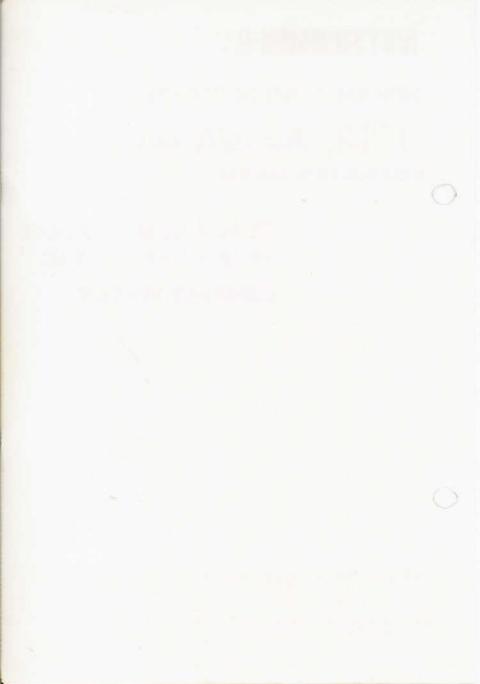
ARHIVA

MITSUBISHI

GENERAL-PURPOSE INVERTER

FREQROL-A024S/A044-EC INSTRUCTION MANUAL

FR-A024-S0.4K - S2.2K-EC FR-A044-0.4K - 3.7K-EC EUROPEAN VERSION



Thank you for choosing a Mitsubishi Inverter.

This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the inverter, please read this manual carefully to use the equipment to its optimum.

Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this instruction manual and appended documents carefully and can use the equipment correctly. Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions.

In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

A WARNING

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

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

Note that 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.

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

A WARNING

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- ⚠ Do not run the inverter with the front cover removed. Otherwise, you may access the exposed highvoltage terminals and charging part and get an electric shock.
- ⚠ 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.
- A Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for no residual voltage with a tester.
- A Use a class 3 or higher earthing method to earth the inverter.
- 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.
- A Operate the switches with dry hands to prevent an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching.
 Otherwise, you may get an electric shock.

2. Fire Prevention

A CAUTION

- ⚠ Mount the inverter and brake resistor on a non-combustible surface. Installing the inverter directly on or near a combustible surface could lead to a fire.
- A If the inverter has become faulty, switch power off on the inverter's power supply side.

 A continuous flow of a large current could cause a fire.
- ⚠ When using a brake resistor, use a circuit to cut off the power when an inverter error signal occurs. Failure to do so could cause the brake resistor to abnormally overheat and a fire to start if a fault occurs in the brake transistor, etc.
- ⚠ Do not connect the resistor directly to the DC terminals +,-. This could cause a fire.

3. Injury Prevention

△ CAUTION

- ⚠ Apply only the voltage specified in the instruction manual to each terminal to prevent damage, etc.
- ⚠ Ensure that the cables are connected to the correct terminals. Otherwise, damage, etc. may occur.
- Always make sure that polarity is correct to prevent damage, etc.
- White power is on or for some time after power-off, do not touch the inverter or brake resistor as these will be not and you may be burned.

4. Additional instructions

To prevent injury, damage, or product failure please note the following points.

(1) Transpotation and mounting

A CAUTION

A Take care when carrying products, use correct lifting gear.

⚠ 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 operate if the inverter is damaged or has parts missing.

⚠ Do not lift the inverter with the front cover attached. It may fall off.

Do not stand or rest heavy objects on the inverter.

⚠ Check the inverter mounting orientation is correct.

Prevent any dust, wire fragments or other foreign bodies from dropping into the inverter during wiring up and commissioning.

⚠ Do not drop the inverter, or subject it to impacts.

⚠ Use the inverter under the following environmental conditions:

Environment	Conditions	
Ambient temperature	-10°C to + 50°C (non-freezing)	
Ambient humidity	90%RH or less (non-condensing)	
Storage temperature	-20°C to + 65°C	
Ambience	Indoors, free from corrosive gas, flammable gas, oil mist, dust and dirt.	
Altitude, vibration	Max. 1000m above sea level, 5.9m/S ² (0.6G) or less (conforming to JIS C 0911)	

· Temperatures applicable for a short time, e.g. in transit.

(2) Wiring

A CAUTION

⚠ Do not fit capacitive equipment such as power factor correction capacitor, noise filter or surge supressor onto the output of the inverter.

⚠ 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

Check all parameters, and ensure that the machine will not be damaged by sudden start-up.

A CAUTION

- ⚠ When retry function is selected, the inverter will try to restart the machine up to 10 times over a one hour period. Ensure operator safety with other devices.
- ⚠ The stop key is valid only when function setting has been made. Prepare an emergency stop switch separately.
- Switch off the start signal when resetting the inverter. Failure to do so may start the motor immediately after reset.
- ⚠ Do not use for loads other than the 3-phase induction motor. If another electric device is connected to the inverter output, the device could be damaged.
- ⚠ Do not modify the equipment.
- \triangle The electronic motor thermal protection does not guarantee to prevent motor burn out.
- ⚠ Do not use a contactor on the inverter input for frequent starting/stopping of the inverter, use control signals.
- ⚠ To reduce the effect of mains conducted electromagnetic interference, use a RFI noise filter. Take care to ensure that electromagnetic radiation from the inverter does not damage or affect the operation of nearby electrical equipment.
- When driving a 400 V class motor with the inverter, use an insulation-enhanced motor, or measures should be taken to suppress the surge voltage. Surge voltages atributable to the wiring constant may occur at motor terminals, deteriorating the insulation of the motor.
- ⚠ When parameter clear or all parameter clear is performed, each parameter returns to the factory setting. Re-set the required parameters before starting operation.
- ⚠ The inverter can be easily set for high-speed operation. Before changing its setting, fully examine the performances of the motor and machine.
- ⚠ The inverter does not have a holding stop facility. For emergency stop, another circuit must be used.

(5) Emergency stop

A CAUTION

Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.

(6) Maintenance, inspection and parts replacement

A CAUTION

⚠ Do not carry out a megger (insulation resistance) test on the control circuit of the inverter.

(7) Disposing of the inverter.

A CAUTION

↑ Treat as industrial waste.

(8) General

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

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GUIDELINES FOR HANDLING

Improper handling of an inverter may cause malfunctioning, reduction in service life, or severe damage.

Handle the inverter carefully; refer to the description and caution information provided in this manual.

	Important	Refer to
Power supply (3~)	Power Supply Specification The power supply must meet requirement of the inverter.	p.101
Miniture circuit breaker	Use of Magnetic Contactor It is not necessary to use a magnetic contactor. If a magnetic contactor is used, do not use it for start/stop control of the inverter. If it is used frequently to start or stop the inverter, it will damage the inverter.	p.110
Magnetic contactor (MC) Power factor improving AC reactor (FR-BAL)	Input Reactor If the inverter is installed directly to a large capacity power supply (500 kVA or larger, and wiring distance of 10m or shorter) or for power factor improvement, installation of a reactor (option) is required. Choose a reactor according to the inverter model: Power factor improving AC reactor 0.4K to 3.7K	p.114
Filter	EMC Filter To conform with EN50081-2 (emission) and EN50082-2 (immunity) a RFI reduction filter must be fitted, in accordance with the EMC Installation Guidelines.	p.115
100	Installation Location The service life of the inverter is influenced by temperature. Ambient temperature should be held within the specified limits. When mounting in a separate enclosure, check the heating effect specifications and provide for adequate heat dissipation.	p.9 p.104
Motor Earth	Wiring Incorrect wiring will damage the inverter. The control signal lines must be run as far from the main circuit as possible so that the inverter will not be affected by noise. If wiring distance is long, check the following: Parameters to be set if general-purpose magnetic flux vector control mode is selected (refer to page 48.) Leakage current (refer to page 100.)	p.10
Earth	noise. • If wiring distance is long, check the following: 1) Parameters to be set if general-purpose magnetic flux vector control mode is selected (refer to page 48.)	adio no

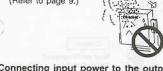


This inverter is designed for use inside a seperately earthed enclosure. It has an IP20 rating, and therefore, precautions must be taken at point of installation to minimize risk of hazard to users, and to comply with EMC directive 89/336.

Use the inverter within the permissible ambient temperature range

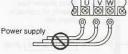
Temperature has a critical influence on the service life of the inverter. Ambient temperature must be controlled so that the inverter is operated within the permissible temperature range. Also see inverter installation instructions and environment.

(Refer to page 9.)



Connecting input power to the output terminals of the inverter, will damage the output transistors.

If power supply voltage is applied to terminals U, V, and W, the inverter will be damaged. Check the wiring and operation sequence (commercial power supply switching, for example) carefully.



Do not touch the inside of the inverter during operation

The inverter has high voltage circuits. Before attempting inspection inside the inverter, disconnect power supply and be that the POWER indicating lamp is

OFF. (also used as the charge indicating lamp)



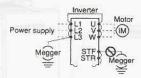
Warning! Hazardous voltage present.
Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

Radio Noises

The inverter input/output circuits (main circuits) contain high harmonics which may cause interference to communication equipment (AM radio) being used near the inverter. If interference occurs, use a noise filter, or line noise filter to reduce radio noise. (For details, refer to page 90 to 100).

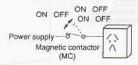
Do not attempt Megger test on inverter control circuit

If insulation resistance is to be measured for the power supply lines and the motor, either disconnect the wire at the inverter terminals or short the terminals as shown in the illustration below.



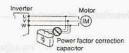
Do not use a magnetic contactor at the inverter input to start or stop the motor (inverter).

If start/stop of the motor (inverter) is repeated frequently, it will cause failure of the inverter. Use the electronic start signal on the inverter.



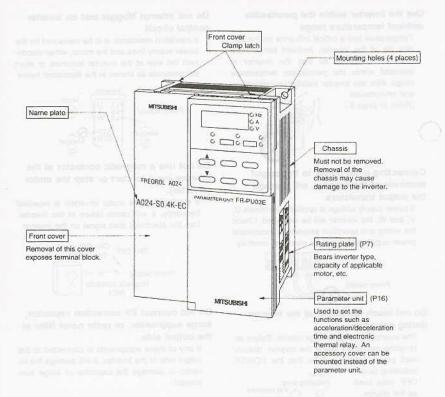
Do not connect PF correction capacitor, surge suppressor, or radio noise filter at the output side.

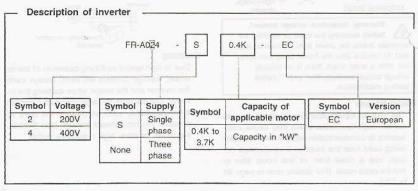
If any of these equipments is connected to the output side of the inverter, it will damage the inverter or damage the capacitor or surge suppressor.



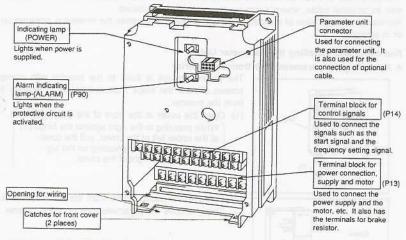
Earthing

Due to high-speed switching operation of the inverter, leakage currents will exist. Always earth the inverter and the motor, when earthing the inverter, use the earth terminal provided. Establish a low resistance earth as close to the drive as possible. Do not connect through pipe threads, slip joints, or other high resistance paths.



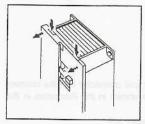


■ Inverter without Front Cover



■ Removing/Attaching the Front Cover

Removing the front cover

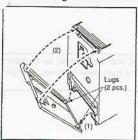


Press down on the latches (2 pcs.) at the top of the front cover and pull forward.

Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

Attaching the front cover



Insert the tabs (2 pcs.) at the bottom of the front cover into the recesses in the chassis and push the front cover toward the chassis until the latches engage securely.

- Notes: 1. After attaching the front cover, test to make sure that it is securely held in place by the latches.
 - The inverter cover can not be removed easily when the parameter unit is connected through to the chassis. Therefore, remove the parament unit before the cover.

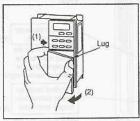
■ Parameter Unit Location

The parameter unit can be mounted directly on the inverter, or installed in a remote location with an optional cable, where it can be mounted in an enclosure.

Removal and installation of the parameter unit is permissible while the inverter is powered up or in operation.

Removing and installing the Parameter Unit

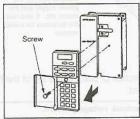
· Removing the parameter unit from the inverter



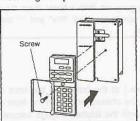
The parameter unit is fixed to the inverter with clamp screws. Follow the steps indicated below to remove it from the inverter.

- (1) Open the cover at the front of the parameter unit.

 (While pressing to the right against the hinge (1) at the upper left of the cover, pull the cover with the thumb lightly pressing on the lug (2), at the upper right of the cover.
- (2) Remove the clamp screw from the parameter unit. Then, remove the parameter unit from the inverter.



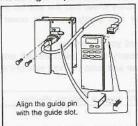
Installing the parameter unit on the inverter directly



- Connection
 Insert the parameter unit connector into the connector in the inverter as shown in the illustration in the left.
- (2) Clamping the parameter unit Clamp the parameter unit to the inverter with the clamp screw.

Warning: When installing the parameter unit to the inverter directly, it must be mounted on the front cover of the inverter. Never install it on the inverter with the front cover removed, as high voltage terminals are exposed.

· Installing the parameter unit using a cable



(1) Connection

Push one end of the connector into the inverter and other end onto the parameter unit. Use the guide pin and guide slot to determine the correct connector orientation. (Forcing the connectors together in opposition to the location guides will damage the inverter.)

(2) Fixing

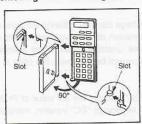
After connecting to the inverter's connector, securely fix with the installation screw.

Note: Use the connection cable available as an optional accessory to the parameter unit.

If it is necessary to fix the cable to the parameter unit, use the L-pattern cable.

- A Never use any sharp or pointed object to depress the keys of the P.U. unit. The membrane keypad was designed ONLY for use with human fingers.
- Do not insert or remove the PU from the inverter or the extension cable without first removing power from the inverter.

Removing and Attaching the Parameter Unit Cover

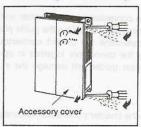


 Pull the parameter unit cover to the left to remove it from the parameter unit.

Adjust the parameter unit cover position so that the slot faces in the direction as illustrated in the left. The parameter unit cover can be removed only when the slots are set in this position.

Note: When attaching the parameter unit cover, set the slots in the cover in the direction as illustrated and push to the right.

■ Removing and Attaching the Accessory Cover



Insert the tip of a screw driver into the slot on the right side of the inverter and gently lever the cover up to loosen it.

Pull the cover toward you to remove.

To attach the accessory cover, insert the left edge into the slot in the inverter and push the right side of the cover against the inverter.

Note: Check that the cover is securely attached.

Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

■ Handling the FR-ARW03E Parameter Copy Unit

The FR-ARW03E parameter copy unit can be connected to the inverter directly or with an optional cable. Options, function settings, and monitoring can be done, the same as with the FR-PU03E. Note that the function assigned to the <a href="https://www.example.com/www.exam

With the FR-ARW03E it is possible to read the parameters set for individual applications and to copy them to other inverters,

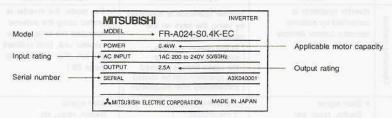
- Note: 1. Do not copy the parameters between differing voltage classes, differing versions or differing capacities. If the parameters are copied between differing voltage classes or differing capacities, the motor rotation may become unstable, unexpected alarms may occur, and the true performance of the inverter may not be achieved. If a copy is made by mistake, please contact Mitsubishi.
 - If copying the parameters from "ER" version to "EC" version, the set value of Pr.31 and Pr.81 changes. After parameter copy from "ER" version to "EC" version, manually set "0" to Pr.31 and set "9999" to Pr.81 in new version.

3. PREPARATION BEFORE OPERATION

1. Unpacking and Checking the Product

After unpacking the inverter, check the rating plate on the right side of the inverter to make sure that you have received the product that you ordered. Also make sure that the product is not damaged.

· Rating plate



· Accessory ---- Instruction manual

If any questions arise or delivered product has defects, please contact your Mitsubishi dealer.



2. Preparation of Apparatus and Components Necessary for Operation

The apparatus and components to be used differ depending on the application requirements. Select the necessary items by referring to the table on page 8 (Operation Control Modes).



3. Installation

Install the inverter considering location, physical orientation ambient temperature, and atmospheric conditions. Improper installation may shorten the service life or degrade the performance of the inverter. (see environmental conditions; page 103)



4. Wiring

Connect the input power, output to the motor, and control signal lines to the terminal block. (see cautions on wiring notes; page 10)

4. OPERATION CONTROL MODES

The FR-A024 inverter has three operation modes. Select the mode that fits the application and operation conditions, and prepare the components required.

Mode	External Signal Operation Mode	2. Parameter Unit (PU) Operation Mode*	3. External Signal/PU Operation Mode	
Operation method	Inverter operation is controlled by external operator control devices.	Inverter operation is controlled by using the keys on the parameter unit. (In this operation mode, since no connection of the signal lines is required, the operation can be started immediately after installation.	In this mode, the inverter is operated using the external control and the keys on the parameter unit, both outlined to the left. (For details, refer to page 28.)	
	Start signal Switch, relay, etc. Frequency setting signal	Parameter unit (FR-PU03E FR-ARW03E FR-DU01 Connection cable (FR-CBL)	Start signal Switch, relay, etc. Frequency setting signal	
tems to be prepared	can be a variable resistor, or an external signal 0 to 5 VDC, 0 to 10 VDC, 4 to 20mA Notes:	Connect the cable if the parameter unit is to be used at a distance for operating the inverter. Set PU disconnection alarm for safety.	can be a variable resistor	
Item	The start signal itself is not sufficient for operating the inverter. It is necessary to send a frequency setting signal with the start signal. If the parameter unit is connected, operation is also possible in the PU operation mode.	Congornation (attended to the Congornation of	Connection cable (FR-CBL, Connect the cable if the parameter unit is used at a distance for operating the inverter. Set PU disconnection alarm for safety.	
Connection examples	Starf switch Variable resistor (Speed setting) (signal	Parameter unit PU PU Connection cable	Pu P	

The parameter unit, hereinafter referred to as the PU, is an optional keypad used for programming and/or operating the inverter.

Install the inverter in the upright position.

The inverter must be installed in an upright position to allow sufficient heat radiation. Other installations will cause over heating and reduced service life.







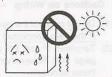
Upright Installation

Flat Installation

Sideways Installation

Avoid installing the inverter in the following places.

- · Places subject to direct sunlight.
- Humid air (above 90% noncondensing)



Places with airborne oil mist, dust, or lint. Places exposed to corrosive gas. Places exposed to salt laden air.



· Places subject to vibration.



· Places exposed to explosive gas.



 On a surface of inflammable material such as wood.

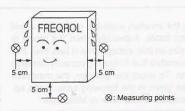


Keep ambient temperature within the permissible temperature range.

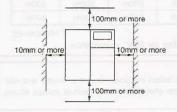
If the inverter is installed in surroundings of high temperature, or installed inside an enclosure without adequate cooling the service life will be significantly reduced.

To install the inverter inside an enclosure, consider the cooling method as well as the dimensions of the enclosure necessary for adequate heat dissipation.

- Permissible temperature range -10 to +50°C
- Points where ambient temperature is measured



· Minimum clearance around the inverter



6.1 Precautions

When wiring, consider the following items to avoid erroneous operation, damage or incorrect usage to the inverter.

Cautions on Wiring

- (1) Do not connect the power supply wires to the output terminals (U, V, W) of the inverter. If they are connected to these terminals, it will damage the inverter.
- (2) Terminals P and PR are used for connection of the optional brake resistor (refer to page 112). Never short circuit or connect anything other than the brake resistor across these terminals.
- (3) Use sleeved solderless terminals for the connection of the power supply and the motor.
- (4) Common terminals SF, 5, and P24 in the terminal block for the control circuit are not at the same potential. Do not connect or ground these terminals.
- (5) Use only shielded or twisted cables to connect the control circuits. These wires must be routed as far as possible from the main power and AC relay logic circuits.
- (6) During wiring, close the slots on the top of the inverter with a cover so that cut pieces of wire will not enter the inverter.
- (7) Additional isolation should be provided between any control terminals, and power terminals via use of correctly rated prepheral devides such as:
 - A) Control Switches
 B) Potentiometers
 C) Meters, etc.
 If possible, these are to be manufactured according to IEC 947 standards or equivalent.



If modification of the wiring or other work becomes necessary after operating the inverter, do not touch the wire or terminals until power is disconnected and the POWER CHARGE indicating lamp is extinguished for at least 10 minutes. Check with a tester that there is no residual voltage across terminals "P/+" and "-" before starting modifications.

Wire Size and Wiring Distance

- (1) If the motor is installed a long distance from the inverter, available motor torque will be reduced due to voltage drop in the motor cable, especially when the motor is operating at low frequencies. Select the wire size so that voltage drop is less than 2%.
- (2) At extreme distances, the charging current generated due to floating capacity between the wires may trigger the current limit function. To avoid this problem, the maximum wiring distance should be limited to the values given in the following table. If the application requires wiring longer than the permissible limits, refer to Mitsubishi.

Inverter Capacity	0.4K	0.75K	1.5K	2.2K	3.7K*)
Non low-noise operation	300m	500m	500m	500m	500m
Low noise operation	200m	300m	500m	500m	500m

*) FR-A044-EC

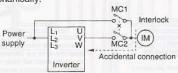
Note: Maximum cable length with filter fitted is 100m for EMC compliance

Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

Items to Be Checked when Designing an Application

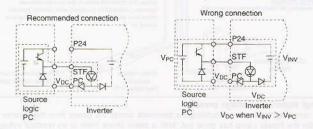
(1) If the application has a commercial power supply by pass circuit as shown in the illustration to the right, accidental connection of line power to the inverter output terminals will damage the inverter. To avoid this problem, interlock MC1 and MC2 both electrically and mechanically.



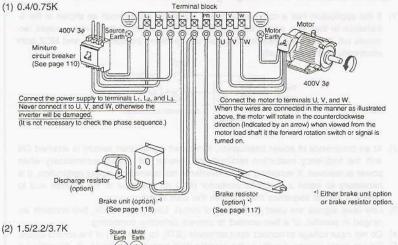
- (2) At an occurrence of power interruption, if the start signal (start switch) is retained ON with the frequency instruction retained, the inverter will restart automatically when power is restored. If restarting of the inverter is not desired on power restoration, it is necessary to install a magnetic contactor (MC) on the input of the inverter and to design a control sequence that disables the start signal.
- (3) Low level signals are used in the control circuit. Use dry contacts, two contacts arranged in parallel, or a twin-contact to prevent defective contacting.
- (4) Do not input voltage to contact input terminals (STF, for example) of the control circuit.
- (5) Do not apply voltage directly to the alarm output signal terminals (A, B, C) without a relay coil or lamp.
- (6) If, according to the application, an open collector output such as an output from a programmable controller is connected directly to the inverter input terminal, use terminal PC (external transistor common).

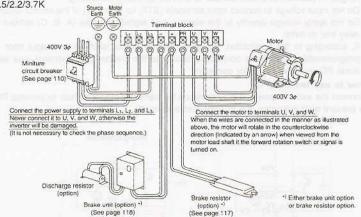
How to use terminal PC

Connect the external power supply common for transistor output signals to terminal PC to prevent malfunctioning due to undesirable current.



6.2 Connecting Three Phase Power Supply and Motor (FR-A044-EC)





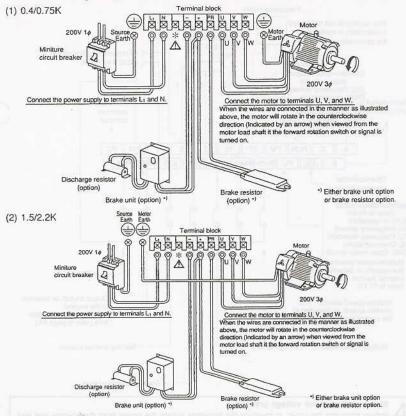
Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.



- . It is not sufficient to use only residual current device as the protection against electric shock.
- · Always connect protective earth terminal for protection against electric shock.
- . Do not connect more than 2 wires on the protective earth terminal.
- Use contactor and no fuse breaker EN/IEC standard compliant.
- · Use transformer or surge absorber EN/IEC standard compliant.

6.3 Connecting Single Phase Power Supply and Motor (FR-A024S-EC)



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

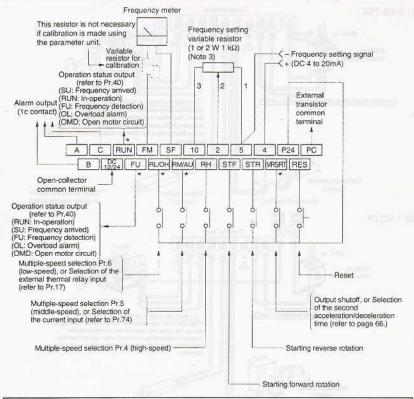
Λ

On the A024S terminal block there is an unmarked terminal (*), DO NOT CONNECT WIRES TO THIS TERMINAL.



- It is not sufficient to use only residual current device as the protection against electric shock.
- · Always connect protective earth terminal for protection against electric shock.
- Do not connect more than 2 wires on the protective earth terminal.
- · Use contactor and no fuse breaker EN/IEC standard compliant.
- Use transformer or surge absorber EN/IEC standard compliant.

6.4 Connecting the Control Signals



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

- Notes: 1. Terminal block
 - Screw size M3
 - For the terminals indicated by an asterisk (*), input or output specifications may be changed by setting Pr.59.
 - 3. If frequency setting must be changed frequently, it is recommended to use 2 W, 1 k Ω resistor.
 - 4. Isolation via optoisolators at 1700V

6.5 Wiring procedures

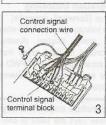
Standard specifications (FR-A024S-0.4K ~ 0.75K, FR-A044-0.4K ~ 0.75K)



Remove the front cover of the inverter, pass the ground wire through the slit on the unit, and connect to the position shown in the drawing.

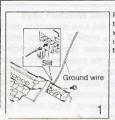


Pass the power and motor connection wires through the wiring hole on the unit, and connect to the motor terminal block.

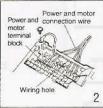


Connect the control signal connection wire to the control signal terminal block as shown in the drawing. After wiring, install the front cover of the unit.

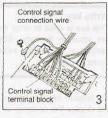
Standard specifications (FR-A024S-1.5K - 2.2K, FR-A044-1.5K - 3.7K)



Remove the front cover of the inverter, pass the ground wire through the slit on the unit, and connect to the position shown in the drawing.



Pass the power and motor connection wires through the wiring hole on the unit, and connect to the motor terminal block.

