MITSUBISHI ELECTRIC

700 series

INVERTER FR-E700

INSTRUCTION MANUAL (BASIC)

FR-E720-0.1K to 15K
FR-E740-0.4K to 15K

Thank you for choosing this Mitsubishi 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-0600277ENG]. The *Instruction Manual (applied)* is separately available from where you purchased the inverter or your Mitsubishi sales representative.

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APPENDIX 123

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 the Instruction Manual (basic) and appended documents carefully and can use the equipment correctly. Do not use this product 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 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, switch off power, 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 code. (NEC section 250, IEC 536 class 1 and other applicable standards)**
  Use an 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 change the cooling fan while power is on. It is dangerous to change the cooling fan while power is on.**
- **Do not touch the printed circuit board with wet hands. Otherwise, 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 an incombustible wall without holes, etc. Mounting it to or near combustible 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 they will be extremely hot. Doing so can cause burns.

4. Additional Instructions

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

(1) Transportation and mounting

⚠CAUTION

- Transport the product using the correct method that corresponds to the weight. Failure to observe this could lead to injuries.
- 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.
- 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	Ambient Temperature	-10°C to +50°C (non-freezing) (-10°C to +40°C for totally-enclosed structure feature)
	Ambient humidity	90%RH maximum (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 1,000m above sea level, 5.9m/s^2 or less

*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/capacitor type filter on the inverter output side.
- The connection orientation of the output cables U, V, W to the motor will affect the direction of rotation of the motor.

(3) Trial run

⚠CAUTION

- Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

(4) Usage

⚠WARNING

- When you have chosen the retry function, stay away from the equipment as it will restart suddenly after trip.
- Since STOP/RESET is valid only when functions are set *(Refer to page 77)*, 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 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 product.

⚠CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter.
- 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 a 400V class motor is inverter-driven, please use an insulation-enhanced motor or measures taken to suppress surge voltages. Surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
- When parameter clear or all parameter 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 any protective function is activated, take the appropriate 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.**

(7) Disposal

⚠CAUTION

- **Treat as industrial waste.**

General instruction

Many of the diagrams and drawings in this Instruction Manual (basic) show the inverter without a cover, or partially open. Never operate the inverter in this manner. Always replace the cover and follow this Instruction Manual (basic) when operating the inverter.

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<Abbreviations>
- PU: Operation panel and parameter unit (FR-PU04, FR-PU07)
- Inverter: Mitsubishi inverter FR-E700 series
- FR-E700: Mitsubishi inverter FR-E700 series
- Pr.: Parameter number
- PU operation: Operation using the PU (FR-PU04/FR-PU07)
- External operation: Operation using the control circuit signals
- Combined operation : Operation using the PU (FR-PU04/FR-PU07) and external operation
- Standard motor : SF-JR
- Constant torque motor : SF-HRCA

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V/F : Indicates functions available during V/F control

AD MFVC : Indicates functions available during advanced magnetic flux vector control

GP MFVC : Indicates functions available during general-purpose magnetic flux vector control

REMARKS: Additional helpful contents and relations with other functions are written

Note: Contents requiring caution or cases when set functions are not activated are written.

POINT: Useful contents and points are written.

MEMO

1 PRODUCT CHECKING AND PARTS IDENTIFICATION

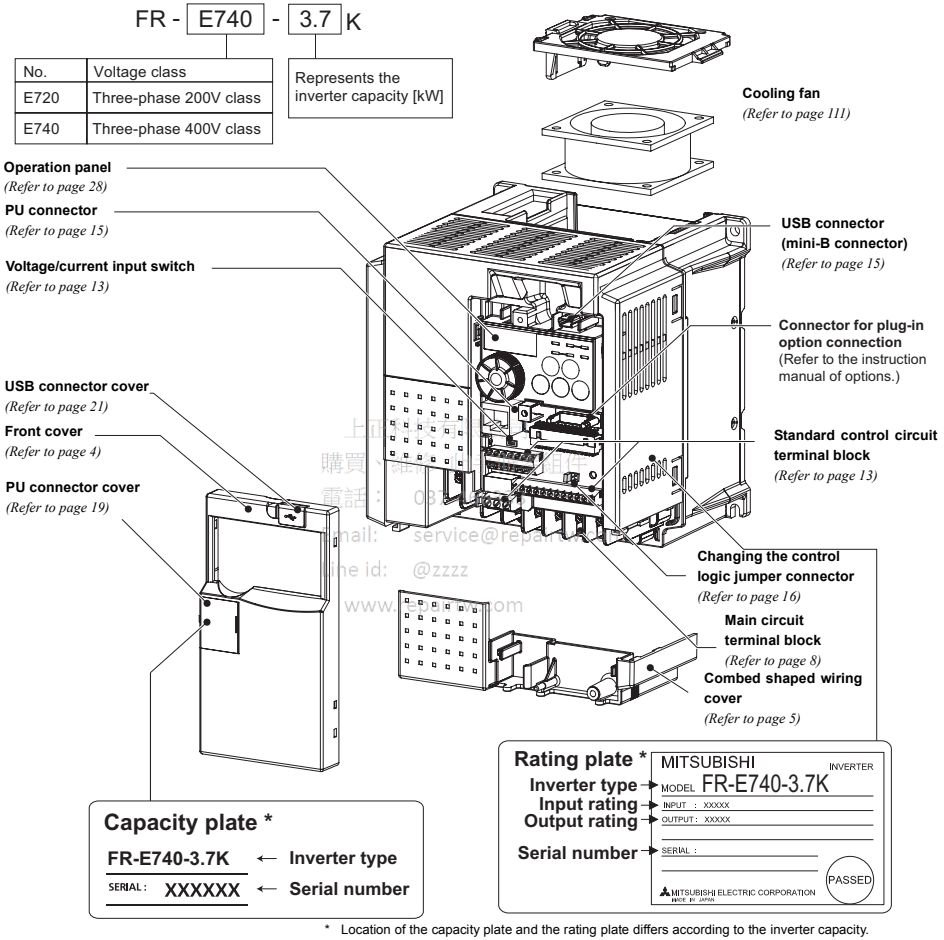
Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

●Inverter type

FR - E740 - 3.7 K

No.	Voltage class
E720	Three-phase 200V class
E740	Three-phase 400V class

Represents the inverter capacity [kW]



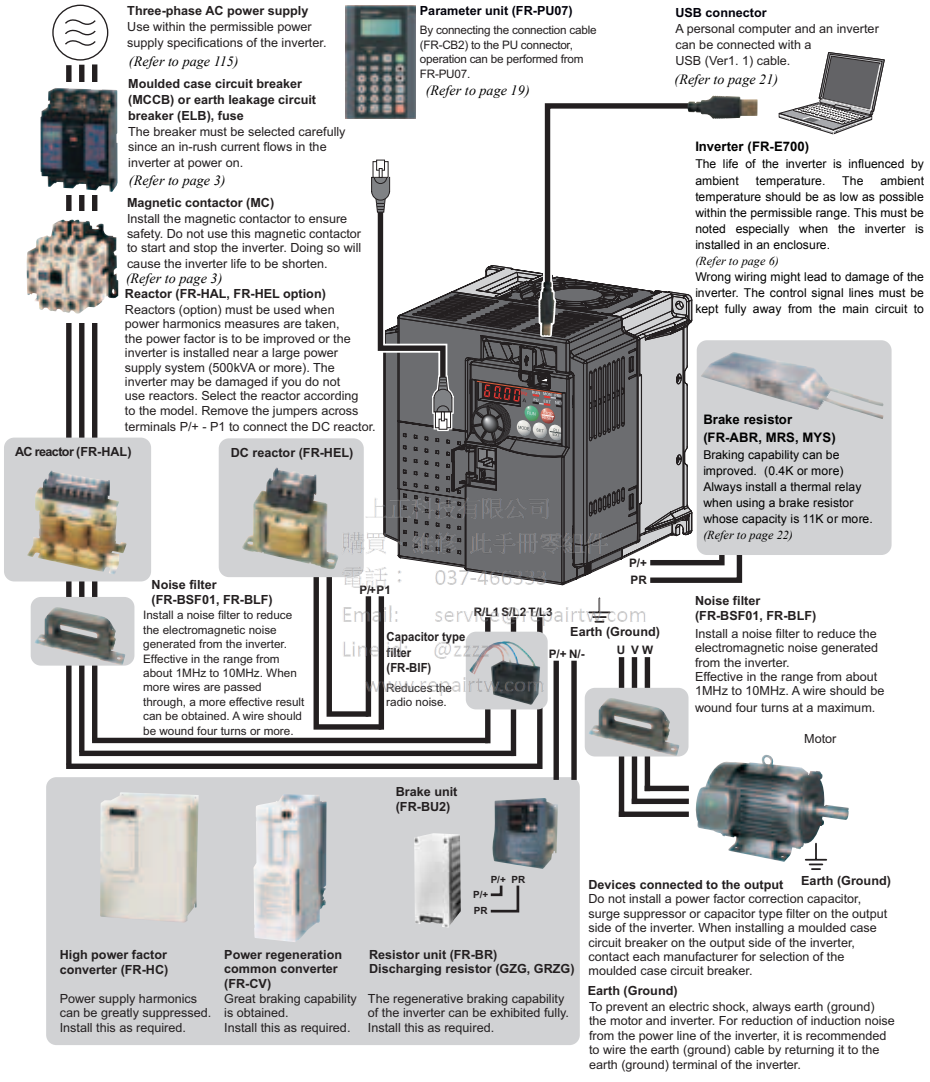
* Location of the capacity plate and the rating plate differs according to the inverter capacity. Refer to the outline dimension drawing.(*Refer to page 118*)

- **Accessory**
  - **Fan cover fixing screws (M3 × 35mm)**
    These screws are necessary for compliance with the European Directive (*Refer to page 125*)

Capacity	Number
1.5K to 3.7K	1
5.5K to 15K	2

Harmonic suppression guideline (when inverters are used in Japan)
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 the chapter 3 of the Instruction Manual (applied).*)

2 INSTALLATION AND WIRING



NOTE

- **Do not install a power factor correction capacitor, surge suppressor or capacitor type 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, install the FR-BIF optional capacitor type filter (for use in the input side only) or FR-BSF01 or FR-BLF common mode filter to minimize interference.
  (Refer to the chapter 3 of the Instruction Manual (applied)).
- **Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.**

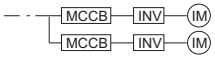
2.1 Peripheral devices

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:

Inverter Type		Motor Output (kW)	Moulded Case Circuit Breaker (MCCB) *1 or Earth Leakage Circuit Breaker (ELB) *4		Magnetic Contactor (MC) *5	
			Reactor connection		Reactor connection	
			without	with	without	with
Three-Phase 200V	FR-E720-0.1K	0.1	30AF 5A	30AF 5A	S-N10	S-N10
	FR-E720-0.2K	0.2	30AF 5A	30AF 5A	S-N10	S-N10
	FR-E720-0.4K	0.4	30AF 5A	30AF 5A	S-N10	S-N10
	FR-E720-0.75K	0.75	30AF 10A	30AF 10A	S-N10	S-N10
	FR-E720-1.5K	1.5	30AF 15A	30AF 15A	S-N10	S-N10
	FR-E720-2.2K	2.2	30AF 20A	30AF 15A	S-N10	S-N10
	FR-E720-3.7K	3.7	30AF 30A	30AF 30A	S-N20, S-N21	S-N10
	FR-E720-5.5K	5.5	50AF 50A	50AF 40A	S-N25	S-N20, S-N21
	FR-E720-7.5K	7.5	100AF 60A	50AF 50A	S-N25	S-N25
	FR-E720-11K	11	100AF 75A	100AF 75A	S-N35	S-N35
	FR-E720-15K	15	225AF 125A	100AF 100A	S-N50	S-N50
Three-Phase 400V	FR-E740-0.4K	0.4	30AF 5A	30AF 5A	S-N10	S-N10
	FR-E740-0.75K	0.75	30AF 5A	30AF 5A	S-N10	S-N10
	FR-E740-1.5K	1.5	30AF 10A	30AF 10A	S-N10	S-N10
	FR-E740-2.2K	2.2	30AF 15A	30AF 10A	S-N10	S-N10
	FR-E740-3.7K	3.7	30AF 20A	30AF 15A	S-N10	S-N10
	FR-E740-5.5K	5.5	30AF 30A	30AF 20A	S-N20	S-N11, S-N12
	FR-E740-7.5K	7.5	30AF 30A	30AF 30A	S-N20	S-N20
	FR-E740-11K	11	50AF 50A	50AF 40A	S-N20	S-N20
	FR-E740-15K	15	100AF 60A	50AF 50A	S-N25	S-N20

*1 •Select an MCCB according to the power supply capacity.
•Install one MCCB per inverter.



*2 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.

*3 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.

*4 For installations in the United States or Canada, use the class T type fuse certified by the UL and cUL. (*Refer to page 127*)

*5 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 or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

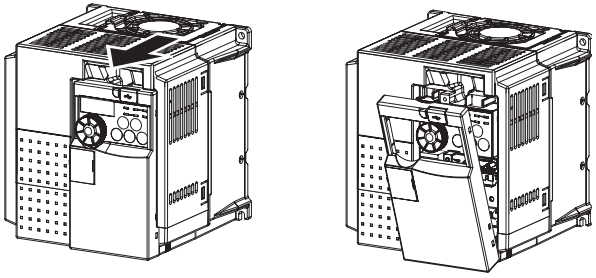
2.2 Removal and reinstallation of the cover

2.2.1 Front cover

FR-E720-3.7K or less, FR-E740-7.5K or less

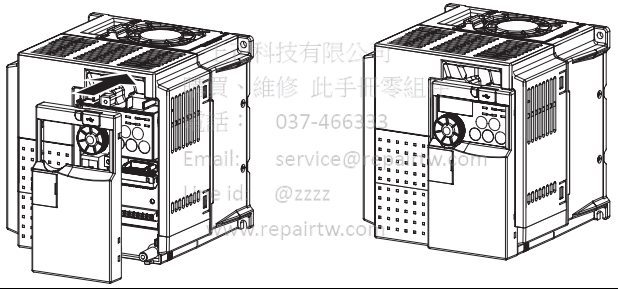
●Removal (Example of FR-E740-3.7K)

Remove the front cover by pulling it toward you in the direction of arrow.



●Reinstallation (Example of FR-E740-3.7K)

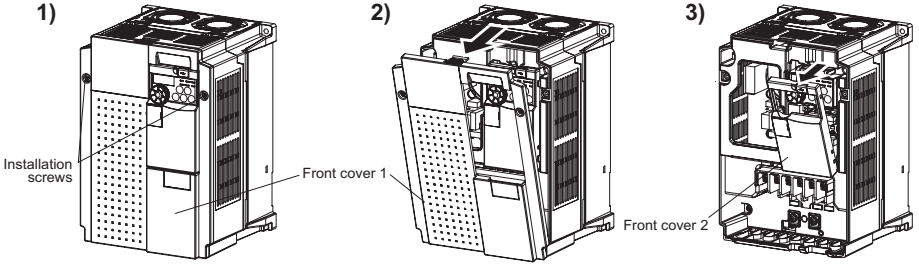
To reinstall, match the cover to the inverter front and install it straight.



FR-E720-5.5K to 15K, FR-E740-11K, 15K

●Removal (Example of FR-E740-11K)

1) Loosen the installation screws of the front cover 1.
2) Remove the front cover 1 by pulling it toward you in the direction of arrow.
3) Remove the front cover 2 by pulling it toward you in the direction of arrow.

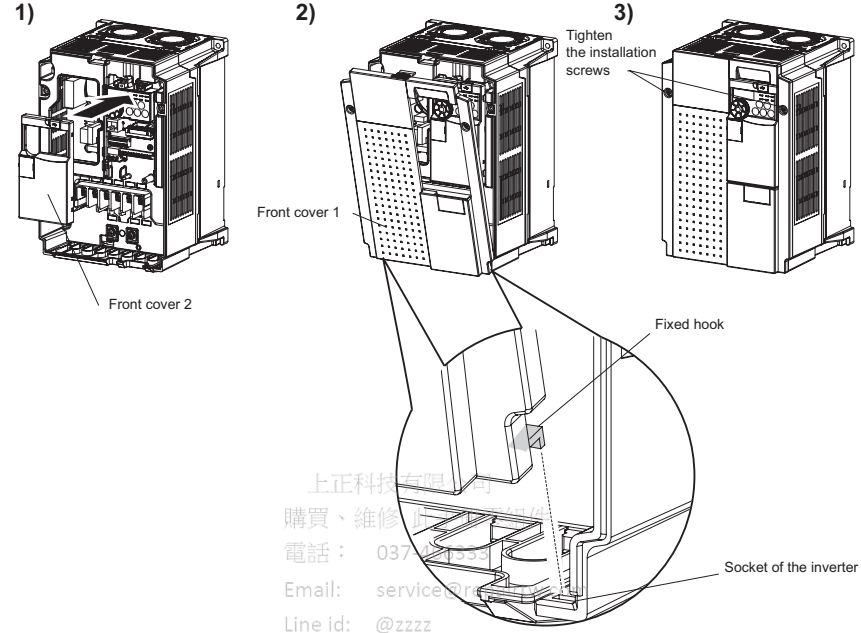


●Reinstallation (Example of FR-E740-11K)

1) Match the front cover 2 to the inverter front and install it straight.

2) Insert the two fixed hooks on the lower side of the front cover 1 into the sockets of the inverter.

3)Tighten the screw of the front cover 1.



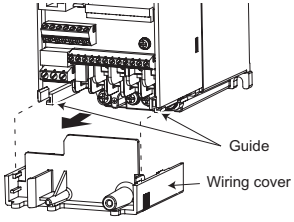
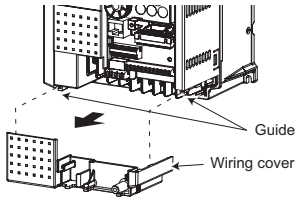
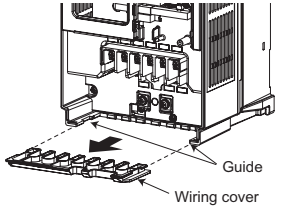
NOTE

- **Fully make sure that the front cover has been reinstalled securely.**
- **The same serial number is printed on the capacity plate of the front cover and the rating plate of the inverter. Since these plates have the same serial numbers, always reinstall the removed cover onto the original inverter.**

2.2.2 Wiring cover

●Removal and reinstallation

The cover can be removed easily by pulling it toward you. To reinstall, fit the cover to the inverter along the guides.

FR-E720-0.1K to 0.75K	FR-E720-1.5K to 3.7K FR-E740-0.4K to 7.5K	FR-E720-5.5K to 15K FR-E740-11K, 15K
		
Example of FR-E720-0.75K	**Example of FR-E740-3.7K**	**Example of FR-E740-11K**

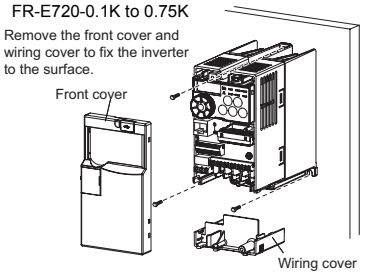
2.3 Installation of the inverter and instructions

- Installation of the inverter

  Enclosure surface mounting

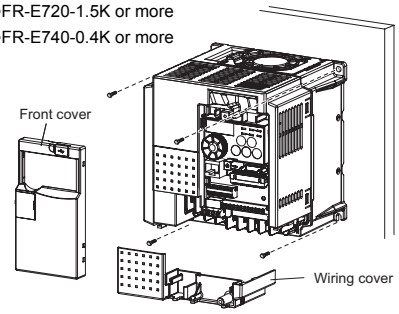
  FR-E720-0.1K to 0.75K

  Remove the front cover and wiring cover to fix the inverter to the surface.



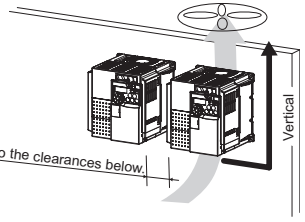
  ●FR-E720-1.5K or more

  ●FR-E740-0.4K or more



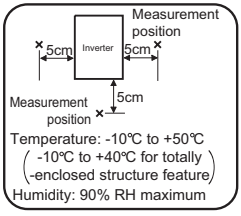
Note

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



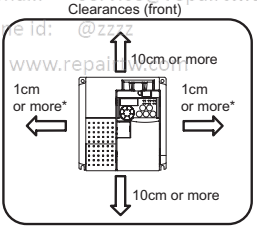
- Install the inverter under the following conditions.

Ambient temperature and humidity



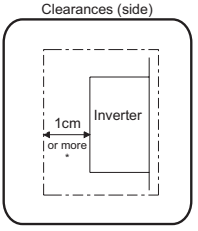
Leave enough clearances and take cooling measures.

Clearances (front)



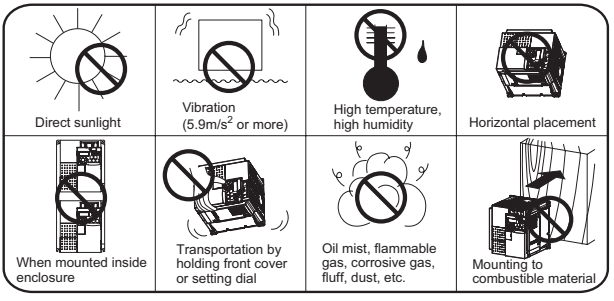
* When using the inverters at the ambient temperature of 40℃ or less, the inverters can be installed without any clearance between them (0cm clearance). When ambient temperature exceeds 40℃, clearances between the inverters should be 1cm or more (5cm or more for the 5.5K or more).

Clearances (side)



* 5cm or more for the 5.5K or more

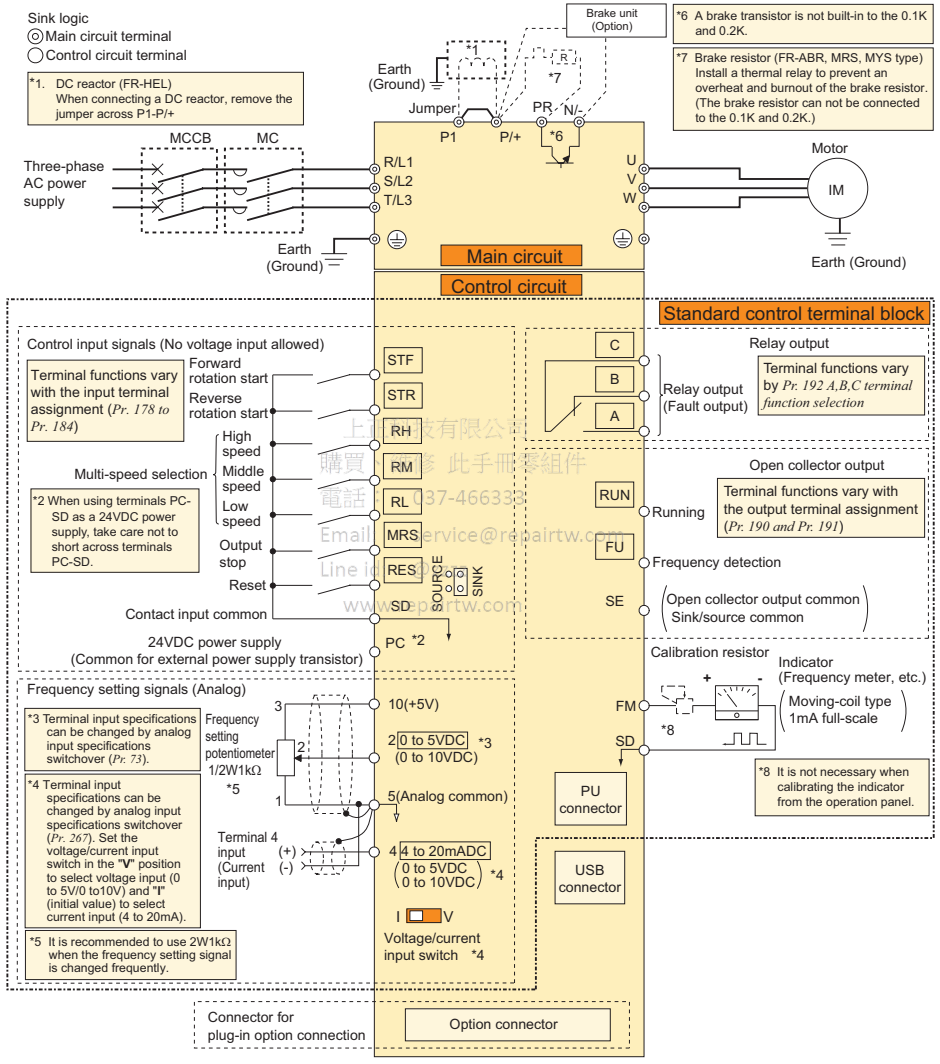
- The inverter consists of precision mechanical and electronic parts. Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.



2.4 Wiring

2.4.1 Terminal connection diagram

- Three-phase 200V power input
- Three-phase 400V power input



NOTE

- **To prevent a malfunction caused by noise, separate the signal cables more than 10cm from the power cables.**
- **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.

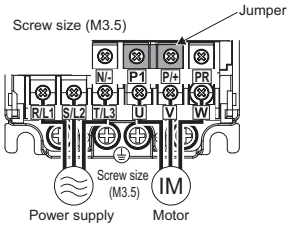
2.4.2 Specification of main circuit terminal

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 (FR-HC) or power regeneration common converter (FR-CV).
U, V, W	Inverter output	Connect a three-phase squirrel-cage motor.
P/+, PR	Brake resistor connection	Connect a brake resistor (FR-ABR, MRS, MYS) across terminals P/+-PR. (The brake resistor can not be connected to the 0.1K or 0.2K.)
P/+, N/-	Brake unit connection	Connect the brake unit (FR-BU2), power regeneration common converter (FR-CV) or high power factor converter (FR-HC).
P/+, P1	DC reactor connection	Remove the jumper across terminals P/+-P1 and connect a DC reactor.
⏚	Earth (Ground)	For earthing (grounding) the inverter chassis. Must be earthed (grounded).

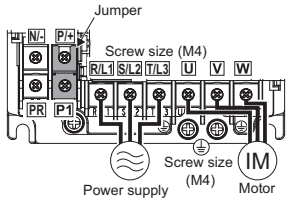
2.4.3 Terminal arrangement of the main circuit terminal, power supply and the motor wiring

200V class

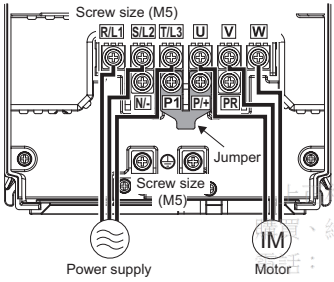
FR-E720-0.1K to 0.75K



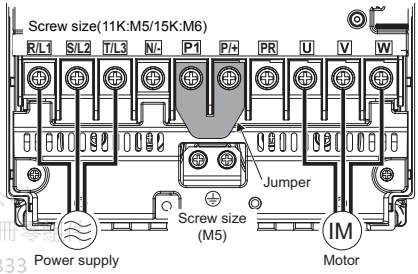
FR-E720-1.5K to 3.7K



FR-E720-5.5K, 7.5K

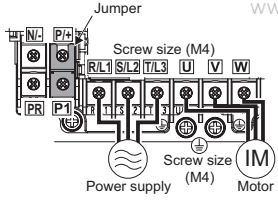


FR-E720-11K, 15K

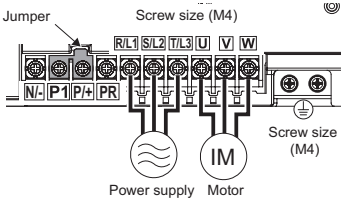


400V class

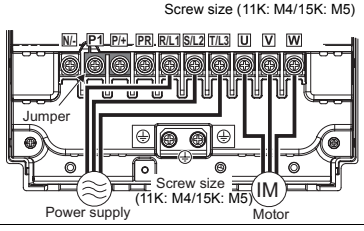
FR-E740-0.4K to 3.7K



FR-E740-5.5K, 7.5K



FR-E740-11K, 15K



NOTE

- **Make sure the power cables are connected to the R/L1, S/L2, T/L3. (Phase need not 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. Turning on the forward rotation switch (signal) at this time rotates the motor counterclockwise when viewed from the load shaft.**

(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 Model	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Size							
					HIV Cables, etc. (mm^2) *1			AWG *2		PVC Cables, etc. (mm^2) *3		
			R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable	R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable
FR-E720-0.1K to 0.75K	M3.5	1.2	2-3.5	2-3.5	2	2	2	14	14	2.5	2.5	2.5
FR-E720-1.5K, 2.2K	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-E720-3.7K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-E720-5.5K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	10	10	6	6	6
FR-E720-7.5K	M5	2.5	14-5	8-5	14	8	5.5	6	8	16	10	6
FR-E720-11K	M5	2.5	14-5	14-5	14	14	14	6	6	16	16	16
FR-E720-15K	M6(M5)	4.4	22-6	22-6	22	22	14	4	4	25	25	16

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

Applicable Inverter Model	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Size							
					HIV Cables, etc. (mm^2) *1			AWG *2		PVC Cables, etc. (mm^2) *3		
			R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable	R/L1 S/L2 T/L3	U, V, W	R/L1 S/L2 T/L3	U, V, W	Earth (ground) cable
FR-E740-0.4K to 3.7K	M4	1.5	2-4	2-4	2	2	2	14	14	2.5	2.5	2.5
FR-E740-5.5K	M4	1.5	5.5-4	2-4	3.5	2	3.5	12	14	4	2.5	4
FR-E740-7.5K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	12	12	4	4	4
FR-E740-11K	M4	1.5	5.5-4	5.5-4	5.5	5.5	8	10	10	6	6	10
FR-E740-15K	M5	2.5	8-5	8-5	8	8	8	8	8	10	10	10

*1 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 ambient temperature is 50°C or less and the wiring distance is 20m or less.

*2 The recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C. Assumes that the ambient temperature is 40°C or less and the wiring distance is 20m or less.
(Selection example for use mainly in the United States.)

*3 The recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 70°C. Assumes that the ambient temperature is 40°C or less and the wiring distance is 20m or less.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, and a screw for earthing (grounding).
A screw for earthing (grounding) of the FR-E720-15K is indicated in ( ).

NOTE

- **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.**

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.

