(N)750	FR-B-1500 or more FR-B3-(N)1500 or more
FR-B, B3 (at normal operation)	300m	500m	500m
FR-B3-N (at low noise operation)	200m	300m	500m

<i>Pr. 72 PWM frequency selection setting (carrier frequency) (FR-B series only)</i>	FR-B-750	FR-B-1500 or more
2 (2kHz) or less	500m	500m
3 to 15 (3kHz to 14.5kHz)	300m	500m



When driving a 400V class motor by the inverter, surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
Take the following measures in this case.

- Use a "400V class inverter-driven insulation-enhanced motor" and set frequency in *Pr. 72 PWM frequency selection* according to wiring length. This setting is only available with FR-B series.

Carrier frequency	Wiring Length		
	50m or less	50m to 100m	exceeding 100m
	14.5kHz or less	9kHz or less	4kHz or less

CAUTION

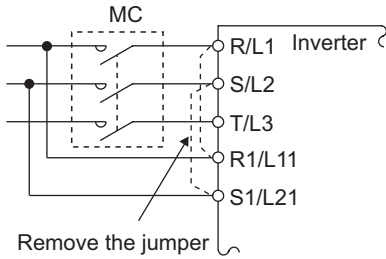
- Especially for long-distance wiring, the inverter may be affected by a charging current caused by the stray capacitances of the wiring, leading to a malfunction of the overcurrent protective function or fast response current limit function or a malfunction or fault of the equipment connected on the inverter output side. If fast response current limit function malfunctions, disable this function.
(For *Pr. 156 Stall prevention operation selection*, refer to the chapter 4 of the Instruction Manual (applied).)
- For details of *Pr. 72 PWM frequency selection*, refer to the chapter 4 of the Instruction Manual (applied).

(4) Cable size of the control circuit power supply (terminal R1/L11, S1/L21)

- Terminal screw size: M4
- Cable size: 0.75mm² to 2mm²
- Tightening torque: 1.5N·m

(5) When connecting the control circuit and the main circuit separately to the power supply (separate power)

<Connection diagram>

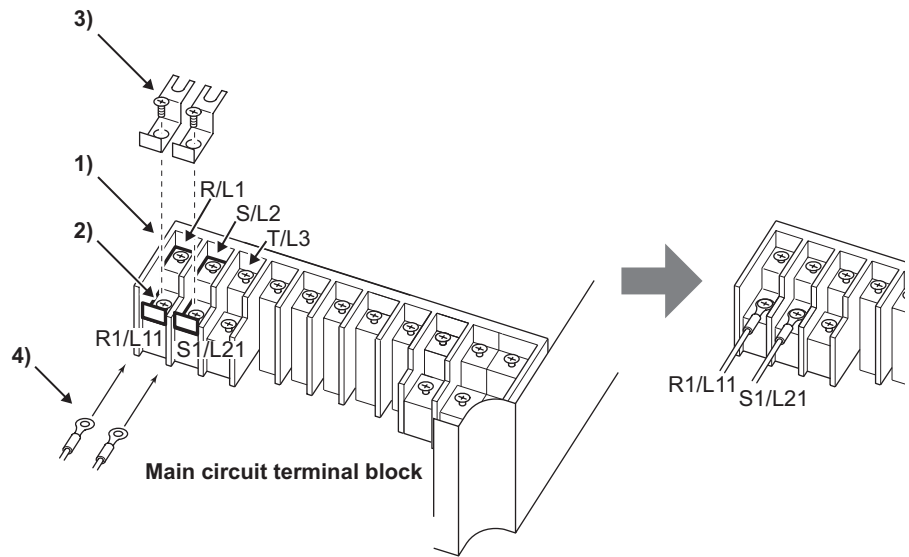


When fault occurs, opening of the electromagnetic contactor (MC) on the inverter power supply side results in power loss in the control circuit, disabling the fault output signal retention. Terminals R1/L11 and S1/L21 are provided to hold a fault signal. In this case, connect the power supply terminals R1/L11 and S1/L21 of the control circuit to the primary side of the MC.

Do not connect the power cable to incorrect terminals. Doing so may damage the inverter.

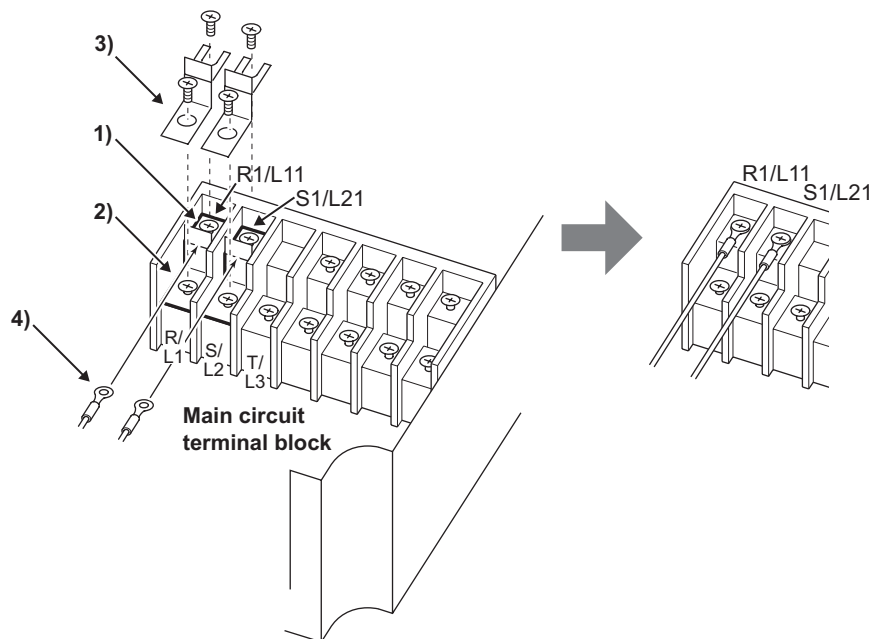
• FR-B-750 to 3700 (200V/400V class), FR-B3-(N)(H) 400 to 3700

- 1) Loosen the upper screws.
- 2) Remove the lower screws.
- 3) Remove the jumper
- 4) Connect the separate power supply cable for the control circuit to the lower terminals (R1/L11, S1/L21).



• FR-B-5.5K, 7.5K (200V class), FR-B-7.5K(400V class), FR-B3-(N)(H)5.5K, 7.5K

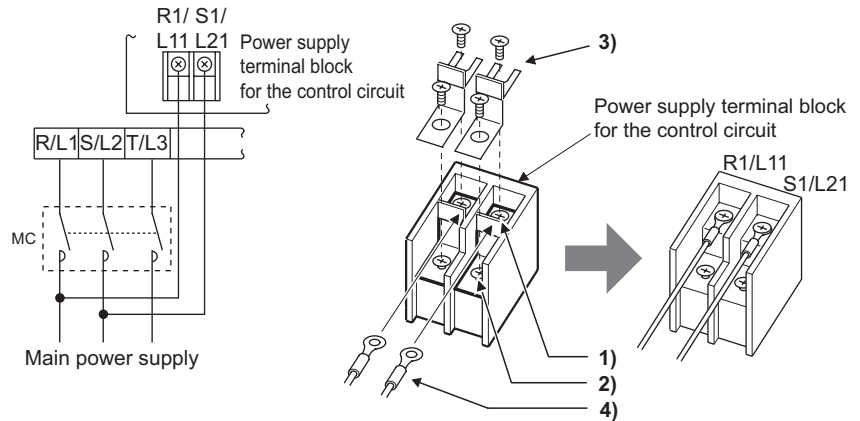
- 1) Remove the upper screws.
- 2) Remove the lower screws.
- 3) Remove the jumper.
- 4) Connect the separate power supply cable for the control circuit to the upper terminals (R1/L11, S1/L21).



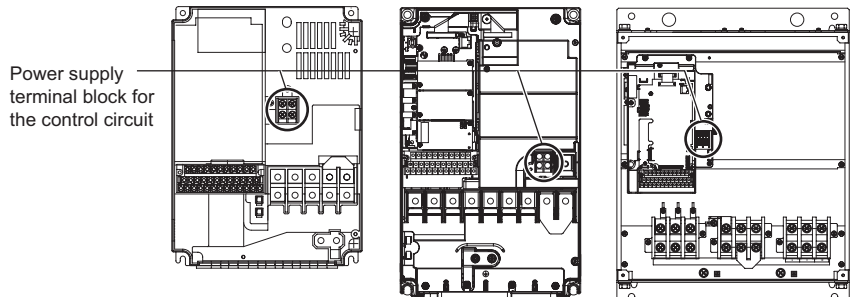


• **FR-B-11K(200V/400V class) or more, FR-B3-(N)(H)11K or more**

- 1) Remove the upper screws.
- 2) Remove the lower screws.
- 3) Pull the jumper toward you to remove.
- 4) Connect the separate power supply cable for the control circuit to the upper terminals (R1/L11, S1/L21).



- | | | |
|--|---|---|
| FR-B-11K(200V)
FR-B-15K(400V)
FR-B3-(N)11K
FR-B3-(N)H11K, 15K | FR-B-15K, 22K(200V)
FR-B-22K(400V)
FR-B3-(N)15K, 18.5K, 22K
FR-B3-(N)H18.5K, 22K | FR-B-30K (200V/400V class) or more,
FR-B3-(N)(H) 30K or more |
|--|---|---|



CAUTION

- Do not turn off the control power (terminals R1/L11 and S1/L21) with the main circuit power (R/L1, S/L2, T/L3) on. Doing so may damage the inverter. Make up a circuit which will switch off the main circuit power supply terminals R/L1, S/L2, T/L3 when the control circuit power supply terminals R1/L11, S1/L21 are switched off.
- Be sure to use the inverter with the jumpers across terminals R/L1-R1/L11 and S/L2-S1/L21 removed when supplying power from other sources. The inverter may be damaged if you do not remove the jumper.
- The voltage should be the same as that of the main control circuit when the control circuit power is supplied from other than the primary side of the MC.
- The power capacity necessary when separate power is supplied from R1/L11 and S1/L21 differs according to the inverter capacity.

	11K or less	15K	18.5K or more
200V class	60VA	80VA	80VA
400V class	60VA	60VA	80VA

- If the main circuit power is switched off (for 0.1s or more) then on again, the inverter resets and a fault output will not be held.

2.4.5 Control circuit terminals

indicates that terminal functions can be selected using Pr. 178 to Pr. 196 (I/O terminal function selection) (Refer to the chapter 4 of the Instruction Manual (applied).)

(1) Input signals

Type	Terminal Symbol	Terminal Name	Description		Rated Specifications	Refer to page
Contact input	STF	Forward rotation start	Turn on the STF signal to start forward rotation and turn it off to stop.	When the STF and STR signals are turned on simultaneously, the stop command is given.	Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	63
	STR	Reverse rotation start	Turn on the STR signal to start reverse rotation and turn it off to stop.			
	STOP	Start self-holding selection	Turn on the STOP signal to self-hold the start signal.			*2
	RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.			64
	JOG	Jog mode selection	Turn on the JOG signal to select Jog operation (initial setting) and turn on the start signal (STF or STR) to start Jog operation.			*2
		Pulse train input	JOG terminal can be used as pulse train input terminal. To use as pulse train input terminal, the Pr. 291 setting needs to be changed. (maximum input pulse: 100kpulses/s)			Input resistance 2kΩ Contacts at short-circuited: 8 to 13mADC
	RT	Second function selection	Turn on the RT signal to select second function.		*2	
	MRS	Output stop	Turn on the MRS signal (20ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.		*2	
	RES	Reset	Used to reset fault output provided when fault occurs. Turn on the RES signal for more than 0.1s, then turn it off. Initial setting is for reset always. By setting Pr. 75, reset can be set to enabled only at a fault occurrence. Recover about 1s after reset is cancelled.		Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	104
	AU	Terminal 4 input selection	Terminal 4 is valid only when the AU signal is turned on. (The frequency setting signal can be set between 4 and 20mADC.) Turning the AU signal on makes terminal 2 (voltage input) invalid.		Contacts at short-circuited: 4 to 6mADC	68
		PTC input	AU terminal is used as PTC input terminal (thermal protection of the motor). When using it as PTC input terminal, set the AU/PTC switch to PTC.			*2
	CS	Selection of automatic restart after instantaneous power failure	When the CS signal is left on, the inverter restarts automatically at power restoration. Note that restart setting is necessary for this operation. In the initial setting, a restart is disabled. (Refer to Pr. 57 Restart coasting time in the chapter 4 of the instruction manual (applied).)			*2
	SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.		—	—
		External transistor common (source)	When connecting the transistor output (open collector output), such as a programmable controller, while source logic is selected, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.			
24VDC power supply common		Common output terminal for 24VDC 0.1A power supply (PC terminal). Isolated from terminals 5 and SE.				
PC	External transistor common (sink) (initial setting)	When connecting the transistor output (open collector output), such as a programmable controller, when sink logic is selected, connect the external power supply common for transistor output to this terminal to prevent a malfunction caused by undesirable currents.		Power supply voltage range 19.2 to 28.8VDC Permissible load current 100mA	23	
	Contact input common (source)	Common terminal for contact input terminal (source logic).				
	24VDC power supply	Can be used as 24VDC 0.1A power supply.				



Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page
Frequency setting	10E	Frequency setting power supply	When connecting the frequency setting potentiometer at an initial status, connect it to terminal 10. Change the input specifications of terminal 2 when connecting it to terminal 10E. (Refer to Pr. 73 Analog input selection in Instruction Manual (applied).)	10VDC Permissible load current 10mA	*2
	10			5VDC Permissible load current 10mA	61, 66
	2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V, 0 to 20mA) provides the maximum output frequency at 5V (10V, 20mA) and makes input and output proportional. Use Pr. 73 to switch from among input 0 to 5VDC (initial setting), 0 to 10VDC, and 0 to 20mA. Set the voltage/current input switch in the ON position to select current input (0 to 20mA) *1	Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC Current input: Input resistance 245Ω ± 5Ω Maximum permissible current 30mA	61, 66
	4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA (5V, 10V) makes input and output proportional. This input signal is valid only when the AU signal is on (terminal 2 input is invalid). Use Pr. 267 to switch from among input 4 to 20mA (initial setting), 0 to 5VDC, and 0 to 10VDC. Set the voltage/current input switch in the OFF position to select voltage input (0 to 5V/0 to 10V). *1 Use Pr. 858 to switch terminal functions. (Refer to the chapter 4 of the Instruction Manual (applied).)	 Voltage/current input switch switch1 switch2	62, 68
	1	Frequency setting auxiliary	Inputting 0 to ±5 VDC or 0 to ±10VDC adds this signal to terminal 2 or 4 frequency setting signal. Use Pr. 73 to switch between the input 0 to ±5VDC and 0 to ±10VDC (initial setting). Use Pr. 868 to switch terminal functions.	Input resistance 10kΩ ± 1kΩ Maximum permissible voltage ± 20VDC	*2
	5	Frequency setting common	Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground).	—	—

*1 Set Pr. 73, Pr. 267 and the voltage/current input switch correctly and input the analog signals in accordance with the setting. When a voltage is input with the switch ON (current input specification) or a current is input with the switch OFF (voltage input specification), a failure may occur in the inverter or the analog circuit of the external device.

*2 Refer to the chapter 4 of the Instruction Manual (applied).

(2) Output signals

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page
Relay	A1, B1, C1	Relay output 1 (fault output)	1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Abnormal: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C)	Contact capacity: 230VAC 0.3A (Power factor=0.4) 30VDC 0.3A	*2
	A2, B2, C2	Relay output 2	1 changeover contact output		*2

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page	
Open collector	RUN	Inverter running	Switched low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched high during stop or DC injection brake operation. ^{*1}	Permissible load 24VDC (27VDC maximum) 0.1A (A voltage drop is 2.8V maximum when the signal is on.) *1 Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).	*2	
	SU	Up to frequency	Switched low when the output frequency reaches within the range of $\pm 10\%$ (initial value) of the set frequency. Switched high during acceleration/deceleration and at a stop. ^{*1}		Fault code (4bit) output	*2
	OL	Overload alarm	Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled. ^{*1}			*2
	IPF	Instantaneous power failure	Switched low when an instantaneous power failure and under voltage protections are activated. ^{*1}			*2
	FU	Frequency detection	Switched low when the inverter output frequency is equal to or higher than the preset detected frequency and high when less than the preset detected frequency. ^{*1}			*2
	SE	Open collector output common	Common terminal for terminals RUN, SU, OL, IPF, FU			—
Pulse	FM	For meter	Select one e.g. output frequency from monitor items. Not output during inverter reset. The output signal is proportional to the magnitude of the corresponding monitoring item.	Output item: Output frequency (initial setting)	Permissible load current 2mA 1440pulses/s at 60Hz	*2
		NPN open collector output		Signals can be output from the open collector terminals by setting Pr. 291.	Maximum output pulse: 50kpulses/s Permissible load current : 80mA	*2
Analog	AM	Analog signal output		Output item: Output frequency (initial setting)	Output signal 0 to 10VDC Permissible load current 1mA (load impedance 10k Ω or more) Resolution 8 bit	*2

*2 Refer to the chapter 4 of the Instruction Manual (applied).

(3) Communication

Type	Terminal Symbol	Terminal Name	Description	Refer to page	
RS-485	—	PU connector	With the PU connector, communication can be made through RS-485. (for connection on a 1:1 basis only) . Conforming standard : EIA-485(RS-485) . Transmission format : Multidrop link . Communication speed : 4800 to 38400bps . Overall length : 500m	25	
	RS-485 terminals	TXD+	Inverter transmission terminal	With the RS-485 terminals, communication can be made through RS-485. . Conforming standard : EIA-485(RS-485) . Transmission format : Multidrop link . Communication speed : 300 to 38400bps . Overall length : 500m	25
		TXD-			
		RXD+	Inverter reception terminal		
		RXD-			
SG	Earth (Ground)				
USB	—	USB connector	The FR Configurator can be performed by connecting the inverter to the personal computer through USB. . Interface:Conforms to USB1.1 . Transmission speed:12Mbps . Connector:USB B connector (B receptacle)	26	



2.4.6 Changing the control logic

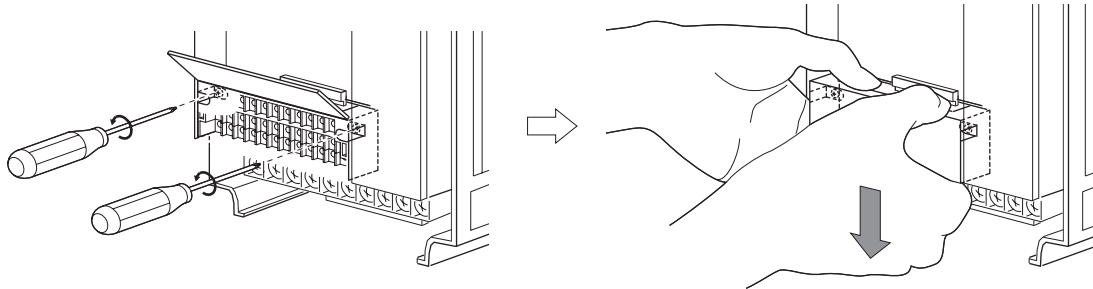
The input signals are set to sink logic (SINK) when shipped from the factory.

To change the control logic, the jumper connector on the back of the control circuit terminal block must be moved to the other position.

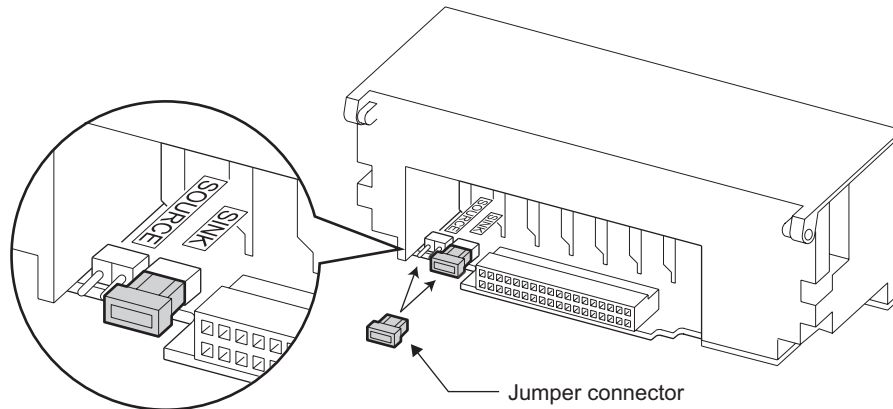
(The output signals may be used in either the sink or source logic independently of the jumper connector position.)

1) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.)

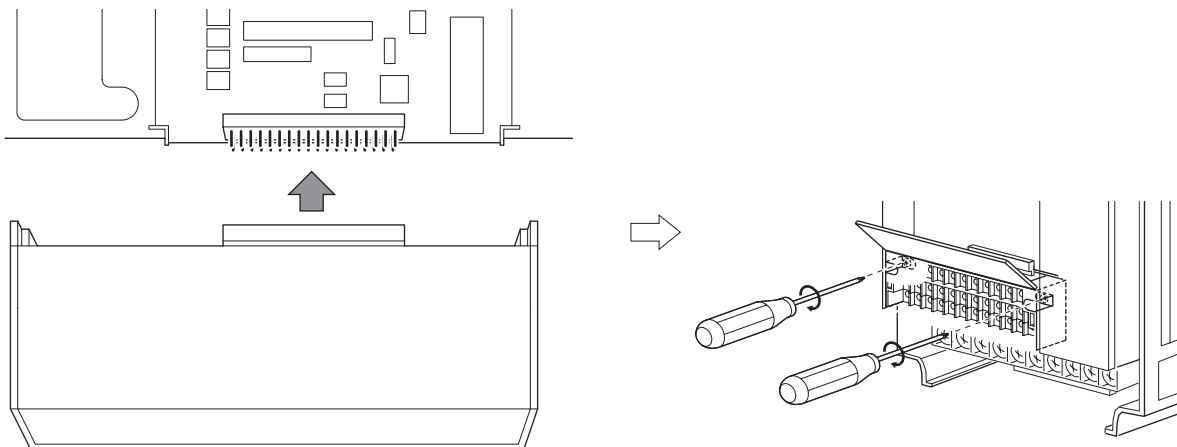
Pull down the terminal block from behind the control circuit terminals.



2) Change the jumper connector set to the sink logic (SINK) on the rear panel of the control circuit terminal block to source logic (SOURCE).



3) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control circuit terminal block and fix it with the mounting screws.



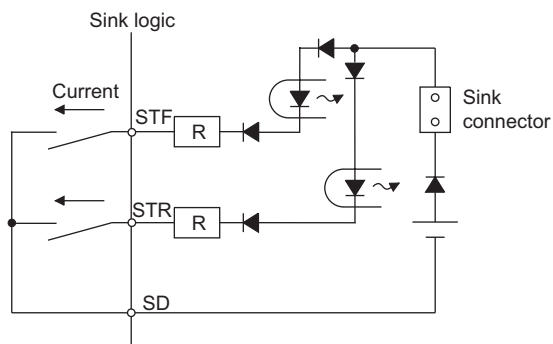
CAUTION

1. Make sure that the control circuit connector is fitted correctly.
2. While power is on, never disconnect the control circuit terminal block.

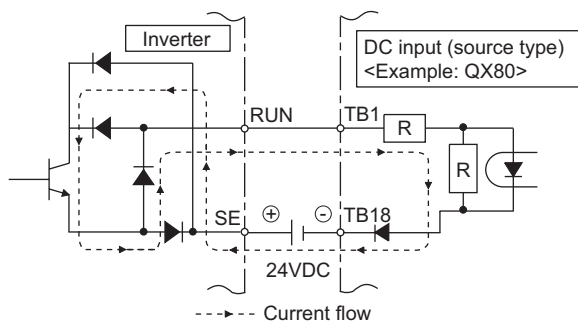
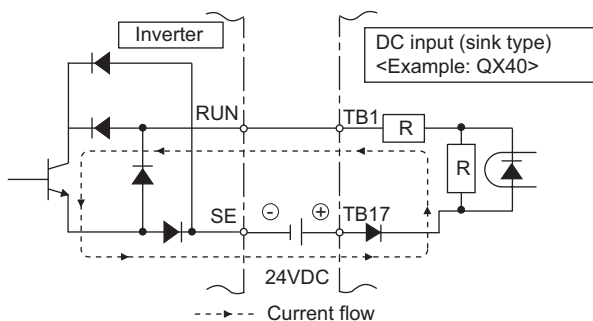
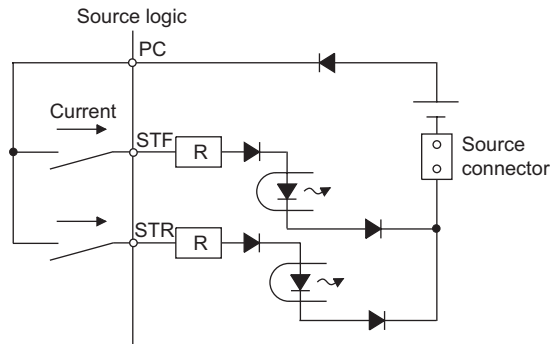
4) Sink logic and source logic

- In sink logic, a signal switches on when a current flows from the corresponding signal input terminal. Terminal SD is common to the contact input signals. Terminal SE is common to the open collector output signals.
- In source logic, a signal switches on when a current flows into the corresponding signal input terminal. Terminal PC is common to the contact input signals. Terminal SE is common to the open collector output signals.

● Current flow concerning the input/output signal when sink logic is selected



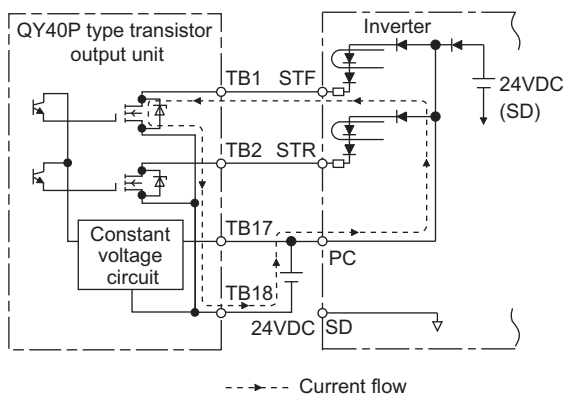
● Current flow concerning the input/output signal when source logic is selected



● When using an external power supply for transistor output

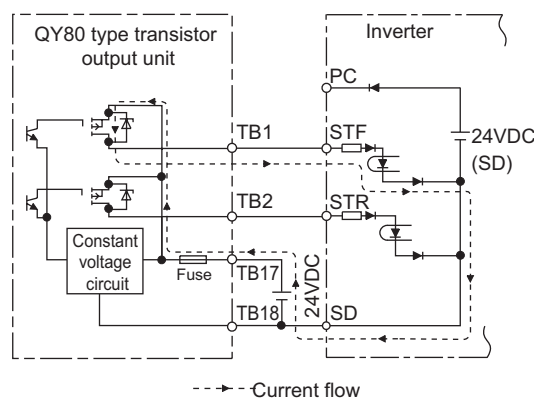
· Sink logic type

Use terminal PC as a common terminal, and perform wiring as shown below. (Do not connect terminal SD of the inverter with terminal 0V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install a power supply in parallel in the outside of the inverter. Doing so may cause a malfunction due to undesirable current.)



· Source logic type

Use terminal SD as a common terminal, and perform wiring as shown below. (Do not connect terminal PC of the inverter with terminal +24V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install an external power supply in parallel with the inverter. Doing so may cause a malfunction in the inverter due to undesirable currents.)

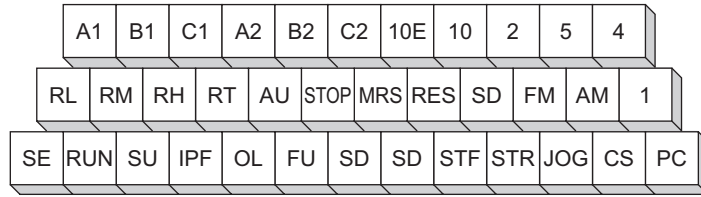




2.4.7 Wiring of control circuit

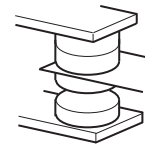
(1) Control circuit terminal layout

Terminal screw size: M3.5
Tightening torque: 1.2N·m

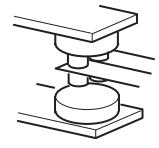


(2) Wiring instructions

- 1) Terminals 5, SD and SE are common to the I/O signals and isolated from each other. Do not earth (ground). Avoid connecting the terminal SD and 5 and the terminal SE and 5.
- 2) Use shielded or twisted wires for connection to the control circuit terminals and run them away from the main and power circuits (including the 200V relay sequence circuit).
- 3) Use two or more parallel micro-signal contacts or twin contacts to prevent a contact faults when using contact inputs since the control circuit input signals are micro-currents.



Micro signal contacts

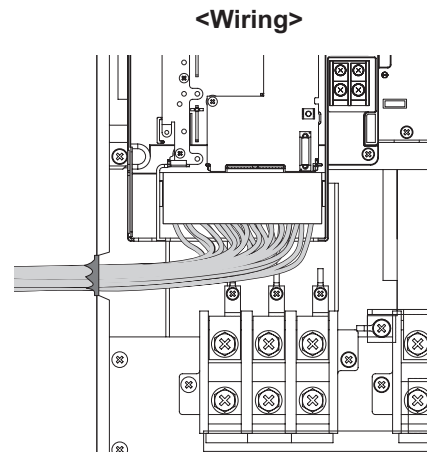
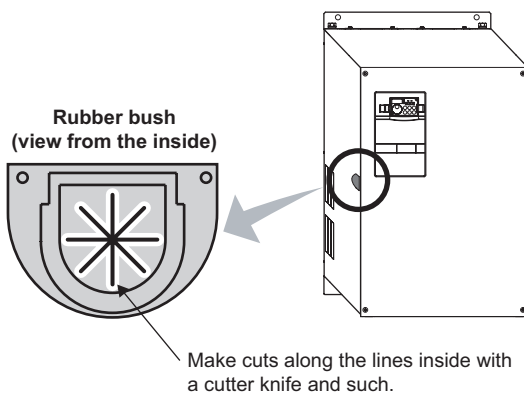


Twin contacts

- 4) Do not apply a voltage to the contact input terminals (e.g. STF) of the control circuit.
- 5) Always apply a voltage to the fault output terminals (A, B, C) via a relay coil, lamp, etc.
- 6) It is recommended to use the wires of 0.75mm² gauge for connection to the control circuit terminals.
If the wire gauge used is 1.25mm² or more, the front cover may be lifted when there are many wires running or the wires are run improperly, resulting in an operation panel contact fault.
- 7) The maximum wiring length should be 30m (200m for terminal FM).

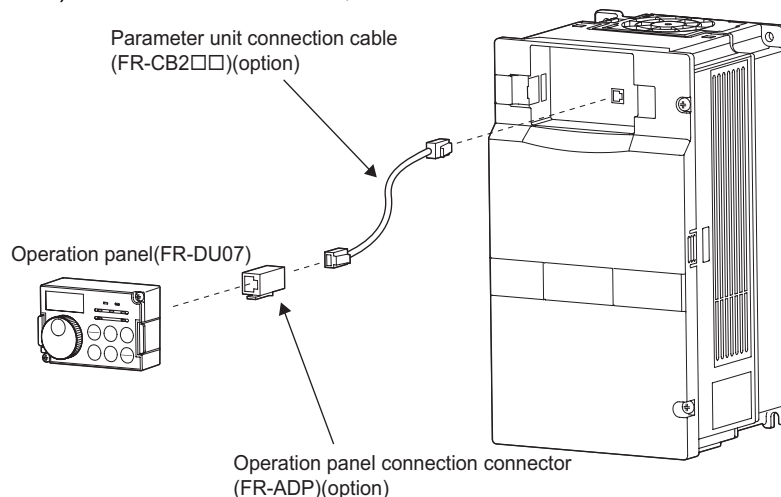
● Wiring of the control circuit of the 75K or more

For wiring of the control circuit of the 75K or more, separate away from wiring of the main circuit.
Make cuts in rubber bush of the inverter side and lead wires.



2.4.8 Connecting the operation panel using a connection cable

Having an operation panel on the enclosure surface is convenient. With a connection cable, you can mount the operation panel (FR-DU07) to the enclosure surface, and connect it to the inverter.



CAUTION

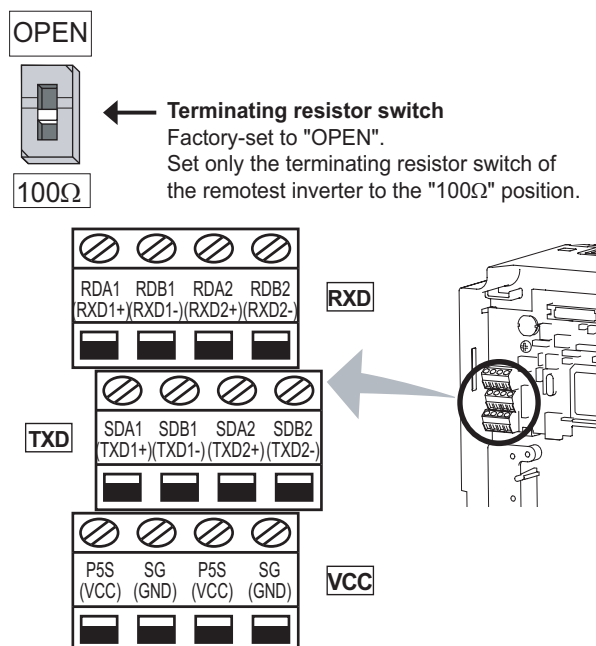
Do not connect the PU connector to the computer's LAN port, FAX modem socket or telephone connector. The inverter and machine could be damaged due to differences in electrical specifications.

REMARKS

- Refer to *page 5* for removal method of the operation panel.
- When using a commercially available connector and cable as a parameter unit connection cable, refer to the chapter 4 of the *Instruction Manual (applied)*.
- The inverter can be connected to the computer and FR-PU04/FR-PU07.

2.4.9 RS-485 terminal block

- Conforming standard: EIA-485(RS-485)
- Transmission format: Multidrop link
- Communication speed: MAX 38400bps
- Overall length: 500m
- Connection cable: Twisted pair cable (4 pairs)

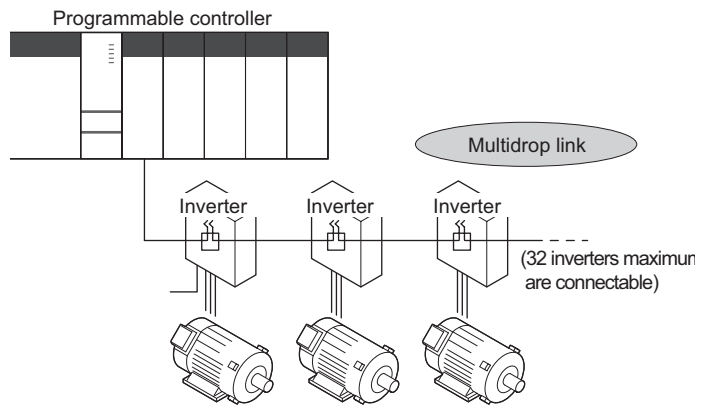




2.4.10 Communication operation

Using the PU connector or RS-485 terminal, you can perform communication operation from a personal computer etc. When the PU connector is connected with a personal, FA or other computer by a communication cable, a user program can run and monitor the inverter or read and write to parameters. For the Mitsubishi inverter protocol (computer link operation), communication can be performed with the PU connector and RS-485 terminal. For the Modbus RTU protocol, communication can be performed with the RS-485 terminal.

For further details, refer to the chapter 4 of the Instruction Manual (applied).

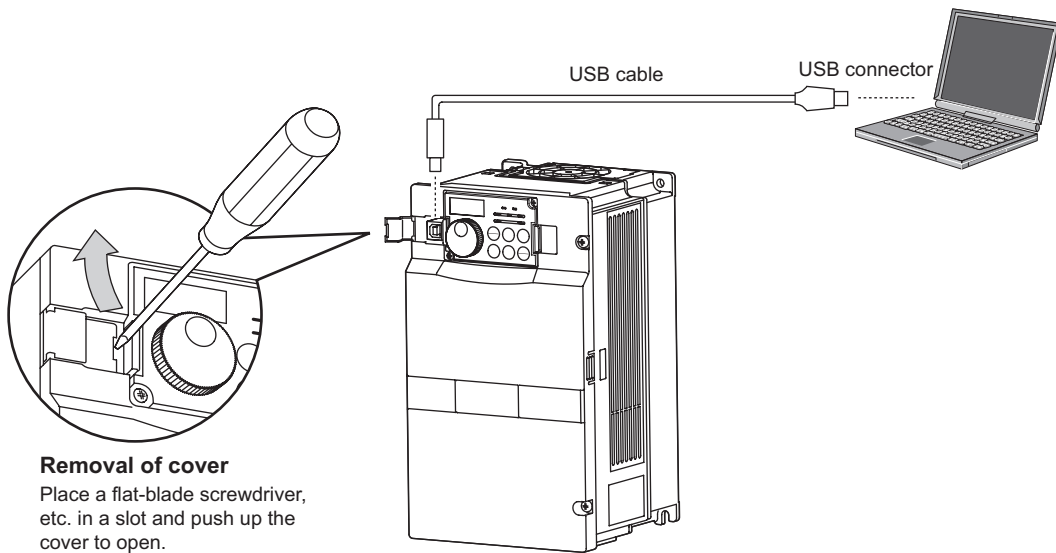


2.4.11 USB connector

A personal computer and an inverter can be connected with a USB (Ver1. 1) cable. You can perform parameter setting and monitoring with the FR Configurator.

•USB communication specifications

Interface	Conforms to USB1.1
Transmission speed	12Mbps
Wiring length	Maximum 5m
Connector	USB B connector (B receptacle)
Power supply	Self-power supply



2.5 Connection of stand-alone option units

The inverter accepts a variety of stand-alone option units as required. Incorrect connection will cause inverter damage or accident. Connect and operate the option unit carefully in accordance with the corresponding option unit manual.

2.5.1 Connection of the dedicated external brake resistor (FR-ABR) (22K or less)

The built-in brake resistor is connected across terminals P/+ and PR. Fit the external dedicated brake resistor (FR-ABR) when the built-in brake resistor does not have enough thermal capability for high-duty operation. At this time, remove the jumper from across terminals PR-PX (7.5K or less) and connect the dedicated brake resistor (FR-ABR) across terminals P/+ -PR.

(For the locations of terminal P/+ and PR, refer to the terminal block layout (page 10).)

Removing jumpers across terminal PR-PX disables the built-in brake resistor (power is not supplied).

Note that the built-in brake resistor is not need to be removed from the inverter.

The lead wire of the built-in brake resistor is not need to be removed from the terminal.

Set parameters below.

· Pr. 30 Regenerative function selection = "1"

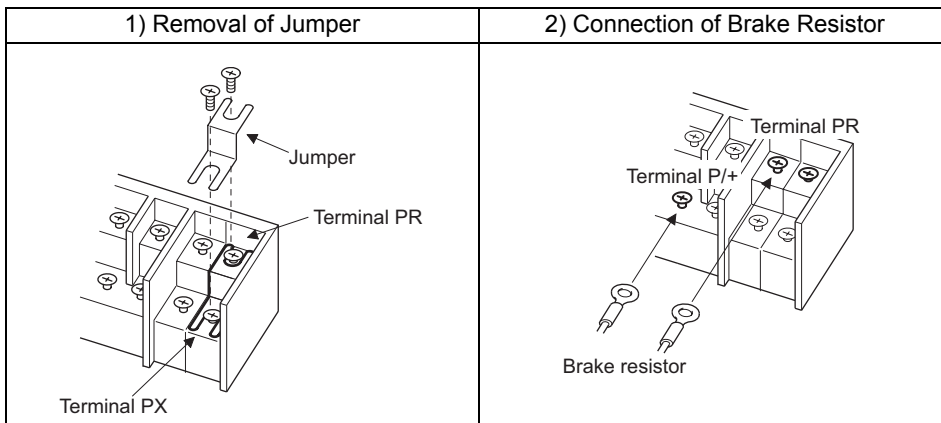
· Pr. 70 Special regenerative brake duty = "7.5K or less: 10%, 11K or more: 6%"

CAUTION

1. The brake resistor connected should be the only dedicated brake resistor.
2. The jumper across terminals PR-PX (7.5K or less) must be disconnected before connecting the dedicated brake resistor. Doing so may damage the inverter.

●FR-B750 (200V class), FR-B3-(N)400, 750

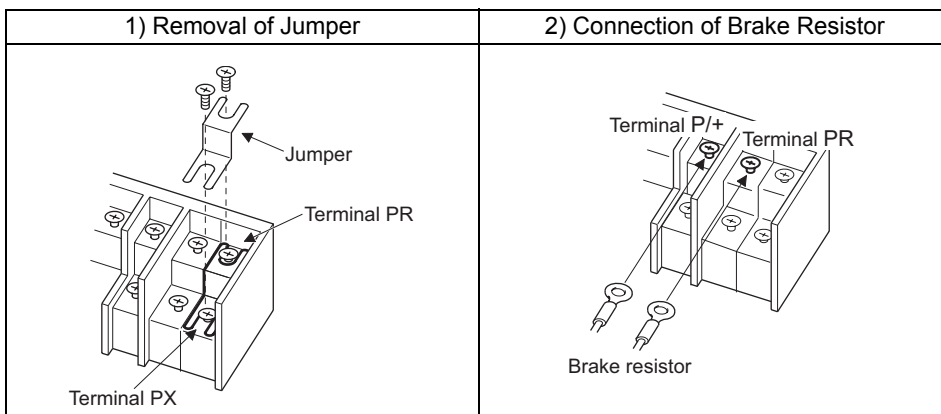
- 1) Remove the screws in terminals PR and PX and remove the jumper.
- 2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)



●FR-B-1500 to 3700 (200V class), FR-B3-(N)1500 to 3700

●FR-B-750 to 3700 (400V class), FR-B3-(N)H400 to 3700

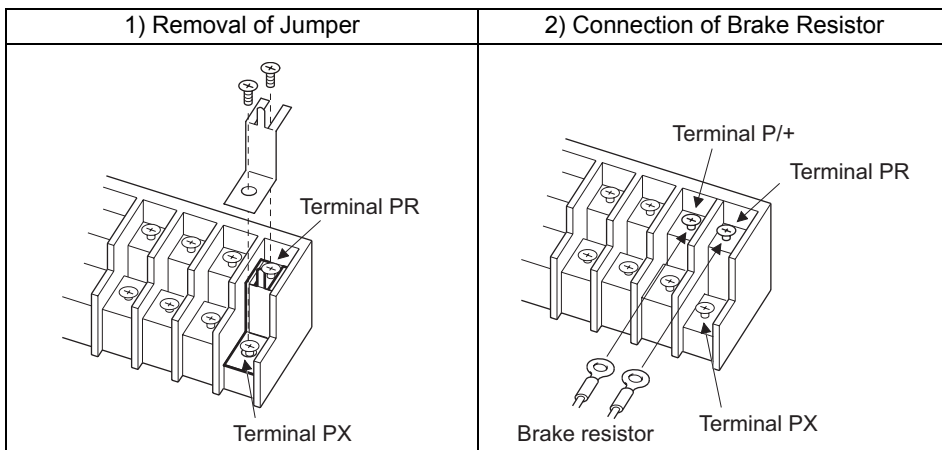
- 1) Remove the screws in terminals PR and PX and remove the jumper.
- 2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)



●FR-B-5.5K, 7.5K (200V class), FR-B3-(N)5.5K, 7.5K

●FR-B-7.5K (400V class), FR-B3-(N)H5.5K, 7.5K

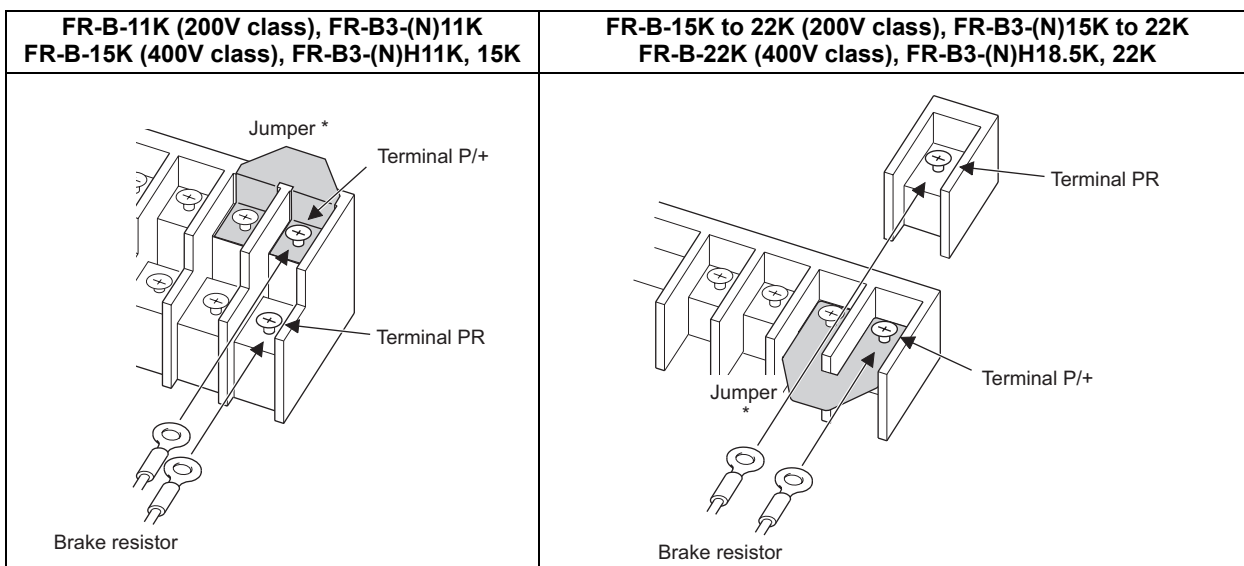
- 1) Remove the screws in terminals PR and PX and remove the jumper.
- 2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)



●FR-B-11K to 22K (200V class), FR-B3-(N)11K to 22K

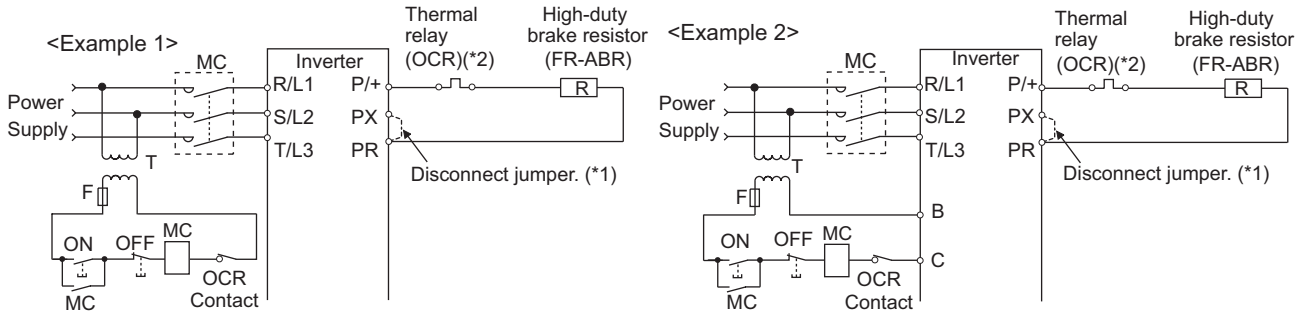
●FR-B-15K, 22K (400V class), FR-B3-(N)H11K to 22K

Connect the brake resistor across terminals P/+ and PR.



* Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

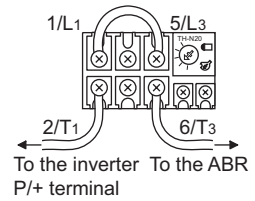
- When the regenerative brake transistor is damaged, the following sequence is recommended to prevent overheat and burnout of the brake resistor.



*1 Since the inverter of 11K or more is not provided with the PX terminal, a jumper does not need to be removed.

*2 Refer to the table below for the type number of each capacity of thermal relay and the diagram below for the connection. (Always install a thermal relay when using the 11K or more)

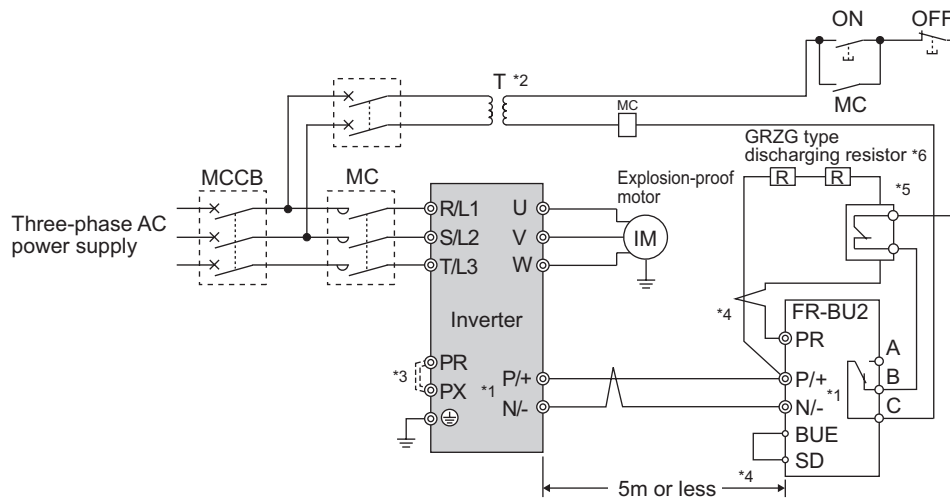
Power Supply Voltage	High-Duty Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	FR-ABR-0.4K	TH-N20CXHZ-0.7A	110VAC 5A 220VAC 2A (AC-11 class) 110VDC 0.5A, 220VDC 0.25A (DC-11 class)
	FR-ABR-0.75K	TH-N20CXHZ-1.3A	
	FR-ABR-2.2K	TH-N20CXHZ-2.1A	
	FR-ABR-3.7K	TH-N20CXHZ-3.6A	
	FR-ABR-5.5K	TH-N20CXHZ-5A	
	FR-ABR-7.5K	TH-N20CXHZ-6.6A	
	FR-ABR-11K	TH-N20CXHZ-11A	
	FR-ABR-15K	TH-N20CXHZ-11A	
	FR-ABR-22K	TH-N60-22A	
400V	FR-ABR-H0.4K	TH-N20CXHZ-0.24A	
	FR-ABR-H0.75K	TH-N20CXHZ-0.35A	
	FR-ABR-H1.5K	TH-N20CXHZ-0.9A	
	FR-ABR-H2.2K	TH-N20CXHZ-1.3A	
	FR-ABR-H3.7K	TH-N20CXHZ-2.1A	
	FR-ABR-H5.5K	TH-N20CXHZ-2.5A	
	FR-ABR-H7.5K	TH-N20CXHZ-3.6A	
	FR-ABR-H11K	TH-N20CXHZ-6.6A	
	FR-ABR-H15K	TH-N20CXHZ-6.6A	
	FR-ABR-H22K	TH-N20-9A	



2.5.2 Connection of the brake unit (FR-BU2)

Connect the brake unit (FR-BU2) as shown below to improve the braking capability at deceleration.

(1) Connection example with the GRZG type discharging resistor



- *1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
- *2 When the power supply is 400V class, install a step-down transformer.
- *3 Be sure to remove a jumper across terminal PR-PX when using the FR-BU2 with the inverter of 7.5K or less.
- *4 Keep a wiring distance of within 5m between the inverter, brake unit (FR-BU2) and discharging resistor. Even when the wiring is twisted, the cable length must not exceed 10m.
- *5 It is recommended to install an external thermal relay to prevent overheat of discharging resistors.
- *6 Refer to FR-BU2 manual for connection method of discharging resistor.

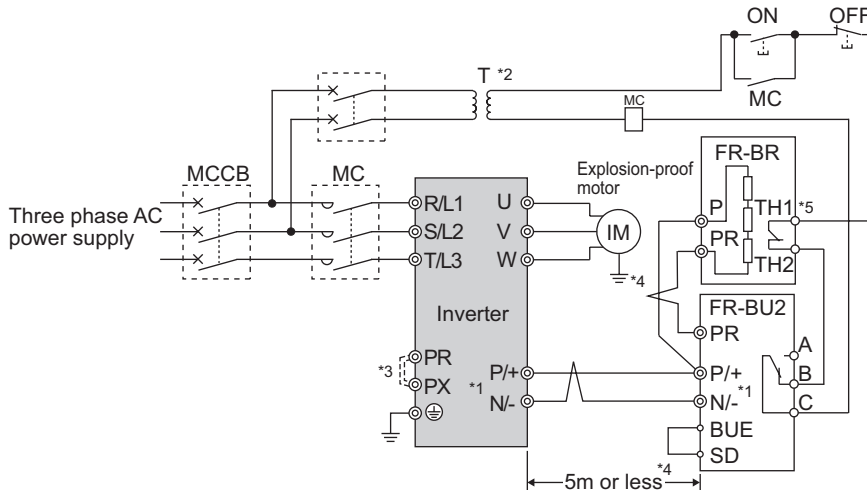
<Recommended external thermal relay>

Brake Unit	Discharging Resistor	Recommended External Thermal Relay
FR-BU2-1.5K	GZG 300W-50Ω (one)	TH-N20CXHZ 1.3A
FR-BU2-3.7K	GRZG 200-10Ω (three in series)	TH-N20CXHZ 3.6A
FR-BU2-7.5K	GRZG 300-5Ω (four in series)	TH-N20CXHZ 6.6A
FR-BU2-15K	GRZG 400-2Ω (six in series)	TH-N20CXHZ 11A
FR-BU2-H7.5K	GRZG 200-10Ω (six in series)	TH-N20CXHZ 3.6A
FR-BU2-H15K	GRZG 300-5Ω (eight in series)	TH-N20CXHZ 6.6A
FR-BU2-H30K	GRZG 400-2Ω (twelve in series)	TH-N20CXHZ 11A

CAUTION

- Set "1" in Pr. 0 Brake mode selection of the FR-BU2 to use GRZG type discharging resistor.
- Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(2) Connection example with FR-BR-(H) type resistor unit

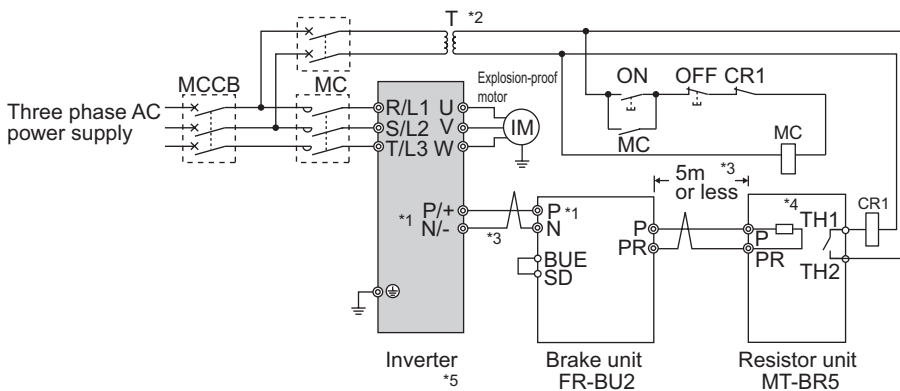


- *1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
- *2 When the power supply is 400V class, install a step-down transformer.
- *3 Be sure to remove a jumper across terminal PR-PX when using the FR-BU with the inverter of 7.5K or less.
- *4 The wiring distance between the inverter, brake unit (FR-BU) and resistor unit (FR-BR) should be within 5m. Even when the wiring is twisted, the cable length must not exceed 10m
- *5 Normal: across TH1-TH2 is closed, Alarm: across TH1-TH2 is open

CAUTION

Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(3) Connection example with MT-BR5 type resistor unit



- *1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
- *2 When the power supply is 400V class, install a step-down transformer.
- *3 The wiring distance between the inverter, brake unit (FR-BU2) and resistor unit (MT-BR5) should be within 5m. If twisted wires are used, the distance should be within 10m.
- *4 Normal: across TH1-TH2 is open, Alarm: across TH1-TH2 is closed
- *5 CN8 connector used with the MT-BU5 type brake unit is not used.

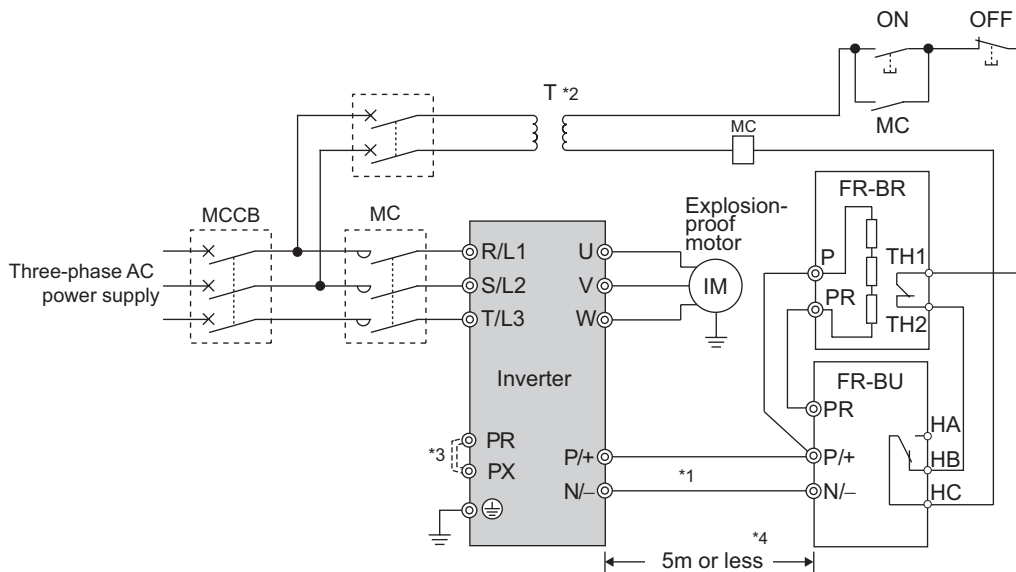
CAUTION

Set "2" in Pr. 0 Brake mode selection of the FR-BU2 to use MT-BR5 type resistor unit.

2.5.3 Connection of the brake unit (FR-BU/MT-BU5)

When connecting the brake unit (FR-BU(H)/MT-BU5) to improve the brake capability at deceleration, make connection as shown below.

(1) Connection with the FR-BU



- *1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU (H)) terminals so that their terminal signals match with each other. (Incorrect connection will damage the inverter.)
- *2 When the power supply is 400V class, install a step-down transformer.
- *3 Be sure to remove a jumper across terminals PR and PX when using the FR-BU with the inverter of 7.5K or less.
- *4 The wiring distance between the inverter, brake unit (FR-BU) and resistor unit (FR-BR) should be within 5m. If twisted wires are used, the distance should be within 10m.

CAUTION

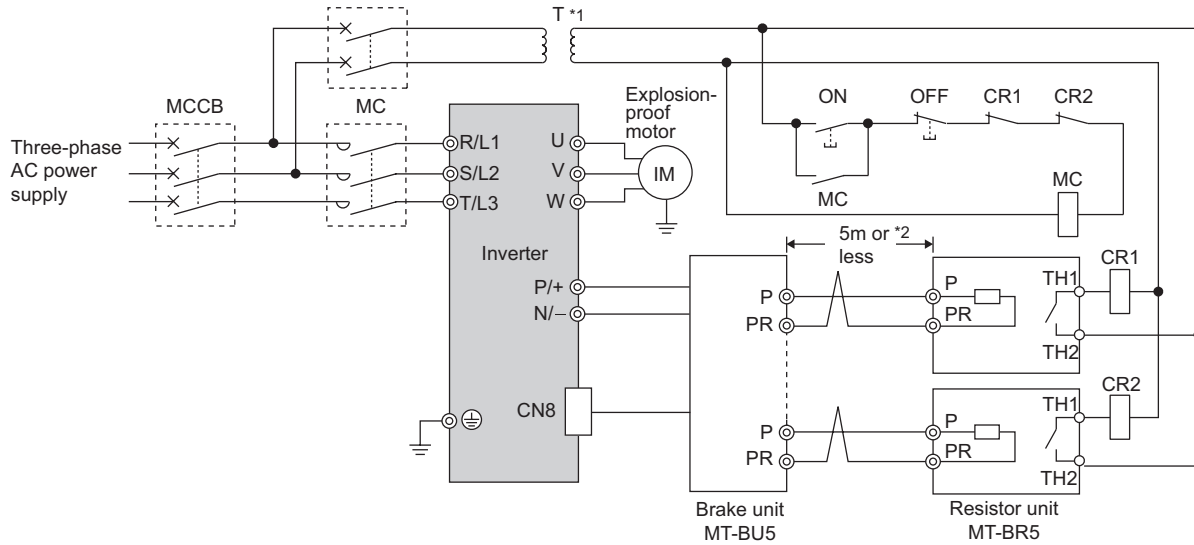
- If the transistors in the brake unit should become faulty, the resistor can be unusually hot, causing a fire. Therefore, install a magnetic contactor on the inverter's input side to configure a circuit so that a current is shut off in case of fault.
- Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(2) Connection with the MT-BU5 (FR-B-75K or more)

After making sure that the MT-BU5 is properly connected, set the following parameters.

Pr. 30 Regenerative function selection = "1"

Pr. 70 Special regenerative brake duty = "10%"



*1 When the power supply is 400V class, install a step-down transformer.

*2 The wiring length between the resistor unit and brake resistor should be 10m maximum when wires are twisted and 5m maximum when wires are not twisted.

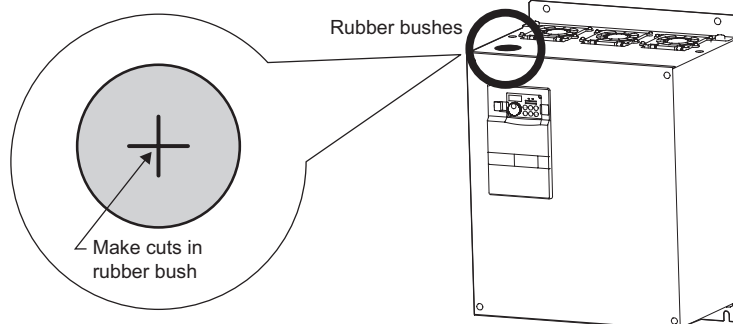
CAUTION

- Install the brake unit in a place where a cooling air reaches the brake unit heatsink and within a distance of the cable supplied with the brake unit reaches the inverter.
- For wiring of the brake unit and inverter, use an accessory cable supplied with the brake unit. Connect the main circuit cable to the inverter terminals P/+ and N/- and connect the control circuit cable to the CN8 connector inside by making cuts in the rubber bush at the top of the inverter for leading the cable.
- The brake unit which uses multiple resistor units has terminals equal to the number of resistor units. Connect one resistor unit to one pair of terminal (P, PR).

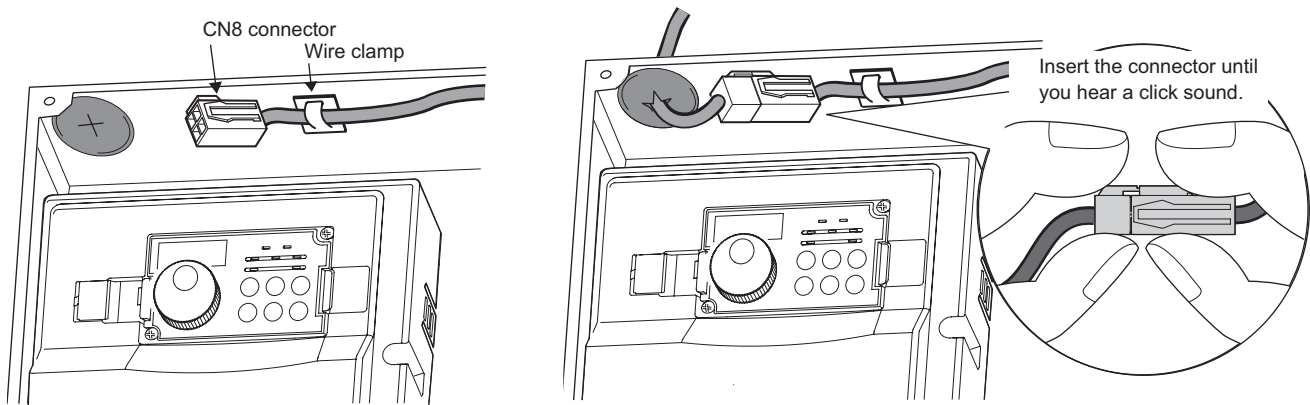
<Inserting the CN8 connector>

Make cuts in rubber bush of the upper portion of the inverter and lead a cable.

1) Make cuts in the rubber bush for leading the CN8 connector cable with a nipper or cutter knife.



2) Insert a connector on the MT-BU5 side through a rubber bush to connect to a connector on the inverter side.



CAUTION

Clamp the CN8 connector cable on the inverter side with a wire clamp securely.

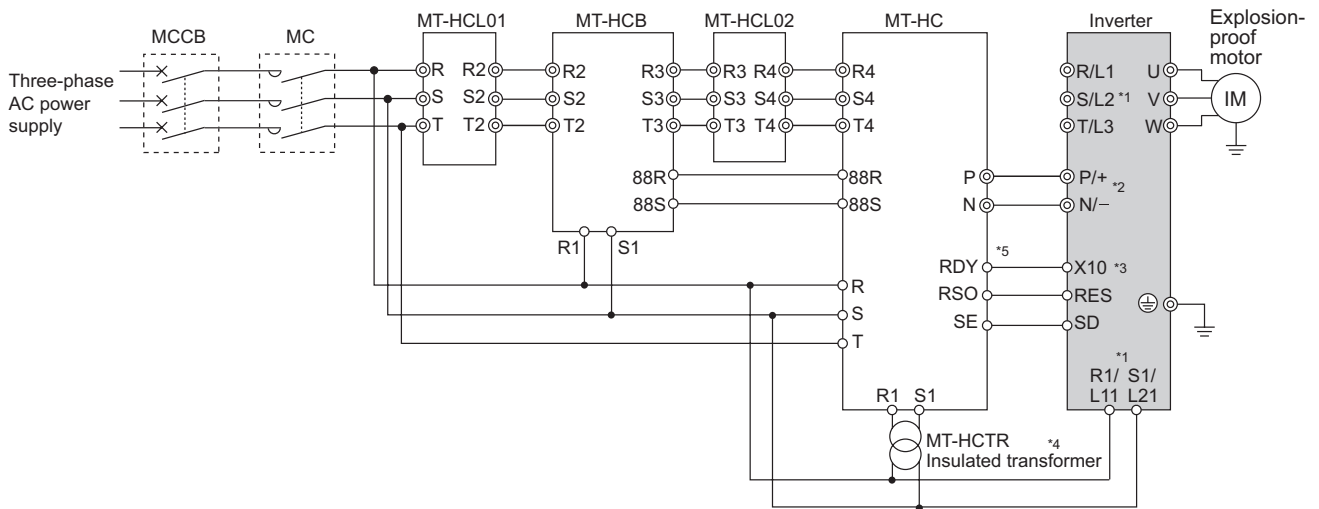
Do not connect the MT-BU5 to a CN8 connector of the FR-B-55K (400V class), FR-B3-(N)H55K.

2.5.4 Connection of the high power factor converter (MT-HC)(FR-B-75K or more)

When connecting the high power factor converter (MT-HC) to suppress power harmonics, perform wiring securely as shown below.

Incorrect connection will damage the high power factor converter and inverter.

After making sure that the wiring is correct, set "2" in Pr. 30 Regenerative function selection.



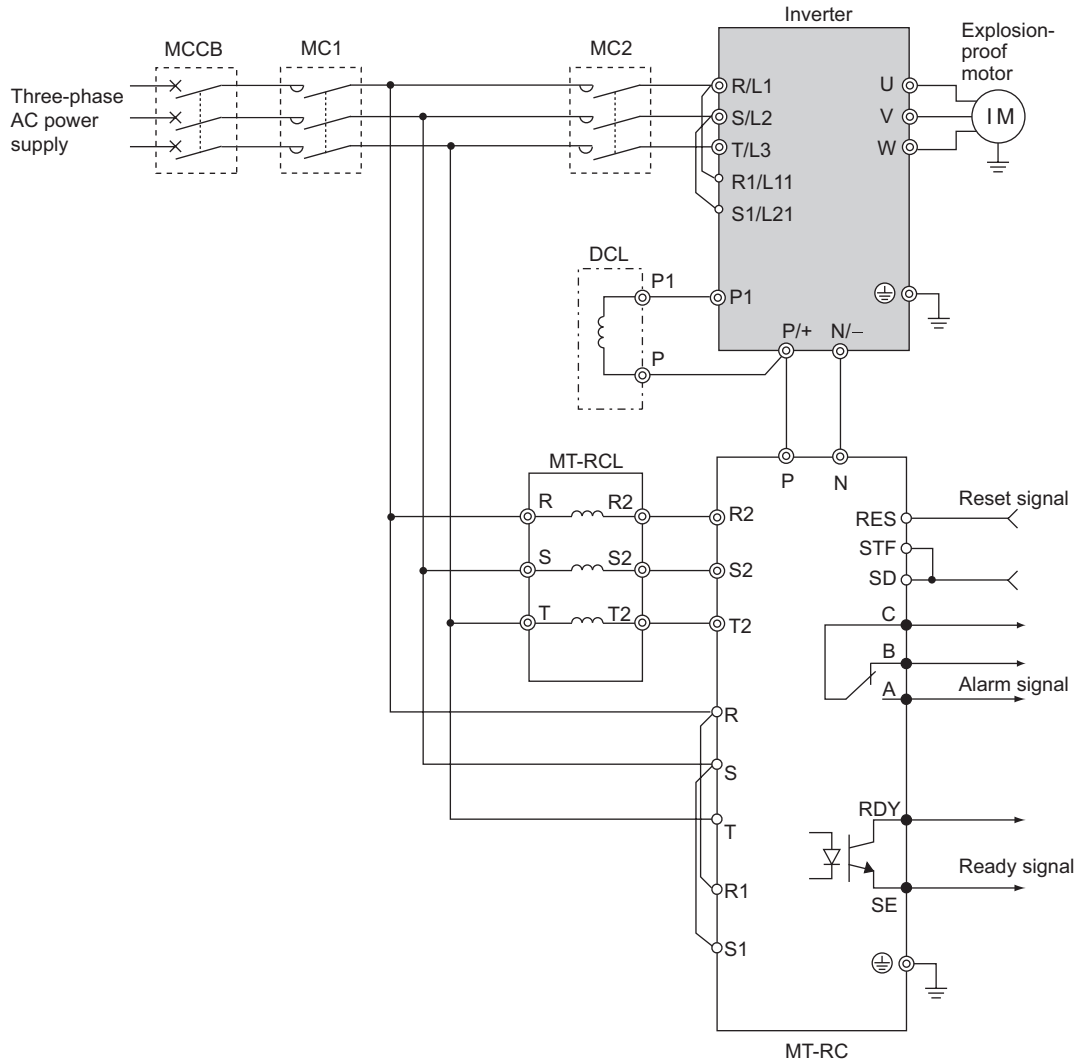
- *1 Remove the jumper across terminals R/L1 - R1/L11, S/L2 - S1/L21 of the inverter, and connect the control circuit power supply to the R1/L11 and S1/L21 terminals. The power input terminals R/L1, S/L2, T/L3 must be open. Incorrect connection will damage the inverter. (E.OPT (option alarm) will occur. (Refer to page 114.)
- *2 Do not insert the MCCB between terminals P/+ - N/- (P - P/+, N - N/-). Opposite polarity of terminals N, P will damage the inverter.
- *3 Use Pr. 178 to Pr. 189 (input terminal function selection) to assign the terminals used for the X10 (X11) signal. (Refer to page 89.) For communication where the start command is sent only once, e.g. RS-485 communication operation, use the X11 signal when making setting to hold the mode at occurrence of an instantaneous power failure. (Refer to page 95.)
- *4 Connect the power supply to terminals R1 and S1 of the MT-HC via an insulated transformer.
- *5 Be sure to connect terminal RDY of the MT-HC to the X10 signal or MRS signal assigned terminal of the inverter, and connect terminal SE of the MT-HC to terminal SD of the inverter. Without proper connection, MT-HC will be damaged.

CAUTION

- The voltage phases of terminals R/L1, S/L2, T/L3 and terminals R4, S4, T4 must be matched.
- Use sink logic (factory setting) when the MT-HC is connected. The MT-HC cannot be connected when source logic is selected.
- When connecting the inverter to the MT-HC, do not connect the DC reactor provided to the inverter.

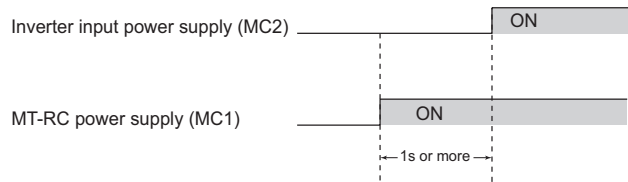
2.5.5 Connection of power regeneration converter (MT-RC) (FR-B-75K or more)

When connecting a power regeneration converter (MT-RC), perform wiring securely as shown below. Incorrect connection will damage the regeneration converter and inverter. After connecting securely, set "1" in Pr. 30 Regenerative function selection and "0" in Pr. 70 Special regenerative brake duty.



CAUTION

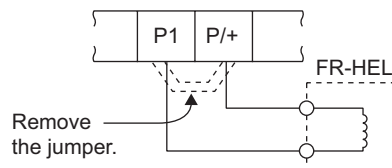
- When using the FR-B series together with the MT-RC, install a magnetic contactor (MC) at the input side of the inverter so that power is supplied to the inverter after 1s or more has elapsed after powering on the MT-RC. When power is supplied to the inverter prior to the MT-RC, the inverter and the MT-RC may be damaged or the MCCB may trip or be damaged.
- Refer to the MT-RC manual for precautions for connecting the power coordination reactor and others.



2.5.6 Connection of the power factor improving DC reactor (FR-HEL)

When using the DC reactor (FR-HEL), connect it between terminals P1-P/+. For the 55K or less, the jumper connected across terminals P1-P/+ must be removed. Otherwise, the reactor will not exhibit its performance.

For the 75K or more, a DC reactor is supplied. Always install the reactor.




CAUTION

- The wiring distance should be within 5m.
- The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3). (Refer to page 14)

2.6 Power-off and magnetic contactor (MC)

(1) Inverter input side magnetic contactor (MC)

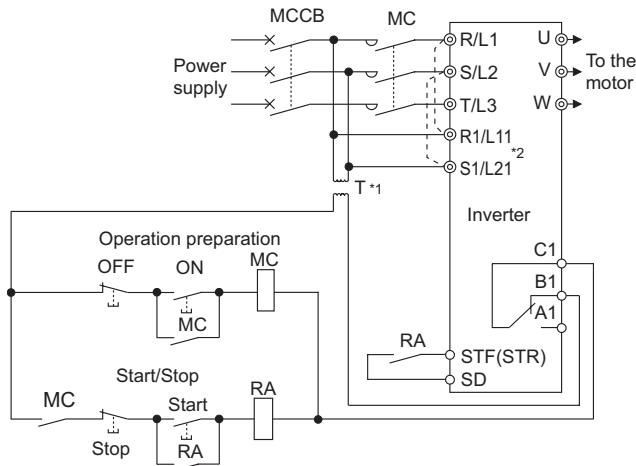
On the inverter input side, it is recommended to provide an MC for the following purposes.

( Refer to *page 3* for selection.)

- 1) To release the inverter from the power supply when the fault occurs or when the drive is not functioning (e.g. emergency stop operation). For example, MC avoids overheat or burnout of the brake resistor when heat capacity of the resistor is insufficient or brake regenerative transistor is damaged with short while connecting an optional brake resistor.
- 2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
- 3) To reset the inverter for an extended period of time
While the power is ON, inverter is consuming a little power even during inverter stop. When stopping the inverter for an extended period of time, powering off the inverter will save power slightly.
- 4) To separate the inverter from the power supply to ensure safe maintenance and inspection work
The inverter's input side MC is used for the above purpose, select class JEM1038-AC3MC for the inverter input side current when making an emergency stop during normal operation.

REMARKS

Since repeated inrush currents at power on will shorten the life of the converter circuit (switching life is about 1 million times. (For the 200V class 37K or more, switching life is about 500,000)), frequent starts and stops of the MC must be avoided. Turn on/off the inverter start controlling terminals (STF, STR) to run/stop the inverter.



• Inverter start/stop circuit example

As shown on the left, always use the start signal (ON or OFF of STF(STR) signal) to make a start or stop.

- *1 When the power supply is 400V class, install a step-down transformer.
- *2 Connect the power supply terminals R1/L11, S1/L21 of the control circuit to the primary side of the MC to hold an alarm signal when the inverter's protective circuit is activated. At this time, remove jumpers across terminals R/L1-R1/L11 and S/L2-S1/L21. (Refer to *page 17* for removal of the jumper.)

(2) Handling of the inverter output side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned on while the inverter is operating, overcurrent protection of the inverter and such will activate.

2.7 Precautions for use of the inverter

The FR-B, B3 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.

Before starting operation, always recheck the following items.

- (1) Use crimping terminals with insulation sleeve to wire the power supply and motor.
- (2) Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Never perform such wiring.
- (3) After wiring, wire offcuts must not be left in the inverter.
Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.
- (4) Use cables of the size to make a voltage drop 2% maximum.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
Refer to *page 14* for the recommended cable sizes.
- (5) The overall wiring length should be 500m maximum.
Especially for long distance wiring, the fast response current limit function may decrease or the equipment connected to the secondary side may malfunction or become faulty under the influence of a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. (*Refer to page 16.*)
- (6) Electromagnetic wave interference
The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, set the EMC filter valid to minimize interference. (*Refer to page 9*)
- (7) Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the inverter output side.
This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices is installed, immediately remove it.
- (8) For some short time after the power is switched off, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched off, and then make sure that the voltage across the main circuit terminals P/+ - N/- of the inverter is not more than 30VDC using a tester, etc.
- (9) A short circuit or earth (ground) fault on the inverter output side may damage the inverter modules.
 - Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter modules.
 - Fully check the to-earth (ground) insulation and inter-phase insulation of the inverter output side before power-on. Especially for an old motor or use in hostile atmosphere, securely check the motor insulation resistance etc.
- (10) Do not use the inverter input side magnetic contactor to start/stop the inverter.
Always use the start signal (ON/OFF of STF and STR signals) to start/stop the inverter. (*Refer to page 8*)
- (11) Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.
Application of permissible voltage to the inverter I/O signal circuit and incorrect polarity may damage the I/O terminal. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short terminals 10E-5.



- (12) If the machine must not be restarted when power is restored after a power failure, provide a magnetic contactor in the inverter's input side and also make up a sequence which will not switch on the start signal.
If the start signal (start switch) remains on after a power failure, the inverter will automatically restart as soon as the power is restored.
- (13) Instructions for overload operation
When performing an operation of frequent start/stop with the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current at locked condition, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. Therefore, choose a large capacity inverter and motor which have enough allowance for current.
- (14) Make sure that the specifications and rating match the system requirements.
- (15) If electromagnetic noise generated from the inverter causes frequency setting signal to fluctuate and motor rotation speed to be unstable when changing motor speed with analog signal, the following countermeasures are effective.
- . Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
 - . Run signal cables as far away as possible from power cables (inverter I/O cables).
 - . Use shield cables as signal cables.
 - . Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).



2.8 Failsafe of the system which uses the inverter

When a fault occurs, the inverter trips to output a fault signal. However, a fault output signal may not be output at an inverter fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi assures best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to machine when the inverter fails for some reason. At the same time, consider the system configuration where failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

(1) Interlock method which uses the inverter status output signals

By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

No	Interlock Method	Check Method	Used Signals	Refer to Page
1)	Inverter protective function operation	Operation check of an alarm contact Circuit error detection by negative logic	Fault output signal (ALM signal)	Refer to the chapter 4 of the instruction manual (applied)
2)	Inverter running status	Operation ready signal check	Operation ready signal (RY signal)	Refer to the chapter 4 of the instruction manual (applied)
3)	Inverter running status	Logic check of the start signal and running signal	Start signal (STF signal, STR signal) Running signal (RUN signal)	Refer to the chapter 4 of the instruction manual (applied)
4)	Inverter running status	Logic check of the start signal and output current	Start signal (STF signal, STR signal) Output current detection signal (Y12 signal)	Refer to the chapter 4 of the instruction manual (applied)

(2) Backup method outside the inverter

Even if the interlock is provided by the inverter status signal, enough failsafe is not ensured depending on the failure status of the inverter itself. For example, when the inverter CPU fails, even if the interlock is provided using the inverter fault signal, start signal and RUN signal, there is a case where a fault signal is not output and RUN signal is kept output even if an inverter fault occurs.

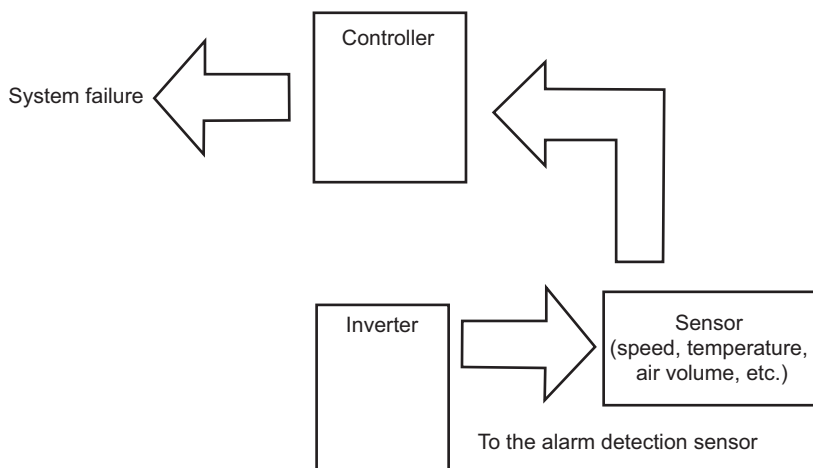
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as checking up as below according to the level of importance of the system.

1) Start signal and actual operation check

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the motor current runs as the motor is running for the period until the motor stops since the inverter starts decelerating even if the start signal turns off. For the logic check, configure a sequence considering the inverter deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.

2) Command speed and actual operation check

Check that there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.

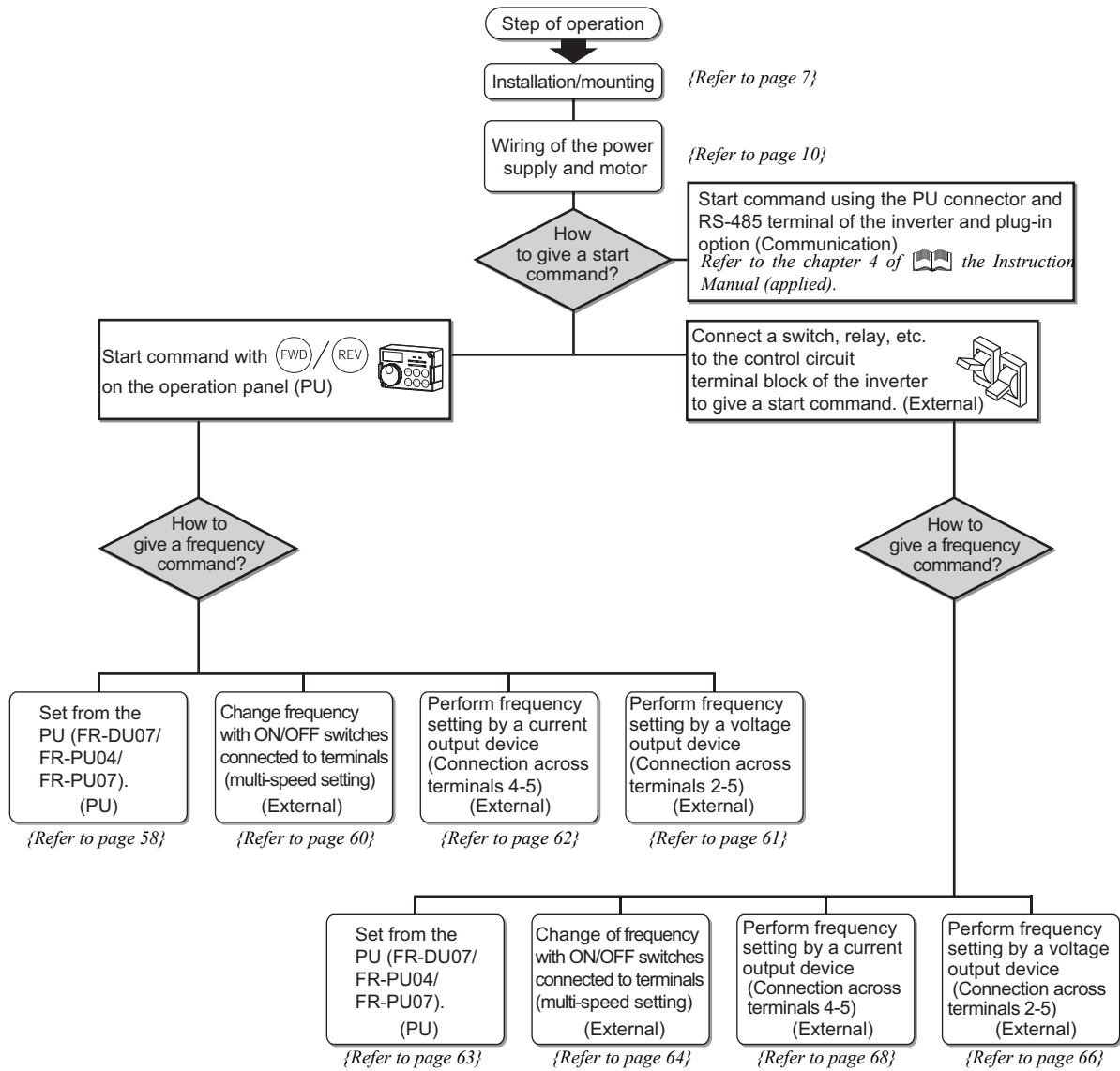


3 DRIVE THE MOTOR

3.1 Step of operation

The inverter needs frequency command and start command. Turning the start command on start the motor rotating and the motor speed is determined by the frequency command (set frequency).

Refer to the flow chart below to perform setting.



CAUTION

Check the following items before powering on the inverter.

- Check that the inverter is installed correctly in a correct place. (Refer to page 7)
- Check that wiring is correct. (Refer to page 8)
- Check that no load is connected to the motor.