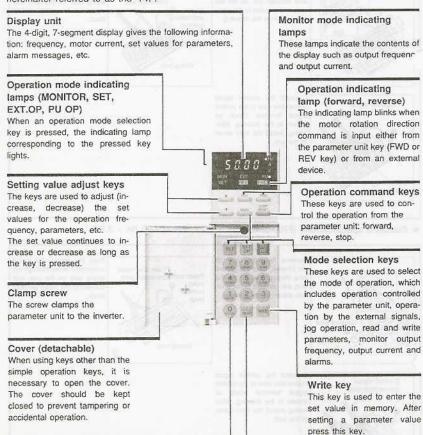


Connect the control signal connection wire to the control signal terminal block as shown in the drawing. After wiring, install the front cover of the unit.

7. NOMENCLATURE OF PARAMETER UNIT

The parameter unit, model FR-PU03E can be directly installed to the FR-A024S-EC and FR-A044-EC series inverters or connected with an optional cable. Functions of the parameter unit are: to operate the inverter, set the parameters (read, write), monitor the operation status, and display alarm codes.

The parameter unit (FR-PU03E) is hereinafter referred to as the "PU". The parameter is hereinafter referred to as the "Pr.".



Function (parameter) and numeric keys

These keys select the basic functions change parameter values, enter frequencies, scroll through faults and various measured data, volts, amps, etc.

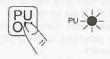
Read key

This is a dual function key used to:

- Fetch and display the contents of a parameter (address in memory).
- 2. Set a decimal point.

8. PRECAUTIONS ON OPERATING THE PARAMETER UNIT

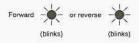
- Precautions for operating the inverter by the parameter unit
- Inverter operation using the parameter unit is enabled only when the [PU OP] key is pressed or the PU mode lamp is lit.



 In the monitor mode (MONITOR mode lamp is lit), the operation frequency cannot be set. Change mode to PU operation.



- In the following cases, jog operation is not possible.
 - (1) While the motor is running.



To execute jog operation, stop the motor first. See page 27.

(2) Precautions for operation

- In the following cases, the operation mode cannot be switched by pressing the [PU OP] or [EXT OP] key.
 - (1) While the motor is running.



- (2) The external start signal (across terminals STR or STF, and SD) is ON.
- (3) The setting for operation mode selection (Pr. 79) is any of the following values.
- Set value: 1 to 4, 7, 8. See page 23.
- (3) Precautions for the number of digits and a decimal point
- The maximum number of digits for a value to be input is 4. If a value is input exceeding this limit, the most significant digit is ignored. See the example below.

Display on the parameter unit 12345 2345 1gnored

8. PRECAUTIONS ON OPERATING THE PARAMETER UNIT

(4) Cautions on writing the set values

- Writing is possible only in the PU operation mode (Pr.79 = 0, 1).
 In the external or combined operation mode, it is not possible to write the set value. Remember that "reading" is possible in any of these operation modes. However, even in the external or conbined operation mode, writing is possible for the following parameters while the motor is stopped.
 (1) 2 paged extring.
 - (1) 3-speed setting Pr.4 to Pr.6 (2) Multiple-speed setting Pr.24 to Pr.27, Pr.126 to Pr.133
 - (3) Display function ---- Pr.54 to Pr.56
 - (4) Selection of operation mode Pr.79(5) FM terminal calibration Pr.900
- (6) Frequency setting bias and gain (voltage,
- current) · · · · · · Pr.902 to Pr.905
 (7) Key click sound selection · · Pr.990
- (8) Alarm clear ----- Pr.996
- (9) Inverter reset · · · · · · Pr.997
- In the factory-setting status (pr.77 = 0), writing is not possible while the motor is running. If writing is attempted in this status, the error message (Err.) is displayed. However, writing is possible for the following parameters while the motor is running.
 - (1) 3-speed setting · · · · · Pr.4 to Pr.6 (2) Multiple-speed
 - setting ----- Pr.24 to Pr.27, Pr.126 to Pr.133

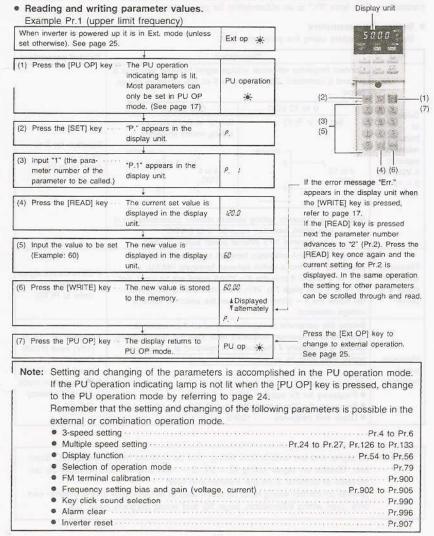
 - (4) PWM frequency selection · · · Pr.72
 - (5) Display function · · · Pr.54 to Pr.56(6) Parameter write disable
 - selection Pr.77
 - (7) FM terminal calibration · · · · Pr.900
 - (8) Frequency setting bias and gain (voltage, current) Pr.902 to Pr.905

- (9) Key click sound selection Pr.990 (10) Alarm clear Pr.996
- (11) Inverter reset · · · · · Pr.997
- In addition to the cases indicated above, writing of the set values is disabled in the following cases as well. If writing is attempted in these cases, the error message (Err.) is displayed.
 - Parameter write disable selection (Pr.77) is set for "disable".
 - (2) A parameter number not given in the parameter list (page 50) is selected.
 - (3) A value outside the permissible setting range is set.
 - (4) A value outside the range established by the upper and lower limits of frequency (Pr.1 and Pr.2) is set.
- If the error message (Err.) is displayed when writing is attempted, repeat the operation from the beginning after pressing the [SET] key.



9. SETTING AND CHANGING THE PARAMETERS

For the control of an inverter, many parameters are used. It is possible to select the specific parameters necessary for inverter operation and to set values for these parameters using the parameter unit to meet the application requirements (load and operation conditions). For details of the parameters, refer to the parameter list on page 50, and inside back cover.



10. SETTING PARAMETERS BEFORE STARTUP

The major parameters to be set, and the functions of these parameters, are explained in the following table. Set the parameters according to the application requirements (load and operation specifications).

For details of the setting procedure, refer to page 19. Refer to page 50 for a complete list of parameters. The term "Pr." is an abbreviation for parameter.

■ Setting the parameters

Set the parameters using the parameter unit.

Item	Description	Related parameters	
	Connect frequency reference voltage signal between terminals 2 (+) and 5 (common). Set Pr.73 for a 5 or 10V signal as shown below.		
V2.W S	0 to 10 VDC 0 to 5 VDC		
Selection of frequency	Set "1" in Pr.73 Set "0" in Pr.73 (factory-setting before shipping).		
reference signal: 0 – 5 VDC (or) 0 – 10 VDC	0 to 10 VDC	Selection for 0 to 5V / 0 to 10V (refer to Pr.73)	
	Note: If a frequency setting variable resistor (potentiometer) is connected, selection must be "0 to 5 VDC". Use terminal 10 if internal power supply is used.	er a saw at see th	
Frequency reference signal 4 to 20mA	Connect 4 – 20mA reference between terminals 4 (+) and 5 (common). Connect a switch between terminals RM/AU, and P24, or a jumper if only the 4 – 20mA signal will be used. Set Pr.74 to 1 (see page 73). With the switch closed, the inverter will follow the 4 – 20mA signal; open the switch to follow a voltage reference.		
-	Setting this parameter is required only when the inverter is operated at a maximum frequency other than the factory setting. Setting is necessary if the inverter is operated at a frequency	Voltage ref., 5V or (10V) input (Pr.38)	
Maximum output frequency	higher than 50Hz by an external input signal. <factory setting=""> Frequency for 5V input50Hz at 5 VDC Frequency for 20mA input-0Hz at 4mA DC, and 50Hz at 20mA Upper limit frequency120Hz</factory>	Current ref., 4 – 20mA input (Pr.39) PU operation mode Upper frequency	

Note: 1. All signal and low level control wiring must be shielded type to meet EMC directive. Shields on signal wiring (0 - 5V, 0 - 10V, and 4 - 20mA) must be terminated at terminal 5 on the inverter end only. Shields on control wiring must be terminated at terminal P24 on the inverter end only. (see wiring information, page 10, and wiring diagram, page 105)

10. SETTING PARAMETERS BEFORE STARTUP

Item	Description	Related Parameters
Upper and lower frequency limits	Setting these parameters is required when the range of output frequency is to be restricted to values other than established in the V/Hz ramp. Example 1 – A pump, for mechanical reasons, must never operate at a frequency below 30Hz. Solution: set Pr.2 to 30Hz. When the inverter is in the run mode it will not output less than 30Hz even though the applied frequency reference command drops below 30Hz. Example 2 – A centrifugal fan draws excessive current at maximum speed because the motor is undersized for the application. A centrifugal fan load reduces as speed is reduced. It was found, by gradually reducing speed, that the current could be reduced to an acceptable level at 45Hz. Setting a maximum level of 45Hz in Pr.1 will limit the inverter output to this level even though the applied frequency reference rises above 45Hz.	● Upper limit (Pr.1) ● Lower limit (Pr.2)
Electronic thermal overload relay	The electronic overload relay function follows an algorithm based on the inverse time protection curves developed for separate motor overloads. The electronic overload relay, by virtue of knowing the output frequency at all times, has the added advantage of reducing the time to trip as the frequency to the motor is reduced. IEC standard motors have fans that are connected to the motor shaft, so have reduced cooling capacity as speed is reduced. The factory setting is the inverter full load amp. rating, except the 0.4 – 0.75K models are set at 85% of their rating.	Electronic thermal relay (Pr.9) Selection of applied load (Pr.14) Selection of external thermal relay input (Pr.17)
Acceleration/ deceleration time	Factory-setting for acceleration/deceleration time is 5 sec. Note: The set value indicates the time the drive will take to accelerate to the frequency stored in Pr.20.	Acceleration time (Pr.7) Deceleration time (Pr.8) Second acceleration deceleration time (Pr.44) Second deceleration time (Pr.45)
Motor voltage & frequency & frequency For optimum performance the motor nameplate data size the inverter. Set motor nameplate voltage Set motor nameplate frequency		Motor voltage (Pr.19) Motor frequency (Pr.3)

Using an inverter that has been used before (parameter all clear) -

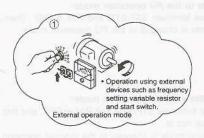
If an inverter which has been used before is to be used, the set values of the parameters might have been changed according to a specific operation. Therefore, it is necessary to initialize the parameter set values before starting the operation. The term initialize refers to the operation to reset the parameter values to the factory-settings, (refer to page 35 for details of initialization procedure.)

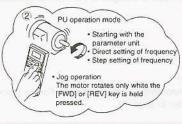
11. OUTLINE OF THE FUNCTIONS

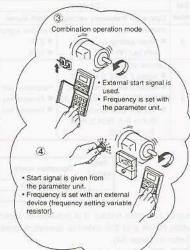
Tł	ne p	arameter unit has the following functions.
0	Sel	ecting the operation mode
		External operation mode
	6.3	Operation using a frequency setting variable resistor, start switch, and other external
		devices
	(2)	PLI operation mode
	(-/	Operation using the keys on the parameter unit
	(3)	Combination operation mode
		Operation by combining the external signals and parameter unit keys.
		Example: External start signal while using the parameter unit to set the operating fre-
		quency etc
•	Set	ting the parameters
	(1)	Reading the current setting
		To check the value of a parameterp.19
	(2)	Updating the setting
		To change the value of a parameter
	(3)	Returning the parameter values to the factory-settings before shipping (initialization)
		Parameter clear, parameter all clear · · · · p.36
	(4)	
	(5)	Calibrating the frequency meterp.44
9	Mo	nitoring
	(1)	Checking the operation status
		Output frequency (Hz)
		Output current (A)
		Rotation speed (m/min)
		Motor rotating direction (forward, reverse)
		Motor in-operation
	(2)	Checking the contents of alarm p.38

12.1 Operation Modes

The operation mode of the inverter is classified into the following three modes – the external operation mode, the PU operation mode and the combined operation mode.







Factory-set operation mode

When power is turned ON or when the inverter is reset, the operation mode is set to "operation using external input signals". Therefore, the inverter can be operated using the external signals when it is turned ON. The inverter starts operating if the start signal (STF/STR-P24) is turned ON in this state. A speed reference signal is also required for motor rotation.



In this mode, if the Parameter unit is removed the motor cannot be controlled.

MODES ② ③ ④ To prevent damage or injury the PU Disconnection Alarm must be activated. Set Pr. 75 = 2, 3, 16 or

■ To fix the operation mode

It is possible to set the operation mode which is established when power is turned ON. For example, if the inverter needs to be operated only in the PU operation mode, it is possible to set the PU operation mode as the mode to be established when power is turned ON. In this state, there is no need to press the operation mode selection key to select the PU operation mode after turning ON power.

The procedure to set the default mode for the mode which is established when power is turned on is explained on page 24.



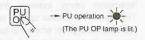
(1) (3)

The "STOP" key can be activated to be used in any mode by Pr.75 to 14, 15, 16 or 17.

12.2 Selecting the Operation Mode

External operation is the factory set operation mode when power is switched on. To change the operation mode, use the mode selection keys on the parameter unit.

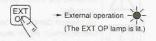
Changing from the external operation mode to the PU operation mode:
 Make sure that the external input signal across terminals STF/STR and P24 is OFF. Then, press the [PU OP] key, and the operation mode is changed to the PU operation mode.



Changing from the PU operation mode to the external operation mode:

Make sure that the external input signal across terminals STF/STR and P24 is OFF, and that both of the FWD and REV indicating lamps are not lit.

Then, press the [EXT OP] key, and the operation mode is changed to the external operation mode.



· Changing to the combination operation mode:

Change the value set for Pr.79 (operation mode selection) as indicated below. For the procedure used to change the value of parameters, refer to page 19.

V.	11/
External operation	PU operation -
External operation (Both of the EXT OP and	PU OP are lit.)

Set value	Contents	
	Operation frequency setting	Start signal
3	Parameter unit ■ Direct setting, or setting with [▲] [▼] keys.	Terminal signal STF STR
4	Terminal signals Across 2 and 5: 0 to 5 VDC Across 2 and 5: 0 to 10 VDC Across 4 and 5: 4 to 20mA DC Multiple-speed selection (Pr.4 to Pr.6, Pr.24 to Pr.27, Pr.126 to 133)	Parameter unit Forward key Reverse key

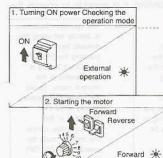
To fix mode at power on:
 Change the set of value of Pr.79.
 Switching between modes is not possible.

Note: By setting "8" for Pr.79 (local/auto external signal selection mode), it is possible to switch the operation mode between the PU operation mode and the external operation mode using an external signal between RH-P24 (refer to page 34).

Note: Pr.79 can also fix operation to PU OP, or EXT. OP, refer to page 75.

12.3 External Operation Mode (Operation Using External input Signals)

Operation procedure (operation at 50Hz)



Turn ON the power (POWER indicator lamp lit) and make sure that the external operation mode indicating lamp is lit. If the indicating lamp is not lit, change the operation mode to the external operation mode by referring to the procedure given on page 24.

Note 1: If both of the forward and reverse switches are turned ON, the inverter will not operate. If both of these switches are turned ON during operation, the motor stops running.

Turn ON the start switch (closing the circuit across terminals STF/STR and P24) (Note 1). The forward or reverse rotation indication lamps begin blinking, indicating that the corresponding signal is output.

Acceleration - Fixed speed Ext. multi speed HI Mid Lo 50.00 4. Deceleration

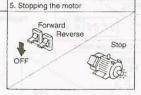
(Blinks)

Turn the variable resistor (used for setting the frequency) clockwise gradually to the end position. The frequency displayed in the display unit increases as the variable resistor is turned and will reach 50Hz. (default values) Otherwise switch the multispeed signals.

> Turn the variable resistor (used for setting the frequency) counterclockwise gradually to the end position (Note 2). The frequency displayed in the display unit decreases gradually as the variable resistor is turned and will reach zero (0Hz), (default values)

Turn OFF the start switch (opening the circuit across terminals STF/STR and P24). The motor stops running.

ote 2: If the start switch is turned OFF while the variable resistor is not at zero, the motor decelerates and stops. A high frequency noise will be generated just before the stop when DC injection braking is working, this does not indicate abnormal operation.



0.00

Hz O A

The "STOP" key can be activated to be used in any mode by setting Pr.75 to 14, 15 16 or 17.

12.4 PU Operation Mode (Operation Using the Parameter Unit)

(1) Ordinary operation

By repeating items 2 and 3 below while the motor is running, it is possible to change the motor speed.

Operation procedure (operation at 50Hz)

1. Turning ON power — Checking the operation mode the operation mode of the operation mode of the operation mode of the operation frequency of the operation operation

WHITE

1023

(0)

Turn ON the power (POWER indicator tamp lit) and press the [PU OP] key. Make sure that the PU operation mode indicating tamp is lit.

If the indicating lamp is not lit, change the operation mode to the PU operation mode by referring to the procedure given on page 24.

Set the operation frequency at 50Hz.

Direct setting (Note 1)
 Step setting (Note 2) (Note 3)

Note 1: The operation frequency is directly set using the numeric keys after pressing the [PU OP] key. Direct setting is not possible in the monitor mode. To set the operation frequency directly while the inverter is in the monitor mode, cancel the monitor mode by pressing the [PU OP] key and set the new operation frequency.

Press the [WRITE] key.

Be sure to press the [WRITE] key after setting the frequency.

The set value is not stored to the memory if it is not pressed.

<Step setting>

3. Writing the value of frequency

Press either the [FWD] or [REV] key. The motor starts running. The mode automatically changes to the monitor mode and the display unit gives the output frequency.

Press the [STOP] key. The motor decelerates and stops.

Note 2: The operation frequency is set by pressing the [▲] and [♥] keys.

The frequency is changed only while the [▲] (or [♥]) key is held pressed. Initially

only while the [A] (or [V]) the Irequency gradually changes to allow fine adjustment of the frequency. The frequency set in the step setting mode is automatically stored in memory 10 seconds after completion of setting.

STOP RESET Stop

controlled.

In this mode, if the
Parameter unit is removed
the the motor cannot be

To prevent damage or injury the PU Disconnection Alarm must be activated. Set Pr. 75 = 2, 3, 16 or 17

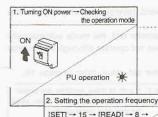
Note 3: Step setting is possible while the inverter is operating.

However, if the [♠] (or [♥]) key is pressed in the monitor mode, the frequency value being adjusted does not stop immediately even when the key is released, but it continues changing. (Since the [♠] and [♥] keys increase and decrease the frequency, an error is generated in the monitor mode.)

(2) Jog operation

For the procedure to be followed for changing the parameter set value, refer to page 19.

Operation procedure (jog operation at 8Hz)



[WRITE]

Turn ON the power (POWER indicator lamp lit) and press the [PU OP] key. Make sure that the PU operation mode indicating lamp

If the indicating lamp is not lit, change the operation mode to the PU operation mode by referring to the procedure given on page 24.

> Set the operation frequency used for jog operation in Pr.15 (jog

frequency). (Note 1)

Note 1: Operation frequency and acceleration/ deceleration time for log operation can be set. <Factory-setting>

- Pr.15 (jog operation frequency)5Hz
- Pr.16 acceleration/deceleration time for jog operation to reach frequency set in Pr.20.

......0.5 sec.

3. Selecting the jog operation mode

J06 4. Operating the motor

Press the [PU OP] key twice.

The jog operation mode is selected and "JOG" is displayed in the display unit.

[FWD] (or [REV])

5. Canceling the jog operation mode

Note 2: If the motor does not start running, check the setting for Pr.13 (start frequency). If the set frequency for jog operation is lower than the start frequency, the motor

Press the [FWD] or [REV] key. The motor runs while the key is held pressed and it stops running when the key is released.

(Note 2)

50.00

Press the [PU OP] key. The jog operation mode is canceled. To return to the jog operation mode using the same operation frequency, simply press the [PU OP] key.

* Setting frequency is displayed

will not run. If the parameter unit is disconnected from the inverter during a jog operation, the inverter recognizes that the [FWO] or [REV] key is released and will decelerate and stop the motor after about 1 second.



In this mode, if the Parameter unit is removed the the motor cannot be controlled.

To prevent damage or injury the PU Disconnection Alarm must be activated. Set Pr. 75 = 2, 3, 16 or 17

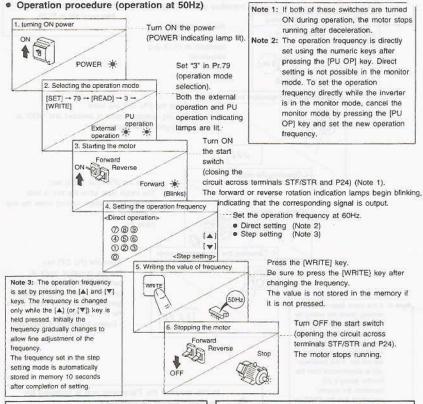
12.5 Combination Operation Mode (Operation Using both External Signals and Parameter Unit)

 To operate the inverter using external start/stop signals and the operation frequency set by the parameter unit:

The frequency external speed setting signal and the forward, reverse, and stop keys on the parameter unit are not functional.

Note: If the forward or reverse key is pressed on the parameter unit, the mode automatically changes to the monitor mode. In this state, the inverter does not operate although the reverse indicating lamp blinks.

For the procedure to be followed to change the parameter set value, refer to page 19.



A

In this mode, if the Parameter unit is removed the the motor speed cannot be controlled. To prevent damage or injury the PU Disconnection

To prevent damage or injury the PU Disconnection Alarm must be activated. Set Pr. 75 = 2, 3, 16 or 17 In this

In this mode, the Parameter unit "START" & "STOP,170 keys are disabled.

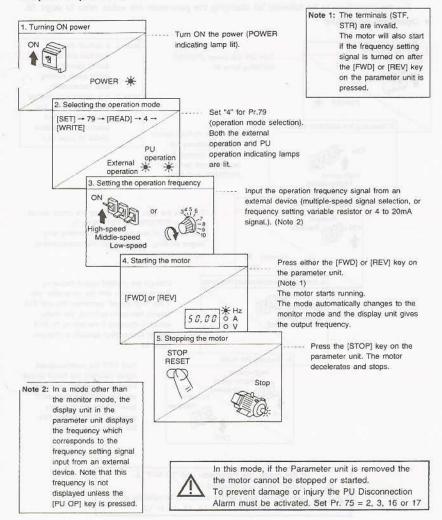
The "STOP" key can be activated to operate in any mode by setting Pr.75 to 14, 15, 16 or 17.

12. OPERATION

(2) To operate the inverter using operation frequency set by an external device and the start and stop commands from the parameter unit:

For the procedure to be followed to change the parameter set value, refer to page 19.

Operation procedure



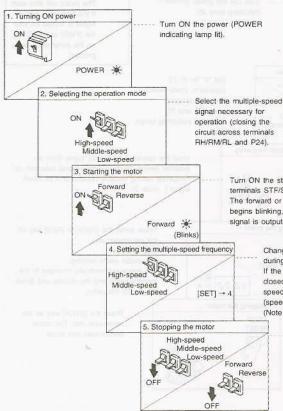
12. OPERATION

(3) To operate the inverter using the start signal and multiple-speed signal input from an external device and the speeds set by the parameter unit:

The operation is accomplished by a setting of "0" (factory-setting) in Pr.79 (operation mode selection).

For the procedure to be followed for changing the parameter set value, refer to page 19.

Operation procedure



Note 1: If both of these switches are turned ON during operation, the motor stops running after deceleration.

Note 2: It is possible to change the frequency for the speed which is not selected for operation. (Refer to page 56.)

Turn ON the start switch (closing the circuit across terminais STF/STR and P24) (Note 1). The forward or reverse rotating indicating lamp begins blinking, indicating that the corresponding signal is output.

Change the multiple-speed frequency during operation with the parameter unit. If the "high-speed" (terminals RH and P24 closed) has been selected, the motor speed is changed if the setting for Pr.4 (speed setting (high-speed)) is changed. (Note 2)

Turn OFF the multiple-speed signal (opening the circuit across terminals RH/RM/RL and P24) and turn OFF the start switch (opening the circuit across terminals STF/STR and P24), the motor stops running.



In this mode, the Parameter unit "START" & "STOP" keys are disabled.

The "STOP" key can be activated to operate in any mode by setting Pr.75 to 14, 15, 16 or 17.

12.6 Switch over mode

With this mode, the external operation mode, PU operation mode and computer link operation modes can be entered while the inverter is running.

The following mode transition functions are valid during the switch over mode.

Operation mode transition	Transition operation/operation state
External operation	Press the PU operation key. The rotation direction will continue to be that applied during external operation, until changed on the PU.
⊃U operation	 The set frequency will continue to be the value set with the variable resistor (frequency setter), until changed on the PU. (Note that once the power is turned OFF or inverter is reset, that set value will be cleared.)
External operation # Computer link operation	Remove the parameter unit, and install the computer link unit FR-CU03 (option). Note: Pr.75 = 0, 1, 14 or 15 Transmit the command to change to the computer link mode from the computer. The rotation direction will continue to be that applied during external operation, until changed by the computer. The set frequency will continue to be the value set with the variable resistor (frequency setter), until changed by the computer. (Note that once the power is turned OFF or inverter is reset, that set value will be cleared.)
PU operation External operation	Press the external operation key on the parameter unit. The rotation direction will be decided by the external operation input signal. The set frequency will be decided by the external frequency setting signal. Care should be taken when changing to External operation. Ensure the direction of rotation, and set speed will not darmage the machine, or cause hazardous situation.
PU operation Computer link operation	Remove the parameter unit, and install the computer link unit FR-CU03 (option). Note: Pr.75 = 0, 1, 14 or 15 Transmit the command to change to the computer link mode from the computer. The rotation direction and setting frequency will continue in the PU operation state, until changed by the computer.
Computer link operation External operation	Remove the computer link unit FR-CU03 (option), and install the parameter unit. Note: Pr.75 = 0, 1, 14 or 15 Press the external operation key on the parameter unit. The rotation direction will be decided by the external operation input signal. The set frequency will be decided by the external frequency setting signal. Care should be taken when changing to External operation. Ensure the direction of rotation, and set speed will not darmage the machine, or cause hazardous situation.
Computer link operation \$ PU operation	Remove the computer link unit FR-CU03 (option), and install the parameter unit. Note: Pr.75 = 0, 1, 14 or 15. Press the PU operation key on the parameter unit. The rotation direction and setting frequency will continue in the computer link operation state, until changed by the PU.

12.7 Edit Enable Signal Mode (-Pr.79)

Usually, the operation mode should be changed to the PU operation mode when changing the set value for parameters. In the edit enable signal mode, changing the values set in parameters is enabled and disabled by turning ON and OFF the external signal input across the terminal MRS/RT and P24.

. In the edit enable signal mode, the following functions are available.

Set value	Signal (MRS - P24)	Function and operation
7	Closed	In the external operation mode, output is shut off. Operation mode is switched to the PU mode. In the PU mode, set values for parameters can be changed. Operation in the PU operation mode is enabled.
	Open	Operation mode is forcibly changed to the external operation mode. Operation in the external operation mode is enabled. Operation mode change to the PU operation mode is disabled.