(2) Earthing (Grounding) precautions

- 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 an 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 on *page 10* , and minimize the cable length. The earthing (grounding) point should be as near as possible to the inverter.

POINT

To be compliant with the European Directive (Low Voltage Directive), earth (ground) the inverter according to the instructions on *page 125*.

(3) Total wiring length

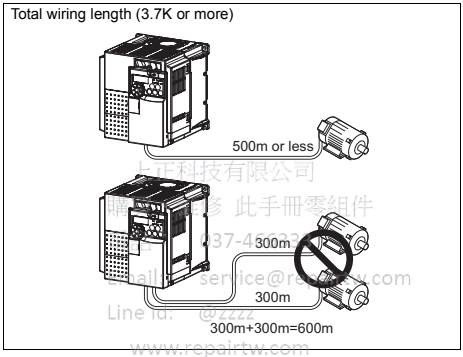
The overall wiring length for connection of a single motor or multiple motors should be within the value in the table below.

200V class

Pr. 72 PWM frequency selection Setting (carrier frequency)	0.1K	0.2K	0.4K	0.75K	1.5K	2.2K	3.7K or More
1 (1kHz) or less	200m	200m	300m	500m	500m	500m	500m
2 to15 (2kHz to 14.5kHz)	30m	100m	200m	300m	500m	500m	500m

400V class

Pr. 72 PWM frequency selection Setting (carrier frequency)	0.4K	0.75K	1.5K	2.2K	3.7K or More
1 (1kHz) or less	200m	200m	300m	500m	500m
2 to15 (2kHz to 14.5kHz)	30m	100m	200m	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 1) or 2) in this case.

1) Use a "400V class inverter-driven insulation-enhanced motor" and set frequency in *Pr. 72 PWM frequency selection* according to wiring length

	Wiring Length		
	50m or less	50m to 100m	Exceeding 100m
Carrier frequency	14.5kHz or less	8kHz or less	2kHz or less

2) Connect the surge voltage suppression filter (FR-ASF-H/FR-BMF-H) on the inverter output side.

NOTE

- **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, fast response current limit function, or stall prevention function or a malfunction or fault of the equipment connected on the inverter output side. If fast-response current limit malfunctions, disable this function. When the stall prevention function misoperates, increase the stall level. (** *Pr. 22 Stall prevention operation level* **and** *Pr. 156 Stall prevention operation selection in the chater 4 of the Instruction Manual (applied)*
- **Refer to** *the chapter 4 of the Instrunction Manual (applied)* **for details of** *Pr. 72 PWM frequency selection. Refer to the manual of the option* **for details of surge voltage suppression filter (FR-ASF-H/FR-BMF-H).**
- **When using the automatic restart after instantaneous power failure function with wiring length exceeding below, select without frequency search (***Pr. 162* **= "1, 11"). (** *Refer to the chapter 4 of the Instruction Manual (applied)*

Motor capacity	0.1K	0.2K	0.4K or more
Wiring length	20m	50m	100m

2.4.4 Standard control circuit terminal

[ ] indicates that terminal functions can be selected using *Pr. 178 to Pr. 184, Pr. 190 to Pr. 192 (I/O terminal function selection)*. (*Refer to the Instruction Manual (applied)*).

(1) Input signal

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 when contacts are open 21 to 26VDC When contacts are short-circuited 4 to 6mADC	*56*
	STR	Reverse rotation start	Turn on the STR signal to start reverse rotation and turn it off to stop. When the STF and STR signals are turned on simultaneously, the stop command is given.		
	RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.		*58*
	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.		*Instruction Manual (applied)*
	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. Factory setting is for reset always. By setting *Pr. 75*, reset can be set to enabled only at fault occurrence. Recover about 1s after reset is cancelled.		*91*
	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, when 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 22 to 26VDC permissible load current 100mA	*17*
		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	10	Frequency setting power supply	Used as power supply when connecting potentiometer for frequency setting (speed setting) from outside of the inverter. (*Refer to the chapter 4 of the Instruction Manual (applied))*	5V±0.2VDC permissible load current 10mA	*54, 60*
	2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V) provides the maximum output frequency at 5V (10V) and makes input and output proportional. Use *Pr. 73* to switch between input 0 to 5VDC input (initial setting) and 0 to 10VDC.	Input resistance10kΩ ± 1kΩ Permissible maximum voltage 20VDC	*54, 60*
	4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA and 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 "V" position to select voltage input (0 to 5V/0 to 10V). (*Refer to the chapter 4 of the Instruction Manual (applied)).*	Current input: Input resistance 233Ω ± 5Ω Maximum permissible current 30mA Voltage input: Input resistance10kΩ ± 1kΩ Permissible maximum voltage 20VDC **Current input (initial status)** **Voltage input** 	*55, 63*
	5	Frequency setting common	Frequency setting signal (terminal 2, 4) common terminal. Do not earth (ground).	—	—

NOTE

Set *Pr. 267* and a voltage/current input switch correctly, then input analog signals in accordance with the settings.
Applying a voltage with voltage/current input switch in "I" position (current input is selected) or a current with switch in "V" position (voltage input is selected) could cause component damage of the inverter or analog circuit of output devices.

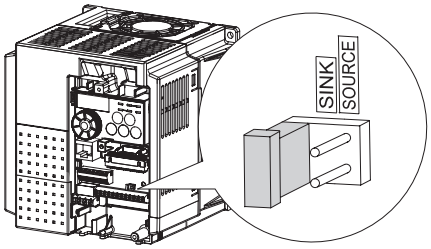
(2) Output signal

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Reference Page
Relay	A, B, C	Relay output (fault output)	1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Fault: discontinuity across B-C (continuity across A-C), Normal: continuity across B-C (discontinuity across A-C)	Contact capacity:230VAC 0.3A (power factor =0.4) 30VDC 0.3A	*Instruction Manual (applied)*
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.*	Permissible load 24VDC (maximum 27VDC) 0.1A (a voltage drop is 3.4V maximum when the signal is on) * Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).	*Instruction Manual (applied)*
	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.*		*Instruction Manual (applied)*
	SE	Open collector output common	Common terminal of terminal RUN and FU.	—	—
Pulse	FM	For meter	Select one e.g. output frequency from monitor items. Not output during inverter reset. 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 1mA 1440 pulses/s at 60Hz	*Instruction Manual (applied)*

(3) Communication

Type	Terminal Symbol	Terminal Name	Description	Reference Page
RS-485	—	PU connector	With the PU connector, communication can be made through RS-485. • Conforming standard: EIA-485 (RS-485) • Transmission format: Multidrop link • Communication speed: 4800 to 38400bps • Overall length: 500m	*19*
USB	—	USB connector	The FR Configurator can be operated by connecting the inverter to the personnel computer through USB. • Interface: conforms to USB1.1 • Transmission speed: 12Mbps • Connector: USB mini B connector (receptacle mini B type)	*21*

2.4.5 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 above the control terminal must be moved to the other position.

- To change to source logic, change the jumper connector in the sink logic (SINK) position to source logic (SOURCE) position using tweezers, a pair of long-nose pliers etc. Change the jumper connector position before switching power on.

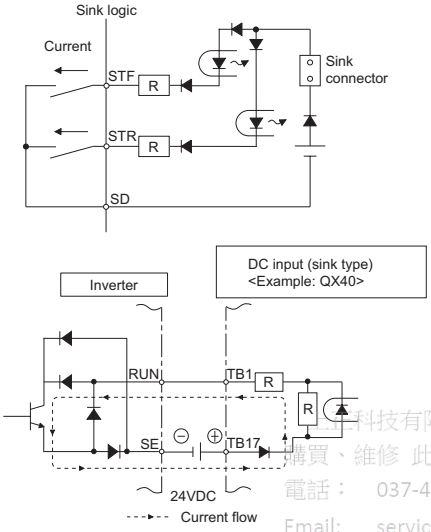
NOTE

- **Fully make sure that the front cover has been reinstalled securely.**
- **The capacity plate is placed on the front cover and the rating plate is on the inverter. Since these plates have the same serial numbers, always reinstall the removed cover onto the original inverter.**
- **The sink-source logic change-over jumper connector must be fitted in only one of those positions. If it is fitted in both positions at the same time, the inverter may be damaged.**

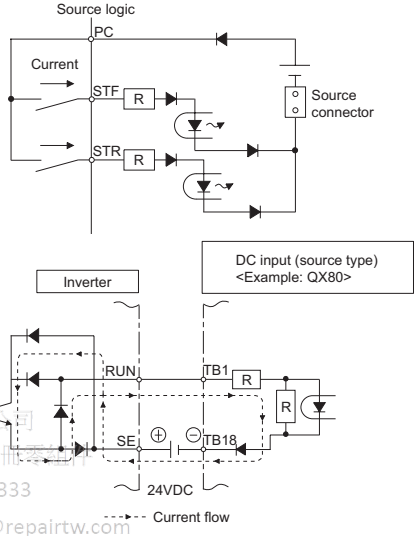
(1) Sink logic type and source logic type

- 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



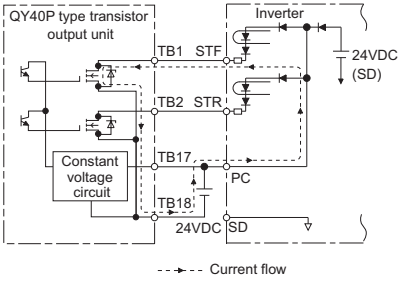
●Current flow concerning the input/output signal when source logic is selected



●When using an external power supply for transistor output

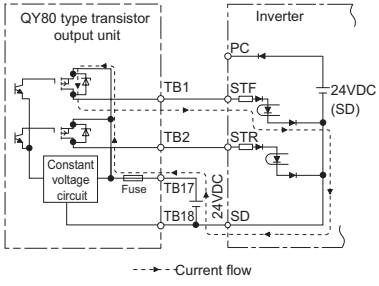
- Sink logic type

  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 an external power supply in parallel with the inverter. Doing so may cause a malfunction in the inverter due to undesirable currents.)



- Source logic type

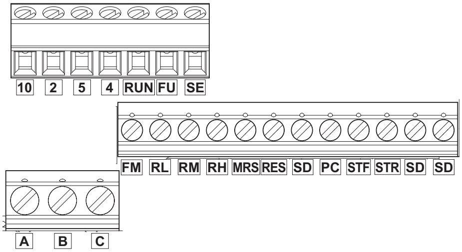
  Use terminal SD as a common terminal, and perform wiring as shown below. (Do not connect terminal PC of the inverter with terminal +24V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install an external power supply in parallel with the inverter. Doing so may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



2.4.6 Wiring of control circuit

(1) Standard control circuit terminal layout

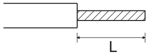
Terminal screw size
M3: (Terminal A, B, C)
M2: (Other than the above)



(2) Wiring method

1) Strip off the sheath of the cable of the control circuit to wire.
Strip off the sheath about the size below. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off.

Cable stripping size



Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.
Use a bar terminal as necessary.

	L(mm)
Terminal A, B, C	6
Other than the above	5

Introduced products on bar terminals: (as of September, 2006)

Terminal Screw Size	Wire Size (mm^2)	Bar Terminal Model		Maker
		With Insulation Sleeve	Without Insulation Sleeve	
M3 (terminal A, B, C)	0.3 to 0.5	AI 0,5-6WH	A 0,5-6	Phoenix Contact Co.,Ltd.
	0.5 to 0.75	AI 0,75-6GY	A 0,75-6	
M2 (other than the above)	0.3 to 0.5	AI 0,5-6WH	A 0,5-6	

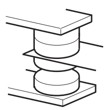
Bar terminal crimping tool: CRIMPFOX ZA3 (Phoenix Contact Co., Ltd.)

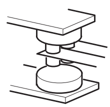
2) Loosen the terminal screw and insert the cable into the terminal.
3) Tighten the screw to the specified torque.
Undertightening can cause cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or unit.
Tightening torque: 0.5N·m to 0.6N·m (terminal A, B, C)
0.22N·m to 0.25N·m (other than the above)

* Screwdriver: ⊖Small flathead screwdriver (Tip thickness: 0.4mm/tip width: 2.5mm)

(3) Wiring instructions

1) Terminals SD, SE and 5 are common to the I/O signals. Do not earth (ground) them.
2) Use shielded or twisted cables 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 contact faults when using contact inputs since the control circuit input signals are micro-currents.

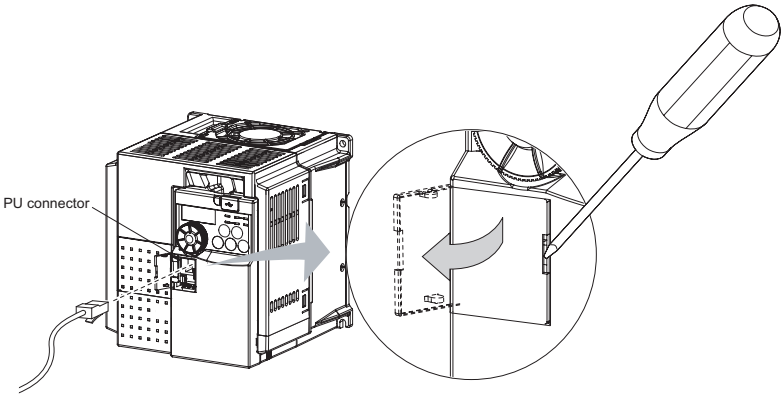

Micro signal contacts


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 cables of 0.3mm^2 to 0.75mm^2 gauge for connection to the control circuit terminals.
If the cable gauge used is 1.25mm^2 or more, the front cover may be lifted when there are many cables running or the cables are run improperly, resulting in a fall off of the front cover.
7) The maximum wiring length should be 30m (200m for terminal FM).
8) Do not short terminal PC and SD. Inverter may be damaged.

2.4.7 Connection to the PU connector

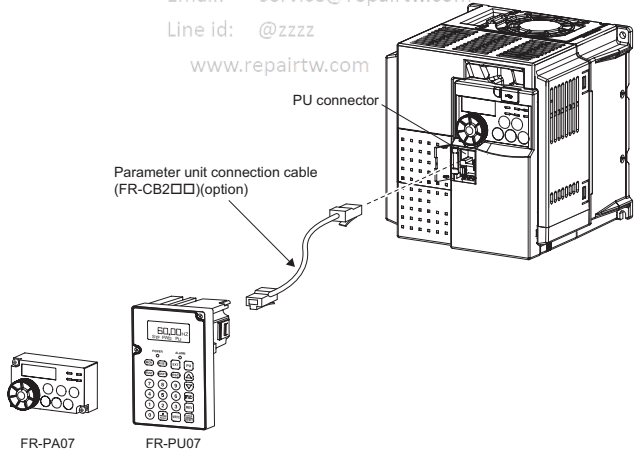
Using the PU connector, you can perform communication operation from the FR-PU07, enclosure surface operation panel or a personal computer etc.
Refer to the figure below to open the PU connector cover.



To open the cover
Place a flathead screwdriver, etc. in a slot and push up the cover to open.

●When connecting the parameter unit, enclosure surface operation panel using a connection cable

Use the optional FR-CB2□□ or connector and cable available on the market.
Insert the cable plugs securely into the PU connector of the inverter and the connection connector of the FR-PU07, FR-PA07 along the guide until the tabs snap into place.



Note

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.

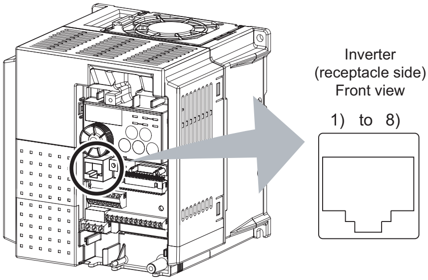
REMARKS

- When using a commercially available connector and cable as a parameter unit connection cable, refer to *the chapter 4 of the Instruction Manual (applied)*.

●RS-485 communication

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.
The protocol can be selected from Mitsubishi inverter and Modbus RTU.

- **PU connector pin-outs**



Pin Number	Name	Description
1)	SG	Earth (ground) (connected to terminal 5)
2)	—	Parameter unit power supply
3)	RDA	Inverter receive+
4)	SDB	Inverter send-
5)	SDA	Inverter send+
6)	RDB	Inverter receive-
7)	SG	Earth (ground) (connected to terminal 5)
8)	—	Parameter unit power supply

NOTE

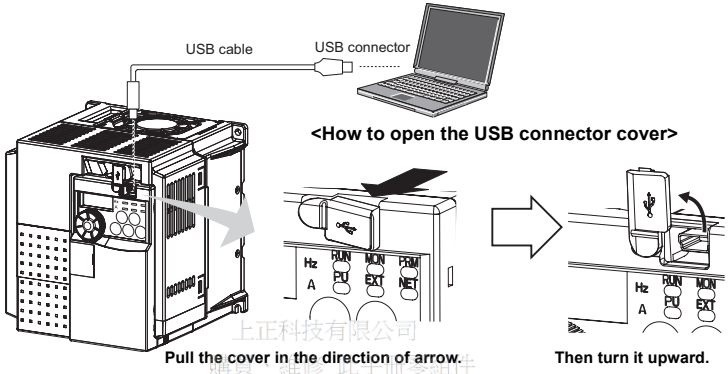
- **Pins No. 2 and 8 provide power to the parameter unit. Do not use these pins for RS-485 communication.**
- **When making RS-485 communication between the FR-E700 series, FR-E500 series and FR-S500 series, incorrect connection of pins No.2 and 8 (parameter unit power supply) of the above PU connector may result in the inverter malfunction or failure.**
- **Do not connect the PU connector to the computer's LAN board, FAX modem socket or telephone modular connector. The product could be damaged due to differences in electrical specifications.**

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

2.4.8 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 (FR-SW3-SETUP-W□).

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



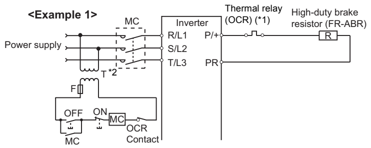
REMARKS

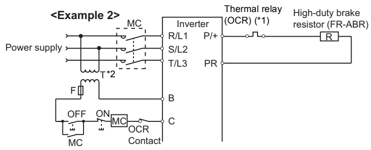
- USB cable

Name	Type	Applications, Specifications, etc.
USB cable	MR-J3USBCBL3M Cable length 3m	Connector for amplifier mini-B connector (5 pin) — Connector for personal computer A connector

2.5 When using the brake resistor (MRS, MYS, FR-ABR)

- It is recommended to configure a sequence, which shuts off power in the input side of the inverter by the external thermal relay as shown below, to prevent overheat and burnout of the brake resistor (MRS, MYS) and high duty brake resistor (FR-ABR) in case the regenerative brake transistor is damaged. (The brake resistor can not be connected to the 0.1K or 0.2K.)



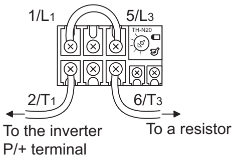


*1 Refer to the table below for the type number of each capacity of thermal relay and the diagram below for the connection. (Always install a thermal relay when using a brake resistor whose capacity is 11K or more)

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

Power Supply Voltage	Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	MRS120W200	TH-N20CXHZ-0.7A	110VAC 5A, 220VAC 2A (AC11 class) 110VDC 0.5A, 220VDC 0.25A (DC11 class)
	MRS120W100	TH-N20CXHZ-1.3A	
	MRS120W60	TH-N20CXHZ-2.1A	
	MRS120W40	TH-N20CXHZ-3.6A	
	MYS220W50 (two units in parallel)	TH-N20CXHZ-5A	

Power Supply Voltage	Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	FR-ABR-0.4K	TH-N20CXHZ-0.7A	110VAC 5A 220VAC 2A (AC11 class) 110VDC 0.5A, 220VDC 0.25A (DC11 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	
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	



Note

- **Brake resistor can not be used with the brake unit, high power factor converter, power supply regeneration converter, etc.**
- **Do not use the brake resistor with a lead wire extended.**
- **Do not connect the resistor directly to the DC terminals P/+ and N/-. This could cause a fire.**

2.6 Power-off and magnetic contactor (MC)

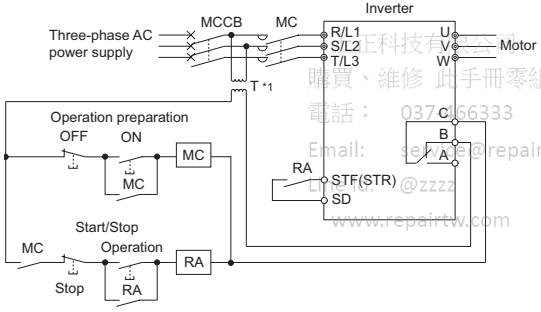
(1) Inverter input side magnetic contactor (MC)

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). When cycle operation or heavy-duty operation is performed with an optional brake resistor connected, overheat and burnout of the discharging resistor can be prevented if a regenerative brake transistor is damaged due to insufficient heat capacity of the discharging resistor and excess regenerative brake duty.
2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
3) The control power supply for inverter is always running and consumes a little power. 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-AC3 MC 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 1,000,000 times.), 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 across terminals STF or STR-SD) to make a start or stop.

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

(2) Handling of 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. When an MC is provided for switching to the commercial power supply, for example, switch it on/off after the inverter and motor have stopped.

2.7 Precautions for use of the inverter

The FR-E700 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 10* for the recommended wire 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 12)*

(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, install the FR-BIF optional capacitor type filter (for use in the input side only) or FR-BSF01 or FR-BLF common mode filter to minimize interference.

(7) Do not install a power factor correction capacitor, surge suppressor or capacitor type 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.

(8) Before starting wiring or other work after the inverter is operated, 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.

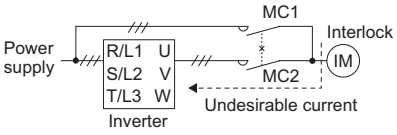
(9) A short circuit or earth (ground) fault on the inverter output side may damage the inverter modules.
- Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter modules.
- Fully check the to-earth (ground) insulation and phase to 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 (turn on/off terminals STF, STR-SD) to start/stop the inverter. *(Refer to page 23)*

(11) Across P/+ and PR terminals, connect only an external regenerative brake discharging resistor.
Do not connect a mechanical brake.
The brake resistor can not be connected to the 0.1K or 0.2K. Leave terminals P/+ and PR open.
Also, never short between these terminals.

(12) Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.
Application of a voltage higher than the permissible voltage to the inverter I/O signal circuits or opposite polarity may damage the I/O devices. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short terminals 10-5.

(13) Provide electrical and mechanical interlocks for MC1 and MC2 which are used for bypass operation. When the wiring is incorrect and if there is a bypass operation circuit as shown right, the inverter will be damaged when the power supply is connected to the inverter U, V, W terminals, due to arcs generated at the time of switch-over or chattering caused by a sequence error.



(14) 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.

(15) Instructions for overload operation
When performing operation of frequent start/stop of the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a repeated 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 the inverter which has enough allowance for current (up to 2 rank larger in capacity).

(16) Make sure that the specifications and rating match the system requirements.

(17) When the motor speed is unstable, due to change in the frequency setting signal caused by electromagnetic noises from the inverter, take the following measures when applying the motor speed by the analog signal.
- 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 and 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.

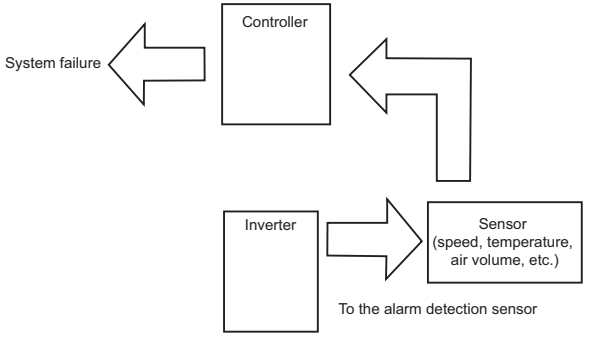
(1) Interlock method which uses the inverter status output signals
By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

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, even if the interlock is provided using the inverter fault output signal, start signal and RUN signal output, there is a case where a fault output 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.

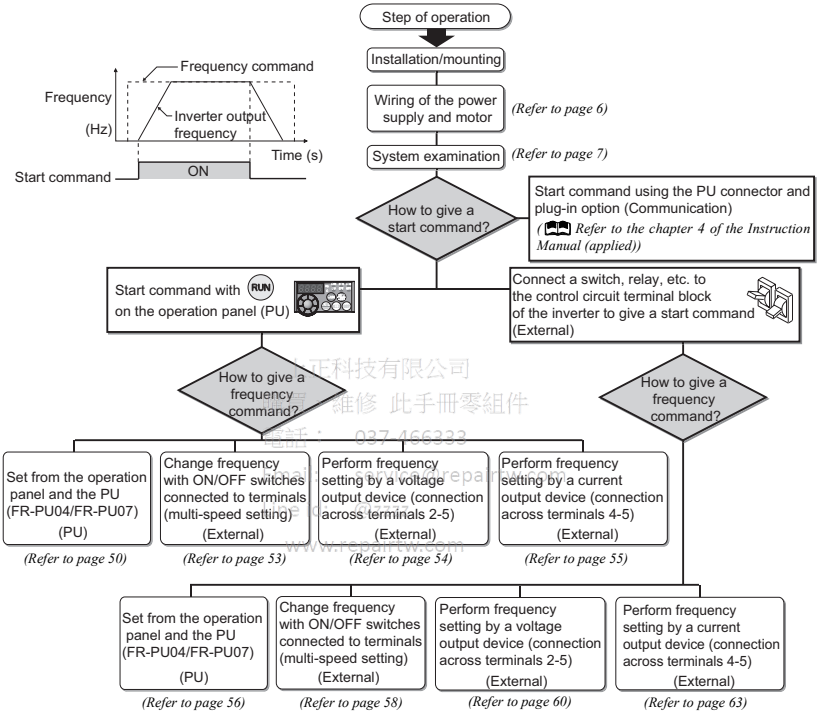
2) Command speed and actual operation check
Check if there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.



3 DRIVE THE MOTOR

3.1 Step of operation

The inverter needs frequency command and start command. Turning the start command on starts the motor rotating and the frequency command (set frequency) determines the motor speed.
Refer to the flow chart below to make setting.



Note

Check the following items before powering on the inverter.

- **Check that the inverter is installed correctly in a correct place.** ***(Refer to page 6)***
- **Check that wiring is correct.** ***(Refer to page 7)***
- **Check that no load is connected to the motor.**

3.2 Operation panel

3.2.1 Names and functions of the operation panel

The operation panel cannot be removed from the inverter.

Operation mode indication
PU: Lit to indicate PU operation mode.
EXT: Lit to indicate external operation mode.
NET: Lit to indicate network operation mode.
PU, EXT: Lit to indicate external/PU combined operation mode 1, 2.

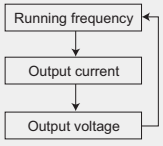
Unit indication
Hz: Lit to indicate frequency.
A: Lit to indicate current.
(Off to indicate voltage and flicker to indicate set frequency monitor.)

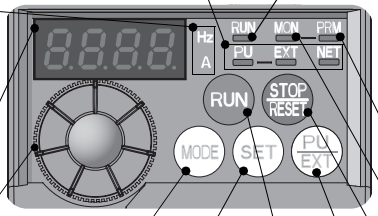
Monitor (4-digit LED)
Shows the frequency, parameter number, etc.

Setting dial
(Setting dial: Mitsubishi inverter dial)
Used to change the frequency setting and parameter values.
Press to display the following.
- Displays the set frequency in the monitor mode
- Currently set value is displayed during calibration
- Displays the order in the faults history mode

Mode switchover
Used to change each setting mode.
Pressing (PU/EXT) simultaneously changes the operation mode. *(Refer to page 30)*
Pressing for a while (2s) can lock operation.
(Refer to page 31)

Determination of each setting
If pressed during operation, monitor changes as below;





Operating status display
Lit or flicker during inverter operation. *
* On: Indicates that forward rotation operation is being performed.
Slow flickering (1.4s cycle):
Reverse rotation operation
Fast flickering (0.2s cycle):
When (RUN) was pressed or the start command was given, but the operation can not be made.
- The frequency command is less than the starting frequency.
- When the MRS signal is input.

Parameter setting mode
Lit to indicate parameter setting mode.

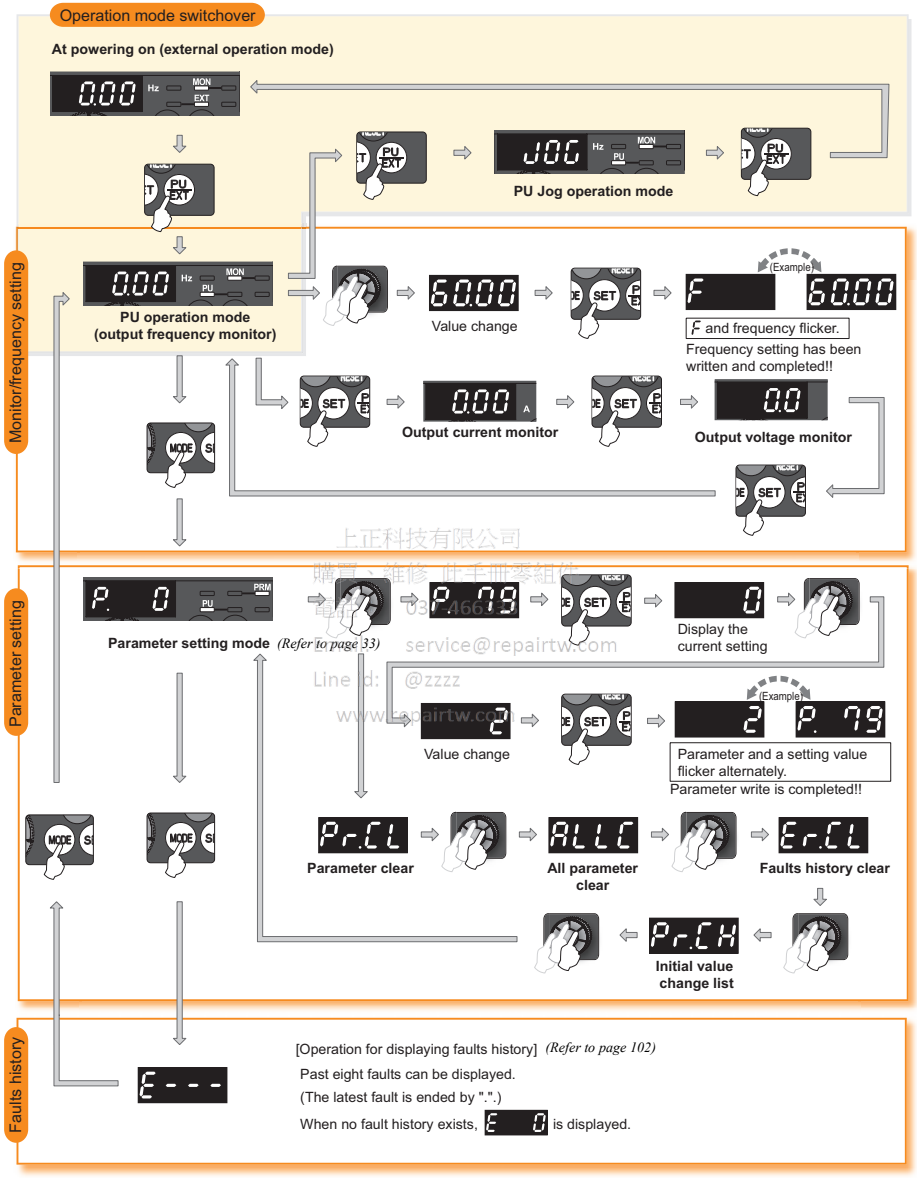
Monitor indication
Lit to indicate monitoring mode.