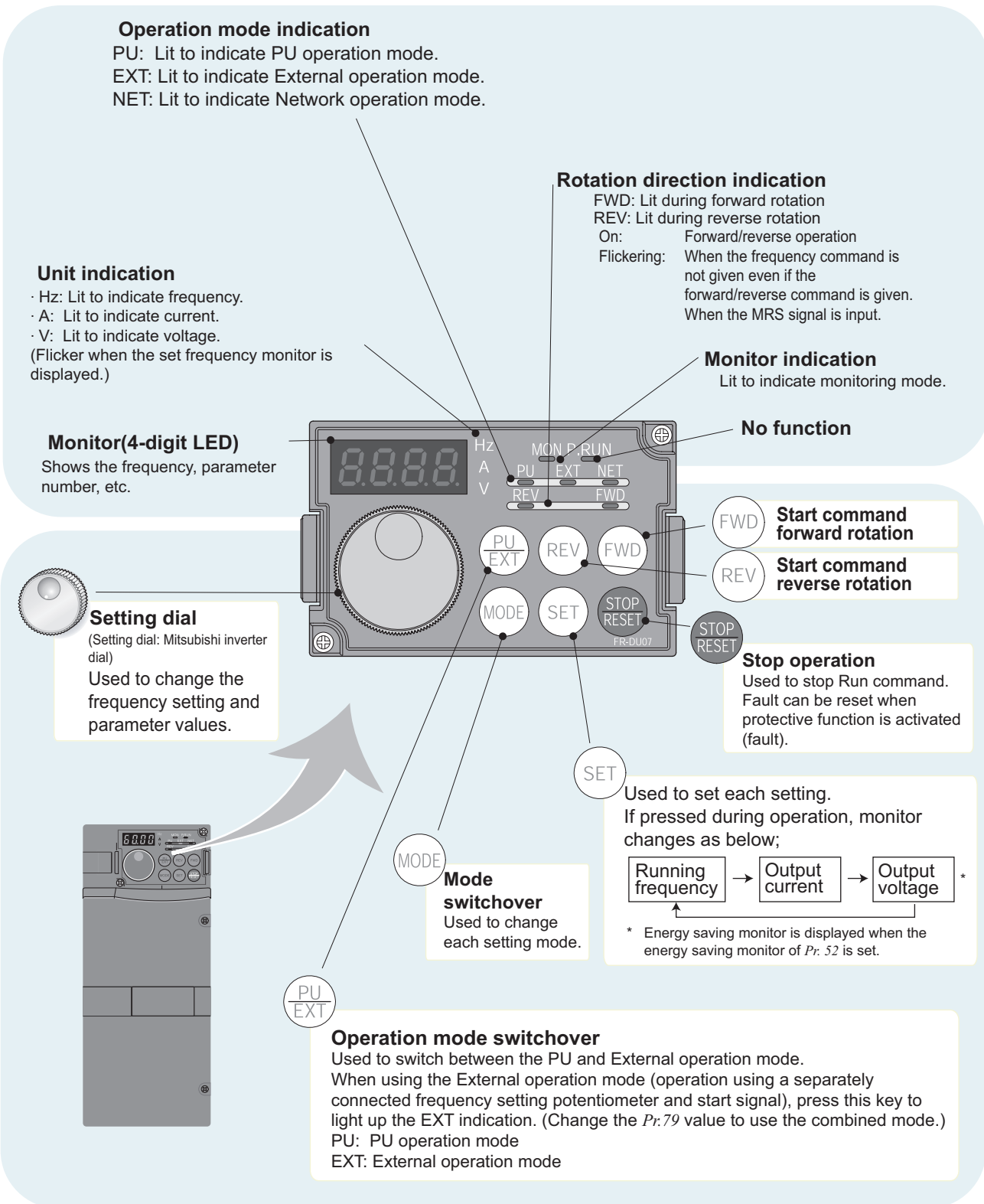


When protecting the motor from overheat by the inverter, set Pr.9 Electronic thermal O/L relay (Refer to page 50)

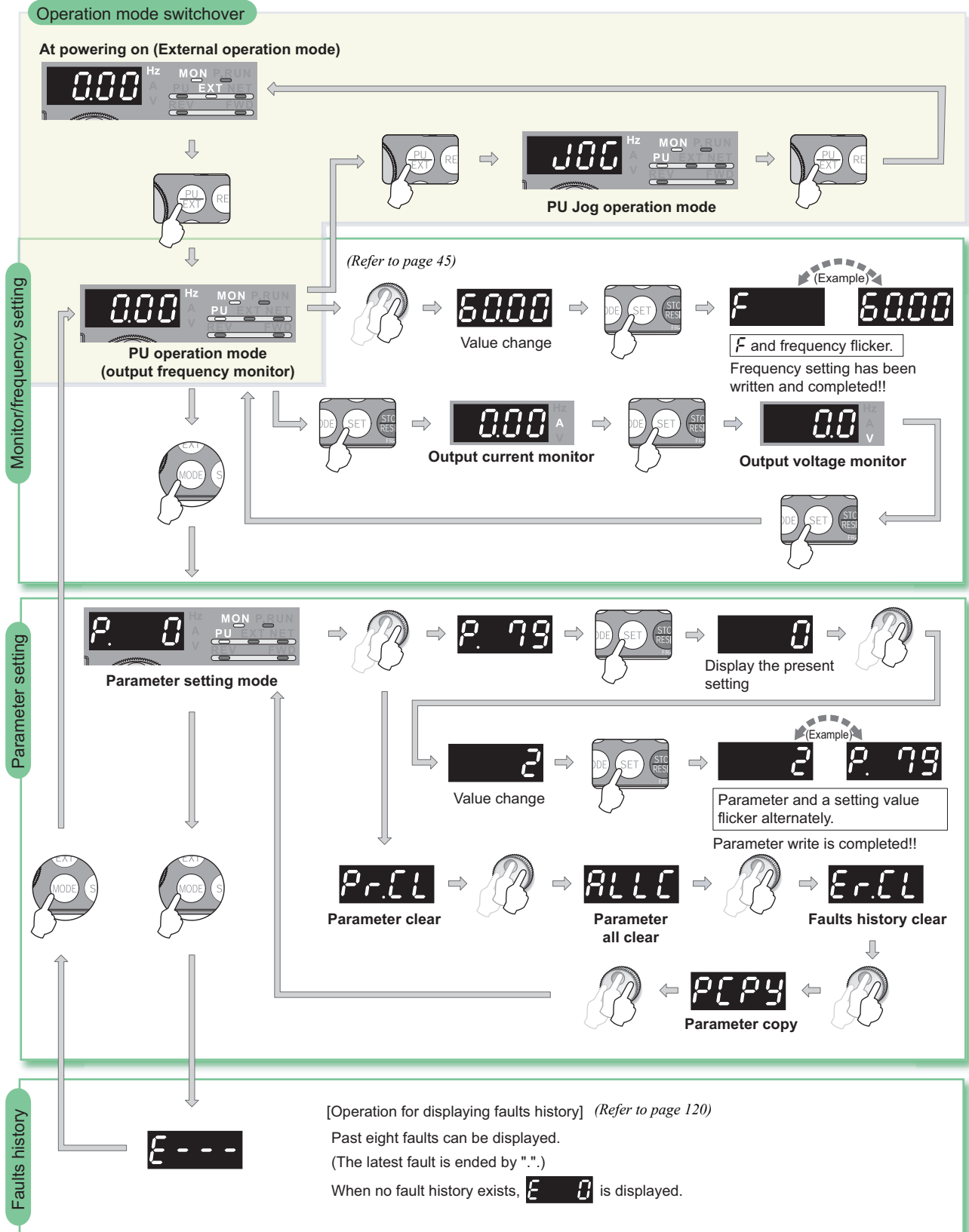


3.2 Operation panel (FR-DU07)

3.2.1 Parts of the operation panel (FR-DU07)



3.2.2 Basic operation (factory setting)



3.2.3 Operation lock (Press [MODE] for an extended time (2s))

Operation using the setting dial and key of the operation panel can be made invalid to prevent parameter change and unexpected start or frequency setting.

· Set "10 or 11" in Pr. 161, then press for 2s to make the setting dial and key operation invalid.

· When the setting dial and key operation are invalid, **HOLD** appears on the operation panel.

If dial and key operation is attempted while dial and key operation are invalid, **HOLD** appears. (When dial or key is not touched for 2s, the monitor display appears.)

· To make the setting dial and key operation valid again, press for 2s.

POINT

Set "10 or 11" (key lock valid) in Pr.161 Frequency setting/key lock operation selection.

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press to choose the PU operation mode.	PU indication is lit.
3. Press to choose the parameter setting mode.	(The parameter number read previously appears.)
4. Turn until P. 161 (Pr. 161) appears.	
5. Press to read the currently set value. "0" (initial value) appears.	
6. Turn to change it to the setting value "10".	
7. Press to set.	Flicker ... Parameter setting complete!!
8. Press for 2s to show the key lock.	 Press for 2s.

Functions valid even in the operation lock status

Stop and reset with .

CAUTION

Cancel the operation lock to release the PU stop by key operation.



3.2.4 Monitoring of output current and output voltage

POINT

Monitor display of output frequency, output current and output voltage can be changed by pushing **SET** during monitoring mode.


Operation		Display
<p>1. Press MODE during operation to choose the output frequency monitor</p>		
<p>2. Independently of whether the inverter is running in any operation mode or at a stop, the output current monitor appears by pressing SET.</p>	<p>SET →</p>	
<p>3. Press SET to show the output voltage monitor.</p>	<p>SET →</p>	

3.2.5 First priority monitor

Hold down **SET** for 1s to set monitor description to be appeared first in the monitor mode.

(To return to the output frequency monitor, hold down **SET** for 1s after displaying the output frequency monitor.)

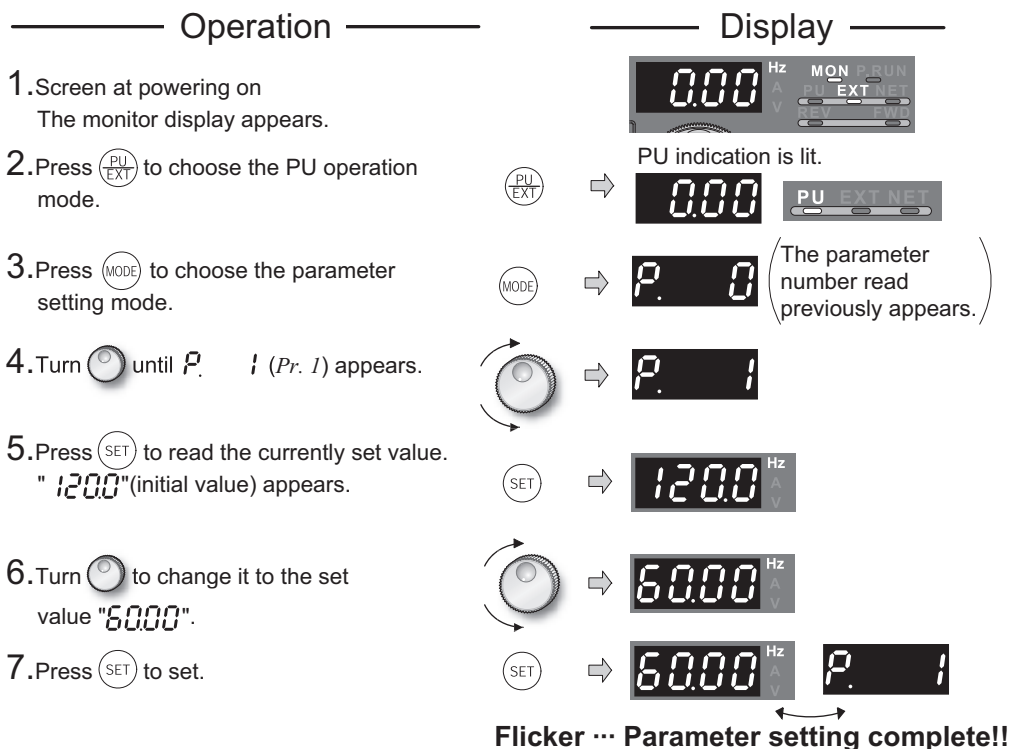
3.2.6 Setting dial push

Push the setting dial () to display the set frequency currently set.



3.2.7 Changing the parameter setting value

Changing example Change the Pr. 1 Maximum frequency.



- By turning , you can read another parameter.
- Press to show the setting again.
- Press twice to show the next parameter.
- Press twice to return the monitor to frequency monitor.

? **Er 1** to **Er 4** are displayed ... Why?

- Er 1** appears.Write disable error
- Er 2** appears.Write error during operation
- Er 3** appears.Calibration error
- Er 4** appears.Mode designation error

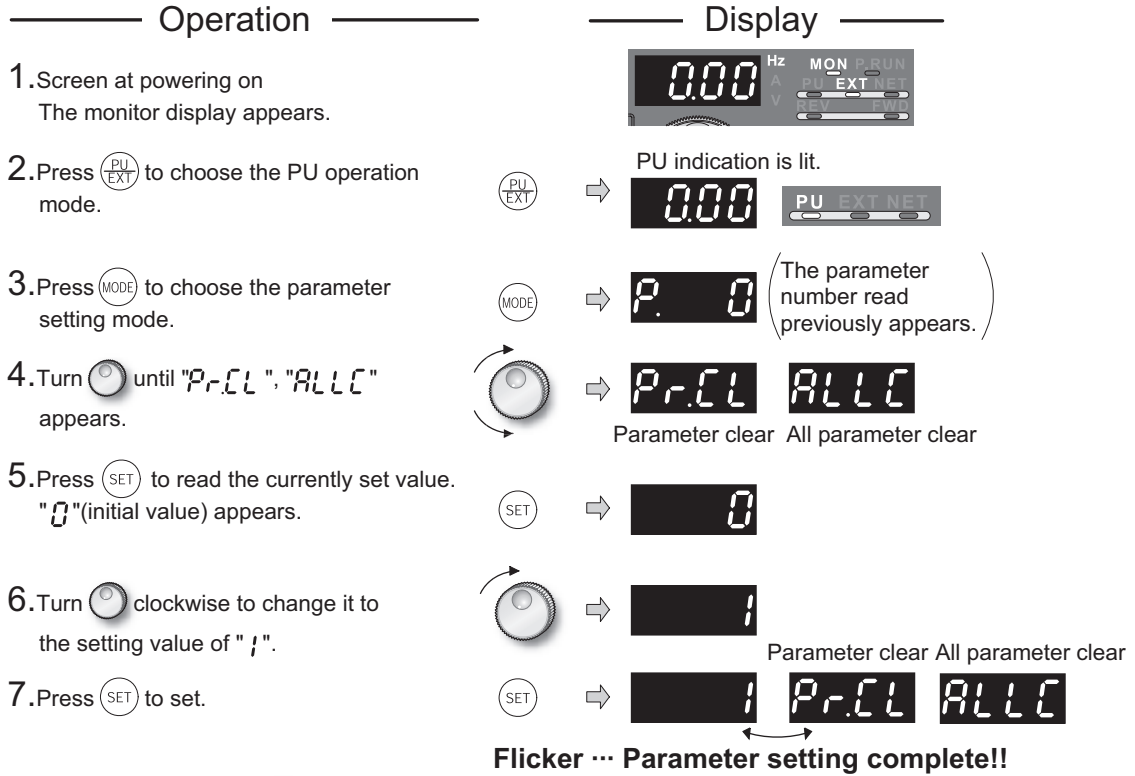
For details refer to *page 106*.



3.2.8 Parameter clear, all parameter clear

POINT

- Set "1" in Pr: CL Parameter clear, ALLC All parameter clear to initialize all parameters. (Parameters are not cleared when "1" is set in Pr: 77 Parameter write selection.)
- Refer to the parameter list on page 70 and later for parameters to be cleared with this operation.



- Turn to read another parameter.
- Press to show the setting again.
- Press twice to show the next parameter.

? are displayed alternately ... Why?

The inverter is not in the PU operation mode.

1. Press .

is lit and the monitor (4 digit LED) displays "0" (Pr: 79 = "0" (initial value)).

2. Carry out operation from step 6 again.

3.2.9 Parameter copy and parameter verification

PCPY Setting	Description
0	Cancel
1	Copy the source parameters to the operation panel.
2	Write the parameters copied to the operation panel into the destination inverter.
3	Verify parameters in the inverter and operation panel. (Refer to page 48.)

REMARKS

- When the copy destination inverter is not the FR-B,B3 series (A700 specifications) or parameter copy write is performed after parameter copy read is stopped, "model error (r-E4)" is displayed.
- Refer to the parameter list on page 70 and later for availability of parameter copy.
- When the power is turned off or an operation panel is disconnected, etc. during parameter copy write, perform write again or check the values by parameter verification.

(1) Parameter copy

Parameter settings can be copied to multiple inverters.

————— Operation —————

1. Connect the operation panel to the copy source inverter.
· Connect it during a stop.
2. Press **(MODE)** to choose the parameter setting mode.
3. Turn **(◀)** until **PCPY** (parameter copy) appears.
4. Press **(SET)** to read the currently set value.
"0" (initial value) appears.
5. Turn **(◀)** to change it to the setting value "1".
6. Press **(SET)** to copy the source parameters to the operation panel.
7. Connect the operation panel to the copy source inverter.
8. After performing steps 2 to 5, turn **(◀)** to change it to "2".
9. Press **(SET)** to write the parameters copied to the operation panel to the destination inverter.
10. When copy is completed, "2" and "PCPY" flicker.
11. After writing the parameter values to the copy destination inverter, always reset the inverter, e.g. switch power off once, before starting operation.

————— Display —————

The parameter number previously read appears.

Flickers for about 30s

About 30s later

Flicker ... Parameter copy complete!!

The frequency flickers for about 30s

Flicker ... Parameter copy complete!!



? *rE1* appears...Why? ☞ Parameter read error. Perform operation from step 3 again.

? *rE2* appears...Why? ☞ Parameter write error. Perform operation from step 8 again.

? *CP* and *000* flicker alternately

☞ Appears when parameters are copied between the inverter of 55K or less and 75K or more.

1. Set "0" in *Pr. 160 User group read selection*.
2. Set the following setting (initial value) in *Pr. 989 Parameter copy alarm release*.

	55K or less	75K or more
<i>Pr. 989 Setting</i>	10	100




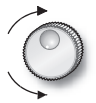











3. Reset *Pr. 9, Pr. 30, Pr. 52, Pr. 54, Pr. 56, Pr. 57, Pr. 70, Pr. 72, Pr. 158, Pr. 557, Pr. 893*.

(2) Parameter verification

Whether same parameter values are set in other inverters or not can be checked.

Operation

Display

1. Move the operation panel to the inverter to be verified.
 - Move it during a stop.
2. Screen at powering on
The monitor display appears.
 
3. Press **(MODE)** to choose the parameter setting mode.
  →  (The parameter number read previously appears.)
4. Turn **(rotary knob)** until *PCPY* (parameter copy) appears.
  → 
5. Press **(SET)** to read the currently set value.
"0" (initial value) appears.
  → 
6. Turn **(rotary knob)** to change it to the set value
"3" (parameter copy verification mode).
  → 
7. Press **(SET)** to read the parameter setting of the verified inverter to the operation panel.
  →  Flickers for about 30s
 - If different parameters exist, different parameter numbers and *rE3* flicker.
 
 - Hold down **(SET)** to verify.
  →  Flickering
8. If there is no difference, *PCPY* and 3 flicker to complete verification.
 

Flicker ... Parameter verification complete!!

REMARKS

When the copy destination inverter is not the FR-B, B3 series (A700 specifications), "model error (*rE4*)" is displayed.

? *rE3* flickers ... Why?

☞ Set frequencies, etc. may be different. Check set frequencies.

3.3 Before operation

3.3.1 Simple mode parameter list

For simple variable-speed operation of the inverter, the initial setting of the parameters may be used as they are. Set the necessary parameters to meet the load and operational specifications. Parameter setting, change and check can be made from the operation panel (FR-DU07). For details of parameters, refer to *the chapter 4 of the Instruction Manual (applied)*.

POINT

Only simple mode parameter can be displayed using *Pr.160 User group read selection*. (All parameters are displayed with the initial setting.) Set *Pr. 160 User group read selection* as required. (Refer to *page 45* for parameter change.)

Pr. 160	Description
9999	Only the simple mode parameters can be displayed.
0 (Initial Value)	Simple mode and extended mode parameters can be displayed.
1	Only the parameters registered in the user group can be displayed.

Parameter Number	Name	Increments	Initial Value		Range		Applications	Refer to
			FR-B	FR-B3	FR-B	FR-B3		
1	Maximum frequency	0.01Hz	60Hz	120Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set when the maximum output frequency need to be limited. * The setting range differs according to the inverter capacity (22K or less/30K or more)	51
2	Minimum frequency	0.01Hz	0Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set when the minimum output frequency need to be limited. * The setting range differs according to the inverter capacity (22K or less/30K or more)	
4	Multi-speed setting (high speed)	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set when changing the preset speed in the parameter with a terminal. * The setting range differs according to the inverter capacity (22K or less/30K or more)	64
5	Multi-speed setting (middle speed)	0.01Hz	30Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz		
6	Multi-speed setting (low speed)	0.01Hz	10Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz		
7	Acceleration time	0.1s	5/15s*		0 to 3600s		Acceleration/deceleration time can be set. * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)	52
8	Deceleration time	0.1s	5/15s*		0 to 3600s			
9	Electronic thermal O/L relay	0.01/ 0.1A*	Rated inverter current		0 to 500/ 0 to 3600A*		Protect the motor from overheat by the inverter. Set the rated motor current. * The increments and setting range differ according to the inverter capacity. (55K or less/75K or more)	50
79	Operation mode selection	1	0		0, 1, 2, 3, 4, 6, 7		Select the operation command location and frequency command location.	53
125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Frequency for the maximum value of the potentiometer (5V initial value) can be changed. * The setting range differs according to the inverter capacity (22K or less/30K or more)	67
126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Frequency for the maximum current input (20mA initial value) can be changed. * The setting range differs according to the inverter capacity (22K or less/30K or more)	69
160	User group read selection	1	0		0, 1, 9999		Parameter which can be read from the operation panel and parameter unit can be restricted.	—



3.3.2 Overheat protection of the motor by the inverter (Pr. 9)

Set the rated motor current in Pr. 9 Electronic thermal O/L relay to protect the motor from overheat.

Parameter Number	Name	Initial Value	Setting Range		Description
9	Electronic thermal O/L relay	Rated inverter current *1	55K or less	0 to 500A	Set the rated motor current.
			75K or more	0 to 3600A	

*1 Refer to page 132 for the rated inverter current value.


The initial values of the FR-B-750(200/400V), FR-B3-(N)(H) 400, 750 are set to 85% of the rated inverter current. The minimum setting increments are 0.01A for the 55K or less and 0.1A for the 75K or more.

Changing example Change the Pr. 9 Electronic thermal O/L relay setting to 7.5A according to the motor rated current. (FR-B-1500, FR-B3-(N)1500)


Operation

1. Screen at powering on
The monitor display appears.
2. Press to choose the PU operation mode.
3. Press to choose the parameter setting mode.
4. Turn until "P. 9" (Pr. 9 Electronic thermal O/L relay) appears.
5. Press to show the present set value. (8A for FR-B-1500, FR-B3-(N)1500)
6. Turn to change the set value to "7.50". (7.5A)
7. Press to set.


Display






PU indication is lit.



The parameter number read previously appears.



Refer to page 132, 134 for initial value of the inverter rated current.

Flicker ... Parameter setting complete!!

- By turning , you can read another parameter.
- Press to show the setting again.
- Press twice to show the next parameter.

CAUTION

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
- Electronic thermal relay may not function when 5% or less of inverter rated current is set to electronic thermal relay setting.

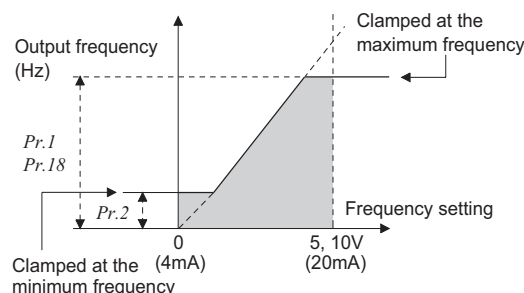
3.3.3 Limit the maximum and minimum output frequency (Pr. 1, Pr. 2)

Motor speed can be limited.

Parameter Number	Name	Initial Value		Setting Range		Description
		FR-B	FR-B3	FR-B	FR-B3	
1	Maximum frequency	60Hz	120Hz	0 to 120Hz/ 0 to 60Hz *	0 to 120Hz	Set the upper limit of the output frequency. Set the <i>Pr.1 Maximum frequency</i> according to the permissible frequency of a pressure-resistant, explosion-proof type motor.
2	Minimum frequency	0Hz		0 to 120Hz/ 0 to 60Hz *	0 to 120Hz	Set the lower limit of the output frequency.

* The setting range differs according to the inverter capacity(22K or less/30K or more)

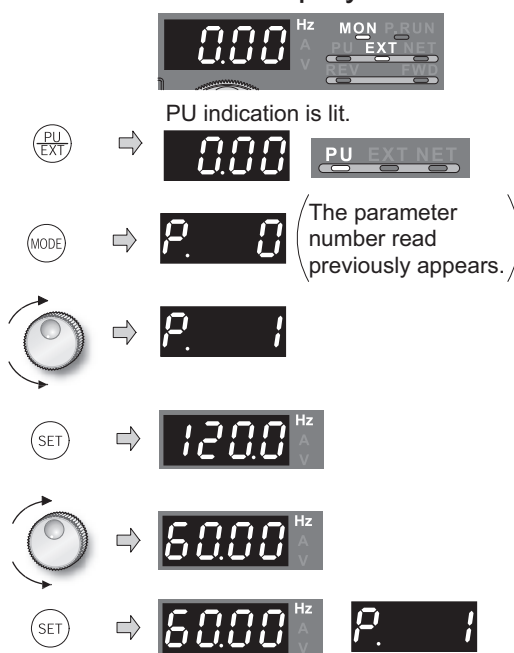
Changing example Limit the frequency set by the potentiometer, etc. to 60Hz maximum.
(Set "60"Hz in *Pr. 1 Maximum frequency*.)



Operation

- Screen at powering on
The monitor display appears.
- Press to choose the PU operation mode.
- Press to choose the parameter setting mode.
- Turn until *P. 1 (Pr. 1)* appears.
- Press to read the currently set value.
"1200"(initial value) appears.
- Turn to change it to the set value "6000".
- Press to set.

Display



Flicker ... Parameter setting complete!!

- By turning , you can read another parameter.
- Press to show the setting again.
- Press twice to show the next parameter.

REMARKS

- The output frequency is clamped by the *Pr. 2* setting even if the set frequency is lower than the *Pr. 2* setting (The frequency will not decrease to the *Pr. 2* setting.)
Note that *Pr. 15 Jog frequency* has higher priority than the minimum frequency.
- When the *Pr. 1* setting is changed, frequency higher than the *Pr. 1* setting can not be set by .

CAUTION

- ⚠ Note that when *Pr. 2* is set higher than *Pr. 13 Starting frequency*, simply turning on the start signal will run the motor at the preset frequency according to the set acceleration time even if the command frequency is not input.



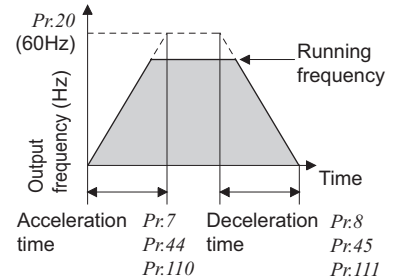
3.3.4 Change acceleration and deceleration time (Pr. 7, Pr. 8)

Set in Pr. 7 Acceleration time a larger value for a slower speed increase and a smaller value for a faster speed increase.
 Set in Pr. 8 Deceleration time a larger value for a slower speed decrease and a smaller value for a faster speed decrease.

Parameter Number	Name	Initial Value		Setting Range	Description
7	Acceleration time	7.5K or less	5s	0 to 3600/ 360s *	Set the motor acceleration time.
		11K or more	15s		
8	Deceleration time	7.5K or less	5s	0 to 3600/ 360s *	Set the motor deceleration time.
		11K or more	15		

* Depends on the Pr. 21 Acceleration/deceleration time increments setting. The initial value for the setting range is "0 to 3600s" and setting increments is "0.1s".

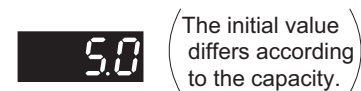
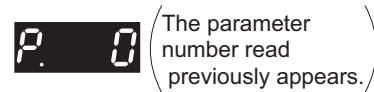
Changing example Change the Pr. 7 Acceleration time setting from "5s" to "10s".



Operation

1. Screen at powering on
The monitor display appears.
2. Press **PU/EXT** to choose the PU operation mode.
3. Press **MODE** to choose the parameter setting mode.
4. Turn **▲** until **P. 7** (Pr. 7) appears.
5. Press **SET** to read the currently set value.
"5.0"(initial value) appears.
6. Turn **▲** to change it to the set value "10.0".
7. Press **SET** to set.

Display



Flicker ... Parameter setting complete!!

- By turning **▲**, you can read another parameter.
- Press **SET** to show the setting again.
- Press **SET** twice to show the next parameter.

3.3.5 Selection of the start command and frequency command locations (Pr. 79)

Select the start command location and frequency command location.

Parameter Number	Name	Initial Value	Setting Range	Description	LED Indication : Off : On		
79	Operation mode selection	0	0	Use external/PU switchover mode (press to switch between the PU and External operation mode. (Refer to page 58)) At power on, the inverter is in the External operation mode.	External operation mode PU operation mode 		
			1	Fixed to PU operation mode			
			2	Fixed to External operation mode Operation can be performed by switching between the external and NET operation mode.	External operation mode NET operation mode 		
			3	External/PU combined operation mode 1		External signal input (terminal STF, STR)	
				Running command	Start command		
			4	External/PU combined operation mode 2		Input from the PU (FR-DU07/FR-PU04/FR-PU07) (,)	
				Running command	Start command		
			6	Switchover mode Switch among PU operation, external operation, and NET operation while keeping the same operating status.	 External operation mode NET operation mode 		
7	External operation mode (PU operation interlock) X12 signal ON *2 Operation mode can be switched to the PU operation mode. (output stop during external operation) X12 signal OFF *2 Operation mode can not be switched to the PU operation mode.	PU operation mode External operation mode 					

*1 The priorities of the frequency commands when Pr. 79 = "3" are "Multi-speed operation (RL/RM/RH/REX) > PID control (X14) > terminal 4 analog input (AU) > digital input from the operation panel".

*2 For the terminal used for the X12 signal (PU operation interlock signal) input, set "12" in Pr. 178 to Pr. 189 (input terminal function selection) to assign functions.

For Pr. 178 to Pr. 189, refer to the chapter 4 of the Instruction Manual (applied).

When the X12 signal is not assigned, function of the MRS signal switches from MRS (output stop) to PU operation interlock signal.



3.3.6 Before operating the FR-B3 series (offline auto tuning) (Pr. 80, Pr.81, Pr. 83, Pr. 84, Pr. 96) B3

Setting can be made only for FR-B3 series.

The FR-B3 series has passed an explosion-proof test performed under Advanced magnetic flux vector control with offline auto tuning in motor rotation mode. Advanced magnetic flux vector control is set in the initial setting. Be sure to perform offline auto tuning in motor rotation mode before operating the inverter.

- What is Advanced magnetic flux vector control?

The low speed torque can be improved by providing voltage compensation to flow a motor current which meets the load torque. Output frequency compensation (slip compensation) is made so that the motor actual speed approximates a speed command value. Effective when load fluctuates drastically, etc.

- What is offline auto tuning?

When performing FR-B3 series, the motor can be run with the optimum operating characteristics by automatically measuring the motor constants (offline auto tuning) even when each motor constants differs, other manufacturer's motor is used, or the wiring length is long.

Parameter Number	Name	Initial Value	Setting Range	Description
80	Motor capacity	Inverter capacity	Inverter capacity	Setting cannot be changed.
81	Number of motor poles	4	4	The number of motor poles is always four.
83	Rated motor voltage	200/400V*	0 to 1000V	Set the rated motor voltage(V). * The initial value differs according to the voltage level. (200V/400V)
84	Rated motor frequency	60Hz	10 to 120Hz	Set the rated motor frequency (Hz).
96	Auto tuning setting/ status	0	0	Offline auto tuning is not performed
			1	Offline auto tuning is performed without motor running
			101	Offline auto tuning is performed with motor running

POINT

- Tuning is enabled even when a load is connected to the motor. (As the load is lighter, tuning accuracy is higher. Tuning accuracy does not change even if the inertia is large.)
- For the offline auto tuning, you can select either the motor non-rotation mode (Pr:96 = "1") or rotation mode (Pr:96 = "101"). Perform tuning in motor rotation mode in this case.
- Reading/writing/copy of motor constants tuned by offline auto tuning are enabled.
- The offline auto tuning status can be monitored with the PU (FR-DU07/FR-PU04/FR-PU07).



(1) Before performing offline auto tuning

Check the following before performing offline auto tuning.

- A motor should be connected. Note that the motor should be at a stop at a tuning start.
- When performing the offline auto tuning, always select the rotation mode (*Pr.96="101"*).
- Note the following when selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status = "101"*).

Torque is not enough during tuning.

The motor may be run at nearly its rated speed.

The brake is open.

No external force is applied to rotate the motor.

(2) Setting

1) Set "101" in *Pr. 96 Auto tuning setting/status* .

- When the setting is "101" Tuning is performed without motor running.

It takes approximately 40s until tuning is completed.

The motor runs at nearly its rated frequency.

2) Set the rated motor current (initial value is rated inverter current) in *Pr. 9 Electronic thermal O/L relay*. (Refer to page 50)

3) Set the rated voltage of motor (initial value is 200V/400V) in *Pr. 83 Rated motor voltage* and rated frequency of motor (initial value is 60Hz) in *Pr. 84 Rated motor frequency* .

(For a Japanese standard motor, etc. which has both 50Hz and 60Hz rated values, use it with initial value (200V/60Hz or 400V/60Hz).)



(3) Execution of tuning

CAUTION

- Before performing tuning, check the monitor display of the operation panel (FR-DU07) or parameter unit (FR-PU04/FR-PU07) if the inverter is ready for tuning. (Refer to 2 below)

1)When performing PU operation, press / of the operation panel.

For external operation, turn on the run command (STF signal or STR signal). Tuning starts.

CAUTION


- When selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status* = "101"), caution must be taken since the motor runs.
- To force tuning to end, use the MRS or RES signal or press of the operation panel.
(Turning the start signal (STF signal or STR signal) off also ends tuning.)
- During offline auto tuning, only the following I/O signals are valid:
 - Input signals <valid signal> STOP, OH, MRS, RT, CS, RES, STF, STR
 - Output terminal RUN, OL, IPF, FM, AM, A1B1C1
 Note that the progress status of offline auto tuning is output in fifteen steps from AM and FM when speed and output frequency are selected.
- Since the RUN signal turns on when tuning is started, caution is required especially when a sequence which releases a mechanical brake by the RUN signal has been designed.
- When executing offline auto tuning, input the run command after switching on the main circuit power (R/L1, S/L2, T/L3) of the inverter.
- Do not perform ON/OFF switching of the second function selection signal (RT) during execution of offline auto tuning. Auto tuning is not executed properly.

2)Monitor is displayed on the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07) during tuning as below.

	Parameter Unit (FR-PU04/FR-PU07) Display	Operation Panel (FR-DU07) Display
<i>Pr. 96</i> setting	101	101
(1) Setting		
(2) Tuning in progress		
(3) Normal end		
(4) Error end (when the inverter protective function is activated)		

·Reference: Offline auto tuning time (when the initial value is set)


Offline Auto Tuning Setting	Time
Rotation mode (<i>Pr. 96</i> = "101")	Approximately 40s (Offline auto tuning time varies with the acceleration and deceleration time settings as indicated below. Offline auto tuning time = acceleration time + deceleration time + approx. 30s)

- 3) When offline auto tuning ends, press  of the operation panel during PU operation. For external operation, turn off the start signal (STF signal or STR signal).
This operation resets the offline auto tuning and the PU's monitor display returns to the normal indication.
(Without this operation, next operation cannot be started.)

REMARKS

- Do not change the *Pr. 96* setting after completion of tuning (103).
If the *Pr. 96* setting is changed, tuning data is made invalid.
If the *Pr. 96* setting is changed, tuning must be performed again.
- 4) If offline auto tuning ended in error (see the table below), motor constants are not set.
Perform an inverter reset and restart tuning.

Error Display	Error Cause	Remedy
8	Forced end	Set "101" in <i>Pr. 96</i> and perform tuning again.
9	Inverter protective function operation	Make setting again.
91	Current limit (stall prevention) function was activated.	Increase acceleration/deceleration time. Set "1" in <i>Pr. 156</i> .
92	Converter output voltage reached 75% of rated value.	Check for fluctuation of power supply voltage.
93	Calculation error A motor is not connected.	Check the motor wiring and make setting again.

- 5) When tuning is ended forcibly by pressing  or turning off the start signal (STF or STR) during tuning, offline auto tuning does not end properly. (The motor constants have not been set.)
Perform an inverter reset and restart tuning.

CAUTION

- The motor constants measured once in the offline auto tuning are stored as parameters and their data are held until the offline auto tuning is performed again.
- An instantaneous power failure occurring during tuning will result in a tuning error.
After power is restored, the inverter goes into the normal operation mode. Therefore, when STF (STR) signal is on, the motor runs in the forward (reverse) rotation.
- Any alarm occurs during tuning is handled as in the ordinary mode. Note that if a fault retry has been set, retry is ignored.
- The set frequency monitor displayed during the offline auto tuning is 0Hz.

⚠ CAUTION

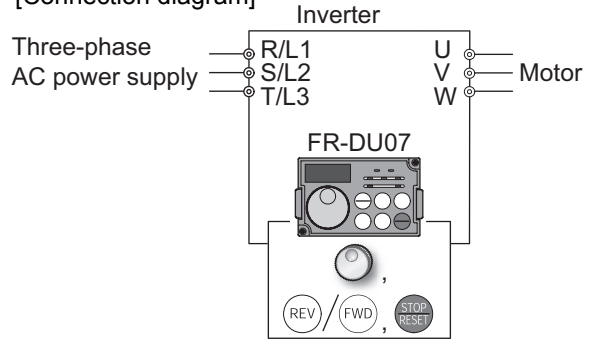
-  Note that the motor may start running suddenly.
-  When the offline auto tuning is used in vertical lift application, e.g. a lifter, it may drop due to insufficient torque.

3.4 Start/stop from the operation panel (PU operation mode)

POINT

- From where is the frequency command given?
- Operation at the frequency set in the frequency setting mode of the operation panel → Refer to 3.4.1 (Refer to page 58)
 - Operation using the setting dial as the potentiometer → Refer to 3.4.2 (Refer to page 59)
 - Change of frequency with ON/OFF switches connected to terminals → Refer to 3.4.3 (Refer to page 60)
 - Perform frequency setting using voltage input signal → Refer to 3.4.4 (Refer to page 61)
 - Perform frequency setting using current input signal → Refer to 3.4.5 (Refer to page 62)

[Connection diagram]

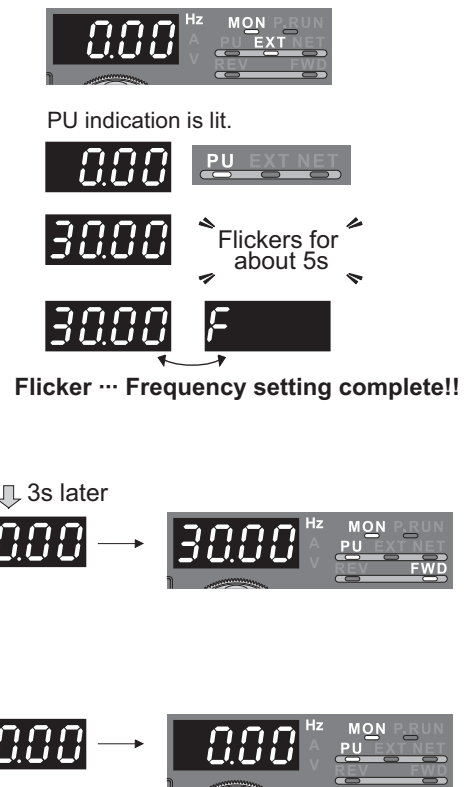


3.4.1 Set the set frequency to operate (example: performing operation at 30Hz)

Operation

1. Screen at powering on
The monitor display appears.
2. Press to choose the PU operation mode.
3. Turn to show the frequency you want to set.
The frequency flickers for about 5s.
4. While the value is flickering, press to set the frequency.
(If you do not press , the value flickers for about 5s and the display then returns to 0.00 (display) Hz.
At this time, return to "Step 3" and set the frequency again.)
5. After the value flickered for about 3s, the display returns to "000" (monitor display).
Press (or) to start operation.
6. To change the set frequency, perform the operation in above steps 3 and 4.
(Starts from the previously set frequency.)
7. Press to stop.

Display



- ? Operation cannot be performed at the set frequency ... Why?
☞ Did you carry out step 4 within 5s after step 3? (Did you press within 5s after turning ?)
- ? The frequency does not change by turning ... Why?
☞ Check to see if the operation mode selected is the External operation mode. (Press to change to the PU operation mode.)
- ? Operation does not change to the PU operation mode ... Why?
☞ Check that "0" (initial value) is set in Pr. 79 Operation mode selection.
☞ Check that the start command is not on.
- ? Change acceleration time ☞ Pr. 7 (Refer to page 52)
- ? Change deceleration time ☞ Pr. 8 (Refer to page 52)

For example, limit the motor speed to 60Hz maximum. ☞ Set "60Hz" in Pr. 1. (Refer to page 51)

REMARKS

- Press to show the set frequency.
- can also be used like a potentiometer to perform operation. (Refer to page 59)






3.4.2 Use the setting dial like a potentiometer to perform operation.

POINT

Set "1" (setting dial potentiometer mode) in *Pr. 161 Frequency setting/key lock operation selection*.

Operation example Change the frequency from 0Hz to 60Hz during operation

Operation

1. Screen at powering on
The monitor display appears.
2. Press  to choose the PU operation mode.
3. Change *Pr. 161* to the setting value "1".
(Refer to page 45 for change of the setting.)
4. Press  (or ) to start the inverter.
5. Turn  until "60.00" appears.
The flickering frequency is the set frequency.
You need not press .

Display




PU indication is lit.



The frequency flickers for about 5s.

REMARKS

- If flickering "60.00" turns to "0.00", the *Pr. 161 Frequency setting/key lock operation selection* setting may not be "1".
- Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning .

CAUTION

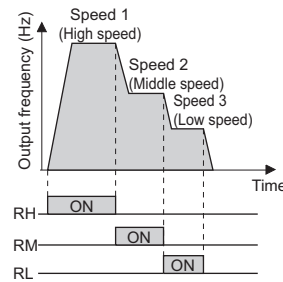
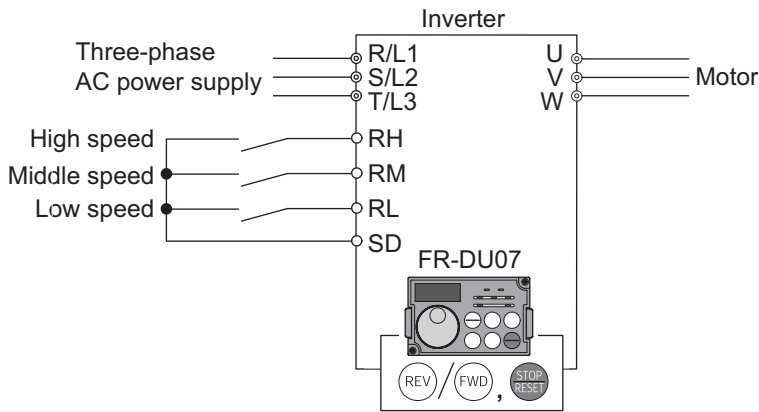
- When using setting dial, the frequency goes up to the set value of *Pr.1 Maximum frequency* (initial value is 120Hz for FR-B3 / 60Hz for FR-B).
Adjust *Pr.1 Maximum frequency* setting according to the application.

3.4.3 Use switches to give a start command and a frequency command (multi-speed setting)

POINT

- Use **FWD** / **REV** to give a start command.
- Pr. 79 Operation mode selection must be set to "4" (external/PU combined operation mode 2)
- The initial values of the terminals RH, RM, RL are 60Hz, 30Hz, and 10Hz. (Refer to page 64 to change frequencies.)
- Operation at 7-speed can be performed by turning on two (or three) terminals simultaneously. (Refer to the chapter 4 of the Instruction Manual (applied).)

[Connection diagram]



Operation

- Screen at powering on
The monitor display appears.
- Change the Pr. 79 setting to "4".
(Refer to page 45 for change of the setting.)
- Press the start switch **FWD** (or **REV**).
FWD (or REV) flickers.
When the frequency command is not given, it flickers.
- Turn on the low speed switch (RL).
The output frequency increases to "10.00".
(10Hz) according to Pr. 7 Acceleration time.
- Turn off the low speed switch (RL).
The output frequency decreases to "0.00"
(0Hz) according to Pr. 8 Deceleration time.
- Turn off the start switch **STOP/RESET**.
FWD (or REV) turns off.

Display



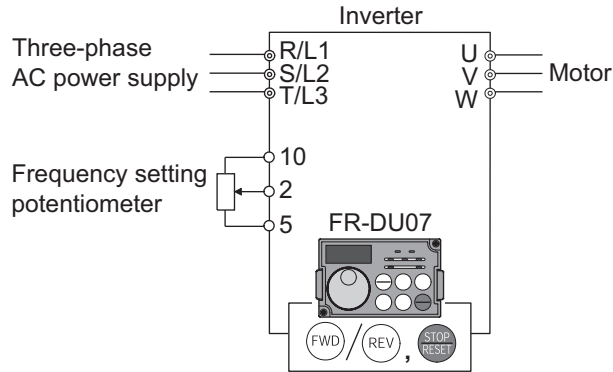
- ? 60Hz for the RH, 30Hz for the RM and 10Hz for the RL are not output when they are turned on ... Why?
 - ☞ Check for the setting of Pr. 4, Pr. 5, and Pr. 6 once again.
 - ☞ Check for the setting of Pr. 1 Maximum frequency and Pr. 2 Minimum frequency once again. (Refer to page 51.)
 - ☞ Check that Pr. 180 RL terminal function selection = "0", Pr. 181 RM terminal function selection = "1", Pr. 182 RH terminal function selection = "2" and Pr. 59 Remote function selection = "0". (all are initial values)
- ? [FWD (or REV)] lamp is not lit ... Why?
 - ☞ Check that wiring is correct. Check the wiring once again.
 - ☞ Check for the Pr. 79 setting once again. (Pr. 79 must be set to "4".) (Refer to page 53.)
- ? Change the frequency of the terminal RL, RM, and RH. ... How?
 - ☞ Refer to page 64 to change the running frequency at each terminal in Pr. 4 Multi-speed setting (high speed), Pr. 5 Multi-speed setting (middle speed), and Pr. 6 Multi-speed setting (low speed).

3.4.4 Perform frequency setting by analog (voltage input)

POINT

- Use **FWD** / **REV** to give a start command.
- Pr. 79 Operation mode selection must be set to "4" (external/PU combined operation mode 2)

[Connection diagram]
 (The inverter supplies 5V of power to the frequency setting potentiometer.(Terminal 10))



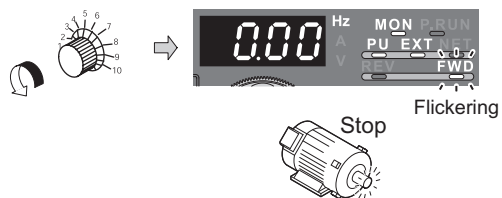
Operation

- Screen at powering on
The monitor display appears.
- Change the Pr. 79 setting to "4".
(Refer to page 45 for change of the setting.)
- Start
Press the start switch **FWD** (or **REV**).
Operating status indication of **FWD** (or **REV**) flickers.

CAUTION
 When both the forward switch and reverse switch turn on, the inverter will not start.
 Also, if both switch turn on while running, the inverter stops.

- Acceleration → constant speed
Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full.
The frequency value on the indication increases according to Pr. 7 Acceleration time until "60.00" (60Hz) is displayed.
- Deceleration
Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full.
The frequency value on the indication decreases according to Pr. 8 Deceleration time until "0.00" (0.00Hz) is displayed and operating status indication of **FWD** or **REV** flickers.
The motor stops.
- Stop
Press **STOP/RESET**.
Operating status indication of **FWD** (or **REV**) turns off.