Note: Setting of "7" is allowed if the setting for Pr.44 (second acceleration/deceleration time) is "9999".

The functions and operation according to ON/OFF status of the external signal (terminal MRS/RT) are summarized below.

MODE	STATUS	STATUS OF MRS/RT - P24	OPERATION MODE CHANGE	OPERATION STATUS CHANGE	PARA- METER WRITE	REMARKS
PU -	STOP	-0-3-60-	Forcibly changed to EXT mode	Forcibly changed to EXT mode speed/ rotation values (3)	becomes disabled	Motor will rotate if STF or STR-P24 and speed signal are present. (8)
PO	RUN FWD or REV	-0-\$-6°	Forcibly changed to EXT OP mode	Forcibly changed to EXT mode speed/rotation values (3)	becomes disabled	Motor will rotate if STF or STR-P24 and speed signal are present. (8)
EXT	STOP	-60-\$-00	Forcibly changed to PU OP mode (7)	remains stopped	becomes enabled	
	RUN STF or STR P24	-60-\$-00	No change (2)	remains in EXT operation.	remains disabled.	

<Precautions>

- After turning ON the MRS/RT terminal, if the setting for Pr.79 is changed to any value other than "7" in the PU operation mode, the MRS/RT terminal functions as the ordinary MRS terminal (mechanical reset terminal) instead of the edit enable signal terminal. Then the operation mode is changed according to the new setting for Pr.79.
- When mode changed is attempted between the external operation mode to the PU operation mode with the MRS/RT terminal ON, the mode change will not occur if the STF or STR terminal is ON.
- 3. In the setting of Pr.79 = 7 with the MRS terminal ON, if the MRS terminal is turned OFF while in the PU operation mode, the operation mode is changed to the external operation mode independent of the ON/OFF status of the terminal (STF, STR). Therefore, if the MRS terminal is turned OFF while either the STF or STR terminal is ON, the motor is controlled in the external operation mode.
- During the operation in the PU operation mode, the ordinary MRS function does not work.
- When the mode is changed from the PU operation mode to the external operation mode forcibly, the parameter unit is internally reset once to secure the monitor screen.
- If an alarm has occurred, the inverter can be reset by pressing the stop key in the PU operation mode. Resetting of the inverter in the external operation mode is not possible. Therefore, resetting the inverter always changes the mode to the PU operation mode.
- If motor is stopped in EXT mode by both STF-P24 and STR-P24, closing MRS/RT-P24 will not forcibly change operation to PU operation mode.
- 8. STF-P24 or STR-P24 must be opened (stop) before PU operation can be resumed.
- The "STOP" key can be activated to operate in any mode by setting Pr.75 to 14, 15, 16 or 17.

12.8 Local/Auto External Signal Selection Mode (-Pr.79)

In this mode, the operation mode can be modified by turning ON/OFF an external signal (terminal RH and P24). Since the operation mode can be fixed by the external signal, erroneous mode switching can be avoided.

Set value	Signal (RH - P24)	Fixed mode	Comment
0	Close	External operation mode	Changing to the PU operation mode is impossible.
8	Open	PU operation mode	Changing to the external operation mode is impossible.

If the circuit across terminals RH and P24 is closed while in the PU operation mode, the operation mode is forcibly changed to the external operation mode. If it is opened, the operation mode is forcibly changed to the PU operation mode.

Note that this mode change is possible only while the inverter is stopped. The mode change is not allowed while the inverter is operating.

Note: If "8" is set for Pr.79, the function of the terminal RH (multiple speed setting (high-speed)) is changed to the local/auto external selection function. In this setting, the multiple speed function of the terminal RH does not work.

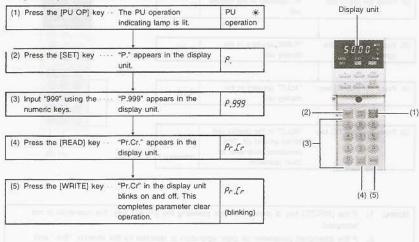
13. INITIALIZING THE PARAMETERS

The operation to return the set values for the parameters, excluding the calibration value, to the factory-set values (initialization) is called "parameter clear".

The operation to initialize all the parameters including the calibration values is called "parameter all clear".

13.1 Parameter Clear (-Pr.999)

Operating procedure



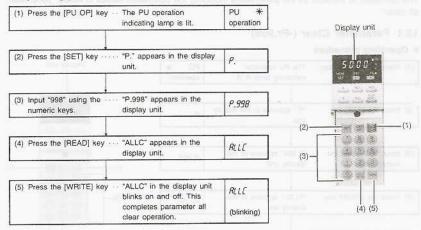
Note: In the parameter clear operation, the following parameters are not initialized.

Pr.900 FM terminal calibration
Pr.903 Frequency setting voltage gain
Pr.905 Frequency setting voltage gain
Pr.905 Frequency setting current bias
Pr.906 Frequency setting current bias
Pr.907 Frequency setting current bias
Pr.908 Frequency at 5V (10V) input
Pr.709 Frequency at 20mA input
Pr.709 Frequency at 5V (10V) input

13. INITIALIZING THE PARAMETERS

13.2 Parameter All Clear (-Pr.998)

Operating procedure



- Notes: 1. If the [WRITE] key is pressed before pressing the [READ] key, the operation is not accepted.
 - If the attempted parameter all clear operation is rejected by the inverter, "Err." and "ALLC" are displayed alternately.

Note: In the parameter all clear operation, the following parameter is not initialized.

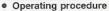
Pr.75 Reset selection/detection of parameter unit disconnection

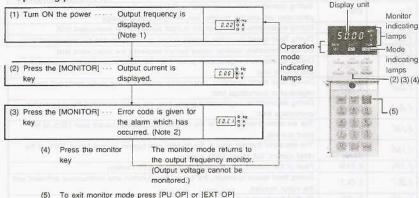
Note: While writing of the parameters is disabled, Pr.77 = 1 or during operation in Pr.77 = 0, it is not permissible to change the value set for parameters. In this case, however, Pr.900 to Pr.905 can be changed.

MONITORING

Just after turning ON the power, or when the monitor key is pressed, the parameter unit enters the monitor mode. In the monitor mode, load status (output frequency, output current, etc.), protective function status in response to an alarm, etc. can be monitored.

(1) Changing the monitor information (output frequency, output current, error code) The monitor information is changed each time the monitor key is pressed.





Notes 1: When the [WRITE] key is pressed while the parameter unit is displaying any of the above indicated monitor data, priority is given to that monitor mode and is displayed first when the mode is changed to the monitor mode or just after the power is turned ON.

If a fault occurs within the inverter, the error message is given immediately. For the procedure used for checking the contents of the alarm, refer to Troubleshooting section on page 90.

(2) Other monitor

Monitor type	Display	Description			
Rotation speed (rpm)	Display unit and monitor mode lamp	The information is displayed when Pr.37 is set.			
Motor rotating direction (forward, reverse)	Samuel annual	The forward or reverse indicating lamp blinks on and off.			
Juring operation	Forward, reverse indicating lamps	The indicating lamp blinks on and off while the inverter operating. The indicating lamp is off while the inverter i stopped. (Note 3)			
External/PU operation mode		The external or PU operation mode indicating lamp is lit.			
Monitor mode	Mode indicating lamp	The monitor mode indicating lamp is lit.			
Setting mode	and the Assessment	The setting mode indicating lamp is lit.			
Jog mode	Display unit	"JOG" is displayed when the jog mode is selected.			

Note 3: When the forward or reverse key is pressed in the PU operation mode or when the forward or reverse switch is turned ON in the external operation mode, the parameter unit recognizes this as "in-operation" and the indicating lamp blinks.

If the stall prevention function is activated while in the monitor mode, the monitor mode indicating lamps
 Hz, A and V blink.

ERRORS

If a failure occurs within the inverter during operation, the corresponding error code is automatically displayed in the parameter unit.

15.1 Error Codes and Contents of Errors

Display	Error code	Contents of error
E. 0	E 0	Normal*
Err.	ERR	Setting operation error, reset signal is ON, incorrect connection between the parameter unit and the inverter, etc. wrong incoming voltage.
E.DC 1	E OC1	During acceleration, inverter output current exceeded the overcurrent limit.
E.0C2	E OC2	During fixed speed operation, inverter output current exceeded the overcurrent limit.
E.DC3	E OC3	During deceleration, inverter output current exceeded the overcurrent limit.
E.Ou 1	E OV1	During acceleration, regenerative power from the motor exceeded the regenerative overvoltage limit.
E.0u2	E OV2	During fixed speed operation, regenerative power from the motor exceeded the regenerative overvoltage limit.
E.Ou3	E OV3	During deceleration, regenerative power from the motor exceeded the regenerative overvoltage limit.
ESHT	E THT	The electronic thermal relay in the inverter was tripped (current over 150% of the rated current).
Е.ГНП	E THM (Note)	The electronic thermal relay in the inverter was tripped (current below 150% of the rated current, but above 100% current).
E FAn	E FAN	Fault of the inverter fan (provided for 1.5K to 3.7K models)
E.DLT	E OLT	During fixed speed operation, the current limit function was continuously activated and the motor stopped.
E. bE	E BE	Fault of the brake transistor in the inverter was detected.
E.OHC	E OHT	An external relay was tripped, which was connect to drive by customer.
E. PE	E PE	Fault of the memory device in the inverter where the parameter data is stored, CPU defective.
E.PUE	E PUE	The parameter unit was disconnected from the inverter.
ErEr	E RET	Restarting was not possible within the set number of retries.
E.EPU	E CPU	Run-away of the CPU.
E. GF	E GF	If a ground fault current has flowed due to a ground fault occurring in the output (load) side of the inverter, this function stops the inverter output. A ground fault occurring at low ground resistance may activate the overcurrent protection (OC1 to OC3). Provided for the 400V type only.
E.DPF	E OPT	Option fault**

Note: The ETHM error occurs to protect the motor if current less than 150% of the motor rated current set in Pr.9 is supplied for an extended period of time. This calculation includes the effect of reduced motor cooling at slow speeds, (ETHM can occur at less than I_{MOT} current value in Pr.9.) see page 57.

Example

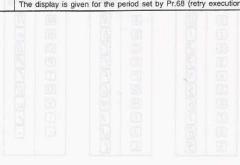
. If "5A" is set for Pr.9 (electronic thermal relay).

5(A) × 150(%) = 7.5(%)

The protective function is activated by a current below 7.5A, due to the I^2 t (the inverse time trip) characteristic of the built-in electronic thermal relay circuit.

- (*) This error is displayed in the emergency stop status established by selecting the PU STOP key function in external operation is stopped by pressing this stop key during external operation and pressing the stop key.
- (**) When using the option FR-CU03, this error will display on the following condition: during error from exceeded retries during communication, exceeded interval of communication time; retry execution during normal operation.

Display	Error code	Contents of error
E.OPT	E OPT	When the retry function is selected, retry is executed if the corresponding inverter alarm occurs. This message is displayed while retry is executed.
	31	The display is given for the period set by Pr.68 (retry execution waiting time).



The posterior of the errors are spored for the part four events. To check the consults of these



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15.2 Digital Display (7-Segment Display) and Actual Characters

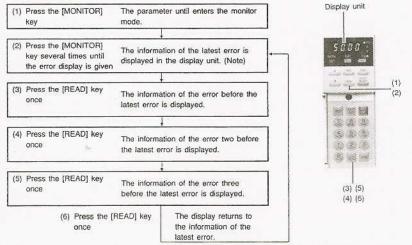
The indication given by the 7-segment display represents the actual characters as shown below.

Actual character	Display	Actual character	Display	Actual character	Display
0103456789					

15.3 Logged Error Contents

The contents of the errors are stored for the past four events. To check the contents of these stored errors, follow the procedure indicated below.

Operating procedure

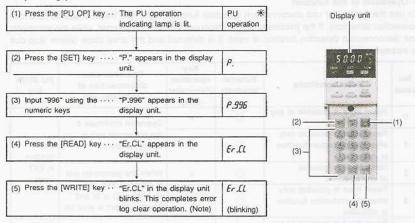


Note: For the information of the latest error, a period is displayed following "E". (Example: E.OC1)

15.4 Clearing Error Log - Pr.996

The error log (four events) can be cleared by the following operation.

Operating procedure



Note: If the attempted error history clear operation is rejected by the inverter, "Err." and "Er.CL" are displayed alternately.

• To check the operation status just before the occurrence of an error:

If an error occurs, the contents of the display unit automatically switches to the display of the actuated protective function. If the monitor key is pressed without resetting the inverter, the display unit displays output frequency. The frequency displayed will be that at which the motor was running just before the occurrence of the error. Current value can be checked in the same manner. However, these values are not stored in the error log and are cleared by the reset operation.

16. PARAMETER UNIT DISCONNECTION DETECTION FUNCTION

This function detects disconnection of the parameter unit from the inverter and stops the inverter operation when Pr.75 is set to 2, 3, 16 or 17.

· Operation of the function

To use the parameter unit disconnection detection function, set Pr.75 (reset selection / PU disconnection detection). If the parameter unit is disconnected from the inverter, while the parameter unit disconnection detection function is valid, it is detected and the drive stops (alarm stop due to inverter error).

Set value	Reset conditions	External terminals	Key operation (Parameter unit)	Operation after disconnection of parameter unit	PU STOF	
0	Reset input is possible at any time.	0	×	Operation continues if		
1	Reset input is possible only when the protection function is activated.	0	0	the parameter unit is disconnected.	No function in EXT mode.	
2	Reset input is possible at any time.	0	×	When the parameter unit		
3	Reset input is possible only when the protection function is activated.	0	0	is disconnected, the ALARM LED is lit and inverter output is shut off.		
14	Reset input is possible at any time (factory-setting). (Note 1)	0	×	Operation continues if	When stop key	
15	Reset input is possible only when the protection function is activated.	0	0	the parameter unit is disconnected.	on PU is pressed in any	
16	Reset input is possible at any time.	0	×	When the parameter unit	operation mode,	
17	Reset input is possible only when the protection function is activated.	0	0	is disconnected, the ALARM LED is lit and inverter output is shut off.	motor stops. (Note)	

O: Yes. x: No

Note: The error display at an occurrence of alarm stop is "E.PUE".

Cautions on setting the parameter unit disconnection detection function:

- (1) If the parameter unit is not connected at the start of operation, an alarm does not occur.
- (2) This function recognizes "disconnection" when the parameter unit is disconnected for more than 1 second.
- (3) To restart the inverter operation after the occurrence of the disconnection alarm, confirm the connection of the parameter unit and reset the inverter, (refer to page 43)
- (4) If the inverter is operated without selecting the parameter unit disconnection detection function, operation is continued even after the parameter unit is disconnected from the inverter, which may create a hazardous situation. Therefore, to ensure safe operation, it is recommended that the parameter unit disconnection detection function be selected.

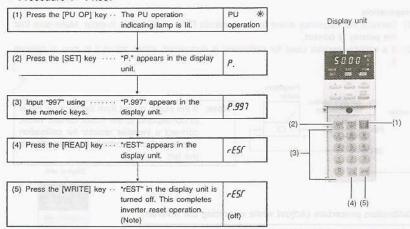


If parameter unit operation or combined operation is used, this protection function must be set, otherwise inverter cannot be controlled if the PU is removed.

17. RESETTING THE INVERTER

To reset the inverter, follow any of the following four procedures. Remember that the accumulated internal thermal data of the electronic thermal relay and the retry count are cleared if the inverter is reset.

Procedure 1 - Pr.997



Note: If the attempted inverter reset clear operation is rejected by the inverter, "Err." and "rEST" are displayed alternately.

Procedure 2

Press the [STOP] key while the inverter is in faulty state. (Alarm has occurred.)

Procedure 4

Close the circuit across the reset terminal RES and P24 for more than 0.1 second and then open it.

'rocedure 3

Turn OFF power supply. After making sure that the POWER indicating lamp or the LED has gone out, turn on power supply again.



The data related to the electronic thermal relay and the regenerative brake duty ratio is cleared when the inverter is reset. Repeated use of the reset function may lead to damage due to thermal built up.

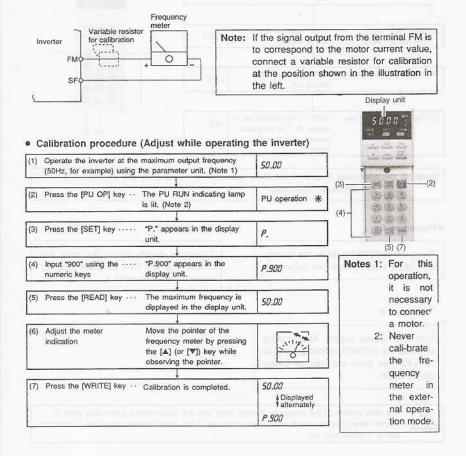
18. CALIBRATING THE FREQUENCY METER

The frequency meter connected to the terminals FM and SF can be calibrated using the parameter unit.

If a digital frequency meter is used, you may want to adjust the frequency of pulse-train output.

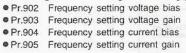
Preparation

- Connect the frequency meter to the terminals FM and SF of the inverter. Make sure that the polarity is correct.
- (2) If a variable resistor used for calibration is connected, either adjust it to zero or remove it.

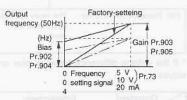


19. ADJUSTING "BIAS" AND "GAIN" OF FREQUENCY SETTING SIGNALS

To control the output frequency of the inverter, external reference signals are input either in voltage (0 to 5 VDC, 0 to 10 VDC) or current (4 to 20mA DC). "Bias" and "Gain" are used to adjust the relationship between the external reference signal and the frequency to be output. Bias and gain are set using the following parameters.



*djust the gain and bias by applying a voltage cross terminals 2 and 5. (Refer to Note.)

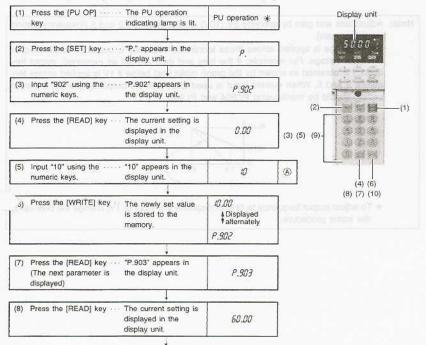


Adjusting Procedure

Example: Pr.902 (frequency setting voltage bias) ... Output frequency should be 10Hz when frequency setting voltage is 0V.

Pr.903 (frequency setting voltage gain) ... Output frequency should be 50Hz when frequency setting voltage is 5V.

In this example before beginning adjustment, make sure that the setting for Pr.73 (0 to 5V / 0 to 10V selection) is "0" (factory setting ... 0 to 5V). Refer to page 72.



19. ADJUSTING "BIAS" AND "GAIN" OF FREQUENCY SETTING SIGNALS

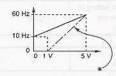
(9)	Input "50" using the numeric keys.	"50" appears in the display unit. Output frequency for 5V input	50	(8)	
(10)	Press the [WRITE] key · ·	The newly set value is stored to the memory.	50.00 Displayed Valternately	ov grilli ov grilli ov grilli	

^{*} If the voltage difference between bias and gain is less than 5% the drive will not accept the values.

Operation AT	1 or 2	entiometer kΩ (Pr 73=0) . 10-2-5 (5V)	0-5V Pr 73 = 0 Term 5 - 2(+)	0 - 10V Pr 73 = 1 Term 5 - 2(+)	4 - 20 MA Term 4(+), 5
8	100	ootentiometer to um setting	Input 0V	Input 0V	Input 4mA
®	1 - 1/	ootentiometer to num setting	Input 5V	Input 10V	Input 20mA

Note: Adjust bias and gain by applying 5V (10V) across terminals 2 and 5 (frequency setting input terminals).

While voltage is applied across these terminals, frequency is output corresponding to the input voltage. For example, if the bias and gain are set as explained, output frequency is obtained as shown by the graph (solid line) below if 1V is applied across terminals 2 and 5. When current input is used to control the output frequency, a similar setting should be made using Pr.904 and Pr.905.



^{*} To adjust output frequency to 0Hz in response the input of 1V, change the bias using the same procedure.

20. CONTROLLING KEY CLICK SOUND (TACTILE FEED BACK)

With the model FR-PU03E parameter unit, a key click sound can be added to confirm complete execution of key stroke. To output key click sound, follow the procedure below.

- Pr.990 is factory set to 0 for no key click sound.
- To change the setting to "with key click sound", set "1" in Pr.990.

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en aligned some entition's a rice of entitions. In proposal limit protoning all struck in a rice of the artificial in a rice of the artificial in a rice of the artificial in a rection control.		

21. SELECTING GENERAL-PURPOSE MAGNETIC FLUX VECTOR CONTROL

The general-purpose magnetic flux vector control is simply selected by setting the motor capacity in Pr.80.

The general-purpose magnetic flux vector control is effective for applications where high starting torque at low speed is required, or where the load is varying.

(1) Conditions for selecting the general-purpose magnetic flux vector control The general-purpose magnetic flux vector control can be effectively used only when the following conditions are satisfied. If these conditions are not satisfied, insufficient torque, irregular rotation, and other problems may occur. In which case, standard voltage/frequency (V/F) control should be selected.

Conditions

- The motor capacity is either equivalent to or one rank below the inverter capacity.
- The motor type is either a Mitsubishi standard motor (0.1kW or larger, 200V class;
 0.2kW or larger 400V class), a Mitsubishi constant torque motor (force ventilation type) or Mitsubishi equivalent.
- The number of poles is 2, 4, or 6. (It is not necessary to set the number of poles. For constant torque motors, 4 poles only)
- Each motor is controlled by its own inverter.
- Wiring distance between the motor and the inverter is within 30 m. If the distance exceeds 30m, refer to Mitsubishi.
- (2) Selecting the general-purpose magnetic flux vector control ... Set the motor capacity in Pr.80. That simple.

Note: Cautions on general-purpose magnetic flux vector control

- (1) Rotation of the motor may be a little more irregular than in the V/F control.
- (2) A 0.1 to 0.2 second delay is generated due to control data calculation at start up.
- (3) If this control is selected, the following parameter settings will be ignored. (Pr.0, 3, 14, 46, 47)

Applications for which the general-purpose magnetic flux vector control is recommended

- On a machine which requires high starting torque
- On a machine where torque variation is excessive
- On a machine which requires more torque at low-speed than V/F mode

(This control is not recommended for machines, such as grinders and lapping machines, which require minimum speed ripple during low-speed operation.)

(3) Parameters related to the general-purpose magnetic flux vector control

Parameter No.	Name	Setting range	Set value	Description	Factory- setting	
		A024S-EC	9999	Selection of V/F control	0	
Pr.80 Motor capacit		0.2K to 2.2K, 9999 A044-EC 0.2K to 3.7K, 9999	0.2 to 3.7	Setting of motor capacity (kW) (Selection of general-purpose magnetic flux vector control)	1=	

21. SELECTING GENERAL-PURPOSE MAGNETIC FLUX VECTOR CONTROL

Setting methods when wiring distance is particularly long

1. Setting procedure

(1) If the maximum wiring distance is longer than the values given in the following table, disable the current limit by setting special parameter 98. (The default setting is "0", but this setting should be set to "8" for long cable applications.)

Inverter capacity	0.1K	0.2K	0.4K	0.75K	1.5K	2.2K	3.7K
For non-low noise operation	200m	200m	300m	500m	500m	500m	500m
For low-noise operation	30m	100m	200m	300m	500m	500m	500m

Pr.98		Current Limit		Stall Prevention			
Value	Accel	Run	Decel	Accel	Run	Decel	
0 (std)	Υ	Y	Y	Y	Y	Y	
1		Υ	Y	0 0	Y	Y	
2	Y	77697	Y	Y		Y	
3			Υ			Y	
4	Y	Υ		Υ	Y		
5		Y	200	Jan Branch - H	Y		
6	Y		100 A / 1 - 100	Y		-56	
7							
8				Y	Y	Y	
9					Y	Y	
10		marks) 0		Y		Y	
11						Y	
12				Υ	Y		
13					Y		
14		10 Hz (1		Y			
15	7			-			

Note) Y: Yes, operation

(2) Special parameter setting procedure

Set the Pr.98 value in (1) above with the following procedure.

①Pr.77: Set to 801 (Note 1), make a record of original Pr.77 value.

@Pr.98: Set the desired value

③Pr.77: Set to 0 or 1 (Return to original setting value.)

Pr.	Name	Setting range	Min. unit	Default setting
98	Current limit, stall preventian function selection	0 ~ 15	1	0

^{#:} Pr.98 is displayed only when Pr.77 is set to 801.

(Note 1) When Pr.77 is set to 801, the parameters following Pr.82 will also be displayed. Do not change the other parameters. The inverter could be damaged if these parameters are changed.