Stop operation
Used to stop Run command.
Fault can be reset when protective function is activated (fault).

Operation mode switchover
Used to switch between the PU and external operation mode.
When using the external operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indication.
(Press (MODE) simultanesouly (0.5s) *(Refer to page 30)*, or change *Pr. 79* setting to change to combined mode .)
(Refer to page 42)
PU: PU operation mode
EXT: External operation mode
Cancels PU stop also.

Start command
The rotation direction can be selected by setting *Pr. 40*.

3.2.2 Basic operation (factory setting)



3.2.3 Easy operation mode setting (easy setting mode)

Setting of *Pr. 79 Operation mode selection* according to combination of the start command and speed command can be easily made.

Operation example: Start command: external (STF/STR), frequency command: operate with 

Operation — **Display**

1. Screen at powering on
   The monitor display appears.

2. Press PU/EXT and MODE for 0.5s.

3. Turn  until 79 - 3 appears.
   (refer to the table below for other settings)

Operation Panel Indication	Operation Method	
	Start command	Frequency command
Flickering 79 - 1 PRM PU Flickering	RUN	
Flickering 79 - 2 PRM EXT Flickering	External (STF, STR)	Analog voltage input
Flickering 79 - 3 PRM PU EXT Flickering	External (STF, STR)	
Flickering 79 - 4 PRM PU EXT Flickering	RUN	Analog voltage input

4. Press SET to set.

Flicker ··· Parameter setting complete!!
The monitor display appears after 3s.

REMARKS

? Er1 is displayed ... Why?

☞ *Pr. 79* is not registered in user group with "1" in *Pr. 160 User group read selection*.

☞ Parameter write is disabled with "1" set in *Pr. 77*.

? Er2 is displayed ... Why?

☞ Setting can not be made during operation. Turn the start switch (RUN, STF or STR) off.

- Press MODE before pressing SET to return to the monitor display without setting. In this case, the mode changes to external operation mode when performed in the PU operation mode (PU JOG operation mode) and PU operation mode when performed in the external operation mode.
- Reset can be made with STOP/RESET.

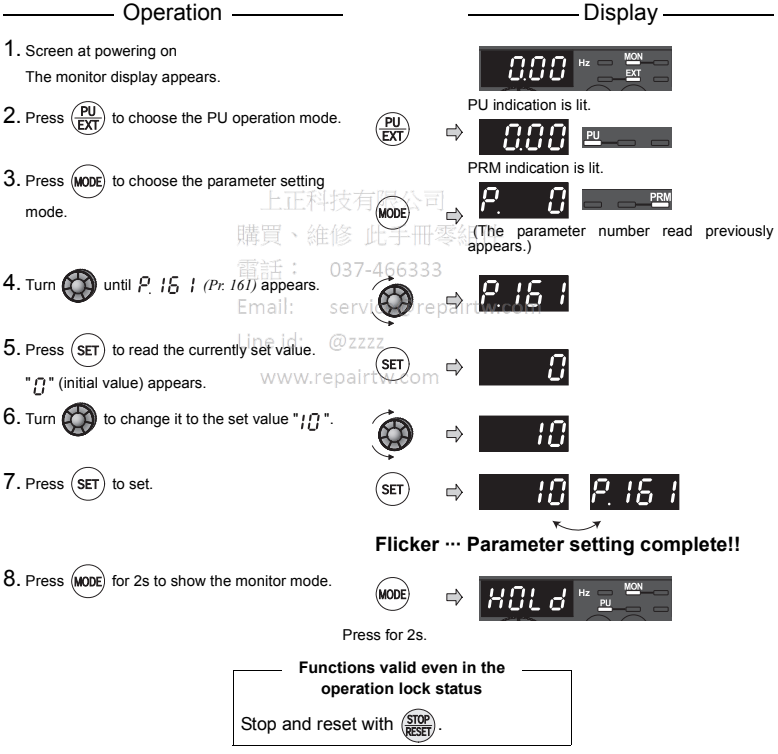
3.2.4 Operation lock (Press [MODE] for a while (2s))

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 (MODE) for 2s to make the setting dial and key operation invalid.
- When the setting dial and key operation is made invalid, HOLd appears on the operation panel. When the setting dial and key operation is invalid, HOLd appears if the setting dial or key operation is performed. (When the setting dial or key operation is not performed for 2s, the monitor display appears.)
- To make the setting dial and key operation valid again, press (MODE) for 2s.

POINT

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



Note

- **Release the operation lock to release the PU stop by key operation.**

3.2.5 Monitoring of output current and output voltage

POINT

Monitor display of output frequency, output current and output voltage can be changed by pressing (SET) during monitoring mode.

Operation		Display	
1. Press (SET) during operation to choose the output frequency monitor			Hz is lit
2. Independently whether the inverter is running in any operation mode or at a stop, the output current monitor appears by pressing (SET).	(SET) ⇨		A is lit
3. Press (SET) to show the output voltage monitor.	(SET) ⇨		Hz/A turns off.

3.2.6 First priority monitor

Hold down (SET) for 1s to set monitor description appears first in the monitor mode.

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

3.2.7 Setting dial push

Press the setting dial () to display the set frequency* currently set.

* Appears when PU operation mode or external/PU combined operation mode 1 (*Pr. 79* = "3") is selected.

3.2.8 Change the parameter setting value

Changing example — Change the *Pr. 1 Maximum frequency* setting.

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU/EXT ⇨  PU indication is lit.
3. Press MODE to choose the parameter setting mode.	MODE ⇨  PRM indication is lit. (The parameter number read previously appears.)
4. Turn dial until P. 1 (*Pr. 1*) appears.	dial ⇨ 
5. Press SET to read the currently set value. "120.0" (120.0Hz (initial value)) appears.	SET ⇨ 
6. Turn dial to change the set value to "60.00" (60.00Hz).	dial ⇨ 
7. Press SET to set.	SET ⇨   Flicker...Parameter setting complete!!

- Turn dial to read another parameter.
- Press SET to show the setting again.
- Press SET twice to show the next parameter.
- Press MODE twice to return the monitor to frequency monitor.

REMARKS

? Er1 to Er4 is displayed...Why?

☞ Er1 appears..... Write disable error
Er2 appears..... Write error during operation
Er3 appears..... Calibration error
Er4 appears..... Mode designation error

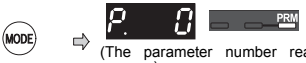
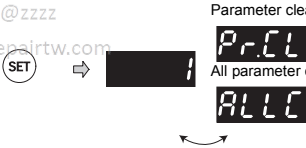
(For details, refer to *page 93*.)

- The number of digits displayed on the operation panel is four. Only the upper four digits of values can be displayed and set. If the values to be displayed have five digits or more including decimal places, the fifth or later numerals can not be displayed nor set.
  (Example) For *Pr. 1*
  When 60Hz is set, 60.00 is displayed.
  When 120Hz is set, 120.0 is displayed and second decimal place is not displayed nor set.

3.2.9 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. 77Parameter write selection*.)
- Refer to the extended parameter list on *page 69* for parameters cleared with this operation.

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU indication is lit. 
3. Press MODE to choose the parameter setting mode.	PRM indication is lit.  (The parameter number read previously appears.)
4. Turn dial until PrCL (ALLC) appears.	Parameter clear  All parameter clear
5. Press SET to read the currently set value. "0"(initial value) appears.	
6. Turn dial to change it to the set value "1".	
7. Press SET to set.	 Parameter clear / All parameter clear

Flicker ··· Parameter setting complete!!

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

Setting	Description
0	Not executed.
1	Return parameters to the initial values. (Parameter clear returns all parameters except *calibration parameters C0 (Pr. 900) to C7 (Pr. 905), C22 (Pr. 922) to C25 (Pr. 923)* to the initial values.

REMARKS

? 1 and Er4 are displayed alternately ... Why?

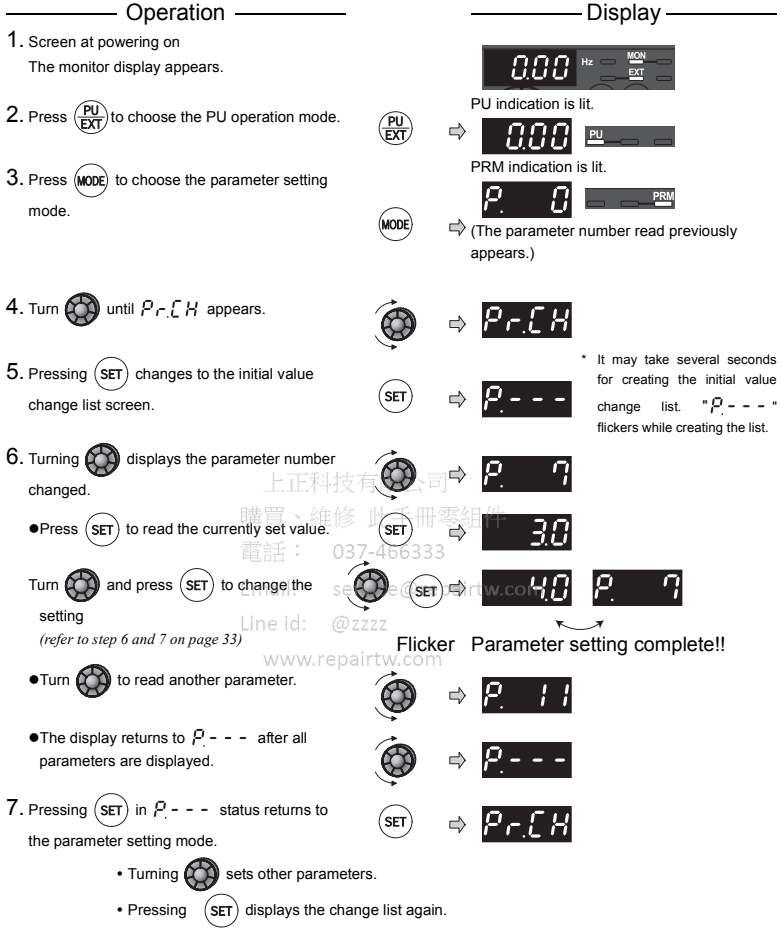
☞ The inverter is not in the PU operation mode.

☞ Is PU connector or USB connector used?

1. Press PU/EXT. [PU] is lit and the monitor (4 digit LED) displays "1". (When *Pr. 79* = "0" (initial value))
2. Carry out operation from step 6 again.

3.2.10 Initial value change list

Displays and sets the parameters changed from the initial value.



NOTE

- **Calibration parameters *(C0 (Pr. 900) to C7 (Pr. 905), C22 (Pr. 922) to C25 (Pr. 923))* are not displayed even they are changed from the initial settings.**
- **Only simple mode parameter is displayed when simple mode is set (*Pr. 160* = 9999)**
- **Only user group is displayed when user group is set (*Pr. 160* = "1").**
- ***Pr. 160* is displayed independently of whether the setting value is changed or not.**
- **When parameter setting is changed after creating the initial value change list, the setting will be reflected to the initial value change list next time.**

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. (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 33* for parameter change)

Pr. 160	Description
9999	Parameters classified as simple mode can be displayed.
0 (initial value)	Both the parameters classified as simple mode and the parameters classified as extended mode can be displayed.
1	Only the parameters registered to the user group can be displayed.

Parameter Number	Name	Unit	Initial Value	Range	Application	Reference Page
0	Torque boost	0.1%	6%/4%/3%/2%*	0 to 30%	Set when you want to increase a starting torque or when the motor with a load will not rotate, resulting in an alarm [OL] and a trip [OC1]. * Initial values differ according to the inverter capacity. (0.75K or less/ 1.5K to 3.7K/5.5K, 7.5K/11K, 15K)	*39*
1	Maximum frequency	0.01Hz	120Hz	0 to 120Hz	Set when the maximum output frequency need to be limited.	*40*
2	Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Set when the minimum output frequency need to be limited.	
3	Base frequency	0.01Hz	60Hz	0 to 400Hz	Set when the rated motor frequency is 50Hz. Check the motor rating plate.	*38*
4	Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Set when changing the preset speed in the parameter with a terminal.	*58*
5	Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz		
6	Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz		
7	Acceleration time	0.1s	5s/10s/15s*	0 to 3600s	Acceleration/deceleration time can be set. * Initial values differ according to the inverter capacity. (3.7K or less/ 5.5K, 7.5K/11K, 15K)	*41*
8	Deceleration time	0.1s	5s/10s/15s*	0 to 3600s		
9	Electronic thermal O/L relay	0.01A	Rated inverter current	0 to 500A	The inverter protects the motor from overheat. Set the rated motor current.	*37*
79	Operation mode selection	1	0	0, 1, 2, 3, 4, 6, 7	Select the start command location and frequency command location.	*42*
125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum value of the potentiometer (5V initial value) can be changed.	*62*
126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum current input (20mA initial value) can be changed.	*65*
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 *	0 to 500A	Set the rated motor current.

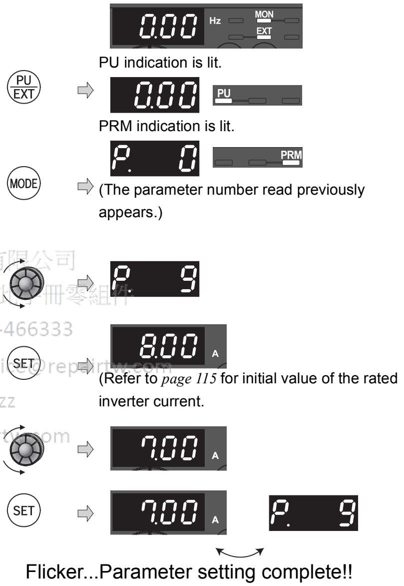
* Refer to *page 115* for the rated inverter current value.
The minimum setting increments of the 0.75K or less is set to 85% of the rated inverter current.

Changing example: Change *Pr. 9 Electronic thermal O/L relay* to 7A according to the motor rated current. (FR-E720-1.5K)

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 (dial) until "P. 9" (*Pr. 9*) appears.
5. Press (SET) to read the currently set value.
   "8.00" (8A (initial value)) appears for the FR-E720-1.5K.
6. Turn (dial) to change the set value "7.00" to (7A).
7. Press (SET) to set.

Display



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

Note

- **Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.**
- **When two or more motors are connected to the inverter, they cannot be protected by the electronic thermal relay function. Install an external thermal relay to each motor.**
- **When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.**
- **A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.**

3.3.3 When the rated motor frequency is 50Hz (Pr. 3) V/F

First, check the motor rating plate. If a frequency given on the rating plate is "50Hz" only, always set *Pr. 3 Base frequency* to "50Hz". Leaving the base frequency unchanged from "60Hz" may make the voltage low and the torque insufficient. It may result in an inverter trip (E.OC□) due to overload.

Parameter Number	Name	Initial Value	Setting Range	Description
3	**Base frequency**	60Hz	0 to 400Hz	Set the rated motor frequency.

Changing example	Change *Pr. 3 Base frequency* to 50Hz according to the motor rated frequency.

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 (dial) until "P. 3" (*Pr. 3*) appears.
5. Press (SET) to read the currently set value.
   "60.00" (60.00Hz (initial value)) appears.
6. Turn (dial) to change the set value to "50.00" (50.00Hz).
7. Press (SET) to set.

Display

Flicker ··· Parameter setting complete!!

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

REMARKS

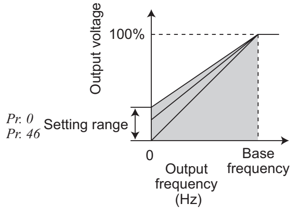
- *Pr. 3* is invalid under advanced magnetic flux vector control and general-purpose magnetic flux vector control and *Pr. 84 Rated motor frequency* is valid.

3.3.4 Increase the starting torque (Pr. 0) V/F

Set this parameter when "the motor with a load will not rotate", "an alarm [OL] is output, resulting in an inverter trip due to [OC1]," etc.

Parameter Number	Name	Initial Value		Setting Range	Description
0	**Torque boost**	0.1K to 0.75K	6%	0 to 30%	Motor torque in the low-frequency range can be adjusted to the load to increase the starting motor torque.
		1.5K to 3.7K	4%		
		5.5K, 7.5K	3%		
		11K, 15K	2%		

Changing example: When the motor will not rotate, increase the *Pr. 0* value by 1% by 1% by looking at the motor movement. (The guideline is for about 10% change at the greatest.



Operation — **Display**

1. Screen at powering on
   The monitor display appears.

PU indication is lit.

2. Press (PU/EXT) to choose the PU operation mode.

PRM indication is lit.

3. Press (MODE) to choose the parameter setting mode.

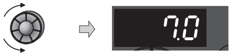
(The parameter number read previously appears.)

4. Turn (setting dial) until P. 0 (*Pr. 0*) appears.

5. Press (SET) to read the currently set value.
   "6.0" (6.0%(initial value)) appears for the 0.75K or less.

(The initial value differs according to the capacity.)

6. Turn (setting dial) to change the set value to "7.0" (7.0%).



7. Press (SET) to set.

Flicker ··· Parameter setting complete!!

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

Note

- **The amount of current flows in the motor may become large according to the conditions such as the motor characteristics, load, acceleration/deceleration time, wiring length, etc. After overcurrent trip, E.OC1 (overcurrent trip during acceleration)), overload trip (E.THM (motor overload trip), or E.THT (inverter overload trip) may occur. (When a fault occurs, release the start command, and decrease the *Pr. 0* setting 1% by 1% to reset.)** *(Refer to page 91.)*

POINT

If the inverter still does not operate properly after the above measures, set *Pr. 80, Pr. 81,* and *Pr. 800* (advanced magnetic flux vector control). The *Pr. 0* setting is invalid under advanced magnetic flux vector control. (*Refer to the chapter 4 of the Instruction Manual (applied)).*

3 DRIVE THE MOTOR

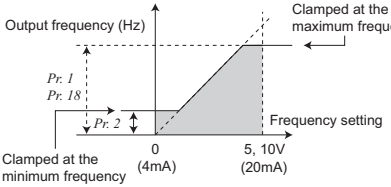
3.3.5 Limit the maximum and minimum output frequency (Pr. 1, Pr. 2)

Motor speed can be limited.

Parameter Number	Name	Initial Value	Setting Range	Description
1	**Maximum frequency**	120Hz	0 to 120Hz	Set the upper limit of the output frequency.
2	**Minimum frequency**	0Hz	0 to 120Hz	Set the lower limit of the output frequency.

Changing example

Limit the frequency set by the potentiometer, etc. to 60Hz maximum.
Change 60Hz to *Pr. 1 Maximum frequency*.



Operation **Display**

1. Screen at powering on
   The monitor display appears.

2. Press PU/EXT to choose the PU operation mode.

PU indication is lit.

3. Press MODE to choose the parameter setting mode.

PRM indication is lit.

(The parameter number read previously appears.)

4. Turn dial until P. 1 *(Pr. 1)* appears.

5. Press SET to read the currently set value.
   "120.0"(120.0Hz (initial value)) appears.

6. Turn dial to change the set value to "60.00" (60.00Hz).

7. Press SET to set.

Flicker ··· Parameter setting complete!!

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

REMARKS

- If the set frequency is less than *Pr. 2*, the output frequency is clamped at *Pr. 2* (will not fall below *Pr. 2*). 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 dial.
- When performing a high speed operation at 120Hz or more, setting of *Pr. 18 High speed maximum frequency* is necessary. *(Refer to the chapter 4 of the Instruction Manual (applied)).*

CAUTION

Note that when *Pr. 2* is set to any value equal to or more than *Pr. 13 Starting frequency*, simply turning on the start signal will accelerate the motor to the set frequency of *Pr. 2* according to the set acceleration time even if the command frequency is not input.

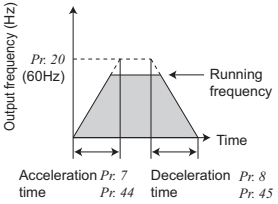
3.3.6 Change acceleration and deceleration time of the motor (Pr. 7, Pr. 8)

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	3.7K or less	5s	0 to 3600/ 360s ∗1	Set the motor acceleration time.
		5.5K, 7.5K	10s		
		11K, 15K	15s		
8	Deceleration time	3.7K or less	5s	0 to 3600/ 360s ∗1	Set the motor deceleration time.
		5.5K, 7.5K	10s		
		11K, 15K	15s		

∗1 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	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU/EXT ⇨  PU indication is lit.
3. Press MODE to choose the parameter setting mode.	MODE ⇨  PRM indication is lit. (The parameter number read previously appears.)
4. Turn dial until "P. 7" (Pr. 7) appears.	⇨ 
5. Press SET to read the currently set value. "5.0" (5.0s (initial value)) appears.	SET ⇨ 
6. Turn dial to change the set value to "10.0" (10.0s).	⇨ 
7. Press SET to set.	SET ⇨  **Flicker ··· Parameter setting complete!!**

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

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

Select the start command location and frequency command location.

POINT

Setting value "1" to "4" can be changed in the easy setting mode. *(Refer to page 30)*

Parameter Number	Name	Initial Value	Setting Range	Description	LED Indication :Off :On
79	Operation mode selection	0	0	External/PU switchover mode Press PU/EXT to switch between the PU and external operation mode. *(Refer to page 50)* At power on, the inverter is placed in the external operation mode.	External operation mode EXT PU operation mode PU
			1	Fixed to PU operation mode	PU
			2	Fixed to external operation mode Operation can be performed by switching between the external and Net operation mode.	External operation mode EXT NET operation mode NET
			3	External/PU combined operation mode 1 Running frequency: Operation panel and PU (FR-PU04/FR-PU07) setting or external signal input (multi-speed setting, across terminals 4-5 (valid when AU signal turns on)). Start signal: External signal input (terminal STF, STR)	PU EXT
			4	External/PU combined operation mode 2 Running frequency: External signal input (terminal 2, 4, JOG, multi-speed selection, etc.) Start signal: Input using RUN of the operation panel and FWD and REV of the PU(FR-PU04/FR-PU07)	
			6	Switchover mode Switchover between PU operation, external operation, and NET operation can be done while keeping the same operation status.	PU operation mode PU External operation mode EXT NET operation mode NET
			7	External operation mode (PU operation interlock) X12 signal ON* Can be shifted to PU operation mode (output stop during external operation) X12 signal OFF* Operation mode can not be switched to the PU operation mode.	PU operation mode PU External operation mode EXT

* For the terminal used for the X12 signal (PU operation interlock signal) input, set "12" in *Pr. 178 to Pr. 184 (input terminal function selection)* to assign functions.

Refer to the chapter 4 of the Instruction Manual (applied) for *Pr. 178 to Pr. 184.*

When the X 12 signal has not been assigned, the function of the MRS signal switches from MRS (output stop) to the PU operation interlock signal.

3.3.8 Large starting torque and low speed torque are necessary (Advanced magnetic flux vector control, general-purpose magnetic flux vector control) (Pr. 71, Pr. 80, Pr. 81, Pr. 800) AD MFVC GP MFVC

Advanced magnetic flux vector control can be selected by setting the capacity, poles and type of the motor used in *Pr. 80 and Pr. 81*.

- Advanced magnetic flux vector control, general-purpose magnetic flux vector control?

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

  General-purpose magnetic flux vector control is the same function as it is for the FR-E500 series. Select this control when operation characteristics as similar as possible are required when replacing from the FR-E500 series. For other cases, select advanced magnetic flux vector control.

Parameter Number	Name	Initial Value	Setting Range	Description
71	Applied motor	0	0,1, 3 to 6, 13 to 16, 23, 24 40, 43, 44 50, 53, 54	By selecting a standard motor or constant-torque motor, thermal characteristic and motor constants of each motor are set.
80	Motor capacity	9999	0.1 to 15kW	Set the applied motor capacity.
			9999	V/F control
81	Number of motor poles	9999	2, 4, 6, 8, 10	Set the number of motor poles.
			9999	V/F control
800	Control method selection	20	20	Advanced magnetic flux vector control *
			30	General-purpose magnetic flux vector control *

* Set a value other than "9999" in *Pr. 80 and Pr. 81*.

POINT

If the following conditions are not satisfied, select V/F control since malfunction such as insufficient torque and uneven rotation may occur.

- The motor capacity should be equal to or one rank lower than the inverter capacity. (Note that the capacity should be 0.1kW or more.)
- Motor to be used is any of Mitsubishi standard motor, high efficiency motor (SF-JR, SF-HR 0.2kW or more) or Mitsubishi constant-torque motor (SF-JRCA four-pole, SF-HRCA 0.4kW to 15kW). When using a motor other than the above (other manufacturer's motor), perform offline auto tuning without fail.
- Single-motor operation (one motor run by one inverter) should be performed.
- The wiring length from inverter to motor should be within 30m. (Perform offline auto tuning in the state where wiring work is performed when the wiring length exceeds 30m.)
- Permissible wiring length between inverter and motor differs according to the inverter capacity and setting value of *Pr. 72 PWM frequency selection* (carrier frequency). *Refer to page 12* for the permissible wiring length.

<Selection method of advanced magnetic flux vector control>

Perform secure wiring.
(Refer to page 7)

↓

Set the motor. *(Pr. 71)*

Motor		*Pr. 71* Setting ∗1	Remarks
Mitsubishi standard motor	SF-JR	0 (initial value)	
	SF-HR	40	
Mitsubishi high efficiency motor	Others	3	Offline auto tuning is necessary. ∗2
Mitsubishi constant-torque motor	SF-JRCA 4P	1	
	SF-HRCA	50	
	Others (SF-JRC, etc.)	13	Offline auto tuning is necessary. ∗2
Other manufacturer's standard motor	—	3	Offline auto tuning is necessary. ∗2
Other manufacturer's constant-torque motor	—	13	Offline auto tuning is necessary. ∗2

∗1 *Refer to chapter 4 of the Instruction Manual (applied)*, for other settings of *Pr. 71*.
∗2 *Refer to page 46* for offline auto tuning.

↓

Set the motor capacity and the number of motor poles.
(Pr. 80, Pr. 81) (Refer to page 43)

Set motor capacity (kW) in *Pr. 80 Motor capacity* and the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).

Select the control method. *(Pr. 800) (Refer to page 43)*

Set "20" (initial value) in *Pr. 800* to make advanced magnetic flux vector control valid.

Set the operation command. *(Refer to page 50)*

Select the start command and speed command.

(1)Start command

1)Operation panel: Setting by pressing RUN of the operation panel
2)External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)

(2)Speed command

1)Operation panel: Setting by pressing of the operation panel
2)External analog command (terminal 2 or 4):
Give a speed command using the analog signal input to terminal 2 (or terminal 4).
3)Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

↓

Test run

As required
• Perform offline auto tuning. *(Pr. 96) (Refer to page 46)*

NOTE

- **Uneven rotation slightly increases as compared to the V/F control. (It is not suitable for machines such as grinding machine and wrapping machine which requires less uneven rotation at low speed.**
- **When a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) is connected between the inverter and motor, output torque may decrease.)**

REMARKS

- Use *Pr. 89* to adjust the motor speed fluctuation at load fluctuation. *(Refer to the chapter 4 of the Instruction Manual (applied).)*

<Selection method of general-purpose magnetic flux vector control>

Perform secure wiring.
(Refer to page 7)

↓

Set the motor. *(Pr. 71)*

Motor		*Pr. 71* Setting *1	Remarks
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR	0 (initial value)	
	SF-HR	40	
	Others	3	Offline auto tuning is necessary. *2
Mitsubishi constant-torque motor	SF-JRCA 4P	1	
	SF-HRCA	50	
	Others (SF-JRC, etc.)	13	Offline auto tuning is necessary. *2
Other manufacturer's standard motor	—	3	Offline auto tuning is necessary. *2
Other manufacturer's constant-torque motor	—	13	Offline auto tuning is necessary. *2

*1 *Refer to chapter 4 of the Instruction Manual (applied)*, for other settings of *Pr. 71*.
*2 *Refer to page 46* for offline auto tuning.

↓

Set the motor capacity and the number of motor poles.
(Pr. 80, Pr. 81) (Refer to page 43)

Set motor capacity (kW) in *Pr. 80 Motor capacity* and the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*.
(V/F control is performed when the setting is "9999" (initial value).

↓

Select the control method. *(Pr. 800) (Refer to page 43)*

Set "30" in *Pr. 800* to make general-purpose magnetic flux vector control valid.

↓

Set the operation command. *(Refer to page 50)*

Select the start command and speed command.
(1)Start command
1)Operation panel: Setting by pressing (RUN) of the operation panel
2)External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)
(2)Speed command
1)Operation panel: Setting by pressing (setting dial) of the operation panel
2)External analog command (terminal 2 or 4):
Give a speed command using the analog signal input to terminal 2 (or terminal 4).
3)Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

↓

Test run

As required
- Perform offline auto tuning. *(Pr. 96) (Refer to page 46)*
- Set slip compensation. *(Pr. 245, Pr. 246, Pr. 247) (Refer to page 84)*

NOTE
- **Uneven rotation slightly increases as compared to the V/F control. (It is not suitable for machines such as grinding machine and wrapping machine which requires less uneven rotation at low speed.**
- **When a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) is connected between the inverter and motor, output torque may decrease.)**

3.3.9 To exhibit the best performance of the motor performance (offline auto tuning) (Pr. 71, Pr. 83, Pr. 84, Pr. 96)

The motor performance can be maximized with offline auto tuning.