Display



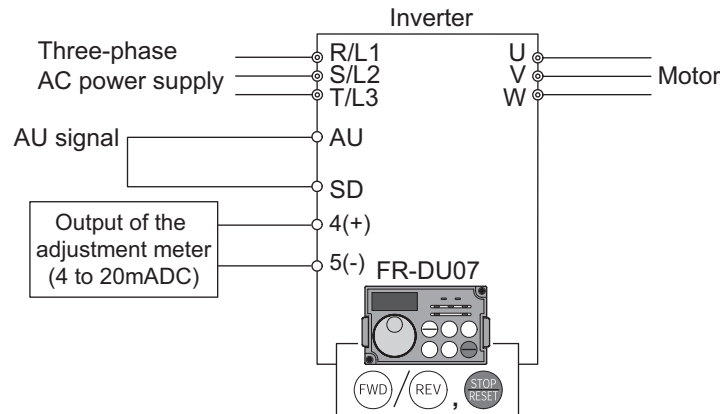
- ? Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value)
 ☞ Adjust the frequency in Pr. 125 Terminal 2 frequency setting gain frequency. (Refer to page 67.)
- ? Change the frequency (0Hz) of the minimum value of potentiometer (at 0V, initial value)
 ☞ Adjust the frequency in calibration parameter C2 Terminal 2 frequency setting bias frequency. (Refer to the chapter 4 of the Instruction Manual (applied).)

3.4.5 Perform frequency setting by analog (current input)

POINT

- Use (FWD)/(REV) to give a start command.
- Turn the AU signal on.
- Pr. 79 Operation mode selection must be set to "4" (external/PU combined operation mode 2)

[Connection diagram]



Operation

1. Screen at powering on
The monitor display appears.
2. Change the Pr. 79 setting to "4".
(Refer to page 45 for change of the setting.)
3. Start
Check that the terminal 4 input selection signal (AU) is on. Press the start switch (FWD) (or (REV)). FWD or REV of operating status indication flickers.

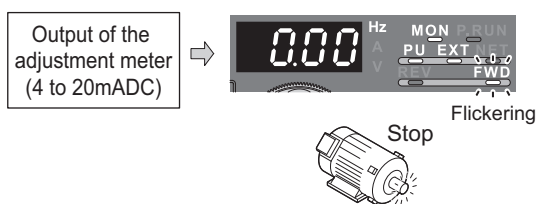
CAUTION

When both the forward switch and reverse switch turn on, the inverter will not start. Also, if both switch turn on while running, the inverter stops.

Display



4. Acceleration → constant speed
Perform 20mA input. The frequency value on the indication increases according to Pr. 7 Acceleration time until "60.00" (60.00Hz) is displayed.
5. Deceleration
Perform 4mA input. The frequency value on the indication decreases according to Pr. 8 Deceleration time until "0.00" (0.00Hz) is displayed and the operating status indication of FWD or REV flickers. The motor stops.
6. Stop
Press (STOP/RESET). FWD or REV of the operating status indication turns off.



REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). (Refer to the chapter 4 of the Instruction Manual (applied).)

- ? Change the frequency (60Hz) at the maximum value of potentiometer (at 20mA, initial value)
Adjust the frequency in Pr. 126 Terminal 4 frequency setting gain frequency. (Refer to page 69.)
- ? Change the frequency (0Hz) at the minimum value of potentiometer (at 4mA, initial value)
Adjust the frequency in calibration parameter C5 Terminal 4 frequency setting bias frequency. (Refer to the chapter 4 of the Instruction Manual (applied).)

3.5 Make a start and stop with terminals (External operation)

POINT

From where is the frequency command given?

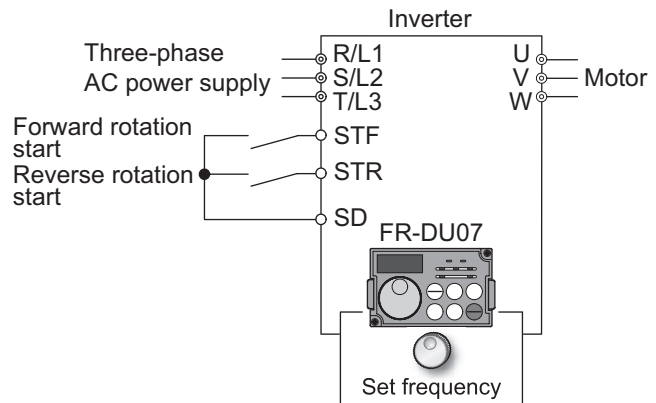
- Operation at the frequency set in the frequency setting mode of the operation panel → Refer to 3.5.1 (Refer to page 63)
- Give a frequency command by switch (multi-speed setting) → Refer to 3.5.2 (Refer to page 64)
- Perform frequency setting by a voltage output device → Refer to 3.5.3 (Refer to page 66)
- Perform frequency setting by a current output device → Refer to 3.5.5 (Refer to page 68)

3.5.1 Use the set frequency set by the operation panel (Pr. 79 = 3)

POINT

- Switch STF(STR) signal on to give a start command.
- Set "3" in Pr. 79 (External/PU combined operation mode 1).
- Refer to page 58 for the set frequency by the operation panel.

[Connection diagram]

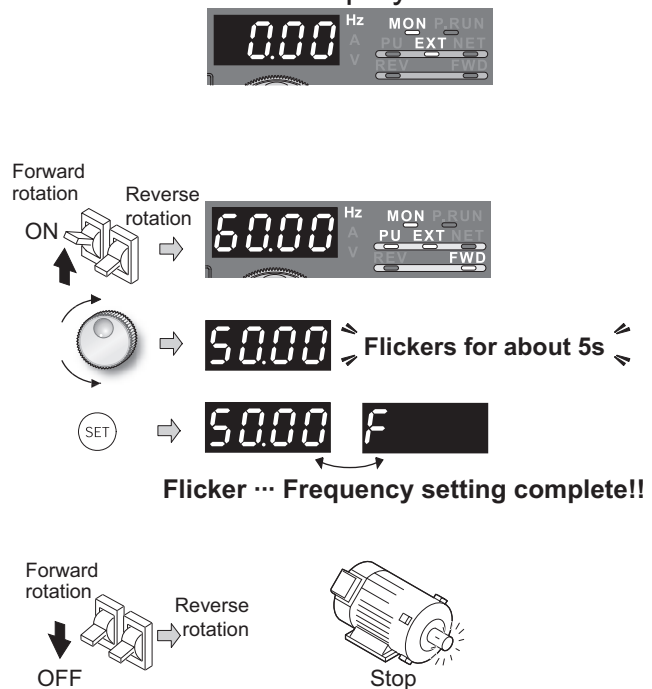


Operation

1. Screen at powering on
The monitor display appears.
2. Change the Pr. 79 setting to "3".
(Refer to page 45 for change of the setting.)
3. Turn the start switch (STF or STR) on.
 - The motor runs at the frequency set in the set frequency mode of the operation panel.
4. Turn to change running frequency.
Display the frequency you want to set.
The frequency flickers for about 5s.
5. While the value is flickering, press to set the frequency.

(If you do not press , the value flickers for about 5s and the display then returns to 60.00 (frequency set at last time). At this time, return to "Step 3" and set the frequency again.)
6. Turn the start switch (STF or STR) off.
The motor decelerates according to Pr. 8 Deceleration time to stop.

Display



REMARKS

- Pr. 178 STF terminal function selection must be set to "60" (or Pr. 179 STR terminal function selection must be set to "61"). (all are initial values)
- When Pr. 79 Operation mode selection is set to "3", multi-speed operation (refer to page 64) is also valid.

? When the inverter is stopped by of the operation panel (FR-DU07), and are displayed alternately.

1. Turn the start switch (STF or STR) off.
2. The display can be reset by .

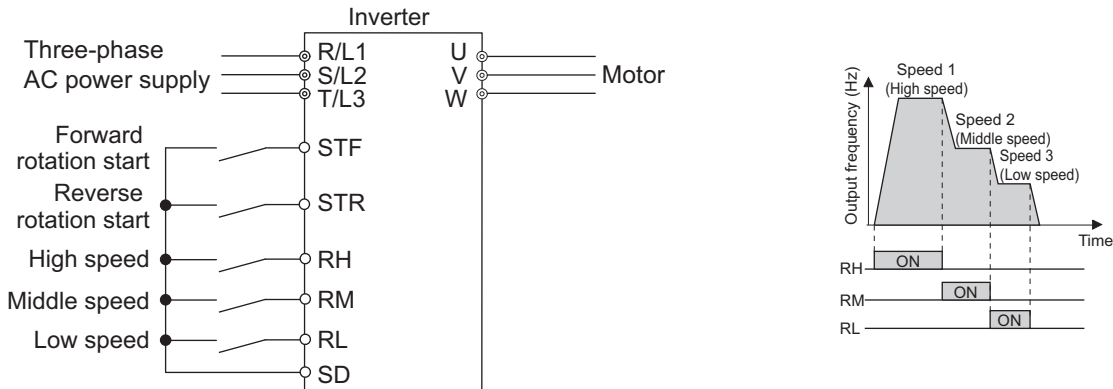


3.5.2 Use switches to give a start command and a frequency command (multi-speed setting) (Pr. 4 to Pr. 6)

POINT


- Start command by terminal STF (STR)
- Frequency command by RH, RM, RL and STR signal
- [EXT] must be lit. (When [PU] is lit, switch it to [EXT] with .)
- The initial values of the terminals RH, RM, RL are 60Hz, 30Hz, and 10Hz. (Use Pr. 4, Pr. 5 and Pr. 6 to change.)
- Operation at 7-speed can be performed by turning two (or three) terminals simultaneously. (Refer to the chapter 4 of the Instruction Manual (applied).)

[Connection diagram]




Changing example Set "50Hz" in Pr. 4 Multi-speed setting (high speed) and turn on RH and STF (STR) signal to operate.


Operation	Display
<p>1. Power on → operation mode check For the initial setting, the inverter operates in the External operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press to change to the external [EXT] operation mode. If the operation mode still does not change, set Pr: 79 to change to the External operation mode.</p>	
<p>2. Change the Pr. 4 setting to "50". (Refer to page 45 for change of the setting.)</p>	
<p>3. Turn on the high speed switch (RH).</p>	
<p>4. Turn the start switch (STF or STR) on. "5000"(50Hz) appears. • 30Hz appears when RM is on and 10Hz appears when RL is on.</p>	
<p>5. Stop Turn the start switch (STF or STR) off. The motor stops according to Pr: 8 Deceleration time.</p>	


? [EXT] is not lit even when  is pressed ... Why?


 Switchover of the operation mode with  is valid when Pr. 79 = "0" (initial value).

? 50Hz, 30Hz and 10Hz are not output from RH, RM and RL respectively when they are turned on. ... Why?


 Check for the setting of Pr. 4, Pr. 5, and Pr. 6 once again.


 Check for the setting of Pr. 1 Maximum frequency and Pr. 2 Minimum frequency once again. (Refer to page 51)

 Check for the Pr. 79 setting once again. (Pr. 79 must be set to "0" or "2".) (Refer to page 53)



 Check that Pr. 180 RL terminal function selection = "0", Pr. 181 RM terminal function selection = "1", Pr. 182 RH terminal function selection = "2" and Pr. 59 Remote function selection = "0". (all are initial values)

? [FWD (or REV)] is not lit. ... Why?



 Check that wiring is correct. Check it again.

 Check that "60" is set in Pr. 178 STF terminal function selection (or "61" is set in Pr. 179 STR terminal function selection)?
(all are initial values)


? How is the frequency setting from 4 to 7 speed ?

 The setting differs according to Pr. 24 to Pr. 27 (multi-speed setting). Refer to the chapter 4 of  the Instruction Manual (applied).

? Perform multi-speed operation more than 8 speed. ... How?

 Use the REX signal to perform the operation. Refer to the chapter 4 of  the Instruction Manual (applied).

REMARKS

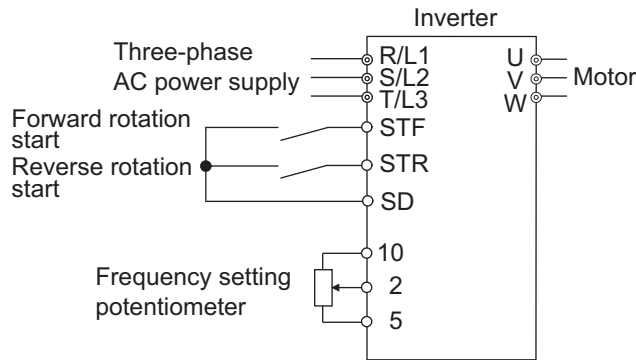
- External operation is fixed by setting "2" (External operation mode) in Pr. 79 Operation mode selection when you do not want to take time pressing  or when you want to use the current start command and frequency command. (Refer to page 53)



3.5.3 Perform frequency setting by analog (voltage input)

[Connection diagram]

(The inverter supplies 5V of power to frequency setting potentiometer. (Terminal 10))



Operation	Display
<p>1. Power on → operation mode check For the initial setting, the inverter operates in the External operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press to change to the External [EXT] operation mode. If the operation mode still does not change, set Pr. 79 to change to the External operation mode. (Refer to page 53)</p>	
<p>2. Start Turn the start switch (STF or STR) on. Operating status indication of FWD (or REV) flickers.</p> <p>CAUTION When both the forward switch and reverse switch are on, the inverter will not start. Also, if both switches turn on while running, the inverter decelerates to stop.</p>	
<p>3. Acceleration → constant speed Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full. The frequency value on the indication increases according to Pr. 7 Acceleration time until "6000" (60Hz) is displayed.</p>	
<p>4. Deceleration Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full. The frequency value of the indication decreases according to Pr. 8 Deceleration time until "000" (0.00Hz) is displayed. The motor stops.</p>	
<p>5. Stop Turn the start switch (STF or STR) off.</p>	



When you want to operate in the External operation mode always at powering on or when you want to save the trouble of input, set "2" (External operation mode) in Pr. 79 Operation mode selection to choose External operation mode always.

REMARKS

Pr. 178 STF terminal function selection must be set to "60" (or Pr. 179 STR terminal function selection must be set to "61"). (all are initial values)

? The motor will not rotate ... Why?

☞ Check that [EXT] is lit.
[EXT] is valid when Pr. 79 = "0" (initial value) or "2".

Use $\frac{PU}{EXT}$ to lit [EXT].

☞ Check that wiring is correct. Check once again.

? Change the frequency (0Hz) of the minimum value of potentiometer (at 0V, initial value)

☞ Adjust the frequency in *calibration parameter C2 Terminal 2 frequency setting bias frequency.* (Refer to the chapter 4 of the Instruction Manual (applied).)

When you want to compensate frequency setting, use terminal 1.

For details, refer to the chapter 4 of the Instruction Manual (applied).

3.5.4 Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value)

<How to change the maximum frequency>

Changing example

When you want to use the 0 to 5VDC input frequency setting potentiometer to change the frequency at 5V from 60Hz (initial value) to 50Hz
Adjust to output 50Hz at 5V voltage input.
Set "50Hz" in Pr. 125.

Operation

1. Turn until P. 125 (Pr. 125) appears.

2. Press to show the present set value.
"60.00" (60.00Hz)

3. Turn to change the set value
to "50.00". (50.00Hz)

4. Press to set.

5. Mode/monitor check

Press twice to choose the monitor/frequency monitor.

6. Turn the start switch (STF or STR) on and turn the potentiometer (frequency setting potentiometer) clockwise to full slowly.
(Refer to 3.5.3 steps 2 to 5)

Display



Flicker ... 50Hz output at 5V input complete!!

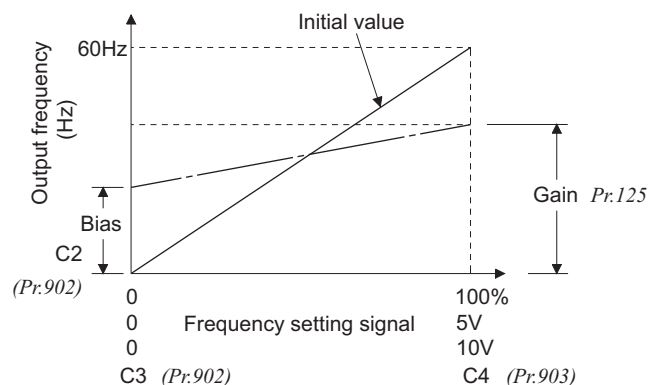


? The frequency meter (indicator) connected across terminals FM-SD does not indicate exactly 50Hz ... Why?

☞ The meter can be adjusted by *calibration parameter C0 FM terminal calibration.* (Refer to the chapter 4 of the Instruction Manual (applied).)

? Set frequency at 0V using *calibration parameter C2* and adjust the indicator using *calibration parameter C0.*

(Refer to the chapter 4 of the Instruction Manual (applied).)



REMARKS

As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied to across terminals 2-5 and adjust at any point without a voltage applied.

(Refer to the chapter 4 of the Instruction Manual (applied) for the setting method of *calibration parameter C4.*)

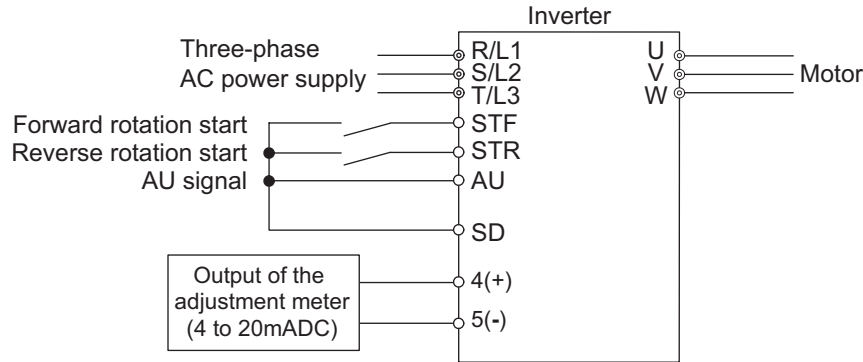


3.5.5 Perform frequency setting by analog (current input)

POINT

- Switch STF(STR) signal on to give a start command.
- Turn the AU signal on.
- Set "2" (External operation mode) in Pr. 79 Operation mode selection

[Connection diagram]

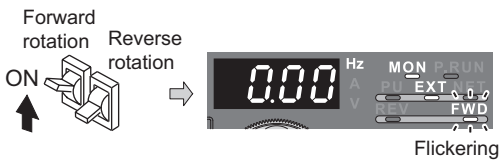


Operation

1. Power on → operation mode check
For the initial setting, the inverter operates in the External operation mode [EXT] when powering on. Check that the operation command indication is [EXT]. If not displayed, press to change to the External [EXT] operation mode. If the operation mode still does not change, set Pr. 79 to change to the External operation mode. (Refer to page 53.)



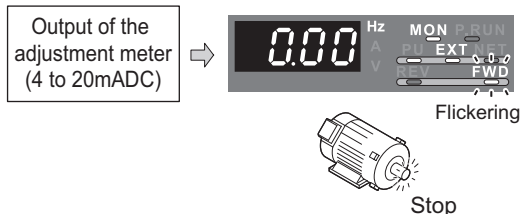
2. Start
Turn the start switch (STF or STR) on.
FWD or REV of operation indication flickers.
CAUTION
When both the forward switch and reverse switch are on, the inverter will not start. Also, if both switches turn on while running, the inverter decelerates to stop.



3. Acceleration → constant speed
Perform 20mA input.
The frequency value on the indication increases according to Pr. 7
Acceleration time until "60.00" (60.00Hz) is displayed.



4. Deceleration
Perform 4mA input.
The frequency value on the indication decreases according to Pr. 8
Deceleration time until "0.00" (0.00Hz) is displayed and FWD or REV of the operating status indication flickers.
The motor stops.



5. Stop
Turn the start switch (STF or STR) off.



REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). (Refer to the chapter 4 the Instruction Manual (applied).)

? The motor will not rotate ... Why?

☞ Check that [EXT] is lit.
[EXT] is valid when Pr. 79 = "0" (initial value) or "2".

Use PU / EXT to lit [EXT].

☞ Check that the AU signal is on.
Turn the AU signal on.

☞ Check that wiring is correct. Check it again.

? Change the frequency (0Hz) of the minimum value of potentiometer (at 4mA, initial value)

☞ Adjust the frequency in calibration parameter C5 Terminal 4 frequency setting bias frequency.

(Refer to the chapter 4 of the Instruction Manual (applied).)

3.5.6 Change the frequency (60Hz) of the maximum value of potentiometer (at 20mA, initial value)

<How to change the maximum frequency>

Changing example

When you want to use the 4 to 20mA input frequency setting potentiometer and change the frequency at 20mA from 60Hz (initial value) to 50Hz
Adjust to output 50Hz at 20mA current input.
Set "50Hz" in Pr. 126.

Operation	Display
1. Turn until P. 126 (Pr. 126) appears.	→
2. Press to show the currently set value. "60.00" (60.00Hz)	→
3. Turn to change the set value to "50.00". (50.00Hz)	→
4. Press to set the value.	→
5. Mode/monitor check Press twice to choose the monitor/frequency monitor.	→
6. Turn the start switch (STF or STR) on to allow 20mA current to flow. (Refer to 3.5.5 steps 2 to 5)	50Hz output at 20mA input complete!!

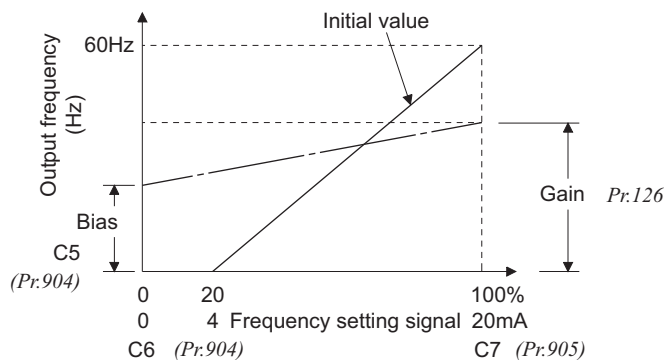
? The frequency meter (indicator) connected to across terminals FM-SD does not indicate exactly 50Hz ... Why?

☞ The meter can be adjusted by calibration parameter C0 FM terminal calibration.

(Refer to the chapter 4 of the Instruction Manual (applied).)

? Set frequency at 4mA using calibration parameter C5 and adjust the indicator using calibration parameter C0.

(Refer to the chapter 4 of the Instruction Manual (applied).)



REMARKS

As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied to across terminals 4-5 and adjust at any point without a voltage applied.

(Refer to the chapter 4 of the Instruction Manual (applied) for the setting method of calibration parameter C7.)



3.6 Parameter List

3.6.1 Parameter list

- © indicates simple mode parameters.
- The abbreviations in the explanations below indicate:



...indicates functions available with the FR-B series only



...indicates functions available with the FR-B3 series only.

(Parameters without any indication are valid for both the FR-B and FR-B3 series.)

- "O" indicates enabled and "x" indicates disabled of "parameter copy", "parameter clear", and "all parameter clear".

Function	Parameter	Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
					FR-B	FR-B3	FR-B	FR-B3				
					O: enabled x: disabled							
Maximum/minimum frequency	1	©	Maximum frequency	0.01Hz	60Hz	120Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the upper limit of the output frequency. * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O
	2	©	Minimum frequency	0.01Hz	0Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the lower limit of the output frequency. * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O
Multi-speed setting operation	4	©	Multi-speed setting (high speed)	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set frequency when the RH signal is on. * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O
	5	©	Multi-speed setting (middle speed)	0.01Hz	30Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set frequency when the RM signal is on. * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O
	6	©	Multi-speed setting (low speed)	0.01Hz	10Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set frequency when the RL signal is on. * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O
	24 to 27		Multi-speed setting (4 speed to 7 speed)	0.01Hz	9999		0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999	Frequency from 4 speed to 15 speed can be set according to the combination of the RH, RM, RL and REX signals.	O	O	O
232 to 239		Multi-speed setting (8 speed to 15 speed)	0.01Hz	9999		0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999	9999: not selected * The setting range differs according to the inverter capacity (22K or less/30K or more)	O	O	O	

Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear			
				FR-B	FR-B3	FR-B	FR-B3							
				O: enabled ×: disabled										
Acceleration/deceleration time setting	7	⊙	Acceleration time	0.1/ 0.01s	5/15s *		0 to 3600/360s		Set the motor acceleration time. * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)		○	○	○	
	8	⊙	Deceleration time	0.1/ 0.01s	5/15s *		0 to 3600/360s		Set the motor deceleration time. * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)		○	○	○	
	20		Acceleration/ deceleration reference frequency	0.01Hz	60Hz		1 to 120Hz/ 1 to 60Hz*	1 to 120Hz	Set the frequency referenced as acceleration/deceleration time. Set the frequency change time from stop to Pr: 20 for acceleration/deceleration time. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○	
	21		Acceleration/ deceleration time increments	1	0		0		Increments: 0.1s Range: 0 to 3600s		The increments and setting range of acceleration/ deceleration time setting can be changed.	○	○	○
							1		Increments: 0.01s Range: 0 to 360s					
	44		Second acceleration/ deceleration time	0.1/ 0.01s	5s		0 to 3600/360s		Set the acceleration/deceleration time when the RT signal is on.		○	○	○	
	45		Second deceleration time	0.1/ 0.01s	9999		0 to 3600/360s		Set the deceleration time when the RT signal is on.		Acceleration time = deceleration time	○	○	○
							9999							
	110		Third acceleration/ deceleration time	0.1/ 0.01s	9999		0 to 3600/360s		Set the acceleration/deceleration time when the X9 signal is on.		Function invalid	○	○	○
							9999							
111		Third deceleration time	0.1/ 0.01s	9999		0 to 3600/360s		Set the deceleration time when the X9 signal is on.		Acceleration time = deceleration time	○	○	○	
						9999								
Motor protection from overheat (electronic thermal)	9	⊙	Electronic thermal O/L relay	0.01/ 0.1A*	Rated inverter current		0 to 500/ 0 to 3600A *		Set the rated motor current. * The increments and setting range differ according to the inverter capacity. (55K or less/75k or more)		○	○	○	
DC injection brake	10		DC injection brake operation frequency	0.01Hz	—	3Hz	—	0 to 120Hz	Set the operation frequency of the DC injection brake.		×	×	×	
		B3					—	9999	Operate when the output frequency becomes less than or equal to Pr: 13 Starting frequency.					
	11		DC injection brake operation time	0.1s	0.5/0s*	0.5s	0		DC injection brake disabled		○	○	○	
							0.5s	0.1 to 10s	Set the operation time of the DC injection brake. * The setting range differs according to the inverter capacity (55K or less/75K or more)					
						—	8888	Operated while the X13 signal is on.						
12		DC injection brake operation voltage	0.1%	—	4/2%*	—	—	0	DC injection brake disabled		×	×	×	
	B3					—	0.1 to 30%	Set the DC injection brake voltage (torque). * The initial value differs according to the inverter capacity. (7.5K or less/11K or more)						

Parameter List



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
					○ : enabled			× : disabled				
Starting frequency	13		Starting frequency	0.01Hz	0.5Hz	0 to 60Hz		Starting frequency can be set.	○	○	○	
		571	Holding time at a start	0.1s	9999	0.0 to 10.0s		Set the holding time of <i>Pr. 13 Starting frequency</i> .	○	○	○	
						9999		Holding function at a start is invalid				
Jog operation	15		Jog frequency	0.01Hz	5Hz	0 to 120Hz/ 0 to 120Hz*	0 to 120Hz	Set the frequency for jog operation. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
	16		Jog acceleration/ deceleration time	0.1/ 0.01s	0.5s	0 to 3600/360s		Set the acceleration/deceleration time for jog operation. Set the time taken to reach the frequency set in <i>Pr. 20 Acceleration/deceleration reference frequency</i> for acceleration/ deceleration time. (Initial value is 60Hz) In addition, acceleration/deceleration time can not be set separately.	○	○	○	
Logic selection of output stop signal (MRS)	17		MRS input selection	1	0	0		Open input always	○	○	○	
						2		Normally closed input (NC contact input specifications)				
						4		External terminal:Normally closed input (NC contact input specifications) Communication :Normally open input				
—	18		Parameter for manufacturer setting. Do not set.									
—	20, 21		Refer to <i>Pr. 7 and Pr. 8</i> .									



Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O : enabled × : disabled							
Stall prevention operation	22	Stall prevention operation level	0.1%	150%	0		Stall prevention operation selection becomes invalid.	○	○	○	
					0.1 to 400%		Set the current value at which stall prevention operation is started.				
	23	Stall prevention operation level compensation factor at double speed	0.1%	9999	0 to 200%		The stall operation level can be reduced when operating at a high speed above the rated frequency.	○	○	○	
					9999		Constant according to Pr. 22				
	48	Second stall prevention operation current	0.1%	150%	0		Second stall prevention operation invalid	○	○	○	
					0.1 to 220%		The stall prevention operation level can be set.				
	49	Second stall prevention operation frequency	0.01Hz	0Hz	0		Second stall prevention operation invalid	○	○	○	
					0.01 to 120Hz/ 0.01 to 60Hz*	0.01 to 120Hz	Set the frequency at which stall prevention operation of Pr. 48 is started. * The setting range differs according to the inverter capacity (22K or less/30K or more)				
					9999		Pr.48 is valid when the RT signal is on.				
	66	Stall prevention operation reduction starting frequency	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency at which the stall operation level is started to reduce. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
	114	Third stall prevention operation current	0.1%	150%	0		Third stall prevention operation invalid	○	○	○	
					0.1 to 220%		The stall prevention operation level can be set.				
	115	Third stall prevention operation frequency	0.01Hz	0	0		Third stall prevention operation invalid	○	○	○	
					0 to 120Hz/ 0 to 60Hz*	0.01 to 120Hz	Set the frequency at which stall prevention operation of Pr. 114 is started. * The setting range differs according to the inverter capacity (22K or less/30K or more)				
	148	Stall prevention level at 0V input	0.1%	150%	0 to 220%		When "4" is set in Pr. 868 (Pr. 858), stall prevention operation level can be changed by the analog signal input to terminal 1 (terminal 4).	○	○	○	
	149	Stall prevention level at 10V input	0.1%	200%	0 to 220%			○	○	○	
154	Voltage reduction selection during stall prevention operation	1	1	0		With voltage reduction	○	○	○		
				1		Without voltage reduction				You can select whether to use output voltage reduction during stall prevention operation or not.	
156	Stall prevention operation selection	1	0	0 to 31, 100, 101		Pr. 156 allows you to select whether to use stall prevention or not according to the acceleration/ deceleration status.	○	○	○		
157	OL signal output timer	0.1s	0s	0 to 25s		Set the output start time of the OL signal output when stall prevention is activated.	○	○	○		
				9999		Without the OL signal output					
858	Terminal 4 function assignment	Refer to page 100.									
868	Terminal 1 function assignment										



Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy ○ : enabled × : disabled	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
—	24 to 27	Refer to Pr. 4 to Pr. 6.									
Input compensation of multi-speed and remote setting	28	Multi-speed input compensation selection	1	0	0		Without compensation	○	○	○	
					1		With compensation				
Acceleration/deceleration pattern and backlash measures	29	Acceleration/deceleration pattern selection	1	0	0		Linear acceleration/ deceleration	○	○	○	
					1		S-pattern acceleration/deceleration A				
					2		S-pattern acceleration/deceleration B				
					3		Backlash measures				
					4		S-pattern acceleration/deceleration C				
					5		S-pattern acceleration/deceleration D				
	140	Backlash acceleration stopping frequency	0.01Hz	1Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the stopping frequency and time for backlash measures. Valid when Pr. 29 = "3" * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
	141	Backlash acceleration stopping time	0.1s	0.5s	0 to 360s			○	○	○	
	142	Backlash deceleration stopping frequency	0.01Hz	1Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz		○	○	○	
	143	Backlash deceleration stopping time	0.1s	0.5s	0 to 360s			○	○	○	
	380	Acceleration S-pattern 1	1%	0%	0 to 50%			Valid when S-pattern acceleration/ deceleration C (Pr. 29 = 4) is set.	○	○	○
	381	Deceleration S-pattern 1	1%	0%	0 to 50%		Set the time taken for S-pattern from starting of acceleration/deceleration to linear acceleration as % to the acceleration/deceleration time (Pr. 7, Pr. 8, etc.)	○	○	○	
	382	Acceleration S-pattern 2	1%	0%	0 to 50%		An acceleration/deceleration pattern can be changed with the X20 signal.	○	○	○	
	383	Deceleration S-pattern 2	1%	0%	0 to 50%			○	○	○	
516	S-pattern time at a start of acceleration	0.1s	0.1s	0.1 to 2.5s		Valid when S-pattern acceleration/ deceleration D (Pr. 29 = 5) is set. Set the time taken for S-pattern acceleration/deceleration (S-pattern operation).	○	○	○		
517	S-pattern time at a completion of acceleration	0.1s	0.1s	0.1 to 2.5s			○	○	○		
518	S-pattern time at a start of deceleration	0.1s	0.1s	0.1 to 2.5s			○	○	○		
519	S-pattern time at a completion of deceleration	0.1s	0.1s	0.1 to 2.5s			○	○	○		

Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O : enabled × : disabled							
Selection of regeneration unit	30	Regenerative function selection	1	0	0		Built-in brake, brake unit (FR-BU2, FR-BU)	○	○	○	
					1		High-duty brake resistor (FR-ABR), Brake unit (MT-BU5) *1, Power regeneration converter (MT-RC) *1				
	70	Special regenerative brake duty	0.1%	0%	0 to 30%/0 to 10%*	High power factor converter (MT-HC) *1		○	○	○	
Avoid mechanical resonance points (frequency jump)	31	Frequency jump 1A	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999	1A to 1B, 2A to 2B, 3A to 3B is frequency jumps 9999: Function invalid * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
	32	Frequency jump 1B	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999		○	○	○	
	33	Frequency jump 2A	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999		○	○	○	
	34	Frequency jump 2B	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999		○	○	○	
	35	Frequency jump 3A	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999		○	○	○	
	36	Frequency jump 3B	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz, 9999*	0 to 120Hz, 9999		○	○	○	
Speed display and speed setting	37	Speed display	1	0	0		Frequency display, setting	○	○	○	
					1 to 9998		Set the machine speed for Pr.505 Set frequency.				
	144	Speed setting switchover	1	4	0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110		Set the number of motor poles when displaying the motor speed.	○	○	○	
	505	Speed setting reference	0.01Hz	60Hz	1 to 120Hz/ 1 to 60Hz*	1 to 120Hz	Set the frequency that will be the basis of machine speed display. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
811	Easy gain tuning response level setting	1	0	0		Running speed increments 1r/min	○	○	○		
				1		Running speed increments 0.1r/min					

*1 Compatible with the FR-B-75K or more.



Function	Parameter	Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
				FR-B	FR-B3	FR-B	FR-B3				
	Related parameters			○: enabled ×: disabled							
Detection of output frequency (SU, FU, FU2, FU3, LS signal)	41	Up-to-frequency sensitivity	0.1%	10%	0 to 100%		Set the level where the SU signal turns on.		○	○	○
	42	Output frequency detection	0.01Hz	6Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency where the FU signal turns on. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
	43	Output frequency detection for reverse rotation	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency where the FU signal turns on in reverse rotation. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
					9999	Same as Pr. 42 setting					
	50	Second output frequency detection	0.01Hz	30Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency where the FU2 signal turns on. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
	116	Third output frequency detection	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency where the FU3 signal turns on. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
865	Low speed detection	0.01Hz	1.5Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency where the LS signal turns on. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○	
—	44, 45	Refer to Pr. 7 and Pr. 8.									
	48, 49	Refer to Pr. 22 and Pr. 23.									
	50	Refer to Pr. 41 to Pr. 43.									
	51	Refer to Pr. 9.									





Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Change of DU/PU monitor descriptions Cumulative monitor clear	52	DU/PU main display data selection	1	0	0, 5, 6, 8 to 14, 17 to 20, 22 to 25, 50 to 57, 100	0, 5 to 14, 17 to 20, 22 to 25, 34, 50 to 57, 100	Select monitor to be displayed on the operation panel and parameter unit and monitor to be output to the terminal FM and AM. 0 : Output frequency (Pr. 52) 1 : Output frequency (Pr. 54, Pr. 158) 2 : Output current (Pr. 54, Pr. 158) 3 : Output voltage (Pr. 54, Pr. 158) 5 : Frequency setting 6 : Running speed 7 : Motor torque (FR-B3) 8 : Converter output voltage 9 : Regenerative brake duty 10 : Electronic thermal relay function load factor 11 : Output current peak value 12 : Converter output voltage peak value 13 : Input power 14 : Output power 17 : Load meter 18 : Motor excitation current 20 : Cumulative energization time (Pr. 52) 21 : Reference voltage output (Pr. 54, Pr. 158) 22 : Orientation status* (Pr. 52) 23 : Actual operation time (Pr. 52) 24 : Motor load factor 25 : Cumulative power (Pr. 52) 34 : Motor output (FR-B3) 50 : Power saving effect 51 : Cumulative saving power (Pr. 52) 52 : PID set point 53 : PID measured value 54 : PID deviation (Pr. 52) 55 : Input/output terminal status (Pr. 52) 56 : Option input terminal status (Pr. 52) 57 : Option output terminal status (Pr. 52) 100 : Set frequency is displayed during a stop and output frequency is displayed during operation (Pr. 52) * Available only when the FR-A7AP is mounted.	○	○	○	
	54	FM terminal function selection	1	1	1 to 3, 5, 6, 8 to 14, 17, 18, 21, 24, 50, 52, 53	1 to 3, 5 to 14, 17, 18, 21, 24, 34, 50, 52, 53	5 : Frequency setting 6 : Running speed 7 : Motor torque (FR-B3) 8 : Converter output voltage 9 : Regenerative brake duty 10 : Electronic thermal relay function load factor 11 : Output current peak value 12 : Converter output voltage peak value 13 : Input power 14 : Output power 17 : Load meter 18 : Motor excitation current 20 : Cumulative energization time (Pr. 52) 21 : Reference voltage output (Pr. 54, Pr. 158) 22 : Orientation status* (Pr. 52) 23 : Actual operation time (Pr. 52) 24 : Motor load factor 25 : Cumulative power (Pr. 52) 34 : Motor output (FR-B3) 50 : Power saving effect 51 : Cumulative saving power (Pr. 52) 52 : PID set point 53 : PID measured value 54 : PID deviation (Pr. 52) 55 : Input/output terminal status (Pr. 52) 56 : Option input terminal status (Pr. 52) 57 : Option output terminal status (Pr. 52) 100 : Set frequency is displayed during a stop and output frequency is displayed during operation (Pr. 52) * Available only when the FR-A7AP is mounted.	○	○	○	
	158	AM terminal function selection	1	1	1 to 3, 5, 6, 8 to 14, 17, 18, 21, 24, 50, 52, 53	1 to 3, 5 to 14, 17, 18, 21, 24, 34, 50, 52, 53	5 : Frequency setting 6 : Running speed 7 : Motor torque (FR-B3) 8 : Converter output voltage 9 : Regenerative brake duty 10 : Electronic thermal relay function load factor 11 : Output current peak value 12 : Converter output voltage peak value 13 : Input power 14 : Output power 17 : Load meter 18 : Motor excitation current 20 : Cumulative energization time (Pr. 52) 21 : Reference voltage output (Pr. 54, Pr. 158) 22 : Orientation status* (Pr. 52) 23 : Actual operation time (Pr. 52) 24 : Motor load factor 25 : Cumulative power (Pr. 52) 34 : Motor output (FR-B3) 50 : Power saving effect 51 : Cumulative saving power (Pr. 52) 52 : PID set point 53 : PID measured value 54 : PID deviation (Pr. 52) 55 : Input/output terminal status (Pr. 52) 56 : Option input terminal status (Pr. 52) 57 : Option output terminal status (Pr. 52) 100 : Set frequency is displayed during a stop and output frequency is displayed during operation (Pr. 52) * Available only when the FR-A7AP is mounted.	○	○	○	
	170	Watt-hour meter clear	1	9999		0	Set "0" to clear the watt-hour meter monitor.	○	×	○	
						10	Set the maximum value when monitoring from communication to 0 to 9999kWh.				
						9999	Set the maximum value when monitoring from communication to 0 to 65535kWh.				
	171	Operation hour meter clear	1	9999	0, 9999	Set "0" to clear the operation time monitor. Setting "9999" has no effect.	×	×	×		
	268	Monitor decimal digits selection	1	9999		0	Displayed as integral value.	○	○	○	
						1	Displayed in 0.1 increments				
						9999	No fixed decimal position				
	563	Energization time carrying-over times	1	0	(0 to 65535)	The numbers of cumulative energization time monitor exceeded 65535h is displayed. Reading only	×	×	×		
	564	Operating time carrying-over times	1	0	(0 to 65535)	The numbers of operation time monitor exceeded 65535h is displayed. Reading only	×	×	×		
867	AM output filter	0.01s	0.01s	0 to 5s	Set the output filter of terminal AM.	○	○	○			
891	Cumulative power monitor digit shifted times	1	9999	0 to 4	Set the number of times to shift the cumulative power monitor digit. Clamp the monitor value at maximum.	○	○	○			
				9999	No shift Clear the monitor value when it exceeds the maximum value.						