22. PARAMETERS

Func- tion	No.	Function	Setting range	Setting unit	Factory- setting	Remarks	Customer set value	Refe to:	
	0	Torque boost (manual)	0 - 30%	0.1%	6%	s may first 10, as donner as to theoretic frames Aquines			
	1	Upper limit frequency	0 - 120Hz	0.01Hz	120Hz			55	
	2	Lower limit frequency	0 - 120Hz	0.01Hz	OHz				
	3	Base frequency	0 - 400Hz	0.01Hz	50Hz				
suoi	4	Multiple-speed (speed 1)	0 – 400Hz	0.01Hz	50Hz	Cestor Least 1		A	
Basic functions	5	Multiple-speed (speed 2)	0 – 400Hz	0.01Hz	30Hz			56	
Basi	6	Multiple-speed (speed 3)	0 – 400Hz	0.01Hz	10Hz				
	7	Acceleration time	0 - 3600 sec.	0.1 sec.	5 sec.	If 0 is entered, 0.04 second is set.			
	8	Deceleration time	0 - 3600 sec.	0.1 sec.	5 sec.	If 0 is entered, 0.04 second is set.			
	9	Electronic thermal overload relay	0 - 500A	0.01A	Rated output current	0.4k and 0.75k are factory-set to 85% of the rating. Set to motor FLC.		57	
	10	DC injection braking frequency	0 - 120Hz	0.01Hz	3Hz			57	
	11	DC injection braking time	0 - 10 sec.	0.1 sec.	0.5 sec.				
	12	DC injection braking voltage	0 - 30%	0.1%	6%				
	13	Starting frequency	0 - 60Hz	0.01Hz	0.5Hz				
w	14	Selection of applied load	0, 1, 2, 3	1	0	Constant torque pattern Pump/fan torque pattern Z, 3: Vertical loads	58		
tion	15	Jog frequency	0 - 400Hz	0.01Hz	5Hz	Operation possible with PU			
oun func	16	Jog accel./decel. time	0 - 3600 sec.	0.1 sec.	0.5 sec.	Operation possible with PU, 0: 0.04 sec,			
Standard operation functions	17	External thermal relay input	0, 1	1	0	O: No external thermal relay terminal 1: RL/OH external thermal relay terminal		18	
	18	Upper limit frequency for high speed operation	120 – 400Hz	0.1Hz	120Hz			59	
	19	Base frequency voltage	0 - 1000V, 8888, 9999	0.1V	8888	Set to motor rated voltage.			
	20	Reference frequency for accel./decel.	1 – 400Hz	0.01Hz	50Hz	Set to motor rated frequency			
	22	Stall prevention function operation level	0 - 200%	0.1%	150%	an Joseph Ar at 15 15 and	Str. (1-	60	

Func- tion	No.	Function	Setting range	Setting unit	Factory- setting	Remarks	Customer set value	Refe to:
	23	Stall prevention level coefficient for double- speed	0 - 200%, 9999	0.1%	9999	9999 = No setting		
suoi	24	Multiple-speed (speed 4)	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting		
Standard operation functions	25	Multiple-speed (speed 5)	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting		60
operatio	26	Multiple-speed (speed 6)	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting		
ndard o	27	Multiple-speed (speed 7)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting		
Star	29	Selection of accel./decel. pattern	0, 1, 2	1	0	0: Linear, 1: S-pattern A 2: S-pattern B		61
	30	Selection of regenerative brake duty ratio	0.1	1	0	Regenerative brake duty 0: 3% (factory-set value) 1: Value set at Pr.70	Ba	62
noi	31	Computer link E ² ROM write validity	0, 1, 9999	1	0	0: Write enable 1: Write disable		
n functi	32	Communication speed	12, 24, 48, 96, 9999	4	96	9999: Computer communi- cation unavailable		
mmunicatio Note 1)	33	Operation command selection	0, 1, 9999	1	0	9999: Computer communi- cation unavailable	1 16	62
Computer communication function (Note 1)	34	Speed command selection	0, 1, 9999	1	0	9999: Computer communi- cation unavailable		
mputer	35	Start-up operation mode	0, 1, 9999	1	0	9999: Computer communi- cation unavailable		-
	36	Station number selection	0 - 31, 9999	1	0	9999: Computer communi- cation unavailable	N/ ITE	
eration	37	Speed display	0, 0.01 - 9998	0.001	0	0: Output frequency [Hz] Load speed 0.1 - 9998 at 60Hz		
Suandard operation functions	38	Frequency at 5V (10V) input	1 – 400Hz	0.01Hz	50Hz	Choose voltage with Pr.73		63
Sieand	39	Frequency at 20mA input	1 – 400Hz	0.01Hz	50Hz			
Mutt-function output-terminal functions	40	Allocation of output terminals (RUN, FU)	00 - 44	1	02	0: RUN, 1: SU, 2: FU, 3: OL, 4: OMD 1st digit Terminal RUN 2nd digit Terminal FU		64
Multi-function t-terminal func	41	SU frequency band width	0 - 100%	0.1%	10%	Access to the same of the same		
out.te	42	FU frequency value	0 – 400Hz	0.01Hz	6Hz			
dino	43	FU frequency value in reverse rotation	0 – 400Hz, 9999	0.01Hz	9999	9999: Pr.42 value even during reverse operation		65

22. PARAMETERS

Func- tion	No.	Function	Setting range	Setting unit	Factory- setting	Remarks	Customer set value	Refer to:	
62	44	2nd acceleration/ deceleration time	0 - 3600sec., 9999	0.1 sec.	9999	0: 0.04 sec., 9999: MRS terminal mechanical reset			
Second functions	45	2nd deceleration time	0 - 3600sec., 9999	0.1sec.	9999	0: 0.04 sec., 9999: stays as Pr.44		66	
puose	46	2nd torque boost	0 - 30%, 9999	0.1%	9999	9999: stays as Pr.0		. 00	
S	47	2nd V/F (base frequency)	0 - 400Hz, 9999	0.01Hz	9999	9999: Stays as Pr.3			
ion	48	Data length	0, 1, 9999	1	0	9999: Computer communi- cation unavailable			
n funct	49	Stop bit length	0, 1, 9999	1	1	9999: Computer communi- cation unavailable			
nicatio 9 1)	50	Parity check	0, 1, 2, 9999	1	2	9999: Computer communi- cation unavailable		62	
communica (Note 1)	51	CR, LF code selection	0, 1, 2, 9999	1	1	9999: Computer communi- cation unavailable			
Computer communication function (Note 1)	52	Number of communication retries	0 - 10, 9999	1	1	Table 2 To Alle			
Con	53	Communication check time interval	0, 0.1 - 999.8, 9999	0, 1	0	D1 12 (0) Harris			
tions	54	Selection of FM terminal function	0, 1	1	0	0: Output frequency [Hz] 1: Output current [A]	4	66	
Display functions	55	Reference for frequency monitor	0 – 400Hz	0.01Hz	50Hz				
Displa	56	Reference for current monitor	0 - 500A	0.01A	Rated	Name of the latest to		67	
tart	57	Freewheeling time for restart	0.05 - 5 sec., 9999	0.1 sec.	9999	9999: No setting.		0,	
Restart	58	Start-up time for restart	0 - 5 sec.	0.1 sec.	0.5 sec.	11-01-0			
Operation Selection Functions	59	Input terminal allocation	0 to 9998, 9999	1	9999	9999: Same as function before allocation		68	
210010327	60	Input fifter time constant	1 - 8, 9999	1	9999	9999: No setting		69	
Standard operation functions	61	Tone control selection	0. 1	1	0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		69	
r circuit unctions	62	Open motor circuit detection level	0 - 200%, 9999	0.1%	5.0%				
Open motor circuit detection functions	63	Open motor circuit detection time	0.05 - 1 sec. 9999	0.01 sec	0.5 sec	april - 1 versus		70	
Slip com- pensation	64	Constant output range slip compensation selection	0, 9999	7	9999			70	

_								
Func- tion	No.	Function	Setting range	Setting unit	Factory- setting	Remarks	Customer set value	Refe to:
	65	Retry selection	0, 1, 2, 3	1	0			71
	66	Frequency for stall prevention level reduction start	0 – 400Hz	0.01Hz	50Hz			60
	67	Retry count after an occurrence of inverter alarm	0 to 10. 101 to 110	1	0			71
	68	Retry waiting time	0.1 - 360sec	0.1sec	1 sec	3001 (11) 100 (10)		
ons	69	clearing retry count	0	2	0			
Operation selection functions	70	Special regenerative brake duty ratio	0 - 30%	0.1%	0%	Readout possible only when Pr.30 = 1		61
election	71	Selecting the applicable motor	0, 1	1	0			
tion se	72	Selection for PWM frequency	0.7 – 14.5kHz	0.1kHz	1kHz	Synchronous operation equivalent to Z024 is not possible		72
Opera	73	Selection for 0 to 5V/0 to 10V	0, 1	1	0	0: 0 - 5V 1: 0 - 10V		
	74	Selection for current input reference/ starting command, rotation direction command selection	0, 1, 100, 101	1	0	0: RM medium speed 1: RM AU terminal		73
	75	Reset selection/ detection of parameter unit disconnection	0, 1, 2, 3, 14 – 17	1	14			
Slip com- pensation	76	Slip compensation time constant	0.01 - 10 sec, 9999	0.01 sec	0.5 sec			70
	77	Selection for disabling parameter writing	0, 1, 2	1	0	D: Write possible (when stopped) 1; Write prohibit 2: Writing constantly possible		
on functions	78	Selection of reverse rotation prevention	0, 1, 2	1	0	Forward/reverse rotation possible Only forward rotation Only reverse rotation		75
Operation selection functions	79	Selection of operation mode	0 - 4, 6 - 8	1	0	0: PU-external changeover possible 1: PU fixed 2: External fixed 3: f-PU, start - external 4: f-external, start - PU		
do	80	Motor capacity	A024-S:0.2- 2.2kW A044:0.2- 3.7kW 9999	0.01kW	9999	9999: V/F control		78
Stip com- pensation	81	Rated slip	0 - 10%, 9999	0.01%	9999	9999: No setting		70
Standard operation functions	91	Frequency jump 1A	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting	LIEVE	79
Stan	92	Frequency jump 1B	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting		1.00

■ Parameter List

Func- tion	No.	Function	Setting range	Setting unit	Factory- setting	Remarks	Customer set value	Refe to:	
	93	Frequency jump 2A	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
	94	Frequency jump 2B	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting		79	
	95	Frequency Jump 3A	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting		19	
	96	Frequency Jump 3B	0 – 400Hz, 9999	0.01Hz	9999	9999: No setting			
nctions	126	Multiple-speed (speed 8)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
ation fu	127	Multiple-speed (speed 9)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
Standard operation functions	128	Multiple-speed (speed 10)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
	129	Multiple-speed (speed 11)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting		56	
	130	Multiple-speed (speed 12)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
	131	Multiple-speed (speed 13)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
	132	Multiple-speed (speed 14)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
	133	Multiple-speed (speed 15)	0 - 400Hz, 9999	0.01Hz	9999	9999: No setting			
S	900	FM terminals calibration	-	=	-	It is possible to correct during PU operation.			
Calibration functions	902	Bias for frequency reference voltage	0 - 60Hz	0.01Hz	0Hz	It is possible to correct during PU operation.			
ation fu	903	Gain for frequency reference voltage	1 - 400Hz	0.01Hz	50Hz	It is possible to correct during PU operation.		80	
Calibra	904	Bias for frequency reference current	0 - 60Hz	0.01Hz	OHz	It is possible to correct during PU operation.			
	905	Gain for frequency reference current	1 - 400Hz	0.01Hz	50Hz	It is possible to correct during PU operation.			
	990	Key sound selection	0, 1	1	0	0: available, 1: unavailable		18	
10	991	PU operation mode	0, 1, 2	1	0				
nctions	996	Error clear	-	-	ш	This function is valid by writing to the Pr.		81	
Auxiliary functions	997	Inverter reset		-	-	This function is valid by writing to the Pr.			
Auxil	998	Parameter all clear	-	-	7	This function is valid by writing to the Pr.		82	
	999	Parameter clear	-	-	-	This function is valid by writing to the Pr.			

(Note 1) Pr.31 - 36 and Pr.48 - 53 are for Communication Option CUO3.
If CUO3 is not used, do not change the Factory setting of these Parameters.
For information on setting value, refer to CUO3 manual.

■ Description of the Parameters

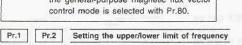
"Pr." in an abbreviation of "Parameter."

Pr.0 Setting the torque boost (manual)

 It is possible to adjust the motor torque in the low frequency range to improve acceleration.

Notes 1: Factory-setting ... 6%

- Change the setting to "4%" for motors designed for use with an inverter (constant torque motor).
- The setting for this parameter is ignored if the general-purpose magnetic flux vector control mode is selected with Pr.80.

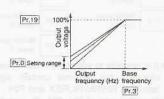


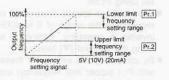
Pr.2 Lower limit frequency

Pr.1

 It is possible to clamp the upper and lower limits of output frequency.

Upper limit frequency

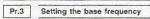




Note: To set the frequency higher than 120Hz, use Pr.18.

△ CAUTION

Note that without the speed command, the motor will start at the preset frequency by merely switching on the start signal if set value of Pr.2 is equal or larger than the value of Pr.13 (starting frequency).

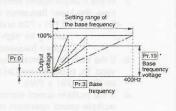


Pr.3 Base frequency

Pr.19 Base frequency voltage

It is possible to set the base frequency on the motor rating plate if it is different to 50Hz.

 By setting the value for Pr.19 (base frequency voltage), the PWM output is modified so that the waveform looks like the voltage value set in parameter 19. This will result in optimum motor performance.



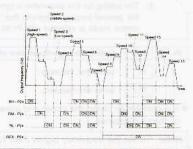
": If "9999" (factory-setting) is set for Pr.19, the maximum output voltage is the same as the power supply voltage.

Note: When general purpose magnetic flux vector mode is selected (Pr.80) the settings of Pr.3 ignored, and 50Hz is used.

When the factory setting of Pr.19 = 8888 is used and Flux Vector is selected, a value of 240V is used in A024S-EC, and 415V in A044-EC for calculations. If the value of Pr.19 \pm 8888, then this value is used for calculations.

Pr.4	Pr.5 Pr.6	Setti	ng the multiple-sp	eed			
Pr.4	Multiple-speed (speed 1)	Pr,24	Multiple-speed (speed 4)	Pr.126	Multiple-speed (speed 8)	Pr.130	Multiple-speed (speed 12)
Pr.5	Multiple-speed (speed 2)	Pr.25	Multiple-speed (speed 5)	Pr.127	Multiple-speed (speed 9)	Pr.131	Multiple-speed (speed 13)
Pr.6	Multiple-speed (speed 3)	Pr.26	Multiple-speed (speed 6)	Pr.128	Multiple-speed (speed 10)	Pr. 132	Multiple-speed (speed 14)
		Pr.27	Multiple-speed (speed 7)	Pr.129	Multiple-speed (speed 11)	Pr.133	Multiple-speed (speed 15)

- It is possible to select the motor speed by simply changing the external contact signal across terminals RH/RM/RL/REX and P24.
- The allocation of RH, RM, RL and REX can be set using Pr.59.
- The individual speeds (frequency) can be set as required, in the range of 0 to 400Hz, while the inverter is operating. Setting is also possible using the [▲] and [▼] keys.
- By combining the setting for these parameters with Pr.1 (upper limit frequency) and Pr.2 (lower limit frequency), setting of up to seventeen speeds is possible.



- Notes 1: If "9999" (factory-setting) is set for Pr.24 to Pr.27 and Pr.126 to Pr.133, speed 4 to speed 15 are not selected.
 - In the multiple-speed setting, if more than two speeds are selected at the same time, the lower frequency is output.
 - <Example> If RH P24 and RL P24 are turned ON at the same time while the setting for high-speed (RH) is 60 Hz and low-speed (RL) is 50 Hz, output frequency is 50Hz.
 - If the external thermal relay input is selected, the multiple-speed 3 setting is not valid, RL becomes the OH terminal. For multiple-speed operation, use the value for Pr.26 (RH + RM).
 - If the multiple-speed signal and external frequency setting signal are input, the multiple-speed operation is given priority.

RL	RM a	RH	REX	speed
-		0	-	Pr.4
	0		_	Pr.5
0	-	-	-	Pr.6
0	0			Pr.24 (when Pr.24 is 9999, speed 4 is not set)
0	-	0		Pr.25 (when Pr.25 is 9999, speed 5 is not set)
-	0	0	-	Pr.26 (when Pr.26 is 9999, speed 6 is not set)
0	0	0	-	Pr.27 (when Pr.27 is 9999, speed 7 is not set)
-	-	-	0	Pr.126 (when Pr.126 is 9999, speed 8 is not set)
		0	0	Pr.127 (when Pr.127 is 9999, speed 9 is the same as Pr.4)
	0	-	0	Pr.128 (when Pr.128 is 9999, speed 10 is the same as Pr.5)
0	-		0	Pr.129 (when Pr.129 is 9999, speed 11 is the same as Pr.6)
0	0	-	0	Pr.130 (when Pr.130 is 9999, speed 12 is the same as Pr.24)
0	(- T	0	0	Pr.131 (when Pr.131 is 9999, speed 13 is the same as Pr.25)
-	0	0	0	Pr.132 (when Pr.132 is 9999, speed 14 is the same as Pr.26)
0	0	0	0	Pr.133 (when Pr.133 is 9999, speed 15 is the same as Pr.27)

Pr.7

Pr.8

Setting the acceleration/deceleration time

Pr.7

Acceleration time

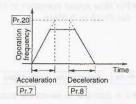
Pr.8

Deceleration time

Pr.20

Base frequency for acceleration/deceleration

- · Acceleration time (Pr.7) indicates the time in which frequency reaches the reference frequency (Pr.20) starting from 0Hz. Deceleration time (Pr.8) indicates the time in which frequency, reaches 0Hz from Pr.20.
- If "0" is set for acceleration/deceleration time. it corresponds to 0.04 sec.



Note: When the acceleration pattern is S-pattern A (refer to Pr.29), the time indicates the period to reach to the base frequency (Pr.3).

Pr.9

Setting the electronic thermal relay

- Set Pr.9 to the motor nameplate full load current the protection includes a compensation factor for reduced motor cooling at lower frequencies.
- If "0" is set, the motor protection function is invalid. The protection function for the output transistor of the inverter is still valid.
- If flux vector mode is used with a force cooled (or inverter rated) motor, set "0" in Pr.9, and to protect the motor use a motor mounted thermal relay into terminals OH & P24. (See Pr.17)
- Factory-setting is "rated output current of the inverter". For 0.4K to 0.75K models, setting is "85%" of the rated output current of the inverter.

Pr.10

Pr.11 Pr.12 Adjusting the DC dynamic braking

Pr.10

DC injection braking frequency

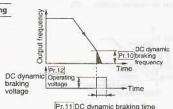
Pr.11

DC injection braking time

Pr.12

DC injection braking voltage

- It is possible to adjust the "positioning on stop" control by setting the DC injection braking voltage, braking time, and the frequency at which braking, applied.
- * DC dynamic braking voltage (factory-setting) ... 6%



Pr.11 DC dynamic braking time

Note: When using an inverter duty motor (constant torque motor) change the setting to 4%

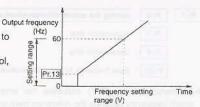
A CAUTION

Install a mechanical brake. There is no stopping torque.

Pr.13

Setting the starting frequency

- The starting frequency can be set from 0 to 60Hz
- For slow speed operation in Flux Vector Control, set Pr.13 to 0.01Hz.



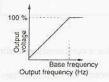
Pr.14

Selecting the applied load

It is possible to select the output V/F characteristics for the application, according to the load.

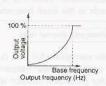
Setting: 0 (factory-setting)

For constant torque load (conveyors, carts)



Setting: 1

For variable torque load (fans, pumps)

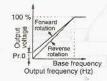


Setting: 2

For vertical loads

Boost for forward rotation ... Setting for Pr.0

Boost for reverse rotation ... 0%

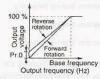


Setting: 3

For vertical loads

Boost for forward rotation ... 0%

Boost for reverse rotation ... Setting for Pr.0



Note: If the general-purpose magnetic flux control mode is selected, the setting for this parameter is ignored.

Pr.15 Pr.16 Setting the jog operation

Pr.15 Jog frequency

Pr.16 Jog acceleration/deceleration time

Output frequency (Hz)
| Ferward rotation |
| Fr.15 | Jog operation |
| frequency |
| settling range | Fr.16 |
| Reverse rotation |
| FWD | ON |
| REV | ON |

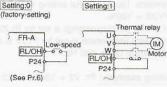
- Pr.16 is the time to accelerate to, or decelerate from the reference frequency set in Pr.20.
- Jog operation is possible using the parameter unit.
 (Jog operation is not allowed when "3" or "4" is set for Pr.79.)
 In the external operation mode, jog operation is not allowed.

Note: If the parameter unit is disconnected from the inverter during jog operation, the inverter will decelerate to a stop.

Pr.17 Setting the thermal relay input

- The function allocated to terminal RL/OH is switched according to the setting of "0" or "1" for Pr.17.
- The allocation of terminals RL/OH, RM/AU, RH and MRS/RT can be set using Pr.59.

RL: Low-speed operation selection signal (see Pr.6)



OH: For inputting the contact signal of the thermal overload relay, installed outside the inverter, or that of the thermal sensor built in the motor. (N.C. contact)

Set	Function of to	1000		
value	RL (Multiple-speed 3) (set using Pr.59)	OH (external thermal relay input)	Comment	
0	•		(factory-setting)	
1	manager and the	0		

Note: If "1" is set in Pr.17, the inverter is expecting a thermal relay N.C, signal. RL is not active.

⚠ CAUTION

Mith the external thermal relay connected, do not switch Pr.17 setting to "0". Otherwise, the motor will be started by the start signal only.

Pr.18 Setting the upper limit frequency for high speed operation

- Set this frequency value if operation is at a frequency higher than 120Hz.
- By setting the frequency for this parameter, the value set for Pr.1 (upper limit frequency) is automatically replaced with this setting.

Pr.19

Refer to Pr.3.

Pr.20

Refer to Pr.7

Pr.22

Pr.23

Dr 66

Setting the stall prevention function operation level

Pr.22

Stall prevention function operation level (current limit operation level)

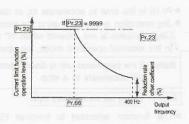
Pr.23

Stall prevention function operation level offset coefficient for double-speed operation (current limit level reduction rate offset coefficient at 400 Hz)

Pr.66

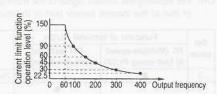
Frequency for stall prevention function level reduction start

- Set the stall prevention function operation level (current limit level) for Pr.22. Usually,the setting should be 150% (factory-setting).
- If the motor is controlled to run at a speed faster than 50 Hz, there are cases when the motor cannot be accelerated because motor current does not increase. For such cases, it is possible to reduce the current limit level in the high frequency range to improve the motor operation characteristics. Usually, initial setting is Pr.66 = 50 Hz, Pr.23 = 100%.
- If "9999" (factory-setting) is set for Pr.23, the current limit level which is set for Pr.22 is applied to the range up to 400 Hz.



Setting example: Pr. 22 = 150%, Pr.23 = 100%, Pr.66 = 60 Hz

Note: The setting value of Pr.22 can not be changed during operation even if Pr.77 is set to 2 (writing during operation enabled.)



Calculating the current limit function operation level

Calculating the current limit function operation level = A + B × $\left(\frac{Pr.22-A}{Pr.22-B}\right)$ × $\left(\frac{Pr.23-100}{100}\right)$

where,

 $A = \frac{Pr.66 \text{ (Hz)} \times Pr.22(\%)}{\text{Output frequency (Hz)}}$

 $= \frac{Pr.66 (Hz) \times Pr.22(\%)}{400 (Hz)}$

A CAUTION

⚠ Do not set the stall prevention operation level too small.
If set so, torque generated will reduce.

Pr.24

Pr.25

Pr.26

Pr.27

Refer to Pr.4.

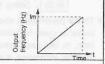
Pr.29

Selecting the acceleration/deceleration pattern

• The acceleration/deceleration pattern can be selected according to the application.

Setting: 0 (linear acceleration/deceleration pattern)

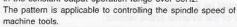
This is the general acceleration/deceleration pattern, the motor is usually operated with this setting.



Setting: 1 (S-pattern A)

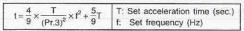
This pattern is used for the applications which require quick acceleration or deceleration in the high speed range (over 50Hz). In this pattern, "fb" (base frequency) is taken as the point of inflection. Using this pattern, it is possible to set the acceleration/deceleration time which fits the motor torque reduction in the constant output operation range over 50Hz.

The pattern is applicable to controlling the spindle speed of



Note: For the value to be set, in Pr.7 and Pr.8 use the time necessary for acceleration up to the base frequency "fb" (Pr.3) instead of the acceleration/deceleration reference frequency (Pr.20).

The actual acceleration time "t" seconds beyond the base frequency "fb" is calculated by the following formula.



Setting: 2 (S-pattern B)

Acceleration/deceleration is always controlled with on S-pattern from "f2" (current frequency) to "f1" (target frequency). Therefore, shock during acceleration and decelration is minimized and this control can be used to prevent loads from being toppled over.

Note: The acceleration/deceleration times set in Pr.7 and Pr.8 relate to the reference frequency in Pr.20.



Note: Even if this parameter is written during operation, it will be validated after the inverter is stopped.

Pr.30	Pr.70	Setting the regenerative brake duty ratio
	Pr.30	Selecting the regenerative brake duty ratio

Pr.70 Setting the special regenerative brake duty ratio

• These parameters should be set when regenerative brake is used frequently due to frequent starts and stop. In this case, since the brake resistor capacity must be increased, it is necessary to use an optional high-frequency brake resistor.

 Setting method: After setting "1" for Pr.30 (changing the duty ratio), set the duty ratio (note 1) for Pr.70.

Model	Setting for Pr.30	Setting range for Pr.70
FR-A024- S0.4K- S2.2K-EC	0 (factory- setting)	(Note 2)
FR-A044- 0.4K- 3.7K-EC	1	0 to 30% (note 3) (factory- setting: 0%

Notes: 1. The brake duty ratio indicates "%ED" of the transistor of built-in brake.

- 2. If Pr.30 = 0, Pr.70 is not displayed. When Pr.30 = 0, the brake duty will be 3%.
- If the set value for Pr.70 should be increased, the value must be smaller than the permissible brake duty ratio of the external brake resistor.

A CAUTION

⚠ Do not set the brake duty above the permissible value of the brake resistor used, otherwise, overheating may occur.

Pr.31	Pr.32 Pr.33 Serial o	ommunic	ation functions		
Pr.34	Pr.35 Pr.36				
Pr.31	Computer link EEPROM write validity	Pr.35	Start-up operation mode	Pr.50	Parity check
Pr.32	Communication speed	Pr.36	Station number selection	Pr.51	CR, LF code selection
Pr.33	Operation command selection	Pr.48	Data length	Pr.52	Number of communication retries
Pr.34	Speed command selection	Pr.49	Stop bit length	Pr.53	Communication check time interval

These Parameters are for Communication Option CU03.
 If CU03 is not used, do not change the Factory setting of these Parameters.
 For information on setting value, refer to CU03 manual.

Pr.37 Setting the speed display unit

- It is possible to display the load speed such as a conveyor, instead of the motor. For this display, it is necessary to set the unit of display which meets the load's speed using the parameter unit.
- Setting should be made for the load's speed at 60Hz.
- Notes: 1. This setting is valid only for the monitor mode using the parameter unit. Parameters related with other speed information such as Pr.1 should be set in units of Hz.
 - The motor speed is given by converting the output frequency. It does not agree with the actual motor speed.
 - Due to the restriction on the resolution of the set frequency, display in the second place right of the decimal point may differ from the set value.

Set value	Display contents	
0 (Factory- setting)	Display is given in output frequency.	
limed d	Set the speed of the load operating at 60Hz.	
0.01 to 9998		If the setting is "950" (r/min), value "950" is displayed when 60Hz is output. (No special unit system is displayed.)

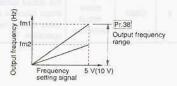
△ CAUTION

Accurately set the operation speed. Failure to do so could lead to motor overspeeding and machine damage.

Pr.38

Frequency at 5V (10V) input

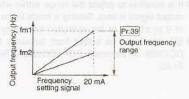
- Set the output frequency corresponding to the external frequency reference signal of 5 VDC or 10 VDC.
- Choose 5 VDC or 10 VDC input with Pr.73.
- Signal input to terminals 5 and 2.



Pr.39

Frequency at 20mA input

- Set the output frequency corresponding to the external frequency reference signal of 20mA.
- Signal input to terminals 4 and 5.



Pr.40 Setting the allocation of output terminals

Output from terminals RUN and FU, can be allocated from the five functions in the table below.
 Setting is made in a two-digit number to be set for Pr.40. Each digit represents the function to be allocated to the individual terminals.

