



# **Inverter**

## **FREQROL Basics (Operation)**

This course will teach you how to configure a system using an inverter, how to use the operation panel, and how to operate the inverter, using the FR-E700 series inverter as an example.

**Introduction****Purpose of the Course**

This course is intended for those who will build an inverter system using the FR-E700 series inverter for the first time. The course will teach you how to configure a system, how to use the operation panel, and how to operate the inverter under External and PU operation modes.

The contents of this course are as follows.

We recommend that you start from Chapter 1.

### **Chapter 1 - Basics of the FR-E700 Series**

Learn about the basic configuration, product features, product lineup, and component names and functions of the FR-E700 series.

### **Chapter 2 - Inverter System Configuration Procedure**

Learn about the inverter system configuring procedure starting from the operation mode selection to the operation in External and PU operation modes.

### **Chapter 3 - Selecting the Operation Mode**

Learn about the roles of start and frequency commands and different operation modes.

### **Chapter 4 - Installing and Wiring the Inverter and Motor**

Learn how to install and wire the inverter and motor.

### **Chapter 5 - Setting Operation Mode and Parameters**

Learn how to use the operation panel to set operation modes and parameters.

### **Chapter 6 - Operating the Inverter System**





Learn how to operate the inverter in PU and External operation modes.

### **Chapter 7 - Responding to Errors During Operation**

Learn about the fault display types, how to reset the protective function, how to check the faults history, and how to respond to a motor malfunction.

### **Final Test**

Passing grade: 60% or higher.

Go to the next page		Go to the next page.
Back to the previous page		Back to the previous page.
Move to the desired page		"Table of Contents" will be displayed, enabling you to navigate to the desired page.
Exit the learning		Exit the learning. Window such as "Contents" screen and the learning will be closed.

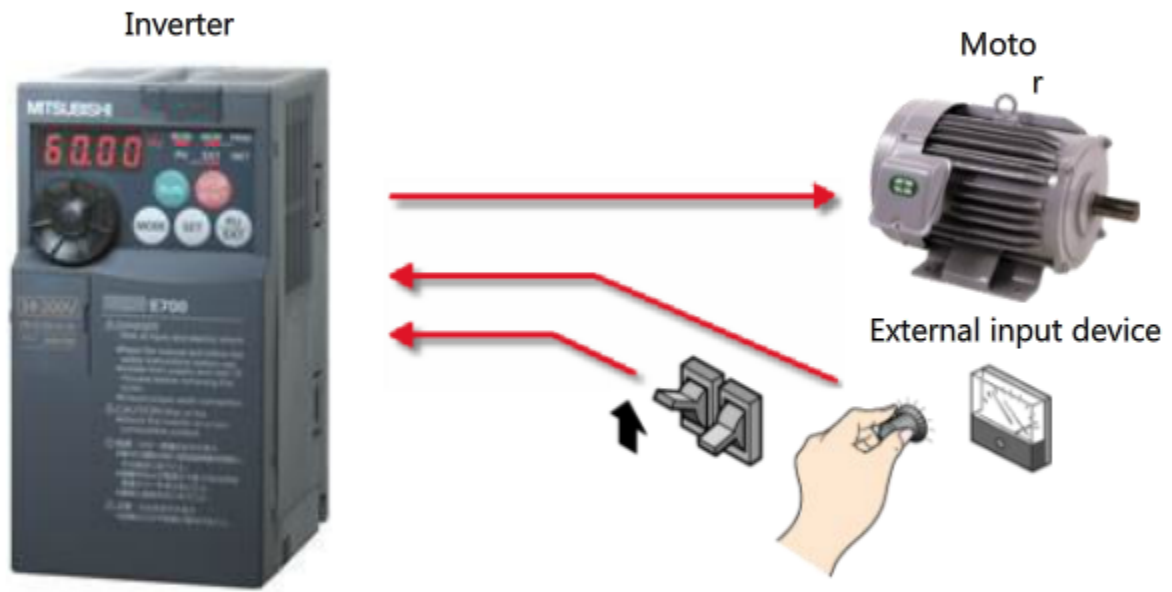


**Safety precautions**

When you learn by using actual products, please carefully read the safety precautions in the corresponding manuals.

# Chapter 1 Basics of the FR-E700 Series

This course will teach you how to configure an inverter system using the Mitsubishi general-purpose FR-E700 inverter (hereafter referred to as FR-E700) and a three-phase induction motor (hereafter referred to as motor). Chapter 1 will provide you the basic knowledge about the FR-E700 series. Here is the basic inverter system configuration with the FR-E700 series inverter.



Device	Role
Inverter	Changes the motor speed by controlling the power supply frequency given to the motor.
Motor	Rotates at the speed of the power supply frequency given by the inverter.
External input device	Forward/reverse start switch. Turns ON or OFF the forward or reverse start command in External operation mode.
	Frequency command device (potentiometer, etc.). Adjusts the motor speed (frequency command) in External operation mode.

## 1.1

## Features of FR-E700 Series

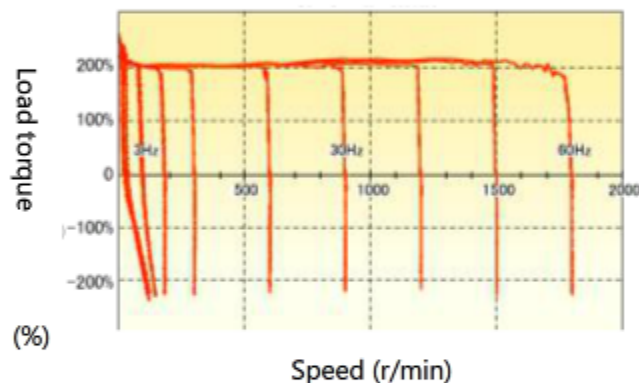
The FR-E700 series inverter has the following features.

For more details, refer to the product catalogs and Mitsubishi Electric Global FA Website.

- Advanced magnetic flux vector control that generates a high torque of 200%/0.5Hz (available in 3.7K or lower capacity inverters)

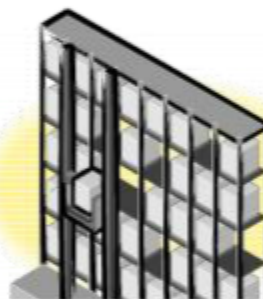
#### Example of speed - torque characteristics

FR-E720-3.7K (Advanced magnetic flux vector control)  
SF-JR 4P 3.7kW



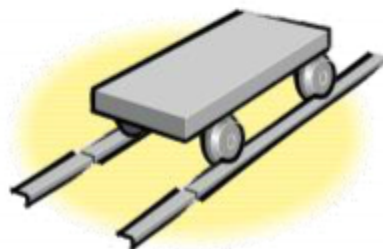
#### Advanced auto tuning

Mitsubishi's unique rotation-less auto tuning function enables optimum control of various motors. This function tunes the inverter to a high precision even when a test run of the motor is not possible.



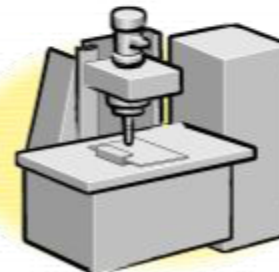
Advanced magnetic flux vector control is suitable for automatic warehouses lifts that require high torque in low speeds.

- Increased short-time overload capability (200% for 3 seconds)



Impacts at bumps can be absorbed by increasing the overload capacity of the carrier.

- Torque limit/current limit function

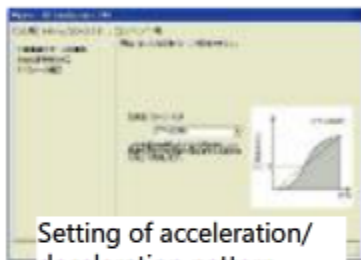


Blade chipping and other machine breakage can be prevented with the torque limit function.

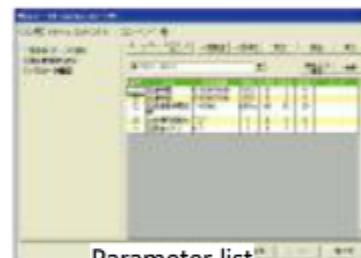
# 1.1 Features of FR-E700 Series

**USB connector**  
Enables easy setting from FR Configurator downloaded to a personal computer.

Setting wizard  
(example: setting of acceleration/deceleration time)



Setting of acceleration/  
deceleration pattern



Parameter list



Setting of acceleration/  
deceleration time

**USB+FR Configurator  
improves operability**

**Support for various networks**

- EIA-485 (RS-485)
- ModbusRTU (equipped as standard)
- CC-Link
- PROFIBUS-DP
- DeviceNet®
- LONWORKS®

High-speed  
graph function



FR Configurator

Mini B  
connector

USB cable



Inverter

**Parameter unit**  
FR-PU07/FR-PU07BB  
(Option)



**Support for various plug-in options**



Plug-in option

Front cover dedicated  
to the plug-in option

**Dedicated control terminal cards for different  
applications**



Terminal card

# 1.1

## Features of FR-E700 Series

Side-by-side installation for space saving



Easy replacement of the cooling fan



Long-life design, leading-edge life diagnosis function

Estimated lifespan of consumable parts

Part name	Estimated lifespan in FR-E700	Recommended lifespan by JEMA(*)
Cooling fan	10 years	2 or 3 years
Main circuit smoothing capacitor	10 years	5 years
On-board smoothing capacitor	10 years	5 years

\*: Excerpt from "Recommendation for Periodic Inspection of General-purpose Inverter" by Japan Electrical Manufacturers' Association (JEMA).

Conformed to UL, cUL, EU Directive (Low Voltage Directive) as standard.

E700 can also conform to the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS).



# 1.2 FR-E700 Series Lineup

A lineup of the FR-E700 series inverters is introduced here.

## How to read the product model name

FR-E720-0.1K-

Symbol	Voltage
1	100V class
2	200V class
4	400V class

Symbol	Number of power phases
None	Three-phase input
S	Single-phase input
W	Single-phase input (double voltage output)

Symbol	Inverter capacity
0.1K to 15K	Indicates the capacity (kW)

Symbol	Protective structure
None	Enclosed structure
C	Totally enclosed structure IP40

## Capacity lineup of each series

Inverter capacity		0.1K	0.2K	0.4K	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K	11K	15K
Inverter type												
Three-phase 200V class FR-E720-												
Three-phase 400V class FR-E740-												
Single-phase 200V class FR-E720S-												
Single-phase 100V class FR-E710W-												



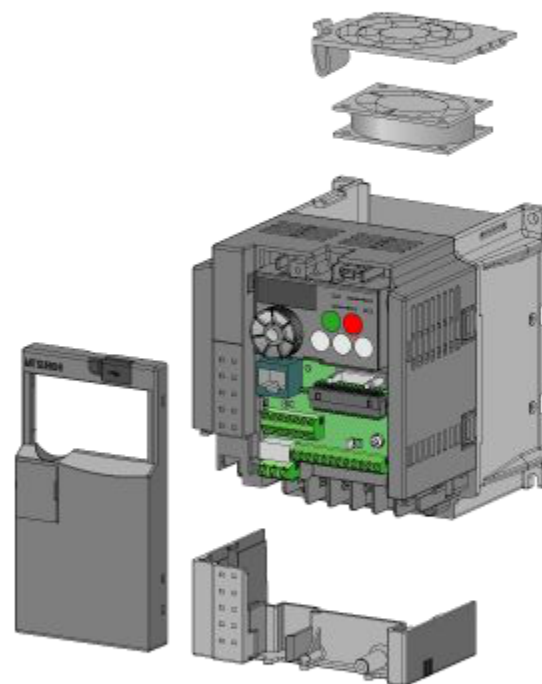


## 1.3

## Names and Functions of Inverter Components

Let's learn about the names of the inverter components and their functions, using "FR-E720-1.5K" as an example. Place your mouse cursor on any component in the table or on the inverter. The corresponding part will be displayed.

Name	Use
Operation panel	Equipped with LEDs, buttons and the setting dial, which are used to give start/stop and frequency (speed) commands to the inverter, set parameters and select monitored items.
PU connector	Connected to an external Parameter Unit, personal computer, or programmable controller.
USB connector	Connected to a personal computer.
Main circuit terminal block	Connected to the power supply and the motor.
Standard control circuit terminal block	Connected to external input devices (start switch, frequency command device, etc.) and external output devices (fault output and output frequency monitor, etc.).
Voltage/current input switch	Selects the voltage input or current input when using an external analog device to give a frequency command.
Control logic switchover jumper connector	Selects the input signal's control logic between SINK and SOURCE. SINK logic is selected in the initial setting. Refer to the manual for details.
Plug-in option connector	Connected to various options to extend the inverter functions. Refer to the manual for details.
Cooling fan	Easily removable fan of the inverter.
Front cover	Removable. The removal and reinstallation method is explained in Chapter 4.
Combed shaped wiring cover	Removable. The removal and reinstallation method is explained in Chapter 4.



## 1.4

## Summary of this Chapter

Here is what you have learned in Chapter 1.

- Basic configuration of an inverter system
- Features of FR-E700 series
- Lineup of FR-E700 series products
- Names and functions of inverter components

**Point**

Please review the following important points:

Basic configuration of an inverter system	You have learned the basic configuration of the inverter system.
Features of the FR-E700 series inverters	You have understood the features of the FR-E700 series inverter.
Features and control method of External operation mode	You have understood the lineup of the FR-E700 series inverters and how to read their model names.
Names and functions of inverter components	You have learned the names and functions of inverter components.



## Chapter 2 Inverter System Configuration Procedure

This flowchart shows the procedures for configuring an inverter system. Each procedure is explained in the order of the configuration.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6

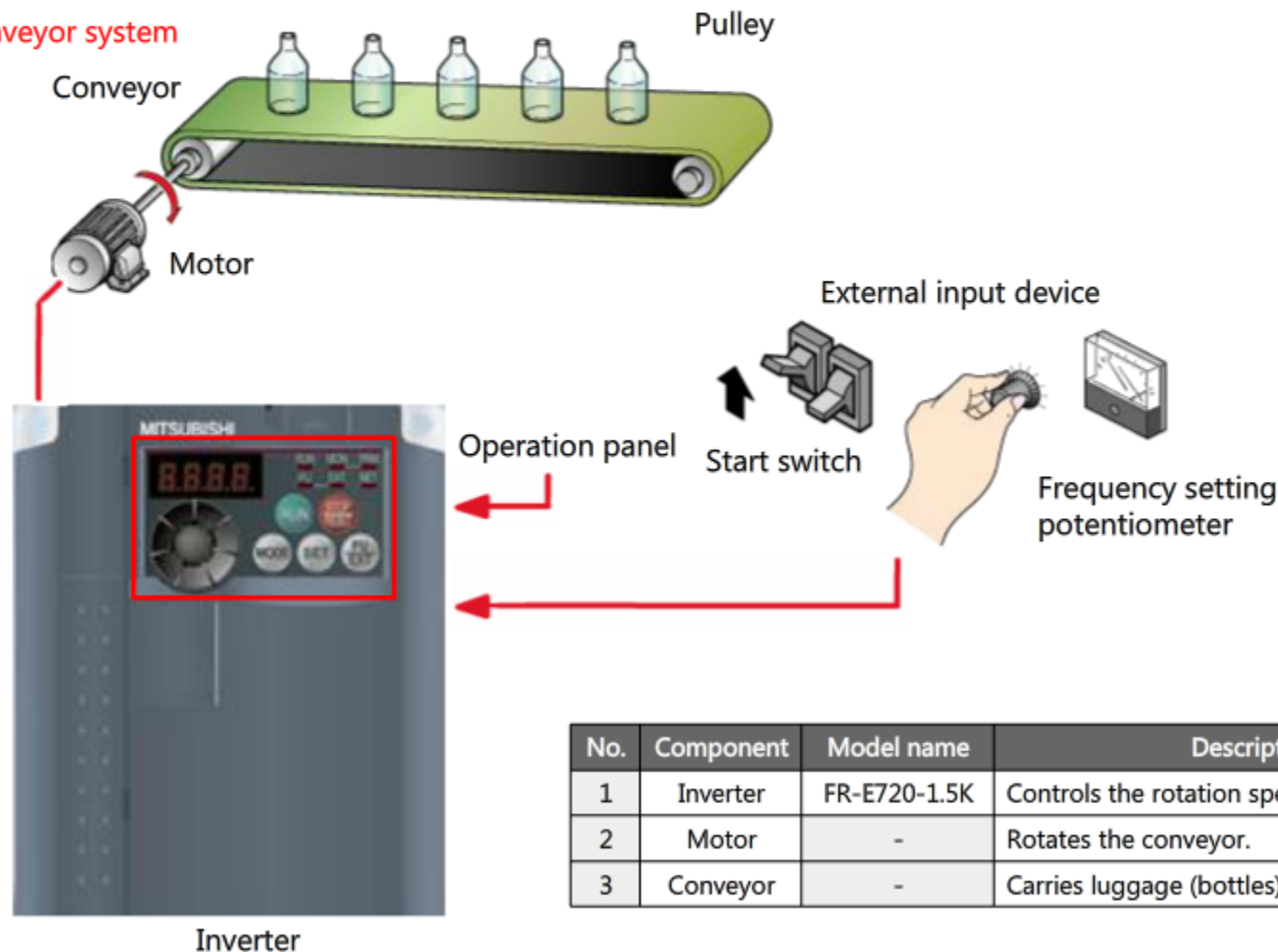


(5) Responding to errors caused during operation — Chapter 7

## 2.1 Configuration of the System

In this course, you will learn how to configure a conveyor system to convey bottles, in the order of the configuration procedure explained in the last page. You will learn two methods for changing the conveyor speed; one is to use the operation panel of the inverter, and the other is to use external input devices (three speed switches and potentiometer). The components of the conveyor system are shown below.