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear		
	Related parameters	55			FR-B	FR-B3	FR-B	FR-B3					O: enabled ×: disabled	
													×	disabled
Change of the monitor output from terminal FM and AM		55	Frequency monitoring reference	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the full-scale value to output the output frequency monitor value to terminal FM and AM. * The setting range differs according to the inverter capacity (22K or less/30K or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		56	Current monitoring reference	0.01/ 0.1A *	Rated inverter current	0 to 500/ 0 to 3600A *		Set the full-scale value to output the output current monitor value to terminal FM and AM. * The increments and setting range differ according to the inverter capacity. (55K or less/75k or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
	866 B3		Torque monitoring reference	0.1%	—	150%	—	0 to 400%	Set the full-scale value to output the torque monitor value to terminal FM and AM.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
Restart operation after instantaneous power failure		57	Restart coasting time	0.1s	9999	0	0.1 to 5s/ 0.1 to 30s *	The coasting time is as follows: 1500 or less 0.5s 2200 to 7.5K 1.0s 11K to 55K 3.0s 75K or more 5.0s Set the waiting time for inverter-triggered restart after an instantaneous power failure. * The setting range differs according to the inverter capacity (55K or less/75k or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
						9999	No restart							
		58	Restart cushion time	0.1s	1s	0 to 60s		Set a voltage starting time at restart.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		162	Automatic restart after instantaneous power failure selection	1	0	0	1 2 10 11 12	With frequency search Without frequency search (Reduced voltage system) Encoder detection frequency Frequency search at every start Reduced voltage system at every start Encoder detection frequency search at every start	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		163	First cushion time for restart	0.1s	0s	0 to 20s		Set a voltage starting time at restart. Consider according to the magnitude of load (inertia moment/torque).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		164	First cushion voltage for restart	0.1%	0%	0 to 100%			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		165	Stall prevention operation level for restart	0.1%	150%	0 to 220%		Consider the rated inverter current as 100% and set the stall prevention operation level during restart operation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		299	Rotation direction detection selection at restarting	1	0	0 1 9999	0 1	Without rotation direction detection With rotation direction detection When Pr. 78 = "0", the rotation direction is detected. When Pr. 78 = "1", "2", the rotation direction is not detected.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
		611	Acceleration time at a restart	0.1s	5/15s *	0 to 3600s 9999		Acceleration time to reach Pr. 20 Acceleration/ deceleration reference frequency at a restart. Acceleration time for restart is the normal acceleration time (e.g. Pr. 7). * The initial value differs according to the inverter capacity. (55K or less/75k or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			

Function	Parameter	Name	Increments	Initial Value		Range		Description		Para meter copy	Para meter clear	All para meter clear		
				FR-B	FR-B3	FR-B	FR-B3							
				O: enabled ×: disabled										
Remote setting function	59	Remote function selection	1	0		0		RH, RM, RL signal function	Frequency setting storage function	○	○	○		
								Multi-speed setting	—					
								Remote setting	Yes					
								Remote setting	No					
						3		Remote setting	No (Turning STF/STR off clears remotely-set frequency.)					
Automatic acceleration/deceleration B3	61	Reference current	0.01A	—	9999	—	0 to 500A	Setting value (rated motor current) is referenced		○	○	○		
							9999	Rated inverter current is referenced						
	62	Reference value at acceleration	0.1%	—		9999		0 to 220%		Setting value is a limit value	Shortest acceleration/deceleration mode	○	○	○
										Setting value is an optimum value	Optimum acceleration/deceleration mode			
								9999		150% is a limit value	Shortest acceleration/deceleration mode			
										100% is an optimum value	Optimum acceleration/deceleration mode			
	63	Reference value at deceleration	0.1%	—		9999		0 to 220%		Setting value is a limit value	Shortest acceleration/deceleration mode	○	○	○
										Setting value is an optimum value	Optimum acceleration/deceleration mode			
								9999		150% is a limit value	Shortest acceleration/deceleration mode			
										100% is an optimum value	Optimum acceleration/deceleration mode			
	292	Automatic acceleration/deceleration	1	—		0		—		0	Normal mode	○	○	○
										1	Shortest acceleration/deceleration mode			
11										Shortest acceleration/deceleration mode	With brake			
3										Optimum acceleration/deceleration mode				
7										Brake sequence mode 1				
8										Brake sequence mode 2				
293	Acceleration/deceleration individual operation selection	1	—		0		—		0	Calculate acceleration/deceleration time of both acceleration and deceleration for the shortest and optimum acceleration/deceleration mode.	○	○	○	
									1	Calculate only acceleration time for the shortest and optimum acceleration/deceleration mode				
									2	Calculate only deceleration time for the shortest and optimum acceleration/deceleration mode				



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
					○: enabled ×: disabled							
Retry function at alarm occurrence	65		Retry selection	1	0		0 to 5	A fault for retry can be selected.	○	○	○	
							0	No retry function				
	67		Number of retries at fault occurrence	1	0		1 to 10	Set the number of retries at fault occurrence. A fault output is not provided during retry operation.	○	○	○	
							101 to 110	Set the number of retries at fault occurrence. (The setting value minus 100 is the number of retries.) A fault output is provided during retry operation.				
	68		Retry waiting time	0.1s	1s		0 to 10s	Set the waiting time from when an inverter fault occurs until a retry is made.	○	○	○	
69		Retry count display erase	1	0		0	Clear the number of restarts succeeded by retry.	○	○	○		
—	66	Refer to Pr. 22 and Pr. 23.										
	67 to 69	Refer to Pr. 65.										
	70	Refer to Pr. 30.										
Motor selection (applied motor) 	71		Applied motor	1	0	—	0	—	Thermal characteristics of a variable-torque motor	○	○	○
1							—	Thermal characteristics of the Mitsubishi constant-torque motor				
Carrier frequency selection 	72		PWM frequency selection	1	1/2 *1		1 to 15/1, 2/2 *2	PWM carrier frequency can be changed. The setting displayed is in [kHz]. Note that 15 indicates 14.5kHz. *1 The initial value differs according to the inverter capacity. (other than 200V 75K/200V 75K) *2 The setting range differs according to the inverter capacity. (55K or less/400V 75K or more/200V 75K)	○	○	○	

Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
Analog input selection	73	Analog input selection	1	1	0 to 7, 10 to 17	You can select the input specifications of terminal 2 (0 to 5V, 0 to 10V, 0 to 20mA) and input specifications of terminal 1 (0 to ±5V, 0 to ±10V). To change the terminal 2 to the voltage input specification (0 to 5V/ 0 to 10V), turn OFF(initial status) the voltage/current input switch 2. To change it to the current input(0 to 20mA), turn ON the voltage/current input switch 2. Override and reversible operation can be selected.		○	×	○	
	242	Terminal 1 added compensation amount (terminal 2)	0.1%	100%	0 to 100%	Set the ratio of added compensation amount when terminal 2 is the main speed.		○	○	○	
	243	Terminal 1 added compensation amount (terminal 4)	0.1%	75%	0 to 100%	Set the ratio of added compensation amount when terminal 4 is the main speed.		○	○	○	
	252	Override bias	0.1%	50%	0 to 200%	Set the bias side compensation value of override function.		○	○	○	
	253	Override gain	0.1%	150%	0 to 200%	Set the gain side compensation value of override function.		○	○	○	
	267	Terminal 4 input selection	1	0	0	Terminal 4 input 4 to 20mA	Turn ON the voltage/current input switch 1 (initial status).	○	×	○	
1	Terminal 4 input 0 to 5V				Turn OFF the voltage/current input switch 1.						
2	Terminal 4 input 0 to 10V										
Response level of analog input and noise elimination	74	Input filter time constant	1	1	0 to 8	The primary delay filter time constant for the analog input can be set. A larger setting results in slower response.		○	○	○	
	849	Analog input offset adjustment	0.1%	100%	0 to 200%	This function provides speed command by analog input (terminal 2) with offset and avoids frequency command to be given due to noise under 0 speed command.		○	○	○	
Reset selection, disconnected PU detection	75	Reset selection/ disconnected PU detection/ PU stop selection	1	14	0 to 3, 14 to 17	You can select the reset input acceptance, disconnected PU (FR-DU07/FR-PU07/FR-PU04) connector detection function and PU stop function. For the initial value, reset always enabled, without disconnected PU detection, and with PU stop function are set.		○	×	×	
Output function of alarm code	76	Fault code output selection	1	0	0	Without fault code output		○	○	○	
					1	With fault code output					
					2	Fault code output at alarm occurrence only					



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear	
	Parameter	Related parameters			FR-B	FR-B3	FR-B	FR-B3					
					○: enabled ×: disabled								
Prevention of parameter rewrite	77		Parameter write selection	1	0	0		Write is enabled only during a stop	○	○	○		
						1		Parameter write is disabled.					
Prevention of reverse rotation of the motor	78		Reverse rotation prevention selection	1	0	0		Both forward and reverse rotations allowed	○	○	○		
						1		Reverse rotation disallowed					
						2		Forward rotation disallowed					
Operation mode selection	79	⊙	Operation mode selection	1	0	0		External/PU switchover mode	○	○	○		
						1		Fixed to PU operation mode					
						2		Fixed to External operation mode					
						3		External/PU combined operation mode 1					
						4		External/PU combined operation mode 2					
						6		Switchover mode					
						7		External operation mode (PU operation interlock)					
	340		Communication startup mode selection	1	0	0		As set in Pr. 79.	○	○	○		
						1, 2		Started in the network operation mode. When the setting is "2", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.					
						10, 12		Started in the network operation mode. Operation mode can be changed between the PU operation mode and network operation mode from the operation panel. When the setting is "12", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.					
Selection of control method	B3		80	Motor capacity	0.01kW	—	Inverter capacity	—	Inverter capacity	Set the applied motor capacity.	×	×	×
			81	Number of motor poles	1	—	4	—	4	The number of motor poles is always four.	×	×	×
			89	Speed control gain (magnetic flux vector)	0.1%	—	9999	—	0 to 200%	Motor speed fluctuation due to load fluctuation is adjusted during Advanced magnetic flux vector control. 100% is a referenced value.	○	×	○
9999	Gain matching with the Mitsubishi explosion-proof motor.												

Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy O: enabled ×: disabled	Para meter clear	All para meter clear	
				FR-B	FR-B3	FR-B	FR-B3					
Offline auto tuning B3	82	Motor excitation current	0.01	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	83	Rated motor voltage	0.1V	—	200/ 400V *	—	0 to 1000V	Set the rated motor voltage(V). * The initial values differ according to the voltage level. (200V/400V)	○	○	○	
	84	Rated motor frequency	0.01Hz	—	60Hz	—	10 to 120Hz	Set the rated motor frequency (Hz).	○	○	○	
	90	Motor constant (R1)	0.001Ω	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	91	Motor constant (R2)	0.001Ω	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	92	Motor constant (L1)	0.001Ω (0.1mH)	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	93	Motor constant (L2)	0.001Ω (0.1mH)	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	94	Motor constant (X)	0.01Ω (0.1%)	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	96	Auto tuning setting/status	1	—	0	—	0 1 101	0 Auto tuning is not performed 1 Tuning performed without motor running 101 Tuning performed with motor running	○	×	○	
	684	Tuning data unit switchover	1	—	0	—	0 1	0 Internal data converted value 1 Displayed in "A, Ω, mH, %".	○	○	○	
	859	Torque current	0.01A	—	9999	—	Reading only Cannot be set	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Use the Mitsubishi motor constants	○	×	○	
	—	89	Refer to Pr. 81.									
	—	90 to 94	Refer to Pr. 82 to Pr. 84.									
—	96	Refer to Pr. 82 to Pr. 84.										
—	110, 111	Refer to Pr. 7.										
—	114, 115	Refer to Pr. 22.										
—	116	Refer to Pr. 41.										



Function	Parameter		Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
	Related parameters	Name		FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
RS-485 communication initial setting		117	PU communication station number	1	0	0 to 31		Specify the inverter station number. Set the inverter station numbers when two or more inverters are connected to one personal computer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		118	PU communication speed	1	192	48, 96, 192, 384		Set the communication speed. The setting value × 100 equals the communication speed. For example, the communication speed is 19200bps when the setting value is "192".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		119	PU communication stop bit length	1	1	0	Stop bit length: 1bit data length: 8bit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						1	Stop bit length: 2bit data length: 8bit				
						10	Stop bit length: 1bit data length: 7bit				
						11	Stop bit length: 2bit data length: 7bit				
		120	PU communication parity check	1	2	0	Without parity check	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						1	With odd parity check				
						2	With even parity check				
		121	Number of PU communication retries	1	1	0 to 10	Set the permissible number of retries at occurrence of a data receive error. If the number of consecutive errors exceeds the permissible value, the inverter will come to trip.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						9999	If a communication error occurs, the inverter will not come to trip.				
		122	PU communication check time interval	0.1s	9999	0	No PU connector communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						0.1 to 999.8s	Set the communication check time interval. If a no-communication state persists for longer than the permissible time, the inverter will come to trip.				
						9999	No communication check				
		123	PU communication waiting time setting	1	9999	0 to 150ms	Set the waiting time between data transmission to the inverter and response.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						9999	Set with communication data.				
		124	PU communication CR/LF selection	1	1	0	Without CR/LF	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						1	With CR				
	2					With CR/LF					
	342	Communication EEPROM write selection	1	0	0	Parameter values written by communication are written to the EEPROM and RAM.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
					1	Parameter values written by communication are written to the RAM.					
	551	PU mode operation command source selection	1	2	1	RS-485 terminals are the command source when PU operation mode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
					2	PU connector is the command source when PU operation mode.					
					3	USB connector is the command source when PU operation mode.					



Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear	
				FR-B	FR-B3	FR-B	FR-B3					
				O: enabled ×: disabled								
Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency of terminal 2 input gain (maximum). * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	×	○	
	126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency of terminal 4 input gain (maximum). (Valid when Pr: 858 = 0 (initial value)) * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	×	○	
	241	Analog input display unit switchover	1	0		0	1	Displayed in % Displayed in V/mA	Select the unit for analog input display.	○	○	○
	C2 (902)	Terminal 2 frequency setting bias frequency	0.01Hz	0Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency on the bias side of terminal 2 input. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	×	○	
	C3 (902)	Terminal 2 frequency setting bias	0.1%	0%		0 to 300%		Set the converted % of the bias side voltage (current) of terminal 2 input.	○	×	○	
	C4 (903)	Terminal 2 frequency setting gain	0.1%	100%		0 to 300%		Set the converted % of the gain side voltage of terminal 2 input.	○	×	○	
	C5 (904)	Terminal 4 frequency setting bias frequency	0.01Hz	0Hz		0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency on the bias side of terminal 4 input. (Valid when Pr: 858 = 0 (initial value)) * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	×	○	
	C6 (904)	Terminal 4 frequency setting bias	0.1%	20%		0 to 300%		Set the converted % of the bias side current (voltage) of terminal 4 input. (Valid when Pr: 858 = 0 (initial value))	○	×	○	
C7 (905)	Terminal 4 frequency setting gain	0.1%	100%		0 to 300%		Set the converted % of the gain side current (voltage) of terminal 4 input. (Valid when Pr: 858 = 0 (initial value))	○	×	○		

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).



Function	Parameter		Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear	
	Related parameters	Name		FR-B	FR-B3	FR-B	FR-B3					O: enabled ×: disabled
PID control	127	PID control automatic switchover frequency	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency at which the control is automatically changed to PID control. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○		
					9999	Without PID automatic switchover function						
	128	PID action selection	1	10	10		PID reverse action	Deviation value signal (terminal 1) Measured value input (terminal 4) Set value (terminal 2 or Pr. 133) Deviation value signal input (LONWORKS, CC-Link communication) Measured value, set value input (LONWORKS, CC-Link communication)	○	○	○	
					11		PID forward action					
					20		PID reverse action					
					21		PID forward action					
					50		PID reverse action					
					51		PID forward action					
					60		PID reverse action					
	61		PID forward action									
	129	PID proportional band	0.1%	100%	0.1 to 1000%		If the proportional band is narrow (parameter setting is small), the manipulated variable varies greatly with a slight change of the measured value. Hence, as the proportional band narrows, the response sensitivity (gain) improves but the stability deteriorates, e.g. hunting occurs. Gain $K = 1/\text{proportional band}$	○	○	○		
					9999	No proportional control						
	130	PID integral time	0.1s	1s	0.1 to 3600s		When deviation step is input, time (Ti) is the time required for only the integral (I) action to provide the same manipulated variable as that for the proportional (P) action. As the integral time decreases, the set point is reached earlier but hunting occurs more easily.	○	○	○		
					9999	No integral control.						
	131	PID upper limit	0.1%	9999	0 to 100%		Set the upper limit value. If the feedback value exceeds the setting, the FUP signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○		
9999					No function							
132	PID lower limit	0.1%	9999	0 to 100%		Set the lower limit value. If the measured value falls below the setting range, the FDN signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○			
				9999	No function							
133	PID action set point	0.01%	9999	0 to 100%		Used to set the set point for PID control.	○	○	○			
				9999	Terminal 2 input voltage is the set point.							

Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
PID control	134	PID differential time	0.01s	9999	0.01 to 10.00s		For deviation lamp input, time (Td) required for providing only the manipulated variable for the proportional (P) action. As the differential time increases, greater response is made to a deviation change.	○	○	○	
					9999		No differential control.				
	575	Output interruption detection time	0.1s	1s	0 to 3600s		If the output frequency after PID operation remains lower than the Pr. 576 setting for longer than the time set in Pr. 575, the inverter stops operation.	○	○	○	
					9999		Without output interruption function				
576	Output interruption detection level	0.01Hz	0Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency at which the output interruption processing is performed. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○		
577	Output interruption cancel level	0.1%	1000%	900 to 1100%		Set the level (Pr. 577 minus 1000%) at which the PID output interruption function is released.	○	○	○		
—	140 to 143	Refer to Pr. 29.									
—	144	Refer to Pr. 37.									
Parameter unit language switchover	145	PU display language selection	1	0	0	Japanese		○	×	×	
					1	English					
					2	Germany					
					3	French					
					4	Spanish					
					5	Italian					
					6	Swedish					
7	Finnish										
—	148, 149	Refer to Pr. 22.									
Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	150	Output current detection level	0.1%	150%	0 to 220%		Set the output current detection level. 100% is the rated inverter current.	○	○	○	
	151	Output current detection signal delay time	0.1s	0s	0 to 10s		Set the output current detection period. Set the time from when the output current has risen above the setting until the output current detection signal (Y12) is output.	○	○	○	
	152	Zero current detection level	0.1%	5%	0 to 220%		Set the zero current detection level. Suppose that the rated inverter current is 100%.	○	○	○	
	153	Zero current detection time	0.01s	0.5s	0 to 1s		Set this parameter to define the period from when the output current drops below the Pr. 152 value until the zero current detection signal (Y13) is output.	○	○	○	
					0 to 10s		Set the retention time when the Y12 signal is on.				
166	Output current detection signal retention time	0.1s	0.1s	0 to 10s		The Y12 signal on status is retained. The signal is turned off at the next start.	○	○	○		
167	Output current detection operation selection	1	0	0	Operation continues when the Y12 signal is on		○	○	○		
				1	The inverter is brought to trip when the Y12 signal is on. (E.CDO)						
—	154	Refer to Pr. 22.									



Function	Parameter		Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
	Related parameters	155			FR-B	FR-B3	FR-B	FR-B3				
Condition selection of function validity by the second function selection signal		155	RT signal function validity condition selection	1	0	0		Second (third) function is immediately valid with on of the RT (X9) signal.	○	○	○	
						10		Second (third) function is valid only during the RT (X9) signal is on and constant speed operation. (invalid during acceleration/ deceleration)				
—	156, 157	Refer to Pr. 22 .										
	158	Refer to Pr. 54 .										
User group function	160	◎	User group read selection	1	0	0		All parameters can be displayed.	○	○	○	
						1		Only the parameters registered in the user group can be displayed.				
						9999		Only the simple mode parameters can be displayed.				
	172	User group registered display/batch clear	1	0	(0 to 16)		Displays the number of cases registered as a user group (reading only).	○	×	×		
					9999		Batch clear the user group registration					
173	User group registration	1	9999	0 to 999, 9999		Set the parameter numbers to be registered to the user group. Read value is always "9999".	×	×	×			
174	User group clear	1	9999	0 to 999, 9999		Set the parameter numbers to be cleared from the user group. Read value is always "9999".	×	×	×			
Operation selection of the operation panel	161		Frequency setting/key lock operation selection	1	0	0		Setting dial frequency setting mode	Key lock invalid	○	×	○
						1		Setting dial potentiometer mode				
						10		Setting dial frequency setting mode	Key lock valid			
						11		Setting dial potentiometer mode				
—	162 to 165	Refer to Pr. 57.										
	166, 167	Refer to Pr. 150.										
	168, 169	Parameter for manufacturer setting. Do not set.										
	170, 171	Refer to Pr. 52.										
	172 to 174	Refer to Pr. 160.										



Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O : enabled × : disabled							
Function assignment of input terminal	178	STF terminal function selection	1	60	0 to 12, 14, 16, 19, 20, 22, 24, 25, 60, 62, 64 to 67, 9999	0 to 9, 12 to 16, 19, 20, 22, 24, 25, 60, 62, 64 to 67, 9999	0: Low-speed operation command (RL) 1: Middle-speed operation command (RM) 2: High-speed operation command (RH) 3: Second function selection (RT) 4: Terminal 4 input selection (AU) 5: Jog operation selection (JOG) 6: Selection of automatic restart after instantaneous power failure, flying start (CS) 7: External thermal relay input (OH) 8: Fifteen speed selection (REX) 9: Third function (X9)	○	×	○	
	179	STR terminal function selection	1	61	0 to 12, 14, 16, 19, 20, 22, 24, 25, 61, 62, 64 to 67, 9999	0 to 9, 12 to 16, 19, 20, 22, 24, 25, 61, 62, 64 to 67, 9999	10: Inverter operation enable signal (MT-HC connection) (X10) 11: MT-HC connection, instantaneous power failure detection (X11) 12: PU operation external interlock (X12) 13: External DC injection brake start (X13) 14: PID control valid terminal (X14) 15: Brake opening completion signal (BRI) 16: PU-external operation switchover (X16)	○	×	○	
	180	RL terminal function selection	1	0	0 to 12, 14, 16, 19, 20, 22, 24, 25, 62, 64 to 67, 9999	0 to 9, 12 to 16, 19, 20, 22, 24, 25, 62, 64 to 67, 9999	19: Load torque high-speed frequency (X19) 20: S-pattern acceleration/ deceleration C switching terminal (X20) 22: Orientation command (X22) *	○	×	○	
	181	RM terminal function selection	1	1			24: Output stop (MRS)	○	×	○	
	182	RH terminal function selection	1	2			25: Start self-holding selection (STOP)	○	×	○	
	183	RT terminal function selection	1	3			60: Forward rotation command (STF) (assigned to STF terminal (Pr: 178) only) 61: Reverse rotation command (STR) (assigned to STR terminal (Pr: 179) only)	○	×	○	
	184	AU terminal function selection	1	4			62: Inverter reset (RES) 63: PTC thermistor input (PTC) (assigned to AU terminal (Pr: 184) only) 64: PID forward/reverse action switchover (X64) 65: PU-NET operation switchover (X65)	○	×	○	
	185	JOG terminal function selection	1	5	0 to 12, 14, 16, 19, 20, 22, 24, 25, 62, 64 to 67, 9999	0 to 9, 12 to 16, 19, 20, 22, 24, 25, 62, 64 to 67, 9999	66: External-NET operation switchover (X66) 67: Command source switchover (X67) 9999 : No function	○	×	○	
	186	CS terminal function selection	1	6			* Available only when used with the FR-A7AP.	○	×	○	
	187	MRS terminal function selection	1	24				○	×	○	
	188	STOP terminal function selection	1	25				○	×	○	
189	RES terminal function selection	1	62				○	×	○		



Function	Parameter		Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
	Related parameters	Name		FR-B	FR-B3	FR-B	FR-B3				
Terminal assignment of output terminal	190	RUN terminal function selection	1	0	0 to 8, 10 to 16, 25 to 28, 34, 45 to 47, 64, 70, 90 to 99, 100 to 108, 110 to 116, 125 to 128, 134, 145 to 147, 164, 170, 190 to 199, 9999	0 to 8, 10 to 16, 20, 25 to 28, 34, 35, 45 to 47, 64, 70, 90 to 99, 100 to 106, 108, 110 to 116, 120, 125 to 128, 134, 135, 145 to 147, 164, 170, 190 to 199, 9999	0, 100: Inverter running (RUN) 1, 101: Up to frequency (SU) 2, 102: Instantaneous power failure/undervoltage (IPF) 3, 103: Overload alarm (OL) 4, 104: Output frequency detection (FU) 5, 105: Second output frequency detection (FU2) 6, 106: Third output frequency detection (FU3) 7, 107: Regenerative brake pre-alarm (RBP) 8, 108: Electronic thermal relay function pre-alarm (THP) 10, 110: PU operation mode (PU) 11, 111: Inverter operation ready (RY) 12, 112: Output current detection (Y12) 13, 113: Zero current detection (Y13) 14, 114: PID lower limit (FDN) 15, 115: PID upper limit (FUP) 16, 116: PID forward/reverse rotation output (RL) 20, 120: Brake opening request (BOF) 25, 125: Fan fault output (FAN) 26, 126: Heatsink overheat pre-alarm (FIN) 27, 127: Orientation in-position (ORA) * 28, 128: Orientation error (ORM)* 34, 134: Low speed output (LS) 35, 135: Torque detection (TU) 45, 145: Inverter running and start command is on (RUN3) 46, 146: During deceleration at occurrence of power failure (retained until release) (Y46) 47, 147: During PID control activated (PID) 64, 164: During retry (Y64) 70, 170: PID output interruption (SLEEP) 90, 190: Life alarm (Y90) 91, 191: Fault output 3 (power-off signal) (Y91) 92, 192: Energy saving average value updated timing (Y92) 93, 193: Current average value monitor signal (Y93) 94, 194: Fault output 2 (ALM2) 95, 195: Maintenance timer signal (Y95) 96, 196: Remote output (REM) 97, 197: Alarm output 2 (ER) 98, 198: Alarm output (LF) 99, 199: Fault output (ALM) 9999: No function 0 to 99: Positive logic 100 to 199: Negative logic * Available only when used with the FR-A7AP.	○	×	○	
	191	SU terminal function selection	1	1				○	×	○	
	192	IPF terminal function selection	1	2				○	×	○	
	193	OL terminal function selection	1	3				○	×	○	
	194	FU terminal function selection	1	4				○	×	○	
	195	ABC1 terminal function selection	1	99				○	×	○	
	196	ABC2 terminal function selection	1	9999				○	×	○	
—	232 to 239	Refer to Pr. 4 to Pr. 6.									
—	241	Refer to Pr. 125 and Pr. 126.									
—	242, 243	Refer to Pr. 73.									



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
					O: enabled ×: disabled							
Increase cooling fan life	244		Cooling fan operation selection	1	1	0		Operates at power on Cooling fan on/off control invalid (The cooling fan is always on at power on)	○	○	○	
						1		Cooling fan on/off control valid The fan is always on while the inverter is running. During a stop, the inverter status is monitored and the fan switches on-off according to the temperature.				
Selection of motor stopping method	250		Stop selection	0.1s	9999	0 to 100s		The motor is coasted to a stop when the preset time elapses after the start signal is turned off. STF signal: Forward rotation start STR signal: Reverse rotation start	○	○	○	
						1000 to 1100s		The motor is coasted to a stop (Pr. 250 - 1000)s after the start signal is turned off. STF signal: Start signal STR signal: Forward/reverse signal				
						9999		When the start signal is turned off, the motor decelerates to stop. STF signal: Forward rotation start STR signal: Reverse rotation start				
						8888		STF signal: Start signal STR signal: Forward/reverse signal				
Input/output phase failure protection selection	251		Output phase failure protection selection	1	1	0		Without output phase failure protection	○	○	○	
						1		With output phase failure protection				
	872		Input phase failure protection selection	1	0	0		Without input phase failure protection	○	○	○	
						1		With input phase failure protection				
—	252, 253		Refer to Pr. 73.									
Display of the life of the inverter parts	255		Life alarm status display	1	0	(0 to 15)		Display whether the control circuit capacitor, main circuit capacitor, cooling fan, and each parts of the inrush current limit circuit has reached the life alarm output level or not. Reading only	×	×	×	
	256		Inrush current limit circuit life display	1%	100%	(0 to 100%)		Display the deterioration degree of the inrush current limit circuit. Reading only	×	×	×	
	257		Control circuit capacitor life display	1%	100%	(0 to 100%)		Display the deterioration degree of the control circuit capacitor. Reading only	×	×	×	
	258		Main circuit capacitor life display	1%	100%	(0 to 100%)		Display the deterioration degree of the main circuit capacitor. Reading only The value measured by Pr. 259 is displayed.	×	×	×	
	259		Main circuit capacitor life measuring	1	0	0, 1		Setting "1" and turning the power supply off starts the measurement of the main circuit capacitor life. When the Pr.259 value is "3" after powering on again, the measuring is completed. Read the deterioration degree in Pr.258.	○	○	○	



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear	
	Related parameters				FR-B	FR-B3	FR-B	FR-B3					
					○ : enabled × : disabled								
Operation at instantaneous power failure	261		Power failure stop selection	1	0	0		Coasting to stop When undervoltage or power failure occurs, the inverter output is shut off.		○	○	○	
						1		Without UV avoidance	When undervoltage or a power failure occurs, the inverter can be decelerated to a stop.				
						11		With UV avoidance					
						2		Without UV avoidance	When undervoltage or a power failure occurs, the inverter can be decelerated to a stop.				
						12		With UV avoidance	If power is restored during a power failure, the inverter accelerates again.				
	262		Subtracted frequency at deceleration start	0.01Hz	3Hz	0 to 20Hz		Normally operation can be performed with the initial value unchanged. But adjust the frequency according to the magnitude of the load specifications (moment of inertia, torque).		○	○	○	
	263		Subtraction starting frequency	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	When output frequency $\geq Pr. 263$ Decelerate from the speed obtained from output frequency minus $Pr. 262$. When output frequency $< Pr. 263$ Decelerate from output frequency * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○	
						9999		Decelerate from the speed obtained from output frequency minus $Pr. 262$.					
	264		Power-failure deceleration time 1	0.1/ 0.01s	5s	0 to 3600/ 360s		Set a deceleration slope down to the frequency set in $Pr. 266$.		○	○	○	
	265		Power-failure deceleration time 2	0.1/ 0.01s	9999	0 to 3600/ 360s		Set a deceleration slope below the frequency set in $Pr. 266$.		○	○	○	
9999						Same slope as in $Pr. 264$							
266		Power failure deceleration time switchover frequency	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency at which the deceleration slope is switched from the $Pr. 264$ setting to the $Pr. 265$ setting. * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○		
					294		UV avoidance voltage gain	0.1%				100%	0 to 200%
—	267	Refer to $Pr. 73$.											
	268	Refer to $Pr. 52$.											
	269	Parameter for manufacturer setting. Do not set.											

Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Load torque high speed frequency control	270	Stop-on contact/load torque high-speed frequency control selection	1	0	0		Without stop-on contact control and load torque high-speed frequency control	○	○	○	
					—	1	Stop-on contact control				
					2		Load torque high speed frequency control				
					—	3	Stop-on contact + load torque high speed frequency control				
	271	High-speed setting maximum current	0.1%	50%	0 to 220%		Set the upper and lower limits of the current at high and middle speeds.	○	○	○	
272	Middle-speed setting minimum current	0.1%	100%	0 to 220%			○	○	○		
273	Current averaging range	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Average current during acceleration from (Pr. 273 × 1/2)Hz to (Pr. 273)Hz can be achieved. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○		
				9999		Average current during acceleration from (Pr. 5 × 1/2)Hz to (Pr. 5)Hz is achieved.					
274	Current averaging filter time constant	1	16	1 to 4000		Set the time constant of the primary delay filter relative to the output current. (The time constant [ms] is $0.75 \times Pr. 274$ and the initial value is 12ms.) A larger setting provides higher stability but poorer response.	○	○	○		
Stop-on contact control B3	275	Stop-on contact excitation current low-speed multiplying factor	0.1%	—	9999	—	0 to 1000%	Usually set a value between 130% and 180%. Set the force (holding torque) for stop-on-contact control.	○	○	○
							9999	No compensation.			



Function	Parameter		Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
	Related parameters	Name		FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Brake sequence function B3	278	Brake opening frequency	0.01Hz	—	3Hz	—	0 to 30Hz	Set to the rated slip frequency of the motor + about 1.0Hz. This parameter may be only set if Pr. 278 ≤ Pr. 282.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	279	Brake opening current	0.1%	—	130%	—	0 to 220%	Generally, set this parameter to about 50 to 90%. If the setting is too low, the load is liable to drop due to gravity at start. Suppose that the rated inverter current is 100%.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	280	Brake opening current detection time	0.1s	—	0.3s	—	0 to 2s	Generally, set this parameter to about 0.1 to 0.3s.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	281	Brake operation time at start	0.1s	—	0.3s	—	0 to 5s	Pr. 292 = 7: Set the mechanical delay time until the brake is loosened. Pr. 292 = 8: Set the mechanical delay time until the brake is loosened + about 0.1 to 0.2s.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	282	Brake operation frequency	0.01Hz	—	6Hz	—	0 to 30Hz	At this frequency, the brake opening request signal (BOF) is switched off. Generally, set this parameter to the Pr. 278 setting + 3 to 4Hz. Setting is enabled only when Pr. 282 ≥ Pr. 278.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	283	Brake operation time at stop	0.1s	—	0.3s	—	0 to 5s	Pr. 292 = 7: Set the mechanical delay time until the brake is closed + 0.1s. Pr. 292 = 8: Set the mechanical delay time until the brake is closed + about 0.2 to 0.3s.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	284	Deceleration detection function selection	1	—	0	—	0	Deceleration is not detected.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							1	If deceleration is not normal during deceleration operation, the inverter fault (E.MB2) is provided to trip and turn off the brake opening request signal (BOF).			
285	Overspeed detection frequency	0.01Hz	—	9999	—	0 to 30Hz	When brake sequence function is valid under encoder feedback control If (detected frequency) - (output frequency) > Pr. 285 under encoder feedback control, the inverter fault (E.MB1) is provided to trip and turn off the brake opening request signal (BOF).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
						9999	Overspeed is not detected.				
	292	Automatic acceleration/ deceleration	1	—	0	—	0, 1, 3, 7, 8, 11	Brake sequence function is valid when a setting is "7 or 8".			
Droop control B3	286	Droop gain	0.1%	—	0%	—	0	Droop control is invalid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
							0.1 to 100%	Set the drooping amount at the rated torque as a percentage with respect to the rated motor frequency.			
	287	Droop filter time constant	0.01s	—	0.3s	—	0 to 1s	Set the time constant of the primary delay filter applied to the torque current.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Pulse train I/O	291	Pulse train I/O selection	1	0	0		JOG terminal	FM output	○	×	○
					1		Pulse train input	FM output			
					10		JOG terminal	Pulse train open collector output (50% duty)			
					11		Pulse train input				
					20		JOG terminal	Pulse train open collector output (ON width is always same)			
21		Pulse train input	Pulse train open collector output (ON width is always same (independently of Pr. 54))								
100											
	384	Input pulse division scaling factor	1	0	0 to 250		Indicates division scaling factor to the input pulse and the frequency resolution to the input pulse changes according to the value.		○	○	○
	385	Frequency for zero input pulse	0.01Hz	0	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency when the input pulse is 0 (bias). * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
	386	Frequency for maximum input pulse	0.01Hz	60Hz	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the frequency when the input pulse is maximum (gain). * The setting range differs according to the inverter capacity (22K or less/30K or more)		○	○	○
—	292, 293	Refer to Pr. 61.									
	294	Refer to Pr. 261.									
	299	Refer to Pr. 57.									
RS-485 communication	331	RS-485 communication station number	1	0	0 to 31 (0 to 247)		Set the inverter station number. (same specifications as Pr. 117) When "1" (Modbus-RTU protocol) is set in Pr. 551, the setting range within parenthesis is applied.		○	○	○
	332	RS-485 communication speed	1	96	3, 6, 12, 24, 48, 96, 192, 384		Used to select the communication speed. (same specifications as Pr. 118)		○	○	○
	333	RS-485 communication stop bit length	1	1	0, 1, 10, 11		Select stop bit length and data length. (same specifications as Pr. 119)		○	○	○
	334	RS-485 communication parity check selection	1	2	0, 1, 2		Select the parity check specifications. (same specifications as Pr. 120)		○	○	○
	335	RS-485 communication retry count	1	1	0 to 10, 9999		Set the permissible number of retries at occurrence of a data receive error. (same specifications as Pr. 121)		○	○	○
	336	RS-485 communication check time interval	0.1s	0s	0		RS-485 communication can be made, but the inverter will come to an alarm stop in the NET operation mode.		○	○	○
					0.1 to 999.8s		Set the communication check time interval. (same specifications as Pr. 122)				
9999					No communication check						
337	RS-485 communication waiting time setting	1	9999	0 to 150ms, 9999		Set the waiting time between data transmission to the inverter and response. (same specifications as Pr. 123)		○	○	○	



Function	Parameter		Name	Increments	Initial Value		Range		Description	Parameter copy	Parameter clear	All parameter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
					O: enabled ×: disabled							
RS-485 communication	338		Communication operation command source	1	0	0			Start command source communication	○	○	○
						1			Start command source external			
	339		Communication speed command source	1	0	0			Frequency command source communication	○	○	○
						1			Frequency command source external			
						2			Frequency command source external (Frequency command from communication is valid, frequency command terminal 2 is invalid)			
	341		RS-485 communication CR/LF selection	1	1	0, 1, 2			Select presence/absence of CR/LF. (same specifications as <i>Pr. 124</i>)	○	○	○
	342		Communication EEPROM write selection	1	0	0			Parameter values written by communication are written to the EEPROM and RAM.	○	○	○
						1			Parameter values written by communication are written to the RAM.			
	343		Communication error count	1	0	—			Display the number of communication errors during Modbus-RTU communication. Read only. Displayed only when Modbus-RTU protocol is selected.	×	×	×
	539		Modbus-RTU communication check time interval	0.1s	9999	0			Modbus-RTU communication can be made, but the inverter will come to an alarm stop in the NET operation mode.	○	○	○
						0.1 to 999.8s			Set the communication check time interval. (same specifications as <i>Pr. 122</i>)			
						9999			No communication check			
	549		Protocol selection	1	0	0			Mitsubishi inverter (computer link) protocol	○	○	○
						1			Modbus-RTU protocol			
	550		NET mode operation command source selection	1	9999	0			The communication option is the command source when NET operation mode.	○	○	○
1								RS-485 terminals are the command source when NET operation mode.				
9999								Automatic communication option recognition Normally, RS-485 terminals are the command source. When a communication option is mounted, the communication option is the command source.				
551		PU mode operation command source selection	1	2	1			RS-485 terminals are the command source when PU operation mode	○	○	○	
					2			PU connector is the command source when PU operation mode.				
					3			USB connector is the command source when PU operation mode.				
—	340		Refer to <i>Pr. 79</i> .									

Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Orientation control	350	Stop position command selection	1	9999	0		Internal stop position command (Pr.356)	○	○	○	
					1		External stop position command (FR-A7AX 16-bit data)				
					9999		Orientation control invalid				
	351	Orientation speed	0.01Hz	2Hz	0 to 30Hz		Decrease the motor speed to the set value when the orientation command (X22) is given.	○	○	○	
	352	Creep speed	0.01Hz	0.5Hz	0 to 10Hz		As soon as the current position pulse reaches the creep switchover position set in Pr.353 after the speed has reached the orientation speed, the speed decelerates down to the creep speed set in Pr.352.	○	○	○	
	353	Creep switchover position	1	511	0 to 16383			○	○	○	
	354	Position loop switchover position	1	96	0 to 8191		As soon as the current position pulse reaches the set position loop switchover position, control is changed to position loop.	○	○	○	
	355	DC injection brake start position	1	5	0 to 255		After changed to position loop, DC injection brake is applied and the motor stops as soon as the current position pulse reaches the set DC injection brake start position.	○	○	○	
	356	Internal stop position command	1	0	0 to 16383		When "0" is set in Pr. 350, the internal position command is activated and the setting value of Pr. 356 becomes a stop position.	○	○	○	
	357	Orientation in-position zone	1	5	0 to 255		Set the in-position zone at a stop of the orientation.	○	○	○	
	358	Servo torque selection	1	1	0 to 13		Functions at orientation completion can be selected.	○	○	○	
359	Encoder rotation direction	1	1	0		<p>Clockwise direction as viewed from A is forward rotation</p>	○	○	○		
				1		<p>Counter clockwise direction as viewed from A is forward rotation</p>					



Function	Parameter		Name	Increments	Initial Value		Range		Description	Para meter copy ○: enabled ×: disabled	Para meter clear	All para meter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
Orientation control	360		16 bit data selection	1	0	0		Speed command	When 1 is set in Pr:350 and the option FR-A7AX is mounted, set a stop position using 16-bit data. Stop position command is input as binary regardless of the Pr:304 setting.	○	○	○
						1		Position command				
						2 to 127		Set the stop position dividing up to 128 stop positions at regular intervals.				
	361		Position shift	1	0	0 to 16383		Shift the origin using a compensation value without changing the origin of the encoder. The stop position is a position obtained by adding the setting value of Pr: 361 to the position command.	○	○	○	
	362		Orientation position loop gain	0.1	1	0.1 to 10		When servo torque function is selected using Pr:358, output frequency for generating servo torque increases to the creep speed of Pr:352 gradually according to the slope set in Pr:362. Although the operation becomes faster when the value is increased, a machine may hunt, etc.	○	○	○	
	363		Completion signal output delay time	0.1s	0.5s	0 to 5s		The orientation complete signal (ORA) is output delaying the set time after in-position zone is entered. Also, the signal turns off delaying the set time after in-position zone is out.	○	○	○	
	364		Encoder stop check time	0.1s	0.5s	0 to 5s		Orientation fault signal (ORM) is output when the encoder remains stopped for the set time without orientation completion in the state where no orientation complete signal (ORA) is output. ORM signal is output when orientation is not completed again in the set time in the state where ORA signal is output.	○	○	○	
	365		Orientation limit	1s	9999	0 to 60s		Measure the time taken after passing the creep switchover position and output the orientation fault signal (ORM) if orientation is not completed within the set time.	○	○	○	
9999							Set to 120s.					
366		Recheck time	0.1s	9999	0 to 5s		Turning off the start signal with orientation command (X22) on after stopping the motor by orientation control, the present position is checked again after the set time elapses and the orientation complete signal (ORA) or orientation fault signal (ORM) is output.	○	○	○		
					9999		Not checked.					
	369		Number of encoder pulses	1	1024	0 to 4096		Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○	

Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O : enabled × : disabled							
Encoder feedback control	359	Encoder rotation direction	1	1	0		<p>Clockwise direction as viewed from A is forward rotation</p>	○	○	○	
					1		<p>Counter clockwise direction as viewed from A is forward rotation</p>				
	367	Speed feedback range	0.01Hz	9999	0 to 120Hz/ 0 to 60Hz*	0 to 120Hz	Set the region of speed feedback control. * The setting range differs according to the inverter capacity (22K or less/30K or more)	○	○	○	
	9999		Encoder feedback control is invalid								
	368	Feedback gain	0.1	1	0 to 100		Set when the rotation is unstable or response is slow.	○	○	○	
369	Number of encoder pulses	1	1024	0 to 4096		Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○		
Overspeed detection	374	Overspeed detection level	0.01Hz	140Hz	0 to 400Hz		When the motor speed reaches or exceeds the speed set in Pr.374 during encoder feedback control, over speed (E.OS) occurs and stops the inverter output.	○	○	○	
Encoder signal loss detection	376	Encoder signal loss detection enable/disable selection	1	0	0		Signal loss detection is invalid	○	○	○	
					1		Signal loss detection is valid When the encoder signal is lost during encoder feedback control, orientation control, or vector control, signal loss detection (E.ECT) is activated to stop the inverter output.				
-	380 to 383	Refer to Pr. 29.									
	384 to 386	Refer to Pr. 291.									
Remote output function (REM signal)	495	Remote output selection	1	0	0		Remote output data clear at powering off	No remote output data held at resetting	○	○	○
					1		Remote output data held at powering off				
					10		Remote output data clear at powering off	Remote output data held at resetting			
					11		Remote output data held at powering off				
	496	Remote output data 1	1	0	0 to 4095		Output terminal can be switched on and off.		×	×	×
497	Remote output data 2	1	0	0 to 4095		×			×	×	



Function	Parameter		Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
	Related parameters				FR-B	FR-B3	FR-B	FR-B3				
					O: enabled ×: disabled							
Maintenance of parts	503		Maintenance timer	1	0	0 (1 to 9998)		Display the cumulative energization time of the inverter in 100h increments. Reading only Writing the setting of "0" clears the cumulative energization time.	×	×	×	
			Maintenance timer alarm output set time	1	9999	0 to 9998	Set the time taken until when the maintenance timer alarm output signal (Y95) is output.	○	×	○		
						9999	No function					
—	505		Refer to Pr. 37.									
—	516 to 519		Refer to Pr. 29.									
Inverter setup using USB communication	547		USB communication station number	1	0	0 to 31		Specify the inverter station number.	○	○	○	
	548		USB communication check time interval	0.1s	9999	0	USB communication is enabled. However, the inverter will come to trip (E. USB) if operation is changed to PU operation mode.	○	○	○		
						0.1 to 999.8s	Set the interval of communication check time.					
						9999	No communication check					
—	539,549		Refer to Pr. 117.									
—	550, 551		Refer to Pr. 338 and Pr. 339.									
Current average value monitor signal	555		Current average time	0.1s	1s	0.1 to 1.0s		Set the time taken to average the current during start bit output (1s).	○	○	○	
	556		Data output mask time	0.1s	0s	0.0 to 20.0s		Set the time for not obtaining (mask) transient state data.	○	○	○	
	557		Current average value monitor signal output reference current	0.01/0.1A *	Rated inverter current	0 to 500/0 to 3600A *		Set the reference (100%) for outputting the signal of the current average value. * The increments and setting range differ according to the inverter capacity. (55K or less/75k or more)	○	○	○	
—	563, 564		Refer to Pr. 52.									
—	571		Refer to Pr. 13.									
—	575 to 577		Refer to Pr. 127.									
—	611		Refer to Pr. 57.									
Speed smoothing control	B	653	Speed smoothing control	0.1%	0	—	0 to 200%	Vibration due to mechanical resonance influences the inverter control, causing the output current (torque) unstable. In this case, the output current (torque) fluctuation can be reduced to ease vibration by changing the output frequency.	○	○	○	
—	665		Refer to Pr. 882.									
—	684		Refer to Pr. 82.									
—	811		Refer to Pr. 37.									
—	849		Refer to Pr. 74.									
Function assignment of analog input terminal	858		Terminal 4 function assignment	1	0	0	Frequency command	○	×	○		
						4	Stall prevention command					
						9999	No function					
	868		Terminal 1 function assignment	1	0	0	Frequency setting auxiliary	○	×	○		
						4	Stall prevention command					
						9999	No function					
—	859		Refer to Pr. 82.									

Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Torque detection 	864	Torque detection	0.1%	—	150%	—	0 to 400%	You can make setting to output a signal if the motor torque exceeds the predetermined value.	○	○	○
	865	Refer to Pr. 41.									
—	866	Refer to Pr. 55.									
	867	Refer to Pr. 52.									
	868	Refer to Pr. 858.									
	872	Refer to Pr. 251.									
Fault definition	875	Restart cushion time	1	0	0		At occurrence of any fault, the base circuit is shut off immediately. At this time, the fault output also turns on.	○	○	○	
					1		At occurrence of external thermal operation (OHT), electronic thermal relay function (THM) or PTC thermistor operation (PTC) fault, the motor is decelerated to a stop and inverter trips. At occurrence of trips other than OHT, THM and PTC, the base circuit is shut off immediately. Same operation as when "0" is set is performed under position control.				
Regeneration avoidance function	882	Regeneration avoidance operation selection	1	0	0		Regeneration avoidance function invalid	○	○	○	
					1		Regeneration avoidance function is always valid				
					2		Regeneration avoidance function is valid only at constant speed				
	883	Regeneration avoidance operation level	0.1V	380 / 760VDC*	300 to 800V		Set the bus voltage level at which regeneration avoidance operates. When the bus voltage level is set to low, overvoltage error will be less apt to occur. However, the actual deceleration time increases. The set value must be higher than the power supply voltage $\times \sqrt{2}$ * The initial value differs according to the voltage level. (200V class / 400V class)	○	○	○	
	884	Regeneration avoidance at deceleration detection sensitivity	1	0	0		Regeneration avoidance by bus voltage change ratio is invalid	○	○	○	
					1 to 5		Set sensitivity to detect the bus voltage change. Setting: 1 → 5 Detection sensitivity: Low → High				
885	Regeneration avoidance compensation frequency limit value	0.01Hz	6Hz	0 to 10Hz		Set the limit value of frequency which rises at activation of regeneration avoidance function.	○	○	○		
				9999		Frequency limit invalid					
886	Regeneration avoidance voltage gain	0.1%	100%	0 to 200%		Adjust responsiveness at activation of regeneration avoidance. Setting a larger value in Pr.886 will improve responsiveness to the bus voltage change. However, the output frequency could become unstable.	○	○	○		
	665 Regeneration avoidance frequency gain	0.1%	100%	0 to 200%		When vibration is not suppressed by decreasing the Pr.886 setting, set a smaller value in Pr.665.	○	○	○		



Function	Parameter	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O: enabled ×: disabled							
Free parameter	888	Free parameter 1	1	9999		0 to 9999		Parameters you can use for your own purposes. Used for maintenance, management, etc. by setting a unique number to each inverter when multiple inverters are used.	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
	889	Free parameter 2	1	9999		0 to 9999			<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
—	891	Refer to Pr. 52.									
Energy saving monitor	892	Load factor	0.1%	100%		30 to 150%		Set the load factor for commercial power-supply operation. This value is used to calculate the power consumption estimated value during commercial power supply operation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	893	Energy saving monitor reference (motor capacity)	0.01/0.1kW *	Inverter rated capacity		0.1 to 55/0 to 3600kW *		Set the motor capacity (pump capacity). Set when calculating power saving rate and average power saving rate value. * The increments and setting range differ according to the inverter capacity. (55K or less/75k or more)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	894	Control selection during commercial power-supply operation	1	0	0		Discharge damper control (fan)		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
					1		Inlet damper control (fan)				
					2		Valve control (pump)				
					3		Commercial power-supply drive (fixed value)				
	895	Power saving rate reference value	1	9999	0		Consider the value during commercial power-supply operation as 100%		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
					1		Consider the Pr. 893 setting as 100%.				
					9999		No function				
	896	Power unit cost	0.01	9999	0 to 500		Set the power unit cost. Display the power saving rate on the energy saving monitor		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9999					No function						
897	Power saving monitor average time	1h	9999	0		Average for 30 minutes		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
				1 to 1000h		Average for the set time					
				9999		No function					
898	Power saving cumulative monitor clear	1	9999	0		Cumulative monitor value clear		<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	
				1		Cumulative monitor value hold					
				10		Cumulative monitor continue (communication data upper limit 9999)					
				9999		Cumulative monitor continue (communication data upper limit 65535)					
899	Operation time rate (estimated value)	0.1%	9999	0 to 100%		Use for calculation of annual power saving amount. Set the annual operation ratio (consider 365 days × 24hr as 100%).		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
				9999		No function					
Adjustment of terminal FM and AM	C0 (900)	FM terminal calibration	—	—		—		Calibrate the scale of the meter connected to terminal FM. (Only when Pr. 291 = 0, 1)	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
	C1 (901)	AM terminal calibration	—	—		—		Calibrate the scale of the analog meter connected to terminal AM.	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
—	C2(902) to C7(905)	Refer to Pr. 125 and Pr. 126.									



Function	Parameter Related parameters	Name	Increments	Initial Value		Range		Description	Para meter copy	Para meter clear	All para meter clear
				FR-B	FR-B3	FR-B	FR-B3				
				O : enabled × : disabled							
—	989	Parameter copy alarm release	1	10/100 *		10, 100		Parameters for alarm release at parameter copy * The initial value differs according to the inverter capacity. (55K or less/75k or more)	○	×	○
Buzzer control of the operation panel	990	PU buzzer control	1	1	0		Without buzzer	○	○	○	
					1		With buzzer				
PU contrast adjustment	991	PU contrast adjustment	1	58	0 to 63		Contrast adjustment of the LCD of the parameter unit (FR-PU04/FR-PU07) can be performed. 0 (Light) → 63 (Dark)	○	×	○	
Parameter clear, parameter copy	Pr.CL	Parameter clear	1	0	0, 1		Setting "1" returns all parameters except calibration parameters to the initial values.				
	ALLC	All parameter clear	1	0	0, 1		Setting "1" returns all parameters to the initial values.				
	Er.CL	Faults history clear	1	0	0, 1		Setting "1" will clear eight past faults.				
	PCPY	Parameter copy	1	0	0		Cancel				
					1		Read the source parameters to the operation panel.				
2					Write the parameters copied to the operation panel to the destination inverter.						
				3		Verify parameters in the inverter and operation panel.					

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

4 TROUBLESHOOTING

When a fault occurs in the inverter, the inverter trips and the PU display automatically changes to any of the following fault or alarm indications.

If the fault does not correspond to any of the following faults or if you have any other problem, please contact your sales representative.

- Retention of fault output signal..... When the magnetic contactor (MC) provided on the input side of the inverter is opened when a fault occurs, the inverter's control power will be lost and the fault output will not be held.
- Fault or alarm indication When a fault or alarm occurs, the operation panel display automatically switches to the fault or alarm indication.
- Resetting method When a fault occurs, the inverter output is kept stopped. Unless reset, therefore, the inverter cannot restart. (*Refer to page 104.*)
- When any fault occurs, take the appropriate corrective action, then reset the inverter, and resume operation. Not doing so may lead to the inverter fault and damage.


Inverter fault or alarm indications are roughly divided as below.

- (1) Error Message
A message regarding operational fault and setting fault by the operation panel (FR-DU07) and parameter unit (FR-PU04 /FR-PU07) is displayed. The inverter does not trip.
- (2) Warnings
The inverter does not trip even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.
- (3) Alarm
The inverter does not trip. You can also output an alarm signal by making parameter setting.
- (4) Fault
When a fault occurs, the inverter trips and a fault signal is output.

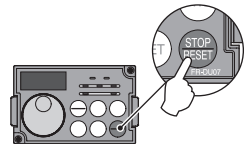
4.1 Reset method of protective function

(1) Resetting the inverter

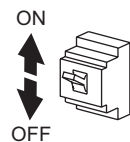
The inverter can be reset by performing any of the following operations. Note that the internal thermal integrated value of the electronic thermal relay function and the number of retries are cleared (erased) by resetting the inverter. Recover about 1s after reset is cancelled.

Operation 1: Using the operation panel, press  to reset the inverter.

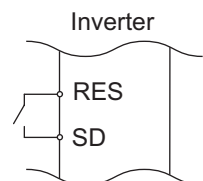
(This may only be performed when a fault occurs (Refer to *page 110* for fault.))



Operation 2:..... Switch OFF the power once, then switch it ON again after the indicator of the operation panel turns OFF.



Operation 3: Turn on the reset signal (RES) for more than 0.1s. (If the RES signal is kept on, "Err." appears (flickers) to indicate that the inverter is in a reset status.)





4.2 List of fault or alarm display

Operation Panel Indication		Name	Refer to		
Error message	E ---	E ---	Faults history	120	
	HOLD	HOLD	Operation panel lock	106	
	Er1 to Er4	Er1 to 4	Parameter write error	106	
	rE1 to rE4	rE1 to 4	Copy operation error	107	
	Err.	Err.	Error	107	
Warnings	OL	OL	Stall prevention (overcurrent)	108	
	oL	oL	Stall prevention (overvoltage)	108	
	rb	RB	Regenerative brake prealarm	109	
	TH	TH	Electronic thermal relay function prealarm	109	
	PS	PS	PU stop	108	
	MT	MT	Maintenance signal output	109	
	CP	CP	Parameter copy	109	
Alarm	Fn	FN	Fan fault	109	
Fault	E.OC1	E.OC1	Overcurrent trip during acceleration	110	
	E.OC2	E.OC2	Overcurrent trip during constant speed	110	
	E.OC3	E.OC3	Overcurrent trip during deceleration or stop	110	
	E.OV1	E.OV1	Regenerative overvoltage trip during acceleration	110	
	E.OV2	E.OV2	Regenerative overvoltage trip during constant speed	111	
	E.OV3	E.OV3	Regenerative overvoltage trip during deceleration or stop	111	
	E.THT	E.THT	Inverter overload trip (electronic thermal relay function)	111	
	E.THM	E.THM	Motor overload trip (electronic thermal relay function)	111	
	E.FIN	E.FIN	Fin overheat	112	
	E.IPF	E.IPF	Instantaneous power failure	112	
	E.bE	E.BE	Brake transistor alarm detection	112	
	E.UVT	E.UVT	Undervoltage	112	
	E.ILF	E.ILF*1	Input phase loss	113	
	E.OLT	E.OLT	Stall prevention	113	
	Fault	E.GF	E.GF	Output side earth (ground) fault overcurrent	113
		E.LF	E.LF	Output phase loss	113
		E.OHT	E.OHT	External thermal relay operation *2	113
E.PTC		E.PTC*1	PTC thermistor operation	114	
E.OPT		E.OPT	Option fault	114	
E.OP3		E.OP3	Communication option fault	114	
E. 1 to E. 3		E. 1 to E. 3	Option fault	114	
E. PE		E.PE	Parameter storage device fault	115	
E.PUE		E.PUE	PU disconnection	115	
E.RET		E.RET	Retry count excess	115	
E.PE2		E.PE2*1	Parameter storage device fault	115	
E. 6 / E. 7 / E.CPU		E. 6 / E. 7 / E.CPU	CPU fault	115	
E.CTE		E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	116	
E.P24		E.P24	24VDC power output short circuit	117	
E.CDO		E.CDO*1	Output current detection value exceeded	117	
E.IOH		E.IOH*1	Inrush current limit circuit fault	117	
E.SER		E.SER*1	Communication fault (inverter)	117	
E.AIE	E.AIE*1	Analog input fault	117		
E.EP	E.EP*2	Encoder phase error	117		
E.MB1 to E.MB7	E.MB1 to E.MB7	Brake sequence fault	116		
E.OS	E.OS	Overspeed occurrence	116		
E.ECT	E.ECT	Signal loss detection	116		
E.USB	E.USB*1	USB communication fault	118		
E. 13	E.13	Internal circuit fault	118		

*1 If an error occurs when using the FR-PU04, "Fault 14" is displayed on the FR-PU04.



*2 Appears only for the FR-B3 series.






4.3 Causes and corrective actions


(1) Error Message


A message regarding operational troubles is displayed. Output is not shut off.

Operation Panel Indication	HOLD	HOLD
Name	Operation panel lock	
Description	Operation lock mode is set. Operation other than  is made invalid. (Refer to page 43.)	
Check point	—	
Corrective action	Press  for 2s to release lock.	

Operation Panel Indication	Er1	Er1
Name	Write disable error	
Description	<ol style="list-style-type: none"> 1. You attempted to make parameter setting when Pr. 77 Parameter write selection has been set to disable parameter write. 2. Frequency jump setting range overlapped. 3. Adjustable 5 points V/F settings overlapped 4. The PU and inverter cannot make normal communication 	
Check point	<ol style="list-style-type: none"> 1. Check the setting of Pr. 77 Parameter write selection (Refer to the chapter 4 of  the Instruction Manual (applied).) 2. Check the settings of Pr. 31 to 36 (frequency jump). (Refer to the chapter 4 of  the Instruction Manual (applied).) 3. Check the connection of the PU and inverter. 	

Operation Panel Indication	Er2	Er2
Name	Write error during operation	
Description	When parameter write was performed during operation with a value other than "2" (writing is enabled independently of operating status in any operation mode) is set in Pr. 77 and the STF (STR) is on.	
Check point	<ol style="list-style-type: none"> 1. Check the Pr. 77 setting. (Refer to the chapter 4 of  the Instruction Manual (applied).) 2. Check that the inverter is not operating. 	
Corrective action	<ol style="list-style-type: none"> 1. Set "2" in Pr. 77. 2. After stopping operation, make parameter setting. 	


Operation Panel Indication	Er3	Er3
Name	Calibration error	
Description	Analog input bias and gain calibration values are too close.	
Check point	Check the settings of C3, C4, C6 and C7 (calibration functions). (Refer to the chapter 4 of  the Instruction Manual (applied).)	

Operation Panel Indication	Er4	Er4
Name	Mode designation error	
Description	You attempted to make parameter setting in the NET operation mode when Pr. 77 is not "2".	
Check point	<ol style="list-style-type: none"> 1. Check that operation mode is "PU operation mode". 2. Check the Pr. 77 setting. (Refer to the chapter 4 of  the Instruction Manual (applied).) 	
Corrective action	<ol style="list-style-type: none"> 1. After setting the operation mode to the "PU operation mode", make parameter setting. (Refer to page 53.) 2. After setting "2" in Pr. 77, make parameter setting. 	



Operation Panel Indication	rE1	rE1
Name	Parameter read error	
Description	An error occurred in the EEPROM on the operation panel side during parameter copy reading.	
Check point	—	
Corrective action	<ul style="list-style-type: none"> · Make parameter copy again. (Refer to page 47.) · Check for an operation panel (FR-DU07) failure. Please contact your sales representative. 	

Operation Panel Indication	rE2	rE2
Name	Parameter write error	
Description	<ol style="list-style-type: none"> 1. You attempted to perform parameter copy write during operation. 2. An error occurred in the EEPROM on the operation panel side during parameter copy writing. 	
Check point	Is the FWD or REV LED of the operation panel (FR-DU07) lit or flickering?	
Corrective action	<ol style="list-style-type: none"> 1. After stopping operation, make parameter copy again. (Refer to page 47.) 2. Check for an operation panel (FR-DU07) failure. Please contact your sales representative. 	

Operation Panel Indication	rE3	rE3
Name	Parameter verification error	
Description	<ol style="list-style-type: none"> 1. Data on the operation panel side and inverter side are different. 2. An error occurred in the EEPROM on the operation panel side during parameter verification. 	
Check point	Check for the parameter setting of the source inverter and inverter to be verified.	
Corrective action	<ol style="list-style-type: none"> 1. Press  to continue verification. Make parameter verification again. (Refer to page 40.) 2. Check for an operation panel (FR-DU07) failure. Please contact your sales representative. 	

Operation Panel Indication	rE4	rE4
Name	Model error	
Description	<ol style="list-style-type: none"> 1. A different model was used for parameter write and verification during parameter copy. 2. When parameter copy write is stopped after parameter copy read is stopped 	
Check point	<ol style="list-style-type: none"> 1. Check that the verified inverter is the same model. 2. Check that the power is not turned off or an operation panel is not disconnected, etc. during parameter copy read. 	
Corrective action	<ol style="list-style-type: none"> 1. Use the same model (FR-B, B3 series(A700 specifications)) for parameter copy and verification. 2. Perform parameter copy read again. 	

Operation Panel Indication	Err.	Err.
Description	<ol style="list-style-type: none"> 1. The RES signal is on 2. The PU and inverter cannot make normal communication (contact fault of the connector) 3. When the voltage drops in the inverter's primary side. 4. When the control circuit power (R1/L11, S1/L21) and the main circuit power (R/L1, S/L2, T/L3) are connected to a separate power, it may appear at turning on of the main circuit. It is not a fault. 	
Corrective action	<ol style="list-style-type: none"> 1. Turn off the RES signal. 2. Check the connection of the PU and inverter. 3. Check the voltage on the inverter's primary side. 	




(2) Warnings


When the protective function is activated, the output is not shut off.


Operation Panel Indication	OL		FR-PU04 FR-PU07	OL
Name	Stall prevention (overcurrent)			
Description	During acceleration	When the output current of the inverter exceeds the stall prevention operation level (<i>Pr. 22 Stall prevention operation level</i> , etc.), this function stops the increase in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency again.		
	During constant-speed operation	When the output current of the inverter exceeds the stall prevention operation level (<i>Pr. 22 Stall prevention operation level</i> , etc.), this function reduces frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency up to the set value.		
	During deceleration	When the output current of the inverter exceeds the stall prevention operation level (<i>Pr. 22 Stall prevention operation level</i> , etc.), this function stops the decrease in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function decreases the frequency again.		
Check point	<ol style="list-style-type: none"> 1. Check that the <i>Pr. 7 Acceleration time</i> and <i>Pr. 8 Deceleration time</i> settings are not too small. 2. Check that the load is not too heavy. 3. Are there any failure in peripheral devices? 4. Check that the <i>Pr. 13 Starting frequency</i> is not too large. <ul style="list-style-type: none"> · Check the motor for use under overload. 5. Check that the <i>Pr. 22 Stall prevention operation level</i> is appropriate. 			
Corrective action	<ol style="list-style-type: none"> 1. Set a larger value in <i>Pr. 7 Acceleration time</i> and <i>Pr. 8 Deceleration time</i>. (Refer to page 52.) 2. Reduce the load weight. 3. Set stall prevention operation current in <i>Pr. 22 Stall prevention operation level</i>. (The initial value is 150%.) The acceleration/deceleration time may change. Increase the stall prevention operation level with <i>Pr. 22 Stall prevention operation level</i>, or disable stall prevention with <i>Pr. 156 Stall prevention operation selection</i>. (Use <i>Pr. 156</i> to set either operation continued or not at OL operation.) 			

Operation Panel Indication	oL		FR-PU04 FR-PU07	oL
Name	Stall prevention (overvoltage)			
Description	During deceleration	<ul style="list-style-type: none"> · If the regenerative energy of the motor becomes excessive and exceeds the regenerative energy consumption capability, this function stops the decrease in frequency to prevent overvoltage trip. As soon as the regenerative energy has decreased, deceleration resumes. · If the regenerative energy of the motor becomes excessive when regeneration avoidance function is selected (<i>Pr. 882 = 1</i>), this function increases the speed to prevent overvoltage trip. (Refer to the chapter 4 of the Instruction Manual (applied).) 		
		<ul style="list-style-type: none"> · Check for sudden speed reduction. · Regeneration avoidance function (<i>Pr. 882 to Pr. 886</i>) is being used? (Refer to the chapter 4 of the Instruction Manual (applied).) 		
Check point				
Corrective action	The deceleration time may change. Increase the deceleration time using <i>Pr. 8 Deceleration time</i> .			

Operation Panel Indication	PS		FR-PU04 FR-PU07	PS
Name	PU stop			
Description	Stop with of the PU is set in <i>Pr. 75 Reset selection/disconnected PU detection/PU stop selection</i> . (For <i>Pr. 75</i> , refer to the chapter 4 of the Instruction Manual (applied).)			
Check point	Check for a stop made by pressing of the operation panel.			
Corrective action	Turn the start signal off and release with .			


Operation Panel Indication	RB	<i>rb</i>	FR-PU04 FR-PU07	RB
Name	Regenerative brake prealarm			
Description	Appears if the regenerative brake duty reaches or exceeds 85% of the <i>Pr. 70 Special regenerative brake duty</i> value. When the setting of <i>Pr. 70 Special regenerative brake duty</i> is the initial value (<i>Pr. 70 = "0"</i>), this warning does not occur. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs. The RBP signal can be simultaneously output with the [RB] display. For the terminal used for the RBP signal output, assign the function by setting "7" (positive logic) or "107" (negative logic) in any of <i>Pr. 190 to Pr. 196 (output terminal function selection)</i> . (Refer to the chapter 4 of  the Instruction Manual (applied))			
Check point	<ul style="list-style-type: none"> • Check that the brake resistor duty is not high. • Check that the <i>Pr. 30 Regenerative function selection</i> and <i>Pr. 70 Special regenerative brake duty</i> values are correct. 			
Corrective action	<ul style="list-style-type: none"> • Increase the deceleration time. • Check the <i>Pr. 30 Regenerative function selection</i> and <i>Pr. 70 Special regenerative brake duty</i> values. 			

Operation Panel Indication	TH	<i>TH</i>	FR-PU04 FR-PU07	TH
Name	Electronic thermal relay function prealarm			
Description	Appears if the cumulative value of the <i>Pr. 9 Electronic thermal O/L relay</i> reaches or exceeds 85% of the preset level. If it reaches 100% of the <i>Pr. 9 Electronic thermal O/L relay</i> setting, a motor overload trip (E. THM) occurs. The THP signal can be simultaneously output with the [TH] display. For the terminal used for the THP signal output, assign the function by setting "8" (positive logic) or "108" (negative logic) in any of <i>Pr. 190 to Pr. 196 (output terminal function selection)</i> . (Refer to the chapter 4 of  the Instruction Manual (applied))			
Check point	<ol style="list-style-type: none"> 1. Check for large load or sudden acceleration. 2. Is the <i>Pr. 9 Electronic thermal O/L relay</i> setting is appropriate? (Refer to page 50.) 			
Corrective action	<ol style="list-style-type: none"> 1. Reduce the load weight or the number of operation times. 2. Set an appropriate value in <i>Pr. 9 Electronic thermal O/L relay</i>. (Refer to page 50.) 			

Operation Panel Indication	MT	<i>MT</i>	FR-PU04 FR-PU07	MT
Name	Maintenance signal output			
Description	Indicates that the cumulative energization time of the inverter has reached a given time. When the setting of <i>Pr. 504 Maintenance timer alarm output set time</i> is the initial value (<i>Pr. 504 = "9999"</i>), this warning does not occur.			
Check point	The <i>Pr. 503 Maintenance timer</i> setting is larger than the <i>Pr. 504 Maintenance timer alarm output set time</i> setting. (Refer to the chapter 4 of  the Instruction Manual (applied).)			
Corrective action	Setting "0" in <i>Pr. 503 Maintenance timer</i> erases the signal.			

Operation Panel Indication	CP	<i>CP</i>	FR-PU04 FR-PU07	CP
Name	Parameter copy			
Description	Appears when parameters are copied between models with capacities of 55K or less and 75K or more.			
Check point	Resetting of <i>Pr.9, Pr.30, Pr.52, Pr.54, Pr.56, Pr.57, Pr.61, Pr.70, Pr.72, Pr.158, Pr.557</i> and <i>Pr.893</i> is necessary.			
Corrective action	Set the initial value in <i>Pr. 989 Parameter copy alarm release</i> .			

(3) Alarm

When an alarm occurs, the output is not shut off. You can also output an alarm signal by making parameter setting. (Set "98" in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. (Refer to the chapter 4 of  the Instruction Manual (applied).))

Operation Panel Indication	FN	<i>Fn</i>	FR-PU04 FR-PU07	FN
Name	Fan fault			
Description	For the inverter that contains a cooling fan, <i>Fn</i> appears on the operation panel when the cooling fan stops due to a fault or different operation from the setting of <i>Pr. 244 Cooling fan operation selection</i> .			
Check point	Check the cooling fan for a fault.			
Corrective action	Check for fan fault. Please contact your sales representative.			



(4) Fault


When a fault occurs, the inverter trips and a fault signal is output.


Operation Panel Indication	E.OC1	E.OC1	FR-PU04 FR-PU07	OC During Acc
Name	Overcurrent trip during acceleration			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during acceleration, the protective circuit is activated to stop the inverter output.			
Check point	<ol style="list-style-type: none"> 1. Check for sudden acceleration. 2. Check that the downward acceleration time is not long in vertical lift application. 3. Check for output short circuit. 4. Check that stall prevention operation is correct. 5. Check that the regeneration is not performed frequently. (Check that the output voltage becomes larger than the V/F reference voltage at regeneration and overcurrent due to increase in motor current occurs.) 			
Corrective action	<ol style="list-style-type: none"> 1. Increase the acceleration time. (Shorten the downward acceleration time in vertical lift application.) 2. When "E.OC1" is always lit at starting, disconnect the motor once and start the inverter. If "E.OC1" is still lit, contact your sales representative. 3. Check the wiring to make sure that output short circuit does not occur. 4. Perform a correct stall prevention operation. (Refer to the chapter 4 of the Instruction Manual (applied).) 			

Operation Panel Indication	E.OC2	E.OC2	FR-PU04 FR-PU07	Stedy Spd OC
Name	Overcurrent trip during constant speed			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during constant speed operation, the protective circuit is activated to stop the inverter output.			
Check point	<ol style="list-style-type: none"> 1. Check for sudden load change. 2. Check for output short circuit. 3. Check that stall prevention operation is correct 			
Corrective action	<ol style="list-style-type: none"> 1. Keep load stable. 2. Check the wiring to avoid output short circuit. 3. Check that stall prevention operation setting is correct. (Refer to the chapter 4 of the Instruction Manual (applied).) 			


Operation Panel Indication	E.OC3	E.OC3	FR-PU04 FR-PU07	OC During Dec
Name	Overcurrent trip during deceleration or stop			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated inverter current during deceleration (other than acceleration or constant speed), the protective circuit is activated to stop the inverter output.			
Check point	<ol style="list-style-type: none"> 1. Check for sudden speed reduction. 2. Check for output short circuit. 3. Check for too fast operation of the motor's mechanical brake. 4. Check that stall prevention operation setting is correct. 			
Corrective action	<ol style="list-style-type: none"> 1. Increase the deceleration time. 2. Check the wiring to avoid output short circuit. 3. Check the mechanical brake operation. 4. Check that stall prevention operation setting is correct. (Refer to the chapter 4 of the Instruction Manual (applied).) 			

Operation Panel Indication	E.OV1	E.OV1	FR-PU04 FR-PU07	OV During Acc
Name	Regenerative overvoltage trip during acceleration			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	<ul style="list-style-type: none"> · Check for too slow acceleration. (e.g. during descending acceleration with lifting load) · Check that the Pr. 22 Stall prevention operation level is not lower than the no load current. 			
Corrective action	<ul style="list-style-type: none"> · Decrease the acceleration time. · Use regeneration avoidance function (Pr. 882 to Pr. 886). (Refer to Instruction Manual (applied).) · Set a value larger than the no load current in Pr. 22 Stall prevention operation level. 			

Operation Panel Indication	E.OV2	<i>E.OV2</i>	FR-PU04 FR-PU07	Stedy Spd OV
Name	Regenerative overvoltage trip during constant speed			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	<ul style="list-style-type: none"> Check for sudden load change. Check that the <i>Pr. 22 Stall prevention operation level</i> is not lower than the no load current. 			
Corrective action	<ul style="list-style-type: none"> Keep load stable. Use regeneration avoidance function (<i>Pr. 882 to Pr. 886</i>). (Refer to the chapter 4 of  the Instruction Manual (applied).) Use the regeneration unit as required. When using the regeneration unit with 55kW or less, another explosion-proof test is necessary. Set a value larger than the no load current in <i>Pr. 22 Stall prevention operation level</i>. 			

Operation Panel Indication	E.OV3	<i>E.OV3</i>	FR-PU04 FR-PU07	OV During Dec
Name	Regenerative overvoltage trip during deceleration or stop			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	Check for sudden speed reduction.			
Corrective action	<ul style="list-style-type: none"> Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) Decrease the braking duty. Use regeneration avoidance function (<i>Pr. 882 to Pr. 886</i>). (Refer to the chapter 4 of  the Instruction Manual (applied).) Use the regeneration unit as required. When using the regeneration unit with 55kW or less, another explosion-proof test is necessary. 			

Operation Panel Indication	E.THT	<i>E.THT</i>	FR-PU04 FR-PU07	Inv. Overload
Name	Inverter overload trip (electronic thermal relay function) *1			
Description	If a current not less than 150% of the rated output current flows and overcurrent trip does not occur (220% or less), the electronic thermal relay activate to stop the inverter output in order to protect the output transistors. (Overload capacity 150% 60s inverse-time characteristic)			
Check point	<ol style="list-style-type: none"> Check that acceleration/deceleration time is not too short. Check the motor for use under overload. 			
Corrective action	<ol style="list-style-type: none"> Increase acceleration/deceleration time. Reduce the load weight. 			

Operation Panel Indication	E.THM	<i>E.THM</i>	FR-PU04 FR-PU07	Motor Ovrload
Name	Motor overload trip (electronic thermal relay function) *1			
Description	The electronic thermal relay function in the inverter detects motor overheat due to overload or reduced cooling capability during constant-speed operation and pre-alarm (TH display) is output when the I^2t value reaches 85% of the <i>Pr. 9 Electronic thermal O/L relay</i> setting and the protection circuit is activated to stop the inverter output when the I^2t value reaches the specified value. When running a special motor such as a multi-pole motor, provide a thermal relay on the inverter output side since such motor(s) cannot be protected by the electronic thermal relay function.			
Check point	<ol style="list-style-type: none"> Check the motor for use under overload. Check that stall prevention operation setting is correct. 			
Corrective action	<ol style="list-style-type: none"> Reduce the load weight. For a constant-torque motor, set the constant-torque motor in <i>Pr. 71 Applied motor</i>. Check that stall prevention operation setting is correct. (Refer to the chapter 4 of  the Instruction Manual (applied).) 			

*1 Resetting the inverter initializes the internal thermal integrated data of the electronic thermal relay function.



Operation Panel Indication	E.FIN	E.FIN	FR-PU04 FR-PU07	H/Sink O/Temp
Name	Fin overheat			
Description	If the heatsink overheats, the temperature sensor is actuated to stop the inverter output. The FIN signal can be output when the temperature becomes approximately 85% of the heatsink overheat protection operation temperature. For the terminal used for the FIN signal output, assign the function by setting "26" (positive logic) or "126" (negative logic) in any of Pr. 190 to Pr. 196 (output terminal function selection). (Refer to the chapter 4 of the Instruction Manual (applied))			
Check point	1. Check for too high surrounding air temperature. 2. Check for heatsink clogging. 3. Check that the cooling fan is stopped. (Check that F_n is displayed on the operation panel.)			
Corrective action	1. Set the surrounding air temperature to within the specifications. 2. Clean the heatsink. 3. Replace the cooling fan.			

Operation Panel Indication	E.IPF	E.IPF	FR-PU04 FR-PU07	Inst. Pwr. Loss
Name	Instantaneous power failure			
Description	If a power failure occurs for longer than 15ms (this also applies to inverter input shut-off), the instantaneous power failure protective function is activated to trip the inverter in order to prevent the control circuit from malfunctioning. If a power failure persists for longer than 100ms, the fault output is not provided, and the inverter restarts if the start signal is on upon power restoration. (The inverter continues operating if an instantaneous power failure is within 15ms.) In some operating status (load magnitude, acceleration/ deceleration time setting, etc.), overcurrent or other protection may be activated upon power restoration. When instantaneous power failure protection is activated, the IPF signal is output. (Refer to the chapter 4 of the Instruction Manual (applied))			
Check point	Find the cause of instantaneous power failure occurrence.			
Corrective action	<ul style="list-style-type: none"> · Remedy the instantaneous power failure. · Prepare a backup power supply for instantaneous power failure. · Set the function of automatic restart after instantaneous power failure (Pr. 57). (Refer to the chapter 4 of the Instruction Manual (applied).) 			

Operation Panel Indication	E.BE	E. bE	FR-PU04 FR-PU07	Br. Cct. Fault
Name	Brake transistor alarm detection Appears only for the 75K or more.			
Description	This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. <u>In this case, the inverter must be powered off immediately.</u>			
Check point	<ul style="list-style-type: none"> · Reduce the load inertia. · Check that the frequency of using the brake is proper. 			
Corrective action	Replace the inverter.			

Operation Panel Indication	E.UVT	E.UVT	FR-PU04 FR-PU07	Under Voltage
Name	Undervoltage			
Description	If the power supply voltage of the inverter decreases, the control circuit will not perform normal functions. In addition, the motor torque will be insufficient and/or heat generation will increase. To prevent this, if the power supply voltage decreases below about 150VAC (300VAC for the 400V class), this function stops the inverter output. When a jumper is not connected across P/+-P1, the undervoltage protective function is activated. When undervoltage protection is activated, the IPF signal is output. (Refer to the chapter 4 of the Instruction Manual (applied))			
Check point	1. Check for start of large-capacity motor. 2. Check that a jumper or DC reactor is connected across terminals P/+-P1.			
Corrective action	1. Check the power supply system equipment such as the power supply. 2. Connect a jumper or DC reactor across terminals P/+-P1. If the problem still persists after taking the above measure, please contact your sales representative.			



Operation Panel Indication	E.I.LF	E I L F	FR-PU04 FR-PU07	Fault 14 Input phase loss
Name	Input phase loss			
Description	Inverter trips when function valid setting (=1) is selected in Pr. 872 <i>Input phase loss protection selection</i> and one phase of the three phase power input is lost. When the setting of Pr. 872 <i>Input phase loss protection selection</i> is the initial value (Pr. 872 ="0"), this warning does not occur. (Refer to the chapter 4 of the Instruction Manual (applied).)			
Check point	Check for a break in the cable for the three-phase power supply input.			
Corrective action	<ul style="list-style-type: none"> · Wire the cables properly. · Repair a break portion in the cable. · Check the Pr. 872 <i>Input phase loss protection selection</i> setting. 			

Operation Panel Indication	E.OLT	E.O L F	FR-PU04 FR-PU07	Still Prev STP (OL shown during stall prevention operation)
Name	Stall prevention			
Description	If the frequency has fallen to 0.5Hz by stall prevention operation and remains for 3s, a fault (E.OLT) appears and trips the inverter. OL appears while stall prevention is being activated.			
Check point	<ul style="list-style-type: none"> · Check the motor for use under overload. (Refer to the chapter 4 of the Instruction Manual (applied).) · Check that the Pr. 865 <i>Low speed detection</i> values are correct. (Check the Pr. 22 <i>Stall prevention operation level</i> setting if V/F control is exercised.) 			
Corrective action	<ul style="list-style-type: none"> · Reduce the load weight. · Change the Pr. 22 <i>Stall prevention operation level</i>, Pr. 865 <i>Low speed detection</i> values. (Check the Pr. 22 <i>Stall prevention operation level</i> setting if V/F control is exercised.) 			

Operation Panel Indication	E.GF	E. O F	FR-PU04 FR-PU07	Ground Fault
Name	Output side earth (ground) fault overcurrent			
Description	This function stops the inverter output if an earth (ground) fault overcurrent flows due to an earth (ground) fault that occurred on the inverter's output (load) side.			
Check point	Check for an earth (ground) fault in the motor and connection cable.			
Corrective action	Remedy the earth (ground) fault portion.			

Operation Panel Indication	E.LF	E. L F	FR-PU04 FR-PU07	E. LF
Name	Output phase loss			
Description	This function stops the inverter output if one of the three phases (U, V, W) on the inverter's output side (load side) is lost.			
Check point	<ul style="list-style-type: none"> · Check the wiring (Check that the motor is normal.) · Check that the capacity of the motor used is not smaller than that of the inverter. 			
Corrective action	<ul style="list-style-type: none"> · Wire the cables properly. · Check the Pr. 251 <i>Output phase loss protection selection</i> setting. 			

Operation Panel Indication	E.OHT	E.O H F	FR-PU04 FR-PU07	OH Fault
Name	External thermal relay operation			
Description	If the external thermal relay provided for motor overheat protection, or the internally mounted temperature relay in the motor, etc. switches on (contacts open), the inverter output is stopped. Functions when "7" (OH signal) is set in any of Pr. 178 to Pr. 189 (<i>input terminal function selection</i>). When the initial value (without OH signal assigned) is set, this protective function does not function.			
Check point	<ul style="list-style-type: none"> · Check for motor overheating. · Check that the value of 7 (OH signal) is set correctly in any of Pr. 178 to Pr. 189 (<i>input terminal function selection</i>). 			
Corrective action	<ul style="list-style-type: none"> · Reduce the load and operating duty. · Even if the relay contacts are reset automatically, the inverter will not restart unless it is reset. 			



Operation Panel Indication	E.PTC	E.PTC	FR-PU04 FR-PU07	Fault 14 PTC activated
Name	PTC thermistor operation			
Description	Stops the inverter output when the motor overheat status is detected for 10s or more by the external PTC thermistor input connected to the terminal AU. This fault functions when "63" is set in <i>Pr. 184 AU terminal function selection</i> and AU/PTC switchover switch is set in PTC side. When the initial value (<i>Pr. 184 = "4"</i>) is set, this protective function does not function.			
Check point	<ul style="list-style-type: none"> · Check the connection between the PTC thermistor switch and thermal protector. · Check the motor for operation under overload. · Is valid setting (= 63) selected in <i>Pr. 184 AU terminal function selection</i>? (Refer to the chapter 4 of the <i>Instruction Manual (applied)</i>.) 			
Corrective action	Reduce the load weight.			

Operation Panel Indication	E.OPT	E.OPT	FR-PU04 FR-PU07	Option Fault
Name	Option fault			
Description	Appears when the AC power supply is connected to the terminal R/L1, S/L2, T/L3 accidentally when a high power factor converter is connected. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	<ul style="list-style-type: none"> · Check that the AC power supply is not connected to the terminal R/L1, S/L2, T/L3 when a high power factor converter (MT-HC) is connected. 			
Corrective action	<ul style="list-style-type: none"> · Check the parameter (<i>Pr. 30</i>) setting and wiring. · The inverter may be damaged if the AC power supply is connected to the terminal R/L1, S/L2, T/L3 when a high power factor converter is connected. Please contact your sales representative. · Check for connection of the plug-in option. · Return the switch for the manufacturer setting of the plug-in option to the initial status. (Refer to <i>instruction manual of each option</i>) 			

Operation Panel Indication	E.OP3	E.OP3	FR-PU04 FR-PU07	Option 3 Fault
Name	Communication option fault			
Description	Stops the inverter output when a communication line error occurs in the communication option.			
Check point	<ul style="list-style-type: none"> · Check for a wrong option function setting and operation. · Check that the plug-in option is plugged into the connector securely. · Check for a break in the communication cable. · Check that the terminating resistor is fitted properly. 			
Corrective action	<ul style="list-style-type: none"> · Check the option function setting, etc. · Connect the plug-in option securely. · Check the connection of communication cable. 			

Operation Panel Indication	E. 1 to E. 3	E. 1 to E. 3	FR-PU04 FR-PU07	Fault 1 to Fault 3
Name	Option fault			
Description	Stops the inverter output if a contact fault or the like of the connector between the inverter and communication option occurs or if a communication option is fitted to the connector 1 or 2. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	<ol style="list-style-type: none"> 1. Check that the plug-in option is plugged into the connector securely. (1 to 3 indicate the option connector numbers.) 2. Check for excess electrical noises around the inverter. 3. Check that the communication option is not fitted to the connector 1 or 2. 			
Corrective action	<ol style="list-style-type: none"> 1. Connect the plug-in option securely. 2. Take measures against noises if there are devices producing excess electrical noises around the inverter. If the problem still persists after taking the above measure, please contact your sales representative or distributor. 3. Fit the communication option to the connector 3. 4. Return the switch position for the manufacturer setting of the plug-in option to the initial status. (Refer to <i>instruction manual of each option</i>) 			



Operation Panel Indication	E.PE	E. PE	FR-PU04 FR-PU07	Corrupt Memry
Name	Parameter storage device fault (control circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	Check for too many number of parameter write times.			
Corrective action	Please contact your sales representative. When performing parameter write frequently for communication purposes, set "1" in <i>Pr. 342</i> to enable RAM write. Note that powering off returns the inverter to the status before RAM write.			

Operation Panel Indication	E.PE2	E.PE2	FR-PU04 FR-PU07	Fault 14 PR storage alarm
Name	Parameter storage device fault (main circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	—			
Corrective action	Please contact your sales representative.			

Operation Panel Indication	E.PUE	E.PUE	FR-PU04 FR-PU07	PU Leave Out
Name	PU disconnection			
Description	<ul style="list-style-type: none"> This function stops the inverter output if communication between the inverter and PU is suspended, e.g. the operation panel and parameter unit is disconnected, when "2", "3", "16" or "17" was set in <i>Pr. 75 Reset selection/disconnected PU detection/PU stop selection</i>. This function stops the inverter output when communication errors occurred consecutively for more than permissible number of retries when a value other than "9999" is set in <i>Pr. 121 Number of PU communication retries</i> during the RS-485 communication with the PU connector. This function stops the inverter output if communication is broken within the period of time set in <i>Pr. 122 PU communication check time interval</i> during the RS-485 communication with the PU connector. 			
Check point	<ul style="list-style-type: none"> Check that the FR-DU07 or parameter unit (FR-PU04/FR-PU07) is fitted tightly. Check the <i>Pr. 75</i> setting. 			
Corrective action	Fit the FR-DU07 or parameter unit (FR-PU04/FR-PU07) securely.			

Operation Panel Indication	E.RET	E.rEr	FR-PU04 FR-PU07	Retry No Over
Name	Retry count excess			
Description	If operation cannot be resumed properly within the number of retries set, this function trips the inverter. Functions only when <i>Pr. 67 Number of retries at fault occurrence</i> is set. When the initial value (<i>Pr. 67 = "0"</i>) is set, this protective function does not function.			
Check point	Find the cause of alarm occurrence.			
Corrective action	Eliminate the cause of the error preceding this error indication.			

Operation Panel Indication	E. 5	E. 5	FR-PU04 FR-PU07	Fault 5
	E. 6	E. 6		Fault 6
	E. 7	E. 7		Fault 7
	E.CPU	E.CPU		CPU Fault
Name	CPU fault			
Description	Stops the inverter output if the communication error of the built-in CPU occurs.			
Check point	Check for devices producing excess electrical noises around the inverter.			
Corrective action	<ul style="list-style-type: none"> Take measures against noises if there are devices producing excess electrical noises around the inverter. Please contact your sales representative. 			



Operation Panel Indication	E.CTE	ECTE	FR-PU04	—
			FR-PU07	E.CTE
Name	Operation panel power supply short circuit, RS-485 terminal power supply short circuit			
Description	When the operation panel power supply (PU connector) is shorted, this function shuts off power output and stops the inverter output. At this time, the operation panel (parameter unit) cannot be used and RS-485 communication from the PU connector cannot be made. When the internal power supply for the RS-485 terminals are shorted, this function shuts off the power output. At this time, communication from the RS-485 terminals cannot be made. To reset, enter the RES signal or switch power off, then on again.			
Check point	1. Check for a short circuit in the PU connector cable. 2. Check that the RS-485 terminals are connected correctly.			
Corrective action	1. Check the PU and cable. 2. Check the connection of the RS-485 terminals			


Operation Panel Indication	E.MB1 to 7	E.MB1 to E.MB7	FR-PU04	—
			FR-PU07	E.MB1 Fault to E.MB7 Fault
Name	Brake sequence fault			
Description	The inverter output is stopped when a sequence error occurs during use of the brake sequence function (Pr. 278 to Pr. 285). This protective function does not function in the initial status (brake sequence function is invalid). (Refer to the chapter 4 of the Instruction Manual (applied))			
Check point	Find the cause of alarm occurrence.			
Corrective action	Check the set parameters and perform wiring properly.			

Operation Panel Indication	E.OS	EOS	FR-PU04	E. OS
			FR-PU07	
Name	Overspeed occurrence			
Description	Stops the inverter output when the motor speed exceeds the Pr. 374 Overspeed detection level during encoder feedback control. This protective function does not function in the initial status.			
Check point	<ul style="list-style-type: none"> · Check that the Pr. 374 Overspeed detection level value is correct. · Check that the number of encoder pulses does not differ from the actual number of encoder pulses. 			
Corrective action	<ul style="list-style-type: none"> · Set the Pr. 374 Overspeed detection level value correctly. · Set the correct number of encoder pulses in Pr. 369 Number of encoder pulses. 			

Operation Panel Indication	E.ECT	E.ECT	FR-PU04	E. ECT
			FR-PU07	
Name	Signal loss detection			
Description	Trips the inverter output when the encoder signal is shut off under orientation control, encoder feedback control. This protective function does not function in the initial status.			
Check point	<ul style="list-style-type: none"> · Check for the encoder signal loss. · Check that the encoder specifications are correct. · Check for a loose connector. · Check that the switch setting of the FR-A7AP is correct. · Check that the power is supplied to the encoder. Or, check that the power is not supplied to the encoder later than the inverter. 			
Corrective action	<ul style="list-style-type: none"> · Remedy the signal loss. · Use an encoder that meets the specifications. · Make connection securely. · Make a switch setting of the FR-A7AP correctly. · Supply the power to the encoder. Or supply the power to the encoder at the same time when the power is supplied to the inverter. <p>If the power is supplied to the encoder after the inverter, check that the encoder signal is securely sent and set "0" in Pr. 376.</p>			


Operation Panel Indication	E.EP	EEP	FR-PU04	Fault 14
			FR-PU07	E.EP
Name	Encoder phase error			
Description	Stops the inverter output when the rotation command of the inverter differs from the actual motor rotation direction detected from the encoder. This protective function does not function in the initial status.			
Check point	<ul style="list-style-type: none"> Check for mis-wiring of the encoder cable. Check for wrong setting of <i>Pr. 359 Encoder rotation direction</i>. 			
Corrective action	<ul style="list-style-type: none"> Perform connection and wiring securely. Change the <i>Pr. 359 Encoder rotation direction</i> value. 			

Operation Panel Indication	E.P24	EP24	FR-PU04	E.P24
			FR-PU07	
Name	24VDC power output short circuit			
Description	When the 24VDC power output from the PC terminal is shorted, this function shuts off the power output. At this time, all external contact inputs switch off. The inverter cannot be reset by entering the RES signal. To reset it, use the operation panel or switch power off, then on again.			
Check point	<ul style="list-style-type: none"> Check for a short circuit in the PC terminal output. 			
Corrective action	<ul style="list-style-type: none"> Remedy the earth (ground) fault portion. 			

Operation Panel Indication	E.CDO	ECDO	FR-PU04	Fault 14
			FR-PU07	OC detect level
Name	Output current detection value exceeded			
Description	Stops the inverter output when the output current exceeds the setting of <i>Pr. 150 Output current detection level</i> . Functions when <i>Pr. 167 Output current detection operation selection</i> is set to "1". When the initial value (<i>Pr. 167</i> = "0") is set, this protective function does not function.			
Check point	Check the settings of <i>Pr. 150 Output current detection level</i> , <i>Pr. 151 Output current detection signal delay time</i> , <i>Pr. 166 Output current detection signal retention time</i> , <i>Pr. 167 Output current detection operation selection</i> . (Refer to  <i>Instruction Manual (applied)</i> .)			