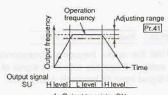
2nd digit
Terminal FU
Terminal RUN
Terminal FU: FU signal

Set value	Function code	Function name	Description	Related Pr.
0	O RUN Inverter operating Signal is output while the inverter is operating at a frequency higher than the starting frequency.		Miny la Miny la su /sa asti k	
1	SU	Frequency arrived	Signal is output when the output frequency	
2	FU	Frequency sensing	Signal is output when a frequency higher than the specified frequency set for sensing level is output.	Pr.42 Pr.43
3	OL	Overload alarm	Signal is output while the current limit function is operating.	Pr.22
Open motor drops below		This is output when the output current drops below a set value during inveter operation.	Pr.62 Pr.63	

Note: If the setting of the 1st digit of Pr.40 is "0" (RUN), the 1st digit value is not displayed. If "02" is set, for example, "2" is displayed.

Pr.41 Adjusting the SU frequency bandwidth

- It is possible to adjust the range within which an output signal is sent. Setting is made in the range of 0 to ±100% of the operation frequency.
- SU signal can be output from terminals RUN -DC12/24 or terminals FU - DC12/24. Refer to Pr.40.



L: Output transistor ON H: Output transistor OFF Pr.42

Pr.43

Setting the sensing for output frequency

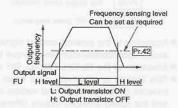
Pr.42

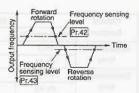
Output frequency sensing

Pr.43

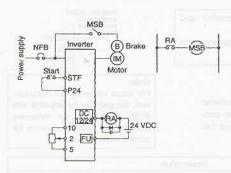
Output frequency sensing in reverse rotation

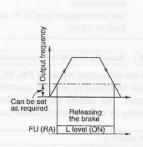
- The signal goes to the L (conducting) level if the output frequency goes beyond the frequency set for the sensing level (the value set for Pr.42). If the output frequency is below this level, the signal is in the H (open) level. This signal ON/OFF operation can be used to control an electromagnetic brake, etc.
- If a value is set for Pr.43, frequency sensing is possible for reverse rotation operation. In this case, the value set for Pr.42 is used only for forward rotation operation. For vertical motion, where the timing to apply the electromagnetic brake is different between the upward and downward motion, the setting for Pr.43 will be effective. When the factory-setting Pr.45 = "9999", the value set for Pr.42 is used for both forward and reverse rotation.
- The FU signal can be output from terminals RUN-DC12/24 or FU-DC 12/24, refer to Pr.40.





Example of output frequency sensing to release an electromechanical brake.





22. PARAMETERS

Pr.44	Pr.45	Pr.46 Pr.47 Setting the second control functions
	Pr.44	2nd acceleration/deceleration time
	Pr.45	2nd deceleration time
	Pr.46	2nd torque boost (manual)
	Pr.47	2nd V/F (base frequency)

- According to the external contact signal input across terminals RT and P24, the setting for the acceleration/deceleration time, torque boost, etc. can be changed collectively.
- Allocation of the RL/OH, RM/AU, RH and MRS/RT terminals is set using Pr.59.
- This feature is effectively used when a single inverter controls two motors, for example a traverse operation motor and vertical operation motor, where the parameter set values differ, and the speed changes require different responses.

Control	A. 787	Signal across	RT and P24
function	Parameter No.	OFF	ON
Acceleration	Pr.7		B 11011
time	Pr.44		0
Deceleration	Pr.8	•	
time	Pr.45		0
Torque boost	Pr.0	0	
(manual)	Pr.46		
Base	Pr.3	•	
frequency	Pr.47		

Before shipping, the output shutoff function is allocated to terminal MRS/RT.

Note: To set different times for acceleration and deceleration:

Set acceleration time in Pr.44 and deceleration time in Pr.45.

Pr.54 Selecting the FM terminal function

 Across the output terminals FM, SF, an ammeter (1mA full-scale) or a digital counter can be connected. The display can read either output frequency or motor current (output current).

Note:

If "9999" (factory-setting) is set for Pr.45, the value set for Pr.44 is used for the second acceleration time and second deceleration time.

If the general-purpose magnetic flux vector control mode is selected by Pr.80, settings for Pr.0, Pr.3, Pr.46, and Pr.47 are all ignored. (See Pr.3 Note)

The second acceleration/deceleration value set for Pr.44 and Pr.45 is the time to reach the value set for Pr.20 (acceleration/deceleration reference frequency) as with the value set for Pr.7 and Pr.8.



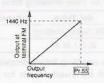
Note:

For output frequency and motor current, the gain can be adjusted with Pr.55 (Reference for frequency monitor) and Pr.56 (Reference for current monitor).

Set value	Description	
0	Output frequency (factory-setting)	
1	Motor current (output current)	

Pr.55 Reference for frequency monitor

 Set the output frequency at which the pulse-train output frequency across terminals FM and SF is 1440Hz. This setting is valid when "0" (output frequency) is set for Pr.54 (selection of FM terminal function).

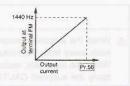


Factory-setting ... 50Hz

'ote: The maximum pulse-train output frequency at terminal FM is 2400Hz. Refer to section 18; Calibrating the frequency meter.

Pr.56 Reference for current monitor

 Set the output current (motor current) at which the pulse-train output frequency across terminals FM and SF, is 1440Hz. This setting is valid when "1" (motor current) is set for Pr.54 (selection of FM terminal function).



Factory-setting ... Rated output current of inverter

Note: The maximum pulse-train output frequency at terminal FM is 2400Hz. Refer to section 18; Calibrating the frequency meter.

Pr.57 Pr.58

Operation restart after momentary power interruption

Pr.57

Free-wheeling time for restart

Pr.58

Start-up time for restart

 At an occurrence of momentary power interruption, it is possible to restart the inverter without stopping the motor when power is restored.

Note: Restart operation after momentary power interruption is made in the 'reduced voltage start method' in which the output voltage is increased gradually while maintaining the set frequency, independent of the motor's free-wheeling speed.

This is different to the method as used with FR-A100 and A200, in which the motor free-wheeling speed is sensed (speed search method), output frequency before the momentary power interruption is output. If power off state continues for more than 0.2 seconds, the frequency before the power interruption cannot be retained and, in such case, the inverter restarts from 0 Hz.

Pr.57 (free-wheeling time)

Set Value	Possibility of Restart
9999 (factory-setting)	Impossible
0, 0.1 to 5*	Possible

Free-wheeling time indicates the time for which the inverter waits for the control for restart.

"If "0" is set for Pr.57, the following standard time is set for the free-wheeling time. Generally, the operation is possible in this setting, the set time can be adjusted in the range of 0.1 to 5 seconds meeting the moment of inertia of load (GD²) and torque.

0.1K to 1.5K.....0.5 sec. 2.2 K to 3.7K.....1.0 sec.

Pr.58 (start-up time)

Usually, the setting of 0.5 seconds (factory-setting) need not be changed. However, it is possible to adjust the output voltage start-up time in the range of 0.1 to 5 seconds meeting the load specification (moment of inertia and torque).

A CAUTION

Men the automatic restart after momentary power interruption function has been selected, keep away from the motor and machine.

When the automatic restart affer momentary power interruption function has been selected, apply the supplied CAUTION seal to an easily identified place.

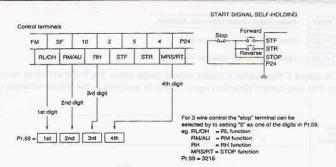
Pr.59 Input terminal allocation

 Nine types of function can be allocated to the control signal input terminals RL/OH, RM/AU, RH, and MRS/RT.

Setting is accomplished by allocating a four-digit value to Pr.59. Each digit represents the function for one of the terminals.

Set value	Function Abbreviation	Function Name	Related Pr.	Remarks
9999	INDOOR IN A	Same as function before allocation	Pr.44, Pr.17, Pr.74	Factory setting
0	AU	Current input selection	Pr.74	
1	RH	Multiple-speed selection (high speed)	Pr.4	
2	RM	Multiple-speed selection (medium speed)	Pr.5	
3	RL	Multiple-speed selection (low speed)	Pr.6	O- North
4	ОН	External thermal relay input	Pr.17	
5	STOP	Start signal self-holding selection	Pr.59	memanta
6	MRS	Output stop	Pr.44	TOTAL SECTION
7	RT	2nd acceleration/deceleration selection	Pr.44	Section 1
8	RT	2nd acceleration/deceleration selection*	Pr.44	
9	REX	15-speed selection	Pr.126 ~ 133	

If 9999 is set for Pr.80, it is possible to switch between V/F control and general-purpose magnetic flux vector control by using the RT terminal.



• When the first digit of Pr.59 is "0", the first digit is not displayed.

Notes: 1. It is also possible to set the same function for two or more terminals. In this case the logical sum of the inputs at each of the terminals is calculated.

- 2. If "8" is set for one of the digits of the Pr.59 setting, and switching between V/F control and general-purpose magnetic flux victor control is executed using the RT terminal, the set values for 2nd acceleration/deceleration time, 2nd torque boost, and 2nd V/F will become effective simultaneously with the RT input, but the switch between V/F control and general-purpose magnetic flux vector control will only take effect when the inverter is stopped.
- When a value between 0 or 8888 is set for Pr.59, terminal functions cannot be selected using Pr.44, Pr.17, or Pr.74.
- The conventional terminal functions are determined by Pr.17, Pr.44 and Pr.74 only when Pr.59 is set to 9999.

Pr.60 Input filter time constant

- Allows the setting of the built-in filter time constant for the external voltage or current frequency setting signal input section. Effective for eliminating noise in the frequency setting circuit.
- Increases the filter time constant if stable operation cannot be performed due to noise. A larger set value results in lower response.

Pr.61 Tone control selection

It is possible to control the motor output tone with the setting of Pr.61.

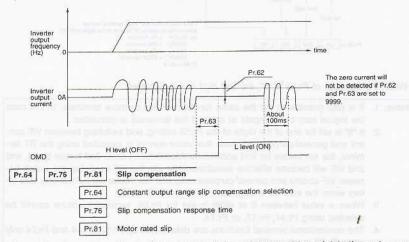
Set Value	Tone Control Selection	
0	No tone control (factory-setting)	
1	Tone controlled	

- The tone control function automatically controls the carrier frequency to change the metallic motor noise to a synthesized tone which is softer on the environment.
- The tone control function is more effective with lower carrier frequency.
 Use this function as a measure to reduce motor noise while restricting electrical noise and leak current.

Note: This function cannot be used if the setting for Pr.72 (PWM carrier frequency) is larger than 10 kHz. Though setting over 10 kHz is possible, tone control will not be available.

Pr.62	Pr.63	Open motor circuit detection function
	Pr.62	Open motor circuit detection level
	Pr.63	Open motor circuit detection time

A signal is output if the inverter's output current drops below the Pr.62 set value during inverter operation. The zero current detection signal (OMD) is assigned to the output terminals with Pr.40.



The motor slip can be estimated from the inverter's output current to maintain the motor speed at a constant level.

Pr.	Function	Explanation of function	Factory setting
76	Slip compensation response time	The slip compensation response time is set. (Note 1)	0.5 sec
81	Motor rated slip (%)	The motor's rated slip is set.	9999

Pr.81 Rated slip = Synchronous speed at base frequency – Rated speed × 100 (%)

Pr.64 selects whether to activate the slip compensation at the constant output range (frequency range higher than frequency set with Pr.3).

Pr.64 setting value	Function
0 10 10	Does not compensate the constant output range slip.
9999	Compensates the constants the output range slip.

Note 1) When this value has a low setting, the response will become quicker, however, the occurrence of the OVT error will increase if the load inertia is large, etc.

Note 2) Slip compensation will not be activated if one or both of Pr.64 and Pr.81 are set to 9999.

Pr.65 Selection of retry

 This parameter can be set to automatically restart the inverter to continue operation by resetting if an inverter alarm occurs. "OPT" is displayed during retry.

A	CAL	1-9-1	CAL
/:\	CAI	U 1 1	ON

A When the retry function has been selected, keep away from the motor and machine unless required. They will start suddenly (after a predetermined time has passed) at occurrence of an alarm.

Set value	Contents of retry		
0	No retry function (factory- setting)		
1	Retry is valid in the case of OV1 to OV3 (shutoff due to overvoltage)		
2	Retry is valid in the case of OC1 to OC3 (shutoff due to overcurrent)		
3	Retry is valid in the case of OV1 to OV3, or OC1 to OC3		

Pr.66 Refer to Pr.22

Pr.67 Pr.68

Retry function

Pr.67

Retry count after an occurrence of inverter alarm

Pr.68

Retry waiting time

Pr.69

Clearing retry count

- The retry function continues inverter operation by automatically resetting and restarting the inverter if an inverter alarm occurs.
- The number of retries is set in Pr.67.

Pr.69

Set value	Alarm signal output			
for Pr.67	Output	Not output	Retry count	
0			Retry not executed (factory-setting)	
1 to 10	×	0	1 to 10	
101 to 110	0	×	1 to 10	

× = NO O = YES

Waiting time until the restart, is set for Pr.68 from 0.1 to 360 seconds.
 It is possible to know the total number of success of the retry for restart by reading Pr.69. If "0" is set, the accumulated count is cleared.

 Λ

- The inverter automatically restarts the operation after the retry waiting time set in Pr.68. Therefore, if the retry function is used, pay sufficient care so that restarting of the inverter will not constitute hazards to the operators.
- In the inverter is reset by the retry function, the accumulated data of electronic thermal relay and regeneration brake duty ratio, etc. is not cleared. This reset is different from the power reset operation.

Pr.70
Refer to Pr.30.

Pr.71 Selecting the applicable motor

• When a Mitsubishi constant torque motor is used, set "1" for Pr.71 independent of the control type (V/F control, general-purpose magnetic flux vector control). The thermal characteristics of the electronic thermal relay are set for the constant torque motor.

Set Value	Characteristics of Electronic Themal Relay	
0	For general-purpose motors	
1	For Mitsubishi constant torque motors	

A CAUTION

⚠ Set this parameter correctly according to the motor used. Incorrect setting may cause the
motor to burn due to overheat.

Pr.72 Changing the PWM carrier frequency

It is possible to charge the noise level of the motor by the setting of Pr.72.

Factory-setting ... 1kHz (not low-noise operation)

- By changing the setting of Pr.72, operation noise is influenced as indicated in the table at the right.
- During the operation of the inverter, the change or writing of the set values is restricted to either of the following ranges.
- (1) 0.7kHz to 1.1kHz
- -(2) 1.2kHz to 14.5kHz

The change or writing of the set values beyond the individual ranges is not permitted.

- Motor Value set RFI Leakage audiable for Pr.72 noise current noise Lower 0.7 Higher Lower Lower - 7kHz Lower Higher 7 -(low noise Higher Higher 14.5kHz operation) (Note 2) (Note 2) (Note 1)
- Notes: 1. If the inverter is operated by setting a value larger than 2kHz for Pr.72 while ambient temperature is higher than 40°C, it is necessary to reduce the rated output current of the inverter.
 - If PWM carrier frequency is increased, RFI and leak current will increase. Therefore, proper measures must be taken (Refer to page 97.)
- If the mechanical system vibrates abnormally due to resonance, vibration might be reduced by changing the setting of Pr.72.

Pr.73 Selecting the frequency command voltage range

 It is possible to change the input specification (terminal 2) according to the frequency reference voltage signal.

Set value	Input voltage at terminal 2		
0 For 0 to 5 VDC input (factory-setting)			
1	For 0 to 10 VDC input		

Notes: 1. To change the output frequency corresponding to the input of the maximum frequency command voltage (or current), a value should be set for Pr.903 frequency setting voltage gain (or Pr.905 frequency setting current gain). It is not necessary to input a command voltage (or current). Refer to page 45 for alternative calibration procedure.

The acceleration/deceleration time is not influenced by a change in Pr.73 setting since it defines the gradient up to the acceleration/deceleration reference frequency set in Pr.20.

2. Set "0" for Pr.73 when the inverter is operated with a potentiometer. (1 or 2W 2kΩ)

Pr.74 Selecting the current input signal/Starting command · rotation direction command selection

• The inverter can be operated by the frequency setting current signal (4 to 20mA DC). If the current input signal function is set for the RM/AU terminal, it is possible by closing the circuit across terminals AU and P24 to use this function.

The external run terminal function can be set for the starting command and rotation command.

Set value	Input at terminal RM/AU	
0/100	For multiple-speed selection (factory-setting is "0")	
1/101	For current input selection	

Pr.74 = 0, 1

STF	STR	Run state
0	0	Stop
1	0	Forward
0	1	Reverse
1	1	Stop

Pr.74 = 100, 101

STF	STR	Run state
0	0	Stop
9-	0	Forward
0	1	Stop
1	THE THE R	Reverse

0: open 1: short

1

Pr.75

Reset selection/detection of parameter unit disconnection

 It is possible to select the reset function for terminal RES. It is also possible for the parameter unit disconnection protection function to be selected.



 If the inverter is operated without selecting the parameter unit disconnection detection function, inverter operation will be continued even after the parameter unit is disconnected from the inverter, which will create hazardous situation.

Therefore, to ensure safe operation, the parameter unit disconnection detection function must be selected.

. The stop key on the parameter unit can be activated to work in all operation modes.

Pr.75 Set Value

Set Value	Reset Conditions	External Terminals	Key Operation (Parameter Unit)	Operation after Disconnection of Parameter Unit	PU STOP Key
0	Reset input is possible at any time.	0	×	Operation continues if the	No function in Ext mode
1	Reset input is possible only when the protection function is activated.	0	0	parameter unit is disconnected.	
2	Reset input is possible at any time.	0	×	When the parameter unit is	
3	Reset input is possible only when the protection function is activated.	0	0	disconnected, the ALARM LED is lit and inverter output is shut off.	
14	Reset input is possible at any time (factory-setting). (Note 1)	0	×	Operation continues if the	When stop
15	Reset input is possible only when the protection function is ectivated.	0	0	parameter unit is disconnected.	key on PU is pressed in any operation mode, motor stops. (Note
16	Reset input is possible at any time.	0	×	When the parameter unit is	
17	Reset input is possible only when the protection function is activated.	0	0	disconnected, the ALARM LED is lit and inverter output is shut off.	2)

O: Yes x: No

Notes: 1. If the circuit across terminals RES and P24 is closed while the inverter is operating, the inverter shuts off the output while the terminals are closed. The data related to the electronic thermal relay and the regenerative brake duty ratio is cleared and the motor free wheels.

- 2. Procedure for restarting after stopping with the parameter unit stop key in Ext mode.
 - (1) After the inverter has stopped, turn off the start signal (STF/STR).
 - (2) Press the parameter unit's external operation key.
 - (3) Switch ON the start command (STF/STR).

Apart from the procedure above, oepration can also be restarted by switching the power off and back on, or by resetting the inverter by closing the circuit across the reset terminals.

When operation is stopped in external mode using the parameter unit stop key, "E0" is displayed on the parameter unit.



The data related to the electronic thermal relay and the regenerative brake duty ratio is cleared and the motor free wheels. Repeated use may lead to damage due to thermal built up.

△ CAUTION

With the start signal input, do not reset the inverter.
After reset, the inverter will start instantaneously, creating a hazardous condition.

Pr.76 Refer to Pr.64

Pr.77 Disabling parameter write

It is possible to disable writing of the parameters.

Set value Write disable function			
0	Parameter writing enabled (during stopped) (factory-setting) (Note 1)		
1	Parameter writing disabled (Note 2)		
2 Parameter writing enabled during operation (Note 3)			

- Notes: 1. Parameters related to monitoring (Pr.54 to Pr.56), multiple-speed input (Pr.4 to Pr.6, Pr.24 to Pr.27) can be set any time.
 - 2. Writing of Pr.77 and Pr.79 (operation mode selection) is always possible.
 - While the inverter is operating, writing of Pr.22, Pr.71, Pr.79, and Pr.80 is not possible.
 - 4. Writing of Pr.990 to Pr.997 is possible.

A CAUTION

During operation, do not change the parameter settings unnecessarily, the new settings may cause an alarm may occur in the inverter, causing the motor to coast.

Pr.78 Reverse lockout

 Select the reverse rotation lockout function if reverse rotation operation causes a problem.

Note: Both parameter unit and external operation are affected.

Set value	Rotation direction	
0	Forward and reverse (factory-setting)	
1	Reverse rotation disabled	
2	Forward rotation disabled	

Pr.79 Selecting the operation mode

• The inverter operation modes include external operation mode in which external signals are used to control the inverter and the PU operation mode. It is possible to select either or both of these modes for inverter operation.

Refer to section 12 for more information.

Set value	Operation method	
0	Switching the operation mode between the external operation mode and the PU operation mode (factory-setting)	
1	PU operation mode only	
2	External operation mode only	
3 (Note 1)	Operation frequency: To be set by parameter unit Start signal: External signal	
4 (Note 1)	Operation frequency: External signal Start signal: To be input by the parameter unit	
6 (Note 2)	Switch over mode	
7 (Note 3)	Edit enable signal mode (valid only when Pr.44 = 9999)	
8 (Note 4)	Local/auto external signal selection mode.	

Notes: 1. In the combined mode operation, the following signals are valid.

Set value	Operation frequency	Start signal
3	Parameter unit Direct setting and setting with [♠] and [♥] keys.	Terminal signals STF STR
	Terminal signals Across 2 and 5: 0 to 5 VDC	Parameter unit Forward key
4	Across 2 and 5: 0 to 10 VDC	Reverse key
	Across 4 and 5: 4 to 20mA DC	
	Multiple-speed selection (Refer to Pr.4)	

The external run mode, PU run mode and computer link mode can be changed during running.

Set Value	Operation mode transition	Transition operation/operation state
	External operation Pu operation	The rotation direction will continue to be that applied during external operation, until changed on the PU. The set frequency will continue to be the value set with the variable resistor (frequency setter), until changed on the PU. (Note that once the power is turned OFF, that set value will be cleared.)
		 Remove the parameter unit, and install the computer link unit FR-CU03 (option). Note: Pr.75 = 0, 1, 14 or 15
	External operation	Transmit the command to change to the computer link mode from the computer,
	Computer link operation	 The rotation direction will continue to be that applied during external operation, until changed by the computer.
nerie inn	nemeson III	 The set frequency will continue to be the value set with the variable resistor (frequency setter), until changed by the computer. (Note that once the power is turned OFF, that set value will be cleared.)
Externs 6 PU operation Computation Computation Computation Services Fig. 12 Fig. 1	PU operation # External operation	Press the external operation key on the parameter unit. The rotation direction will be decided by the external operation input signal. The set frequency will be decided by the external frequency setting signal. Care should be taken when changing to External operation. Ensure the direction of rotation, and set speed will out darmage the machine, or cause hazardous situation.
	PU operation Computer link operation	Remove the parameter unit, and install the computer link unit FR-CU03 (option). Note: Pr.75 = 0, 1, 14 or 15 Transmit the command to change to the computer link mode from the computer. The rotation direction and setting frequency will continue in the PU operation state, until changed by the computer.
		Remove the computer link unit FR-CU03 (option), and install the parameter unit. Note: Pr.75 = 0, 1, 14 or 15
	Computer link operation External operation	Press the external operation key on the parameter unit. The rotation direction will be decided by the external operation input signal. The set frequency will be decided by the external frequency setting signal. Care should be taken when changing to External operation. Ensure the
	name part and	direction of rotation, and set speed will not darmage the machine, or cause hazardous situation.
neu da re	Computer link operation	Remove the computer link unit FR-CU03 (option), and install the parameter unit. Note: Pr.75 = 0, 1, 14 or 15.
diam'r	B PU operation	 Press the PU operation key on the parameter unit. The rotation direction and setting frequency will continue in the computer link operation state, until changed by the PU.

Notes: 3. In the edit enable signal mode, the following functions are available.

Set value	Signal (MRS - P24)	Function and Operation
7	Closed	 In the external operation mode, output is shut off. Operation mode can be switched to the PU mode. In the PU mode, values set for parameters can be changed. Operation in the PU operation mode is enabled.
	Open	 Operation mode is forcibly changed to the external operation mode. Operation in the external operation mode is enabled. Change to the PU operation mode is disabled.

The allocation of the RL/OH, RM/AU, RH and MRS/RT terminals is set using Pr.59.

In local/auto external signal selection mode selection is made as indicated below.
 Mode change is not allowed during operation. Change the mode only while the inverter is stopped.

Set value Signal (RH - P24)		Mode	
8	Closed	External operation mode only (not switchable to the PU operation mode)	
	Open	PU operation mode only (Not switchable to the external operation mode)	

The allocation of the RL/OH, RM/AU, RH and MRS/RT terminals is set using Pr.59.

Pr.80

Capacity of applicable motor (for general-purpose magnetic flux vector control)

To select general-purpose magnetic flux vector control (Refer to page 48), set the capacity (kW)
of the motor to be used.

Note: The following conditions apply to the selection of general-purpose magnetic flux control mode.

- For general-purpose squirrel cage standard motors (0.1kW or larger), motor capacity is equivalent to or one rank below the capacity of the inverter.
- 2. The number of poles is 2, 4, or 6. It is not necessary to set the number of poles.
- 3. The motor is controlled by its own inverter.
- Wiring length between the motor and the inverter is within 30m. If the length exceeds 30m, refer to Mitsubishi.

If the conditions indicated above are not satisfied, satisfactory operation performance may not be obtained.

Set value	Description	Factory setting	
9999	V/F control	0	
Motor capacity (kw)	General purpose flux vector control	×	

- The general-purpose magnetic flux vector control for FR-A024 series differs from the magnetic flux control for FR-A200/A200E series inverters.
- When constant torque (force cooled) motors are used, note the following:
 Set Pr.9 = 0 (Thermal O/L disabled)

Pr.17 = 1 (RL/OH input set to motor mounted thermal sensor)

Use a motor with a thermal sensor built in.

Pr.81

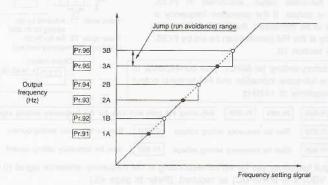
Refer to Pr.64

Pr.91	Pr.92	Pr.93
Pr 94	Pr.95	Pr 96

Frequency jump

Resonance can occur at certain speeds in some applications when a motor is driven by an inverter. To avoid this resonance upto three jump positions can be set, by diffining the upper and lower frequency limits in Pr.91 to Pr.96.

The 1A, 2A or 3A setting value becomes the jumping point, the inverter will run at that frequency while in the frequency jump range.



- Note) 1: Frequency jump will not function if 9999 (defalut value) is set.
 - During acceleration and deceleration, the frequency in the setting range will be passed through.

Pr.126 Pr.127 Pr.128 Pr.129
□ Refer to Pr.4

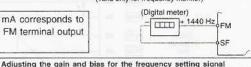
□ Pr.130 Pr.131 Pr.132 Pr.133

Pr.900 Calibrating the output at terminal FM

- It is possible to calibrate the meter connected to the FM terminal using the parameter unit, the calibration function is valid for both monitor functions selected by Pr.54.
- At the terminal FM, pulses are output as illustrated below. However, by setting a value for Pr.900, the indication of the meter connected to the inverter can be calibrated by using the parameter unit without connecting a variable resistor. (Refer to page 44.)
- Monitoring using a digital counter The pulse-train output at the FM terminal is used to display the monitor data on the digital counter. At the full-scale value, explained in Pr.55, 1440Hz is output. If the operation frequency is selected to be monitored, the ratio of the output frequency at the FM terminal can be set by Pr.55.
- Refer to section 18.