### Conveyor system



No.	Component	Model name	Description
1	Inverter	FR-E720-1.5K	Controls the rotation speed of the motor.
2	Motor	-	Rotates the conveyor.
3	Conveyor	-	Carries luggage (bottles).

## 2.2

## Summary of this Chapter

Here is what you have learned in Chapter 2.

- System configuration procedure
- Specifications of the conveyor system example

### Point

Please review the following important points:

System configuration procedure	You have learned the configuration procedure of a general inverter system.
Specifications of the conveyor system example	You have learned the specifications of the conveyor system example.

## Chapter 3 Selecting the Operation Mode

In this chapter, you will learn about different inverter operation modes and their features. You will need to select the operation mode best suited to the application.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6



(5) Responding to errors caused during operation — Chapter 7

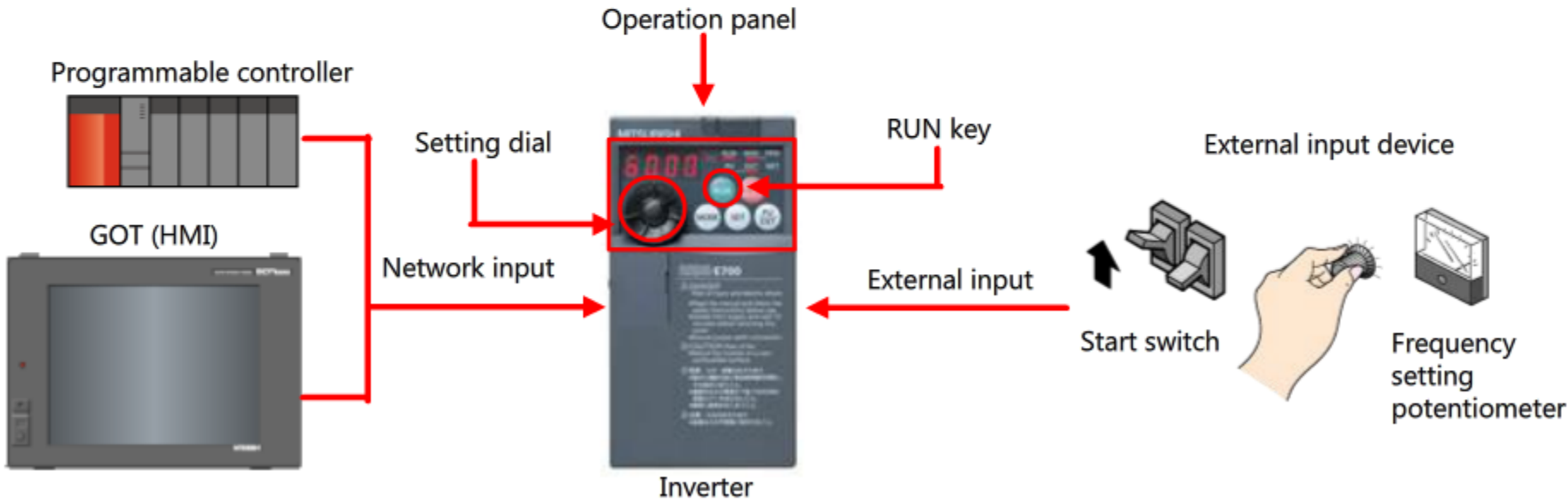
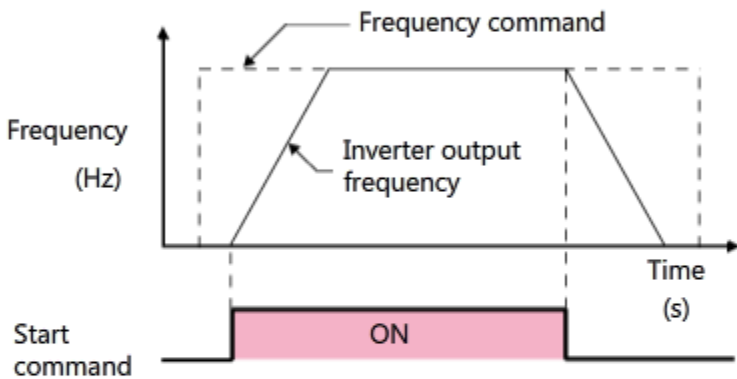
### Contents of Chapter 3

- 3.1 Operation Modes
  - 3.1.1 PU operation mode
  - 3.1.2 External operation mode
  - 3.1.3 Combined operation mode
  - 3.1.4 Network (NET) operation mode

# 3.1 Operation Modes

A "start command" and a "frequency command" are required to operate an inverter. Turning ON the start command rotates the motor, and turning ON the frequency command sets the motor speed. FR-E700 refers to each inverter operation method as "operation mode". For how to switch between operation modes, you will learn this in Chapter 5 Setting the Operation Mode and Parameters.

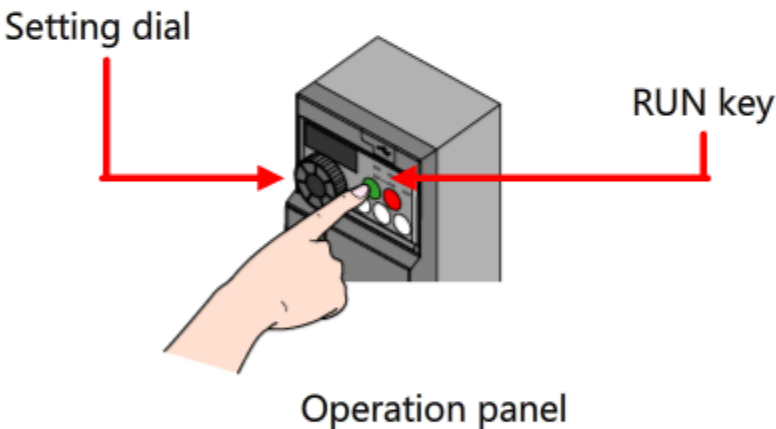
Operation mode	Start command source	Frequency command source
PU operation mode	Operation panel (RUN key)	Operation panel (setting dial)
External operation mode	External input (switch)	External input (potentiometer)
Combined operation mode (Combination 1)	External input (switch)	Operation panel (setting dial)
Combined operation mode (Combination 2)	Operation panel (RUN key)	External input (potentiometer)
NET (network) operation mode	Network input device	Network input device



# 3.1.1 PU Operation Mode

In PU operation mode, a start command and a frequency command are both input from the operation panel of the inverter. A simple system, which uses only one inverter as the command source, is operated under this PU operation mode. The setting dial can be used to change the frequency (rotation speed) during operation. The following figure shows the basic configuration example in the PU operation mode.

Start command	Operation panel (RUN key)
Frequency command	Operation panel (setting dial)



## 3.1.2

## External Operation Mode

In External operation mode, an external input device (switch, potentiometer, etc.) connected to the inverter inputs a start command and a frequency command.

This operation mode requires the connection of an external input device.

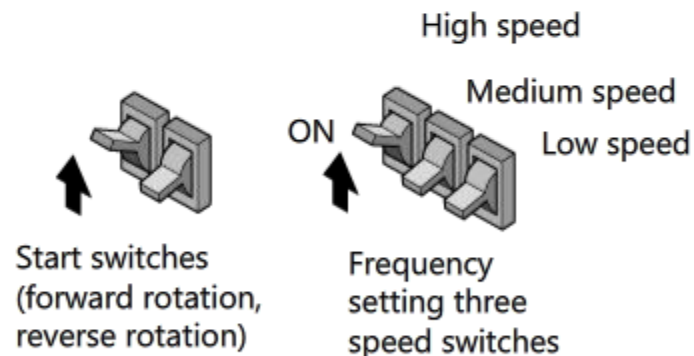
This operation mode is suitable when the inverter's operation panel cannot be directly operated because the inverter is installed inside an enclosure, etc.

The following figures show the basic configuration examples in the External operation mode.

### Changing the frequency using three speed switches

Start command source	Start switch
Frequency command source	Three speed switches

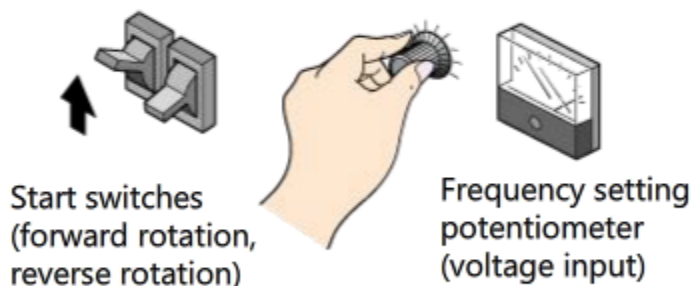
External input device



### Changing the frequency using a potentiometer (voltage input)

Start command source	Start switch
Frequency command source	Potentiometer (voltage input)

External input device



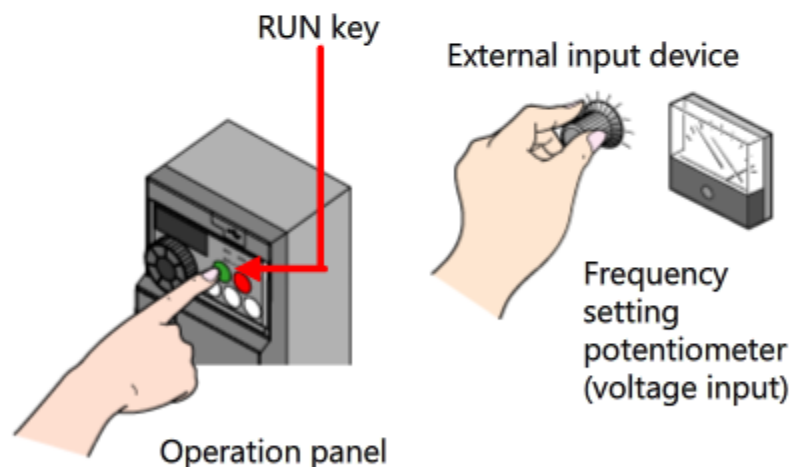
### 3.1.3

## Combined Operation Mode

The combined operation mode is a combination between the PU operation mode and External operation mode. For example, a start command can be input from the operation panel (RUN key) and a frequency command can be input from an external input device (potentiometer), as shown in Combination 1. You can set parameters to change the combination. (Details are given in Section 5.3.2.) The basic configurations of the combined operation modes are shown below.

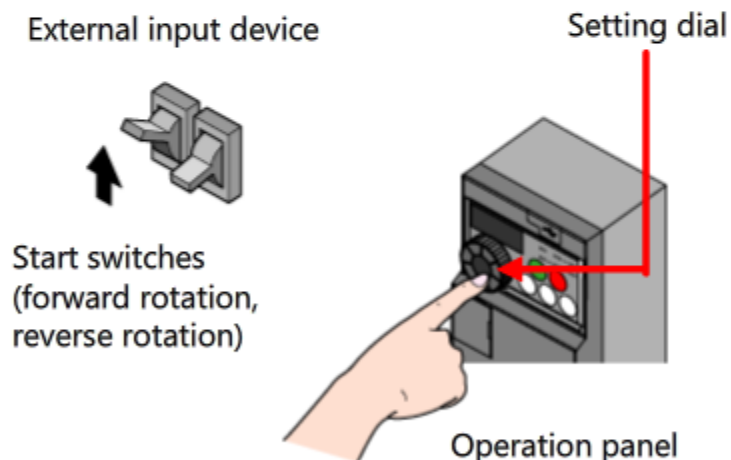
#### Combination 1

Start command source	RUN key on the operation panel
Frequency command source	Potentiometer (voltage input)



#### Combination 2

Start command source	Start switch
Frequency command source	Setting dial on the operation panel





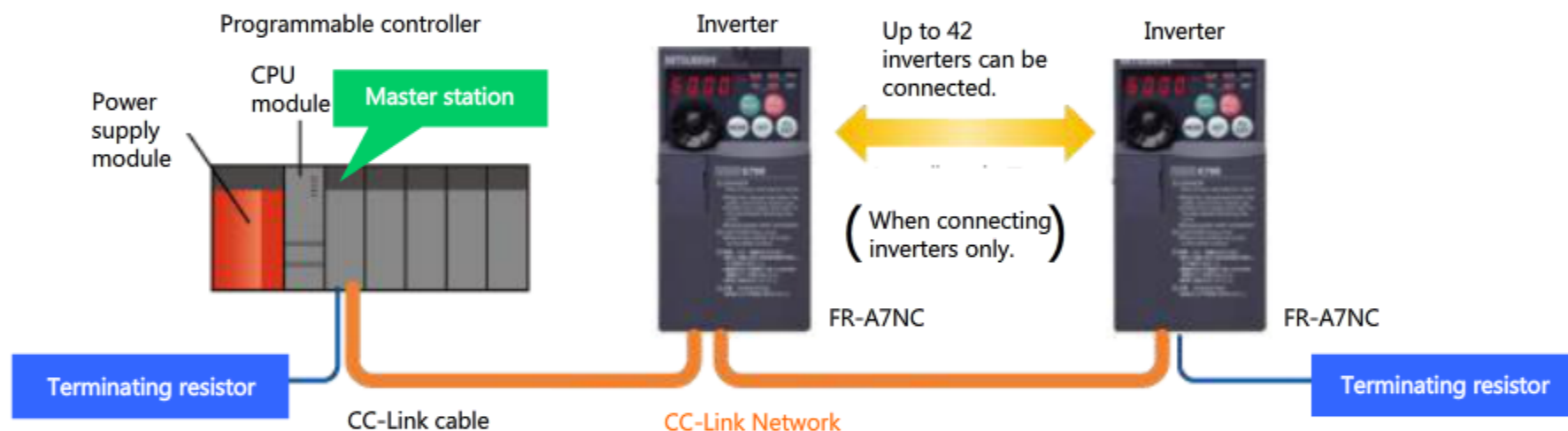
### 3.1.4

## NET (Network) Operation Mode

In NET (network) operation mode, a start command and a frequency command are input via a network from a personal computer, programmable controller, or GOT (HMI) to the inverter equipped with PU connector (RS-485 communication) or another communication option.

This course explains briefly about NET operation mode. For more details, refer to the manuals.

### Example of CC-Link Network connection



## 3.2

## Summary of this Chapter

Here is what you have learned in Chapter 3.

- Operation modes
- Operating method and features of PU operation mode
- Operating method and features of External operation mode
- Operating method and features of combined operation mode
- Basics of NET (network) operation mode

### Point

Please review the following important points:

Operation modes	You have learned that a start command and a frequency command are required for inverter control and that you need to select the operation mode according to the configured inverter system.
Control method and features of PU operation mode	You have learned that operation is possible with the inverter operation panel alone.
Control method and features of External operation mode	You have learned that control from an external device (switch, potentiometer, etc.) is possible in an environment where the operation panel cannot be operated directly.
Control method and features of combined operation mode	You have learned that PU and External operation modes can be used in combination to use different start and frequency command sources.