●What is offline auto tuning?

When performing advanced magnetic flux vector control or general-purpose magnetic flux vector control, 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
71	Applied motor	0		0, 1, 3 to 6, 13 to 16, 23, 24, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant-torque motor, thermal characteristic and motor constants of each motor are set.
83	Motor rated voltage	200V class	200V	0 to 1000V	Rated motor voltage (V).
		400V class	400V		
84	Rated motor frequency	60Hz		10 to 120Hz	Rated motor frequency (Hz).
96	Auto tuning setting/ status	0		0	Offline auto tuning is not performed
				1	For advanced magnetic flux vector control Offline auto tuning is performed without motor running (all motor constants).
				11	For general-purpose magnetic flux vector control Offline auto tuning is performed without motor running. (motor constant (R1) only)
				21	Offline auto tuning for V/F control (automatic restart after instantaneous power failure (with frequency search)) *(refer to the chapter 4 of the Instruction Manual (applied))*

POINT

- This function is made valid only when a value other than "9999" is set in *Pr. 80 and Pr. 81* and advanced magnetic flux vector control or general-purpose magnetic flux vector control is selected.
- You can copy the offline auto tuning data (motor constants) to another inverter with the PU (FR-PU07).
- Even when motors (other manufacturer's motor, SF-JRC, etc.) other than Mitsubishi standard motor, high efficiency motor (SF-JR, SF-HR 0.2kW or more), and Mitsubishi constant-torque motor (SF-JRCA four-pole, SF-HRCA 0.4kW to 15kW) are used or the wiring length is long, using the offline auto tuning function runs the motor with the optimum operating characteristics.
- Tuning is enabled even when a load is connected to the motor.
  As the motor may run slightly, fix the motor securely with a mechanical brake or make sure that there will be no problem in safety if the motor runs (caution is required especially in elevator). Note that tuning performance is unaffected even if the motor runs slightly.
- Reading/writing/copy of motor constants tuned by offline auto tuning are enabled.
- The offline auto tuning status can be monitored with the operation panel and PU (FR-PU04/FR-PU07).
- Do not connect a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) between the inverter and motor.

(1) Before performing offline auto tuning

Check the following before performing offline auto tuning.

- Make sure advanced magnetic flux vector control or general-purpose magnetic flux vector control (*Pr. 80, Pr. 81*) is selected. (Tuning can be performed even under V/F control selected by turning on X18.)
- A motor should be connected. Note that the motor should be at a stop at a tuning start.
- The motor capacity should be equal to or one rank lower than the inverter capacity. (note that the capacity should be 0.1kW or more)
- The maximum frequency is 120Hz.
- A high-slip motor, high-speed motor and special motor cannot be tuned.
- As the motor may run slightly, fix the motor securely with a mechanical brake or make sure that there will be no problem in safety if the motor runs (caution is required especially in elevator). Note that tuning performance is unaffected even if the motor runs slightly.
- Offline auto tuning will not be performed properly if it is performed with a surge voltage suppression filter (FR-ASFH/FR-BMF-H) connected between the inverter and motor. Remove it before starting tuning.

(2) Setting

1) Select advanced magnetic flux vector control or general-purpose magnetic flux vector control. (*Refer to page 43*)

2) Set "1" or "11" in *Pr. 96 Auto tuning setting/status*.

- When the setting is "1" .....Tune all motor constants without running the motor.
  When performing advanced magnetic flux vector control, set "1" to perform tuning.
  It takes approximately 25 to 75s∗ until tuning is completed.
  (Excitation noise is produced during tuning.)
  ∗Tuning time differs according to the inverter capacity and motor type.
- When the setting is "11" .....Tune motor constants (R1) only without running the motor.
  When performing general-purpose magnetic flux vector control, set "11" to perform tuning.
  It takes approximately 9s until tuning is completed.

3) Set the rated motor current (initial value is rated inverter current) in *Pr. 9 Electronic thermal O/L relay*. (*Refer to page 37*)

4) Set the rated voltage of motor (initial value is 200V/400V) in *Pr. 83 Motor rated voltage* and rated motor frequency (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 an initial value (200V/60Hz or 400V/60Hz).

5) Set *Pr. 71 Applied motor* according to the motor used.

Motor		*Pr. 71* Setting ∗1
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR	3
	SF-JR 4P 1.5kW or less	23
	SF-HR	43
	Others	3
Mitsubishi constant-torque motor	SF-JRCA 4P	13
	SF-HRCA	53
	Others (SF-JRC, etc.)	13
Other manufacturer's standard motor	—	3
Other manufacturer's constant-torque motor	—	13

∗1 *Refer to the chapter 4 of the Instruction Manual (applied),* for other settings of *Pr. 71*.

(3) Execution of tuning

POINT

Before performing tuning, check the monitor display of the operation panel or parameter unit (FR-PU04/FR-PU07) if the inverter is in the status for tuning. (Refer to 2) below) When the start command is turned on under V/F control, the motor starts.

1) When performing tuning or PU operation, press RUN of the operation panel or FWD or REV of the parameter unit (FR-PU04/FR-PU07).
For external operation, turn on the run command (STF signal or STR signal). Tuning starts.

NOTE

- **To force tuning to end, use the MRS or RES signal or press STOP/RESET 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: (initial value)**
  - **Input terminal <valid signal> MRS, RES, STF, STR**
  - **Output terminal RUN, FM, A, B, C**

  Note that the progress status of offline auto tuning is output in eight steps from FM when speed and output frequency are selected.
- **Since the RUN signal turns on when tuning is started, caution is required especially when a sequerence 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 excecuted properly.**

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

	Parameter Unit (FR-PU04/FR-PU07) Display		Operation Panel Indication	
Pr. 96 setting	1	11	1	11
(1) Setting	READ:List 1 --- STOP PU	READ:List 11 --- STOP PU	1 MON EXT	11 MON EXT
(2)Tuning in progress	TUNE 2 STF FWD PU	TUNE 12 STF FWD PU	2 RUN MON EXT	12 RUN MON EXT
(3)Normal end	TUNE 3 COMPLETION STF STOP PU	TUNE 13 COMPETION STF STOP PU	Flickering 3 RUN MON EXT	Flickering 13 RUN MON EXT
(4)Error end (when inverter protective function operation is activated)	TUNE ERROR 9 STF STOP PU		9 RUN MON EXT	

REMARKS

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

Offline Auto Tuning Setting	Time
Tune all motor constants (*Pr. 96* = "1")	Approximately 25 to 75s (Tuning time differs according to the inverter capacity and motor type.)
Tune motor constants (R1) only (*Pr. 96* = "11")	Approximately 9s

- The set frequency monitor displayed during the offline auto tuning is 0Hz.

3) When offline auto tuning ends, press STOP RESET of the operation panel during PU operation. For external operation, turn off the start signal (STF signal or STR signal) once.
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 (3 or 13).
  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 "1" or "11" in *Pr. 96* and perform tuning again.
9	Inverter protective function operation	Make setting again.
91	Current limit (stall prevention) function was activated.	Set "1" in *Pr. 156*.
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. Set the rated current of the motor in *Pr. 9*.

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

NOTE

- **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 occurring during tuning is handled as in the ordinary mode. Note that if a fault retry has been set, retry is ignored.**

CAUTION

As the motor may run slightly during offline auto tuning, fix the motor securely with a mechanical brake or make sure that there will be no problem in safety if the motor runs. Note that if the motor runs slightly, tuning performance is unaffected.

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

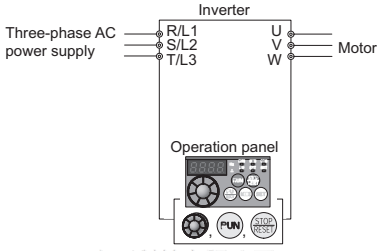
POINT

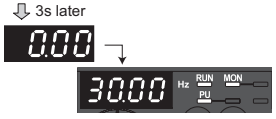
From where is the frequency command given?

- **Operation at the frequency set in the frequency setting mode of the operation panel** ☞ *refer to 3.4.1 (Refer to page 50)*
- **Operation using the setting dial as the potentiometer** ☞ *refer to 3.4.2 (Refer to page 52)*
- **Change of frequency with ON/OFF switches connected to terminals** ☞ *refer to 3.4.3 (Refer to page 53)*
- **Perform frequency setting using voltage input signal** ☞ *refer to 3.4.4 (Refer to page 54)*
- **Perform frequency setting using current input signal** ☞ *refer to 3.4.5 (Refer to page 55)*

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

[Connection diagram]



Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU indication is lit. 
3. Turn the setting dial to show the frequency you want to set. The frequency flickers for about 5s.	
4. While the value is flickering, press SET to set the frequency. (If you do not press SET, the value flickers for about 5s and the display then returns to "0.00" (0.00Hz.). At this time, return to "Step 3" and set the frequency again.	 **Flicker...frequency setting complete!!**
5. After the value flickered for about 3s, the display returns to "0.00" (monitor display). Press RUN to start operation.	3s later 
6. To change the set frequency, perform the operation in above steps 3 and 4. (Starting from the previously set frequency.)	
7. Press STOP RESET to stop.	

REMARKS

? Operation cannot be performed at the set frequency ... Why?

☞ Did you carry out step 4 within 5s after step 3? (Did you press SET 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 PU EXT 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 deceleration time

☞ *Pr. 7 (Refer to page 41)*

? Change deceleration time

☞ *Pr. 8 (Refer to page 41)*

For example, operation not exceeding 60Hz

☞ Set "60Hz" in *Pr. 1*. (*Refer to page 40)*

- Press to show the set frequency.
- can also be used like a potentiometer to perform operation. (*Refer to page 52)*
- Use *Pr. 295 Magnitude of frequency change setting* to change the frequency setting increments of .

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*.

Changing example — Changing the frequency from 0Hz to 60Hz during operation

Operation	Display
1. Screen at powering on The monitor display appears.	
2. Press PU/EXT to choose the PU operation mode.	PU indication is lit. 
3. Change the *Pr. 161* setting to "1". (Refer to *page 33* for change of the setting.)	
4. Press RUN to start the inverter.	
5. Turn the setting dial until "60.00" (60.00Hz) appears. The flickering frequency is the set frequency. You need not press SET.	 The frequency flickers for about 5s.

REMARKS

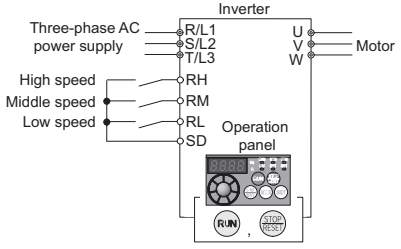
- If flickering "60.00" turns to "0.00", the *Pr. 161 Frequency setting/key lock operation selection* setting may not be "1".
- Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning the setting dial. (Use *Pr. 295 Magnitude of frequency change setting* to change the frequency setting increments of the setting dial.)

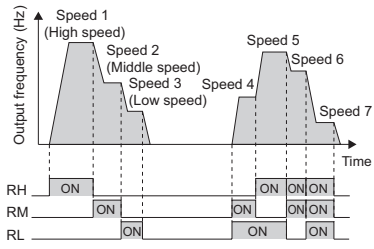
3.4.3 Use switches to give a frequency command (multi-speed setting)

POINT

- Use (RUN) 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. (Use *Pr. 4, Pr. 5 and Pr. 6* (*Refer to page 58)* to change.)
- 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	Display
1. Screen at powering on The monitor display appears.	
2. Change the *Pr. 79* setting to "4". (Refer to *page 30* for change of the setting.) [PU] display and [EXT] display are lit.	
3. Turn on the start switch (RUN). When the frequency command is not given, [RUN] flickers fast.	(RUN) ⇨  Flickering
4. Turn on the low speed signal (RL). The output frequency increases to 10Hz according to *Pr. 7 Acceleration time*. [RUN] display is lit during forward rotation operation and flickers slowly during reverse rotation operation.	Low speed  ⇨ 
5. Turn off the low speed signal (RL). The output frequency decreases to 0Hz according to *Pr. 8 Deceleration time*. [RUN] flickers fast.	Low speed  ⇨  Flickering
6. Turn off the start switch (STOP RESET). [RUN] turns off.	(STOP RESET) ⇨ 

REMARKS

? 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 40)*
- ☞ 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)

? [RUN] is not light ... Why?
- ☞ Check that wiring is correct. Check it again.
- ☞ Check for the *Pr. 79* setting once again. (*Pr. 79* must be set to "4"). (*Refer to page 42)*

? Change the frequency of the terminal RL, RM, and RH.
- ☞ Refer to *page 58* 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)*.

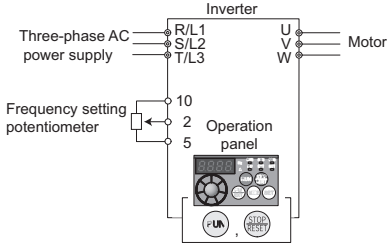
3.4.4 Perform frequency setting by analog (voltage input)

POINT

- Use (RUN) 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	Display
1. Screen at powering on The monitor display appears.	
2. Change the *Pr. 79* setting to "4". (Refer to *page 30* for change of the setting.) [PU] display and [EXT] display are lit.	
3. Start Turn on the start switch (RUN). When the frequency command is not given, [RUN] flickers fast.	 Flickering
4. Acceleration → constant speed Turn the potentiometer clockwise slowly to full. The frequency value on the indication increases according to *Pr. 7 Acceleration time* until "60.00" (60.00Hz) is displayed. [RUN] display is lit during forward rotation operation and flickers slowly during reverse rotation operation.	
5. Deceleration Turn the potentiometer counterclockwise slowly to full. The frequency value on the indication decreases according to *Pr. 8 Deceleration time* and displays "0.00" (0.00Hz) when the motor is stopped. [RUN] flickers fast.	 Flickering  Stop
6. Stop Switch power off (STOP RESET). [RUN] turns off.	

REMARKS

? Change the frequency (60Hz) at the maximum voltage input (5V initial value)

☞ Adjust the frequency in *Pr. 125 Terminal 2 frequency setting gain frequency*. (*Refer to page 62*)

? Change the frequency (0Hz) at the minimum voltage input (0V initial value)

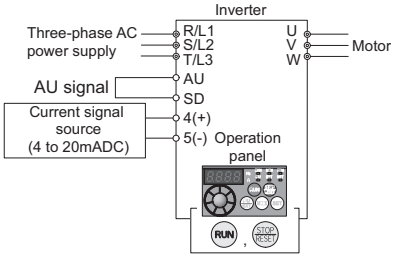
☞ Adjust the frequency in *calibration parameter C2 Terminal 2 frequency setting bias frequency.* (*Refer to the chapter 4 of the Instruction Manual (applied).*)

3.4.5 Perform frequency setting by analog (current input)

POINT

- Use (RUN) 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	Display
1. Screen at powering on The monitor display appears.	
2. Change the *Pr. 79* setting to "4". (Refer to *page 30* for change of the setting. [PU] display and [EXT] display are lit.	
3. Start Check that the terminal 4 input selection signal (AU) is on. Turn on the start switch (RUN). When the frequency command is not given, [RUN] flickers fast.	(RUN) ⇨  Flickering
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. [RUN] display is lit during forward rotation operation and flickers slowly during reverse rotation operation.	Current signal source (4 to 20mADC) ⇨ 
5. Deceleration Perform 4mA input. The frequency value on the indication decreases according to *Pr. 8 Deceleration time* and displays "0.00" (0.00Hz) when the motor is stopped. [RUN] flickers fast.	Current signal source (4 to 20mADC) ⇨  Flickering  Stop
6. Stop Switch power off (STOP RESET). [RUN] turns off.	(STOP RESET) ⇨ 

REMARKS

Set "4" in *Pr. 178 to Pr. 184 (input terminal function selection)* to assign terminal 4 input selection signal (AU) to the input terminal. *(Refer to the chapter 4 of the Instruction Manual (applied).)*

? Change the frequency (60Hz) at the maximum current input (at 20mA, initial value)

☞ Adjust the frequency in *Pr. 126 Terminal 4 frequency setting gain frequency. (Refer to page 65)*

? Change the frequency (0Hz) at the minimum current input (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?

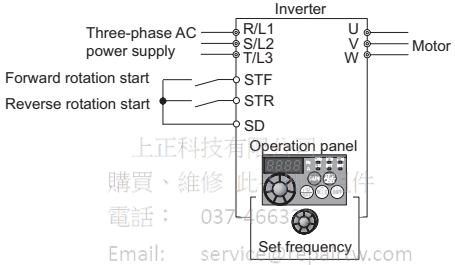
- **Operation at the frequency set in the frequency setting mode of the operation panel** ☞ *refer to 3.5.1 (Refer to page 56)*
- **Give a frequency command by switch (multi-speed setting)** ☞ *refer to 3.5.2 (Refer to page 58)*
- **Perform frequency setting by a voltage input signal** ☞ *refer to 3.5.3 (Refer to page 60)*
- **Perform frequency setting by a current input signal** ☞ *refer to 3.5.5 (Refer to page 63)*

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

POINT

- Switch terminal STF(STR)-SD on to give a start command.
- Set "3" (exrnal/PU combined operation mode 1) in *Pr. 79* .
- Refer to page *50* for the set frequency by the operation panel.

[Connection diagram]



Operation	Display
1. Screen at powering on The monitor display appears.	
2. Change the *Pr. 79* setting to "3". (Refer to page *30* for change of the setting.) [PU] display and [EXT] display are lit.	
3. Turn the start switch (STF or STR) on. [RUN] display is lit during forward rotation operation and flickers during reverse rotation operation. ● The motor rotates 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 (SET) to set the frequency. (If you do not press (SET), the value flickers for about 5s and the display then returns to "0.00" (0.00Hz.). At this time, return to "Step 3" and set the frequency again.)	 **Flicker...frequency setting complete!!**
6. Turn the start switch (STF or STR) off. The motor decelerates according to *Pr. 8 Deceleration time* to stop. [RUN] turns off.	

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 58)* is also made valid.

? Pressing (STOP RESET) to stop the motor and the display shows 

.

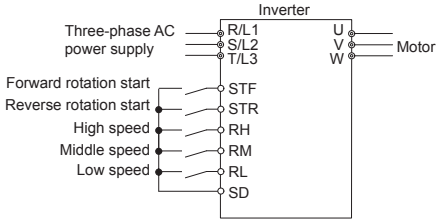
1. Turn the start switch (STF or STR) off.
2. The display can be reset by (PU EXT).

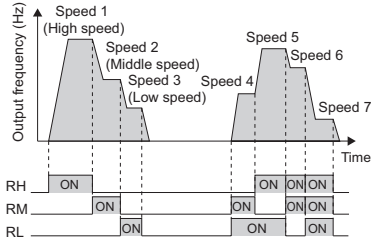
3.5.2 Use switches to give a start command and a frequency command (multi-speed setting) (Pr. 4 to Pr. 6)

POINT

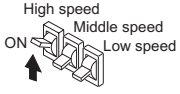
- Start command by terminal STF (STR)-SD
- Frequency command by terminal RH, RM, RL-SD
- [EXT] must be lit. (When [PU] is lit, switch with PU/EXT.)
- The initial values of the terminals RH, RM, RL are 60Hz, 30Hz, and 10Hz. (Use *Pr. 4, Pr. 5 and Pr. 6* to change.)
- Operation at 7-speed can be performed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

[Connection diagram]





Operation example: Set "50Hz" in *Pr. 4 Multi-speed setting (high speed)* and turn on terminal RH and STF (STR)-SD to operate.

Operation	Display
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 PU/EXT 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 42*)	
2. Change the *Pr.4* setting to "50". (*Refer to page 33* for change of the setting.)	
3. Turn on the high speed switch (RH).	
4. Turn the start switch (STF or STR) on. "50.00" (50.00Hz) is displayed. [RUN] display is lit during forward rotation operation and flickers during reverse rotation operation. ● 30Hz appears when RM is on and 10Hz appears when RL is on.	
5. Stop Turn the start switch (STF or STR) off. The motor stops according to *Pr. 8 Deceleration time*. [RUN] turns off.	

REMARKS

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

☞ Switchover of the operation mode with PU/EXT is valid when *Pr. 79* = "0" (initial value).

? 50Hz 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 40)*

☞ Check for the *Pr. 79* setting once again. *Pr. 79* must be set to "0" or "2". (*Refer to page 42)*

☞ 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)

? [RUN] is not light...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 higher than 8 speed...How?

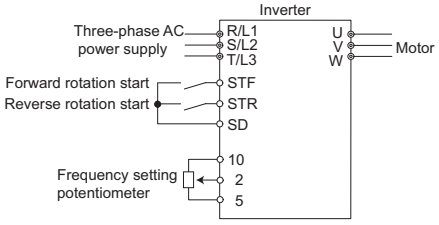
☞ Use the REX signal to perform the operation. 📖 *Refer to the chapter 4 of the Instruction Manual (applied)*.

- 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 PU/EXT or when you want to use the current operation command and frequency command. (*Refer to page 42*)

3.5.3 Perform frequency setting by analog (voltage input)

[Connection diagram]

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



Operation	Display

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 (PU/EXT) 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 42)*

2. Start

   Turn the start switch (STF or STR) on. When the frequency command is not given, [RUN] flickers fast.

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 "60.00 "(60.00Hz) is displayed. [RUN] display is lit during forward rotation operation and flickers slowly during reverse rotation operation.

4. Deceleration

   Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full. The frequency value on the indication decreases according to *Pr.8 Deceleration time* and displays "0.00" (0.00Hz) when the motor is stopped. [RUN] flickers fast.

5. Stop

   Turn the start switch (STF or STR) off. [RUN] turns off.

POINT

When you always want to operate in the external operation mode at powering on or when you want to save the trouble of (PU/EXT) 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 (PU/EXT) to lit [EXT].

☞ Check that wiring is correct. Check it again.

? Change the frequency (0Hz) of the minimum value of the potentiometer (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)*).

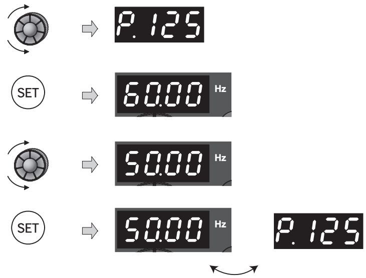
3.5.4 Change the frequency (60Hz) at the maximum voltage input (5V initial value)

< How to change the maximum frequency?>

Changing example	When you use the 0 to 5VDC input and want to change the frequency at 5V from 60Hz (initial value) to 50Hz, set "50Hz" in *Pr. 125*.

Operation — **Display**

1. Turn (dial) until "P. 125" (*Pr. 125*) appears.
2. Press (SET) to show the currently set value "60.00" (60.00Hz).
3. Turn (dial) to change the set value to "50.00" (50.00Hz).
4. Press (SET) to set.



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

5. Mode/monitor check

   Press (MODE) twice to choose the monitor/ frequency monitor.

6. To check the setting, turn the start switch (STF or STR) on and input 5V (turn the potentiometer clockwise slowly to full). (Refer to operation 2 to 5 of the section 3.5.3)

REMARKS

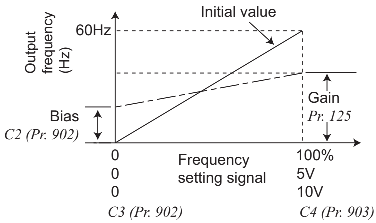
To change the value to more than 120Hz, the maximum frequency must be set to more than 120Hz.

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

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

? Use *calibration parameter C2* to set frequency at 0V and *calibration parameter C0* to adjust the indicator.

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



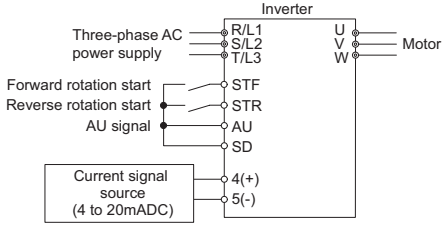
As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied to across terminals 2-5 and adjust at any point without a voltage applied. (*Refer to the Instruction Manual (applied)* for the setting method of *calibration parameter C4.)*

3.5.5 Perform frequency setting by analog (current input)

POINT

- Switch terminal STF(STR)-SD 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	Display
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 (PU/EXT) 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 42)*	ON  
2. Start Turn the start switch (STF or STR) on. When the frequency command is not given, [RUN] flickers fast.	Forward rotation ON Reverse rotation  Flickering 
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. [RUN] display is lit during forward rotation operation and flickers slowly during reverse rotation operation.	Current signal source (4 to 20mADC) 
4. Deceleration Perform 4mA input. The frequency value on the indication decreases according to *Pr.8 Deceleration time* and displays "0.00 " (0.00Hz) when the motor is stopped. [RUN] flickers fast.	Current signal source (4 to 20mADC)  Flickering  Stop
5. Stop Turn the start switch (STF or STR) off. [RUN] turns off.	Forward rotation OFF Reverse rotation 

REMARKS

Set "4" in *Pr.178 to Pr.184 (input terminal function selection)* to assign terminal 4 input selection signal (AU) to the input terminal. (*Refer to the chapter 4 of 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) at the minimum current input (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) at the maximum current input (at 20mA, initial value)

<How to change the maximum frequency?>

Changing example: When you use the 4 to 20mA input and want to change the frequency at 20mA from 60Hz (initial value) to 50Hz, set "50Hz" in *Pr. 126*.

Operation	Display
1. Turn ◎ until "P. 126" *(Pr. 126)* appears.	◎ ⇨ P.126
2. Press (SET) to show the currently set value "60.00" (60.00Hz).	(SET) ⇨ 60.00 Hz
3. Turn ◎ to change the set value to "50.00" (50.00Hz).	◎ ⇨ 50.00 Hz
4. Press (SET) to set.	(SET) ⇨ 50.00 Hz ⇄ P.126
	Flicker...50Hz output at 20mA input complete!!
5. Mode/monitor check Press (MODE) twice to choose the monitor/ frequency monitor.	(MODE) ⇨ 0.00 Hz (MON, PU)
6. To check the setting, turn the start switch (STF or STR) on and input 20mA. (Refer to operation 2 to 5 of the section 3.5.5)	

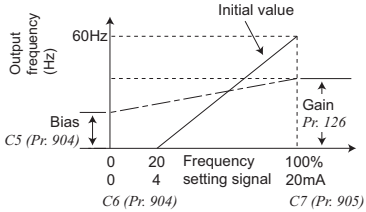
REMARKS

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

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

? Use *calibration parameter C5* to set frequency at 4mA and *calibration parameter C0* to adjust the indicator.

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



- 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 Instruction Manual (applied)* for the setting method of *calibration parameter C7*).
- When performing a high speed operation at 120Hz or more, setting of *Pr. 18 High speed maximum frequency* is necessary. (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*

3.6 Parameter list

3.6.1 List of parameters classified by purpose of use

Set parameters according to the operating conditions. The following list indicates purpose of use and corresponding parameters.