Operation Panel Indication	E.IOH	EIOH	FR-PU04	Fault 14
			FR-PU07	Inrush overheat
Name	Inrush current limit circuit fault			
Description	Stops the inverter output when the resistor of inrush current limit circuit overheated. The inrush current limit circuit failure			
Check point	Check that frequent power ON/OFF is not repeated.			
Corrective action	Configure a circuit where frequent power ON/OFF is not repeated. If the problem still persists after taking the above measure, please contact your sales representative.			

Operation Panel Indication	E.SER	ESER	FR-PU04	Fault 14
			FR-PU07	VFD Comm error
Name	Communication fault (inverter)			
Description	This function stops the inverter output when communication error occurs consecutively for more than permissible retry count when a value other than "9999" is set in <i>Pr. 335 RS-485 communication retry count</i> during RS-485 communication from the RS-485 terminals. This function also stops the inverter output if communication is broken for the period of time set in <i>Pr. 336 RS-485 communication check time interval</i> .			
Check point	Check the RS-485 terminal wiring.			
Corrective action	Perform wiring of the RS-485 terminals properly.			

Operation Panel Indication	E.AIE	EAI E	FR-PU04	Fault 14
			FR-PU07	Analog in error
Name	Analog input fault			
Description	Stops the inverter output when 30mA or more is input or a voltage (7.5V or more) is input with the terminal 2/4 set to current input.			
Check point	Check the setting of <i>Pr. 73 Analog input selection</i> and <i>Pr. 267 Terminal 4 input selection</i> . (Refer to  <i>Instruction Manual (applied)</i> .)			
Corrective action	Either give a frequency command by current input or set <i>Pr. 73 Analog input selection</i> or <i>Pr. 267 Terminal 4 input selection</i> to voltage input.			



Operation Panel Indication	E.USB	E.USB	FR-PU04	Fault 14
			FR-PU07	USB comm error
Name	USB communication fault			
Description	When the time set in <i>Pr. 548 USB communication check time interval</i> has broken, this function stops the inverter output.			
Check point	Check the USB communication cable.			
Corrective action	<ul style="list-style-type: none"> · Check the <i>Pr. 548 USB communication check time interval</i> setting. · Check the USB communication cable. · Increase the <i>Pr. 548 USB communication check time interval</i> setting. Or, change the setting to 9999. (Refer to section 4 of <i>Instruction Manual (applied)</i>) 			

Operation Panel Indication	E.13	E. 13	FR-PU04	Fault 13
			FR-PU07	
Name	Internal circuit fault			
Description	Stops the inverter output when an internal circuit error occurred.			
Corrective action	Please contact your sales representative.			

CAUTION

- If protective functions of E.ILF, E.PTC, E.PE2, E.EP, E.OD, E.CDO, E.IOH, E.SER, E.AIE, E.USB are activated when using the FR-PU04, "Fault 14" appears.
Also when the faults history is checked on the FR-PU04, the display is "E.14".
- If faults other than the above appear, contact your sales representative.

4.4 Correspondences between digital and actual characters

There are the following correspondences between the actual alphanumeric characters and the digital characters displayed on the operation panel.

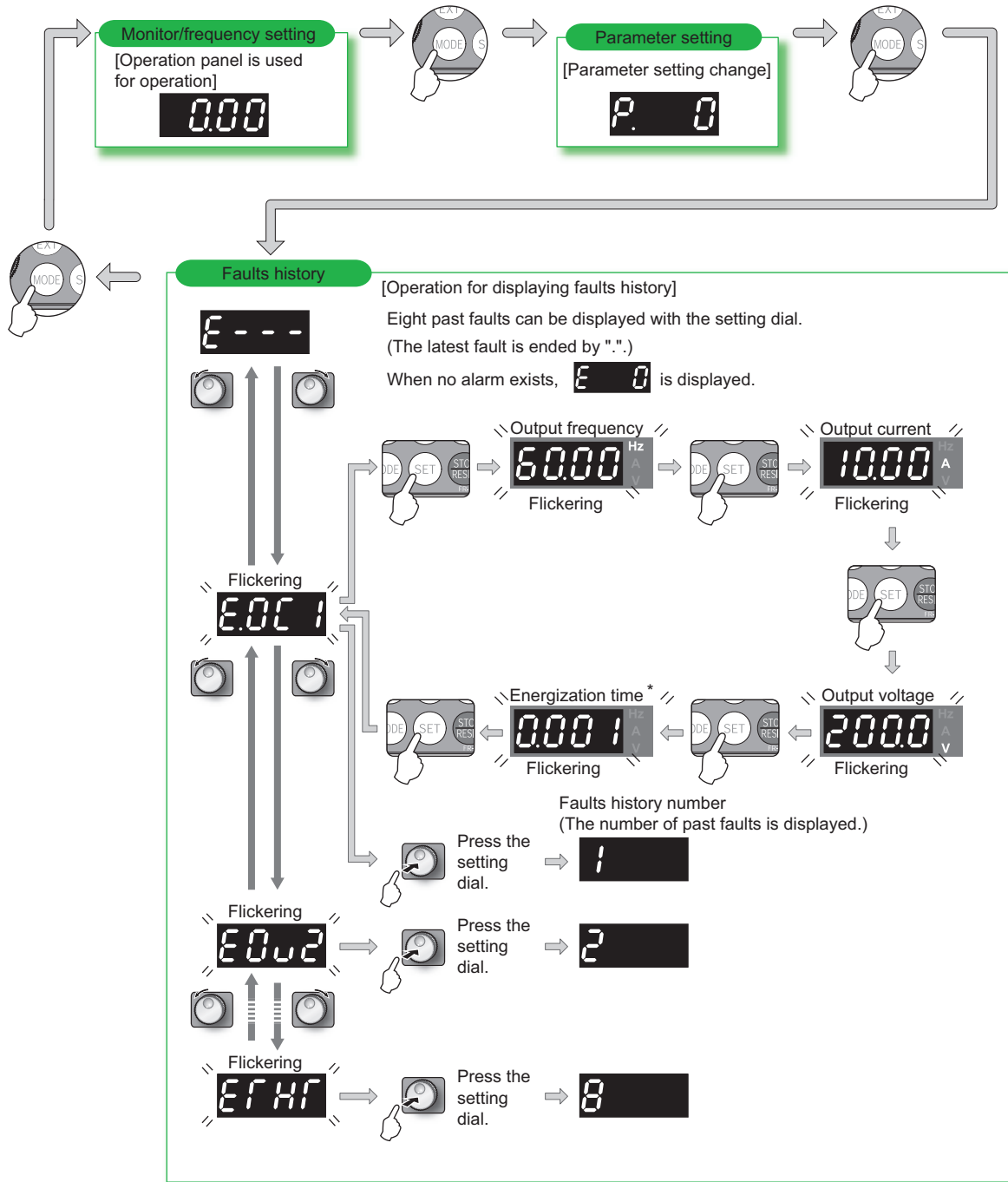
Actual	Digital
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Actual	Digital
A	A
B	b
C	C
D	d
E	E
F	F
G	G
H	H
I	I
J	J
L	L

Actual	Digital
M	m
N	n
O	O
o	o
P	P
S	S
T	T
U	U
V	V
r	r
-	-

4.5 Check and clear of the faults history

(1) Check for the faults history



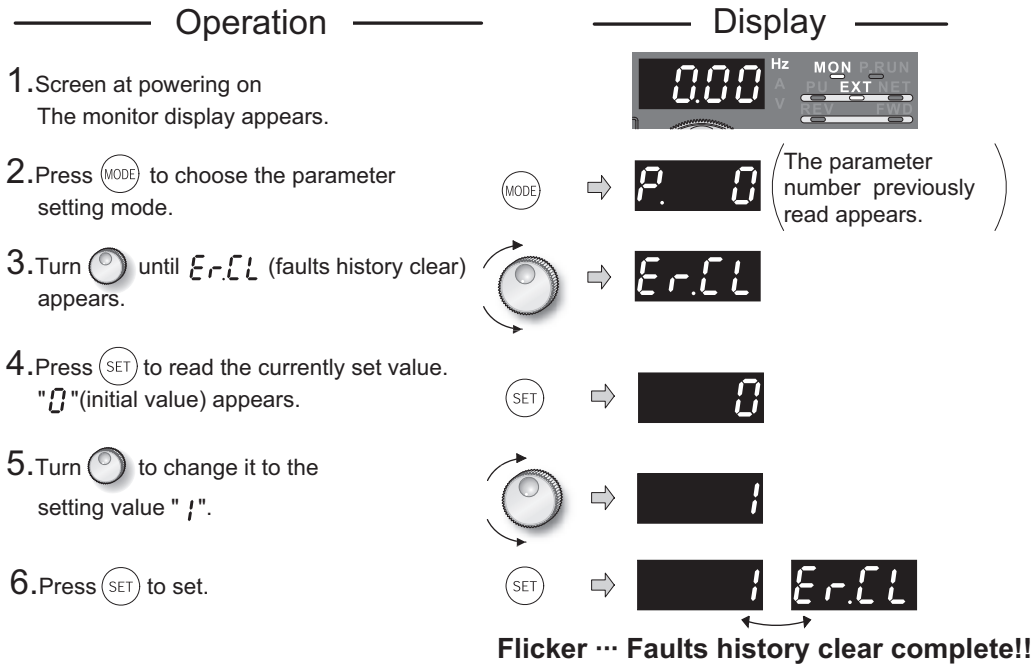
* The cumulative energization time and actual operation time are accumulated from 0 to 65535 hours, then cleared, and accumulated again from 0.

When the operation panel (FR-DU07) is used, the time is displayed up to 65.53 (65530h) in the indication of 1h = 0.001, and thereafter, it is added up from 0.

(2) Clearing procedure

POINT

· The faults history can be cleared by setting "1" in *Er.CL Faults history clear*.



- Press (rotary knob) to read another parameter.
- Press (SET) to show the setting again.
- Press (SET) twice to show the next parameter.



4.6 Check first when you have a trouble

POINT

If the cause is still unknown after every check, it is recommended to initialize the parameters (initial value) then reset the required parameter values and check again.

4.6.1 Motor does not start


1) Check the main circuit

- Check that a proper power supply voltage is applied (operation panel display is provided).
- Check that the motor is connected properly.
- Check that the jumper across P/+-P1 is connected.

2) Check the input signals

- Check that start signal is input.
- Check that both the forward and reverse rotation start signals are not input simultaneously.
- Check that the frequency setting signal is not zero. (When the frequency command is 0Hz and the start command is entered, FWD or REV LED on the operation panel flickers.)
- Check that the AU signal is on when terminal 4 is used for frequency setting signal.
- Check that the output stop signal (MRS) or reset signal (RES) is not on.
- Check that the CS signal is not OFF with automatic restart after instantaneous power failure function is selected (*Pr. 57* ≠ "9999").
- Check that the sink or source jumper connector is fitted securely. (*Refer to page 22*)
- Check that the voltage/current input switch is correctly set for analog input signal (0 to 5V/0 to 10V, 4 to 20mA).

3) Check the parameter settings

- Check that *Pr. 78 Reverse rotation prevention selection* is not selected.
- Check that the *Pr. 79 Operation mode selection* setting is correct.
- Check that the bias and gain (*calibration parameter C2 to C7*) settings are correct.
- Check that the *Pr. 13 Starting frequency* setting is not greater than the running frequency.
- Check that frequency settings of each running frequency (such as multi-speed operation) are not zero. Check that especially the *Pr. 1 Maximum frequency* setting is not zero.
- Check that the *Pr. 15 Jog frequency* setting is not lower than the *Pr. 13 Starting frequency* setting.
- Check that the *Pr.359 Encoder rotation direction* setting is correct during the encoder feedback control. When "REV" is lit on the operation panel under the forward rotation command, set "1" in *Pr.359*.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.
(*Refer to the chapter 4 of  the Instruction Manual (applied)*)

4) Inspection of load

- Check that the load is not too heavy.
- Check that the shaft is not locked.

4.6.2 Motor generates abnormal noise

- Check for any mechanical looseness.
- Contact the customer support of the motor manufacturer.

4.6.3 Motor generates heat abnormally

- Is the fan for the motor is running? (Check for accumulated dust.)
- Check that the load is not too heavy. Lighten the load.
- Check that the inverter output voltages (U, V, W) balanced.
- Was the motor type set? Check the setting of *Pr. 71 Applied motor*.
- When using any FR-B3 series, perform offline auto tuning. (*Refer to page 54.*)



4.6.4 Motor rotates in opposite direction

- Check that the phase sequence of output terminals U, V and W is correct.
- Check that the start signals (forward rotation, reverse rotation) are connected properly. (Refer to page 63)

4.6.5 Speed greatly differs from the setting

- Check that the frequency setting signal is correct. (Measure the input signal level.)
- Check that the Pr. 1, Pr. 2, Calibration parameter C2 to C7 settings are correct
- Check that the input signal lines are not affected by external noise. (Use shielded cables)
- Check that the load is not too heavy.
- Check that the Pr. 31 to Pr. 36 (frequency jump) settings are correct.

4.6.6 Acceleration/deceleration is not smooth

- Check that the acceleration and deceleration time settings are not too short.
- Check that the load is not too heavy.

4.6.7 Motor current is large

- Check that the load is not too heavy.

4.6.8 Speed does not increase

- Check that the Pr. 1 Maximum frequency setting is correct.
- Check that the load is not too heavy. (In agitators, etc., load may become heavier in winter.)
- Check that brake resistor is not connected between terminal P and P1 by mistake.

4.6.9 Speed varies during operation

When the FR-B3 series, encoder feedback control is exercised, the output frequency varies with load fluctuation between 0 and 2Hz. This is a normal operation and is not a fault.


1) Inspection of load

- Check that the load is not varying.

2) Check the input signals

- Check that the frequency setting signal is not varying.
- Check that the frequency setting signal is not affected by noise. Input filter to the analog input terminal using Pr. 74 Input filter time constant.
- Check for a malfunction due to undesirable currents when the transistor output unit is connected. (Refer to page 23)

3) Others

- For the FR-B3 series, perform offline auto tuning. (Refer to the chapter 4 of  the Instruction Manual
- Check that the wiring length is not too long for V/F control. (FR-B series only)






4.6.10 Operation mode is not changed properly

If the operation mode does not change correctly, check the following:

1) Inspection of load

- Check that the STF or STR signal is off.
When it is on, the operation mode cannot be changed.

2) Parameter setting

- Check the *Pr. 79* setting.
When the *Pr. 79 Operation mode selection* setting is "0" (initial value), the inverter is placed in the External operation mode at input power-on. At this time, press  on the operation panel (press  when the parameter unit (FR-PU04/FR-PU07) is used) to switch to the PU operation mode.
For the other values (1 to 4, 6, 7), the operation mode is limited accordingly.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.
(Refer to the chapter 4 of  the Instruction Manual (applied))


4.6.11 Operation panel (FR-DU07) display is not operating

- Check that the operation panel is connected to the inverter securely.

4.6.12 POWER lamp is not lit

- Check that wiring is securely performed and installation is correct.

4.6.13 Parameter write cannot be performed

- Make sure that operation is not being performed (signal STF or STR is not ON).
- Make sure that you are not attempting to set the parameter in the External operation mode.
- Check *Pr. 77 Parameter write selection*.
- Check *Pr. 161 Frequency setting/key lock operation selection*.
- Check that the operation location by *Pr. 550* and *Pr. 551* is correct.
(Refer to the chapter 4 of  the Instruction Manual (applied))

5 PRECAUTIONS FOR MAINTENANCE AND INSPECTION

The inverter is a static unit mainly consisting of semiconductor devices. Daily inspection must be performed to prevent any fault from occurring due to the adverse effects of the operating environment, such as temperature, humidity, dust, dirt and vibration, changes in the parts with time, service life, and other factors.

• Precautions for maintenance and inspection

For some short time after the power is switched off, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched off, and then make sure that the voltage across the main circuit terminals P/+-N/- of the inverter is not more than 30VDC using a tester, etc.

5.1 Inspection item

5.1.1 Daily inspection

Basically, check for the following faults during operation.

- (1) Motor operation fault
- (2) Improper installation environment
- (3) Cooling system fault
- (4) Unusual vibration and noise
- (5) Unusual overheat and discoloration

During operation, check the inverter input voltages using a tester.

5.1.2 Periodic inspection

Check the areas inaccessible during operation and requiring periodic inspection.

Consult us for periodic inspection.

- 1) Check for cooling system fault Clean the air filter, etc.
- 2) Tightening check and retightening The screws and bolts may become loose due to vibration, temperature changes, etc.
Tighten them according to the specified tightening torque. (*Refer to page 14*)
- 3) Check the conductors and insulating materials for corrosion and damage.
- 4) Measure insulation resistance.
- 5) Check and change the cooling fan and relay.



5.1.3 Daily and periodic inspection

Area of Inspection	Inspection Item	Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check
			Daily	Periodic ^{*2}		
General	Surrounding environment	Check the surrounding air temperature, humidity, dirt, corrosive gas, oil mist, etc	○		Improve environment	
	Overall unit	Check for unusual vibration and noise	○		Check alarm location and retighten	
	Power supply voltage	Check that the main circuit voltages and control voltages are normal ^{*1}	○		Inspect the power supply	
Main circuit	General	(1)Check with megger (across main circuit terminals and earth (ground) terminal). (2)Check for loose screws and bolts. (3)Check for overheat traces on the parts. (4)Check for stain		○ ○ ○ ○	Contact the manufacturer Retighten Contact the manufacturer Clean	
	Conductors, cables	(1)Check conductors for distortion. (2)Check cable sheaths for breakage and deterioration (crack, discoloration, etc.)		○ ○	Contact the manufacturer Contact the manufacturer	
	Transformer/reactor	Check for unusual odor and abnormal increase in whining sound.	○		Stop the device and contact the manufacturer.	
	Terminal block	Check for damage.		○	Stop the device and contact the manufacturer.	
	Smoothing aluminum electrolytic capacitor	(1)Check for liquid leakage. (2)Check for safety valve projection and bulge. (3)Visual check and judge by the life check of the main circuit capacitor (Refer to page 127)		○ ○ ○	Contact the manufacturer Contact the manufacturer	
	Relay/contacter	Check that the operation is normal and no chatter is heard.		○	Contact the manufacturer	
	Resistor	(1)Check for crack in resistor insulation. (2)Check for a break in the cable.		○ ○	Contact the manufacturer Contact the manufacturer	
Control circuit protective circuit	Operation check	(1)Check that the output voltages across phases with the inverter operated alone is balanced (2)Check that no fault is found in protective and display circuits in a sequence protective operation test.		○ ○	Contact the manufacturer Contact the manufacturer	
	Parts check	Overall		○ ○	Stop the device and contact the manufacturer. Contact the manufacturer	
		Aluminum electrolytic capacitor	(1)Check for liquid leakage in a capacitor and deformation trace (2)Visual check and judge by the life check of the control circuit capacitor. (Refer to page 127.)		○ ○	Contact the manufacturer
Cooling system	Cooling fan	(1)Check for unusual vibration and noise. (2)Check for loose screws and bolts (3)Check for stain	○	○ ○ ○	Replace the fan Retighten Clean	
	Heatsink	(1)Check for clogging (2)Check for stain		○ ○	Clean Clean	
	Air filter, etc.	(1)Check for clogging (2)Check for stain		○ ○	Clean or replace Clean or replace	
Display	Indication	(1)Check that display is normal. (2)Check for stain	○	○	Contact the manufacturer Clean	
	Meter	Check that reading is normal	○		Stop the device and contact the manufacturer.	
Load motor	Operation check	Check for vibration and abnormal increase in operation noise	○		Stop the device and contact the manufacturer.	

*1 It is recommended to install a device to monitor voltage for checking the power supply voltage to the inverter.

*2 One to two years of periodic inspection cycle is recommended. However, it differs according to the installation environment. Consult us for periodic inspection.

5.1.4 Display of the life of the inverter parts

The self-diagnostic alarm is output when the life span of the control circuit capacitor, cooling fan, each parts of the inrush current limit circuit is near its end. It gives an indication of replacement time .

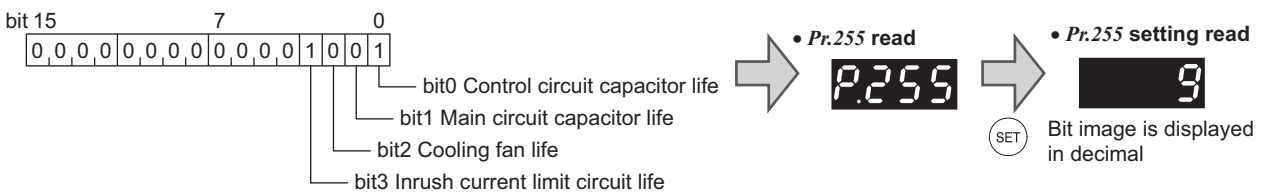
The life alarm output can be used as a guideline for life judgement.

Parts	Judgement Level
Main circuit capacitor	85% of the initial capacity
Control circuit capacitor	Estimated 10% life remaining
Inrush current limit circuit	Estimated 10% life remaining (Power on: 100,000 times left)
Cooling fan	Less than 40% of the predetermined speed

For the life check of the main circuit capacitor, the alarm signal (Y90) will not be output if a measuring method of (2) is not performed. (Refer to page 128.)

(1) Display of the life alarm

- Pr. 255 Life alarm status display can be used to confirm that the control circuit capacitor, main circuit capacitor, cooling fan, and each parts of the inrush current limit circuit has reached the life alarm output level.



Pr. 255 (decimal)	Bit (binary)	Inrush Current Limit Circuit Life	Cooling Fan Life	Main Circuit Capacitor Life	Control Circuit Capacitor Life
15	1111	○	○	○	○
14	1110	○	○	○	×
13	1101	○	○	×	○
12	1100	○	○	×	×
11	1011	○	×	○	○
10	1010	○	×	○	×
9	1001	○	×	×	○
8	1000	○	×	×	×
7	0111	×	○	○	○
6	0110	×	○	○	×
5	0101	×	○	×	○
4	0100	×	○	×	×
3	0011	×	×	○	○
2	0010	×	×	○	×
1	0001	×	×	×	○
0	0000	×	×	×	×

○: with alarm, ×: without alarm

POINT

Life check of the main circuit capacitor needs to be done by Pr. 259. (Refer to the following.)



(2) Measuring method of life of the main circuit capacitor

- If the value of capacitor capacity measured before shipment is considered as 100%, Pr. 255 bit1 is turned on when the measured value falls below 85%.
- Measure the capacitor capacity according to the following procedure and check the deterioration level of the capacitor capacity.
 - 1) Check that the motor is connected and at a stop.
 - 2) Set "1" (measuring start) in Pr. 259
 - 3) Switch power off. The inverter applies DC voltage to the motor to measure the capacitor capacity while the inverter is off.
 - 4) After confirming that the LED of the operation panel is off, power on again.
 - 5) Check that "3" (measuring completion) is set in Pr. 259, then read Pr. 258 and check the life of the main circuit capacitor.


REMARKS

- When the main circuit capacitor life is measured under the following conditions, "forced end" (Pr. 259 = "8") or "measuring error" (Pr. 259 = "9") occurs or it remains in "measuring start" (Pr. 259 = "1"). When measuring, avoid the following conditions to perform. In addition, even when "measurement completion" (Pr. 259 = "3") is confirmed under the following conditions, normal measurement can not be done.
 - (a) MT-HC or MT-RC is connected.
 - (b) Terminal R1/L11, S1/L21 or DC power supply is connected to the terminals P/+ and N/-.
 - (c) Switch power on during measuring.
 - (d) The motor is not connected to the inverter.
 - (e) The motor is running.(The motor is coasting.)
 - (f) The motor capacity is two rank smaller as compared to the inverter capacity.
 - (g) The inverter is at an alarm stop or an alarm occurred while power is off.
 - (h) The inverter output is shut off with the MRS signal.
 - (i) The start command is given while measuring.
- Operating environment:Surrounding air temperature (annual average 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt))
Output current (80% of the inverter rated current)

POINT

For the accurate life measuring of the main circuit capacitor, perform after more than 3h passed since the turn off of the power as it is affected by the capacitor temperature.

WARNING

 When measuring the main circuit capacitor capacity (Pr. 259 Main circuit capacitor life measuring = "1"), the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

5.1.5 Cleaning

Always run the inverter in a clean status.

When cleaning the inverter, gently wipe dirty areas with a soft cloth immersed in neutral detergent or ethanol.

CAUTION

Do not use solvent, such as acetone, benzene, toluene and alcohol, as they will cause the inverter surface paint to peel off. The display, etc. of the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07) are vulnerable to detergent and alcohol. Therefore, avoid using them for cleaning.

5.1.6 Replacement of parts

The inverter consists of many electronic parts such as semiconductor devices.

The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or fault of the inverter. For preventive maintenance, the parts must be replaced periodically.

Use the life check function as a guidance of parts replacement.

Part Name	Standard Replacement Interval *1	Description
Cooling fan	10 years	Replace (as required)
Main circuit smoothing capacitor	10 years *2	Replace (as required)
On-board smoothing capacitor	10 years	Replace the board (as required)
Relays	—	as required

*1 Replacement years for when the yearly average surrounding air temperature is 40°C (without corrosive gas, flammable gas, oil mist, dust and dirt etc)

*2 Output current : 80% of the inverter rated current

CAUTION

For parts replacement, consult the nearest Mitsubishi FA Center.

(1) Cooling fan

The replacement interval of the cooling fan used for cooling the parts generating heat such as the main circuit semiconductor is greatly affected by the surrounding air temperature. When unusual noise and/or vibration is noticed during inspection, the cooling fan must be replaced immediately.

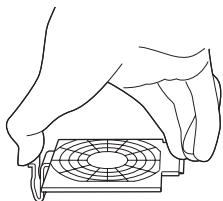
CAUTION

For parts replacement, consult the nearest Mitsubishi FA Center.

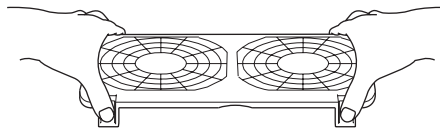
	Inverter Type		Fan Type	Units
	FR-B	FR-B3		
200V	1500 to 3700	(N)1500 to (N)3700	MMF-06F24ES-RP1 BKO-CA1638H01	1
	5.5K to 11K	(N)5.5K to (N)11K	MMF-08D24ES-RP1 BKO-CA1639H01	2
	15K	(N)15K to 18.5K	MMF-12D24DS-RP1 BKO-CA1619H01	1
	22K	(N)22K	MMF-06F24ES-RP1 BKO-CA1638H01	1
			MMF-12D24DS-RP1 BKO-CA1619H01	1
	30K to 55K	(N)30K, (N)37K	MMF-12D24DS-RP1 BKO-CA1619H01	2
	75K	-	MMF-12D24DS-RP1 BKO-CA1619H01	3
400V	2200, 3700	(N)H2200, (N)H3700	MMF-06F24ES-RP1 BKO-CA1638H01	1
	7.5K, 15K	(N)H5.5K to (N)H15K	MMF-08D24ES-RP1 BKO-CA1639H01	2
	22K	(N)H18.5K, (N)H22K	MMF-12D24DS-RP1 BKO-CA1619H01	1
			MMF-09D24TS-RP1 BKO-CA1640H01	2
	37K, 55K	(N)H37K	MMF-12D24DS-RP1 BKO-CA1619H01	2
	75K, 110K	-		3

FR-B-750, FR-B3-(N)400, 750, FR-B3-(N)H400 to 1500

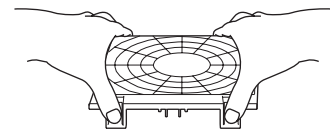
- Removal (FR-B-1500 to 75K(200V), FR-B-2200 to 110K(400V), FR-B3-(N)1500 to 37K, FR-B3-(N)H2200 to 37K)
- 1) Push the hooks from above and remove the fan cover.



FR-B-1500 to 3700(200V)
FR-B-2200, 3700(400V)
FR-B3-(N)1500 to 3700
FR-B3-(N)H2200, 3700

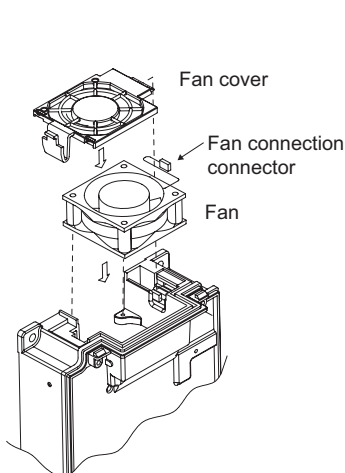


FR-B-5.5K to 22K(200V)
FR-B-7.5K to 22K(400V)
FR-B3-(N)(H)5.5K to 22K

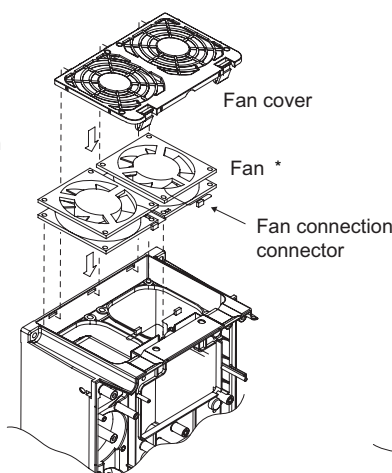


FR-B-30K or more(200V/400V)
FR-B3-(N)(H)30K or more

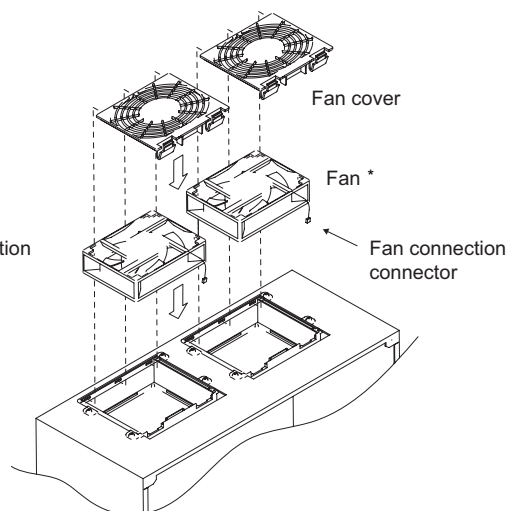
- 2) Disconnect the fan connectors.
- 3) Remove the fan.



FR-B-1500 to 3700(200V)
FR-B-2200, 3700(400V)
FR-B3-(N)1500 to 3700
FR-B3-(N)H2200, 3700



FR-B-5.5K to 22K(200V)
FR-B-7.5K to 22K(400V)
FR-B3-(N)(H)5.5K to 22K

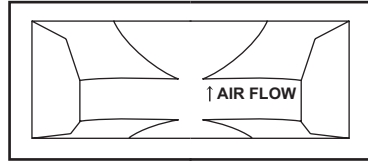


FR-B-30K or more(200V/400V)
FR-B3-(N)(H)30K or more

* The number of cooling fans differs according to the inverter capacity. (Refer to the table above)



- Reinstallation (FR-B-1500 to 75K(200V), FR-B3-(N)1500 to 37K, FR-B-2200 to 110K(400V), FR-B3-(N)H2200 to 37K)
 - 1) After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.



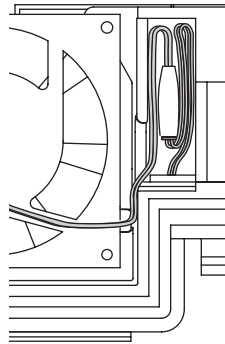
<Fan side face>

CAUTION

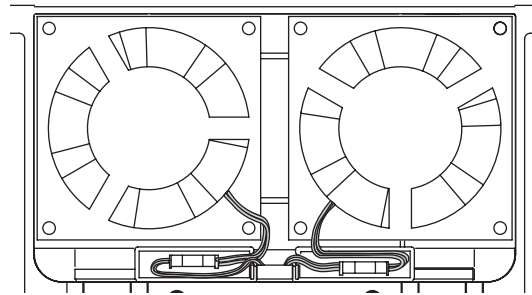
Installing the fan in the opposite of air flow direction can cause the inverter life to be shorter.

- 2) Reconnect the fan connectors.

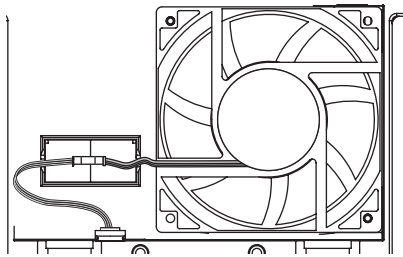
When wiring, avoid the cables being caught by the fan.



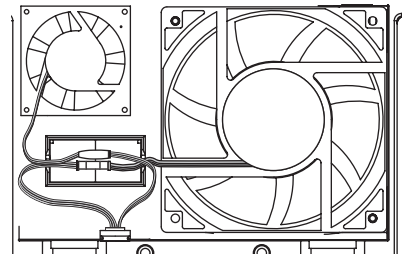
FR-B-1500 to 3700(200V), FR-B-2200, 3700(400V)
FR-B3-(N)1500 to 3700, FR-B3-(N)H2200, 3700



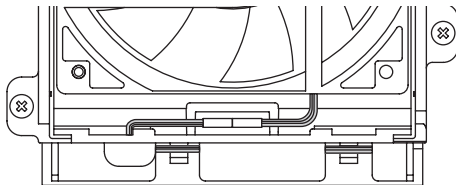
FR-B-5.5 to 11K(200V), FR-B-5.5K to 15K(400V)
FR-B3-(N)5.5K to 11K, FR-B3-(N)H5.5K to 15K



FR-B-15K(200V), FR-B-22K(400V)
FR-B3-(N)15K, 18.5K, FR-B3-(N)H18.5K, 22K



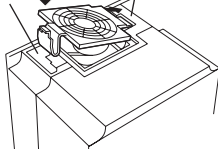
FR-B-22K(200V)
FR-B3-(N)22K



FR-B-30K(200V) or more, FR-B-30K(400V) or more,
FR-B3-(N)30K or more, FR-B3-(N)H30K or more

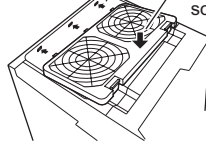
- 3) Reinstall the fan cover.

2. Insert hooks until you hear a click sound.
1. Insert hooks into holes.



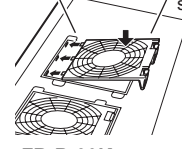
FR-B-1500 to 3700(200V),
FR-B-2200, 3700(400V)
FR-B3-(N)1500 to 3700, FR-B3-(N)H2200, 3700

1. Insert hooks into holes.
2. Insert hooks until you hear a click sound.



FR-B-5.5K to 22K(200V),
FR-B-7.5K to 22K(400V)
FR-B3-(N)(H)5.5K to 22K

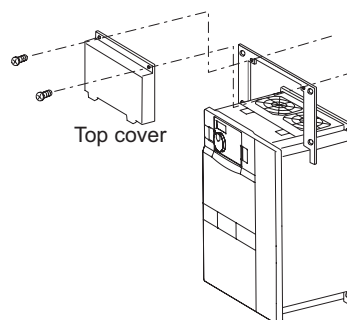
1. Insert hooks into holes.
2. Insert hooks until you hear a click sound.



FR-B-30K or more(200V/400V),
FR-B3-(N)(H)30K or more

(2) Replacement procedure of the cooling fan when using a heatsink protrusion attachment (FR-A7CN)

When replacing a cooling fan, remove a top cover of the heatsink protrusion attachment and perform replacement.
After replacing the cooling fan, replace the top cover in the original position.



(3) Smoothing capacitors

A large-capacity aluminum electrolytic capacitor is used for smoothing in the main circuit DC section, and an aluminum electrolytic capacitor is used for stabilizing the control power in the control circuit. Their characteristics are deteriorated by the adverse effects of ripple currents, etc.

The replacement intervals greatly vary with the surrounding air temperature and operating conditions. When the inverter is operated in air-conditioned, normal environment conditions, replace the capacitors about every 10 years.

The appearance criteria for inspection are as follows:

- 1) Case: Check the side and bottom faces for expansion
- 2) Sealing plate: Check for remarkable warp and extreme crack.
- 3) Check for external crack, discoloration, fluid leakage, etc. Judge that the capacitor has reached its life when the measured capacitance of the capacitor reduced below 80% of the rating.



Refer to page 128 to perform the life check of the main circuit capacitor.

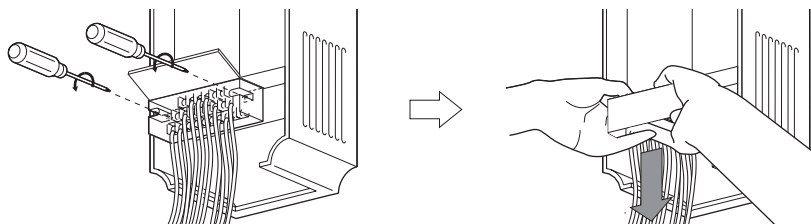
(4) Relays

To prevent a contact fault, etc., relays must be replaced according to the cumulative number of switching times (switching life).

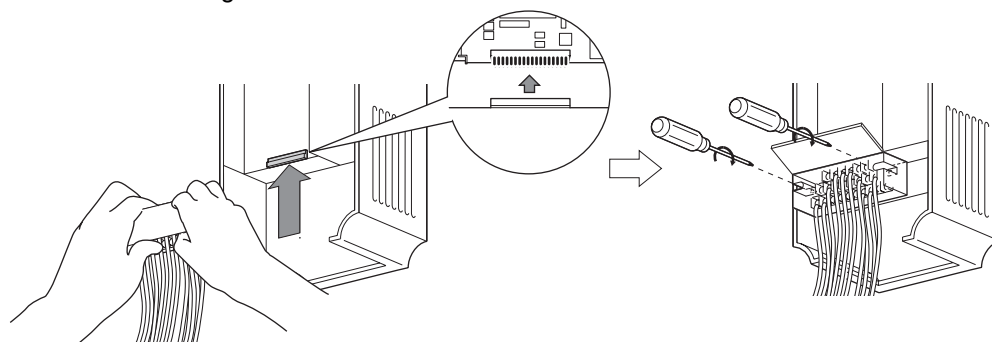
5.1.7 Inverter replacement

The inverter can be replaced with the control circuit wiring kept connected. Before replacement, remove the wiring cover of the inverter.

- 1) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.)
Pull down the terminal block from behind the control circuit terminals.



- 2) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control circuit terminal block and fix it with the mounting screws.



CAUTION

Before starting inverter replacement, switch power off, wait for at least 10 minutes, and then check the voltage with a tester and such to ensure safety.

6 SPECIFICATIONS

6.1 FR-B Series Specifications

6.1.1 FR-B series ratings

FR-B series (suitable for inverter drive variable-torque explosion-proof type motor)

●200V class

Type FR-B-□□□□□		750			1500	2200	3700	5.5K	7.5K	11K	15K	22K	30K	37K	45K	55K	75K	
Applicable motor capacity (kW) *1	60Hz standard variable-torque	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	22	30	37	45	55	75	
	50Hz standard variable-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	75	
	60Hz standard constant-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	
	60Hz standard constant-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	
Output	Rated capacity (kVA) *2	1.9			3.1	4.2	6.7	9.2	12.6	17.6	23.3	34	44	55	67	82	110	
	Rated current (A)	5			8	11	17.5	24	33	46	61	90	115	145	175	215	288	
	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics)																
	Voltage *4	Three-phase 200V																
Regenerative braking torque	Maximum value/ permissible duty	150% torque/ 3%ED				100% torque/ 3%ED			100% torque/ 2%ED			20% torque/continuous					10% torque/continuous	
	Rated input AC voltage/frequency	Three-phase 200V 50Hz, 200/220V 60Hz																
Permissible AC voltage fluctuation		180 to 220V 50Hz, 180 to 242V 60Hz																
Permissible frequency fluctuation		±5%																
Power supply capacity (kVA) *5	Variable-torque type	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28	41	52	66	80	100	110	
	Constant-torque type	-	1.5	-	2.2	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
Protective structure (JEM 1030) *7		Enclosed type (IP20) *6										Open type (IP00)						
Cooling system		Self-cooling				Forced air cooling												
Approx. mass (kg)		2.3			3.8	3.8	3.8	7.1	7.1	7.5	13.0	14.0	23.0	35.0	35.0	58.0	70.0	

●400V class

Type FR-B-□□□□□		750			1500	2200	3700	7.5K		15K	22K	37K		55K		75K	90K	110K	
Applicable motor capacity (kW) *1	60Hz standard variable-torque	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	22	30	37	45	55	75	90	110
	50Hz standard variable-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	90	110
	60Hz standard constant-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	75	90
	60Hz standard constant-torque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	55	75
Output	Rated capacity (kVA) *2	1.9			3	4.6	6.9	13		23.6	32.8	54		84		110	137	165	
	Rated current (A)	2.5			4	6	9	17		31	44	71		110		144	180	216	
	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics)																	
	Voltage *4	Three-phase 380V to 440V																	
Regenerative braking torque	Maximum value/ permissible duty	100% torque/ 2%ED						20% torque/continuous						10% torque/continuous					
	Rated input AC voltage/frequency	Three-phase 400V 50Hz, 400/440V 60Hz																	
Permissible AC voltage fluctuation		360 to 440V 50Hz, 360 to 484V 60Hz																	
Permissible frequency fluctuation		±5%																	
Power supply capacity (kVA) *5	Variable-torque type	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28	41	52	66	100	144	180	216	
	Constant-torque type	-	1.5	-	4.5	5.5	-	9	12	17	20	28	34	41	52	66	100	144	180
Protective structure (JEM 1030) *7		Enclosed typ (IP20) *6										Open type (IP00)							
Cooling system		Self-cooling				Forced air cooling													
Approx. mass (kg)		3.5			3.5	3.5	3.5	6.5	7.5	13.0	35.0	37.0		50.0	57.0	72.0			

- *1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Pressure-resistant, explosion-Proof motor. The motors are XE-(N)E, XF-(N)E and TH series.
- *2 The rated output capacity indicated assumes that the output voltage is 220V for 200V class and 440V for 400V class.
- *3 The % value of the overload current rating indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
- *4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- *5 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- *6 When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).
- *7 FR-DU07:IP40 (except for the PU connector)

6.1.2 FR-B series common specifications

Control specifications	Control method		Sine wave PWN control (V/F constant control)	
	Output frequency range		0.2 to 120Hz (22K or less), 0.2 to 60Hz (30K or more)	
	Frequency setting resolution	Analog input	0.015Hz/0 to 60Hz (terminal 2, 4: 0 to 10V/12bit) 0.03Hz/0 to 60Hz (terminal 2, 4: 0 to 5V/11bit, 0 to 20mA/about 11bit, terminal 1: 0 to ±10V/12bit) 0.06Hz/0 to 60Hz (terminal 1: 0 to ±5V/11bit)	
		Digital input	0.01Hz	
	Frequency accuracy	Analog input	Within ±0.2% of the max. output frequency (25°C±10°C)	
		Digital input	Within 0.01% of the set output frequency	
	Voltage/frequency characteristics		Base frequency is always 50Hz	
	Acceleration/deceleration time setting		0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration can be selected.	
	DC injection brake		Operation at 3Hz (fixed) is selectable	
	Stall prevention operation level		Operation current level can be set (0 to 200% adjustable), whether to use the function or not can be selected	
Operation specifications	Frequency setting signal	Analog input	• Terminal 2, 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected • Terminal 1: -10 to +10V, -5 to +5V can be selected	
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)	
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.	
	Input signals		You can select any twelve signals using <i>Pr. 178 to Pr. 189 (input terminal function selection)</i> from among multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (MT-HC connection), MT-HC connection (instantaneous power failure detection), PU operation/external inter lock signal, PID control enable terminal, PU operation/external operation switchover, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, pre-excitation, output stop, start self-holding selection, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover, command source switchover, DC feeding operation permission, and DC feeding operation cancel.	
			Pulse train input	100kpps
	Operational functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, electronic bypass operation, forward/reverse rotation prevention, remote setting, second function, third function, multi-speed operation, original operation continuation at instantaneous power failure, stop-on-contact control, load torque high speed frequency control, regeneration avoidance, operation mode selection, PID control, computer link operation (RS-485).	
	Output signals		Operating status	You can select any signals using <i>Pr. 190 to Pr. 196 (output terminal function selection)</i> from among inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake pre-alarm, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, orientation complete*1, fan fault output, heatsink overheat pre-alarm, inverter running/start command on, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, life alarm, fault output 1, 2, 3 (power-off signal), power savings average value update timing, current average value monitor, maintenance timer fault, remote output, forward rotation output*1, reverse rotation output*1, low speed output, alarm output and fault output. Open collector output (5 points), relay output (2 points) and alarm code of the inverter can be output (4 bit) from the open collector.
			When used with the FR-A7AY, FR-A7AR (option)	In addition to the above, you can select any signals using <i>Pr. 313 to Pr. 319 (extension output terminal function selection)</i> from among control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life. (only positive logic can be set for extension terminals of the FR-A7AR)
			Pulse train output	50kpps
	Pulse/analog output		You can select any signals using <i>Pr. 54 FM terminal function selection (pulse train output)</i> and <i>Pr. 158 AM terminal function selection (analog output)</i> from among output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*2, output terminal option monitor*2, option fitting status*3, terminal assignment status*3, feed back pulse*1.	
Indication	PU (FR-DU07/FR-PU07/FR-PU04)	Operating status	Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed, motor torque, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*2, output terminal option monitor*2, option fitting status*3, terminal assignment status*3, feed back pulse*1.	
		Fault definition	Fault definition is displayed during the fault occurs, the output voltage/current/frequency/cumulative energization time right before the fault occurs and past 8 fault definitions are stored.	
		Interactive guidance	Operation guide/trouble shooting with a help function*3	
Protective/warning function		Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase loss*5, motor overload, output side earth (ground) fault overcurrent, output short circuit, main circuit element overheat, output phase loss, external thermal relay operation*5, PTC thermistor operation*5, option fault, parameter error, PU disconnection, retry count excess*5, CPU alarm, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess*5, inrush current limit circuit alarm, communication alarm (inverter), USB communication fault, error, analog input fault, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake pre-alarm*5, electronic thermal relay function pre-alarm, PU stop, maintenance timer alarm*2*5, brake transistor alarm, parameter write error, copy operation error, operation panel lock, parameter copy alarm.		
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing)	
	Ambient humidity		90%RH maximum (non-condensing)	
	Storage temperature*4		-20°C to +65°C	
	Atmosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)	
	Altitude/vibration		Maximum 1000m above sea level, 5.9m/s ² or less at 10 to 55Hz (directions of X, Y, Z axes).	