Note: Factory-setting (at 50Hz): 1mA corresponds to the full-scale indication and FM terminal output frequency of 1440Hz.

Analogue meter (1mA full-scale) n Ir SF Pulse width T1: Adjusted by the setting for Pr.900 Pulse cycle T2: Set for Pr.55 (valid only for frequency monitor)



Pr.902

Pr.903 Pr.902 Pr.904

Pr.905

Bias for frequency setting voltage

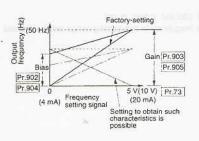
Pr.904 Bias for frequency setting current

Pr 903 Gain for frequency setting voltage

Pr.905

Gain for frequency setting current

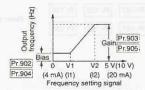
 The output frequency can be set corresponding to the frequency reference signal (0 to 5 VDC, 0 to 10 VDC, 4 to 20mA DC) as required. (Refer to page 45.)



Refer to page 42 for detailed explanation.

Example: To set bias and gain by applying V1 (V) and V2 (V) across terminals 2 and 5, respectively.

Between terminals 4 and 5, set bias by applying a current of 12mA and gain by applying a current of 12mA.



Note: When bias and gain are set using these parameters the setting for Pr.38 (frequency at 5 VDC input) or Pr.39 (frequency at 20mA input) is automatically changed.

A Take care when setting Pr.902 or 904 to any value other than "0". In this case, without the speed command, the motor starts at the preset frequency by merely switching the start signal on.

Pr.990 Selecting key click sound (parameter unit)

 This parameter is used to select whether click sound is output or not in response to the key operation on the parameter unit. (Refer to page 47).

Set value	Key click sound	
0	Not output (factory-setting) quiet	
1	Output - click	

Pr.991 Selection of the parameter unit display data

 The contents of monitor display of the parameter unit can be fixed (or given priority) to the set frequency. (Refer to page 37)

Set value	Contents
0	Standard specification
1	Set frequency is given priority. (Note 1)
2	Fixed to the set frequency. (Note 2)

Note: 1. Pressing the [▲] or [▼] key during the operation frequency monitor will change the display to the set frequency.

At 10 seconds after the [A] or [V] key has been released, the monitor display will automatically return to the operation frequency.

2. The monitor display is given only when the [MONITOR] key is pressed.

Pr.996 Clearing the alarm

It the [WRITE] key is pressed after reading the data set for Pr.966, the inverter alarm is cleared.
 (Refer to page 41)

Note: The accumulated values for the electronic thermal relay and the retry count are not cleared.

When the data in Pr.996 is read, "&c.fl" is always displayed. It blinks on and off when the alarm
is cleared.

or.997 Resetting the inverter

It is possible to reset the inverter using the [WRITE] key after reading the data in Pr.997 without inputting a signal to the RES terminal or turning on and off the power. (Refer to page 43).

Note: In this reset operation, the accumulated values for the electronic thermal relay and the retry count are cleared.

 When the data in Pr.997 is read, "rE Sf" is always displayed. The display is cleared once and then the initial screen is appears when the inverter is reset.

Pr.998	Pr.999	Initializing the parameters
	Pr.998	Parameter all clear
	Pr.999	Parameter clear

By pressing the [WRITE] key after reading the data in Pr.998 or Pr.999, the values set for the
parameter can be changed to the values initially set before shipping (factory-setting) collectively. (Refer to page. 36)

• The parameters for which the set values can be changed collectively are:

Pr.998 ... All parameters

Pr.999 ... Parameters excluding those used for calibration (Pr.900 to Pr.905).

 If the parameter write is disabled (Pr.77 = 1, or during operation in the setting of Pr.77 = 0), you may not change the setting of the parameters.

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• When the set values for the parameters are read, the display in the display unit is: "#!!!!" for Pr.998 and "Pr.f.r" for Pr.999.

The display blinks on and off when the parameters are initialized.

23. INSPECTION AND MAINTENANCE

The general-purpose inverter is static equipment consisting of semi-conductor devices. To prevent problems occurring due to environmental conditions such as high temperature, humidity, dust, vibration, or ageing of the component parts, inspection at regular intervals is necessary.

23.1 Precautions on Inspection and Maintenance



After the power is turned off, the smoothing capacitor remains charged at high voltage for a while. Wait until 10 minutes after the POWER indicating lamp (refer to page 3) on the printed circuit board goes off before starting modifications. Check with a tester that there is no residual voltage across terminals "P/+" and "-".

23.2 Inspection Items

(1) Daily inspection

Check the following items during operation.

- a) The motor operates properly.
- b) The environment is normal.
- c) The cooling system is working.
- d) There is no unusual vibration or noise.
- e) There is no overheating or discoloration.

During operation, check the inverter input/output voltage with a multi-meter.

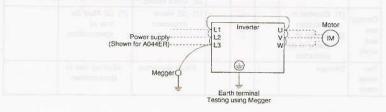
(2) Regular inspection

The following items which may be checked only after stopping the inverter shouled be checked at regular intervals.

- a) Check the cooling system. Clean the air filter, etc.
- b) Tighten the screws and bolts. Since screws and bolts will loosen due to vibration and thermal expansion, check the screws and bolts and tighten them if loose.
- c) Check the conductors and insulators for corrosion and damage.
- d) Measure insulation resistance.
- c) Check the cooling fan, smoothing capacitor, and relay. Replace a defective part.

(3) Testing insulation resisting using a Megger

- a) To test the insulation resistance of the external circuit, disconnect all wires from the inverter terminals so that test voltage will not be applied to the inverter circuits.
- b) For the continuity test of the control circuit, use a multimeter (high resistance range). Do not use a Megger or buzzer for the test.
- Conduct the insulation resistance test on the inverter main circuit only. Do not conduct the test on the control circuits.



Daily inspection and regular interval inspection

			Inspec	ction in	nterval		Ludemont leader	
Location	Item	Contents	- 119	Inte	erval	Inspection method	Judgment Ambient temperature: -10°C to +50°C (without freezing) Humidity: Less than 90% (non-condensation) Must be free of abnormal vibration and noise. A024-EC- 220 to 240V 50/60Hz A044-EC- 300 to 415 50/60Hz (1) Must be larger than 5 MΩ. (2) (3) Must be free of abnormalities.	Instrument
			Daily	1 year	2 years	tine multipour		
Overall inspec-	Environ- ment	Check ambient temperature, humidity, dust, etc.	U		(4004 (4004 (4007)	Refer to cautions on page 9.	temperature: -10°C to +50°C (without freezing) Humidity: Less than 90% (non- condensation)	Thermometer hygrometer, recorder
tion	Equip- ment	Vibration and noise	0			Visual inspection, inspection by ear.	abnormal vibration	as year) (I
	Supply voltage	Main circuit voltage	0			Measure voltage across terminals L1, L2, and L3.	50/60Hz A044-EC- 300 to 415	Multimeter, digital multimeter
Main circuit	Overall inspec- tion	(1) Insulation resistance (between the main circuit terminal and grounding terminal) (2) Loose connection (3) Overheat on component part (4) Cleaning	INTO THE PROPERTY OF THE PROPE	0 0	etas kari u die udi	(1) After disconnecting all wires at the inverter terminals, close L1, L2, L3, U, V, and W terminals. Measure insulation resistance between the point where these terminals are connected and the grounding terminal using a Megger. (2) Tighten the loose screws and bolts. (3) Check visually.	larger than 5 MΩ. (2) (3) Must be free of abnormalities.	500 VDC Megger
	Conduc- tors and wires	(1) Distortion in conductors (2) Damage on coating of the conductors		0		(1) (2) Visual inspection	(1) (2) Must be free of abnormalities.	
	Ter- minal block	Damage		0		Visual inspection	Must be free of abnormalities.	

Daily inspection and regular interval inspection

			Inspection interval					
Location	Item	Contents	Inter		erval	Inspection method	Judgment	Instrument
			Daily	1 year	2 years			
	Inverter module conver- ter module	Resistance across the terminals			0	After disconnecting all wires at the inverter terminals, measure resistance across terminals L1, L2, L3 and +, – and U, V, W and +, — with a multimeter in the \times 1 Ω range.	MICHAEL PARTIES AND	Analogue multimeter
Main circuit	Smooth- ing capa- citor	(1) Leak of fluid (2) Protrusion of the safety valve, or bulging. (3) Measuring the capacitance	00	0		(1) (2) Visual inspection (3) Measure with a capacitance measuring instrument.	(1) (2) Must be free of abnormali- ties. (3) High than 85% of the rated capacity.	Capacity meter
	Relay	Chattering noise during operation Smoothness on contact		0 0		(1) Listening inspection (2) Visual inspection	Must be free of abnormalities. Must be free of abnormalities.	
	(1) Crack of resistor insulato	Crack on resistor insulator Disconnection		0 0	110	(1) Visual inspection Cement resistors, wire wound resistor (2) Disconnept the wire at ohe side and measure resistance with a multimeter.	(1) Must be free of abnormalities. (2) Must be within ±10% of the indicated resistance.	Multimeter, digital multimeter
Control circuit protec- tion circuit	Opera- tion check	(1) Check the balance of interphase output voltage by operating the inverter independently. (2) Conduct the sequence protection operation test to check the protection and display circuits.		0		(1) Measure voltage across the inverter output terminals U, V, W. (2) Short the inverter protection circuit outputs.	(1) Imbalance should be within 4V (for 200V), 8V (for 400V). (2) The alarm should be output.	Digital multimeter, rectifier voltmeter

23. INSPECTION AND MAINTENANCE

Daily inspection and regular interval inspection

	Item	Contents	Inspection interval		nterval	and recipions of		
Location			Interval		erval	Inspection method	Judgment	Instrument
			Daily	1 year	2 years			
Cooling system	Cooling fan	(1) Abnormal vibration and noise (2) Loose connection	0	0		(1) Turn the fan without applying voltage. (2) Tighten loose screws and bolts.	(1) Must be able to turn smoothly. (2) Must be free of abnormalities.	terili Plani Mari
	Display unit	(1) LEDs (2) Cleaning	0	0		Check the LEDs on the panel. Clean with rag.	(1) Make sure that the LEDs are lit.	Exer
Display	Indication O Meter	(1) Check the indication of the meter on the panel.	(1) The indication must conform to the specified value.	Voltmeter, ammeter				
Motor	Overall inspec- tion	Abnormal vibration and noise Abnormal smell	0			(1) Visual inspection, inspection by body feeling (vibration) and by ear. (2) Smell due to overheating, damage, etc.	(1) (2) Must be free of abnormali- ties.	an e
	Insula- tion resis- tance	Check with Megger (across terminals and ground terminal)			0	(1) Disconnect wires from the U, V, and W terminals. Motor wires should be included.	(1) Must be higher than 5MΩ.	500V Megget



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

23.3 Replacing Parts

The inverter consists of a number of electronic component parts such as semiconductor devices. Due to their physical properties, it is anticipated that the following component parts will deteriorate with time, leading to problems or lowered performance of the inverter. They should be replaced at regular intervals for preventive maintenance.

(1) Cooling fan

A cooling fan is used to cool heat generating parts such as semiconductor devices in the main circuit. Although the service life of the bearing used in the cooling fan is, under normal operating conditions, 20,000 hours, it may vary between 10,000 and 35,000 hours depending on ambient temperatures.

Therefore, if the system is continuously operated, it is necessary to replace the cooling fan assembly every two to three years. Beside this regular replacement, if abnormal noise or vibration is detected during inspection, the cooling fan assembly should be replaced immediately.

(2) Smoothing capacitor

A large capacity aluminum electrolytic capacitor for smoothing the current is used in the direct current circuit in the main circuit. The performance of the capacitor is degraded due to the influence of ripple current etc. The service life of the capacitor varies depending on the ambient temperatures and operating conditions. The capacitor should be replaced every five years assuming that the unit is used within specified environmental limits.

Since the deterioration of a capacitor accelerates over time, it should be checked at least once a year. As it approaches the end of service life, it should be checked every six months or at shorter intervals. The inspection items and defects which require the capacitor to be replaced are summarized below.

- 1) Case conditions: Expansion of the case at the side and bottom
- 2) Sealing conditions: Excessive curvature or cracks
- 3) Safety valve conditions: Excessive expansion of the valve or vent
- 4) Others:

Check for cracks, discoloration, leakage, or other defects. Measure the capacity. If measured capacity is less than 85% of rated, the capacitor should be replaced.

(3) Relays

Relay contacts deteriorate with use. Relays should be replaced according to the total number of make/break operations (service life).

(4) Replacement criteria

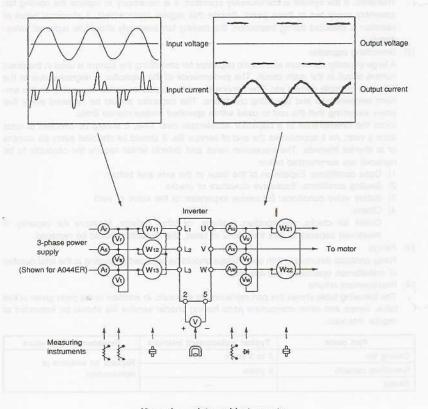
The following table shows the part replacement intervals. In addition to the parts given in this table, lamps and other component parts having shorter service life should be inspected at regular intervals.

Part name	Typical replacement intervals	Replacement procedure	
Cooling fan	2 to 3 years	Design of	
Smoothing capacity	5 years	Replace on evidence of deterioration	
Relays	_	detendration	

23.4 Measuring Voltage, Current, and Power in Main Circuit

· Measuring the voltage and current

Since the inverter input/output voltage and current include high harmonic components, measurement results vary depending on the measuring instrument and the circuits used in measurement. To measure voltage and current with an instrument for commercial frequency application, use the instrument in the table given in the next page and the circuit in the following diagram.



Measuring points and instruments

23. INSPECTION AND MAINTENANCE

Measuring points and instruments

Item	Measuring point	Instrument	Remark (criteria	of measured value)	
Line voltage V ₁	Across L_1 and L_2 , L_2 and L_3 and L_3 and L_1 .	Moving-iron type voltmeter	Commercial voltage 198-264V 50/60Hz (/ 323-506V 50/60Hz (/	A024S-EC)	
Input current I ₁	Line current at L ₁ , L ₂ , and L ₃	Moving-iron type ammeter			
Input power P ₁	On L ₁ , L ₂ , and L ₃ , and across L ₁ and L ₂ , L ₂ and L ₃ and L ₃ and L ₁	Electrodynamic type single-phase wattmeter	P ₁ = W ₁₁ + W ₁₂ + W method)	13 (three wattmeter	
Input power factor Pf ₁	To be calculated using and input power. $Pf_1 = \frac{P_1}{\sqrt{3} V_1 \times I_1} \times 100$	ng the formula indicate	d below, from the line	voltage, input current	
Output voltage V ₂	and W and W and (*1) (moving iron type is 140) or tone		Difference between p ±1% or less of the m voltage.		
Output current l ₂	Line current at U, V, and W	Moving-iron type ammeter	Current should be equal to or less than the in rated current. Difference between phases should be 10% or		
Output power P ₂	On U, V, and W, and across U and V, V and W	Electrodynamic type single-phase wattmeter	P ₂ = W ₂₁ + W ₂₂ (two wattmeter method (or three wattm method))		
Output power factor Pf ₂	To be calculated using and input power in the Pf ₁ = $\frac{P_1}{\sqrt{3} \text{ V}_2 \times \text{I}_2} \times 100$	ng the formula indicated the same manner as cal %	d below, from the line of culating input power fa	voltage, input current actor.	
Frequency	Across 2 (+) and 5		0 to 5/0 to 10 VDC		
setting signal	Across 4 (+) and 5		4 to 20mADC	MATRICE CONTROL OF CON	
Power supply for frequency setting	Across 10 (+) and 5	Chill Chill	5 VDC	"5" for common	
Frequency meter signal	Across FM (+) and SF	Moving coil type (multimeter, etc.) (internal resistance;	Approx. 7 VDC at the maximum frequency (without frequency meter)	"P24" for common	
Start signal Selecting signal	Across STF, STR, RH, RL/OH, RM/RT, RM/AU and P24	50 kΩ or larger)	20 to 30 VDC		
Reset	Across RES (+)		when opened 1	THE PART OF THE	
			VDC or lower when		
signal	and P24		closed (ON)		
signal Output stop signal	and P24 Across MRS/RT (+) and P24	-	closed (ON)		

^{*1:} A multimeter must not be used since error is excessive.

If a fault occurs and the inverter fails to operate properly, locate the cause of the fault and take corrective action by referring to the troubleshooting below. If the corresponding information is not found in the table, the inverter has problem, or the component parts are damaged, contact the nearest service representative.

24.1 Inspection by the Display on the Parameter Unit

In response to the occurrence of a fault, the display unit of the inverter automatically displays the code of the detected fault.

	Display	Probable cause	Check	Corrective action
Err:	Error	Operation setting error Reset signal is ON. PU is not connected to the inverter correctly. High input voltage Faulty internal circuit CPU run-away	Review the operation method. Is wiring at the reset terminal correct? Is connector secured correctly? Is input voltage correct?	Refer to page 18. Turn OFF the reset signal. Correct the connection. Use correct input voltage. Change the inverter (page 43).
OC1:	Overcurrent during acceleration (*1)	V = -W = V expression v = V expression expression	Is acceleration too fast? Is output short-circuited or grounded?	Extend acceleration time.
OC2:	Overcurrent during constant speed operation (*1)	Overcurrent	Was load changed suddenly? Is output short- circuited or grounded?,	Eliminate sudden load change.
OC3:	Overcurrent during deceleration (*1)	SA ASSESSED ASSESSEDA	Is deceleration too fast? Is output short-circuited for grounded? Is mechanical brake applied too early?	Extend deceleration time. Check the brake application timing.
OV1:	Overvoltage during acceleration	20V III et 05	Is acceleration too fast?	Extend acceleration time.
OV2:	Overvoltage during constant speed operation	DC overvoltage in	Is load changed suddenly?	Eliminate sudden load change.
OV3:	Overvoltage during deceleration	main circuit	Is deceleration too fast?	 Extend deceleration time. (adjust deceleration time compensating for load GD²) Reduce braking frequency.

24. TROUBLESHOOTING

	Display	Probable cause	Check	Corrective action
THT:	Overload warning Overload warning	Thermal relay for inverter is tripped.	Is motor used in the overloaded condition?	Reduce the load. Increase the capacity of motor and inverter.
FAN:	Fan alarm	Cooling fan of the inverter has stopped.	Is there foreign matter inside the fan assembly? Is there wiring error?	Remove foreign matter. Check the wiring.
OLT:	Stall prevention	Operation of the stall prevention function or the current limit function for a long period.	Is motor used in the overloaded condition?	Reduce the load. Increase the capacity of motor and inverter.
BE:	Brake transistor alarm (*2)	Faulty brake transistor	Is braking frequency correct?	 Reduce load (GD²). Reduce braking frequency.
OHT:	External thermal relay tripped	An external thermal relay has been tripped.	Is the motor overheated? Is an external relay in use?	 Reduce load (GD²). Reduce braking frequency. Eliminate sending.
PE:	Parameter storing device error	Faulty EEPROM	Is the number of parameter writes too many? Is EEPROM wom out?	Replace the inverter
PUE:	PU disconnection detected	Connector of the parameter unit is disconnected.	Is the parameter unit connection loose?	 Install and connect the parameter unit securely.
rET:	Retry count over	If operation cannot be resumed within the number of retry times set the inverter alarms and stop retry attempts.	Check the cause of the error	teen was want
CPU:	CPU error	CPU run-away		Replace the inverter.
OPT	Option alarm	Times of communication retries are over or check time intervals is over	Check communication datas and check time interval	Correct communication datas
0:	Stop key function	PU stop key pressed while Pr.75 = 14 to 17.	Pr.75 value	Change setting.

Notes: 1. *1. With the FR-A024-S-1.5K-S2.2K-EC and FR-A044-2.2K-3.7K-EC if the cooling fan stops, the protection function is activated due to overheating of the main circuit devices. Therefore, check the cooling fan also. The cooling fan must start when power is turned on.

*2. For the inverter equipped with the optional brake resistor.

Error output is not given if input voltage is low or momentary power interruption occurs. In these cases, however, the inverter is protected so that the inverter will not be damaged. Depending on the operating status (magnitude of load, during acceleration/deceleration, etc.), the overcurrent protection function, etc. may be actuated when the input power is restored.

24.2 Problems and Check Points

Check points
(1) Check the main circuit. Is power supplied? (Is the POWER indicating lamp lit?) Is the motor connected correctly?
(2) Check the input signals. Is the start signal input? Are both the forward and reverse rotation signals input?
 Is the frequency set signal zero? Is the circuit across terminals AU and P24 closed (ON) when the frequency setting signal is in the range from 4 to 20mA? Is the output stop signal (across terminals MRS and P24) or the reset signal (across terminals RES and P24) ON?
 (3) Check the values set for parameters. Is the reverse rotation prevention (Pr.78) function set? Is the setting to the reverse mode (Pr.79) correct? Are the setting for the bias and gain (Pr.902 to Pr.905) correct? Is the setting for the start frequency (Pr.13) larger than the operation frequency? Is the frequency setting for the operation functions (multiple-speed operation, etc.) correct?
Is the setting for the upper limit frequency (Pr.1) zero? (4) Check the load. Is the load too heavy? Is the motor start constrained? (5) Others Is the alarm indicating lamp (ALARM) lit?
Is the phase sequence (U, V, W) at the output terminals correct?
Are the start signals (forward, reverse) connected correctly?
Is the frequency setting signal correct? (Measure the input signal level.) Are the values set for the following parameters correct? Pr.1 (upper limit frequency), Pr.38 (frequency at 5 VDC input), Pr.39 (frequency at 20mA input), Pr.902 to Pr.905 (bias and gain) Are the input signal lines influenced by external noise? (use shielded wires, if influenced.)
 Is acceleration or deceleration time too short? Is the Load too heavy? Is the stall prevention function activated due to excessively large value set for torque boost?
Is the load changing?
Is the frequency setting signal stable?
Is the load too heavy?
Is the value set for torque boost (manual) too large?
Is the value set for upper limit frequency correct? Is it too small? Is the load too heavy? Is the stall prevention function activated due to excessively large value.

24. TROUBLESHOOTING

Problems	Check points				
Motor speed fluctuates during motor operation.	 (1) Check the load Is the load changing? (2) Check the input signals. Is the frequency setting signal stable? (3) Others In the general-purpose magnetic flux vector control mode, is the setting for applicable motor capacity (Pr.80) correct for the inverter capacity and motor capacity? In the general-purpose magnetic flux vector control mode, is the wiring length longer than 30m? In the V/F control mode, is the wiring length to long? 				

Note: "Pr." is an abbreviation of "Parameter." bullious primarity parent dealer bream as to lark to

Protective Functions

The following protection functions are provided to protect the inverter. If any of the protection functions is activated, the inverter output is shut off, the error message is displayed, and at the same time the error signal is output. In this case, the drive output is halted and the motor is free to rotate. To restart operation, it is necessary to reset the inverter.

Funct	tion	Description		Display (Parameter unit	
	a distance of	If the inverter output current exceeds 200% of the rated current during acceleration/deceleration	During acceleration	E.0C 1	(OC1)
Overcurrent shut-off		or constant speed operation, the protection circuit is actuated and inverter output is shut off. This		E.0C2	(OC2
		protection function is also activated if the cooling fan stops.	During deceleration	E.0C3	(OC3)
		If the DC voltage in the main circuit exceeds the specified value due to	During acceleration	E.Ou 1	(OV1)
Regenerati overvoltage		regenerative energy during braking, the protection circuit is activated and inverter	During constant speed operation	E.Ou?	(OV2)
		output is shut off.	During deceleration	E.Du3	(OV3)
Overload shut-off (electronic	Motor	If overheating of the motor due to overload or lowered cooling performance during low speed operation is sensed by the electronic thermal relay built in the inverter, the inverter output is shut off. To operate a multiple-pole motor or more than one motor, provide a thermal relay on the output side of the inverter for each motor.		Е.ГНП	(ТНМ)
thermal relay) (*2)	Inverter	If the current exceeds 150% of the rated output current, but lower than 200% (overcurrent shut-off level), the electronic thermal relay is activated due to inverse time characteristics to shut off the inverter output, thereby protecting the output transistors.			(тнт)
External the relay input		If the motor overheat protection thermal relay, externally, or the thermal relay built in the mo (contact break), the inverter output is shut off the inverter does not restart even if the relay automatically unless the inverter is reset.	tor is activated In this case,	E.OHF	(OHT)
Brake transistor error detection (*3)		If an error of the brake transistor occurs due to excessively large regeneration energy (optional brake resistor connected), the function detects the error and shuts of the inverter output.			(BE]
Parameter error The error signal is output and the inverter output is shut off. If an EEPROM error is detected.		E. PE	(PE)		
Parameter unit inve		inverter is suspended due to disconnection of	ommunications between the parameter unit and the erter is suspended due to disconnection of the parameter t from the inverter while the setting for Pr.75 is 2, 3, 16 or the inverter output is shut off		(PUE)
Retry count	t over	If the operation cannot be restarted within the of retries, the inverter output is shut off.	preset number	ExE	(RET)

24. TROUBLESHOOTING

Func	tion	Description	Display (Parameter unit)
CPU error During accele-		If the cycle of the CPU is not completed within the set time, the self-diagnostics interprets this as an error and shuts off inverter output.	E.EPU (CPU)
accele- ration		If current exceeding 150% (*4) of the rated inverter current flows in the motor, frequency ramp is halted until load current is reduced to prevent overcurrent shut-off the inverter. If the load current is reduced to 150%, the frequency will increase again.	Indicating lamps of the monitor mode blinks
Jurrent limit stall prevention	During constant speed operation If current exceeding 150% (*4) of the rated inverter curreflows in the motor, frequency decreases until load current educed to prevent overcurrent shut-off of the inverter. It load current is reduced to 150%, the frequency will increase again. If frequency decreases to 0Hz, the error signal is output the inverter output is shut off.		Indicating lamps of the monitor mode blinks After the stop, if frequency decreases to OHz £.DLF (OLT)
Current During limit stall decele-		If the motor regeneration energy increases excessively and exceeds brake performance, this function stops decreasing of the frequency to prevent overvoltage shut-off. Deceleration continues after the regeneration energy has been reduced. If current exceeding 150% (*4) of the rated inverter current flows in the motor, frequency decrease is halted until load current is reduced to prevent overcurrent shut-off the inverter. If the load current is reduced to 150%, the frequency will decreases again.	Indicating lamp of the monitor mode blinks.
Earth fault		If a earth fault current has flowed due to a earth fault occurring in the output (load) side of the inverter, this function stops the inverter output. A earth fault occurring at low earth resistance may activate the overcurrent protection (OC1 to OC3).	E. GF (EGF)
Fan failure		When the cooling fan of the inverter has stopped due to a foreign matter stuck in the fan or malfunction, the inverter output will be ceased. (1.5k to 2.2k 200V, 2.2k to 3.7k 400V)	E.F.R.n (FAN)
iption alarr	n -	Using computer communication, if times of communication retries are over or check time interval is over, the error signal is output and the inverter output is shut off.	E.DPF (OPT)

PU stop key function	By setting Pr.75 = 14 to 17 the parameter unit stop key with function in any mode.	E.0	(0)
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- Notes: "1. If the inverter is reset, the accumulated internal thermal data of the electronic thermal relay is initialized. If "0" is set for Pr.9 (electronic thermal relay), the motor overload shut-off prevention function (THM) is invalid.
 - *2. This function is valid only when the "external thermal relay" is set.
 - *3. The function is valid only when the optional brake resistor is connected.
 - *4. The stall prevention function activation current level can be set as required. Factory-setting is 150%.
 - Retaining the error output signal..... If the power input supply side, is removed function is activate.