Purpose of Use		Parameter Number
Control mode	Change the control method	*Pr. 80*, *Pr. 81*, *Pr. 800*
Adjust the output torque (current) of the motor	Manual torque boost	*Pr. 0*, *Pr. 46*
	Advanced magnetic flux vector control, general-purpose magnetic flux vector control	*Pr. 80*, *Pr. 81*, *Pr. 800*
	Slip compensation	*Pr. 89*, *Pr. 245* to *Pr. 247*
	Stall prevention operation	*Pr. 22*, *Pr. 23*, *Pr. 48*, *Pr. 66*, *Pr. 156*, *Pr. 157*, *Pr. 277*
Limit the output frequency	Maximum/minimum frequency	*Pr. 1*, *Pr. 2*, *Pr. 18*
	Avoid mechanical resonance points (frequency jump)	*Pr. 31* to *Pr. 36*
Set V/F pattern	Base frequency, voltage	*Pr. 3*, *Pr. 19*, *Pr. 47*
	V/F pattern matching applications	*Pr. 14*
Frequency setting with terminals (contact input)	Multi-speed setting operation	*Pr. 4* to *Pr. 6*, *Pr. 24* to *Pr. 27*, *Pr. 232* to *Pr. 239*
	Jog operation	*Pr. 15*, *Pr. 16*
	Remote setting function	*Pr. 59*
Acceleration/deceleration time/pattern adjustment	Acceleration/deceleration time setting	*Pr. 7*, *Pr. 8*, *Pr. 20*, *Pr. 21*, *Pr. 44*, *Pr. 45*, *Pr. 147*
	Starting frequency	*Pr. 13*, *Pr. 571*
	Acceleration/deceleration pattern	*Pr. 29*
	Set the shortest acceleration/deceleration time automatically. (automatic acceleration/deceleration)	*Pr. 61* to *Pr. 63*, *Pr. 292*, *Pr. 293*
	Regeneration avoidance function	*Pr. 665*, *Pr. 882*, *Pr. 883*, *Pr. 885*, *Pr. 886*
Selection and protection of a motor	Motor protection from overheat (electronic thermal relay function)	*Pr. 9*, *Pr. 51*
	Use the constant torque motor (applied motor)	*Pr. 71*, *Pr. 450*
	Offline auto tuning	*Pr. 71*, *Pr. 82* to *Pr. 84*, *Pr. 90* to *Pr. 94*, *Pr. 96*, *Pr. 859*
Motor brake and stop operation	DC injection brake	*Pr. 10* to *Pr. 12*
	Selection of regeneration unit	*Pr. 30*, *Pr. 70*
	Selection of motor stopping method and start signal	*Pr. 250*
	Decelerate the motor to a stop at instantaneous power failure	*Pr. 261*
	Stop-on-contact control	*Pr. 6*, *Pr. 270*, *Pr. 275*, *Pr. 276*
	Brake sequence function	*Pr. 278* to *Pr. 283*, *Pr. 292*
Function assignment of external terminal and control	Function assignment of input terminal	*Pr. 178* to *Pr. 184*
	Start signal selection	*Pr. 250*
	Logic selection of output stop signal (MRS)	*Pr. 17*
	Terminal assignment of output terminal	*Pr. 190* to *Pr. 192*
	Detection of output frequency (SU, FU signal)	*Pr. 41* to *Pr. 43*
	Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	*Pr. 150* to *Pr. 153*
	Remote output function (REM signal)	*Pr. 495* to *Pr. 497*

Purpose of Use		Parameter Number
Monitor display and monitor output signal	Speed display and speed setting	*Pr. 37*
	Change of DU/PU monitor descriptions Cumulative monitor clear	*Pr. 52*, *Pr. 170*, *Pr. 171*, *Pr. 563*, *Pr. 564*
	Change of the monitor output from terminal FM	*Pr. 54* to *Pr. 56*
	Selection of the decimal digits of the monitor	*Pr. 268*
	Adjustment of terminal FM output (calibration)	*C0* (*Pr. 900*)
Detection of output frequency and current	Detection of output frequency (SU, FU signal)	*Pr. 41* to *Pr. 43*
	Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	*Pr. 150* to *Pr. 153*
Operation selection at power failure and instantaneous power failure	Restart operation after instantaneous power failure/Flying start	*Pr. 57*, *Pr. 58*, *Pr. 162*, *Pr. 165*, *Pr. 298*, *Pr. 299*, *Pr. 611*
	Decelerate the motor to a stop at instantaneous power failure	*Pr. 261*
Operation setting at fault occurrence	Retry function at fault occurrence	*Pr. 65*, *Pr. 67* to *Pr. 69*
	Input/output phase failure protection selection	*Pr. 251*, *Pr. 872*
	Earth (ground) fault detection at start	*Pr. 249*
	Regeneration avoidance function	*Pr. 665*, *Pr. 882*, *Pr. 883*, *Pr. 885*, *Pr. 886*
Energy saving operation	Energy saving control selection	*Pr. 60*
Reduction of the motor noise Measures against noise and leakage currents	Carrier frequency and Soft-PWM selection	*Pr. 72*, *Pr. 240*
	Noise elimination at the analog input	*Pr. 74*
	Reduce mechanical resonance (speed smoothing control)	*Pr. 653*
Frequency setting by analog input	Analog input selection	*Pr. 73*, *Pr. 267*
	Noise elimination at the analog input	*Pr. 74*
	Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	*Pr. 125*, *Pr. 126*, *Pr. 241*, *C2* to *C7* (*Pr. 902* to *Pr. 905*)
Misoperation prevention and parameter setting restriction	Reset selection, disconnected PU detection	*Pr. 75*
	Prevention of parameter rewrite	*Pr. 77*
	Prevention of reverse rotation of the motor	*Pr. 78*
	Display necessary parameters only. (user group)	*Pr. 160*, *Pr. 172* to *Pr. 174*
	Control of parameter write by communication	*Pr. 342*
Selection of operation mode and operation location	Operation mode selection	*Pr. 79*
	Operation mode when power is on	*Pr. 79*, *Pr. 340*
	Operation command source and speed command source during communication operation	*Pr. 338*, *Pr. 339*
	Selection of the NET mode operation control source	*Pr. 550*
	Selection of the PU mode control source	*Pr. 551*
Communication operation and setting	RS-485 communication initial setting	*Pr. 117* to *Pr. 124*, *Pr. 502*
	Control of parameter write by communication	*Pr. 342*
	Modbus RTU communication specifications	*Pr. 343*
	Operation command source and speed command source during communication operation	*Pr. 338*, *Pr. 339*, *Pr. 550*, *Pr. 551*
	Use setup software (USB communication)	*Pr. 547*, *Pr. 548*
	Selection of the NET mode operation control source	*Pr. 550*
	Modbus RTU protocol (communication protocol selection)	*Pr. 549*

Purpose of Use		Parameter Number
Special operation and frequency control	PID control	*Pr. 127* to *Pr. 134*
	Dancer control	*Pr. 128* to *Pr. 134*
	Droop control	*Pr. 286*, *Pr. 287*
Useful functions	Increase cooling fan life	*Pr. 244*
	To determine the maintenance time of parts.	*Pr. 255* to *Pr. 259*, *Pr. 503*, *Pr. 504*, *Pr. 555* to *Pr. 557*
	Use the operation panel (PA02) of the FR-E500 series.	*Pr. 146*, *C22* to *C25* (*Pr. 922*, *Pr. 923*)
Setting the parameter unit and operation panel	RUN key rotation direction selection	*Pr. 40*
	Parameter unit display language selection	*Pr. 145*
	Operation selection of the operation panel	*Pr. 161*
	Control of the parameter unit buzzer	*Pr. 990*
	Contrast adjustment of the parameter unit	*Pr. 991*

3.6.2 Parameter list

- ◎ indicates simple mode parameters..
- V/F ......V/F control, AD MFVC ......Advanced magnetic flux vector control

  GP MFVC .....General-purpose magnetic flux vector control

  (Parameters without any indication are valid for all control.)
- "O" indicates enabled and "x" indicates disabled of "parameter copy", "parameter clear", and "all parameter clear".

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Manual torque boost V/F	0 ◎		**Torque boost**	0.1%	6/4/3/2% *	0 to 30%	Set the output voltage at 0Hz as %. The setting depends on the inverter capacity. (0.1K to 0.75K/1.5K to 3.7K/5.5K, 7.5K/11K, 15K)	○	○	○
		46	**Second torque boost**	0.1%	9999	0 to 30% 9999	Torque boost when the RT signal is on. Without second torque boost	○	○	○
Maximum/minimum frequency	1 ◎		**Maximum frequency**	0.01Hz	120Hz	0 to 120Hz	Upper limit of the output frequency.	○	○	○
	2 ◎		**Minimum frequency**	0.01Hz	0Hz	0 to 120Hz	Lower limit of the output frequency.	○	○	○
		18	**High speed maximum frequency**	0.01Hz	120Hz	120 to 400Hz	Set when performing the operation at 120Hz or more.	○	○	○
Base frequency, voltage V/F	3 ◎		**Base frequency**	0.01Hz	60Hz	0 to 400Hz	Rated motor frequency. (50Hz/60Hz)	○	○	○
		19	**Base frequency voltage**	0.1V	9999	0 to 1,000V 8888 9999	Base voltage. 95% of power supply voltage Same as power supply voltage	○	○	○
		47	**Second V/F (base frequency)**	0.01Hz	9999	0 to 400Hz 9999	Base frequency when the RT signal is on. Second V/F invalid	○	○	○
Multi-speed setting operation	4 ◎		**Multi-speed setting (high speed)**	0.01Hz	60Hz	0 to 400Hz	Frequency when RH turns on.	○	○	○
	5 ◎		**Multi-speed setting (middle speed)**	0.01Hz	30Hz	0 to 400Hz	Frequency when RM turns on.	○	○	○
	6 ◎		**Multi-speed setting (low speed)**	0.01Hz	10Hz	0 to 400Hz	Frequency when RL turns on.	○	○	○
		24 to 27	**Multi-speed setting (4 speed to 7 speed)**	0.01Hz	9999	0 to 400Hz 9999	Frequency from 4 speed to 15 speed can be set according to the combination of the RH, RM, RL and REX signals. 9999: not selected	○	○	○
		232 to 239	**Multi-speed setting (8 speed to 15 speed)**	0.01Hz	9999	0 to 400Hz, 9999		○	○	○

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Acceleration/deceleration time setting	7 ◎		**Acceleration time**	0.1/ 0.01s	5/10/ 15s *	0 to 3600/ 360s	Motor acceleration time. * The setting range differs according to the inverter capacity (3.7K or less/5.5K, 7.5K/11K, 15K)	○	○	○
	8 ◎		**Deceleration time**	0.1/ 0.01s	5/10/ 15s *	0 to 3600/ 360s	Motor deceleration time. * The setting range differs according to the inverter capacity (3.7K or less/5.5K, 7.5K/11K, 15K)	○	○	○
		20	**Acceleration/ deceleration reference frequency**	0.01Hz	60Hz	1 to 400Hz	Frequency that will be the basis of acceleration/deceleration time. Acceleration/deceleration time is the frequency changing time from stop to *Pr. 20*	○	○	○
		21	**Acceleration/ deceleration time increments**	1	0	0	Increments: 0.1s Range: 0 to 3600s (Increments and setting range of acceleration/ deceleration time setting can be changed.)	○	○	○
						1	Increments: 0.01s Range: 0 to 360s (Increments and setting range of acceleration/ deceleration time setting can be changed.)			
		44	**Second acceleration/ deceleration time**	0.1/ 0.01s	5/10/ 15s *	0 to 3600/ 360s	Acceleration/deceleration time when the RT signal is on. * The setting range differs according to the inverter capacity (3.7K or less/5.5K, 7.5K/11K, 15K)	○	○	○
		45	**Second deceleration time**	0.1/ 0.01s	9999	0 to 3600/ 360s	Deceleration time when the RT signal is on.	○	○	○
						9999	Acceleration time = deceleration time			
		147	**Acceleration/ deceleration time switching frequency**	0.01Hz	9999	0 to 400Hz	Frequency when automatically switching to the acceleration/deceleration time of *Pr. 44* and *Pr. 45*.	○	○	○
						9999	No function			
Motor protection from overheat (electronic thermal relay function)	9 ◎		**Electronic thermal O/L relay**	0.01A	Rated inverter current*	0 to 500A	Set the rated motor current. * The initial value of the 0.75K or less is 85% of the rated inverter current.	○	○	○
		51	**Second electronic thermal O/L relay**	0.01A	9999	0 to 500A	Valid when the RT signal is on. Set the rated motor current.	○	○	○
						9999	Second electronic thermal O/L relay invalid			
DC injection brake preexcitation	10		**DC injection brake operation frequency**	0.01Hz	3Hz	0 to 120Hz	Operation frequency of the DC injection brake.	○	○	○
	11		**DC injection brake operation time**	0.1s	0.5s	0	DC injection brake disabled	○	○	○
						0.1 to 10s	Operation time of the DC injection brake.			
	12		**DC injection brake operation voltage**	0.1%	6/4/2% *	0	DC injection brake disabled	○	○	○
						0.1 to 30%	DC injection brake voltage (torque). * The setting depends on the inverter capacity. (0.1K, 0.2K/0.4K to 7.5K/11K, 15K)			
Starting frequency	13		**Starting frequency**	0.01Hz	0.5Hz	0 to 60Hz	Starting frequency.	○	○	○
		571	**Holding time at a start**	0.1s	9999	0.0 to 10.0s	Holding time of *Pr. 13 Starting frequency*.	○	○	○
						9999	Holding function at a start is invalid			

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
V/F pattern matching applications (V/F)	14		Load pattern selection	1	0	0	For constant torque load	○	○	○
						1	For reduced-torque load			
						2	For constant torque elevators: Boost for reverse rotation 0%			
						3	For constant torque elevators: Boost for forward rotation 0%			
Jog operation	15		Jog frequency	0.01Hz	5Hz	0 to 400Hz	Frequency for jog operation.	○	○	○
	16		Jog acceleration/ deceleration time	0.1/ 0.01s	0.5s	0 to 3600/ 360s	Acceleration/deceleration time for jog operation. The time taken to reach the frequency (initial value is 60Hz) set in *Pr. 20 Acceleration/deceleration reference frequency.* Acceleration/deceleration time can not be set separately.	○	○	○
Logic selection of output stop signal (MRS)	17		MRS input selection	1	0	0	Normally open input	○	○	○
						2	Normally closed input (NC contact input specifications)			
						4	External terminal: Normally closed input (NC contact input specifications) Communication: Normally open input			
——	18		Refer to *Pr. 1 and Pr. 2.*							
	19		Refer to *Pr.3.*							
	20, 21		Refer to *Pr.7, Pr.8.*							
Stall prevention operation	22		Stall prevention operation level	0.1%	150%	0	Stall prevention operation selection becomes invalid.	○	○	○
						0.1 to 200%	Current value at which stall prevention operation will be 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%	9999	0	Second stall prevention operation invalid	○	○	○
						0.1 to 200%	Second stall prevention operation level.			
						9999	Same level as *Pr.22*.			
		66	Stall prevention operation reduction starting frequency	0.01Hz	60Hz	0 to 400Hz	Frequency at which the stall operation level is started to reduce.	○	○	○
		156	Stall prevention operation selection	1	0	0 to 31 100, 101	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	Output start time of the OL signal output when stall prevention is activated.	○	○	○
						9999	Without the OL signal output			
		277	Stall prevention operation current switchover	1	0	0	When the output current exceeds the limit level, output frequency is limited to limit current. The inverter rated current is the reference to the limit level.	○	○	○
						1	When the output torque exceeds the limit level, output frequency is limited to limit torque. The rated motor torque is the reference to the limit level.			

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
—	24 to 27		Refer to *Pr.4 to Pr.6*.							
Acceleration /deceleration pattern	29		Acceleration/ deceleration pattern selection	1	0	0	Linear acceleration/ deceleration	○	○	○
						1	S-pattern acceleration/deceleration A			
						2	S-pattern acceleration/deceleration B			
Selection of regeneration unit	30		Regenerative function selection	1	0	0	Without regenerative function, Brake resistor (MRS), Brake unit (FR-BU2), High power factor converter (FR-HC), Power regeneration common converter (FR-CV)	○	○	○
						1	High-duty brake resistor (FR-ABR)			
						2	High power factor converter (FR-HC), (when an automatic restart after instantaneous power failure is selected)			
		70	Special regenerative brake duty	0.1%	0%	0 to 30%	Brake duty when using the high-duty brake resistor (FR-ABR)	○	○	○
Avoid mechanical resonance points (frequency jump)	31		Frequency jump 1A	0.01Hz	9999	0 to 400Hz 9999	1A to 1B, 2A to 2B, 3A to 3B is frequency jumps 9999: Function invalid	○	○	○
	32		Frequency jump 1B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	33		Frequency jump 2A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	34		Frequency jump 2B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	35		Frequency jump 3A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	36		Frequency jump 3B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
Speed display	37		Speed display	0.001	0	0	Frequency display, setting	○	○	○
						0.01 to 9998	Machine speed at 60Hz.			
RUN key rotation direction selection	40		RUN key rotation direction selection	1	0	0	Forward rotation	○	○	○
						1	Reverse rotation			
Detection of output frequency and motor speed (SU, FU signal)	41		Up-to-frequency sensitivity	0.1%	10%	0 to 100%	Level where the SU signal turns on.	○	○	○
	42		Output frequency detection	0.01Hz	6Hz	0 to 400Hz	Frequency where the FU signal turns on.	○	○	○
	43		Output frequency detection for reverse rotation	0.01Hz	9999	0 to 400Hz	Frequency where the FU signal turns on in reverse rotation.	○	○	○
						9999	Same as *Pr. 42* setting			
—	44, 45		Refer to *Pr. 7, Pr. 8*.							
	46		Refer to *Pr. 0*.							
	47		Refer to *Pr. 3*.							
	48		Refer to *Pr. 22*							
	51		Refer to *Pr. 9*.							

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Change of DU/PU monitor descriptions Cumulative monitor clear	**52**		**DU/PU main display data selection**	1	0	0, 5, 7 to 12, 14, 20, 23 to 25, 52 to 57, 61, 62, 100	Select monitor to be displayed on the operation panel and parameter unit and monitor to be output to the terminal FM. 0: Output frequency *(Pr.52)* 1: Output frequency *(Pr.54)* 2: Output current *(Pr.54)* 3: Output voltage *(Pr.54)* 5: Frequency setting value 7: Motor torque 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 14: Output power 20: Cumulative energization time *(Pr. 52)* 21: Reference voltage output *(Pr. 54)* 23: Actual operation time *(Pr. 52)* 24: Motor load factor 25: Cumulative power *(Pr. 52)* 52: PID set point 53: PID measured value 54: PID deviation *(Pr. 52)* 55: I/O terminal status *(Pr. 52)* 56: Option input terminal status *(Pr. 52)* 57: Option output terminal status *(Pr. 52)* 61: Motor thermal load factor 62: Inverter thermal load factor 100: Set frequency is displayed during a stop and output frequency is displayed during operation *(Pr. 52)*	○	○	○
	54		**FM terminal function selection**	1	1	1 to 3, 5, 7 to 12, 14, 21, 24, 52, 53, 61, 62		○	○	○
		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" does not clear.	×	×	×
		268	**Monitor decimal digits selection**	1	9999	0	Displayed as integral value	○	○	○
						1	Displayed in 0.1 increments.			
						9999	No function			
		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)	×	×	×

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Change of the monitor output from terminal FM	55		Frequency monitoring reference	0.01Hz	60Hz	0 to 400Hz	Full-scale value to output the output frequency monitor value to terminal FM.	○	○	○
	56		Current monitoring reference	0.01A	Rated inverter current	0 to 500A	Full-scale value to output the output current monitor value to terminal FM.	○	○	○
Restart operation after instantaneous power failure/Flying start	57		Restart coasting time	0.1s	9999	0	1.5K or less ..... 1s 2.2K to 7.5K ..... 2s 11K or more..... 3s The above times are coasting time.	○	○	○
						0.1 to 5s	Waiting time for inverter-triggered restart after an instantaneous power failure.			
						9999	No restart			
	58		Restart cushion time	0.1s	1s	0 to 60s	Voltage starting time at restart.	○	○	○
		30	Regenerative function selection	1	0	0, 1	The motor starts at the starting frequency when MRS (X10) turns on then off			
						2	Restart operation is performed when MRS (X10) turns on then off			
		162	Automatic restart after instantaneous power failure selection	1	1	0	With frequency search	When using the frequency search, consider the wiring length limit. (*Refer to page 12*)	○	○	○
						1	Without frequency search (reduced voltage system)			
						10	Frequency search at every start			
						11	Reduced voltage at every start			
		165	Stall prevention operation level for restart	0.1%	150%	0 to 200%	Considers the rated inverter current as 100% and sets the stall prevention operation level during restart operation.	○	○	○
		298	Frequency search gain	1	9999	0 to 32767	When offline auto tuning is performed under V/F control, frequency search gain necessary for frequency search for automatic restart after instantaneous power failure is set as well as the motor constants (R1).	○	×	○
						9999	Uses the Mitsubishi motor (SF-JR, SF-HRCA) constants			
		299	Rotation direction detection selection at restarting	1	0	0	Without rotation direction detection	○	○	○
						1	With rotation direction detection			
						9999	When *Pr. 78* =0, the rotation direction is detected. When *Pr. 78* =1, 2, the rotation direction is not detected.			
		611	Acceleration time at a restart	0.1s	9999	0 to 3600s	Acceleration time to reach the set frequency at a restart.	○	○	○
						9999	Acceleration time for restart is the normal acceleration time (e.g. *Pr. 7*).			

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
Remote setting function	59		Remote function selection	1	0		RH, RM, RL signal function	Frequency setting storage function	○	○	○
						0	Multi-speed setting	—			
						1	Remote setting	Yes			
						2	Remote setting	No			
						3	Remote setting	No (Turning STF/STR off clears remotely-set frequency.)			
Energy saving control selection V/F	60		Energy saving control selection	1	0	0	Normal operation mode		○	○	○
						9	Optimum excitation control mode				
Automatic acceleration/deceleration	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	1%	9999	0 to 200%	Setting value is a limit value		○	○	○
						9999	150% is a limit value				
	63		Reference value at deceleration	1%	9999	0 to 200%	Setting value is a limit value		○	○	○
						9999	150% is a limit value				
		292	Automatic acceleration/deceleration	1	0	0	Normal mode		○	○	○
						1	Shortest acceleration/deceleration mode	Without brake			
						11		With brake			
						7	Brake sequence mode 1				
						8	Brake sequence mode 2				
		293	Acceleration/deceleration separate selection	1	0	0	Calculates acceleration/deceleration time of both acceleration and deceleration for the shortest acceleration/deceleration mode.		○	○	○
						1	Calculates only acceleration time for the shortest acceleration/deceleration mode.				
						2	Calculates only deceleration time for the shortest acceleration/deceleration mode				
Retry function at fault occurrence	65		Retry selection	1	0	0 to 5	A fault for retry can be selected.		○	○	○
		67	Number of retries at fault occurrence	1	0	0	No retry function		○	○	○
						1 to 10	Number of retries at fault occurrence. A fault output is not provided during retry operation.				
						101 to 110	Number of retries at fault occurrence. (The setting value of minus 100 is the number of retries.) A fault output is provided during retry operation.				
		68	Retry waiting time	0.1s	1s	0.1 to 360s	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, Pr.23*.								
	67 to 69		Refer to *Pr.65*.								
	70		Refer to *Pr.30*.								

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
Motor selection (applied motor)	71		Applied motor	1	0	0	Thermal characteristics of a standard motor		○	○	○
						1	Thermal characteristics of the Mitsubishi constant-torque motor				
						40	Thermal characteristic of Mitsubishi high efficiency standard motor (SF-HR)				
						50	Thermal characteristic of Mitsubishi constant torque motor (SF-HRCA)				
						3	Standard motor	Select "offline auto tuning setting"			
						13	Constant-torque motor				
						23	Mitsubishi standard motor (SF-JR 4P 1.5kW or less)				
						43	Mitsubishi high efficiency motor (SF-HR)				
						53	Mitsubishi constant-torque motor (SF-HRCA)				
						4	Standard motor	Auto tuning data can be read, changed, and set.			
						14	Constant-torque motor				
						24	Mitsubishi standard motor (SF-JR 4P 1.5kW or less)				
						44	Mitsubishi high efficiency motor (SF-HR)				
						54	Mitsubishi constant-torque motor (SF-HRCA)				
						5	Standard motor	Star connection Direct input of motor constants is enabled			
						15	Constant-torque motor				
						6	Standard motor	Delta connection Direct input of motor constants is enabled			
						16	Constant-torque motor				
		450	Second applied motor	1	9999	0	Thermal characteristics of a standard motor		○	○	○
						1	Thermal characteristics of the Mitsubishi constant-torque motor				
						9999	Second motor is invalid (thermal characteristic of the first motor *(Pr.71)*)				
Carrier frequency and Soft-PWM selection	72		PWM frequency selection	1	1	0 to 15	PWM carrier frequency. The setting displayed is in [kHz]. Note that 0 indicates 0.7kHz and 15 indicates 14.5kHz.		○	○	○
		240	Soft-PWM operation selection	1	1	0	Soft-PWM is invalid		○	○	○
						1	When *Pr. 72* = "0 to 5", Soft-PWM is valid.				

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Analog input selection	73		Analog input selection	1	1		Terminal 2 input / Polarity reversible	○	×	○
						0	0 to 10V / Not used			
						1	0 to 5V / Not used			
						10	0 to 10V / With			
						11	0 to 5V / With			
		267	Terminal 4 input selection	1	0	0	Terminal 4 input 4 to 20mA	○	×	○
						1	Terminal 4 input 0 to 5V			
						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	Primary delay filter time constant for the analog input. A larger setting results in a larger filter.	○	○	○
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-PU04/FR-PU07) 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.	○	×	×
Prevention of parameter rewrite	77		Parameter write selection	1	0	0	Write is enabled only during a stop	○	○	○
						1	Write disabled.			
						2	Write is enabled in any operation mode regardless of operation status.			
Prevention of reverse rotation of the motor	78		Reverse rotation prevention selection	1	0	0	Both forward and reverse rotations allowed	○	○	○
						1	Reverse rotation disabled			
						2	Forward rotation disabled			
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	Started in network operation mode.			
						10	Started in network operation mode. Operation mode can be changed between the PU operation mode and network operation mode from the operation panel.			
Selection of control method AD MFVC GP MFVC	80		Motor capacity	0.01kW	9999	0.1 to 15kW	Applied motor capacity.	○	○	○
						9999	V/F control			
	81		Number of motor poles	1	9999	2, 4, 6, 8, 10	Set the number of motor poles.	○	○	○
						9999	V/F control			
		89	Speed control gain (advanced 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 motor set in *Pr. 71*.			
		800	Control method selection	1	20	20	Advanced magnetic flux vector control / When a value other than "9999" is set in *Pr. 80* and *Pr. 81*.	○	○	○
						30	General-purpose magnetic flux vector control / When a value other than "9999" is set in *Pr. 80* and *Pr. 81*.			

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Offline auto tuning	82		**Motor excitation current**	0.01A*	9999	0 to 500A*	Tuning data (The value measured by offline auto tuning is automatically set.) * The range differs according to the *Pr. 71* setting. (*Refer to the chapter 4 of the Instruction Manual (applied)*).	○	×	○
						9999	Uses the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA) constants			
	83		**Motor rated voltage**	0.1V	200V/ 400V *	0 to 1,000V	Rated motor voltage (V). * Differs according to the voltage class (200V/ 400V)	○	○	○
	84		**Rated motor frequency**	0.01Hz	60Hz	10 to 120Hz	Rated motor frequency (Hz).	○	○	○
		90	**Motor constant (R1)**	0.001Ω *	9999	0 to 50Ω*, 9999	Tuning data (The value measured by offline auto tuning is automatically set.) * The range differs according to the *Pr.71* setting. (*Refer to the chapter 4 of the Instruction Manual (applied)*). 9999: Use constants of the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA)	○	×	○
		91	**Motor constant (R2)**	0.001Ω *	9999			○	×	○
		92	**Motor constant (L1)**	0.1mH*	9999	0 to 1000mH*, 9999	Tuning data (The value measured by offline auto tuning is automatically set.) * The range differs according to the *Pr.71* setting. (*Refer to the chapter 4 of the Instruction Manual (applied)*). 9999: Use constants of the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA)	○	×	○
		93	**Motor constant (L2)**	0.1mH*	9999			○	×	○
		94	**Motor constant (X)**	0.1%*	9999	0 to 100%*	Tuning data (The value measured by offline auto tuning is automatically set.) * The range differs according to the *Pr.71* setting. (*Refer to the chapter 4 of the Instruction Manual (applied)*).	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA) constants			
		96	**Auto tuning setting/status**	1	0	0	Offline auto tuning is not performed	○	×	○
						1	For advanced magnetic flux vector control Offline auto tuning is performed without motor running (all motor constants)			
						11	For general-purpose magnetic flux vector control Offline auto tuning is performed without motor running(motor constant (R1) only)			
						21	Offline auto tuning for V/F control (automatic restart after instantaneous power failure (with frequency search)) (*Refer to the chapter 4 of the Instruction Manual (applied)*)			
		859	**Torque current**	0.01A*	9999	0 to 500A*	Tuning data (The value measured by offline auto tuning is automatically set.) * The range differs according to the *Pr.71* setting. (*Refer to the chapter 4 of the Instruction Manual (applied)*).	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HR, SF-JRCA, SF-HRCA) constants			
—	89		Refer to *Pr.81*.							
	90 to 94		Refer to *Pr.82 to Pr.84*.							
	96		Refer to *Pr.82 to Pr.84*.							

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
PU connector communication	117		PU communication station number	1	0	0 to 31 (0 to 247)	Inverter station number. Set the inverter station numbers when two or more inverters are connected to one personal computer. When "1" (Modbus-RTU protocol) is set in *Pr. 549*, the setting range within parenthesis is applied.	○	○	○
	118		PU communication speed	1	192	48, 96, 192, 384	Communication speed. The setting value X 100 equals the communication speed. (For example, 19200bps when the setting value is 92)	○	○	○
	119		PU communication stop bit length	1	1	0	Stop bit length: 1 bit data length: 8bit	○	○	○
						1	Stop bit length: 2 bit data length: 8bit			
						10	Stop bit length: 1 bit data length: 7bit			
						11	Stop bit length: 2 bit data length: 7bit			
	120		PU communication parity check	1	2	0	Without parity check (for Modbus-RTU: stop bit length: 2bit)	○	○	○
						1	With odd parity check (for Modbus-RTU: stop bit length: 1bit)			
						2	With even parity check (for Modbus-RTU: stop bit length: 1bit)			
	121		Number of PU communication retries	1	1	0 to 10	Number of retries at data receive error occurrence. If the number of consecutive errors exceeds the permissible value, the inverter will come to trip.	○	○	○
						9999	If a communication error occurs, the inverter will not come to trip.			
	122		PU communication check time interval	0.1s	0	0	RS-485 communication can be made. Note that a communication error (E.PUE) occurs as soon as the inverter is switched to the operation mode with command source.	○	○	○
						0.1 to 999.8s	Communication check (signal loss detection) time interval. If a no-communication state persists for longer than the permissible time, the inverter will come to trip (depends on *Pr. 502*).			
						9999	No communication check (signal loss detection)			
	123		PU communication waiting time setting	1	9999	0 to 150ms	Waiting time between data transmission to the inverter and response.	○	○	○
						9999	Set with communication data.			
	124		PU communication CR/LF selection	1	1	0	Without CR/LF	○	○	○
						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.	○	○	○
						1	Parameter values written by communication are written to the RAM.			
		343	Communication error count	1	0	—	Displays the number of communication errors during Modbus-RTU communication. (Reading only) Displayed only when Modbus-RTU protocol is selected.	×	×	×
		502	Stop mode selection at communication error	1	0	0, 3	Select the inverter operation if a communication error occurs.: Coasts to stop	○	○	○
						1, 2	Select the inverter operation if a communication error occurs.: Decelerates to stop			
		549	Protocol selection	1	0	0	Mitsubishi inverter (computer link operation) protocol. After setting change, reset is required (switch power off, then on). The setting change is reflected after a reset.	○	○	○
						1	Modbus-RTU protocol. After setting change, reset is required (switch power off, then on). The setting change is reflected after a reset.			