## Chapter 4 Installing and Wiring the Inverter and Motor

In this chapter, you will learn how to install and wire the inverter and motor.  
The wiring method differs by the operation mode, which explained in Chapter 3. Please note that point.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6



(5) Responding to errors caused during operation—Chapter 7

### Contents of Chapter 4

- 4.1 Handling of the Front and Wiring Covers
- 4.2 Installing the Inverter
  - 4.2.1 Installation conditions and handling method
- 4.3 Wiring the Inverter and Motor
- 4.4 Grounding the Inverter and Motor
- 4.5 Wiring to the Main Circuit Terminals
  - 4.5.1 Connecting the power supply cable
  - 4.5.2 Connecting the motor cable
- 4.6 Wiring to the Standard Control Circuit Terminals
  - 4.6.1 Connecting the start switches
  - 4.6.2 Connecting the three speed switches
  - 4.6.3 Connecting the current inputs
  - 4.6.4 Connecting the voltage inputs

## 4.1

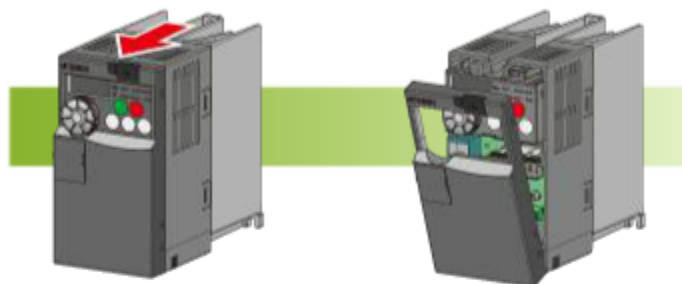
# Handling of the Front and Wiring Covers

When installing an inverter, the front and wiring covers must be removed and reinstalled.  
How to remove and reinstall the front and wiring covers is explained below (using FR-E720-0.75K as an example).

Front cover (FR-E720-3.7K or lower, or FR-E740-7.5K or lower)

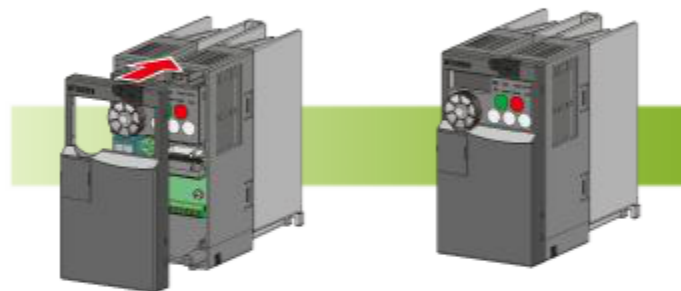
### - Removing

Pull the area shown by the arrow.



### - Reinstalling

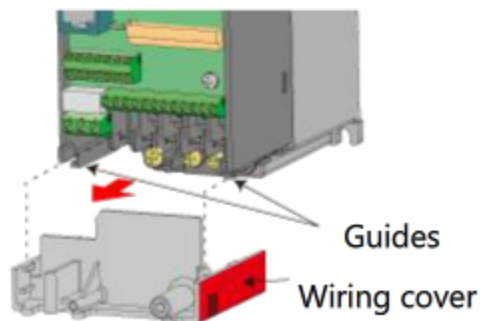
Fit the cover straight to the front of the inverter and press it.



Wiring cover (FR-E720-0.1K to 0.75K)

### - Removing and reinstalling

You can remove the wiring cover easily by pulling it. Reinstall the cover along the guides.

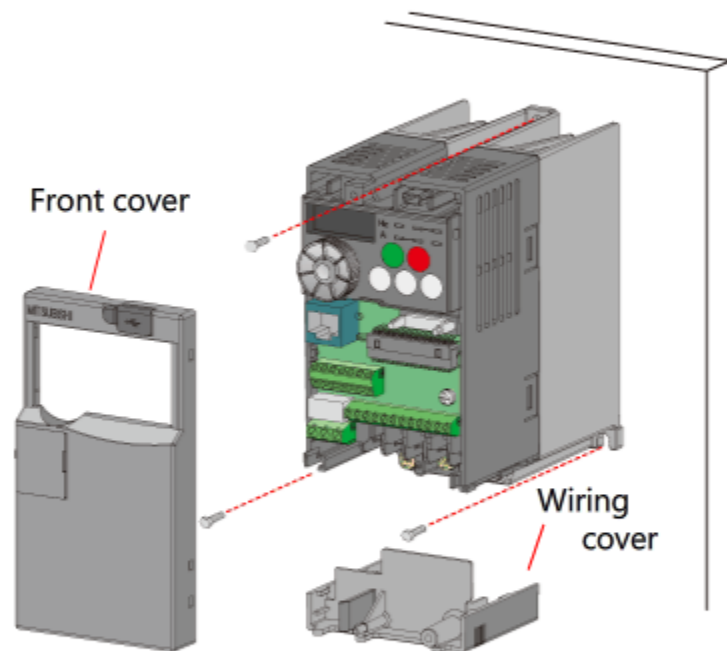


## 4.2

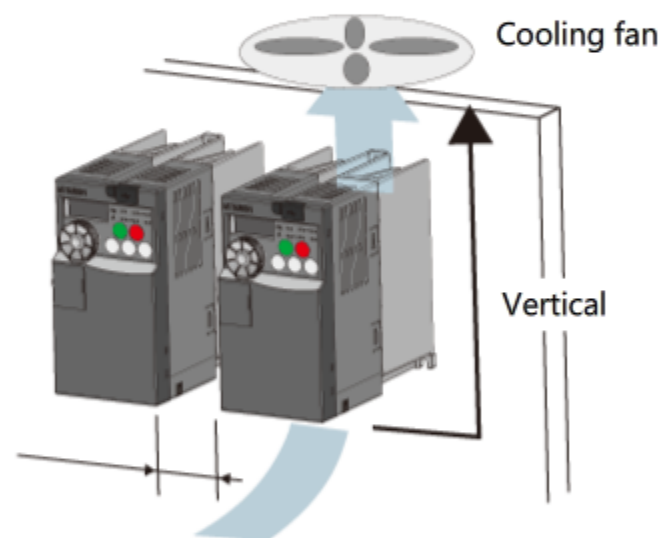
## Installing the Inverter

This is how you install an inverter.

After removing the front and wiring covers, fit the inverter to a wall. (FR-E720-0.1K to 0.75K)



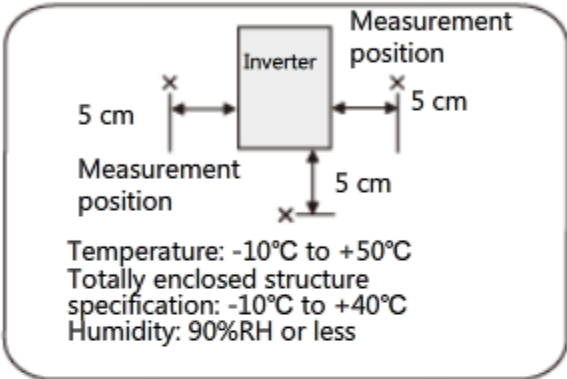
When installing two or more inverters, installing them in parallel and take cooling measures. Install the inverters vertically.



# 4.2.1 Installation Conditions and Handling Method

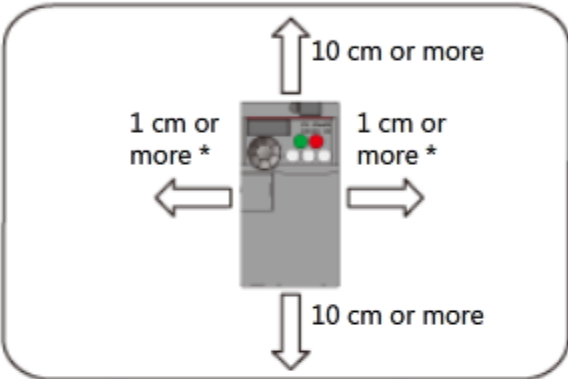
Install an inverter under the following conditions:

## Surrounding air temperature and humidity



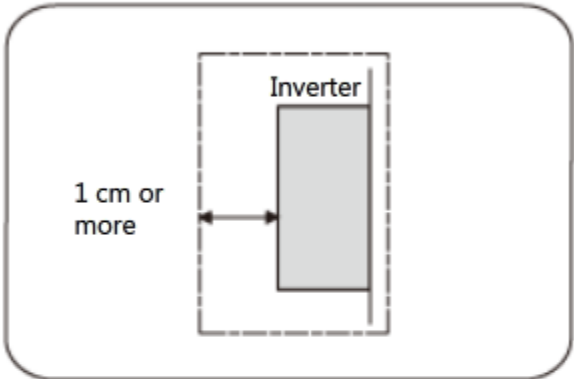
Leave enough clearances and take cooling measures.

## Clearances (front)



\* At a surrounding air temperature of 40°C or less, inverters can be installed without any clearance between them (0cm clearance). When the surrounding temperature exceeds 40°C, clearances between inverters should be 1 cm or more (5cm or more for 5.5K or higher capacity inverters).

## Clearances (side)



\* 5 cm or more is required for 5.5K or higher capacity inverters.

## 4.2.1

## Installation Conditions and Handling Method

An inverter consists of precision mechanical and electronic parts.

Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.



Direct sunlight



Vibration  
( $5.9\text{m/s}^2$  or higher)



High temperature  
and high humidity



Horizontal placement



Serial installation  
in an enclosure



Transportation by  
holding the front cover  
or the setting dial



Oil mist, inflammable gas,  
corrosive gas, fluff, dust,  
etc.



Mounting to  
combustible material

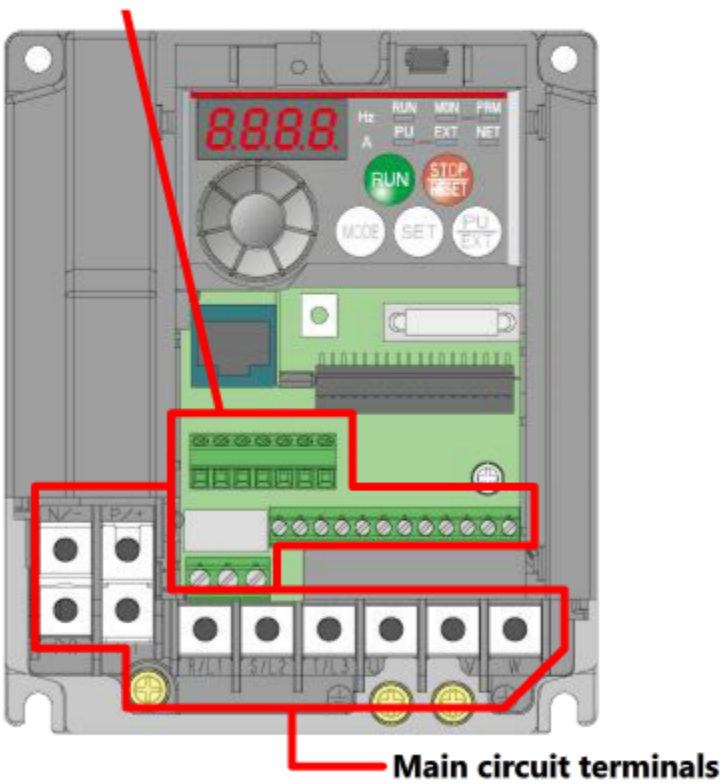


# 4.3 Wiring the Inverter and Motor

Let's learn how to connect the inverter and the motor.  
The inverter's input/output terminals consist of main circuit terminals and control circuit terminals.  
The power supply cable and motor are connected to the main circuit terminals, and switches and frequency command devices are connected to the control circuit terminals.  
The standard control circuit terminals are divided into the three terminal blocks by the input/output terminal types.

Front view of FR-E720-1.5K (with the front cover and wiring cover removed)

## Standard control circuit terminals





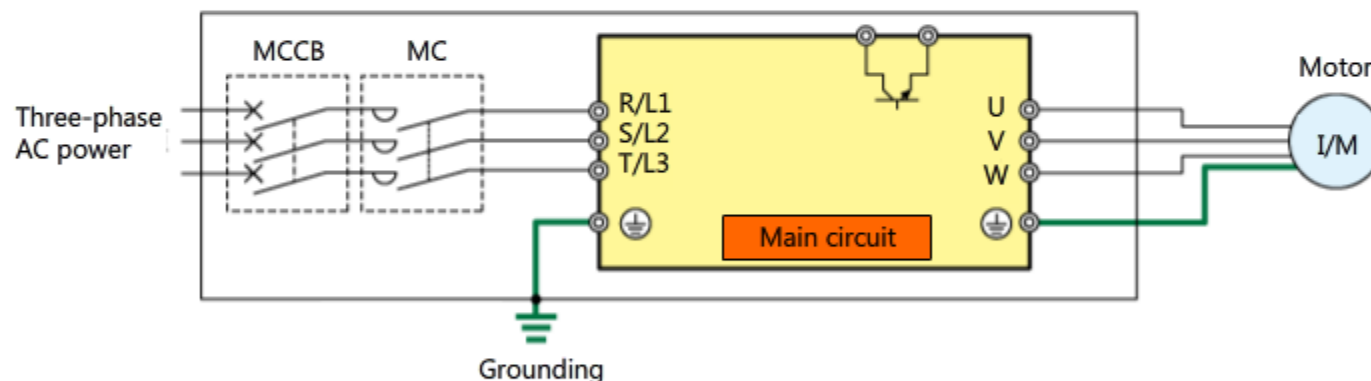
## 4.4

## Grounding the Inverter and Motor

Before connecting the power supply, ground the inverter and motor.  
Do not fail to ground the inverter and motor to prevent an electrical shock and noise.

Generally an electrical device has a ground terminal, which should always be connected to the ground before use. An electrical circuit is generally insulated by an insulation material and housed in a case. However, no insulation material can completely shut out leakage current, and slight current always leaks to the case. The purpose of grounding is to prevent you from being electrically shocked by this leakage current when you touch the case of the electrical device. For devices dealing with weak signals and fast-running devices, such as audio equipment, sensors, and computers, this type of grounding is critical to minimize electromagnetic interferences (EMI).

### Connection example



## 4.5

## Wiring to the Main Circuit Terminals

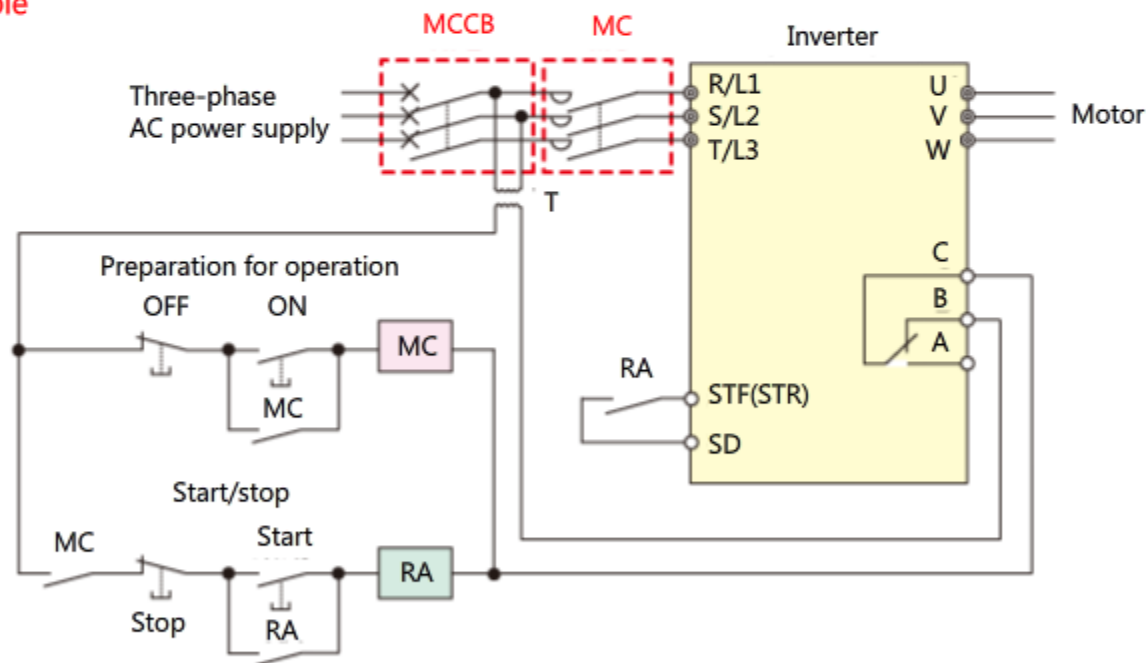
Connect the commercial power supply (three-phase AC power supply) to the inverter.

Always install a moulded case circuit breaker (MCCB) to the power supply cable.

Provide a magnetic contactor (MC) between the power supply and the main circuit terminals of the inverter for the following purposes:

- To disconnect the inverter from the power supply when a protective function activates or the driven machine fails (such as an emergency stop operation).
- To prevent accidents by the automatic restart of an inverter after a power failure, etc.
- To save some energy by disconnecting the power supply to the inverter when the inverter is to be stopped for a long time.
- To disconnect the inverter from the power supply to perform inspection and maintenance safely.