If the power input to the inverter power supply side, is removed, when the protection function is activated, the inverter cont. power supply is lost and the error output signal cannot be retained. If the error output signal must be retained, the drive wiring must be designed to retain the error output signal externally. See the block diagram for information.

1

24.4 Electrical Noise

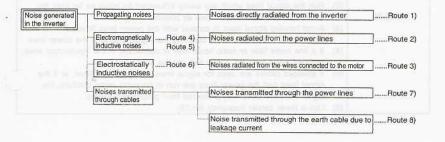
There are two types of electrical noise external noise which may cause malfunctioning of the inverter and those radiated from the inverter which may cause malfunctioning of a peripheral device. Although the inverters are designed not to be influenced by noise the following general measures must be taken since the inverter is an electronic device which handles weak signals. In addition, since the inverter chops the output at high frequency, the inverter itself is a source of noise. If peripheral equipment is affected by the noise generated by the inverter, noise suppressing measures must also be taken. The noise suppressing measures differ depending on noise propagation route.

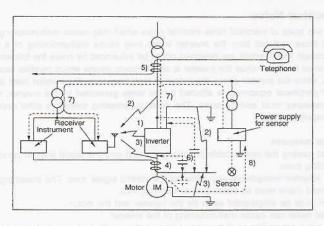
(1) General measures

- Avoid running the power cable (input/output lines) and the signal lines in parallel or bundling them.
- Use shielded twisted-wire pair cable for the control signal lines. The sheathing of the shielded cable must be connected to terminal, P24.
- Earth must be single-point earth for the inverter and the motor.
- (2) External noise can cause malfunctioning of the inverter

When noise generating equipment (magnetic contactor, electromagnetic brake, a number of relays, etc.) is installed near the inverter, the inverter could malfunction due to the noise generated by such equipment, it is necessary to take the measures indicated below.

- To install a surge suppressor in the equipment which generates noise.
- To install a data line filter in the signal lines.
- (3) Noise radiated from the inverter that causes malfunctioning of peripheral devices Noise generated by an inverter are largely classified into the following types: noise radiated from the wires connected to the inverter and the inverter main circuit (input/output), noise induced electromagnetically or electrostatically in the signal lines which run close to the power cables of the main circuit, and noise which is transmitted through the power supply.

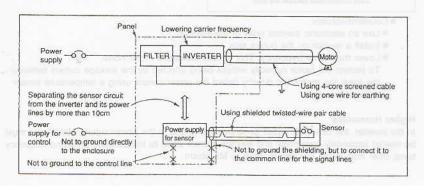




Noise propagation/ transmission Route	Measures Measures
1) 2) 3)	Equipment or devices such as measuring instruments, receivers, and sensors, which are noise susceptible, or those in which the signal lines are run in the same enclosure or close to the signal lines of the inverter, may malfunction due to noise propagation. In such a case, it is necessary to take the following measures: (1) Install the equipment/devices which are easily influenced by noise away from the inverter. (2) Run the signal lines which are easily influenced by noise as far from the inverter and its input/output lines as possible. (3) Avoid running signal lines in parallel with the power lines (inverter input/output lines), also avoid bundling the signal lines with the power lines. (4) If a line noise filter or radio noise filter is connected in the input/output lines radiated noise from the power line can be suppressed. (5) If shielded cables are used for signal lines and the power lines, or if the signal lines and the power lines are run in separate metal conduits, the signal lines are effectively protected from propagated noises.
	(6) Use a lower carrier frequency (Pr.72)

Noise propagation/ transmission Route	Measures Measures
4) 5) 6)	If the signal lines are run in parallel to the power lines or if the signal lines are bundled with the power lines, noise (electromagnetically induced noise, electrostatically induced noise) may propagate to the signal lines causing malfunctioning. In such cases, it is necessary to take the following measures: (1) Install the equipment/devices which are easily influenced by noise away from the inverter. (2) Run the signal lines which are easily influenced by noise as far from the inverter and its input/output lines as possible. (3) Avoid running signal lines parallel with the power lines (inverter input/output lines), also avoid bundling the signal lines with the power lines. (4) If shielded cables are used for signal lines and the power lines, or if the signal lines and the power lines are run in the individual metal conduits, the signal lines are effectively protected from propagation of noise. (5) Use a lower carrier frequency (Pr.72)
7)	If peripheral device is connected to the same power supply where the inverter is connected, noise generated by the inverter may be transmitted to the peripheral device through the power lines causing malfunctioning of the peripheral device. In such a case, it is necessary to take the following measures: (1) Install a radio noise filter (FR-BIF) in the power line (input/output lines) of the inverter. (2) Install a line noise filter in the power line (input/output lines) of the inverter.
8)	If a closed loop circuit is formed due to the wiring of a peripheral device to the inverter, leakage current may flow into the peripheral device through the grounding cable of the inverter and cause malfunctioning of the peripheral equipment. If this occurs, disconnect the grounding cable of the peripheral device.

Noise protection measures



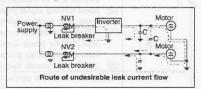
Leakage Current

Between the input/output lines of the inverter and in the motor, capacitance exists and due to this capacitance leakage current flows. Since amount of leakage current varies depending on the capacitance and carrier frequency, leakage current will increase if low-noise operation is attempted by higher carrier frequency setting. It is necessary to take the measures indicated below if such operation mode is required.

(1) Leakage current to earth

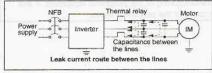
Leakage current not only flows into the circuits of the inverter itself, but it also flows into the circuits of other systems through the earth.

- Countermeasures
- Lower the carrier frequency (Pr.72). If the carrier frequency is lowered, motor noise is increased.
- Use leakage breaker designed for higher harmonic and surge, New Super NV series of Mitsubishi for example. This allows low noise operation (at higher carrier frequency). For details of breaker selection, refer to section 26.



(2) Leakage current between the lines

There are cases that an external thermal relay is tripped unexpectedly due to higher harmonic component of the leakage current generated by the capacitance between the inverter output lines.



- Countermeasures
 - Use an electronic thermal relay of the inverter.
 - Install a reactor on the output side.
 - Lower the carrier frequency. This causes increased motor noise.
 To protect the motor correctly without being affected by the leakage current between the lines, the method to directly detect the motor sensor using a temperature sensor is recommended.

Higher Harmonics

In the inverter, the converter circuit generates harmonics in the power supply. Harmonics must be treated separately from noise and leakage current since its transmission style and frequency band differ from them. For details, refer to Mitsubishi.

25.1 Standard Specifications

■ 200V Series

Mod	lel FR-A024-SE	C	0.4k	0.75k	1.5k	2.2k		
App	plicable motor capacity (kW)	*1	0.4	0.75	1.5	2.2		
Output -	Rated capacity (kVA)	*2	0.95	1.5	2.7	3.8		
Output	Rated output current (A)		2.5	4	7	10		
ratings			150% for 60 seconds, 200% 0.5 seconds (inverse time characteristics)					
	Rated output voltage	*5		3-phase 22	20 - 240V			
	Rated input AC voltage	No. of Lot	Single phase 220 - 240V 50/60Hz					
Power	Permissible AC voltage fluctua	*1 0.4 0.75 1.5 *2 0.95 1.5 2.7 2.5 4 7 *4 150% for 60 seconds, 200% 0.5 seconds, 200% 0	V 50/60Hz	THE PERSON NAMED IN				
supply	Permissive frequency fluctuation	n	±5%					
1000	Power supply capacity (kVA)	^6	1.5	2.3	4.0	5.2		
Protecti	ve structure		Enclosed 1	type (IP20)	Open typ	e (IP00)		
Cooling	system		Self-c	ooling	Fan c	ooling		
Weight	(kg)	1.7	1.2	1.5	2.2	2.3		

Notes: *1. The listed values are the maximum applicable capacity for an induction motor 4P. In general, the rated current (at 50Hz) of applicable motor shall not exceed the rated output current.

2. The listed rated capacity is for 230V output voltage.

*4. The value (%) for the rated overload current is its ratio to the rated output current of the inverter.

*5. The output voltage cannot exceed the supply voltage.

*6. The power supply capacity varies depending on the impedance of the power circuit (including input reactor and power line). Provide power supply capacity of the specified value or larger.

*7. Without parameter unit (The weight will increase by 0.1kg when the parameter unit is used.)

■ 400V Class

Mo	del FR-A044-	-EC	0.4k	0.75k	1.5k	2.2k	3.7k
Ap	plicable motor capacity (kW)	*1	0.4	0.75	1.5	2.2	3.7
	Rated capacity (kVA)	.5	1.2	2.0	3.0	4.6	7.2
Output ratings Power supply	Rated output current (A) "3		1.6 (1.4)	2.6 (2.2)	4.0 (3.8)	6.0 (5.4)	9.5 (8.7)
	Rated overload current	•4	150				nds
	Rated output voltage	3-phase 380 - 460V					
1700	Rated input AC voltage	3-phase 380 - 460V 50/60Hz *8					
Rated output current (A)	- 506V 50/6	50/60Hz					
supply	Permissive frequency fluctua	ation			±5%		
Power supply	Power supply capacity (kVA) *6	1.5	2.5	4.5	5.5	9.5
Protecti	ve structure	CVIII IN THE	Enclosed t	ype (IP20)	Op	en type (IP)	00)
Cooling	system	- towards		Self-cooling	THE PARTY OF	Fan c	ooling
Weight	(kg)	1.7	1.7	2.3	2.6	2.7	

Notes: *1. The listed values are the maximum applicable capacity for an induction motor 4P. In general, the rated current (at 50Hz) of applicable motor shall not exceed the rated output current.

*2. The listed rated capacity is for 440V output voltage.

The rated output current when Pr.72 (PWM frequency selection) is set over 2kHz is shown in
).

*4. The value (%) for the rated overload current is its ratio to the rated output current of the inverter.

*5. The output voltage cannot exceed the supply voltage.

*6. The power supply capacity varies depending on the impedance of the power circuit. Provide power supply capacity of the specified value or larger.

*7. Without parameter unit (The weight will increase by 0.1kg when the parameter unit is used.)

*8. For LVD compliance within Europe, input voltage range is 3-phase 380 - 415V 50/60 Hz.

25.2 Common Specifications

■ Common Specifications

	Control me	thod	Sinusoid	dal PWM control system				
	Output freq	luency	0.2 - 40	00Hz (starting frequency: 0 to 60Hz adjustable)				
	Frequency	Digital input		(less than 100Hz), 0.1Hz (100Hz or higher) when a parameter unit.				
	resolution	Analoge input	1/500 of maximum frequency (during DC5V input), 1/1((at DC10V or 4 - 20mA input)					
so.	Frequency	Digital setting	Within 0.01% of set output frequency (-10 to +50°C), when set with a parameter unit.					
tion	accuracy	Analogue setting	Within ±	:0.5% of maximum output frequency (25°C ±10°C)				
ecifica	Voltage/free	quency characteristics	1	equency selectable between 0 - 400Hz, constant or reduced torque pattern is selectable.				
r sp	Torque boo	ost	Manual	torque boost setting (0 - 30%) available				
Controller specifications	Accel./dece	el. characteristics	(Acceler	conds and from 0.1 to 3600 seconds can be set. ration and deceleration time may be set ally.) Linear or S-pattern modes can be selected.				
	Braking torque	Regenerative .9	A024-S	0.4k: 100% Min., 0.75k: 50% Min., 1.5k/2.2k: 20% Min.				
		braking torque	A044	0.4k, 0.75k: 100% Min., 1.5k: 50% Min., 2.2k/3.7k: 20% Min.				
		DC injection brake	Actuation frequency (0 - 120Hz), actuation time (0 - 1 seconds), and voltage (0 - 30%) can be set.					
	Stall prever	Stall prevention actuation level		Actuation current level (0 - 200%) can be set.				
	Frequency	Frequency reference signal		DC0 - 5V, DC0 - 10V, DC4 - 20mA				
		Start signal	Forward	and reverse rotation can be individually set				
		Multi-speed selection	Up to 15 speeds can be selected (frequency can be varied during operation with the parameter unit)					
so.	Input	Second accel./decel. time setting	0.04 seconds and 0.1 to 3600 seconds can be set. (Acceleration and deceleration time can be set individ					
ication	signals	Current input selection	Selection of input of frequency reference current sign from DC4 to 20mA					
Operational specifications	I STATE	External thermal relay input selection	Selection	n of input of external thermal relay actuating signal				
nal		Output shutoff	Inverter	output shutoff				
ratic		Reset	Actuated	d and retained protective function is canceled				
odo	Output	Operation status	In opera	n of two from: tion (RUN), max. frequency reach (SU), and requency reach (FU), overload (OL), and open rcuit (OMD)				
	signals	Alarm	1c conta	act point signal output				
	- Look	Monitor *10	The state of the s	ogue (full scale 1mA) meter or digital /50Hz) indicator				

Common Specifications (Continued)

Operation specifications	Operation of solution and solution of solu		Current limit, Max./Min. frequency limit setting, bias/gain setting, electronic thermal relay for a motor, operation mode setting, output terminal function selection, output signal actuating point setting. FM terminal output selection, second function setting (torque boost, base frequency, acceleration/deceleration time), frequency meter calibration etc.					
Setting, electronic thermal relamode setting, output terminal signal actuating point setting, second function setting (torqui acceleration/deceleration time) etc. Parameter unit Alarm Operation status Information on activated prote Four alarm codes are stored. LED display Power on (Power), activated prote Four alarm codes are stored. Protective alarm and warning functions Ambient temperature —10 to +50°C (Without freezin powercurrent. Ambient humidity 90%RH or less (Without dew Storage temperature 113 —20 to +65°C Indoors, free from corrosive gimist, or dust. Altitude, vibration Below 1000m above sea lever Serial interface RS422A, RS4	Parameter	Operation status	Output frequency, motor current, (*11) setting frequency, direction of rotation					
			Information on activated protective function is displayed. Four alarm codes are stored.					
	Power on (Power), activated protective function (ALARM)							
Prote	ctive alarm a	and warning functions	Overcurrent shutoff (acceleration, deceleration, constant speed), ground fault, regenerative overvoltage shutoff, overload shutoff (electronic thermal relay), brake transistor fault, undervoltage, (*12) instantaneous power failure, (*12) external thermal relay, stall prevention, ground fault overcurrent.					
	Ambient ter	mperature	-10 to +50°C (Without freezing)					
Environmental do Oisplay condition as	Ambient hu	midity	90%RH or less (Without dew condensing)					
	Storage ten	nperature *13	-20 to +65°C					
cond	Atmosphere	1	Indoors, free from corrosive gases, inflammable gases, oil mist, or dust.					
	Altitude, vibration		Below 1000m above sea level, less than 5.9m/S2 {0.6G}.					
С	omputer con	nmunication *14						

Notes: *9. Magnitude of braking torque is not continuous regenerative torque, but shows the average deceleration torque (which varies according to motor loss) when the motor alone is decelerated from 50Hz in the shortest time. During deceleration when the frequency exceeds the base frequency, the average deceleration torque value will drop. The inverter does not have a built-in brake resistor, so use an optional brake resistor when the regenerative energy is large. (See options)

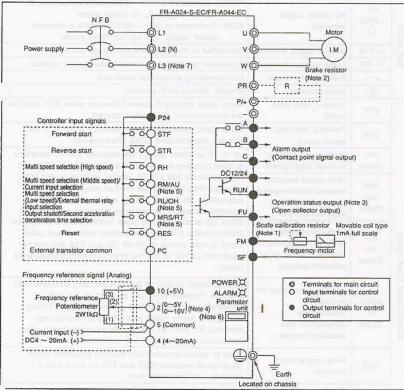
*10. Monitor signal for output frequency or for motor current can be selected. Use the parameter unit (Pr.54) to select output signal specifications.

25. SPECIFICATIONS

- *11. Motor current may not be correctly indicated depending on operation status (during acceleration/deceleration, light load etc.)
- *12. If an undervoltage or instantaneous power failure occurs, the alarm display and alarm output will not activate but the inverter itself will be protected. The overcurrent protection may activate according to the operation state (when load is large, etc.) when the power is restored.
- *13. These are short-term temperatures for during transportation, etc.
- *14. The option must be used for computer communication.

25.3 Connection

■ Terminal Connection Diagram



Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

- Notes: 1. This resistor is unnecessary when the scale is calibrated with the parameter unit.
 - The inverter does not have a brake resistor built in, but connect an optional brake resistor to this terminal if the regenerative duty is large.
 - 3. The output signal type (within four types) can be selected, refer to Pr.40.
 - 4. The input signal 5V/10V is selected with the parameter unit, refer to Pr.73.
 - 5. The input terminal function is selected with the parameter unit, refer to Pr.59.
 - 6. Either FR-PU03E, or FR-ARW03E, or FR-CU03 or FR-DU01 can be used.
 - 7. L3 terminal is not used for FR-A024-S-EC.

■ Terminals for Wiring

	Symbol	Terminal name	Description					
Main circuit	L1, L2(N), L3	AC power supply terminals	A024S: Connected to 220 – 240V, 50/60Hz commercial power supply. (L, N) Single phase A044: Connected to 380 – 460V, 50/60Hz commercial power supply. (L1, L2, L3) Three phase					
II C	U.V.W	Inverter output terminals	Connected to three-phase squirrel cage motor.					
Ma	P, PR	Brake resistor terminals	Connected to exclusive external brake resistor (Option).					
	+, -	Brake unit terminals	For connecting an optional brake unit.					
	(4)	Earth terminals	Inverter chassis earth terminal.					
	STF	Forward start input signal	Motor starts rotating in forward direction when STF and are short-circuited Stops when opened.					
	STR	Reversal start input signal circuit	Motor starts rotating in reverse direction when STR and P24 are short-circuited Stops when opened.					
	RH (Note)	Multi-speed selection terminal (high-speed)	Up to 15 operation speeds are available with combinations of short-circuiting across terminals RH, RM, RL, REX and					
	RM/ AU (Note)	Multi-speed selection terminal (middle-speed) or current input selection terminal	P24. Terminals RM and RL can be used as current input selection (AU) and external thermal relay selection (OH) respectively. As factory setting, multi-speed setting is selected. Operation by frequency reference signal of 4 to					
Control circuit (input signal)	RL/ OH (Note)	Multi-speed selection terminal (low-speed) or external thermal relay selection terminal	20mA DC is possible only when terminals AU and P24 short-circuited. If an external thermal relay contact point signal is input across terminals OH and P24, the inverte stops with control by thermal relay operation (contact poopen).					
Control circuit (ii	MRS/ RT (Note)	Inverter output shut off or 2nd acceleration/ deceleration time selection terminal	Inverter output is shut off by short-circuiting terminals MRS and P24. Terminal MRS can be used as the 2nd acceleration/deceleration the selection (RT). As factory setting, it is set to output shut off. By short-circuiting terminals RT and P24, 2nd acceleration/deceleration time, 2nd torque boost and 2nd V/F can be selected.					
	RES	Reset signal input terminal	Used to cancel activated and retained protective circuit. Short-circuit terminals RES and P24 for more than 0.1 seconds, and then open them.					
	P24	Common terminal for contact input	Common to contract input signal, Insulated from common circuit of inverter control circuit.					
	PC	External transistor common terminal	To connect the transistor output (open collector output) of a programmable controller, connect the external power supply common terminal for the transistor output to this terminal. This prevents malfunctioning of the inverter due to transisto leakage current.					
	10	Power supply terminal for frequency reference	5 VDC. Allowable maximum load current: 10mA					

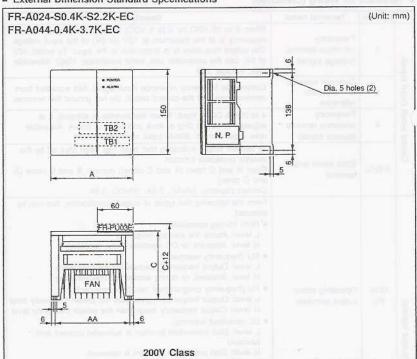
■ Terminals for Wiring (Continued)

	Symbol	Terminal name	Description
gnal)	2	Frequency reference terminal (voltage signal)	When 0 to 10 VDC (or 0 to 5 VDC) is input, the output frequency is at the maximum at 10V (or 5V) of the input voltage. The output frequency is in proportion to the input. To select 10V or 5V, use the parameter unit. Input resistance: 10kΩ. Allowable max. voltage; 20V
(input si	5	Common terminal for frequency reference	Common to frequency reference input signal. Not insulated from common circuit of the control circuit. Do not ground this terminal.
Control circuit (input signal)	4	Frequency reference terminal (current signal)	4 to 20mA DC is input. When the inverter is shipped, it is adjusted to output 0Hz at 4mA and 50Hz of 20mA. Allowable max. input current: 30mA. Input resistance: 250Ω.
Contr	A.B.C.	Error alarm output terminal	1c contact output indicating that base has been shut off by the inverter protective function. Error: B and C open (A and C close), normal: B and C close (A and C open) Contact capacity: 50VAC, 0.3A: 30VDC, 0.3A
Control circuit (output signals)	RUN FU	Operating status output terminals	From the following five types of output specification, two can be selected. RUN (during operation) L level: Above the starting frequency H level: Stopped, or DC injection brake operating SU (frequency reached) L level: Output frequency reaches the set frequency. H level: Stopped, or during acceleration/deceleration FU (frequency programmed has been reached) L level: Output frequency higher than the preset frequency level H level: Output frequency lower than the preset frequency level OL (overload warning) L level: Stall prevention function is activated (current limit function). H level: Stall prevention function is released.
cnit	- 0		Open collector output Permissible load: 24 VDC, 0.1A OMD (Open Motor circuit Derection)
trol cir	813		L level: Output current below value set in Pr.62. H level: Output current above value set in Pr.62.
Con	DC 12/24	Open collector common terminal	Common to RUN and FU. Insulated from common circuit of the inverter control circuit.
	FM	Frequency indicator connection terminal	When the inverter is shipped, the signal is set so that approx. 5 VDC (FM, SF opened) is output when the inverter output frequency is 50Hz. The output voltage is proportional to the output frequency and has pulse train waveform that allows connection of a digital indicator. Pulse of 8V is output at frequency 1440Hz/50Hz.
	SF	Frequency indicator connection terminal common	Common to FM, insulated from common circuit of the inverter control circuit.

Note: 1. For these terminals, the function allocated is selectable by Pr.59 "Input terminal allocation" setting from 10 functions.

The multiple-speed selection is given higher priority than analogue frequency reference signal.

■ External Dimension Standard Specifications



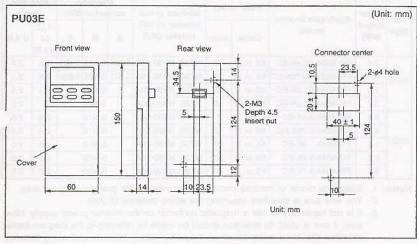
Inverter model	A	AA	C
FR-A024-S0.4K and S0.75K-EC	140	128	116
FR-A024-S1.5K and S2.2K-EC	200	188	126

400V Class

Inverter model	Α	AA	С
FR-A044-0.4K and 0.75K-EC	140	128	116
FR-A044-1.5K, 2.2K and 3.7K-EC	200	188	136

Note: FR-A024-S1.5K/S2.2K-EC and FR-A044-2.2K/3.7K-EC have a cooling fan.

Parameter Unit



PU03E Protection Rating IP40

	Item		Specification
	Temperature	Operating temperature	-10 to +50 °C
Ambient	remperature	Storage temperature	-20 to +65 °C
	Humidity	10% to 90% RH	-10 to +50 °C -20 to +65 °C To be free of condensing and corrosive gas, and dense dust ries inverter, or special cable (FR-CBL) verter or remote installation using a special cable tt display, and indicating lamps)
Environm	ent	To be free of oil mist and corr	osive gas, and dense dust
Cooling n	nethod >	Self-cooling	D- R
To be co	nnected to	FR-A024 and A044 series inve	erter, or special cable (FR-CBL)
Power su	pply ·	From inverter	
Connection	on	Direct installation to inverter or	remote installation using a special cable
Display		LED (4-digit, 7-segment display	y, and indicating lamps)
Operation		21 operation keys (protected w	vith polyurethane film)
External of	dimensions	150 (height) × 60 (width) × 14	(depth) (5.9") (H) × (2.4" (W) × (0.55") (D)
Approxim	ate mass	0.1kg (3.5 onces)	
Max. write	e operation	100,000 times	

26. SELECTION OF PERIPHERAL DEVICE

Vol- tage	Motor	Applicable inverter model	Fuse rating		Miniture circuit	Magnetic contactor (MC)			Wire size (mm²)	
	output (kW)		Class	Amp.	breaker or GFI breaker (NV)	A	В	С	L1,L2, L3 (L1,N)	U.V.W
200V	0.4	FR-A024-S0.4K-EC	K5 or H	12	NF30, NV30-15A	S-N21	S-N25	S-K50	2.5	2.5
	0.75	FR-A024-S0.75K-EC	K5 or H	20	NF30, NV30-15A	S-N21	S-N25	S-K50	2.5	2.5
2001	1.5	FR-A024-S1.5K-EC	K5 or H	35	NF30, NV30-20A	S-N21		2.5	2.5	
	2.2	FR-A024-S2.2K-EC	K5 or H	45	NF30, NV30-30A	S-N25		4	2.5	
	0.4	FR-A044-0.4K-EC	K5 or H	7	NF30, NV30-5A	S-N10		2.5	2.5	
	0.75	FR-A044-0.75K-EC	K5 or H	12	NF30, NV30-5A	S-N10		2.5	2.5	
400V	1.5	FR-A044-1.5K-EC	K5 or H	20	NF30, NV30-10A	S-N10		2.5	2.5	
	2.2	FR-A044-2.2K-EC	K5 or H	25	NF30, NV30-15A		S-N20		2.5	2.5
	3.7	FR-A044-3.7K-EC	K5 or H	40	NF30, NV30-20A		S-N20		2.5	2.5

Notes: 1. Select the model of miniture circuit breaker meeting the power supply capacity.

2. The wire size is specified assuming the wiring distance of 20m.

3. It is not necessary to use a magnetic contactor on the inverter power supply. However, if one is used, its selection should be made by referring to the diagram below; selection should be made based on the power supply capacity and wiring distance. For FR-A024-S0.4K-EC to S1.5K-EC, if power factor improving AC reactor FR-BAL is used, SK should be selected.