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
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 400Hz	Frequency of terminal 2 input gain (maximum).		○	×	○
	126 ◎		Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency of terminal 4 input gain (maximum).		○	×	○
		241	Analog input display unit switchover	1	0	0	Displayed in %	Select the unit of analog input display.	○	○	○
						1	Displayed in V/mA				
		C2 (902)	Terminal 2 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Frequency on the bias side of terminal 2 input.		○	×	○
		C3 (902)	Terminal 2 frequency setting bias	0.1%	0%	0 to 300%	Converted % of the bias side voltage (current) of terminal 2 input.		○	×	○
		C4 (903)	Terminal 2 frequency setting gain	0.1%	100%	0 to 300%	Converted % of the gain side voltage of terminal 2 input.		○	×	○
		C5 (904)	Terminal 4 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Frequency on the bias side of terminal 4 input.		○	×	○
		C6 (904)	Terminal 4 frequency setting bias	0.1%	20%	0 to 300%	Converted % of the bias side current (voltage) of terminal 4 input.		○	×	○
		C7 (905)	Terminal 4 frequency setting gain	0.1%	100%	0 to 300%	Converted % of the gain side current (voltage) of terminal 4 input.		○	×	○
		C22 (922)	Frequency setting voltage bias frequency (built-in potentiometer)	0.01Hz	0	0 to 400Hz	Frequency on the bias side of built-in potentiometer.	Valid when the operation panel (PA02) for the FR-E500 series is fitted.	○	×	○
		C23 (922)	Frequency setting voltage bias (built-in potentiometer)	0.1%	0	0 to 300%	Converted % of the bias side voltage of built-in potentiometer.		○	×	○
		C24 (923)	Frequency setting voltage gain frequency (built-in potentiometer)	0.01Hz	60Hz	0 to 400Hz	Frequency of the gain (maximum) of built-in potentiometer.		○	×	○
		C25 (923)	Frequency setting voltage gain (built-in potentiometer)	0.1%	100	0 to 300%	Converted % of the gain side voltage of built-in potentiometer.		○	×	○

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

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
PID control / Dancer control	127		PID control automatic switchover frequency	0.01Hz	9999	0 to 400Hz	Frequency at which the control is automatically changed to PID control.		○	○	○
						9999	Without PID automatic switchover function				
	128		PID action selection	1	0	0	PID control invalid		○	○	○
						20	PID reverse action	Measured value input (terminal 4) Set value (terminal 2 or *Pr. 133*)			
						21	PID forward action				
						40 to 43	Dancer control				
						50	PID reverse action	Deviation value signal input (LONWORKS, CC-Link communication)			
						51	PID forward action				
						60	PID reverse action	Measured value, set point input (LONWORKS, CC-Link communication)			
						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 Kp= 1/proportional band		○	○	○
						9999	No proportional control				
	130		PID integral time	0.1s	1s	0.1 to 3600s	For deviation step input, time (Ti) 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%	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%	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	PID control	Terminal 2 input voltage is the set point.			
							Dancer control	Always 50%			
	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.				
		44	Second acceleration/ deceleration time	0.1/ 0.01s	5/10/ 15s *	0 to 3600/ 360s	This parameter is the acceleration time of the main speed during dancer control. It will not function as second acceleration time. * The setting range differs according to the inverter capacity (3.7K or less/5.5K, 7.5K/11K, 15K)		○	○	○
		45	Second deceleration time	0.1/ 0.01s	9999	0 to 3600/ 360s, 9999	This parameter is the deceleration time of the main speed during dancer control. It will not function as second deceleration time.		○	○	○

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Parameter unit display language selection	145		PU display language selection	1	0	0	Japanese	○	×	×
						1	English			
						2	Germany			
						3	French			
						4	Spanish			
						5	Italian			
						6	Swedish			
						7	Finnish			
Frequency setting command selection	146		Built-in potentiometer switching	1	1	0	PA02 Built-in frequency setting potentiometer valid / Valid when the operation panel (PA02) for the FR-E500 series is fitted.	○	×	×
						1	PA02 Built-in frequency setting potentiometer invalid / Valid when the operation panel (PA02) for the FR-E500 series is fitted.			
—	147		Refer to *Pr. 7, Pr. 8.*							
Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	150		Output current detection level	0.1%	150%	0 to 200%	Output current detection level. 100% is the rated inverter current.	○	○	○
	151		Output current detection signal delay time	0.1s	0s	0 to 10s	Output current detection period. 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 200%	Zero current detection level. The rated inverter current is assumed to be 100%.	○	○	○
	153		Zero current detection time	0.01s	0.5s	0 to 1s	Period from when the output current drops below the *Pr. 152* value until the zero current detection signal (Y13) is output.	○	○	○
—	156, 157		Refer to *Pr.22*							
User group function	160◎		User group read selection	1	0	0	Display all parameters	○	○	○
						1	Only the parameters registered to 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	Parameter numbers to be registered to the user group. Read value is always "9999".	×	×	×
		174	User group clear	1	9999	0 to 999, 9999	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 mode invalid	○	×	○
						1	Setting dial potentiometer mode / Key lock mode invalid			
						10	Setting dial frequency setting mode / Key lock mode valid			
						11	Setting dial potentiometer mode / Key lock mode valid			

Function	Parameter (Related Parameter)	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
—	162, 165	Refer to *Pr. 57*.							
	168, 169	**Parameter for manufacturer setting. Do not set.**							
	170, 171	Refer to *Pr. 52*.							
	172 to 174	Refer to *Pr. 160*.							
Function assignment of input terminal	**178**	**STF terminal function selection**	1	60	0 to 5, 7, 8, 10, 12, 14 to 16, 18, 24, 25, 60, 62, 65 to 67, 9999	0: Low-speed operation command 1: Middle-speed operation command 2: High-speed operation command 3: Second function selection 4: Terminal 4 input selection 5: JOG operation selection 7: External thermal relay input 8: Fifteen speed selection 10: Inverter operation enable signal (FR-HC/FR-CV connection) 12: PU operation external interlock 14: PID control valid terminal 15: Brake opening completion signal 16: PU-external operation switchover 18: V/F switchover 24: Output stop 25: Start self-holding selection 60: Forward rotation (assigned to STF terminal (*Pr. 178*) only) 61: Reverse rotation (assigned to STR terminal (*Pr. 179*) only) 62: Inverter reset 65: PU-NET operation switchover 66: External-NET operation switchover 67: Command source switchover 9999: No function	○	×	○
	179	**STR terminal function selection**	1	61	0 to 5, 7, 8, 10, 12, 14 to 16, 18, 24, 25, 61, 62, 65 to 67, 9999		○	×	○
	180	**RL terminal function selection**	1	0	0 to 5, 7, 8, 10, 12, 14 to 16, 18, 24, 25, 62, 65 to 67, 9999		○	×	○
	181	**RM terminal function selection**	1	1			○	×	○
	182	**RH terminal function selection**	1	2			○	×	○
	183	**MRS terminal function selection**	1	24			○	×	○
	184	**RES terminal function selection**	1	62			○	×	○

Parameter List

3

DRIVE THE MOTOR

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Terminal assignment of output terminal	**190**		**RUN terminal function selection**	1	0	0, 1, 3, 4 7, 8, 11 to 16, 20, 25, 26, 46, 47, 64, 90, 91, 93, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116 120, 125 126, 146 147, 164 190, 191, 193, 195, 196, 198, 199, 9999	0, 100: Inverter running 1, 101: Up to frequency 3, 103: Overload alarm 4, 140: Output frequency detection 7, 107: Regenerative brake pre-alarm 8, 108: Electronic thermal relay function pre-alarm 11, 111: Inverter operation ready 12, 112: Output current detection 13, 113: Zero current detection 14, 114: PID lower limit 15, 115: PID upper limit 16, 116: PID forward/reverse rotation output 20, 120: Brake opening request 25, 125: Fan fault output 26, 126: Heatsink overheat pre-alarm 46, 164: During deceleration due to power failure stop function (retained until release) 47, 147: During PID control activated 64, 164: During retry 90, 190: Life alarm 91, 191: Fault output 3 (power-off signal) 93, 193: Current average value monitor signal 95, 195: Maintenance timer signal 96, 196: Remote output 98, 198: Alarm output 99, 199: Fault output 9999, —: No function 0 to 99: Positive logic 100 to 199: Negative logic	○	×	○
	191		**FU terminal function selection**	1	4			○	×	○
	192		**A,B,C terminal function selection**	1	99	0, 1, 3, 4, 7, 8, 11 to 16, 20, 25, 26, 46, 47, 64, 90, 91, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 120, 125, 126, 146, 147, 164, 190, 191, 195, 196, 198, 199, 9999		○	×	○
—	**232 to 239**		**Refer to *Pr.4 to Pr.6*.**							
	240		**Refer to *Pr.72*.**							
	241		**Refer to *Pr.125, Pr.126*.**							
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.			
Slip compensation V/F GP MFVC	**245**		**Rated slip**	0.01%	9999	0 to 50%	Rated motor slip.	○	○	○
						9999	No slip compensation			
	246		**Slip compensation time constant**	0.01s	0.5s	0.01 to 10s	Slip compensation response time. When the value is made smaller, response will be faster. However, as load inertia is greater, a regenerative overvoltage trip (E.OV□) is more liable to occur.	○	○	○
	247		**Constant-power range slip compensation selection**	1	9999	0	Slip compensation is not made in the constant power range (frequency range above the frequency set in *Pr. 3*).	○	○	○
						9999	Slip compensation in the constant power range.			

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
Ground fault detection	249		Earth (ground) fault detection at start	1	0	0	Without ground fault detection		○	○	○
						1	With ground fault detection				
Selection of motor stopping method and start signal	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 loss protection selection	1	1	0	Without output phase loss protection		○	○	○
						1	With output phase loss protection				
		872	Input phase loss protection selection	1	1	0	Without input phase loss protection		○	○	○
						1	With input phase loss protection				
Display of the life of the inverter parts	255		Life alarm status display	1	0	(0 to 15)	Displays 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%)	Displays the deterioration degree of the inrush current limit circuit. (Reading only)		×	×	×
	257		Control circuit capacitor life display	1%	100%	(0 to 100%)	Displays the deterioration degree of the control circuit capacitor. (Reading only)		×	×	×
	258		Main circuit capacitor life display	1%	100%	(0 to 100%)	Displays 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 switching 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. Displays the deterioration degree in *Pr. 258*.		○	○	○

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Operation at instantaneous power failure	261		Power failure stop selection	1	0	0	Coasts to stop. When undervoltage or power failure occurs, the output is shut off.	○	○	○
						1	Decelerates to a stop when undervoltage or a power failure occurs.			
						2	Decelerates to a stop when undervoltage or a power failure occurs. If power is restored during a power failure, the inverter accelerates again.			
——	267		Refer to *Pr. 73*.							
	268		Refer to *Pr. 52*.							
	269		Parameter for manufacturer setting. Do not set.							
Stop-on contact control	270		Stop-on contact control selection	1	0	0	Without stop-on contact control	○	○	○
						1	Stop-on contact control			
	275		Stop-on contact excitation current low-speed multiplying factor	0.1%	9999	0 to 300%	Force (holding torque) for stop-on contact control. Usually a value between 130% and 180%.	○	○	○
						9999	No compensation.			
	276		PWM carrier frequency at stop-on contact	1	9999	0 to 9	PWM carrier frequency for stop-on contact control. (Valid at the output frequency of 3Hz or less.)	○	○	○
						9999	As set in *Pr. 72 PWM frequency selection*.			
——	277		Refer to *Pr.22*.							
Brake sequence function	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 set only if *Pr. 278* ≤ *Pr. 282*.	○	○	○
	279		Brake opening current	0.1%	130%	0 to 200%	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%.	○	○	○
	280		Brake opening current detection time	0.1s	0.3s	0 to 2s	Generally, set to about 0.1 to 0.3s.	○	○	○
	281		Brake operation time at start	0.1s	0.3s	0 to 5s	*Pr. 292* = 7: 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.	○	○	○
	282		Brake operation frequency	0.01Hz	6Hz	0 to 30Hz	Frequency to switch off the brake opening request signal (BOF). Generally, set this parameter to the *Pr. 278* setting + 3 to 4Hz. This parameter may be set only if *Pr. 282* ≥ *Pr. 278*.	○	○	○
	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 0.3 seconds.	○	○	○
		292	Automatic acceleration/ deceleration	1	0	0, 1, 7, 8, 11	Brake sequence function is valid when a setting is "7 or 8".			

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
Droop control AD MFVC	286		Droop gain	0.1%	0%	0	Droop control is invalid	○	○	○
						0.1 to 100%	Drooping amount at the rated torque with respect to the rated motor frequency.			
	287		Droop filter time constant	0.01s	0.3s	0 to 1s	Time constant of the primary delay filter applied to the torque current.	○	○	○
——	292, 293		Refer to *Pr. 61*.							
Setting of the magnitude of frequency change by the setting dial	295		Magnitude of frequency change setting	0.01	0	0	Invalid	○	○	○
						0.01, 0.10, 1.00, 10.00	The setting increments when the set frequency is changed by the setting dial.			
——	298, 299		Refer to *Pr. 57*.							
Operation command source and speed command source during communication operation	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 (Frequency command from communication is invalid, frequency command from terminal 2 is valid)			
						2	Frequency command source external (Frequency command from communication is valid, frequency command from terminal 2 is invalid)			
		550	NET mode operation command source selection	1	9999	0	The communication option is the command source when NET operation mode.	○	○	○
						2	PU connector is the command source when NET operation mode.			
						9999	Automatic communication option recognition Normally, PU connector is the command source. When a communication option is mounted, the communication option is the command source.			
		551	PU mode operation command source selection	1	9999	2	PU connector is the command source when PU operation mode.	○	○	○
						3	USB connector is the command source when PU operation mode.			
						4	Operation panel is the command source when PU operation mode.			
						9999	USB connection, PU07 connection automatic recognition Priorities: USB>PU07>operation panel			
——	340		Refer to *Pr. 79*.							
	342, 343		Refer to *Pr. 117 to Pr. 124*.							
	450		Refer to *Pr.71*.							

Function	Parameter	Related Parameter	Name	Incre-ments	Initial Value	Range	Description		Parameter Copy	Parameter Clear	All Parameter Clear
Remote output function (REM signal)	**495**		**Remote output selection**	1	0	0	Remote output data clear at powering off	Remote output data clear at inverter reset	○	○	○
						1	Remote output data retention at powering off				
						10	Remote output data clear at powering off	Remote output data retention at inverter reset			
						11	Remote output data retention 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			×	×	×
—	**502**		**Refer to *Pr.124*.**								
Maintenance of parts	**503**		**Maintenance timer**	1	0	0(1 to 9998)	Displays the cumulative energization time of the inverter in 100h increments. (Reading only) Writing the setting of "0" clears the cumulative energization time.		×	×	×
	504		**Maintenance timer alarm output set time**	1	9999	0 to 9998	Time taken until when the maintenance timer alarm output signal (Y95) is output.		○	×	○
						9999	No function				
Inverter setup using USB communication	**547**		**USB communication station number**	1	0	0 to 31	Inverter station number.		○	○	○
	548		**USB communication check time interval**	0.1s	9999	0	USB communication is enabled. However, the inverter will trip (E. USB) if operation is changed to PU operation mode.		○	○	○
						0.1 to 999.8s	Interval of communication check time.				
						9999	No communication check				
		551	**Refer to *Pr.338 and Pr.339*.**								
—	**549**		**Refer to *Pr.117 to Pr.124*.**								
	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	Time taken to average the current during start bit output (1s).		○	○	○
	556		**Data output mask time**	0.1s	0s	0.0 to 20.0s	Time for not obtaining (mask) transient state data.		○	○	○
	557		**Current average value monitor signal output reference current**	0.01A	Rated inverter current	0 to 500A	Reference (100%) for outputting the signal of the current average value.		○	○	○
—	**563, 564**		**Refer to *Pr.52*.**								
	571		**Refer to *Pr.13*.**								
	611		**Refer to *Pr.57*.**								
Reduce mechanical resonance	**653**		**Speed smoothing control**	0.1%	0	0 to 200%	The torque fluctuation is reduced to reduce vibration due to mechanical resonance.		○	○	○
—	**665**		**Refer to *Pr.882*.**								

Function	Parameter	Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
——	800		Refer to *Pr.80*.							
——	859		Refer to *Pr.84*.							
——	872		Refer to *Pr.251*.							
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 during a constant speed operation			
	883		Regeneration avoidance operation level	0.1V	400VDC/ 780VDC *	300 to 800V	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 x $\sqrt{2}$". * Differs according to the voltage class (200V/ 400V)	○	○	○
	885		Regeneration avoidance compensation frequency limit value	0.01Hz	6Hz	0 to 10Hz	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%	Responsiveness at activation of regeneration avoidance. A larger setting of *Pr. 886* will improve responsiveness to the bus voltage change. However, the output frequency could become unstable. When vibration is not suppressed by decreasing the *Pr. 886* setting, set a smaller value in *Pr. 665*.	○	○	○
		665	Regeneration avoidance frequency gain	0.1%	100%	0 to 200%		○	○	○
Free parameter	888		Free parameter 1	1	9999	0 to 9999	Parameters for your own purposes. Used for maintenance, management, etc. by setting a unique number to each inverter when multiple inverters are used. Data is held even if the inverter power is turned off.	○	×	×
	889		Free parameter 2	1	9999	0 to 9999		○	×	×
Adjustment of terminal FM output (calibration)	C0 (900)		FM terminal calibration	—	—	—	Calibrates the scale of the meter connected to terminal FM.	○	×	○
——	C2(902) to C7(905) C22(922) to C25(923)		Refer to *Pr. 125 and Pr. 126*.							
Buzzer control of the operation panel	990		PU buzzer control	1	1	0	Without buzzer	○	○	○
						1	With buzzer			

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

Function	Parameter / Related Parameter	Name	Increments	Initial Value	Range	Description	Parameter Copy	Parameter Clear	All Parameter Clear
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	○	×	○
Clear parameter, initial value change list	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" clears eight past faults.			
	Pr.CH	Initial value change list	—	—	—	Displays and sets the parameters changed from the initial value.			

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 91)*
- 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 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.

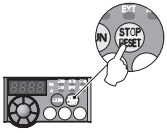
(4) Fault
When a fault occurs, the inverter trips and a fault signal is output.

4.1 Reset method of protective function

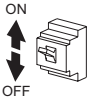
(1) Resetting the inverter

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.

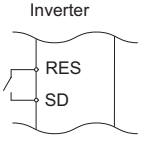
Operation 1: ..... Using the operation panel, press (STOP RESET) to reset the inverter.
(This may only be performed when a fault occurs (*Refer to page 96* for fault.))



Operation 2: ..... Switch power off once, then switch it on again.



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 indications

	Operation Panel Indication		Name	Refer to Page
Error message	E---	E---	Faults history	102
Error message	HOLd	HOLD	Operation panel lock	93
Error message	Er1 to Er4	Er1 to 4	Parameter write error	93
Error message	Err.	Err.	Inverter reset	93
Warnings	OL	OL	Stall prevention (overcurrent)	94
Warnings	oL	oL	Stall prevention (overvoltage)	94
Warnings	rb	RB	Regenerative brake prealarm	95
Warnings	TH	TH	Electronic thermal relay function prealarm	95
Warnings	PS	PS	PU stop	94
Warnings	MT	MT	Maintenance signal output	95
Warnings	Uv	UV	Undervoltage	95
Alarm	Fn	FN	Fan fault	95
Fault	E.OC1	E.OC1	Overcurrent trip during acceleration	96
Fault	E.OC2	E.OC2	Overcurrent trip during constant speed	96
Fault	E.OC3	E.OC3	Overcurrent trip during deceleration or stop	96
Fault	E.Ov1	E.OV1	Regenerative overvoltage trip during acceleration	96
Fault	E.Ov2	E.OV2	Regenerative overvoltage trip during constant speed	97
Fault	E.Ov3	E.OV3	Regenerative overvoltage trip during deceleration or stop	97
Fault	E.THT	E.THT	Inverter overload trip (electronic thermal relay function)	97
Fault	E.THM	E.THM	Motor overload trip (electronic thermal relay function)	97
Fault	E.FIn	E.FIN	Fin overheat	98

	Operation Panel Indication		Name	Refer to Page
Fault	E.ILF	E.ILF *	Input phase loss	98
Fault	E.OLT	E.OLT	Stall prevention	98
Fault	E. bE	E. BE	Brake transistor alarm detection	98
Fault	E. GF	E.GF	Output side earth (ground) fault overcurrent at start	98
Fault	E. LF	E.LF	Output phase loss	99
Fault	E.OHT	E.OHT	External thermal relay operation	99
Fault	E.OP1	E.OP1	Communication option fault	99
Fault	E. 1	E. 1	Option fault	99
Fault	E. PE	E.PE	Parameter storage device fault	99
Fault	E.PE2	E.PE2 *	Internal board fault	100
Fault	E.PUE	E.PUE	PU disconnection	100
Fault	E.rET	E.RET	Retry count excess	100
Fault	E. 6/ E. 7/ E.CPU	E. 6/ E. 7/ E.CPU	CPU fault	100
Fault	E.IOH	E.IOH *	Inrush current limit circuit fault	100
Fault	E.AIE	E.AIE *	Analog input fault	101
Fault	E.USb	E. USB *	USB communication fault	101
Fault	E.Mb4 to E.Mb7	E.MB4 to E.MB7	Brake sequence fault	100
Fault	E. 13	E.13	Internal circuit fault	101

* If a fault occurs when using with the FR-PU04, "Fault 14" is displayed on the FR-PU04.

4.3 Causes and corrective actions

(1) Error message

A message regarding operational troubles is displayed. Output is not shutoff.

Operation panel indication	HOLD	HOLd
Name	Operation panel lock	
Description	Operation lock mode is set. Operation other than STOP RESET is made invalid. *(Refer to page 31)*	
Check point	—	
Corrective action	Press MODE for 2s to release lock.	

Operation panel indication	Er1	Er 1
Name	Write disable error	
Description	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. The PU and inverter cannot make normal communication.	
Check point	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 Pr. 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 operation status in any operation mode) is set in *Pr. 77* and the STF (STR) is on.	
Check point	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	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	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	1. After setting the operation mode to the "PU operation mode", make parameter setting. *(Refer to page 42)* 2. After setting "2" in *Pr. 77*, make parameter setting.	

Operation panel indication	Err.	Err.
Name	Inverter reset	
Description	• Executing reset using RES signal, or reset command from communication or PU • Displays at powering off.	
Corrective action	• Turn off the reset command	

(2) Warnings

When a warning occurs, the output is not shut off.

Operation panel indication	OL	OL	FR-PU04 FR-PU07	OL
Name	Stall prevention (overcurrent)			
Description	During acceleration	When the output current (output torque when *Pr. 277 Stall prevention current switchover* = "1") of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, 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 reduced below stall prevention operation level, this function increases the frequency again.		
	During constant-speed operation	When the output current (output torque when *Pr. 277 Stall prevention current switchover* = "1") of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function reduces frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has reduced below stall prevention operation level, this function increases the frequency up to the set value.		
	During deceleration	When the output current (output torque when *Pr. 277 Stall prevention current switchover* = "1") of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, 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	1. Check that the *Pr. 0 Torque boost* setting is not too large. 2. Check that the *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time* settings are not too small. 3. Check that the load is not too heavy. 4. Are there any failure in peripheral devices? 5. Check that the *Pr. 13 Starting frequency* is not too large. 6. Check that the *Pr. 22 Stall prevention operation level* is appropriate			
Corrective action	1. Increase or decrease the *Pr. 0 Torque boost* setting 1% by 1% and check the motor status. *(Refer to page 39)* 2. Set a larger value in *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time*. *(Refer to page 41)* 3. Reduce the load weight. 4. Try advanced magnetic flux vector control and general-purpose magnetic flux vector control. 5. Change the *Pr. 14 Load pattern selection* setting. 6. Set stall prevention operation current in *Pr. 22 Stall prevention operation level*. (The initial value is 150%.) The acceleration/deceleration time may change. Increase the stall prevention operation level with *Pr. 22 Stall prevention operation level*, or disable stall prevention with *Pr. 156 Stall prevention operation selection*. (Operation at OL occurrence can be selected using *Pr. 156*.)			

Operation panel indication	oL	oL	FR-PU04 FR-PU07	oL
Name	Stall prevention (overvoltage)			
Description	During deceleration	• If the regenerative energy of the motor becomes excessive to exceed the regenerative energy consumption capability, this function stops the decrease in frequency to prevent overvoltage trip. As soon as the regenerative energy has reduced, deceleration resumes. • If the regenerative energy of the motor becomes excessive when regeneration avoidance function is selected (*Pr. 882* =1), this function increases the speed to prevent overvoltage trip. *(Refer to the chapter 4 of the Instruction Manual (applied)).*		
Check point	• Check for sudden speed reduction. • Check that regeneration avoidance function *(Pr. 882, Pr. 883, Pr. 885, Pr. 886)* is used. *(Refer to the chapter 4 of the Instruction Manual (applied)).*			
Corrective action	The deceleration time may change. Increase the deceleration time using *Pr. 8 Deceleration time*.			

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

Operation panel indication	RB	rb	FR-PU04 FR-PU07	RB
Name	Regenerative brake prealarm			
Description	Appears if the regenerative brake duty reaches or exceeds 85% of the *Pr. 70 Special regenerative brake duty* value. When the setting of *Pr. 70 Special regenerative brake duty* is the initial value (*Pr. 70* = "0"), 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 *Pr. 190 to Pr. 192 (output terminal function selection)*. (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*			
Check point	1. Check that the brake resistor duty is not high. 2. Check that the *Pr. 30 Regenerative function selection* and *Pr. 70 Special regenerative brake duty* settings are correct.			
Corrective action	1. Increase the deceleration time. 2. Check that the *Pr. 30 Regenerative function selection* and *Pr. 70 Special regenerative brake duty* settings.			

Operation panel indication	TH	TH	FR-PU04 FR-PU07	TH
Name	Electronic thermal relay function prealarm			
Description	Appears if the cumulative value of the *Pr. 9 Electronic thermal O/L relay* reaches or exceeds 85% of the preset level. If it reaches 100% of the *Pr. 9 Electronic thermal O/L relay* setting, a motor overload trip (E. THM) occurs. The THP signal can be simultaneously output with the [TH] display. For the terminal used for THP signal output, assign the function by setting "8 (positive logic) or 108 (negative logic)" in any of *Pr. 190 to Pr. 192 (output terminal function selection)*. (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*			
Check point	1. Check for large load or sudden acceleration. 2. Is the *Pr. 9 Electronic thermal O/L relay* setting is appropriate? *(Refer to page 37)*			
Corrective action	1. Reduce the load and frequency of operation. 2. Set an appropriate value in *Pr. 9 Electronic thermal O/L relay*. *(Refer to page 37)*			

Operation panel indication	MT	MT	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 *Pr. 504 Maintenance timer alarm output set time* is the initial value (*Pr. 504* = "9999"), this warning does not occur.			
Check point	The *Pr. 503 Maintenance timer* setting is larger than the *Pr. 504 Maintenance timer alarm output set time* setting. (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*			
Corrective action	Setting "0" in *Pr. 503 Maintenance timer* erases the signal.			

Operation panel indication	UV	UV	FR-PU04 FR-PU07	—
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 115VAC (230VAC for 400V class), this function stops the inverter output and displays UV. An alarm is reset when the voltage returns to normal.			
Check point	Check that the power supply voltage is normal.			
Corrective action	Check the power supply system equipment such as power supply.			

(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. 192 (output terminal function selection)*. 📖 *Refer to the chapter 4 of the Instruction Manual (applied)*).

Operation panel indication	FN	FN	FR-PU04 FR-PU07	FN
Name	Fan fault			
Description	For the inverter that contains a cooling fan, FN appears on the operation panel when the cooling fan stops due to an alarm or different operation from the setting of *Pr. 244 Cooling fan operation selection*.			
Check point	Check the cooling fan for an alarm.			
Corrective action	Check for fan alarm. 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.OC 1	FR-PU04 FR-PU07	OC During Acc
Name	Overcurrent trip during acceleration			
Description	When the inverter output current reaches or exceeds approximately 230% of the rated current during acceleration, the protective circuit is activated and the inverter trips.			
Check point	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/ground fault. 4. Check that the *Pr. 3 Base frequency* setting is not 60Hz when the motor rated frequency is 50Hz. 5. Check that stall prevention operation is appropriate. 6. Check that regeneration is not performed frequently. (Check that the output voltage becomes larger than the V/F reference value at regeneration and overcurrent occurs due to the high voltage.)			
Corrective action	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/ground fault does not occur. 4. Set 50Hz in *Pr. 3 Base frequency*. *(Refer to page 38)* 5. Perform stall prevention operation appropriately. *(Refer to the chapter 4 of the Instruction Manual (applied)).* 6. Set base voltage (rated voltage of the motor, etc.) in *Pr. 19 Base frequency voltage*. *(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 230% of the rated current during constant speed operation, the protective circuit is activated and the inverter trips.			
Check point	1. Check for sudden load change. 2. Check for output short-circuit/ground fault. 3. Check that stall prevention operation is appropriate.			
Corrective action	1. Keep load stable. 2. Check the wiring to make sure that output short circuit/ground fault does not occur. 3. Perform stall prevention operation appropriately. *(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 230% of the rated inverter current during deceleration (other than acceleration or constant speed), the protective circuit is activated and the inverter trips.			
Check point	1. Check for sudden speed reduction. 2. Check for output short-circuit/ground fault. 3. Check for too fast operation of the motor's mechanical brake. 4. Check that stall prevention operation is appropriate.			
Corrective action	1. Increase the deceleration time. 2. Check the wiring to make sure that output short circuit/ground fault does not occur. 3. Check the mechanical brake operation. 4. Perform stall prevention operation appropriately. *(Refer to the chapter 4 of the Instruction Manual (applied)).*			

Operation panel indication	E.OV1	E.Ou 1	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 and the inverter trips. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	1. Check for too slow acceleration. (e.g. during downward acceleration in vertical lift load) 2. Check that the setting of *Pr. 22 Stall prevention operation level* is not too small.			
Corrective action	1. • Decrease the acceleration time. • Check that regeneration avoidance function *(Pr. 882, Pr. 883, Pr. 885, Pr. 886)* is used. *(Refer to the chapter 4 of the Instruction Manual (applied)).* 2. Set the *Pr.22 Stall prevention operation level* correctly.			

Operation panel indication	E.OV2	E.0u2	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	1. Check for sudden load change. 2. Check that the setting of *Pr. 22 Stall prevention operation level* is not too small.			
Corrective action	1. • Keep load stable. • Check that regeneration avoidance function *(Pr. 882, Pr. 883, Pr. 885, Pr. 886)* is used. *(Refer to the chapter 4 of the Instruction Manual (applied)).* • Use the brake resistor, brake unit or power regeneration common converter (FR-CV) as required. 2. Set the *Pr.22 Stall prevention operation level* correctly.			

Operation panel indication	E.OV3	E.0u3	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	• Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) • Longer the brake cycle. • Use regeneration avoidance function *(Pr. 882, Pr. 883, Pr. 885, Pr. 886). (Refer to the chapter 4 of the Instruction Manual (applied)).* • Use the brake resistor, brake unit or power regeneration common converter (FR-CV) as required.			