## Connection example

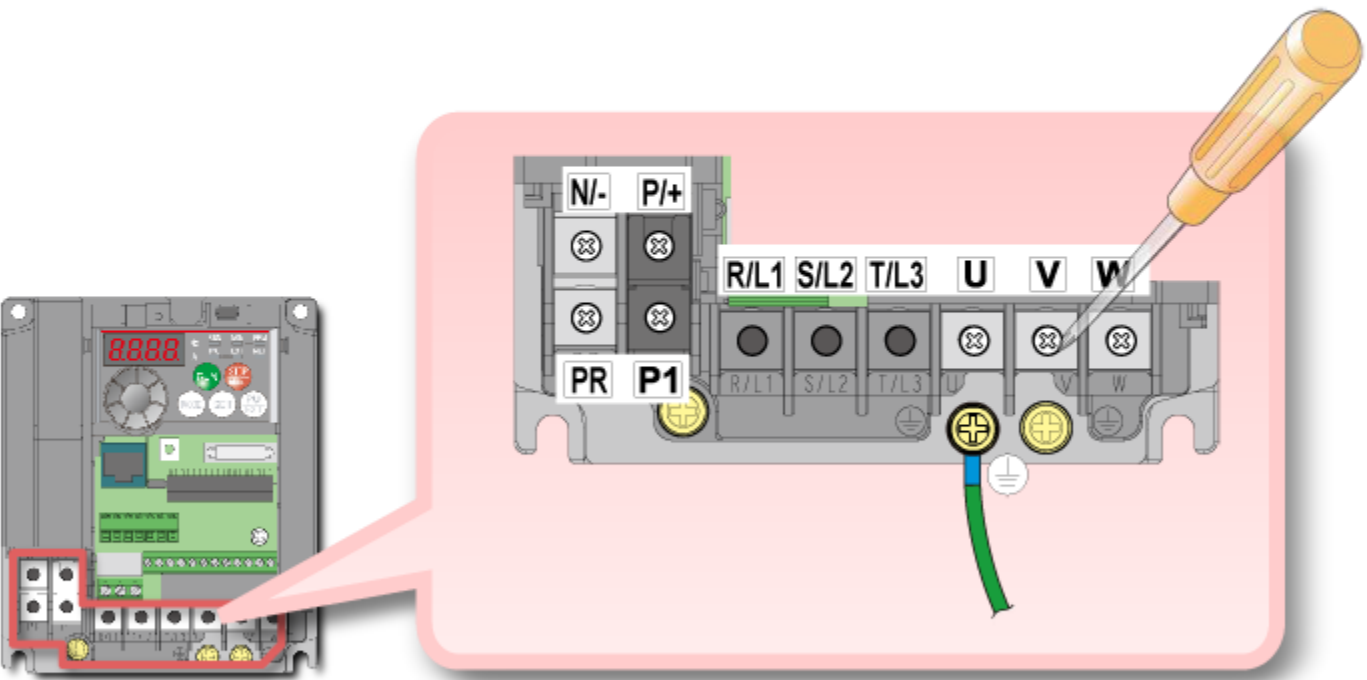


\* For the selection (including capacity selection) of the moulded case circuit breaker (MCCB) and magnetic contactor (MC), refer to the instruction manual of each product.

# 4.5.1 Connecting the Power Supply Cable

Let's learn how to connect the power supply cable to the inverter.  
 Connect the power supply cable to main circuit terminals R, S, and T.  
 Never connect the power supply cable to output terminals U, V, and W of the inverter. Doing so will damage the inverter.

Wire connection diagram of FR-E720-1.5K



## 4.5.2

## Connecting the Motor Cable

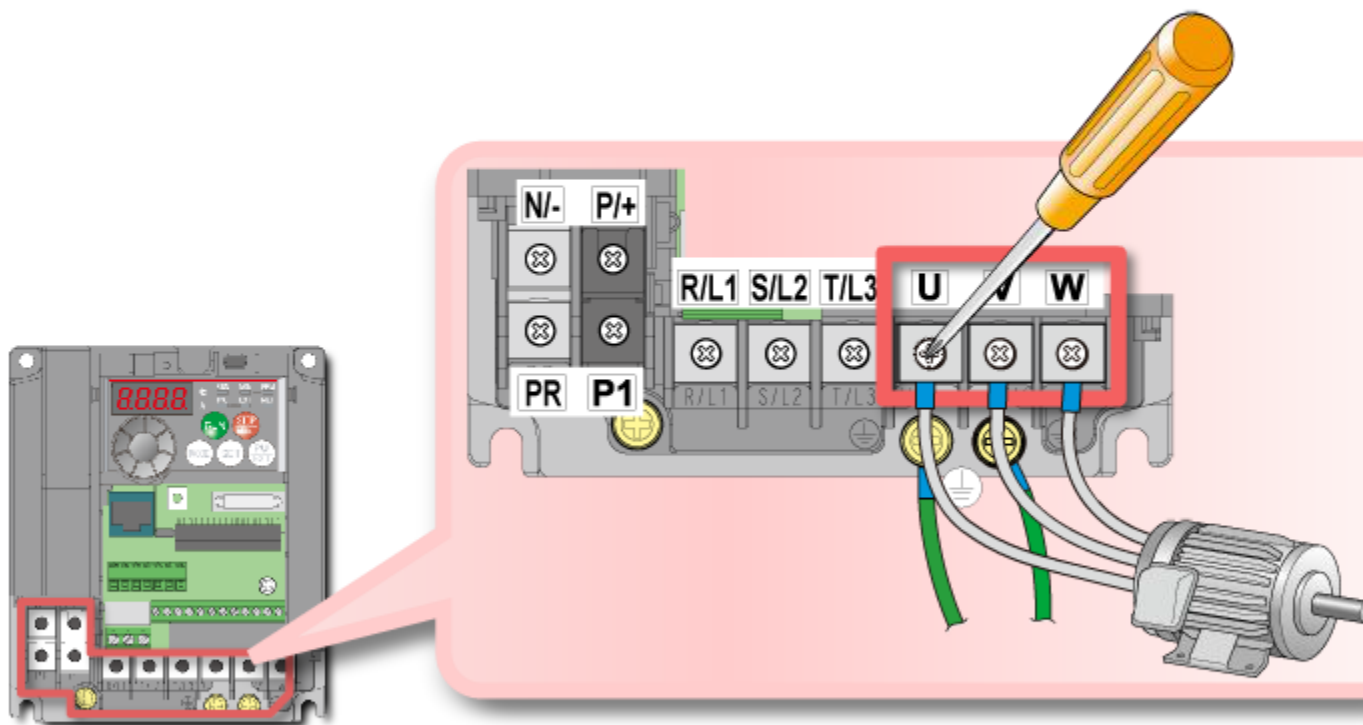
Let's learn how to connect the motor cable to the inverter.

Connect the motor cable to main circuit terminals U, V, and W.

Confirm that the forward and reverse rotation commands match the motor's rotation direction.

Determine the appropriate total wiring length according to the inverter capacity. Refer to the manual for details.

Wiring connection diagram of FR-E720-1.5K



## 4.6

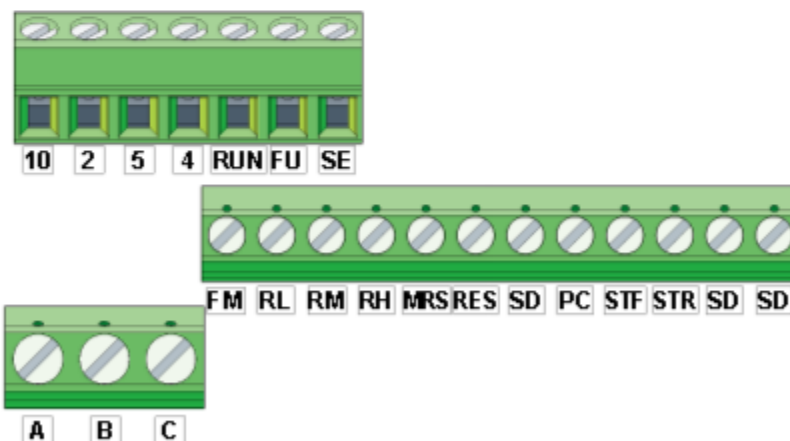
## Wiring to the Standard Control Circuit Terminals

Let's learn how to wire switches and potentiometer, which control start/stop and speed of the motor in External and combined operation modes. Switches and potentiometer are connected to the standard control circuit terminals. When connecting these devices, note the following points:

- A wire gauge of  $0.3\text{mm}^2$  to  $0.75\text{mm}^2$  is recommended for the wiring to the control circuit terminals.
- Use a wiring length of 30m or less (200m for terminal FM).
- Use a shielded cable or twisted-wire cable for the connection to the control circuit terminals and isolate such cable from the main circuit and strong electrical circuits (including the 200V relay sequence circuit).
- SD, SE, and 5 are common terminals for input/output signals. Do not ground these common terminals.
- The control circuit uses minute electric current for signal inputs. For the control circuit contacts, use at least two minute-signal contacts in parallel or a twin-contact to prevent contact faults.
- Do not input a voltage to the contact input terminals (such as STF) of the control circuit.
- When using fault output terminals A, B, and C, be sure to connect a load (such as a relay or lamp) to the terminals.

## (1) Layout of the standard control circuit terminals

Terminal screw size  
M3: Terminals A, B, and C  
M2: Other than the above



## 4.6

## Wiring to the Standard Control Circuit Terminals

## (2) Wiring

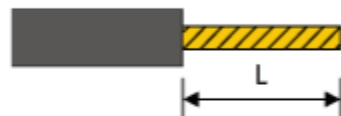
## method

- 1) For wiring to the control circuit, peel the sheath of the cable and use it as is.

Peel the sheath as shown below. If you peel it too much, a short circuit may occur with adjacent cables.

If the peeling length is too short, the cable may come off.

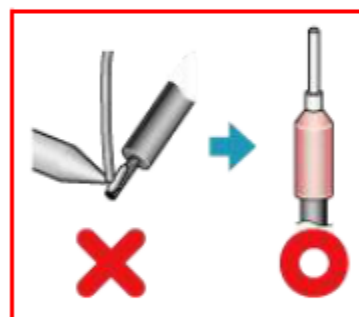
Sheath peeling length



Treat the wires to prevent them from getting loose.

Do not solder the cable. If needed, use a blade terminal.

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



- 2) Loosen the terminal screw, and insert the cable to a terminal.

- 3) Tighten the screw with the specified tightening torque.

Too loose tightening may cause cable disconnection or a malfunction. Tightening too much may cause a short circuit or malfunction due to damage to the screw or unit.

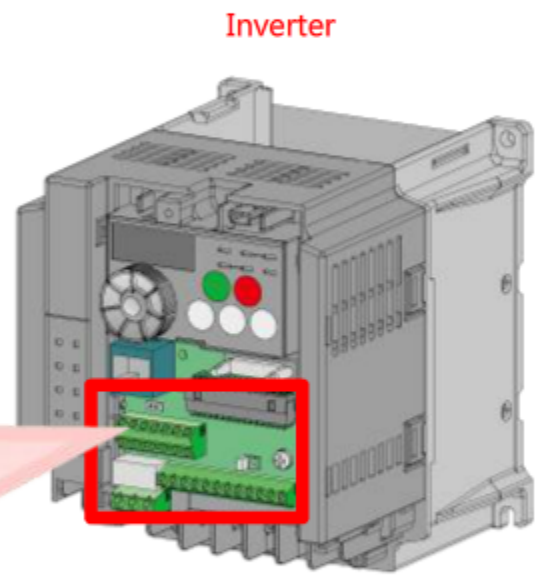
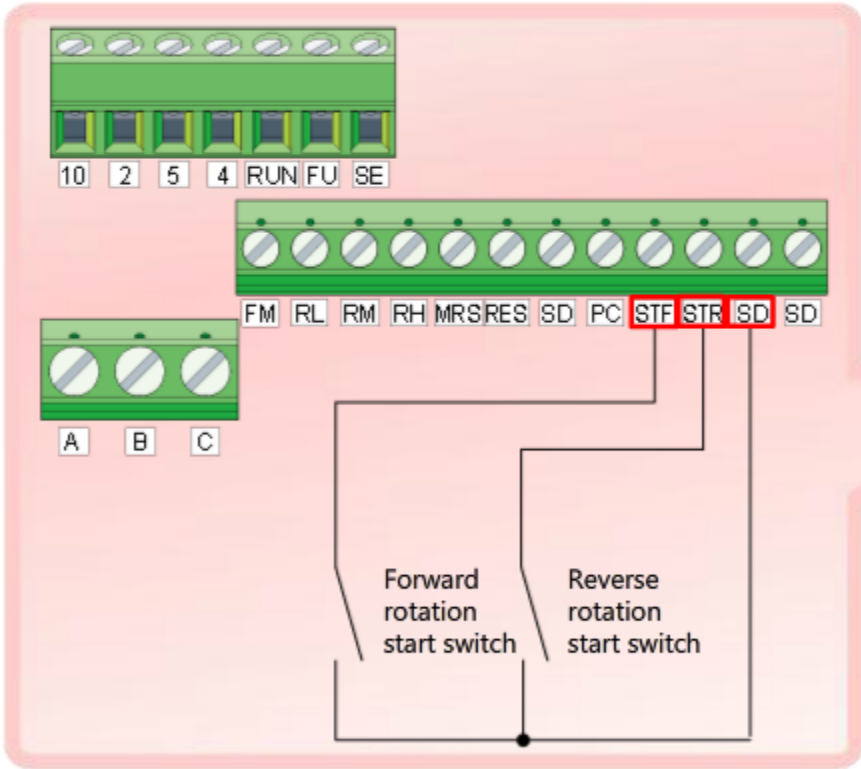
Terminal	Tightening torque
Terminals A, B, and C	0.5N·m to 0.6N·m
Other than the above	0.22N·m to 0.25N·m

Recommended screwdriver: Small flat-blade screwdriver (tip thickness 0.4mm, tip width 2.5mm)

# 4.6.1 Connecting the Start Switches

Let's learn how to connect the forward and reverse rotation switches, which are used to start or stop the motor. Turning ON the STF signal (forward rotation start) or STR signal (reverse rotation start) starts the motor, and turning it OFF stops the motor. Be careful not to turn ON the STF and STR signals together. Doing so will shut off the outputs.

Wire connection diagram of FR-E720-1.5K



Enlarged view of standard control circuit terminal block

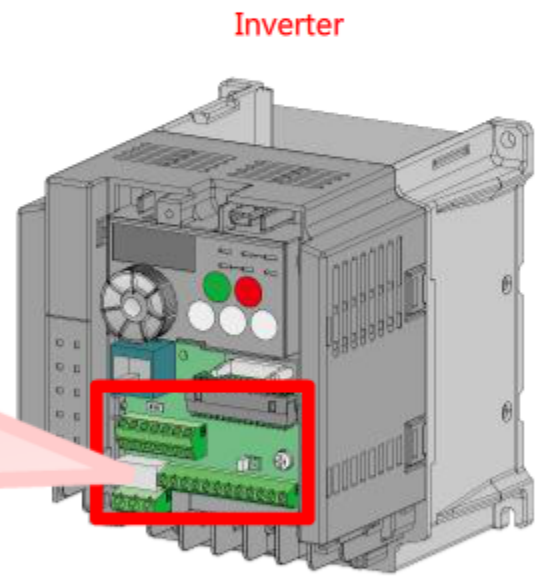
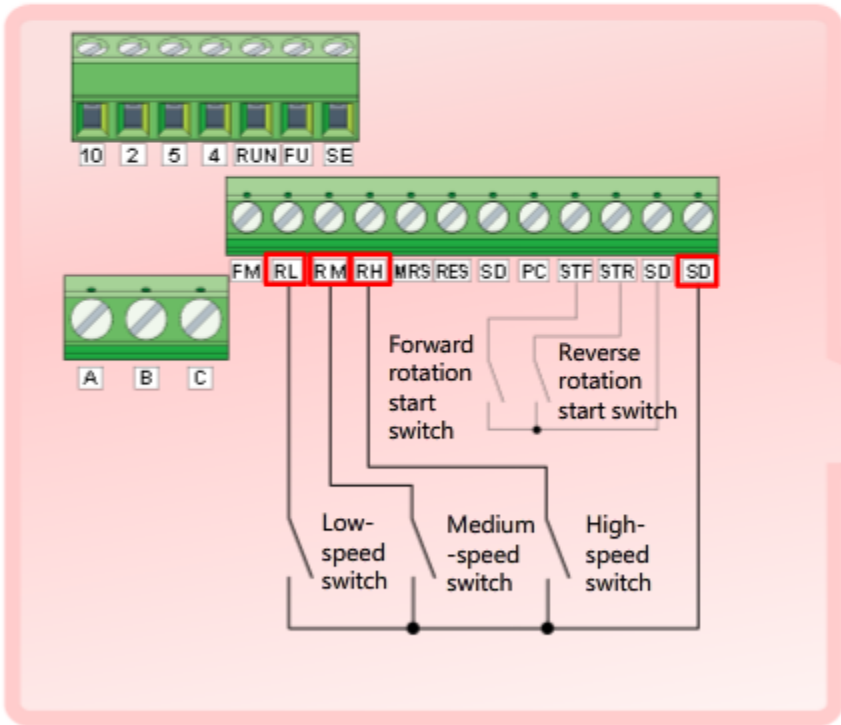


# 4.6.2 Connecting the Three Speed Switches

Let's learn how to connect the three speed switches (low, medium, and high speeds), which input RL (low speed), RM (medium speed), and RH (high speed) signals to control the motor speed (frequency command). In the initial setting, the frequency of each signal is as follows: 10Hz for RL signal, 30Hz for RM signal, and 60Hz for RH signal.