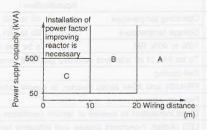
4. If wiring distance is longer than 20m, refer to page 10.

5. Above recommendable wire size is selected under following conditions.

Ambient Temp: 40°C

Wire Installation: On wall without ducts or conduits

If conditions are different from above, select appropriate wire according to TABLE 5 in EN60204 ANNEX C.



Note: The power supply capacity in this diagram is applicable when the specified wire size is used.

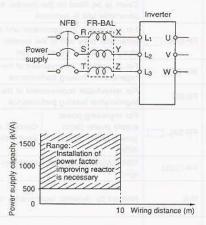
26. SELECTION OF PERIPHERAL DEVICE

· Installation and selection of no-fuse breaker

To protect the wiring on the input side of the inverter, it is necessary to install a fuse or no-fuse breaker (NFB). The NFB must be selected with regard to the power factor on the power supply side of inverter (This will vary according to power supply voltage, output frequency, and load). For selection, refer to the table above. Especially, when a NFB of electromagnetic type is used, the operating characteristics vary due to high harmonic currents. This means that the NFB which is one rank above the proper size must be selected.

· Power factor improving AC reactor

If the inverter is connected directly to a large capacity power transformer (capacity: 500kVA or larger, wiring distance: 10m or less), or a power factor correction capacitor is used, an excessive peak current may flow through the power supply input circuit and damage the converter. In this situation, it may be necessary to install a power factor improving AC reactor like the FR-BAL (option).



Notes: 1. Input power factor is improved to approx. 90%.

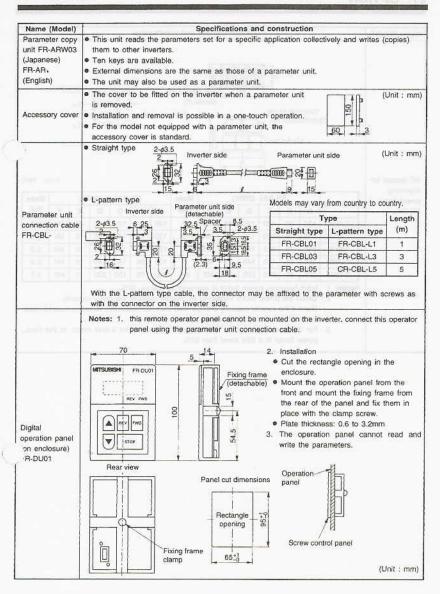
- Select the power factor improving AC reactor to meet the motor capacity. Even if the inverter capacity is large than the motor capacity, selection must be made on the basis of motor capacity.
- For the motor smaller than 0.4kW, select the reactor for 0.4kW motor. In this case, power factor will be a little lower than 90%.

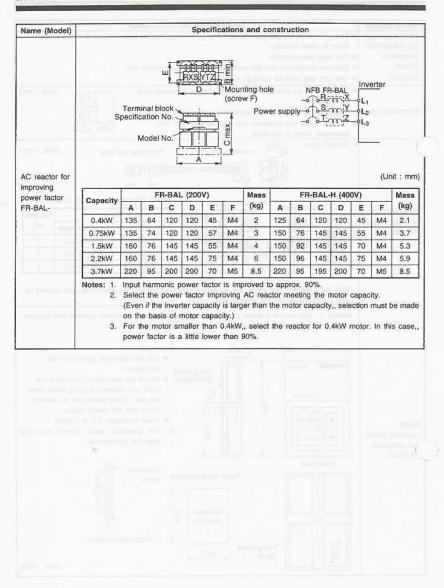
27. OPTION

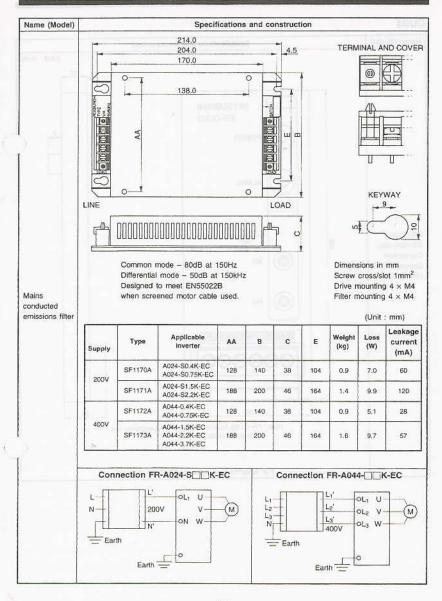
■ List of Options

	Name	Model	Application, spe	ecifications	Applicable inverter
	Parameter unit	FR-PU03	Digital data setting and monitoring equipment		
	Parameter (English)	FR-PU03E	Digital data setting and equipment	monitoring	PER SELECTIVE
	Parameter copy unit	FR-ARW03	For collective wiring of t with verify function	For collective wiring of the set values; with verify function	
	Parameter copy unit (English)	FR-ARW03E	For collective wiring of the set values; with verify function		series
	Digital operation panel	FR-DU01	Operation panel		Lectron IA
	Accessory cover	-	Cover to be fitted on the inverter when a parameter unit is removed.		
Remote installation	Parameter unit connection cable	FR-CBL-	For connecting the parameter unit or parameter copy unit to the inverter straight type and L-pattern type		Common to all models
note in	BU brake unit	BU-	For remarkable improvement of the regenerative braking performance		Depending or
Веп	Brake unit	FR-BU	For remarkable improvement of the regenerative braking performance		
	AC reactor for improving power factor	FR-BAL	For improving power supply power factor (power factor: approx. 90%)	Connect on input side	capacity
	Computer link	FR-CU03	RS422A/485 compactible computer link option		Common to all models
	Brake Resistor	N/A	Needed for dynamic reg	enerative loads	Depending on capacity and duty
	EMC instruction compliance noise filter	SF 🗆 🗆	Noise filter complying w instructions (EN50081-2		0.4K to 3.7K capacities comply

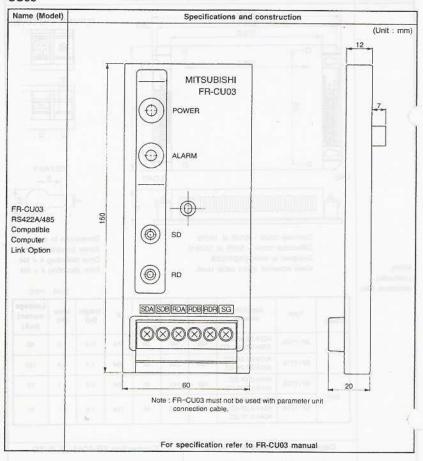
Note: Not all options are available in every country. Please refer to your local Mitsubishi Distributor for information regarding stock.







CU03



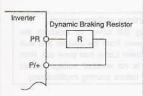
Selection of Brake Resistor

 Use an external brake resistor to increase the braking torque and permissible duty cycle (%ED). For 0.1K and 0.2K brake resistor cannot be used.

A guide to Brake Resistor Size

Class		20	ov		400V
Capacity	Acceptable	duty 3% ED	Acceptable of	duty 10% ED	Acceptable duty 10% ED
	100% torque	150% torque	100% torque	150% torque	100% torque
0.4K	120W 200Ω	120W 200Ω	80W 200Ω	80W 200Ω	80W 1200Ω
0.75K	120W 100Ω	120W 100Ω	150W 100Ω	150W 100Ω	80W 700Ω
1.5K	120W 60Ω	120W 60Ω	250W 60Ω	250W 60Ω	150W 350Ω
2.2K	120W 60Ω	120W 40Ω	250W 60Ω	300W 40Ω	250W 250Ω
3.7K					500W 150Ω

Note: Pulse rated resistors should be used, available locally. It is important to size braking resistors correctly, if in doubt consult your local Mitsubishi distributor.



Warning!

Never use a resistor with a lower value in others than shown, this will cause higher currents to flow, and will often cause damage to the dynamic braking transistor, or cause an overcurrent trip.

A Warning! Hazardous voltage present.

Before touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across inverter terminals "P/+" and "-" before starting modifications.

- BU Brake Unit (BU-
 - The brake unit is an option used for improving the regenerative braking performance.
 - It must always be used in combination with a discharge resistor. Select the brake unit to meet the required braking torque.
- · Brake unit selection table

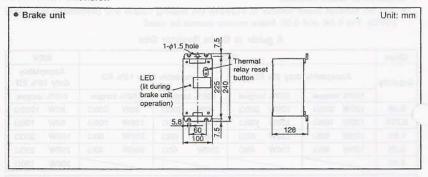
Motor (kW) Braking torque	0.4 0.75	1.5	2.2	3.7	
50% 30 min.	BU-	1500	BU-	3700	
100% 30 min.	BU-1500	BU-3700	BU-7.5K		
50% 30 min.	BU-H7.5K				
100% 30 min.	BU-H7.5K			No. of Street,	

Combination between brake unit and discharge

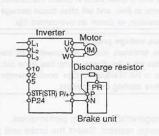
Brake unit	Discharge resistor	Wire to be Used (P/+, -)
BU-1500	300W-50Ω*	2mm²
BU-3700	200W-10Ω Serial connection (3 pcs.)*	2mm²
BU-7.5K	300W-5Ω Serial connection (4 pcs.)*	3.5mm²
BU-H7.5K	200W-10Ω Serial connection (6 pcs.) [®]	2mm²

^{*} For guidance only, contact your local Mitsubishi Electric distributor for more information.

External Dimension



Wiring Example



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "-" before starting modifications.

- Notes: 1. Connect the brake unit to the inverter so that the terminals of the same symbols are connected. If the brake unit is not connected correctly,, the inverter may be damaged.
 - 2. Wires connecting the inverter and the brake unit and those connecting the discharge resistor and the brake unit should be as short as possible. If wire length exceeds 2m., use twisted-pair wire. The length must not exceed 5m even if the twisted-pair wire is used.

Cautions on Handling

1. If the brake unit keeps operating beyond its rating,, the thermal relay incorporated in the brake unit will trip. If the thermal relay is tripped,, reset it and increase the deceleration time of the inverter.



The discharge resistor can be heated to 100°C, use high temperature wire and insure that wires are not exposed.

Enclose resistor in a cabinet to avoid possibility of touching and being burnt.

27. OPTION

■ Brake Unit (FR-BU)

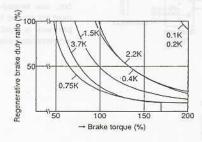
- The brake unit (and resistor) are both options used for improving the regenerative braking performance of the inverter. They are always used in a set.
- Select the brake unit and the resistor from the selection table to meet the required braking torque and deceleration time.
- The brake unit is equipped with a 7-segment LED which indicates the duty cycle (%ED), the resistor cooling time and alarm code.

Brake unit selection table

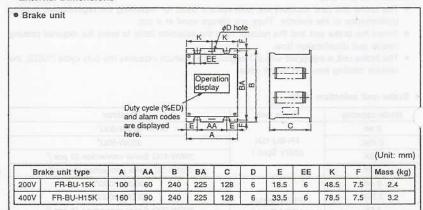
Motor capacity	Brake unit	Resistor
0.4K		300W-50Ω*
0.75K	FR-BU-15K (200V Spec.)	300W-50Ω*
1.5K		200W-10Ω Serial connection (3 pcs.)*
2.2K		300W-5Ω Serial connection (4 pcs.)*
0.4K		300W-200Ω [‡]
0.75K	FR-BU-H15K	300W-200Ω*
1.5K	(400V Spec.)	300W-20Ω Serial connection (4 pcs.)*
2.2K		300W-20Ω Serial connection (4 pcs.)*
3.7K		300W-20Ω Serial connection (4 pcs.)*

^{*} For guidance only, contact your'local Mitsubishi Electric distributor for more information.

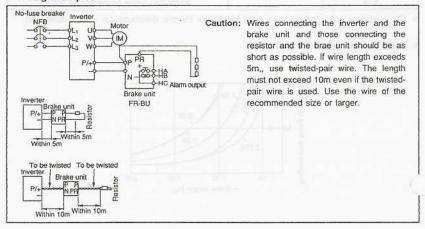
· Short-time permissible power



■ External Dimensions



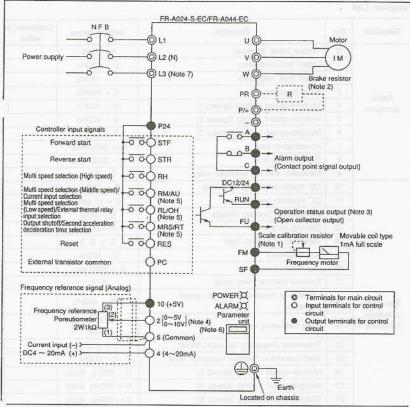
■ Wiring Examples



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across inverter terminals "P/+" and "-" before starting modifications.

Terminal Connection Diagram



Warning! Hazardous voltage present.

Before removing the cover or touching the terminals isolate the power from the inverter and wait 10 minutes after the Power Lamp has gone out. With a tester check there is no residual voltage across terminals "P/+" and "." before starting modifications.

- Notes: 1. This resistor is unnecessary when the scale is calibrated with the parameter unit.
 - The inverter does not have a brake resistor built in, but connect an optional brake resistor to this terminal if the regenerative duty is large.
 - 3. The output signal type (within four types) can be selected, refer to Pr.40.
 - 4. The input signal 5V/10V is selected with the parameter unit, refer to Pr.73.
 - 5. The input terminal function is selected with the parameter unit, refer to Pr.59.
 - 6. Either FR-PU03E, or FR-ARW03E, or FR-CU03 or FR-DU01 can be used.
 - 7. L3 terminal is not used for FR-A024S-EC.

Details of Each Function

Function List

Function	No.	Function	Setting range	Customer's value
	0	Torque boost (manual)	0 - 30%	
	1	Upper limit frequency	0 - 120Hz	
Pagis	2	Lower limit frequency	0 - 120Hz	
	3	Base frequency	0 - 400Hz	
Basic functions	4	Multiple-speed setting (speed 1)	0 - 400Hz	
TUTIONS	5	Multiple-speed setting (speed 2)	0 - 400Hz	
	6	Multiple-speed setting (speed 3)	0 - 400Hz	
	7	Acceleration time	0 - 3600 sec.	
	8	Deceleration time	0 - 3600 sec.	
	9	Electronic thermal overload relay	0 - 500A	
	10	DC injection braking frequency	0 - 120Hz	
j	11	DC injection braking time	0 - 10 sec.	
-	12	DC injection braking voltage	0 - 30%	
	13	Starting frequency	0 - 60Hz	
	14	Selection of applied load	0, 1, 2, 3	
	15	Jog frequency	0 - 400Hz	
	16	Jog accel./decel. time	0 - 3600 sec.	
	17	External thermal relay input	0, 1	
Standard	18	Upper limit frequency for high speed operation	120 – 400Hz	
operation functions	19	Base frequency voltage	0 - 1000V, 8888, 9999	
	20	Reference frequency for accel./decel.	1 - 400Hz	
	22	Stall prevention function operation level	0 - 200%	
	24	Multiple-speed setting (speed 4)	0 - 400Hz, 9999	
	25	Multiple-speed setting (speed 5)	0 - 400Hz, 9999	
	26	Multiple-speed setting (speed 6)	0 - 400Hz, 9999	
	27	Multiple-speed setting (speed 7)	0 - 400Hz, 9999	
Danebell Hit	29	Selection of accel./decel. pattern	0, 1, 2	STATE OF THE PARTY
settem agost	30	Selection of regenerative brake duty ratio	0. 1	
	37	Speed display	0, 0.01 - 9998	
	38	Frequency at 5V (10V) input	1 – 400Hz	Personal States
Miller Appl	39	Frequency at 20mA input	1 - 400Hz	
Multi-function	40	Allocation of output terminals	00 - 44	1 4
output-	41	SU frequency band width	0 - 100%	
terminal	42	FU frequency value	0 - 400Hz	(C. St.
functions	43	FU frequency value in reverse rotation	0 - 400Hz, 9999	

Details of Each Function

Function List (Continued)

Function	No.	Function	Setting range	Customer's value
	44	2nd acceleration/deceleration time	0 - 3600 sec., 9999	
Second functions	45	2nd deceleration time	0 - 3600 sec., 9999	
	46	2nd torque boost	0 - 30%, 9999	
7	47	2nd V/F (base frequency)	0 - 400Hz, 9999	
Display	54	Selection of FM terminal function	0, 1	
function	55	Reference for frequency monitor	0 - 400Hz	
	56	Reference for current monitor	0 - 500A	
Restart	57	Freewheeling time for restart	0.05 - 5 sec., 9999	
function	58	Start-up time for restart	0 - 5 sec.	
Operation selection functions	59	Input terminal allocation	0 to 9998, 9999	
Standard	60	Input filter time constant	1 - 8, 9999	
operation functions	61	Tone control selection	0, 1	noticed
Motor circuit	62	Motor open circuit detection level	0 - 200%, 9999	
detection functions	63	Motor open circuit detection time	0.05 - 1 sec., 9999	
Slip compensation	64	Slip compensation selection	0, 9999	
	65	Retry selection	0, 1, 2, 3	
	66	Frequency for stall prevention level reduction start	0 – 400Hz	
	67	Retry count after inverter alarm	0 to 10 101 to 110	
Operation	68	Retry waiting time	0.1 - 360 sec.	THE SAME
selection	69	Clearing retry count	0	=====
function	70	Special regenerative brake duty ratio	0 - 30%	
	71	Select the applicable motor	0, 1	
	72	Selection for PWM frequency	0.7 - 14.5kHz	
	73	Selection for 0 to 5V/0 to 10V	0, 1	
	74	Selection for current input reference	0, 1	
	75	Reset selection/detection of parameter unit disconnection	0, 1, 2, 3 14, 15, 16, 17	
Slip compensation	76	Slip compensation time constant	0.01 - 10 sec., 9999	

Details of Each Function

Function List (Continued)

Function	No.	Function Pulliment	Setting range	Customer's value
	77	Selection for disabling parameter writing	0, 1, 2, 801	
	78	Selection of reverse rotation prevention	0, 1, 2	
Operation	79	Selection of operation mode	0, 1, 2, 3, 4, 7, 8	
selection function	80	Motor capacity	A024-S:0.2 – 2.2kW A044: 0.2 – 3.7kW 9999	
Slip compensation	81	Rated slip	0 - 10%, 9999	
	91	Frequency jump 1A	0 - 400Hz, 9999	
	92	Frequency jump 1B	0 - 400Hz, 9999	i ajii
Standard operation functions	93	Frequency jump 2A	0 - 400Hz, 9999	
	94	Frequency jump 2B	0 - 400Hz, 9999	
	95	Frequency jump 3A	0 - 400Hz, 9999	
	96	Frequency jump 3B	0 - 400Hz, 9999	
	126	Multiple-speed (speed 8)	0 - 400Hz, 9999	
	127	Multiple-speed (speed 9)	0 - 400Hz, 9999	
	128	Multiple-speed (speed 10)	0 - 400Hz, 9999	
	129	Multiple-speed (speed 11)	0 - 400Hz, 9999	
	130	Multiple-speed (speed 12)	0 - 400Hz, 9999	
	131	Multiple-speed (speed 13)	0 - 400Hz, 9999	
	132	Multiple-speed (speed 14)	0 - 400Hz, 9999	
	133	Multiple-speed (speed 15)	0 - 400Hz, 9999	
0 11 1	900	FM terminals calibration		
Calibration function	902	Bias for frequency reference voltage	0 - 60Hz	
Auxiliary	903	Gain for frequency reference voltage	1 - 400Hz	
function	904	Bias for frequency reference current	0 - 60Hz	
	905	Gain for frequency reference current	1 - 400Hz	
	990	Key sound selection	0, 1	304
	991	PU operating mode	0, 1, 2	
Auxiliary	996	Error clear		
function	997	Inverter reset		
	998	Parameter all clear		
	999	Parameter clear	-	

INSTRUCTIONS FOR COMPLIANCE WITH THE EUROPEAN DIRECTIVES

1. EMC DIRECTIVE

(1) Our view of inverters for the EMC Directive

An inverter does not function independently. It is a component designed for installation in a control box and for use with another equipment to control a machine or equipment. Therefore, we do not think that the EMC Directive applies directly to inverters. For this reason, we do not place the CE mark on the inverters themselves. The European power drive manufacturers' organization (CEMEP) also holds this point of view.

(2) Compliance

We do not think that the inverters themselves are covered directly by the EMC Directive. However, the EMC Directive applies to machines and equipment into which inverters have been incorporated, and these machines and equipment must carry the CE mark. Hence, we have prepared a technical document "EMC Installation Guidelines" (manual number BCN-A21041-202) so that machines and equipment incorporating inverters may conform to the EMC Directive more easily.

(3) Outline of installation method

It is recommended to install an inverter in the following method:

- *Use the inverter with an European Standard-compliant noise filter.
- ★For wiring between the inverter and motor use, shielded cables or run cables in metal conduit and ground the cables or conduit at the inverter and motor ends. Use the shortest possible cable length.
- ★Install the inverter in an grounded metal enclosure. The enclosure should prevent radiated noise leakage.
- *Insert a line noise filter and ferrite core into the power and control lines as required.

Full information including the European Standard-compliant noise filter (for 400V class only) specifications are published in the "EMC Installation Guidelines" (manual number BCN-A21041-202). Please contact your sales representative.

2. Low Voltage Directive

- Our view of inverters for the Low Voltage Directive Inverter are covered by the Low Voltage Directive.
- (2) Compliance

We declare we meet Low Voltage Directive and place CE marking on the inverter.

The European verification institution has approved that our inverters conform to DIN VDE0160.

(3) Instructions

To conform to DIN VDE0160, the following specifications and instructions listed are different from those of the standard models.

- ★For the 400V class inverters, the rated input voltage range is 3-phase, 380V to 415V, 50/60Hz.
- ★Do not use residual current device as the only protection against indirect contact. Protective earth connection is essential.
- ★Wire the earth terminal independently. (Do not connect two or more cables.)
- *Only use EN or IEC compliant no-fuse breaker and magnetic contactors.
- ★Use the inverter under condition of Over Voltage Category II and Pollution Degree 2 or better.
- ① Insert an EN or IEC Standard-compliant isolation transformer or surge suppresser to make the Over Voltage Category II if power supply over voltage category is III or IV.
- ② Install in a cabinet with IP54 rating or better to have Pollution Degree 2.
- ★For the input and output of the inverter, only use cables of the type and size set forth in EN60204 Appendix C.
- ★The rating of the alarm output relay is 30V DC, 0.3A. There is basic insulation between the alarm output relay and the inverter control circuit.

INSTRUCTIONS FOR COMPLIANCE WITH THE UL STANDARD (for FR-A044-EC only)

1. UL STANDARD

The UL Standard is the most general standard for motor control equipment in the USA. This standard sets forth the safety of equipment, instruments and materials to protect lives and properties from fire, electric shock and other accidents. Inverters are covered by UL508C (Power Conversion Equipment) as part of power conversion equipment.

2. REQUIREMENT OF UL LISTING

In the U.S.A., laws are multiplexed, i.e. there are the federal law and state, municipal and other local laws. The Federal Government provides for only the least required legal regulations and the local governments provide for particulars. Therefore we are not compelled by the federal law to comply with the UL Standard. It should be noted that the laws of several local governments require products to the certified as safe by the UL or other testing institution, and in local governments which do not have legal regulations, the minimum requirement of the federal law that "products should be safe" must be fulfilled.

3. INSTRUCTIONS

When using the FR-A044 as UL-listed product, refer to the following:

(1) Installation

The FR-A044 is UL-listed as a product used in an enclosure. Install it is an enclosure.

(2) Wiring of power supply and motor

When Wiring the input (L1, L2, L3) and output (U, V, W) terminals of the inverter, refer to the following list and use the UL-listed round crimping terminals. Use a crimping tool recommended your terminal manufacture to crimping terminals.

A	Screw	Tightening	1000000	nping ninals		Wires	(Note)	
Applicable Inverter Model	Size	Torque	L1, L2,		m	m ²	A	WG
	3.20	kgf cm	L3	U, V, W	L1, L2, L3	U, V, W	L1, L2, L3	υ, ν, w
FR-A044-0.4K-EC	M3.5	12	2-4	2-4	2	2	14	14
FR-A044-0.75K-EC	M3.5	12	2-4	2-4	2	2	14	14
FR-A044-1.5K-EC	M4	15	2-4	2-4	2	2	14	14
FR-A044-2.2KK-EC	M4	15	2-4	2-4	2	2	14	14
FR-A044-3.7K-EC	M4	15	2-4	2-4	. 2	2	14	14

Note: Use 75°C copper wires.

(3) Short circuit ratings

The drive is suitable for use on a Circuit Capable of delivering not more than ____ RM. Symmetrical Amperes, 500 volts Maximum.

Inverter Capacity	San Park
0.75kW or less	1,000
1.5kW to 3.7kW	5,000

"WARRANTY"

1. Exceptions to the warranty, such as opportunity losses

We do not warrant to reimburse you or your customers for opportunity losses, damage to produce other than ours, or any other businesses which result from a failure of our product, whether such failure has occurred within the free warranty period or not.

2. Repair after production stop

If we stop producing any of our models (products), we will repair such model within seven years after the month of the year when its production is stopped.

3. Delivery condition

It is understood that a standard product which does not include setting and/or adjustment in applications is delivered when it arrives on your promises, and we are not obliged to adjust or test run such product on the spot.

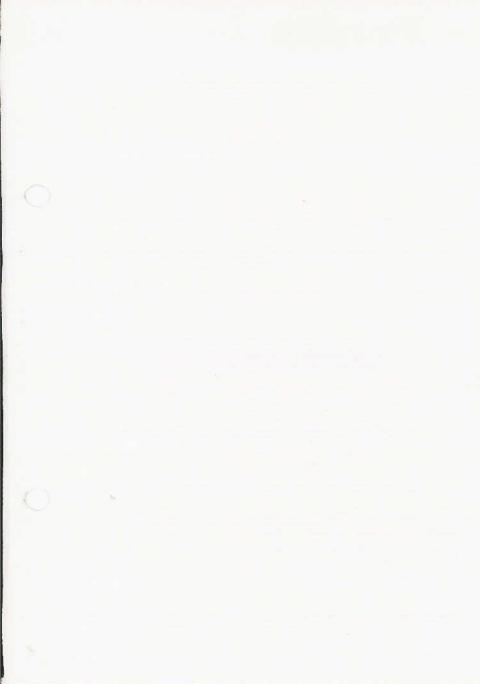
Application of this product

- This product is not designed or manufactured for use with any equipment or system which will be operated under conditions hazardous to life.
- If you are planning to use this product in any specific application such as passenger mobile, medical, aerospace, atomic, power or submarine junction equipment or system, please refer to our business department.
- This product is manufactured under rigorous quality control. However, safety devices should be installed if this product is applied to any facility that may result in a serious accident or loss due to a failure of this product.
- . This product should only be used with a load of three-phase induction motor.

Revisions

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

Print data	*Manual number	Revision
February 1996	IB-66627-A	Print of first edition
December 1996		 Addition of precautions due to application of European Standards
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