Operation panel indication	E.THT	E.THT	FR-PU04 FR-PU07	Inv. Overload
Name	Inverter overload trip (electronic thermal relay function)			
Description	If the temperature of the output transistor element exceeds the protection level under the condition that a current not less than the rated inverter current flows and overcurrent trip does not occur (230% or less), the electronic thermal relay activates to stop the inverter output. (Overload capacity 150% 60s, 200% 3s)			
Check point	1. Check the motor for use under overload. 2. Check for too high ambient temperature.			
Corrective action	1. Reduce the load weight. 2. Set the ambient temperature to within the specifications.			

Operation panel indication	E.THM	E.THM	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 integrated value reaches 85% of the *Pr. 9 Electronic thermal O/L relay* setting and the protection circuit is activated to stop the inverter output when the integrated value reaches the specified value. When running a special motor such as a multi-pole motor or multiple motors, provide a thermal relay on the inverter output side since such motor(s) cannot be protected by the electronic thermal relay function.			
Check point	1. Check the motor for use under overload. 2. Check that the setting of *Pr. 71 Applied motor* for motor selection is correct.*(Refer to the chapter 4 of the Instruction Manual (applied)).* 3. Check that stall prevention operation setting is correct.			
Corrective action	1. Reduce the load weight. 2. For a constant-torque motor, set the constant-torque motor in *Pr. 71 Applied motor*. 3. 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		FR-PU04 FR-PU07	H/Sink O/Temp
Name	Fin overheat			
Description	If the heatsink overheats, the temperature sensor is actuated and the inverter trips. 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. 192 (output terminal function selection).* (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*			
Check point	1. Check for too high ambient temperature. 2. Check for heatsink clogging. 3. Check that the cooling fan is not stopped (Check that  is not displayed on the operation panel).			
Corrective action	1. Set the ambient temperature to within the specifications. 2. Clean the heatsink. 3. Replace the cooling fan.			

Operation panel indication	E.ILF		FR-PU04 FR-PU07	Fault 14 Input phase loss
Name	Input phase loss			
Description	This fault is output when function valid setting (=1) is set in *Pr. 872 Input phase loss protection selection* and one phase of the three phase power input is lost. (📖 *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	• Wire the cables properly. • Repair a brake portion in the cable. • Check the *Pr. 872 Input phase loss protection selection* setting.			

Operation panel indication	E.OLT		FR-PU04 FR-PU07	Stll Prev STP (OL shown during stall prevention operation)
Name	Stall prevention			
Description	If the output frequency has fallen to 1Hz 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	• Check the motor for use under overload. (📖 *Refer to the chapter 4 of the Instruction Manual (applied)).*			
Corrective action	• Reduce the load weight. Check the *Pr. 22 Stall prevention operation level* setting.			

Operation panel indication	E.BE		FR-PU04 FR-PU07	Br. Cct. Fault
Name	Brake transistor alarm detection			
Description	When a brake transistor alarm has occurred due to the large regenerative energy from the motor etc., the brake transistor alarm is detected and the inverter trips. In this case, the inverter must be powered off immediately.			
Check point	• Reduce the load inertia. • Check that the frequency of using the brake is proper.			
Corrective action	Replace the inverter.			

Operation panel indication	E.GF		FR-PU04 FR-PU07	Ground Fault
Name	Output side earth (ground) fault overcurrent at start			
Description	The inverter trips if an earth (ground) fault overcurrent flows at start due to an earth (ground) fault that occurred on the inverter's output side (load side). Whether this protective function is used or not is set with *Pr. 249 Earth (ground) fault detection at start* . When the setting of *Pr. 249 Earth (ground) fault detection at start* is the initial value *(Pr. 249 ="0")*, this warning does not occur.			
Check point	Check for a ground fault in the motor and connection cable.			
Corrective action	Remedy the ground fault portion.			

Operation panel indication	E.LF	E. LF	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. Whether the protective function is used or not is set with *Pr. 251 Output phase loss protection selection*.			
Check point	• 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	• Wire the cables properly. • Check the *Pr. 251 Output phase loss protection selection* settting.			

Operation panel indication	E.OHT	E.OHT	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 to any of *Pr. 178 to Pr. 184 (input terminal function selection)*. This protective function does not function in the initial status (OH signal is not assigned).			
Check point	• Check for motor overheating. • Check that the value of 7 (OH signal) is set correctly in any of *Pr. 178 to Pr. 184 (input terminal function selection)*.			
Corrective action	• Reduce the load and frequency of operation. • Even if the relay contacts are reset automatically, the inverter will not restart unless it is reset.			

Operation panel indication	E.OP1	E.OP 1	FR-PU04 FR-PU07	Option slot alarm 1
Name	Communication option fault			
Description	Stops the inverter output when a communication line fault occurs in the communication option.			
Check point	1. Check for a wrong option function setting and operation. 2. Check that the plug-in option unit is plugged into the connector securely. 3. Check for a break in the communication cable. 4. Check that the terminating resistor is fitted properly.			
Corrective action	1. Check the option function setting, etc. 2. Connect the plug-in option securely. 3. Check the connection of communication cable. 4. Connect the terminating resistor correctly.			

Operation panel indication	E. 1	E. 1	FR-PU04 FR-PU07	Fault 1
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. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	1. Check that the plug-in option unit is plugged into the connector securely. 2. Check for excess electrical noises around the inverter. 3. Check the switch position for the manufacturer setting of the plug-in option.			
Corrective action	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. 3. Return the switch position for the manufacturer setting of the plug-in option to the initial status. (*Refer to the instruction manual of each option*)			

Operation panel indication	E.PE	E. PE	FR-PU04 FR-PU07	Corrupt Memry
Name	Parameter storage device fault (control circuit board)			
Description	Appears when a fault occurred in the stored parameters. (EEPROM fault)			
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 *Pr. 342* 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	Internal board fault			
Description	When a combination of control board and main circuit board is wrong, the inverter is tripped.			
Check point	—			
Corrective action	Please contact your sales representative. (For parts replacement, consult the nearest Mitsubishi FA Center.)			

Operation panel indication	E.PUE	E.PUE	FR-PU04 FR-PU07	PU Leave Out
Name	PU disconnection			
Description	• This function stops the inverter output if communication between the inverter and PU is suspended, e.g. the parameter unit is disconnected, when "2", "3", "16" or "17" was set in *Pr. 75 Reset selection/disconnected PU detection/ PU stop selection*. • 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 *Pr. 121 Number of PU communication retries* during the RS-485 communication with the PU connector (use *Pr. 502 Stop mode selection at communication error* to change). • This function also stops the inverter output if communication is broken within the period of time set in *Pr. 122 PU communication check time interval* during the RS-485 communication with the PU connector.			
Check point	• Check that the parameter unit (FR-PU04/FR-PU07) is fitted tightly. • Check the *Pr. 75* setting.			
Corrective action	Connect the parameter unit (FR-PU04/FR-PU07) securely.			

Operation panel indication	E.RET	E.rET	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 *Pr. 67 Number of retries at fault occurrence* is set. When the initial value (*Pr. 67* = "0") is set, this protective function does not function.			
Check point	Find the cause of fault occurrence.			
Corrective action	Eliminate the cause of the error preceding this error indication.			

Operation panel indication	E. 6	E. 6	FR-PU04 FR-PU07	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 fault of the built-in CPU occurs.			
Check point	Check for devices producing excess electrical noises around the inverter.			
Corrective action	• Take measures against noises if there are devices producing excess electrical noises around the inverter. • Please contact your sales representative.			

Operation panel indication	E.MB4 to 7	E.MB4 to E.MB7	FR-PU04 FR-PU07	E.MB4 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. 283)* . This protective function does not function in the initial status. *(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.IOH	E.IOH	FR-PU04 FR-PU07	Fault 14 Inrush overheat
Name	Inrush current limit circuit fault			
Description	This function is activated when the resistor of the inrush current limit circuit overheats. The inrush current limit circuit fault			
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.AIE	E.AI E	FR-PU04	Fault 14
			FR-PU07	Analog in error
Name	Analog input fault			
Description	Appears when 30mA or more is input or a voltage (7.5V or more) is input with the terminal 4 set to current input.			
Check point	Check the setting of *Pr. 267 Terminal 4 input selection* and voltage/current input switch. *(Refer to the chapter 4 of the Instruction Manual (applied)).*			
Corrective action	Either give a frequency command by current input or set *Pr. 267 Terminal 4 input selection*, and voltage/current input switch 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 communication has broken during the time set in *Pr. 548 USB communication check time interval*, this function stops the inverter output.			
Check point	• Check the USB communication cable.			
Corrective action	• Check the *Pr. 548 USB communication check time interval* setting. • Check the USB communication cable. • Increase the *Pr. 548 USB communication check time interval* setting. Or, change the setting to 9999. *(Refer to the chapter 4 of the Instruction Manual (applied)).*			

Operation panel indication	E.13	E. 13	FR-PU04 FR-PU07	Fault 13
Name	Internal circuit fault			
Description	Appears when an internal circuit fault occurred.			
Corrective action	Please contact your sales representative.			

NOTE

- **If protective functions of E.ILF, E.AIE, E.USB, E.IOH, E.PE2 are activated when using the FR-PU04, "Fault 14" is displayed.**
  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:

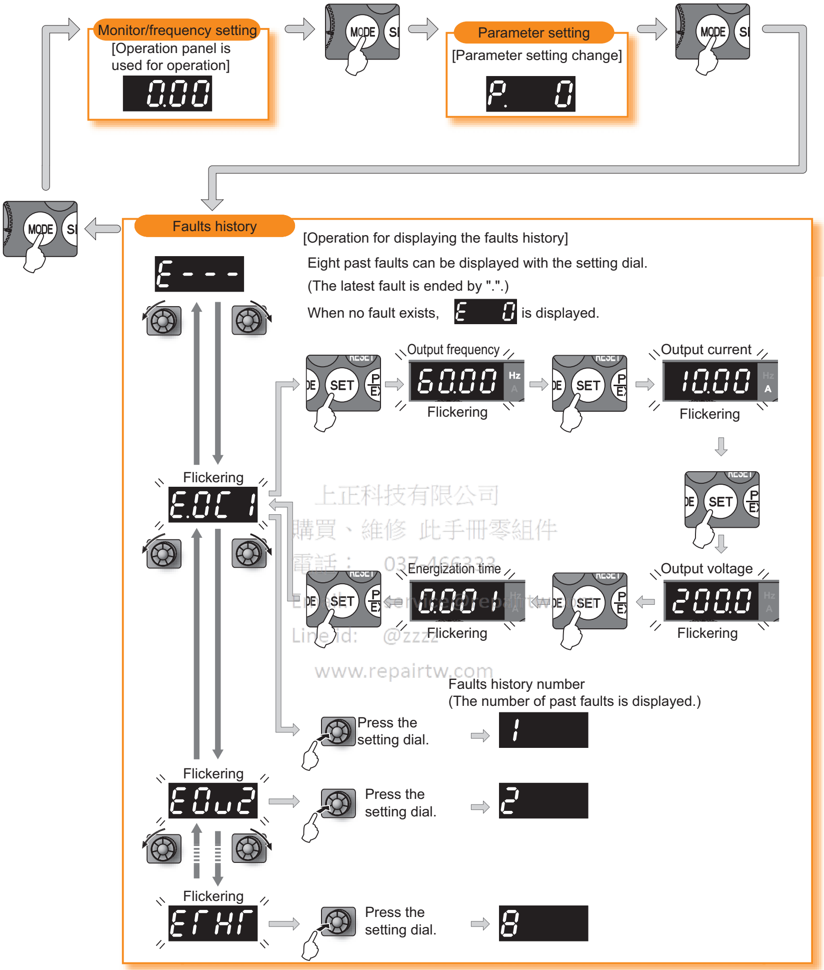
Actual	Digital
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

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



(2) Clearing procedure

POINT

- Set "1" in *Er.CL Fault history clear* to clear the faults history.

Operation		Display
1. Screen at powering on The monitor display appears.		
2. Press MODE to choose the parameter setting mode.		PRM indication is lit. 
	MODE	⇨ (The parameter number read previously appears.)
3. Turn until Er.CL (faults history clear) appears.		⇨ Er.CL
4. Press SET to read the currently set value. "0" (initial value) appears.	SET	⇨ 0
5. Turn to change it to the set value " 1".		⇨ 1
6. Press SET to set.	SET	⇨ 1 Er.CL Flicker...Faults history clear complete!!

- Turn 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 some troubles

POINT

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

4.6.1 Motor will not start

- 1) Check the *Pr. 0 Torque boost* setting if V/F control is exercised. *(Refer to page 39)*
- 2) 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.
- 3) Check the input signals
  - Check that the 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, RUN LED of the operation panel flickers.)
  - Check that the AU signal is on when terminal 4 is used for frequency setting.
  - Check that the output stop signal (MRS) or reset signal (RES) is not on.
  - Check that the sink or source jumper connector is fitted securely. *(Refer to page 16)*
- 4) Check the parameter settings
  - Check that *Pr. 78 Reverse rotation prevention selection* is not set.
  - Check that the *Pr. 79 Operation mode selection* setting is correct.
  - Check that *Pr. 146 Built-in potentiometer switching* setting is "1", when not using the built-in frequency setting potentiometer of the operation panel (PA02) for the FR-E500 series.
  - Check that the bias and gain *(calibration parameter C2 to C7)* settings are correct.
  - Check that the starting frequency *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 maximum frequency *Pr. 1 Maximum frequency* is not zero.
  - Check that the *Pr. 15 Jog frequency* setting is not lower than the *Pr. 13 Starting frequency* value.
  - Check that the operation location by *Pr. 550* and *Pr. 551* is appropriate. (Example: write from the operation panel is disabled when USB is connected)

    (Refer to the chapter 4 of the Instruction Manual (applied)).
- 5) Inspection of load
  - Check that the load is not too heavy.
  - Check that the shaft is not locked.
- 6) Others
  - Check that the operation panel display does not show a fault (e.g. E.OC1).

4.6.2 Motor generates abnormal noise

- No carrier frequency noises (metallic noises) are generated.
  - Soft-PWM control to change the motor tone into an unoffending complex tone is factory-set to valid by *Pr. 72 PWM frequency selection*.

    Adjust *Pr. 72 PWM frequency selection* to change the motor tone.
- Check for any mechanical looseness.
- Contact the motor manufacturer.

4.6.3 Motor generates heat abnormally

- Is the fan for the motor is running? (Check for dust accumulated.)
- Check that the load is not too heavy. Lighten the load.
- Are the inverter output voltages (U, V, W) balanced?
- Check that the *Pr. 0 Torque boost* setting is correct.
- Was the motor type set? Check the setting of *Pr. 71 Applied motor*.
- When using any other manufacturer's motor, perform offline auto tuning. *(Refer to page 46.)*

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 56)*
- Check that the *Pr. 40 RUN key rotation direction selection* setting is correct. *(Refer to the chapter 4 of the Instruction Manual (applied)).*

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, Pr. 19, Pr. 245, calibration parameter Pr. 125, Pr. 126, 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.
- Check that the torque boost *(Pr. 0, Pr. 46)* setting is not too large to activate the stall function under V/F control.

4.6.7 Motor current is large

- Check that the load is not too heavy.
- Check that the *Pr. 0 Torque boost* setting is correct.
- Check that the *Pr. 3 Base frequency* setting is correct.
- Check that the *Pr. 19 Base frequency voltage* setting is correct
- Check that the *Pr. 14 Load pattern selection* setting is correct.

4.6.8 Speed does not increase

- Check that the *Pr. 1 Maximum frequency* setting is correct. (If you want to run the motor at 120Hz or more, set *Pr. 18 High speed maximum frequency*. *(Refer to the chapter 4 of the Instruction Manual (applied)).*
- Check that the load is not too heavy. (In agitators, etc., load may become heavier in winter.)
- Check that the torque boost *(Pr. 0, Pr. 46)* setting is not too large to activate the stall function under V/F control.
- Check that the brake resistor is not connected to terminals P/+-P1 or P1-PR accidentally.

4.6.9 Speed varies during operation

When slip compensation is set under general-purpose magnetic flux vector control, or advanced magnetic flux vector 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. Set 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 17)*

3) Others
- Check that the value of *Pr. 80 Motor capacity* and *Pr. 81 Number of motor poles* are correct to the inverter capacity and motor capacity under advanced magnetic flux vector control and general-purpose magnetic flux vector control.
- Check that the wiring length is not exceeding 30m when advanced magnetic flux vector control or general-purpose magnetic flux vector control is exercised. Perform offline auto tuning. *(Refer to the chapter 4 of the*
- Check that the wiring length is not too long for V/F control.
- Change the *Pr. 19 Base frequency voltage* setting (about 3%) under V/F control.

4.6.10 Operation mode is not changed properly

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

1) External input signal
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 PU/EXT on the operation panel (press PU when the parameter unit (FR-PU04/FR-PU07) is used) to switch to the PU operation mode. For 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. (Example: write from the operation panel is disabled when USB is connected)

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

4.6.11 Operation panel display is not operating

- Check that wiring is securely performed and installation is correct.
- Make sure that the connector is fitted securely across terminals P-P1.

4.6.12 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. (Example: write from the operation panel is disabled when USB is connected)

  (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 items

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) Abnormal vibration, abnormal noise
(5) Abnormal overheat, 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. Check and tighten them.
Tighten them according to the specified tightening torque *(Refer to page 10, 18)*.
(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: Daily	Interval: Periodic *2	Corrective Action at Alarm Occurrence	Customer's Check
General	Surrounding environment	Check the ambient temperature, humidity, dirt, corrosive gas, oil mist, etc.	○		Improve environment	
General	Overall unit	Check for unusual vibration and noise.	○		Check alarm location and retighten	
General	Power supply voltage	Check that the main circuit 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	
Main circuit	Conductors, cables	(1) Check conductors for distortion. (2) Check cable sheaths for breakage and deterioration (crack, discoloration, etc.)		○ ○	Contact the manufacturer Contact the manufacturer	
Main circuit	Terminal block	Check for damage.		○	Stop the device and contact the manufacturer.	
Main circuit	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 110)*		○ ○ ○	Contact the manufacturer Contact the manufacturer	
Main circuit	Relay	Check that the operation is normal and no chatter is heard.		○	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	
Control circuit, Protective circuit	Parts check: Overall	(1) Check for unusual odor and discoloration. (2) Check for serious rust development		○ ○	Stop the device and contact the manufacturer. Contact the manufacturer	
Control circuit, Protective circuit	Parts check: Aluminum electrolytic capacitor	(1) Check for liquid leakage in a capacitor and deformation trance (2) Visual check and judge by the life check of the main circuit capacitor *(Refer to page 109)*		○ ○	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	
Cooling system	Heatsink	(1) Check for clogging (2) Check for stain		○ ○	Clean Clean	
Display	Indication	(1) Check that display is normal. (2) Check for stain	○	 ○	Contact the manufacturer Clean	
Display	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 and each parts of the inrush current limit circuit is near to give an indication of replacement time.

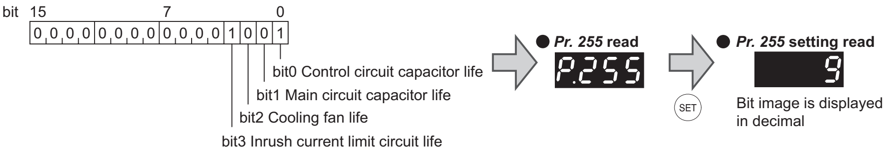
The life alarm output can be used as a guideline for life judgement.

Parts	Judgement Level
Main circuit capacitor	85% of the initial capacity
Control circuit capacitor	Estimated remaining life 10%
Inrush current limit circuit	Estimated remaining life 10% (Power on: 100,000 times left)
Cooling fan	Less than 50% 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.

(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 page 110)*

(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"). Therefore, do not measure in such case. In addition, even when "measurement completion" (*Pr. 259* = "3") is confirmed under the following conditions, normal measurement can not be done.

(a)FR-HC, FR-CV, or FR-BU2 is connected.
(b)DC power supply is connected to terminal P/+ and N/-.
(c)Switch power on during measuring.
(d)The motor is not connected to the inverter.
(e)The motor is running (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.
(j)The parameter unit (FR-PU04/FR-PU07) is connected.
(k)Using terminal PC as power supply.
(l)I/O terminal of the control terminal block and plug-in option is on (continuity).
(m)Plug-in option is fitted. (Only for the 0.75K or less)

- Turning the power on during measuring before LED of the operation panel turns off, it may remain in “measuring” (*Pr. 259* = ”2”) status.In such case, carry out operation from step 2.

POINT

For the accurate life measuring of the main circuit capacitor, perform after more than 3 hrs 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.

NOTE

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 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 ambient temperature is 40°C (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)
∗2 Output current: equivalent to rating current of the Mitsubishi standard motor (4 poles)

NOTE

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 ambient temperature. When unusual noise and/or vibration is noticed during inspection, the cooling fan must be replaced immediately.

NOTE

For parts replacement, consult the nearest Mitsubishi FA Center.

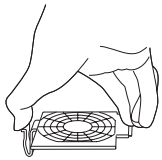
Inverter Capacity	Fan Type	Units
1.5K to 3.7K	MMF-06F24ES-RP1 BKO-CA1638H01	1
5.5K, 7.5K	MMF-06F24ES-RP1 BKO-CA1638H01	2
11K, 15K	MMF-08D24ES-RP1 BKO-CA1639H01	2

The 0.75K or less are not provided with a cooling fan.

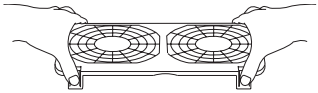
●**Removal**

1) Push the hooks from above and remove the fan cover.

3.7K or less

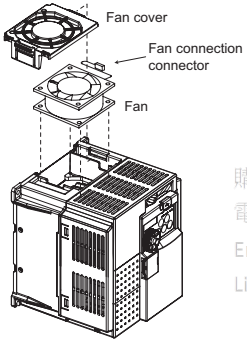


5.5K or more



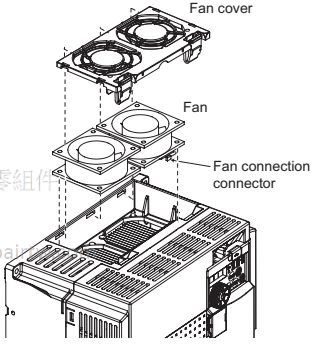
2) Disconnect the fan connectors.
3) Remove the fan.

3.7K or less



Example for FR-E740-3.7K

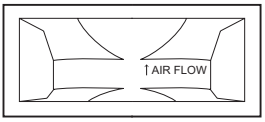
5.5K or more



Example for FR-E740-5.5K

●Reinstallation

1) After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.

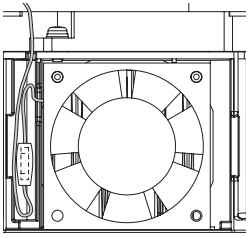


<Fan side face>

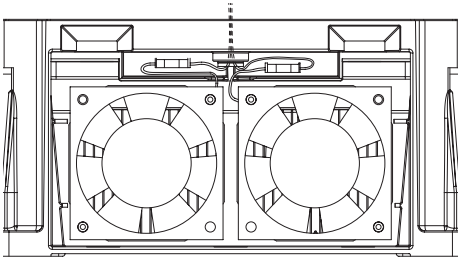
2) Reconnect the fan connectors.

3) When wiring, use care to avoid the cables being caught by the fan.

3.7K or less

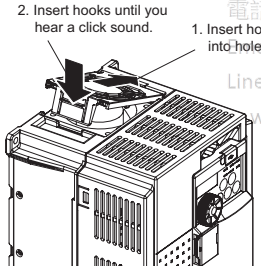


5.5K or more



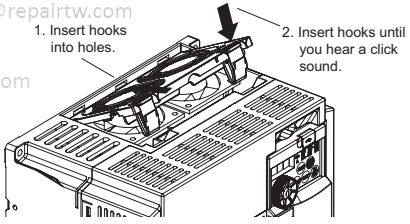
4) Reinstall the fan cover.

3.7K or less



Example for FR-E740-3.7K

5.5K or more



Example for FR-E740-5.5K

NOTE

- **Installing the fan in the opposite air flow direction can cause the inverter life to be shorter.**
- **Prevent the cable from being caught when installing a fan.**
- **Switch the power off before replacing fans. Since the inverter circuits are charged with voltage even after power off, replace fans only when the inverter cover is on the inverter to prevent an electric shock accident.**

(2) 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 ambient temperature and operating conditions. When the inverter is operated in air-conditioned, normal environment conditions, replace the capacitors about every 10 years.

When a certain period of time has elapsed, the capacitors will deteriorate more rapidly. Check the capacitors at least every year (less than six months if the life will be expired soon).

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, liquid leakage, etc. Judge that the capacitor has reached its life when the measured capacitance of the capacitor reduced below 80% of the rating.

POINT

Refer to page 110 to perform the life check of the main circuit capacitor.

(3) Relays

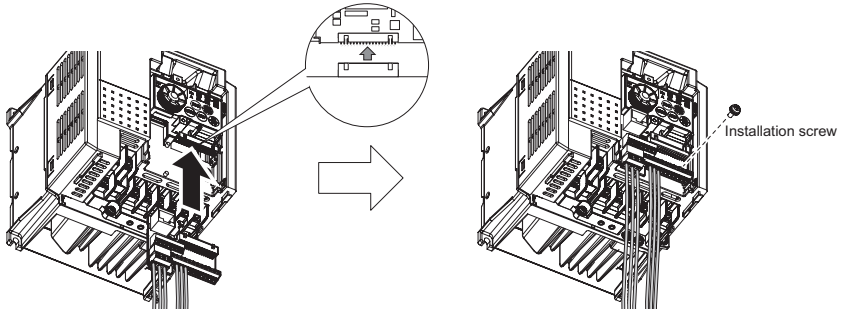
To prevent a contact fault, etc., relays must be replaced according to the cumulative number of switching times (switching life).

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) Remove the installation screw of the control circuit terminal block.
Pull the control circuit terminal downward.

(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 installation screw.



NOTE

- **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 Rating

● Three-phase 200V power supply

Type FR-E720-□K(-C) *8		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Applicable motor capacity (kW) *1		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Output	Rated capacity (kVA) *2	0.3	0.6	1.2	2.0	3.2	4.4	7.0	9.5	13.1	18.7	23.9
Output	Rated current (A) *6	0.8 (0.8)	1.5 (1.4)	3 (2.5)	5 (4.1)	8 (7)	11 (10)	17.5 (16.5)	24 (23)	33 (31)	47 (44)	60 (57)
Output	Overload current rating *3	150% 60s, 200% 3s (inverse time characteristics)										
Output	Voltage *4	Three-phase 200 to 240V										
Power supply	Rated input AC (DC) voltage/frequency	Three-phase 200 to 240V 50Hz/60Hz (283 to 339VDC *7)										
Power supply	Permissible AC (DC) voltage fluctuation	170 to 264V 50Hz/60Hz (240 to 373VDC *7)										
Power supply	Permissible frequency fluctuation	±5%										
Power supply	Power supply capacity (kVA) *5	0.4	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28
Protective structure (JEM1030)		Enclosed type (IP20). IP40 for totally enclosed structure series.										
Cooling system		Self-cooling				Forced air cooling						
Approximate mass (kg)		0.5	0.5	0.7	1.0	1.4	1.4	1.7	4.3	4.3	9.0	9.0

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 230V.

*3 The % value of the overload current rating indicated is 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 Setting 2kHz or more in *Pr. 72 PWM frequency selection* to perform low acoustic noise operation in the ambient temperature exceeding 40°C (totally-enclosed structure is 30°C), the rated output current is the value in parenthesis.

*7
- Connect DC power supply to terminal P/+ and N/-. Connect the plus side of the power supply to terminal P/+ and minus side to terminal N/-.
- Since the voltage between P/+ and N/- may increase due to the regeneration energy from the motor and exceeds 415V temporarily, select the DC power supply which can withstand the voltage/energy during regeneration. If using the power supply which can not withstand voltage/energy during regeneration, insert diodes in series for reverse current prevention.
- Although the FR-E700 series has the built-in inrush current limit circuit, select the DC power supply considering the inrush current at powering on as the inrush current four times of the rated inverter flows at powering on.
- Since the power supply capacity depends on the output impedance of the power, select the power supply capacity which has enough allowance according to the AC power supply system capacity.

*8 Totally enclosed structure series ends with -C.

● Three-phase 400V power supply

Model FR-E740-□K(-C)*7		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Applicable motor capacity (kW)*1		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Output	Rated capacity (kVA)*2	1.2	2.0	3.0	4.6	7.2	9.1	13.0	17.5	23.0
	Rated current (A)*6	1.6 (1.4)	2.6 (2.2)	4.0 (3.8)	6.0 (5.4)	9.5 (8.7)	12	17	23	30
	Overload current rating*3	150% 60s, 200% 3s (inverse-time characteristics)								
	Voltage*4	Three phase 380 to 480V								
Power supply	Rated input voltage/frequency	Three-phase 380 to 480V 50Hz/60Hz								
	Permissible AC voltage fluctuation	325 to 528V 50Hz/60Hz								
	Permissible frequency fluctuation	±5%								
	Power supply capacity (kVA)*5	1.5	2.5	4.5	5.5	9.5	12	17	20	28
Protective structure (JEM1030)		Enclosed type (IP20). IP40 for totally enclosed structure series.								
Cooling system		Self-cooling		Forced air cooling						
Approximate mass (kg)		1.4	1.4	1.9	1.9	1.9	3.2	3.2	5.9	5.9

*1 The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2 The rated output capacity indicated assumes that the output voltage is 440V.

*3 The % value of the overload current rating indicated is 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 Setting 2kHz or more in *Pr. 72 PWM frequency selection* to perform low acoustic noise operation with the ambient temperature exceeding 40°C (totally-enclosed structure is 30°C), the rated output current is the value in parenthesis.

*7 Totally enclosed structure series ends with -C.