The three speed switches can also be used for voltage or current input. If a three speed signal and a voltage/current signal are input simultaneously, the three speed signal is given priority.

Wire connection diagram of FR-E720-1.5K



Enlarged view of the standard control circuit terminal block



## 4.6.3 Connecting the Current Inputs

Let's learn how to connect current inputs that control the motor speed (frequency command).

The motor speed is controlled by current inputs (4mA to 20mA DC) from a regulator (current output unit for numerical control, etc.) connected across terminals 4 and 5.

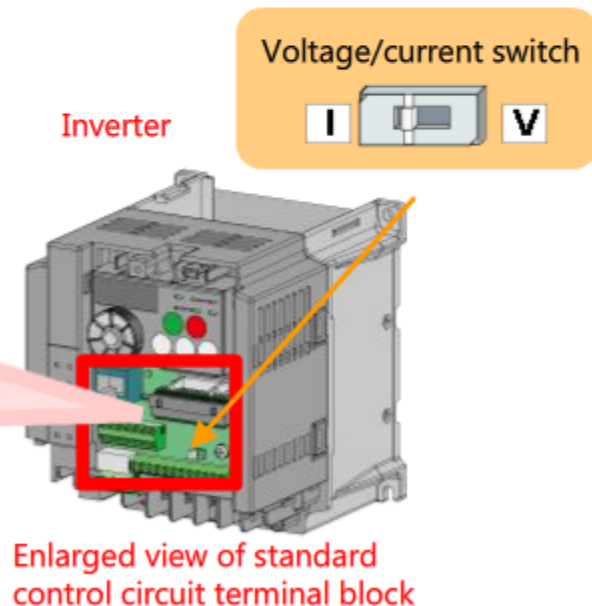
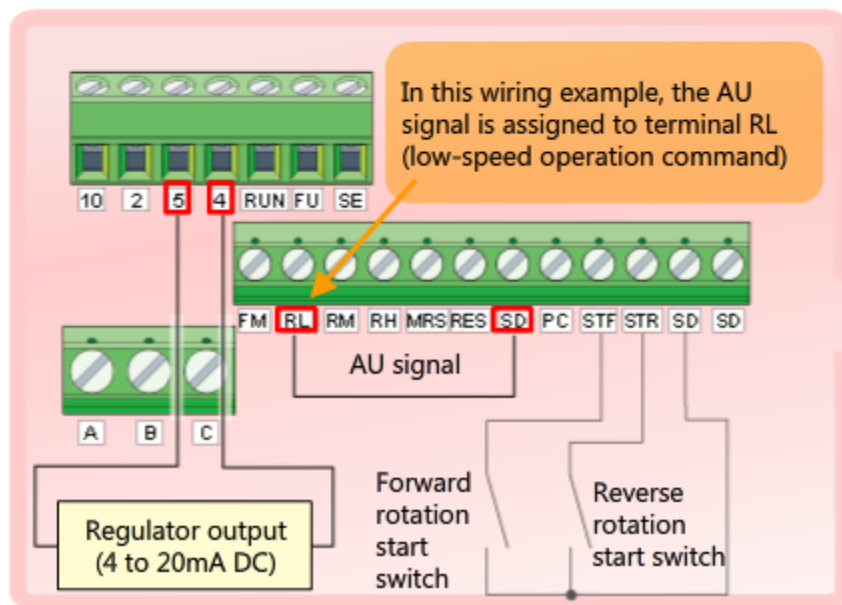
The outputs are stopped at 4mA, and the maximum frequency (initial value 60Hz) is output at 20mA. Current and frequency are thus proportional to each other.

The maximum frequency (initial value 60Hz) at 20mA can be set using a parameter. (Details are given in Chapter 5.)

When connecting current inputs, note the following points:

- Set the voltage/current switch to "I" (current).  
(The switch is set to "I" (current) in the initial setting.)
- Turn ON the AU signal to enable terminal 4.
- Assign the "AU signal (terminal 4 input selection)" to any of STF, STR, RL, RM, RH, MRS, and RES terminals by using a parameter. Refer to the manual for details.

### Wire connection diagram of FR-E720-1.5K

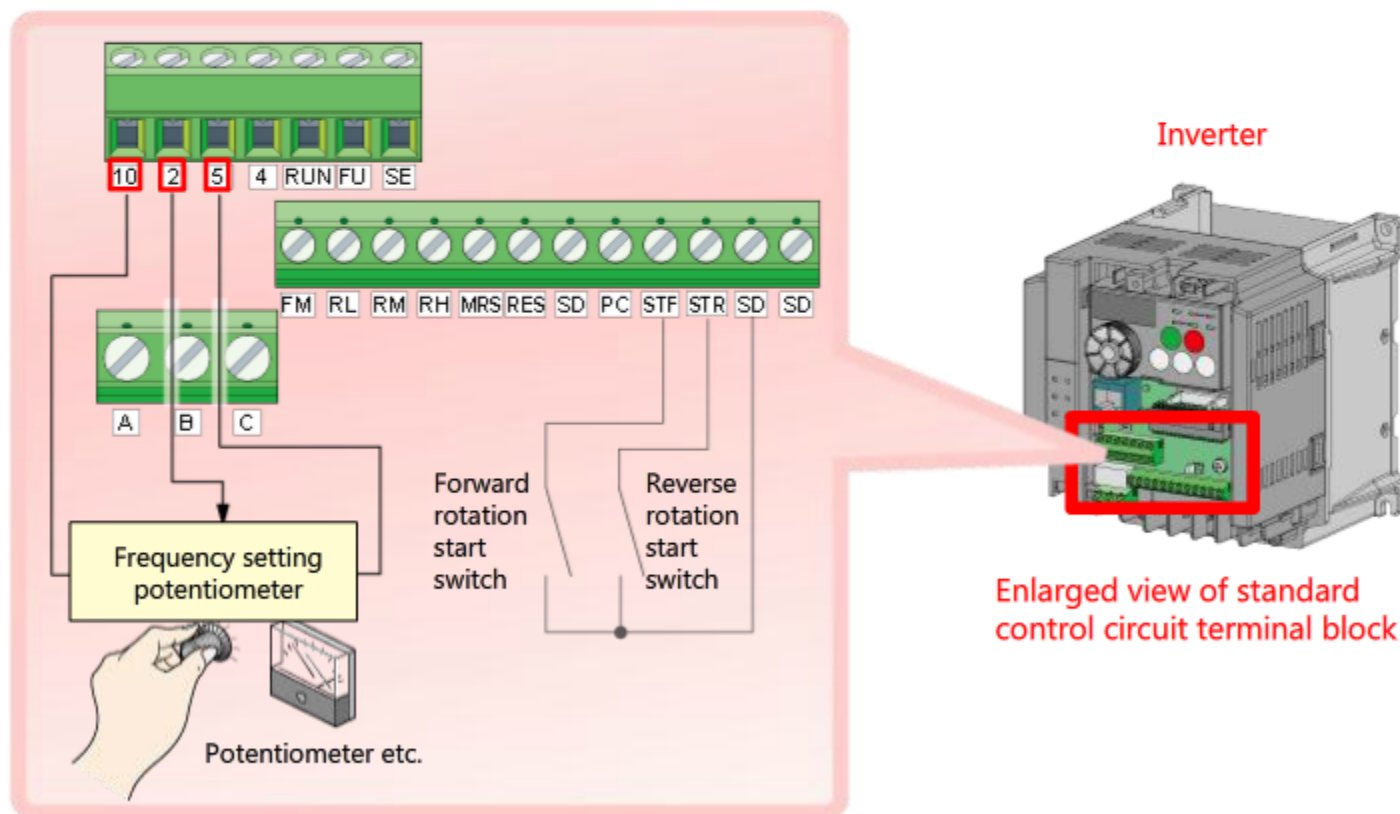


## 4.6.4

## Connecting the Voltage Inputs

Let's learn how to connect voltage inputs that control the motor speed (frequency command). The motor speed is controlled by voltage inputs (0V to 5VDC) from the frequency setting potentiometer connected between terminals 10 and 5. Outputs are stopped at 0V, and the maximum frequency is output at 5V. Voltage and frequency are thus proportional to each other. The maximum frequency (initial value 60Hz) at 5V can be set using a parameter. (Details are given in Chapter 5.)

### Wire connection diagram of FR-E720-1.5K



## 4.7

## Summary of this Chapter

Here is what you have learned in Chapter 4.

- Handling of the front and wiring covers
- Installation of the inverter
- Grounding of the inverter and motor
- Wiring to the main circuit terminals (power supply and motor)
- Wiring to the control circuit terminals (external input devices)

**Point**

Please review the following important points:

Handling of the front and wiring covers	You have learned how to remove and reinstall the front and wiring covers that need to be done for wiring the inverter.
Installation of the inverter	You have learned how to install the inverter and also learned the suitable environment and precautions on handling.
Grounding of the inverter and motor	You have learned how to ground the inverter and motor and why grounding is required.
Wiring to the main circuit terminals (power supply and motor)	You have learned how to connect the power supply and motor to the main circuit terminals of the inverter. You have also understood why a moulded case circuit (MCCB) and magnetic contactor (MC) are required for the power supply.
Wiring to the control circuit terminals (external input devices)	You have learned about wiring to the control circuit terminals and precautions on wiring. You have also learned how to connect external input devices (switch and potentiometer) that control start/stop and the speed of the motor.

## Chapter 5 Setting the Operation Mode and Parameters

In Chapter 5, you will learn how to set the operation mode and parameters using the operation panel of the inverter.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6



(5) Responding to errors caused during operation — Chapter 7

### Contents of Chapter 5

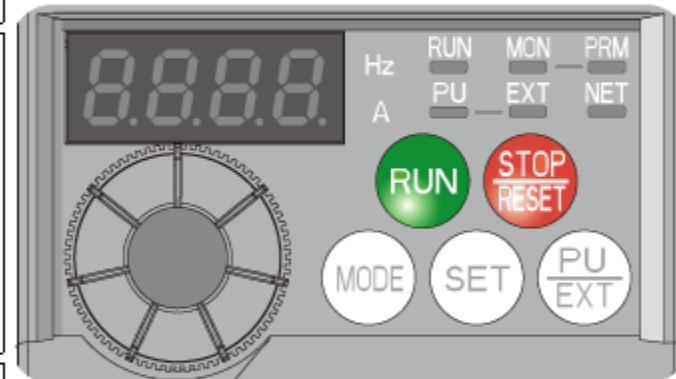
- 5.1 Names and Functions of Operation Panel Components
- 5.2 How to Read Digital Characters Displayed on Monitor
- 5.3 Basic Operation of Operation Panel
  - 5.3.1 Switching between External and PU operation modes
  - 5.3.2 Switchover to combined operation mode
  - 5.3.3 Switching between setting modes
- 5.4 Setting Parameters
  - 5.4.1 Setting the maximum frequency
  - 5.4.2 Setting the upper and lower limits of output frequency
  - 5.4.3 Setting the motor acceleration and deceleration time
- 5.5 Preventing Incorrect Operation of Operation Panel
- 5.6 Finding the Changed Parameters
  - 5.6.1 Checking the changed parameters
  - 5.6.2 Resetting parameters

## 5.1 Names and Functions of Operation Panel Components

Let's learn about the names of the operation panel display components and their functions.  
Place your mouse cursor on any LED component in the table or on the operation panel. The corresponding part will be displayed.

\* Details on the operating parts are given on the next page.

Monitor (4-digit LED)	Indicates the frequency, parameter number, etc.
Unit indicator	Hz: Lit to indicate frequency. (Flickers when the frequency is monitored.) A: Lit to indicate current. Both "Hz" and "A" turn OFF when a voltage value is displayed.
Operation status indicator	Lit or flickers during inverter operation. Lit: When forward rotation is being performed. Slow flickering (1.4s cycle): When the reverse rotation is being performed. Fast flickering (0.2s cycle): When <b>RUN</b> has been pressed or the start command has been given, but the operation cannot be made by the following reasons: - The frequency command is less than the starting frequency. - The MRS signal is being input.
Monitor indicator	Lit to indicate the monitor mode.
Parameter setting mode indicator	Lit to indicate the parameter setting mode.
Operation mode indicator	PU: Lit to indicate the PU operation mode. EXT: Lit to indicate the External operation mode. NET: Lit to indicate the Network operation mode.






# 5.1

## Names and Functions of Operation Panel Components

Let's learn about the names of the operation panel operating parts and their functions.

Place your mouse cursor on any key or the setting dial in the table or on the operation panel. The corresponding part will be displayed.

Setting dial (Mitsubishi inverter dial)	Sets the frequency or changes the parameter value that has been set. Pressing the dial displays the following parameter data. -The set frequency in the monitor mode -The present set value during calibration -The faults history number in the faults history mode
Start command (RUN)	The rotation direction can be selected by setting Pr. 40.
Stop operation (STOP/RESET)	Stops the operation. Also resets an activated protective function that has been caused by a fault.
Mode switchover (MODE)	Changes the setting mode. Pressing this key with  key together changes the operation mode. Pressing it for a while (2s) locks the operation.
Determination of each setting (SET)	If pressed during operation, the monitor changes as below: <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 5px;">Operation frequency</div> <div style="margin: 0 5px;">→</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 5px;">Output current</div> <div style="margin: 0 5px;">→</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 5px;">Output voltage</div> </div> <div style="margin-top: 10px;">  </div>
Operation mode switchover (PU/EXT)	Switches between the PU and External operation mode. To use External operation mode (operation using a separately connected frequency setting potentiometer and start signal), press this key to light up the EXT.  To change to the combined operation mode, press this key and  key together (0.5s), or change Pr. 79 setting.  PU: PU operation mode EXT: External operation mode. This switch also cancels PU stop.



## 5.2 How to Read Digital Characters Displayed on Monitor

The tables below show the correspondences between the digital characters displayed on the operation panel and actual characters. Some digital alphabetical characters, such as M, O, T, and V require special attention as they are commonly confused. For some uppercase letters, lowercase letters (b, d, n) and a numerical character (0 for O) are used for convenience. If you are unsure of any indicated character, refer to the following table or the product's manual.

Correspondence between digital characters and actual characters

Actual character	Indication
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Actual character	Indication
A	A
B	b
C	c
D	d
E	e
F	f
G	g
H	h
I	i
J	j
L	l

Actual character	Indication
M	m
N	n
O	0
o	o
P	p
S	s
T	t
U	u
V	v
r	r
-	-



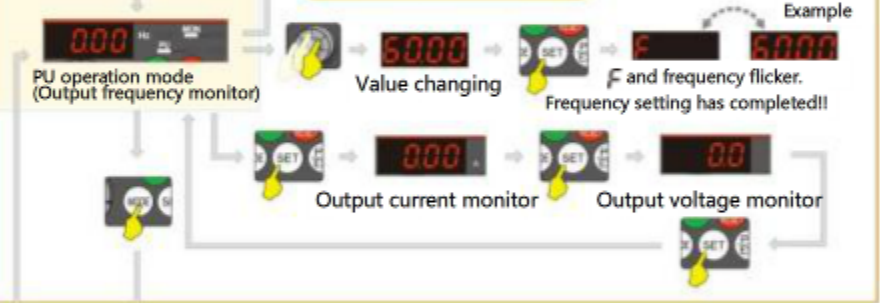
# 5.3 Basic Operation of Operation Panel

Let's learn about the basic operation of the operation panel.  
Use the PU/EXT key to switch between External and PU operation modes, and use the MODE key to switch between the setting modes. The flow of the basic operation is shown below.