*1 Available only when the option (FR-A7AP) is mounted

*2 Can be displayed only on the operation panel (FR-DU07).

*3 Can be displayed only on the parameter unit (FR-PU07/FR-PU04).

*4 Temperature applicable for a short period in transit, etc.

*5 This protective function does not function in the initial status.



6.2 FR-B3 Series Specifications

6.2.1 FR-B3 series ratings

FR-B3 series (suitable for inverter drive constant-torque explosion-proof type motor)

●200V class

Type FR-B3-(N)H-□□□□		400	750	1500	2200	3700	5.5	7.5	11	15	18.5	22	30	37
Applicable motor capacity (kW) *1		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
Output	Rated capacity (kVA) *2	1.1	1.9	3.1	4.2	6.7	9.2	12.6	17.6	23.3	29	34	44	55
	Rated current (A)	3	5	8	11	17.5	24	33	46	61	76	90	115	145
	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics)												
	Voltage *4	Output according to a pressure-resistant, explosion-proof motor												
Regenerative braking torque	Maximum value/ permissible duty	150% torque/ 3%ED			100% torque/ 3%ED		100% torque/ 2%ED		20% torque/continuous					
	Three-phase 200V 50Hz, 200/220V 60Hz													
Power supply	Rated input AC voltage/frequency	Three-phase 200V 50Hz, 200/220V 60Hz												
	Permissible AC voltage fluctuation	180 to 220V 50Hz, 180 to 242V 60Hz												
	Permissible frequency fluctuation	±5%												
	Power supply capacity (kVA) *5	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66
Protective structure (JEM 1030) *7		Enclosed type (IP20)*6											Open type (IP00)	
Cooling system		Self-cooling			Forced air cooling									
Approx. mass (kg)		1.9	2.3	3.8	3.8	3.8	7.1	7.1	7.5	13.0	13.0	14.0	23.0	35.0

●400V class

Type FR-B3-(N)H-□□□□		400	750	1500	2200	3700	5.5	7.5	11	15	18.5	22	30	37
Applicable motor capacity (kW) *1		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
Output	Rated capacity (kVA) *2	1.1	1.9	3	4.6	6.9	9.1	13	17.5	23.6	29	32.8	43.4	54
	Rated current (A)	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71
	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics)												
	Voltage *4	Output according to a pressure-resistant, explosion-proof motor												
Regenerative braking torque	Maximum value/ permissible duty	100% torque/2%ED						20% torque/continuous						
	Three-phase 400V 50Hz, 400/440V 60Hz													
Power supply	Rated input AC voltage/frequency	Three-phase 400V 50Hz, 400/440V 60Hz												
	Permissible AC voltage fluctuation	360 to 440V 50Hz, 360 to 484V 60Hz												
	Permissible frequency fluctuation	±5%												
	Power supply capacity (kVA) *5	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66
Protective structure (JEM 1030) *7		Enclosed type (IP20)*6											Open type (IP00)	
Cooling system		Self-cooling			Forced air cooling									
Approx. mass (kg)		3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13.0	13.0	23.0	35.0

- *1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Pressure-resistant, explosion-Proof motor. For FR-B3-(H)400 to 37K, the motors are XF-(N)ECA-2 series. For FR-B3-N(H)400 to 37K, the motors are XF-(N)ECA-1 series.
- *2 The rated output capacity indicated assumes that the output voltage is 220V for 200V class and 440V for 400V class.
- *3 The % value of the overload current rating indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
- *4 The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
- *5 The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
- *6 When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).
- *7 FR-DU07:IP40 (except for the PU connector)



6.2.2 FR-B3 series common specifications

Control specifications	Control method		Soft-PWM control/high carrier frequency PWM control (selectable from among, Advanced magnetic flux vector control).	
	Output frequency range		0.2 to 120Hz	
	Frequency setting resolution	Analog input	0.015Hz/0 to 60Hz (terminal 2, 4: 0 to 10V/12bit) 0.03Hz/0 to 60Hz (terminal 2, 4: 0 to 5V/11bit, 0 to 20mA/about 11bit, terminal 1: 0 to ±10V/12bit) 0.06Hz/0 to 60Hz (terminal 1: 0 to ±5V/11bit)	
		Digital input	0.01Hz	
	Frequency accuracy	Analog input	Within ±0.2% of the max. output frequency (25°C±10°C)	
		Digital input	Within 0.01% of the set output frequency	
	Voltage/frequency characteristics		Constant-torque up to 60Hz, constant output from 60Hz to the maximum frequency (When the rated motor frequency is set to 60Hz)	
	Starting torque		200% 0.3Hz (0.4K to 3.7K), 150% 0.3Hz (5.5K or more)	
	Acceleration/deceleration time setting		0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration can be selected.	
	DC injection brake		Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) variable	
Stall prevention operation level		Operation current level can be set (0 to 400% adjustable), whether to use the function or not can be selected		
Operation specifications	Frequency setting signal	Analog input	• Terminal 2, 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected • Terminal 1: -10 to +10V, -5 to +5V can be selected	
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)	
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.	
	Input signals		You can select any twelve signals using Pr. 178 to Pr. 189 (input terminal function selection) from among multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (FR-HC/FR-CV connection), FR-HC connection (instantaneous power failure detection), PU operation/external inter lock signal, external DC injection brake operation start, PID control enable terminal, brake opening completion signal, PU operation/external operation switchover, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, output stop, start self-holding selection, forward rotation command, reverse rotation command, inverter reset, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover and command source switchover.	
	Pulse train input		100kpps	
	Operational functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, third function, multi-speed operation, original operation continuation at instantaneous power failure, stop-on-contact control, load torque high speed frequency control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS-485).	
	Output signals	Operating status		You can select any signals using Pr. 190 to Pr. 196 (output terminal function selection) from among inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake pre-alarm, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, brake opening request, fan fault output, heatsink overheat pre-alarm, inverter running/start command on, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, life alarm, alarm output 1, 2, 3 (power-off signal), power savings average value update timing, current average value monitor, maintenance timer alarm, remote output, forward rotation output*1, reverse rotation output*1, low speed output, torque detection, minor failure output and alarm output. Open collector output (5 points), relay output (2 points) and alarm code of the inverter can be output (4 bit) from the open collector.
		When used with the FR-A7AY, FR-A7AR (option)		In addition to the above, you can select any signals using Pr. 313 to Pr. 319 (extension output terminal function selection) from among control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life. (only positive logic can be set for extension terminals of the FR-A7AR)
		Pulse train output		50kpps
		Pulse/analog output		You can select any signals using Pr. 54 FM terminal function selection (pulse train output) and Pr. 158 AM terminal function selection (analog output) from among output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, power saving effect, regenerative brake duty, PID set point, PID measured value, motor output, torque command, torque current factor, and torque monitor.
Indication	PU (FR-DU07/FR-PU07/FR-PU04)	Operating status		Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*2, output terminal option monitor*2, option fitting status*3, terminal assignment status*3, motor output
		Alarm definition		Alarm definition is displayed during the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and past 8 alarm definitions are stored.
		Interactive guidance		Operation guide/trouble shooting with a help function*3
Protective/warning function		Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase loss*5, motor overload, output side earth (ground) fault overcurrent, output short circuit, main circuit element overheat, output phase loss, external thermal relay operation*5, PTC thermistor operation*5, option alarm, parameter error, PU disconnection, retry count excess*5, CPU alarm, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess*5, inrush current limit circuit alarm, communication alarm (inverter), USB communication fault, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake pre-alarm*5, electronic thermal relay function pre-alarm, PU stop, maintenance timer alarm*2*5, brake transistor alarm, parameter write error, copy operation error, operation panel lock, parameter copy alarm, signal loss detection*1*5, overspeed*1*5, brake sequence error*5, encoder phase error*1*5..		
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing)	
	Ambient humidity		90%RH maximum (non-condensing)	
	Storage temperature*4		-20°C to +65°C	
	Atmosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)	
	Altitude/vibration		Maximum 1000m above sea level, 5.9m/s ² or less at 10 to 55 Hz (directions of X, Y, Z axes).	

*1 Available only when the option (FR-A7AP) is mounted

*2 Can be displayed only on the operation panel (FR-DU07).

*3 Can be displayed only on the parameter unit (FR-PU07/FR-PU04).

*4 Temperature applicable for a short period in transit, etc.

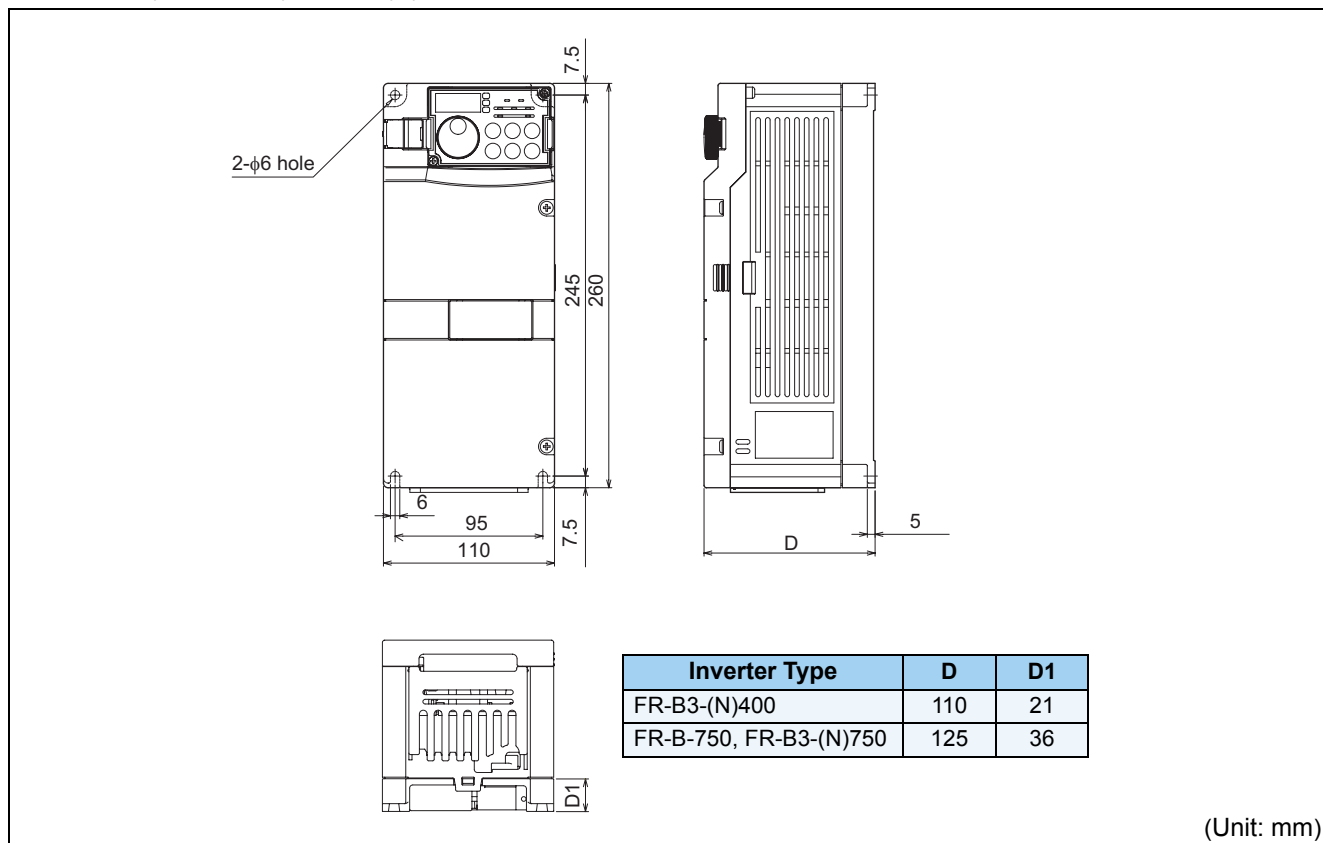
*5 This protective function does not function in the initial status.



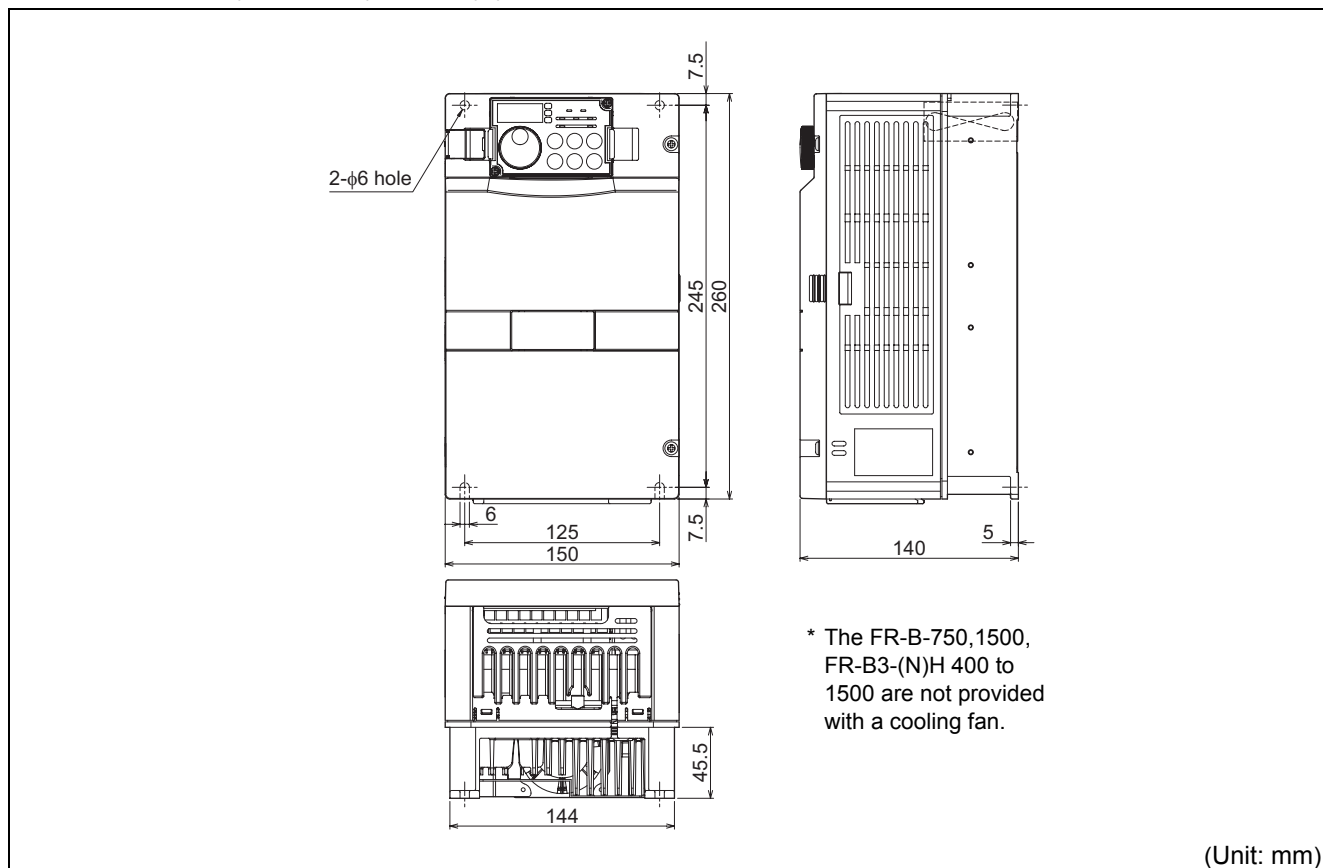
6.3 Outline dimension drawings

6.3.1 Inverter outline dimension drawings

- FR-B-750 (200V class), FR-B3-(N)400, 750

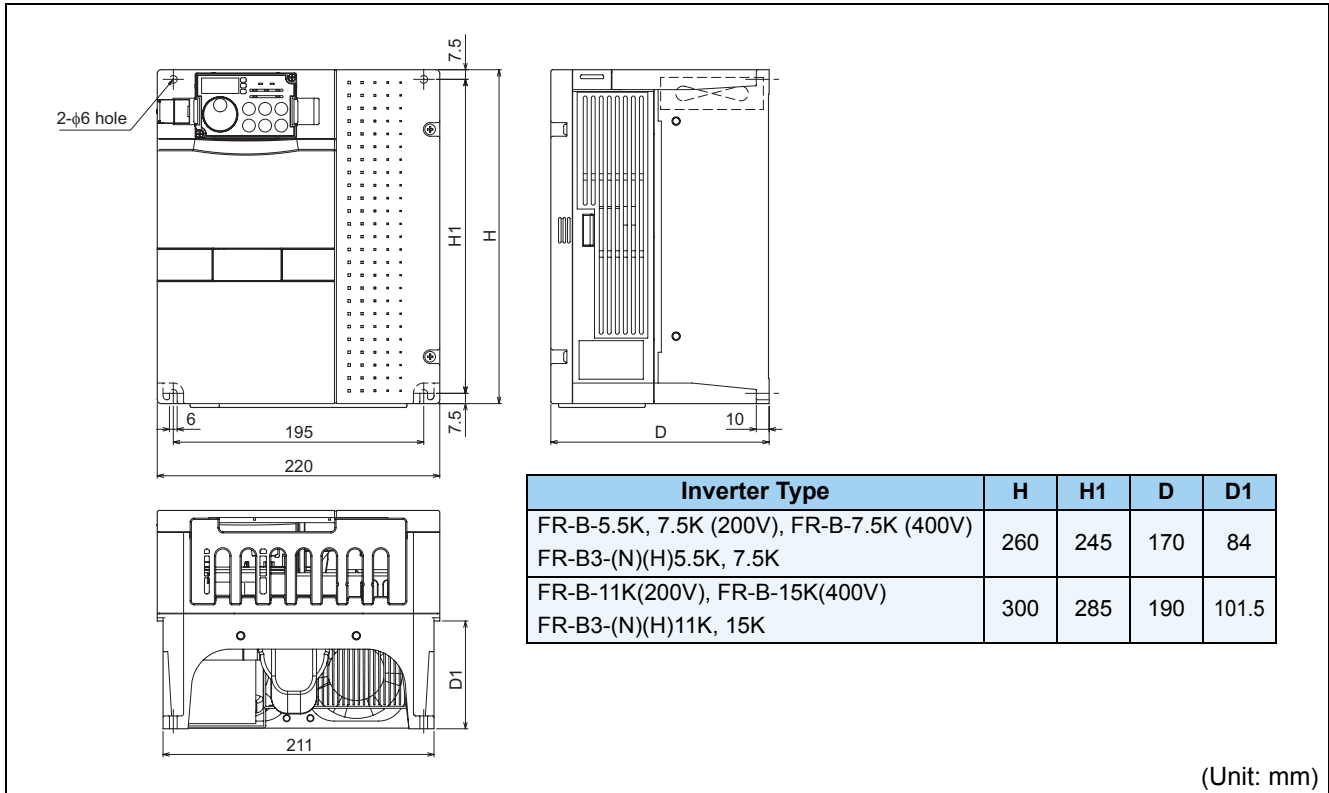


- FR-B-1500 to 3700 (200V class), FR-B3-(N)1500 to 3700
- FR-B-750 to 3700 (400V class), FR-B3-(N)H400 to 3700

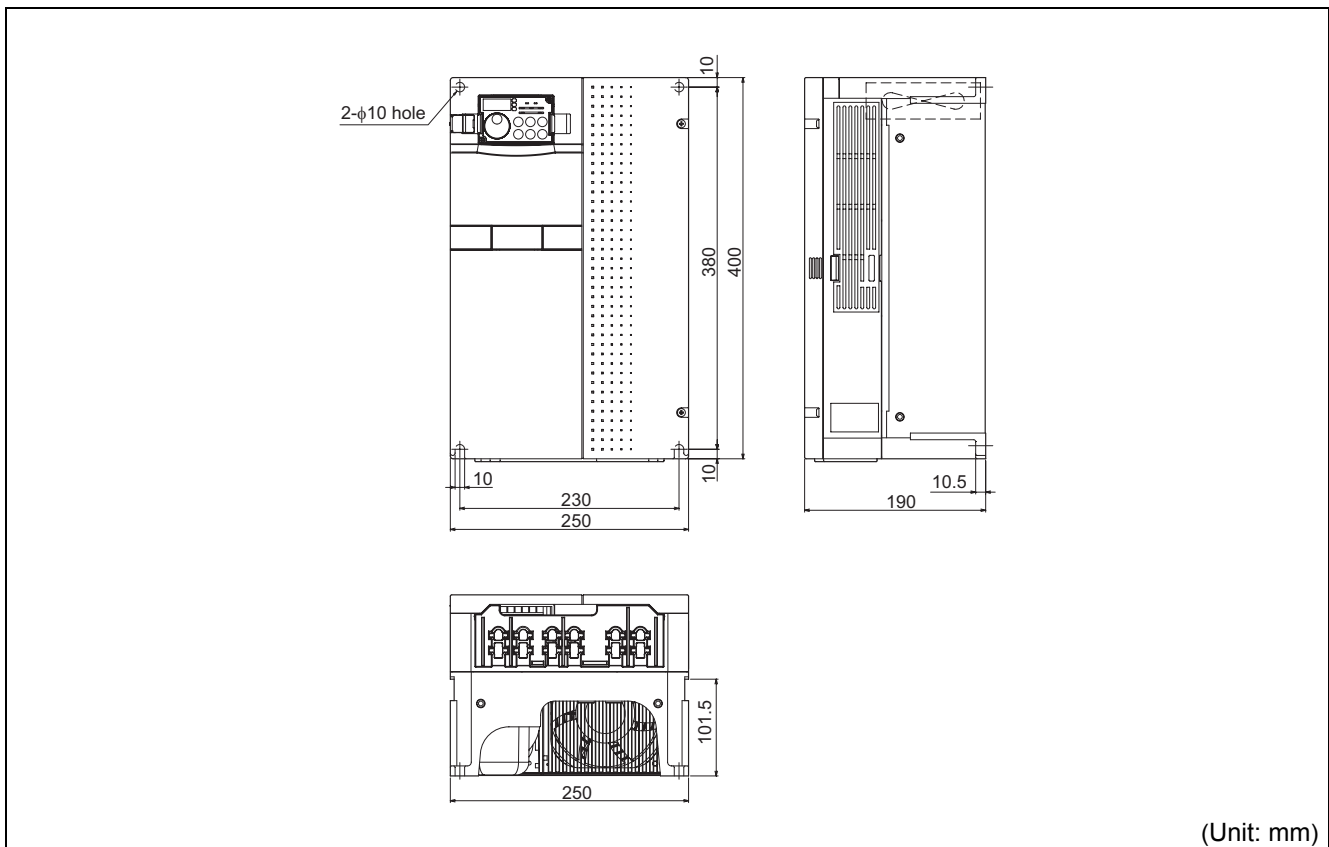




- FR-B-5.5K to 11K(200V class), FR-B3-(N)5.5K to 11K
- FR-B-7.5K,15K(400V class), FR-B3-(N)H5.5K to 15K

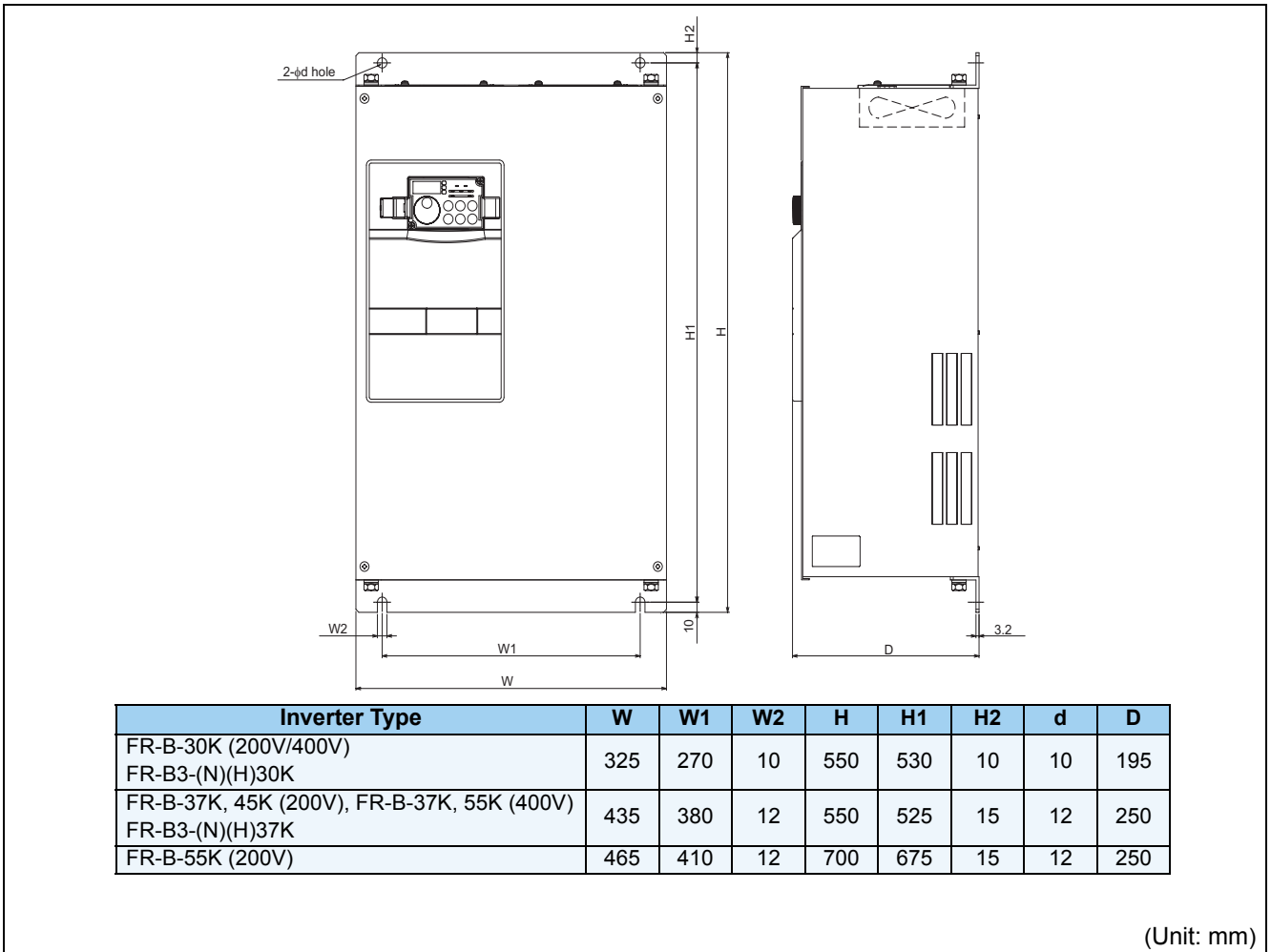


- FR-B-15K,22K(200V class), FR-B3-(N)15K to 22K
- FR-B-22K(400V class), FR-B3-(N)H18.5K, 22K

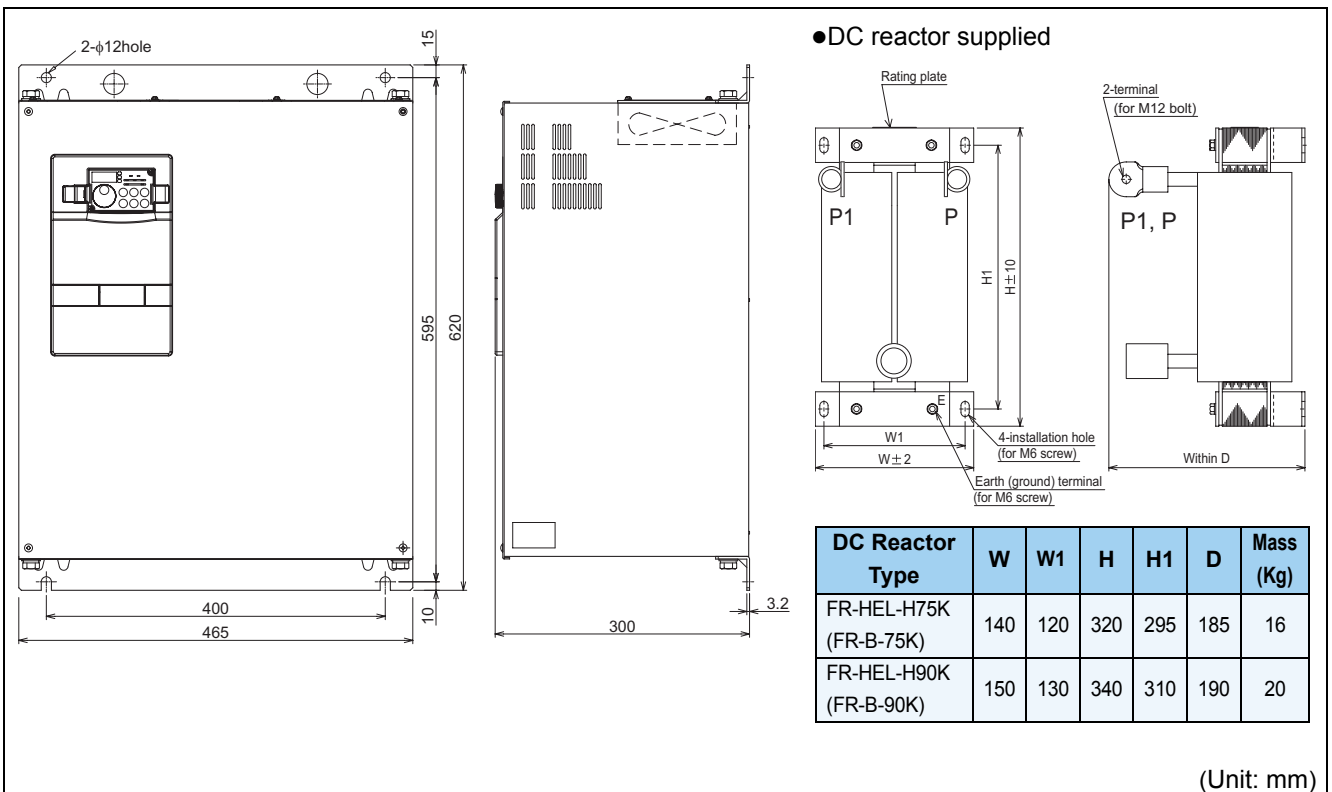


Outline dimension drawings

- FR-B-30K to 55K (200V class), FR-B3-(N)30K, 37K
- FR-B-37K, 55K (400V class), FR-B3-(N)H30K, 37K

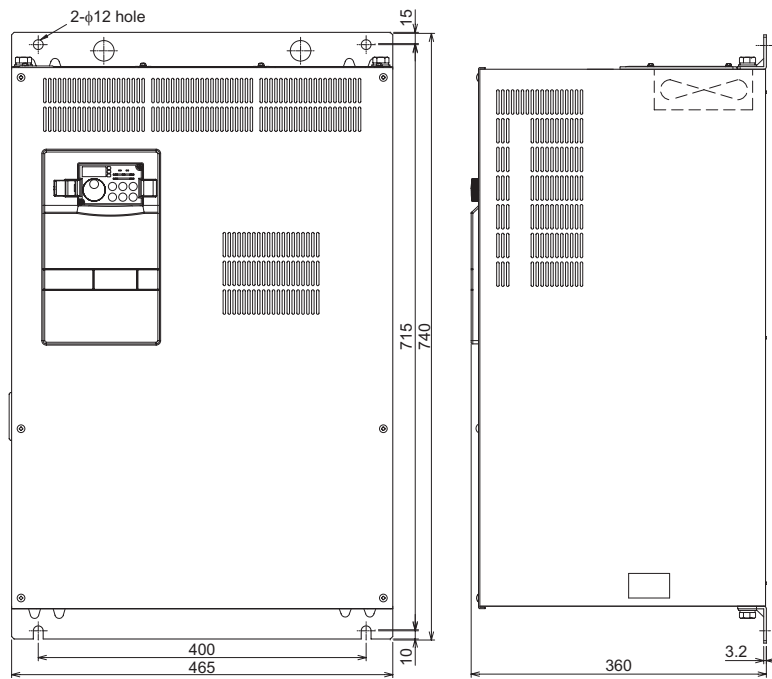


- FR-B-75K, 90K (400V class)

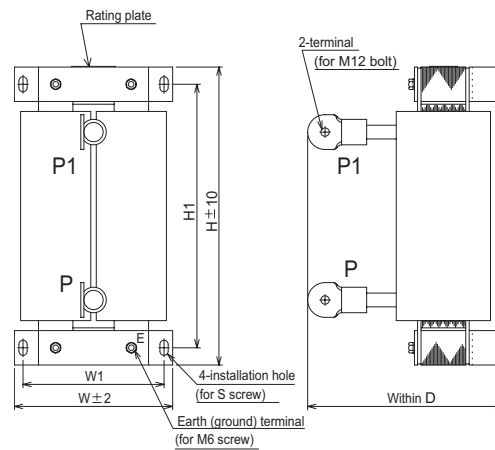




- FR-B-75K (200V class)
- FR-B-110K (400V class)



- DC reactor supplied

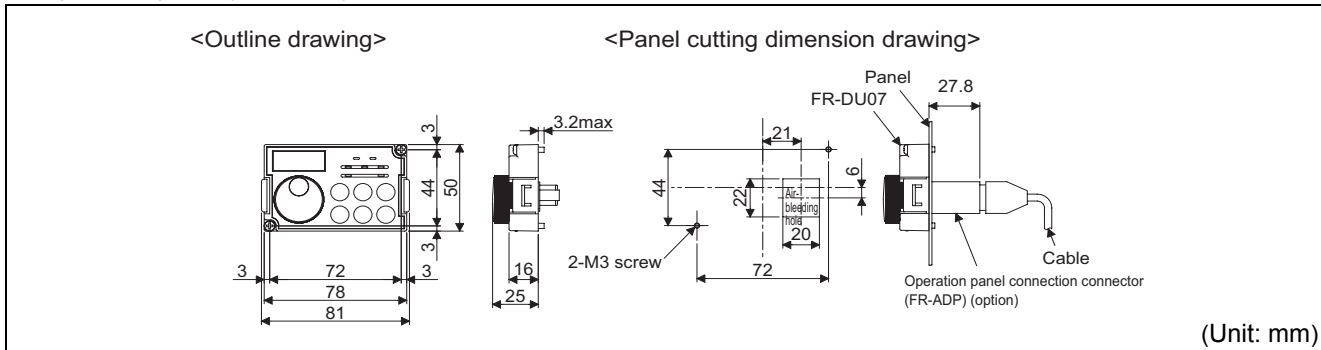


DC Reactor Type	W	W1	H	H1	D	S	Mass (kg)
FR-HEL-75K (FR-B-75K)	150	130	340	310	190	M6	17
FR-HEL-H110K (FR-B-110K)	150	130	340	310	195	M6	22

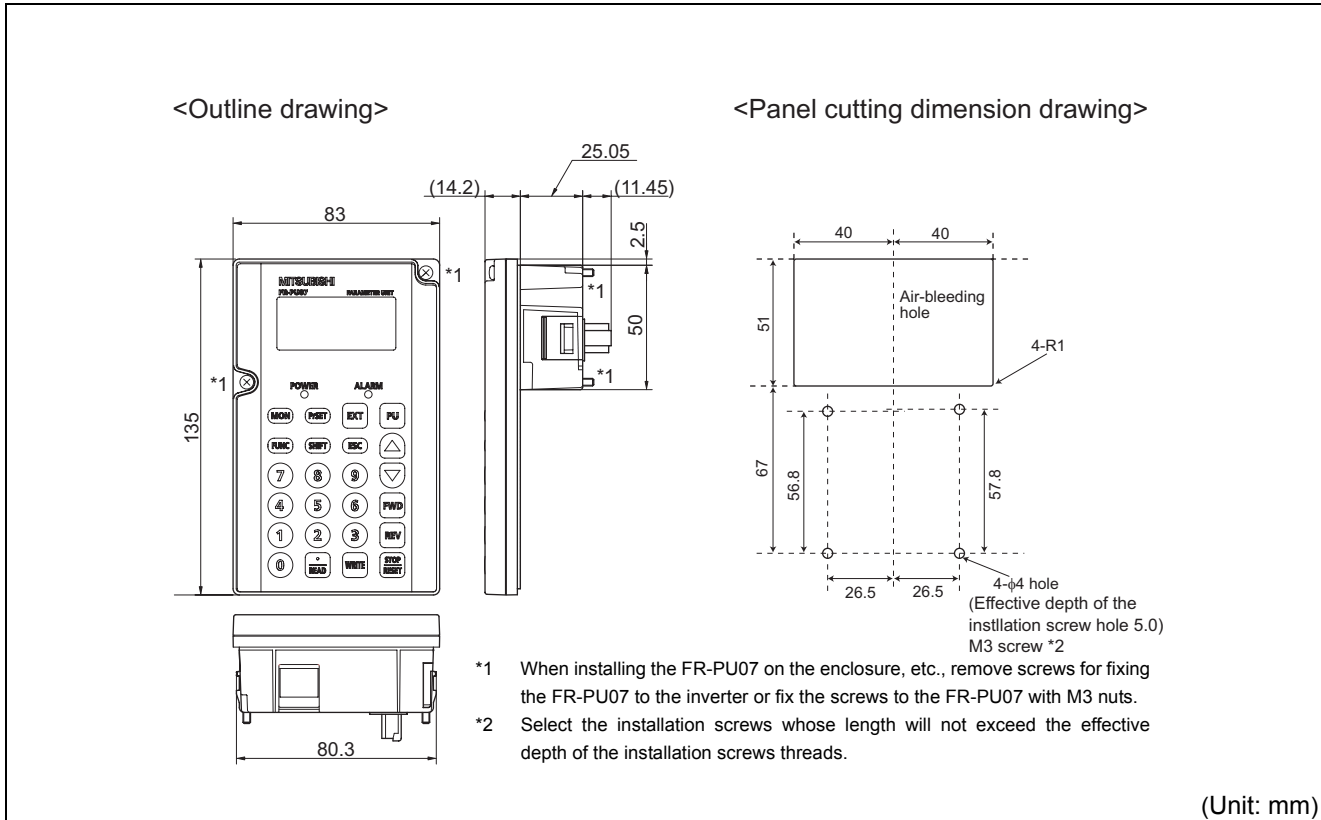
(Unit: mm)



● Operation panel (FR-DU07)



● Parameter unit (option) (FR-PU07)



APPENDICES

Appendix 1 For customers who are replacing the older model with this inverter

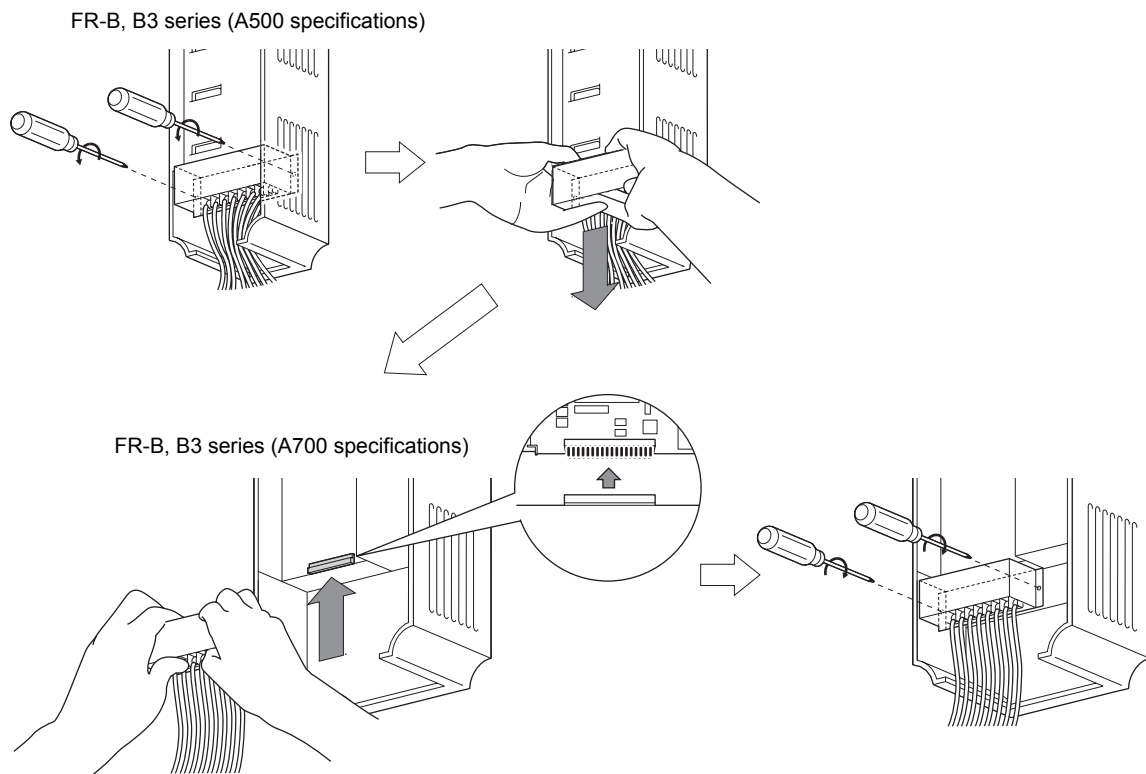
Appendix 1-1 Replacement of the FR-B,B3 series (A500 specifications)

(1) Instructions for installation

- 1)Removal procedure of the front cover was changed. (With screws.) Please note. (Refer to page 5.)
- 2)Removal procedure of the operation panel was changed. (With screws.) Please note. (Refer to page 5.)
- 3)Plug-in options of the B,B3 series (A500 specifications) are not compatible
- 4)Operation panel (FR-DU04) can not be used.
- 5)Setup software (FR-SW0-SETUP/FR-SW1-SETUP) can not be used.

(2) Wiring instructions

- 1)The control circuit terminal block can be used for the FR-B, B3 series (A700 specifications) without removing wiring.
Note that the wiring cover (400 to 22K) is not compatible.



(Note that the relay output 2 (A2, B2, C2) specific for the FR-B, B3 series (A700 specifications) can not be used with the FR-B, B3 series (A500 specifications) terminals.)

(3) Instructions for continuous use of the FR-PU04 (parameter unit)

- 1)For the FR-B, B3 series (A700 specifications), many functions (parameters) have been added. When setting these parameters, the parameter name and setting range are not displayed. User initial value list and user clear of the HELP function can not be used.
- 2)For the FR-B, B3 series (A700 specifications), many protective functions have been added. These functions activate, but all faults are displayed as "Fault 14". When the faults history has been checked, "E.14" appears. Added faults display will not appear on the parameter unit.
- 3) User initial value setting can not be used.
- 4) User registration/clear (user group 2) can not be used.
- 5) Parameter copy/verification function can not be used.

(4) Main differences between the explosion proof inverter and standard inverter

Specifications		FR-B3-(N) (FR-A700 specifications)	FR-A700
Power supply voltage	200V class	200V 50Hz 200/220V 60Hz	200V to 220V 50Hz 200V to 240V 60Hz
	400V class	400V 50Hz 400/440V 60Hz	380 to 480V 50/60Hz
Maximum output frequency		Limit according to the maximum operating frequency of the motor	400Hz
Advanced magnetic flux vector control		Available (Advanced magnetic flux vector control operation is required)	Available
Real sensorless vector control		Not available	Available
Energy saving control selection		Not available (due to Advanced magnetic flux vector control)	Available
PWM frequency		Two types, standard(2kHz)/law noise (14.5kHz), are available	Law noise(Variable)

MEMO

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Apr., 2006	IB(NA)-0600271ENG-A	First edition
Feb., 2009	IB(NA)-0600271ENG-B	<p>Additions</p> <p><i>Pr. 653 Speed smoothing control (FR-B series)</i></p> <p><i>Pr. 72 PWM frequency selection (FR-B series)</i></p> <p><i>Pr. 547 USB communication station number</i></p> <p><i>Pr. 548 USB communication check time interval</i></p> <p>Changes</p> <p><i>Pr.30 and Pr.70 setting values</i></p>

 **For Maximum Safety**

- Mitsubishi inverters are not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product are likely to cause a serious accident.
- Please do not use this product for loads other than three-phase induction motors.