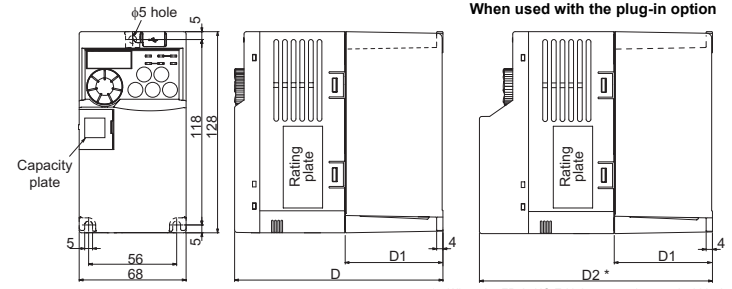
6.2 Common specifications

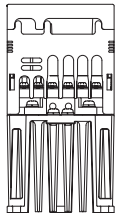
Control specifications	Control method		Soft-PWM control/high carrier frequency PWM control (V/F control, advanced magnetic flux vector control, general-purpose magnetic flux vector control, optimum excitation control can be selected)
	Output frequency range		0.2 to 400Hz
	Frequency setting resolution	Analog input	0.06Hz/60Hz (terminal2, 4: 0 to 10V/10bit) 0.12Hz/60Hz (terminal2, 4: 0 to 5V/9bit) 0.06Hz/60Hz (terminal4: 4 to 20mA/10bit)
		Digital input	0.01Hz
	Frequency accuracy	Analog input	Within ±0.5% of the max. output frequency (25°C ±10°C)
		Digital input	Within 0.01% of the set output frequency
	Voltage/frequency characteristics		Base frequency can be set from 0 to 400Hz Constant torque/variable torque pattern can be selected
	Starting torque		200% or more (at 0.5Hz)...when advanced magnetic flux vector control is set (3.7K or less)
	Torque boost		Manual torque boost
	Acceleration/deceleration time setting		0.01 to 360s, 0.1 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode 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 200% adjustable), whether to use the function or not can be selected
Operation specifications	Frequency setting signal	Analog input	Two points Terminal 2: 0 to 10V, 0 to 5V can be selected Terminal 4: 0 to 10V, 0 to 5V, 4 to 20mA can be selected
		Digital input	Entered from operation panel and parameter unit
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signal		Seven points You can select from among multi-speed selection, remote setting, stop-on contact selection, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, brake opening completion signal, external thermal input, PU-external operation switchover, V/F switchover, output stop, start self-holding selection, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, and PU operation external interlock
	Operational functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, multi-speed operation, stop-on contact control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS-485)
	Output signal	Output signal points / Open collector output	Two points
		Output signal points / Relay output	One point
		Operating status	You can select from among inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, brake opening request, fan alarm*2, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, during retry, life alarm, current average value monitor, remote output, alarm output, fault output, fault output 3, and maintenance timer alarm
		For meter Output points / Pulse output	MAX 2.4kHz: one point
		For meter	You can select from among output frequency, motor current (steady), output voltage, frequency setting, motor torque, converter output voltage, regenerative brake duty, electronic thermal relay function load factor, output current peak value, converter output voltage peak value, reference voltage output, motor load factor, PID set point, PID measured value, output power Pulse train output (1440 pulses/s/full scale)
Indication	Operation panel Parameter unit (FR-PU07)	Operating status	You can select from among output frequency, motor current (steady), output voltage, frequency setting, cumulative energization time, actual operation time, motor torque, converter output voltage, regenerative brake duty, electronic thermal relay function load factor, output current peak value, converter output voltage peak value, motor load factor, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, I/O terminal option monitor, output power, cumulative power, motor thermal load factor, and inverter thermal load factor.
		Fault definition	Fault definition is displayed when the fault occurs and the past 8 fault definitions (output voltage/current/frequency/cumulative energization time right before the fault occurs) are stored
	Additional display by the parameter unit (FR-PU04/FR-PU07) only	Operating status	Not used
		Fault definition	Output voltage/current/frequency/cumulative energization time immediately before the fault occurs
		Interactive guidance	Function (help) for operation guide
Protective/warning function			<Protective functions> 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, input phase failure, output side earth (ground) fault overcurrent at start*4, output phase failure, external thermal relay operation *4, option fault, parameter error, internal board fault, PU disconnection, retry count excess *4, CPU fault, brake transistor alarm, inrush resistance overheat, communication error, analog input error, USB communication error, brake sequence error 4 to 7 *4 <Warning functions> Fan alarm*2, overcurrent stall prevention, overvoltage stall prevention, PU stop, parameter write error, regenerative brake prealarm *4, electronic thermal relay function prealarm, maintenance output *4, undervoltage
Environment	Ambient temperature		-10°C to +50°C (non-freezing) (-10°C to +40°C for totally-enclosed structure feature) *3
	Ambient humidity		90%RH maximum (non-condensing)
	Storage temperature*1		-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

*1 Temperatures applicable for a short time, e.g. in transit.
*2 As the 0.75K or less is not provided with the cooling fan, this alarm does not function.
*3 When using the inverters at the ambient temperature of 40°C or less, the inverters can be installed closely attached (0cm clearance).
*4 This protective function does not function in the initial status.

6.3 Outline dimension drawings

●FR-E720-0.1K, 0.2K, 0.4K, 0.75K

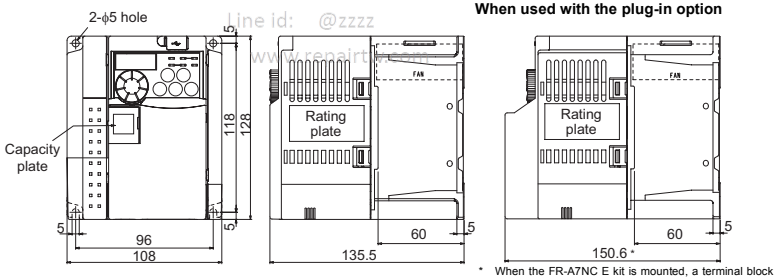


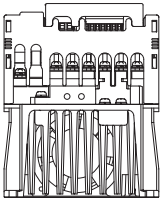


Inverter Type	D	D1	D2
FR-E720-0.1K, 0.2K	80.5	10	95.6
FR-E720-0.4K	112.5	42	127.6
FR-E720-0.75K	132.5	62	147.6

(Unit: mm)

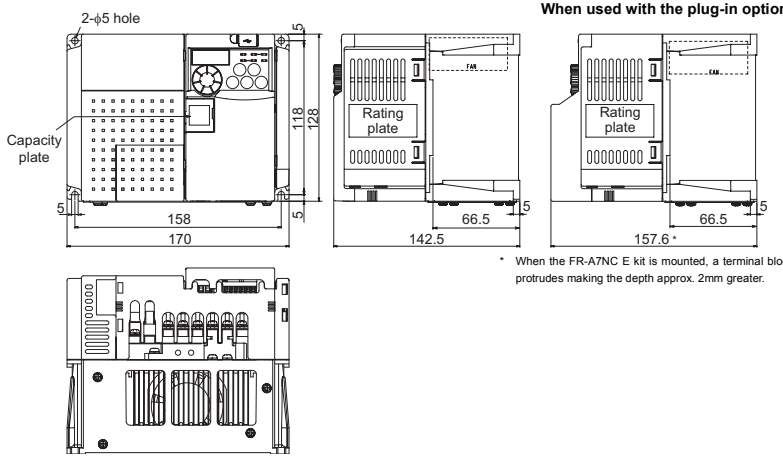
●FR-E720-1.5K, 2.2K





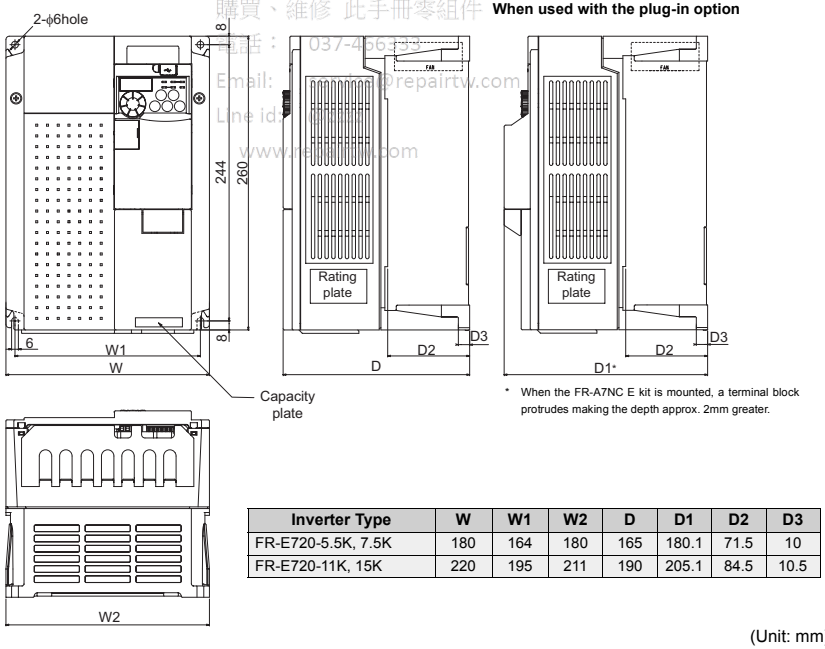
(Unit: mm)

●FR-E720-3.7K



(Unit: mm)

●FR-E720-5.5K to 15K

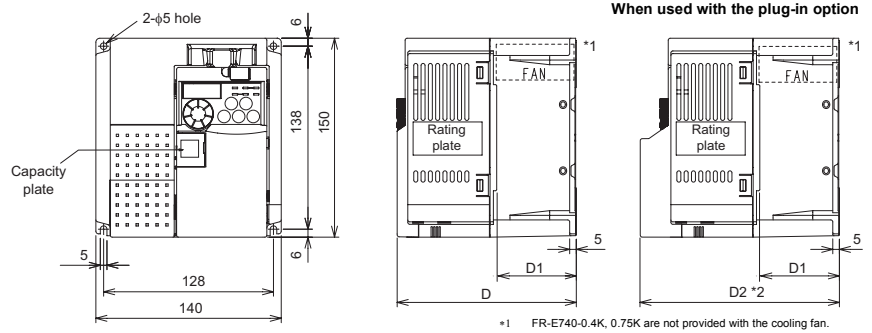


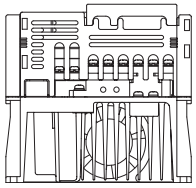
Inverter Type	W	W1	W2	D	D1	D2	D3
FR-E720-5.5K, 7.5K	180	164	180	165	180.1	71.5	10
FR-E720-11K, 15K	220	195	211	190	205.1	84.5	10.5

(Unit: mm)

Outline dimension drawings

●FR-E740-0.4K to 3.7K



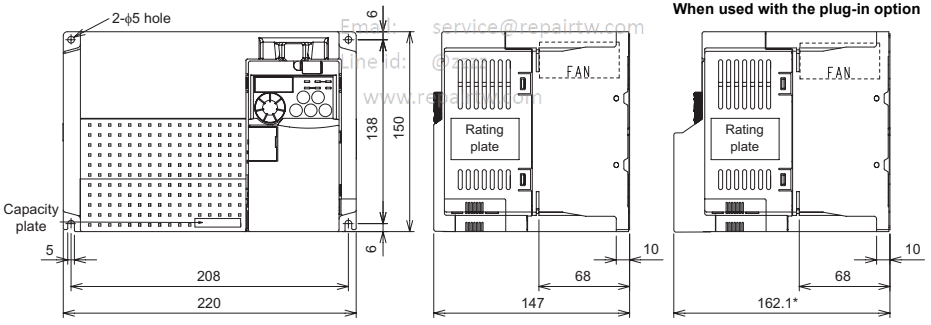


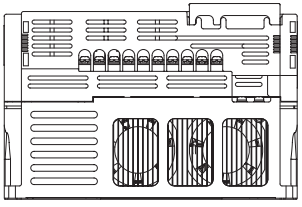
*1 FR-E740-0.4K, 0.75K are not provided with the cooling fan.
*2 When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2mm greater.

Inverter Type	D	D1	D2
FR-E740-0.4K, 0.75K	114	39	129.1
FR-E740-1.5K to 3.7K	135	60	150.1

(Unit: mm)

●FR-E740-5.5K, 7.5K

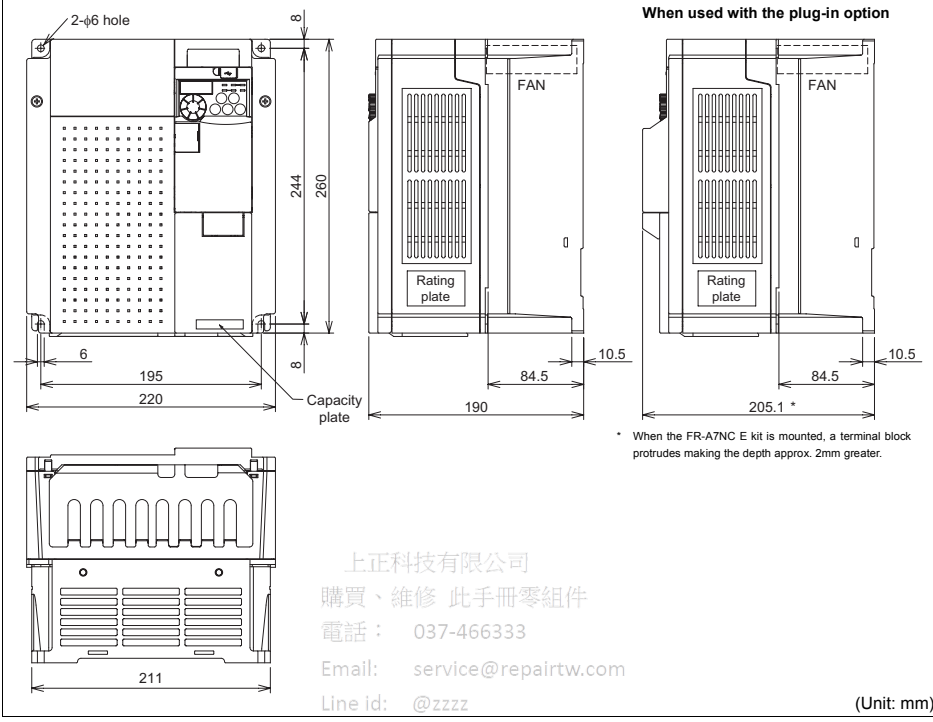




* When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2mm greater.

(Unit: mm)

●FR-E740-11K, 15K

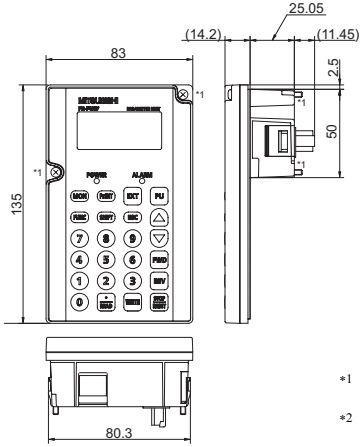


* When the FR-A7NC E kit is mounted, a terminal block protrudes making the depth approx. 2mm greater.

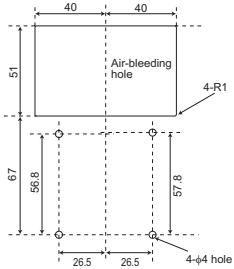
(Unit: mm)

●Parameter unit (option) (FR-PU07)

<Outline drawing>



<Panel cut dimension drawing>



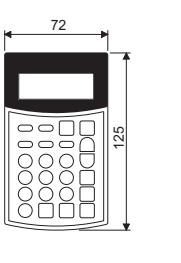
*1 When installing the FR-PU07 on the enclosure, etc., remove screws or fix the screws to the FR-PU07 with M3 nuts.

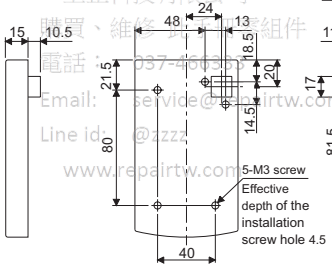
*2 Select the installation screw whose length will not exceed the effective depth of the installation screw hole.

(Unit: mm)

●Parameter unit (option) (FR-PU04)

<Outline drawing>





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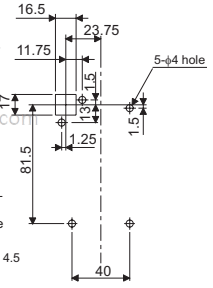
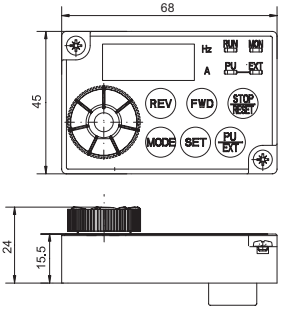


Select the installation screws whose length will not exceed the effective depth of the installation screw hole.

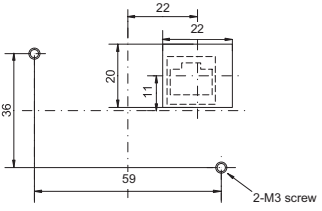
(Unit: mm)

●Enclosure surface operation panel (option) (FR-PA07)

<Outline drawing>



<Panel cut dimension drawing>



(Unit: mm)

APPENDIX

Appendix1 For customers who have replaced the conventional model with this inverter

Appendix 1-1 Replacement of the FR-E500 series

(1) Instructions for installation

1) Removal procedure of the front cover was changed. *(Refer to page 4)*
2) The operation panel cannot be removed from the inverter.
3) Plug-in options of the FR-E500 series are not compatible.
4) Setup software (FR-SW0-SETUP, FR-SW1-SETUP, FR-SW2-SETUP) can not be used.

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

1) For the FR-E700 series, many functions (parameters) have been added. User initial value list and user clear of the HELP function can not be used.
2) For the FR-E700 series, 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.

(3) Parameter resetting

It is easy if you use setup software (FR Configurator FR-SW3-SETUP).

(4) Main differences and compatibilities with the FR-E500 Series

Item	FR-E500	FR-E700
Control method	V/F control General-purpose magnetic flux vector control	V/F control General-purpose magnetic flux vector control Advanced magnetic flux vector control Optimum excitation control
Changed/cleared functions	Torque boost *(Pr. 0)* initial value FR-E520-1.5K to 7.5K: 6% FR-E540-1.5K to 3.7K: 6% FR-E540-5.5K, 7.5K: 4%	FR-E720-1.5K to 3.7K: 4% FR-E720-5.5K, 7.5K: 3% FR-E740-1.5K to 3.7K: 4% FR-E740-5.5K, 7.5K: 3%
	DC injection brake operation voltage *(Pr. 12)* initial value 0.4K to 7.5K: 6%	0.4K to 7.5K: 4%
	Frequency at 5V (10V) input (*Pr. 38*) Frequency at 20mA input frequency (*Pr. 39*) Second electronic thermal O/L relay (*Pr. 48*) Shortest acceleration/deceleration mode (*Pr. 60*)	Parameter number change *(Pr. 125 Terminal 2 frequency setting gain frequency)* *(Pr. 126 Terminal 4 frequency setting gain frequency*) *(Pr. 51 Second electronic thermal O/L relay)* *(Pr. 60 Energy saving control selection)* *(Pr. 292 Automatic acceleration/deceleration)*
	Reverse rotation from the inverter operation panel Press REV .	After setting "1" in *Pr. 40 RUN key rotation direction selection* , press RUN .
	FM terminal function selection (*Pr. 54*) setting 0: Output frequency (initial value), 1: Output current, 2: Output voltage	1: Output frequency (initial value), 2: Output current, 3: Output voltage
	Second applied motor *Pr. 71* = 100 to 123	*Pr. 450 Second applied motor*
	Terminal 2 0 to 5V, 0 to 10V selection (*Pr. 73*) setting 0: 0 to 5V (initial value), 1: 0 to 10V	*Pr. 73 Analog input selection* 0: 0 to 10V 1: 0 to 5V (initial value)
	Operation mode selection (*Pr. 79*) Initial value 1: PU operation mode Setting 8: Operation mode switching by external signal	 Initial value 0: External operation mode is selected at power on Setting 8: deleted (X16 signal is used instead)
	Setting general-purpose magnetic flux vector *Pr. 80* ≠ 9999	 *Pr. 80* ≠ 9999, *Pr. 81* ≠ 9999, *Pr. 800* = 30
	User group 1 (16), user group 2 (16) *(Pr. 160, Pr. 173 to Pr. 175)*	User group (16) only, setting methods were partially changed (*Pr. 160, Pr. 172, Pr. 173*)
	Input terminal function selection (*Pr. 180 to Pr. 183*) setting 5: MRS signal (output stop) 6: STOP signal (start self-holding selection)	*Pr. 178 to Pr. 184 Input terminal function selection* setting 5: JOG signal (jog operation selection) 6: None 24: MRS signal (output stop) 25: STOP signal (start self-holding selection)
	Long wiring mode (*Pr. 240 setting* 10, 11)	Setting is unnecessary (*Pr. 240* setting 0, 11 are deleted)
	Cooling fan operation selection (*Pr. 244*) initial setting 0: Cooling fan operates in power-on status.	 1: Cooling fan on/off control valid
	Stop selection (*Pr. 250*) setting increments 1s	 0.1s
	RS-485 communication control source from the PU connector PU operation mode	Network operation mode (PU operatioin mode as FR-E500 when *Pr. 551* = 2)
	Earth (ground) fault detection 400V class: Detects always	 400V class: Detects only at a start
Inrush current limit circuit	Provided for the 200V class 2.2K or more and 400V class	Provided for the all capacity
Control terminal block	Fixed terminal block (can not be removed) (Phillips screw M2.5)	Removable terminal block (Flathead screw M2 (M3 for terminal A, B, and C only)
Operation panel	Removable operation panel (PA02)	Integrated operation panel (can not be removed)
PU	FR-PU04	FR-PU07 FR-PU04 (some functions, such as parameter copy, are unavailable.)
Plug-in option	Dedicated plug-in option (installation is incompatible)	
	for 400V class only FR-E5NC : CC-Link communication FR-E5ND : DeviceNet communication FR-E5NL : LonWorks communication	 FR-A7NC E kit : CC-Link communication FR-A7ND E kit : DeviceNet communication FR-A7NL E kit : LonWorks communication
Installation size	0.1 to 7.5K are compatible in mounting dimensions	

Appendix2 Instructions for Compliance with the European Directives

(1) EMC Directive

1) Our view of transistorized inverters for the EMC Directive

A transistorized inverter is a component designed for installation in an enclosure and for use with the other equipment to control the equipment/device. Therefore, we understand that the EMC Directive does not apply directly to transistorized inverters. For this reason, we do not place the CE mark on the transistorized inverters. (The CE mark is placed on inverters in accordance with the Low Voltage Directive.) CEMEP

2) Compliance

We understand that the general-purpose inverters are not covered directly by the EMC Directive. However, the EMC Directive applies to machines/equipment into which inverters have been incorporated, and these machines and equipment must carry the CE marks. EMC Installation Guidelines BCN-A21041-202

3) Outline of installation method

Install an inverter using the following methods:

- Use the inverter with an European Standard-compliant noise filter.
- For wiring between the inverter and motor, use shielded cables or run them in a metal piping and ground the cables on the inverter and motor sides with the shortest possible distance.
- Insert a common mode filter and ferrite core into the power and control lines as required.

  Full information including the European Standard-compliant noise filter specifications are written in the technical information "EMC Installation Guidelines" (BCN-A21041-202). Please contact your sales representative.

(2) Low Voltage Directive

We have self-confirmed our inverters as products compliant to the Low Voltage Directive (Conforming standard EN 50178) and place the CE mark on the inverters.

Outline of instructions

- Do not use an earth leakage circuit breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
- Wire the earth (ground) terminal independently. (Do not connect two or more cables to one terminal.)
- Use the cable sizes on *page 10* under the following conditions.

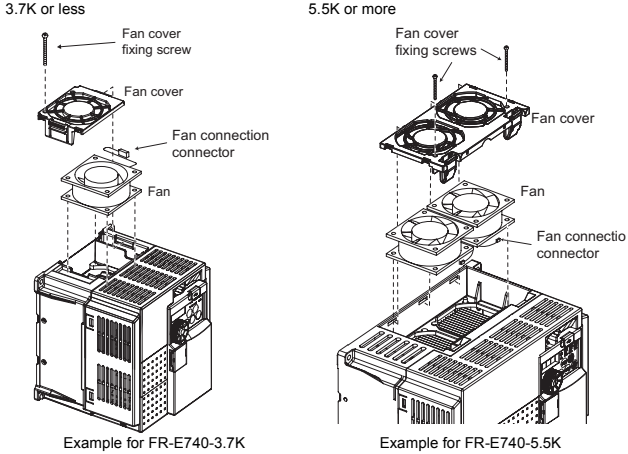
  •Ambient Temperature: 40°C maximum

  If conditions are different from above, select appropriate wire according to EN60204 ANNEX C TABLE 5.
- When tightening the screw, be careful not to damage the threads.

  For use as a product compliant with the Low Voltage Directive, use PVC cable on *page 10*.
- Use the moulded case circuit breaker and magnetic contactor which conform to the EN or IEC Standard.
- When using an earth leakage circuit breaker, use a residual current operated protective device (RCD) of type B (breaker which can detect both AC and DC). If not, provide double or reinforced insulation between the inverter and other equipment, or put a transformer between the main power supply and inverter.
- Use the inverter under the conditions of overvoltage category II (usable regardless of the earth (ground) condition of the power supply), overvoltage category III (usable with the earthed-neutral system power supply, 400V class only) specified in IEC664.

•To use the inverter under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher.

•To use the inverter outside of an enclosure in the environment of pollution degree 2, fix a fan cover with fan cover fixing screws enclosed.



∗On the input and output of the inverter, use cables of the type and size set forth in EN60204 Appendix C.

∗The operating capacity of the relay outputs (terminal symbols A, B, C) should be 30VDC, 0.3A. (Relay outputs are basically isolated from the inverter internal circuit.)

∗Control circuit terminals on page *7* are safely isolated from the main circuit.

∗Environment

	Running	In Storage	During Transportation
Ambient Temperature	-10°C to +50°C	-20°C to +65°C	-20°C to +65°C
Humidity	90% RH or less	90% RH or less	90% RH or less
Maximum Altitude	1000m	1000m	10000m

Details are given in the technical information "Low Voltage Directive Conformance Guide" (BCN-A21041-203). Please contact your sales representative.

Appendix3 Instructions for UL and cUL

(Standard to comply with: UL 508C, CSA C22.2 No. 14)

1. General Precaution

The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/- with a meter etc., to avoid a hazard of electrical shock.

2. Installation

The below types of inverter have been approved as products for use in enclosure and approval tests were conducted under the following conditions. Design the enclosure so that the ambient temperature, humidity and ambience of the inverter will satisfy the above specifications.

Wiring protection

For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code and any applicable provincial codes.
For installation in Canada, branch circuit protection must be provided in accordance with the Canadian Electrical Code and any applicable provincial codes.
Provide the appropriate UL and cUL listed Class T type fuse that is suitable for branch circuit protection in accordance with the table below.

FR-E720-□□K (C)		0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		240V or more										
Fuse Maximum allowable rating (A)*	Without power factor improving reactor	15	15	15	20	30	40	60	70	80	150	175
	With power factor improving reactor	15	15	15	20	20	30	50	60	70	125	150

FR-E740-□□K (C)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Rated fuse voltage(V)		480V or more								
Fuse Maximum allowable rating (A)*	Without power factor improving reactor	6	10	15	20	30	40	70	80	90
	With power factor improving reactor	6	10	10	15	25	35	60	70	90

* Maximum allowable rating by US National Electrical Code.Exact size must be chosen for each installation.

3. Short circuit ratings

- **200V class**

  Suitable For Use in A Circuit Capable of Delivering Not More Than 100 kA rms Symmetrical Amperes, 264 V Maximum.

- **400V class**

  Suitable For Use in A Circuit Capable of Delivering Not More Than 100 kA rms Symmetrical Amperes, 528 V Maximum.

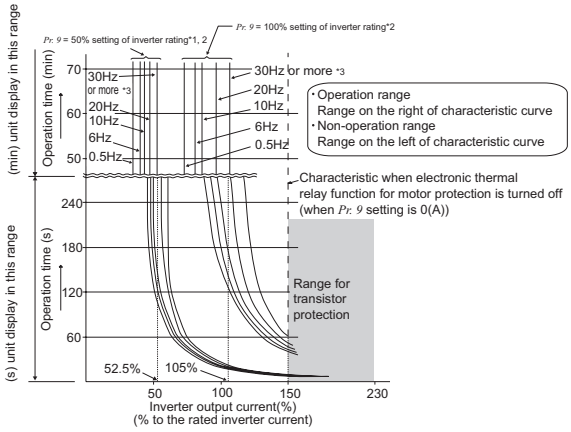
4. Wiring

- The cables used should be 75°C copper cables.
- Tighten the terminal screws to the specified torques.
  Undertightening can cause a short or misoperation.
  Overtightening can cause the screws and unit to be damaged, resulting in a short or misoperation.
- Use the UL approved round crimping terminals. Crimp the terminals with the crimping tool recommended by the terminal manufacturer.

5. Motor overload protection

When using the electronic thermal relay function as motor overload protection, set the rated motor current to Pr. 9 "Electronic thermal O/L relay".

Electronic thermal relay function operation characteristic



This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.
(The operation characteristic is shown on the left)

When using the Mitsubishi constant-torque motor

1) Set "1" or any of "13" to "16", "50", "53", "54" in *Pr. 71*. (This provides a 100% continuous torque characteristic in the low-speed range.)
2) Set the rated current of the motor in *Pr. 9*.

*1 When a value 50% of the inverter rated output current (current value) is set in *Pr. 9*

*2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the motor rated current.

*3 When you set the electronic thermal relay function dedicated to the Mitsubishi constant-torque motor, this characteristic curve applies to operation at 6Hz or higher.

Note

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
- When multiple motors are operated by a single inverter, protection cannot be provided by the electronic thermal relay function. Install an external thermal relay to each motor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use the external thermal relay.

MEMO

REVISIONS

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

Print Date	*Manual Number	Revision
Mar., 2007	IB(NA)-0600276ENG-A	First edition
May, 2007	IB(NA)-0600276ENG-B	Additions • FR-E720-11K, 15K • Setting value "61 and 62" of *Pr. 52 DU/PU main display data selection* • Setting value "61 and 62" of *Pr. 54 FM terminal function selection*
Oct., 2007	IB(NA)-0600276ENG-C	Additions • FR-E740-0.4K to 7.5K • *Pr. 147 Acceleration/deceleration time switching frequency* • Internal board fault (E.PE2)
Jan., 2008	IB(NA)-0600276ENG-D	Additions • FR-E740-11K to 15K

⚠ 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.