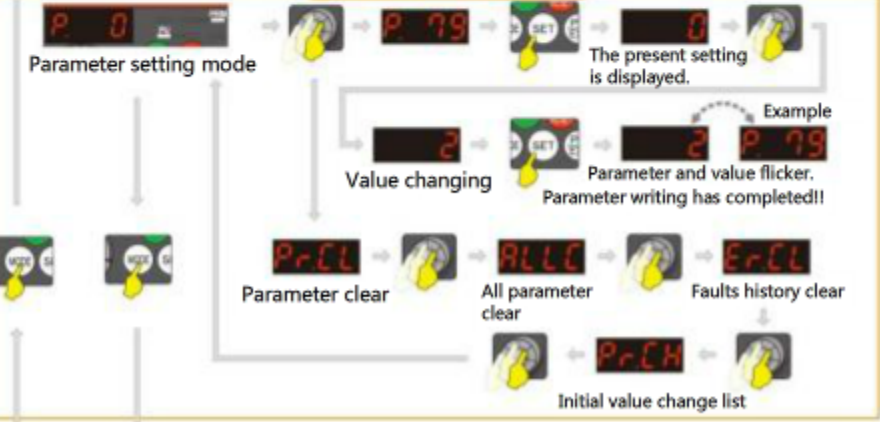
## Switching the operation mode



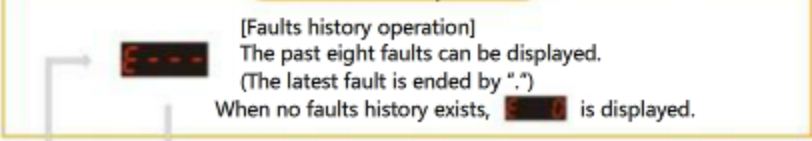
## Monitor/frequency setting



## Parameter setting



## Faults history





### 5.3.1

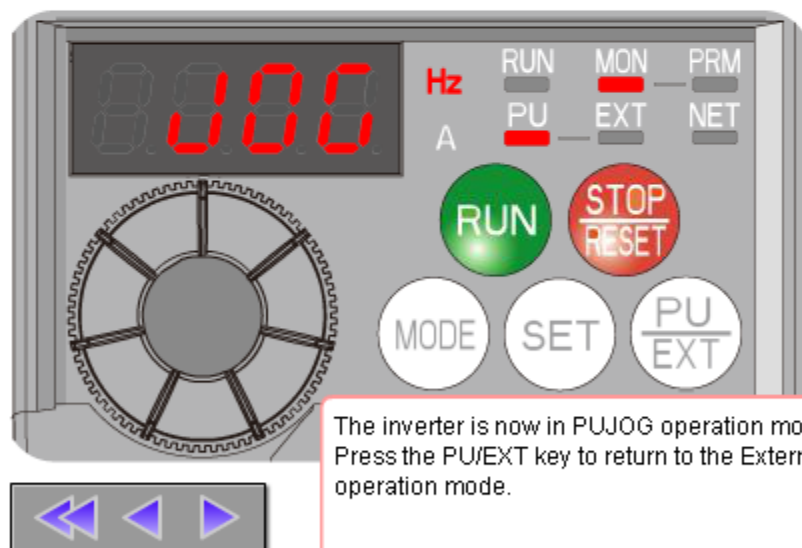
## Switching between External and PU operation modes

Let's learn how to use the operation panel to change the operation mode that you have learned in Chapter 3.

With the PU/EXT key, the operation mode can be switched among the three modes ("External operation", "PU operation", and "PUJOG operation"). At power ON, External operation mode is selected, and each time the PU/EXT key is pressed, it changes in the order of "External operation -> PU operation -> PUJOG operation".

\* This course does not cover the "PUJOG operation". Refer to the product's manual for details.

Switch between the External and PU operation modes using the operation panel simulator below.

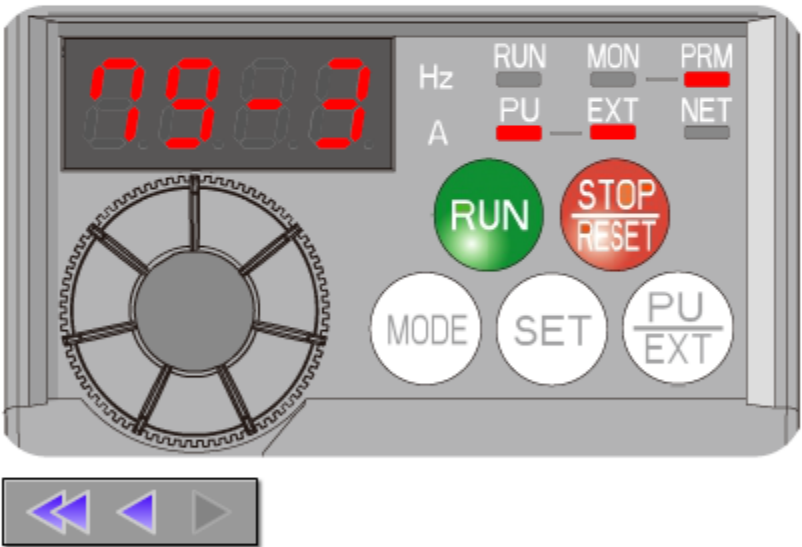










# 5.3.2 Switchover to Combined Operation Mode

Let's learn how to switch over to the combined operation mode.

To switch over to the combined operation mode, press the PU/EXT and MODE keys together for 0.5 second. Use the setting dial to select the operation mode with appropriate start and frequency command sources. See the table below for the correspondences between the setting values and the operation modes.

Switch to the combined operation mode using the operation panel simulator below.



Operation panel indication	Operation mode	
	Start command source	Frequency command source
		
	External (STF, STR)	Analog voltage input
	External (STF, STR)	
		Analog voltage input

### 5.3.3

## Switching between Setting Modes

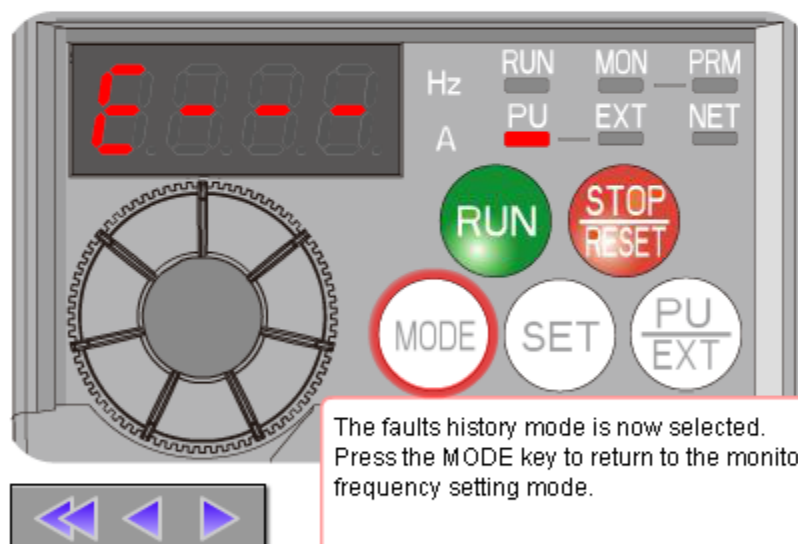
Let's learn how to switch between the setting modes.

With the MODE key, the setting mode can be switched among the three modes (monitor/frequency setting mode, parameter setting mode, and faults history mode).

The setting mode changes in the order of "monitor/frequency setting mode -> parameter setting mode -> faults history mode" each time the MODE key is pressed.

Before switching between the setting modes, switch the operation mode to "PU operation mode".

Switch between the setting modes using the operation panel simulator below.



**5.4****Setting Parameters**

Let's learn about how to set parameters.

An inverter can perform simple variable-speed operation in the initial setting.

Set necessary parameters according to the load and operation specifications.

To set parameters, press the PU/EXT key to enter the PU operation mode, and then press the MODE key to enter the parameter setting mode.

Most parameters cannot be set during operation.

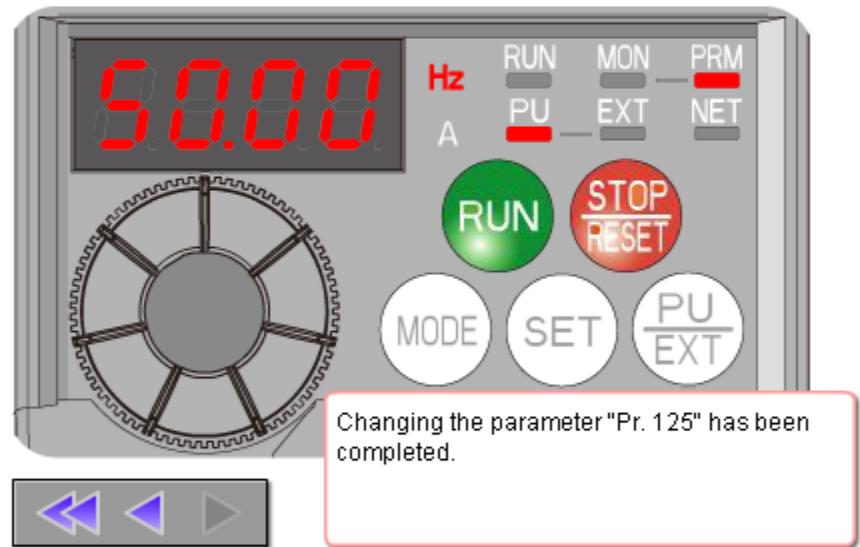
In this section, you will simulate parameter settings of the frequently-used parameters (maximum frequency, upper and lower limits of output frequency, and motor acceleration and deceleration time).

These simulations will familiarize you with the parameter setting method.

# 5.4.1 Setting the Maximum Frequency

When you are using an external (voltage input) potentiometer and want to change the frequency at the maximum input (5V), use "Pr.125 Terminal 2 frequency setting gain frequency". The initial value of this parameter is 60Hz.

Change the "Pr.125" setting from 60Hz (initial value) to 50Hz using the operation panel simulator below.

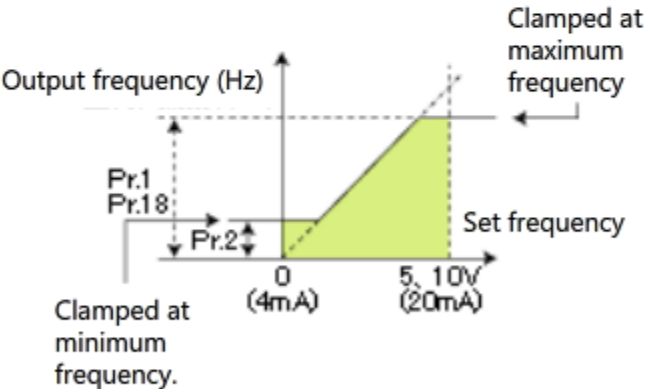
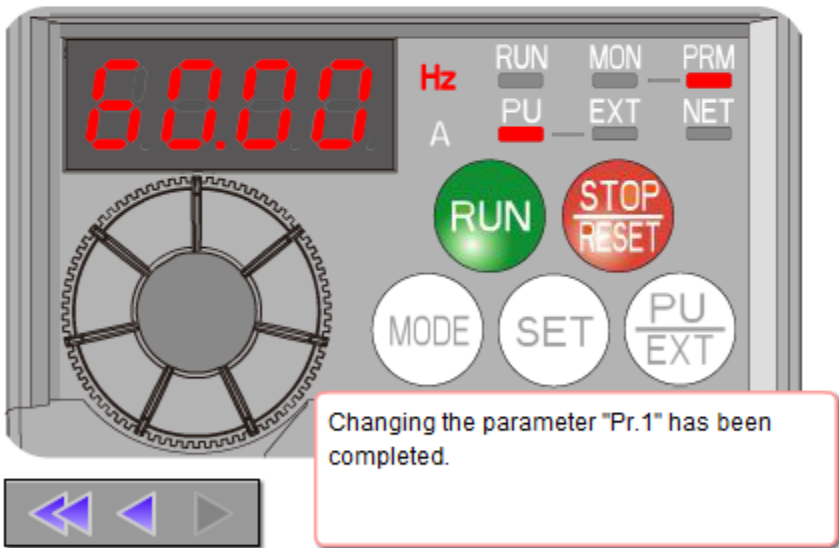


# 5.4.2 Setting the Upper and Lower Limits of Output Frequency

To set the upper and lower limits of the output frequency, use "Pr. 1 Maximum frequency" and "Pr. 2 Minimum frequency". The initial values and the setting ranges of upper limit and lower limit frequencies are as follows.

Parameter No.	Parameter	Initial value	Setting range	Description
1	Maximum frequency	120Hz	0 to 120Hz	Set the maximum output frequency.
2	Minimum frequency	0Hz	0 to 120Hz	Set the minimum output frequency.

Change the "Pr.1 Maximum frequency" setting from "120H" (initial value) to "60H" using the operation panel simulator below.



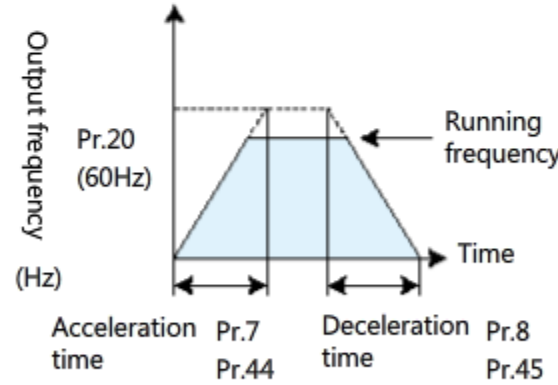
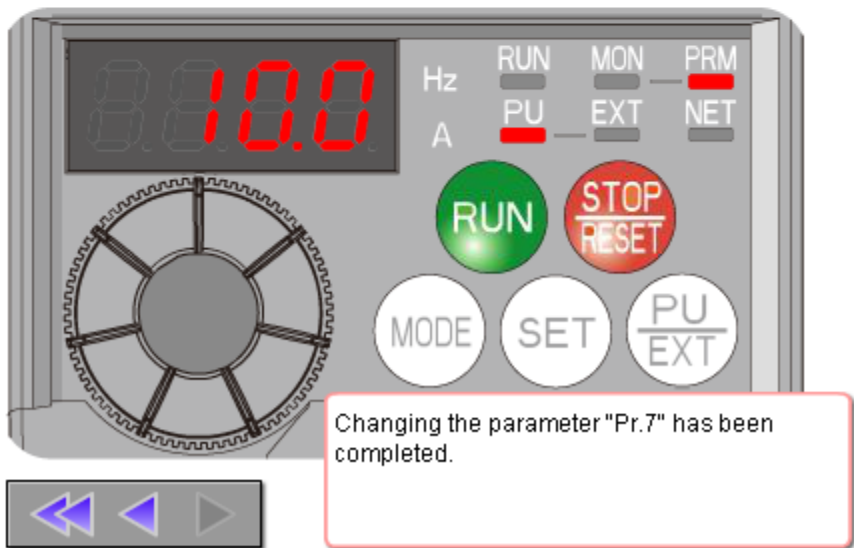
# 5.4.3 Setting the Motor Acceleration and Deceleration Time

To set the motor acceleration time and deceleration time, use "Pr.7 Acceleration time" and "Pr.8 Deceleration time". The initial values and the setting ranges of the acceleration time and deceleration time are as follows. (The initial value varies depending on the inverter capacity.)

Parameter No.	Parameter	Initial value		Setting range	Description
7	Acceleration time	3.7K or lower	5s	0 to 3600/360 s *1	Set the motor acceleration time.
		5.5K, 7.5K	10s		
		11K, 15K	15s		
8	Deceleration time	3.7K or lower	5s	0 to 3600/360s *1	Set the motor deceleration time.
		5.5K, 7.5K	10s		
		11K, 15K	15s		

\*1 Depends on the "Pr.21 Acceleration/deceleration time increments" setting. The initial setting range is "0 to 3600s" and the setting increment is "0.1s".

Change the "Pr.7 Acceleration time" setting from the "5.0s" (initial value) to "10.0s" using the operation panel simulator below.



## 5.5

## Preventing Incorrect Operation of Operation Panel

Let's learn how to lock the operation panel keys to prevent accidental operation. Even while the key operation is locked, the STOP/RESET key can be used to stop operation or reset the inverter system.

Lock and unlock the key operation using the operation panel simulator below.





## 5.6

## Finding the Changed Parameters

Let's learn how to find changed parameters and their changed settings.

The inverter has the "initial value change list" and "parameter clear" function. The "initial value change list" shows the parameters changed from the initial settings. "Parameter clear" resets parameter settings to the initial values.

To find changed parameters, try the "initial value change list" first and make necessary changes.

If changed parameters are not identifiable with the "initial value change list", reset the parameter settings to the initial values with "parameter clear".

### Precautions on parameter clear

The inverter does not back up the present parameter values.

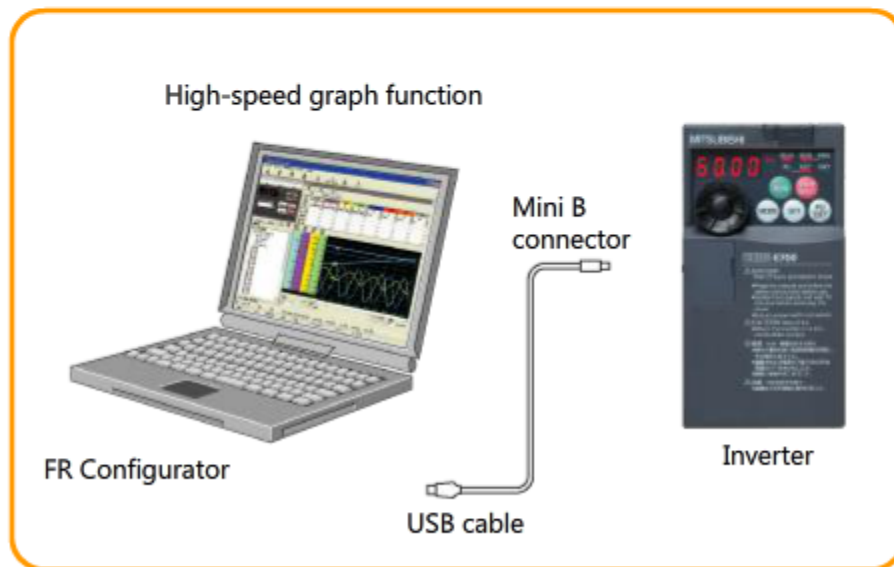
Once parameters are cleared, their settings cannot be restored.

To back up parameters, use an external parameter unit (FR-PU07) or FR Configurator (setup software).

#### Parameter unit



#### Personal computer + FR Configurator



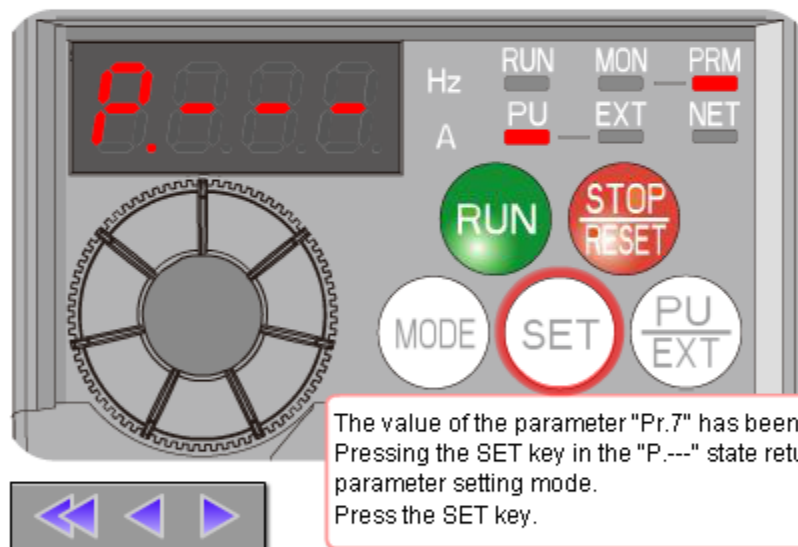
## 5.6.1

## Checking the Changed Parameters

Let's learn how to use the "initial value change list". The "initial value change list" allows you to check the parameters that have been changed from their initial values.

Using this function, you can confirm the parameters you have changed and change them again.

Find the parameters that have been changed from their initial values, and change their settings again, using the operation panel simulator below.

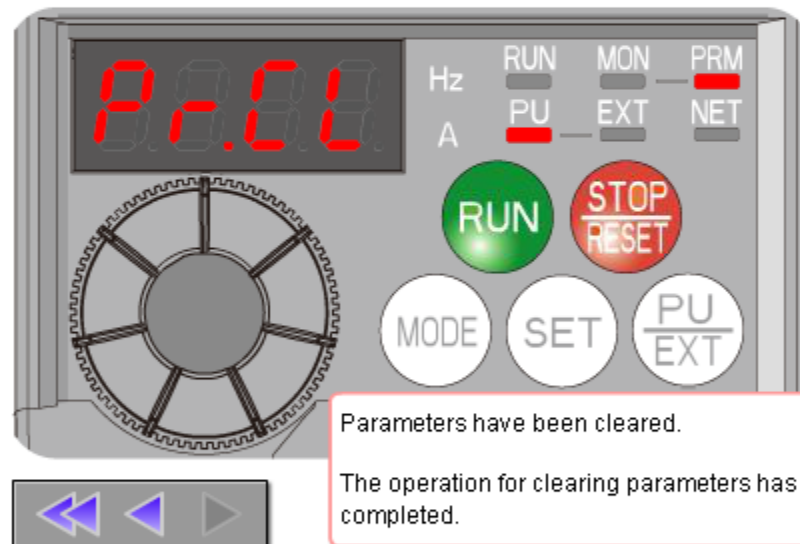


## 5.6.2

## Resetting Parameters

Let's learn how to use the "parameter clear" function that resets the parameters to their initial values. The inverter does not back up parameter settings, so be careful when clearing parameters.

Perform the parameter clear using the operation panel simulator below.



## 5.7

## Summary of this Chapter

Here is what you have learned in Chapter 5.

- Names and functions of the operation panel components
- How to read the digital characters displayed on the monitor
- Basic operation of the operation panel
- How to switch between operation modes
- How to switch between the setting modes
- How to set parameters
- How to prevent accidental operation of the operation panel
- How to identify changed parameters

**Point**

Please review the following important points:

Names and functions of operation panel components	You have understood the names and functions of operation panel components.
Switching between operation modes	You have learned how to switch the operation modes from External operation mode to PU operation mode or to combined operation mode.
Switching between setting modes	You have learned how to switch the frequency setting/monitor mode to parameter setting mode and then to faults history mode.
Setting parameters	You have learned how to set parameters with the operation panel, using three parameter setting examples.
Preventing accidental operation of operation panel	You have learned how to lock the key operation of the operation panel.
Identifying changed parameters	You have learned how to find the parameters that have been changed from their initial values and how to reset the parameters to their initial values.

## Chapter 6 Operating the Inverter

Now, you have finished installing and wiring the inverter and motor as well as setting parameters. In this chapter, you will learn how to operate the inverter in the conveyor system in PU operation mode and External operation mode.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6



(5) Responding to errors caused during operation—Chapter 7

### Contents of Chapter 6

- 6.1 Operation in PU Operation Mode
  - 6.1.1 Using the setting dial like a potentiometer
- 6.2 Operation in External Operation Mode
  - 6.2.1 Changing the motor speed using the three speed switches
  - 6.2.2 Changing the motor speed using the potentiometer (voltage input)
- 6.3 Monitoring the Output Frequency, Output Current, and Output Voltage during Operation

## 6.1

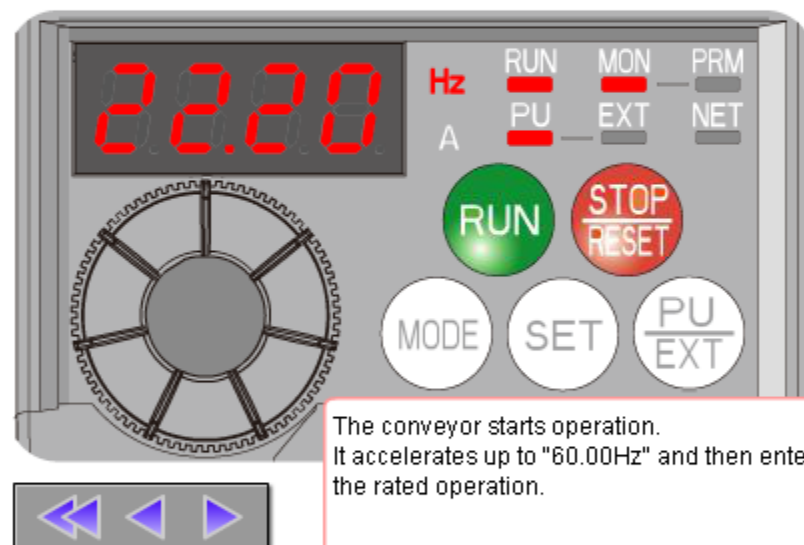
## Operation in PU Operation Mode

This section explains about the inverter operation in PU operation mode.

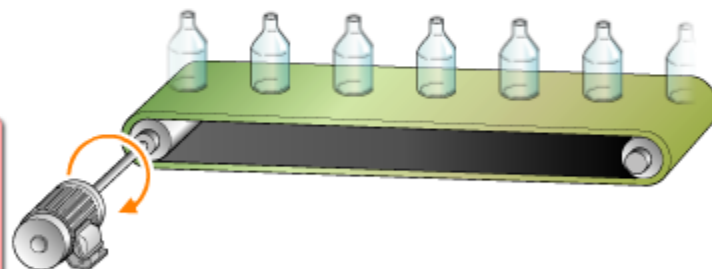
In PU operation mode, the RUN key (start command) on the operation panel is used to start or stop the motor, and the setting dial is used to change the speed (frequency command).

Operate the conveyor in PU operation mode using the simulator below.

In this simulation, the acceleration/deceleration time is set to "5s".







The conveyor starts operation.  
It accelerates up to "60.00Hz" and then enters  
the rated operation.



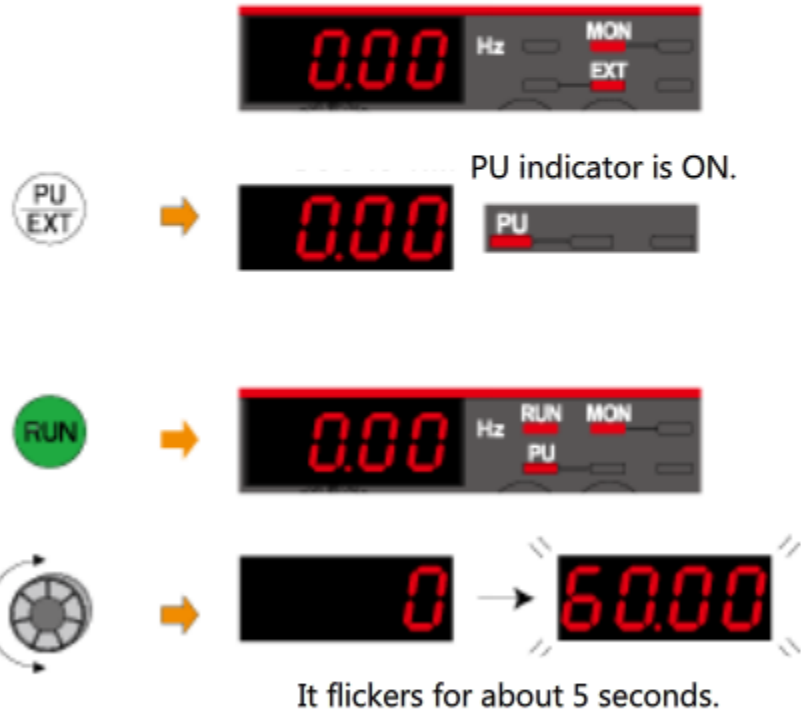
# 6.1.1 Using the Setting Dial Like a Potentiometer

"Pr.161 Frequency setting/key lock operation selection" enables the setting dial to behave like a potentiometer while setting a frequency in PU operation mode. With this parameter, you can use the setting dial to set a frequency in real time just like using the potentiometer. This means that you need not press the SET key each time you have changed the frequency.

## Operation

1. Screen at power ON  
The monitor display appears.
2. Press  to choose the PU operation mode.
3. Set "1" in "Pr.161".
4. Press  to run the inverter.
5. Turn  to "60.00" (60.00Hz). The set frequency flickers.  
No need to press .

## Indication



## 6.2

## Operation in External Operation Mode

This section explains about the inverter operation in External operation mode.

In External operation mode, forward/reverse start switches on the external input device are used to start or stop (start command) the motor, and three speed switches and or a potentiometer (voltage input) are used to change the speed (frequency command).

In this course, you will simulate the inverter operation with two speed command sources: the three speed switches and a potentiometer (voltage input).

	Start command source	Frequency command source
Combination 1	Forward and reverse start switches	Three speed switches (low speed, medium speed, high speed)
Combination 2		Potentiometer (voltage input)



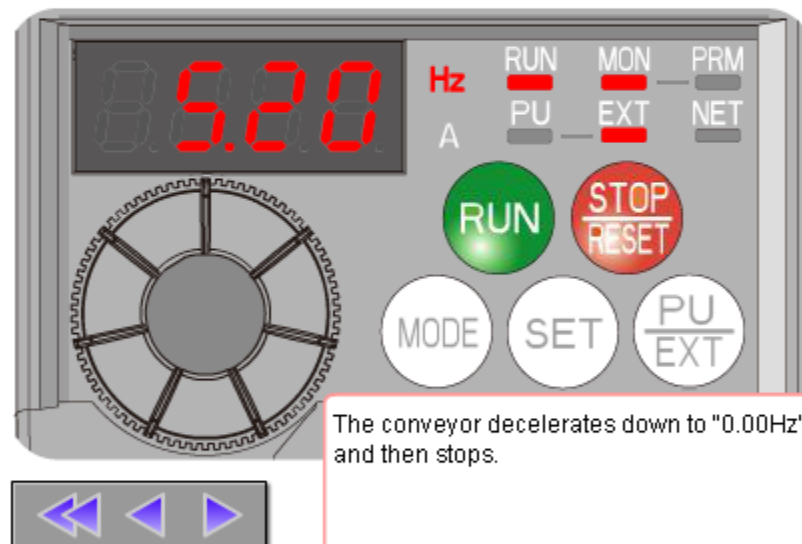
## 6.2.1

## Changing the Motor Speed Using the Three Speed Switches

Let's learn how to change the motor speed (frequency command) using the three speed switches (low speed, medium speed, and high speed).

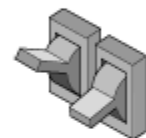
In this simulation, the frequencies of the three speed switches are set to "low speed 10.00Hz", "medium speed 30.00Hz", and "high speed 60.00Hz". For the acceleration/deceleration time, "5s" is set for all three speeds.

Operate the conveyor in External operation mode using the operation panel and external input device of the simulator below.



The conveyor decelerates down to "0.00Hz" and then stops.

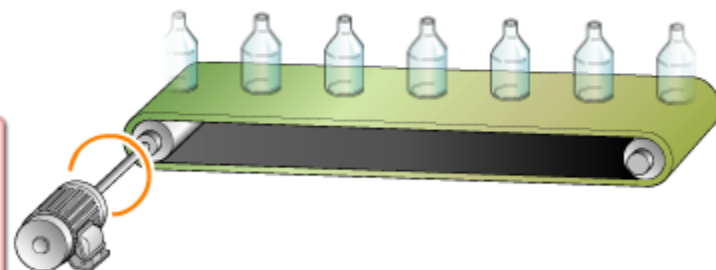
Forward rotation



Reverse rotation

High speed

Medium speed  
Low speed



## 6.2.2

## Changing the Motor Speed Using the Potentiometer (Voltage Input)

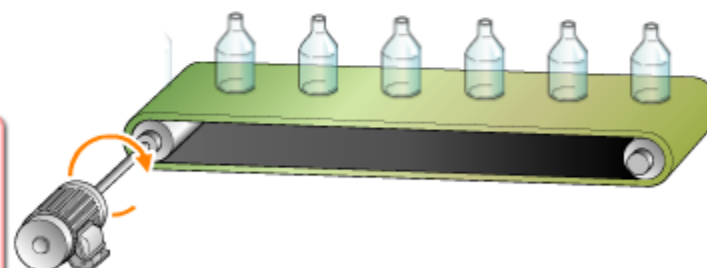
The motor speed (frequency command) can be changed using the potentiometer (voltage input).

In this simulation, the maximum value of the potentiometer (turned all the way to the right) is set to "60.00Hz" and the acceleration/deceleration time set to "5 s".

Operate the conveyor in External operation mode using the operation panel and the external switches of the simulator below.



Slowly turn the potentiometer all the way to the left so that the conveyor decelerates down to "0.00Hz" and the stops.

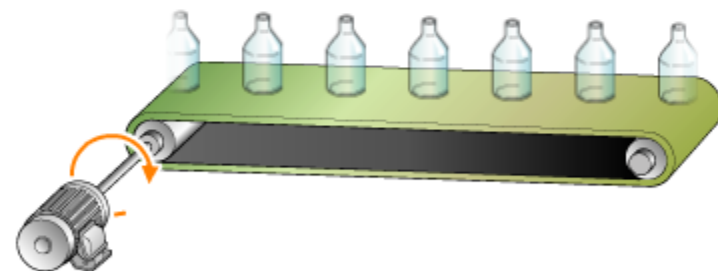
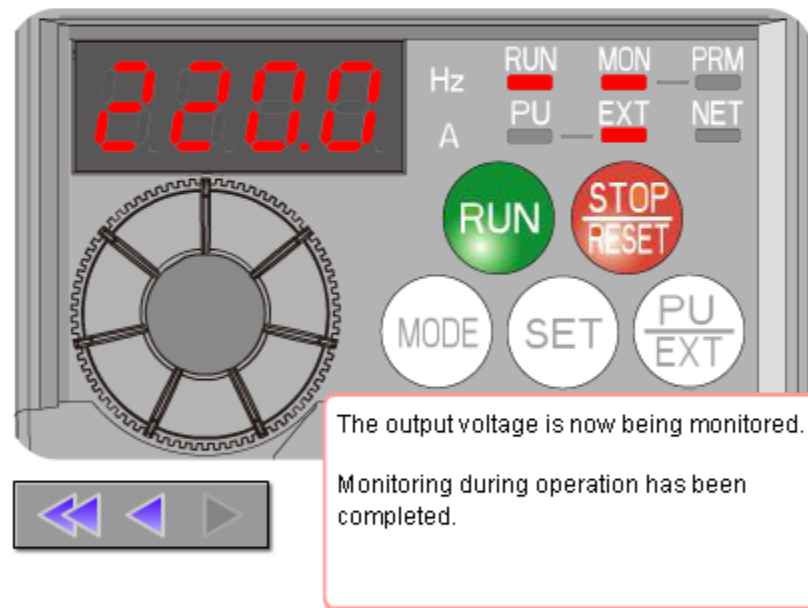


## 6.3 Monitoring the Output Frequency, Output Current, and Output Voltage during Operation

Let's learn how to monitor the output frequency, output current, and output voltage during operation.

While the setting mode is the frequency command/monitor mode, press the SET key on the operation panel. The output frequency, output current, and output voltage during operation are sequentially displayed each time the SET key is pressed.

Check the monitored output frequency, output current, and output voltage during operation using the simulator below.



## 6.4

## Summary of this Chapter

Here is what you have learned in Chapter 6.

- Operating the inverter in PU operation mode
- Using the setting dial on the operation panel like the potentiometer
- Operating the inverter in External operation mode
  1. Changing the speed using the three speed switches
  2. Changing the speed using the potentiometer (voltage input)
- Monitoring the output frequency, output current, output voltage during operation

**Point**

Please review the following important points:

Operating the inverter in PU operation mode	You have learned how to operate the conveyor, as an example, using the RUN key and setting dial on the operation panel.
Operating the inverter in External operation mode	You have learned how to operate the conveyor, as an example, using the start switch on the external input device and also using the three speed switches and potentiometer for frequency setting.
Monitoring the output frequency, output current, output voltage during operation	You have learned how to monitor the output frequency, output current, and output voltage on the display during operation.

## Chapter 7 Responding to Errors Caused during Operation

In this chapter, you will learn how to respond to errors caused during operation.

(1) Selecting the operation mode — Chapter 3



(2) Installing and wiring the inverter and motor — Chapter 4



(3) Setting the operation mode and parameters — Chapter 5



(4) Starting operation — Chapter 6



(5) Responding to errors caused during operation—Chapter 7

### Contents of Chapter 7

- 7.1 Inverter Fault Display
- 7.2 Resetting the Activated Protective Function
- 7.3 Confirming the Faults History
- 7.4 Corrective Action for Non-Operable Motor

## 7.1

## Inverter Fault Display

If error (fault) occurs in an inverter, the protective function activates to trip the inverter and automatically changes the display on the operation panel to the following error (fault) display.

If the protective function activates, remove the error cause, reset the inverter, and restart the operation.

Otherwise, the inverter may fail or may be damaged. (Details are given in Section 7.2.)

The inverter fault display can be roughly divided into the following types.


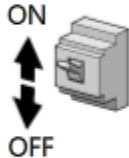

Fault display type	Description
Error message	Incorrect setting or misoperation of the operation panel or parameter unit is displayed as an error message. The inverter does not trip.
Warning	The inverter does not trip even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.
Alarm	The inverter does not trip. An alarm signal can be also output by making parameter setting.
Fault	When a fault occurs, the inverter trips and a fault signal is output.

## 7.2 Resetting the Activated Protective Function

Let's learn how to reset the protective function that has been tripping an inverter.

The inverter can be reset by performing one of the following operations.

Note that the internal accumulated heat value of the electronic thermal relay function and the number of retries are cleared (erased) by resetting the inverter. Inverter recovers about 1s after the reset.

Item	Operation method
Operation 1	<p>Press the STOP/RESET key on the operation panel. (This may only be performed when a fault occurs.)</p> 
Operation 2	<p>Switch the power OFF once. After the indicator of the operation panel turns OFF, switch it ON again.</p> 
Operation 3	<p>Turn ON the reset signal (RES) for more than 0.1s. If the RES signal is kept ON, "Err." appears (flickers) to indicate that the inverter is in a reset status.</p> 

Refer to the product's manual for the fault display list and corrective actions.

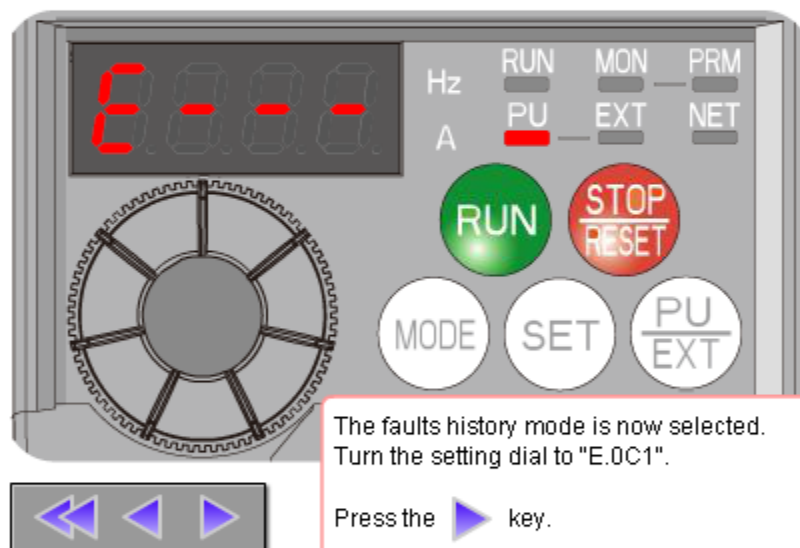
## 7.3

## Confirming the Faults History

You can check the past eight faults using the faults history.  
Switch to the PU operation mode, and press the MODE key to switch to the faults history mode.

Check the faults in the faults history mode using the simulator below.

The system is now in External operation mode.  
Press the PU/EXT key to switch to the PU operation mode.





# 7.4 Corrective Action for Non-Operable Motor

Let's learn how to respond when the motor does not start or is faulty.  
 This section explains about the cases in which the motor does not start even though no fault (error) is output.  
 First, check the following points. If the problem still persists, initialize the parameters, set necessary parameters again, and check again.

## 1. The motor does not start.

Where to check	Possible cause	Corrective action
Main circuit	Appropriate power supply voltage is not applied. (The operation panel is not displayed.)	Turn ON the circuit breaker (NFB), earth leakage circuit breaker (ELB), or magnetic contactor (MC).
		Check for input voltage drop, input phase loss, and wiring errors.
	The motor is not connected properly.	Check the wiring between the inverter and motor.
Input signal	The start signal is not input.	Check the start command source, and input a start signal. PU operation mode: RUN key External operation mode: STF/STR signal
	Both the forward and reverse rotation start signals (STF, STR) are input together.	Turn ON only one of the forward and reverse start signals (STF, STR). If the STF and STR signals turn ON together in the initial setting, a stop command is given.
	The frequency command is zero.	Check the frequency command source and input a frequency command. (If a start command is input while the frequency command is 0Hz, the RUN LED on the operation panel flickers.)
	The output stop signal (MRS) or inverter reset signal (RES) is ON.	Turn OFF the MRS or RES signal. The motor starts with the given start and frequency commands. Before turning OFF, ensure the safety.
Load	Load is too heavy.	Reduce the load.
	The shaft is locked.	Check the machine (motor).

## 7.4

## Corrective Action for Non-Operable Motor

2. The motor generates heat abnormally.

Where to check	Cause	Corrective action
Motor	The motor fan is not working. (Dust is accumulated.)	Clean the motor fan. Improve the environment.
Main circuit	The inverter output voltage (U, V, W) are unbalanced.	Check the inverter output voltage. Check the insulation of the motor.

3. The motor rotates in the opposite direction.

Where to check	Cause	Corrective action
Main circuit	Phase sequence of output terminals U, V and W is incorrect.	Connect phase sequence of the output cables (terminal U, V, W) to the motor correctly.
Input signal	The start signals (forward rotation, reverse rotation) are connected improperly.	Check the wiring. (STF for forward rotation, STR for reverse rotation)

4. The speed greatly differs from the setting.

Where to check	Cause	Corrective action
Input signal	The frequency setting signal is incorrectly input.	Measure the input signal level.
	The input signal line is affected by external EMI.	Take measures against EMI such as using shielded cables for the input signal lines.
Load	Stall prevention function is activated due to a heavy load.	Reduce the load.
Motor		Check the capacities of the inverter and motor.

## 7.5

## Summary of this Chapter

Here is what you have learned in Chapter 7.

- Inverter fault display
- Resetting the activated protective function
- Confirming the faults history
- Corrective action for the non-operable motor

**Point**

Please review the following important points:

Inverter fault display	You have learned the inverter operation at fault occurrence and the types of fault displays.
Resetting the activated protective function	You have learned the three resetting methods for the activated protective function.
Confirming the faults history	You have learned how to check the faults occurred in the past.
Corrective action for the non-operable motor	You have understood the corrective action to be taken if the motor does not start even though no fault is indicated.

**Test****Final Test**

Now that you have completed all of the lessons of the **Inverter FREQROL Basics (Operation)** Course, you are ready to take the final test. If you are unclear on any of the topics covered, please take this opportunity to review those topics.

**There are a total of 8 questions (39 items) in this Final Test.**

You can take the final test as many times as you like.

**How to score the test**

After selecting the answer, make sure to click the **Answer** button. Your answer will be lost if you proceed without clicking the Answer button. (Regarded as unanswered question.)

**Score results**

The number of correct answers, the number of questions, the percentage of correct answers, and the pass/fail result will appear on the score page.

Correct Answers : **2**

Total Questions : **9**

Percentage : **22%**

To pass the test, you have to answer **60%** of the questions correct.

Proceed

Review

Retry

- Click the **Proceed** button to exit the test.
- Click the **Review** button to review the test. (Correct answer check)
- Click the **Retry** button to retake the test again.

**Test****Final Test 1**

The following explains the roles of the start command and frequency command.  
Fill in the blanks of the explanation.

The start command controls  of the motor.

The frequency command controls  of the motor.

is  to the magnitude of the frequency.

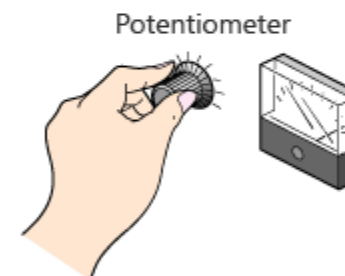
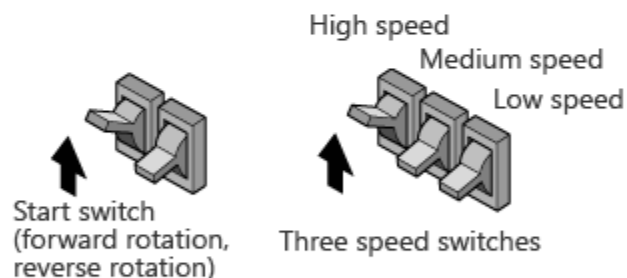
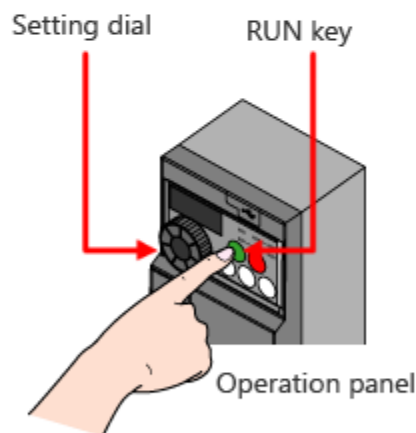
[Answer](#)[Back](#)

## Test

## Final Test 2

Choose the optimal operation mode for each combination of the start and frequency commands.

Start command source	Frequency command source	Operation mode
Start switch	Setting dial	--Select--
Start switch	Potentiometer	--Select--
RUN key	Three speed switches	--Select--
Start switch	Three speed switches	--Select--
RUN key	Setting dial	--Select--


[Answer](#)
[Back](#)

**Test****Final Test 3**

The following explains how to connect the power supply to the inverter.  
Fill in the blanks of the explanation.

Always use  in the power input cable.

Also, be sure to connect  between the power supply and the main circuit terminal of the inverter and wire so that  can be turned  to  when the protective function is activated or the driven machine fails (emergency stop, etc.).

[Answer](#)[Back](#)

**Test****Final Test 4**

Choose the appropriate name of each function.

Start command	Name
Resets parameters to their initial values.	--Select-- ▼
Displays the last eight faults.	--Select-- ▼
Checks/changes the parameters that have been changed from their initial values.	--Select-- ▼
Disables the setting dial and key operation from the operation panel.	--Select-- ▼
At fault output, shuts off the inverter outputs to protect the circuit.	--Select-- ▼

[Answer](#)[Back](#)



Choose the function of the operation panel used to perform each of the following operations.

Operation	Function of operation panel
Selects the frequency and various settings.	--Select--
Displays the last eight faults.	--Select--
Starts the motor running.	--Select--
Stops the motor running.	--Select--
Switches the setting mode.	--Select--
Switches between External and PU operation modes.	--Select--
Switches over to the combined operation mode.	--Select--
Releases from the activated protective function.	--Select--
Locks or unlocks key operation.	--Select--
Switches the monitored item (output frequency, output current, output voltage).	--Select--

Answer

Back

## Test

## Final Test 6



Fill in the blanks of the explanation of the procedure for changing the "Pr.125 Terminal 2 frequency setting gain frequency" parameter from the initial value 60Hz to 50Hz in parameter setting mode.

- (1) Press   in External operation mode to switch to the PU operation mode.
- (2) Press   to switch to the parameter setting mode.
- (3) "P.0" is displayed.
- (4) Turn  to select the parameter "P.125".
- (5) Press  to display the present value (60Hz) of "P.125".
- (6) Turn  to change "60Hz" to "50Hz".
- (7) Press  to enter the set value "50Hz" that has been set.
- (8) "F" and "50.00" flicker alternately to indicate the parameter value has been changed.

[Answer](#)[Back](#)

**Test****Final Test 7**

Choose the type(s) of error(s) that activate(s) the protective function to shut off the inverter output.

- ☐ Error message
- ☐ Warning
- ☐ Alarm
- ☐ Fault

[Answer](#)[Back](#)

**Test****Final Test 8**

Choose the correct method(s) of resetting the protective function.

- ☐ Hold the reset signal ON for 0.1 second.
- ☐ Hold the reset signal OFF for 0.1 second.
- ☐ Turn off the power and, after the LED goes off, turn on the power again.
- ☐ Disconnect the inverter from the motor.
- ☐ Execute "parameter clear" in parameter setting mode.
- ☐ Press the STOP/RESET key on the operation panel.
- ☐ Press down the RUN key on the operation panel for 2 seconds.

[Answer](#)[Back](#)

**Test****Test Score**

You have completed the Final Test. Your results are as follows.  
To end the Final Test, proceed to the next page.

Correct answers : 0

Total questions : 8

Percentage : 0%

[Proceed](#)[Review](#)[Retry](#)

**You failed the test**

You have completed the **Inverter FREQROL Basics (Operation)** Course.

Thank you for taking this course.

We hope you enjoyed the lessons and the information you acquired in this course will be useful in the future.

You can review the course as many times as you want.

**Review**

**Close**