

**English Version**

**ENGLISH**



# Preface

Thank you for purchasing our multi-function keypad "TP-G1-J1."

By mounting the multi-function keypad directly on your inverter as an attached keypad or connecting them together using an optional remote operation extension cable (CB-5S, CB-3S, or CB-1S), you can operate the inverter locally or remotely. In either mode, you can, in the same way as with a built-in keypad, run and stop the motor, monitor the running status, and set the function codes. In addition, you can perform "data copying" (Reading function code data from an inverter, writing it into another inverter, and verifying it).

This manual describes the multi-function keypad. It is edited to be commonly used for the FRENIC-Eco, FRENIC-Multi and FRENIC-MEGA series of inverters. Note that the monitor items, accessible function codes, and other support ranges are inverter-model dependent.

Before using the multi-function keypad, read through this manual in conjunction with the inverter's instruction manual and familiarize yourself with its proper use. Improper use may prevent normal operation or cause a failure or reduced life of the inverter.



## CAUTION

- This product is designed to remotely control our inverters. Read through this instruction manual and be familiar with the handling procedure for correct use.
- Improper handling blocks correct operation or causes a short life or failure.
- Deliver this manual to the end user of the product. Keep this manual in a safe place until the multi-function keypad is discarded.

### ■ Safety precautions

Read this manual thoroughly before proceeding with installation, connections (wiring), operation, or maintenance and inspection. Ensure you have sound knowledge of the device and familiarize yourself with all safety information and precautions before proceeding to operate the inverter.

Safety precautions are classified into the following two categories in this manual.

 <b>WARNING</b>	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in death or serious bodily injuries.
 <b>CAUTION</b>	Failure to heed the information indicated by this symbol may lead to dangerous conditions, possibly resulting in minor or light bodily injuries and/or substantial property damage.

Failure to heed the information contained under the CAUTION title can also result in serious consequences. These safety precautions are of utmost importance and must be observed at all times.

## Operation

### **WARNING**

- Be sure to install the terminal cover or the front cover before turning the power ON. Do not remove the covers while power is applied.

**Otherwise electric shock could occur.**



- Do not operate switches/buttons with wet hands.

**Doing so could cause electric shock.**

- If the retry function has been selected, the inverter may automatically restart and drive the motor depending on the cause of tripping.  
(Design the machinery or equipment so that human safety is ensured after restarting.)

- If the stall prevention function has been selected, the inverter may operate at an acceleration/ deceleration time or frequency different from the set ones. Design the machine so that safety is ensured even in such cases.

**Otherwise an accident could occur.**

- The  key on the keypad is enabled only when "RUN/STOP keys on keypad" is selected with function code F02. Prepare an emergency stop switch separately. If you disable the STOP key priority function and enable operation by external commands, the inverter cannot be emergency-stopped by the  key on the keypad.

- If an alarm state is reset with the run signal being turned ON, a sudden start will occur. Ensure that the run signal is turned OFF beforehand.

**Otherwise an accident could occur.**

- If the "Restart mode after momentary power failure" is set to "Continue to run or Restart" (Function code F14 = 3, 4, or 5), then the inverter automatically restarts running the motor when the power is recovered.  
(Design the machinery or equipment so that human safety is ensured after restarting.)

- If you set the function codes wrongly or without completely understanding the related instruction manuals and user's manual, the motor may rotate with a torque or at a speed not permitted for the machine.

**An accident or injuries could occur.**

- Never touch the inverter terminals while the power is applied to the inverter even if the inverter stops.

**Doing so could cause electric shock.**

## Wiring

### **WARNING**

- Do not operate the switches/buttons with wet hands.

**Doing so could cause electric shock.**

- Before opening the cover of the inverter to mount the multi-functional keypad, turn OFF the inverter and wait for at least five minutes for models of 22 kW or below, or ten minutes for models of 30 kW or above. Further, make sure that the LED monitor is turned OFF, the charger indicator is OFF, and the DC link bus voltage between the terminals P (+) and N (-) has dropped below the safe voltage level (+25 VDC), using a circuit tester or another appropriate instrument.

**Otherwise electric shock could occur.**

- In general, sheaths of the control signal wires are not specifically designed to withstand a high voltage (i.e., reinforced insulation is not applied). Therefore, if a control signal wire comes into direct contact with a live conductor of the main circuit, the insulation of the sheath might break down, which would expose the signal wire to a high voltage of the main circuit. Make sure that the control signal wires will not come into contact with live conductors of the main circuit.

**Otherwise, an accident or electric shock could occur.**

## Disposal

### CAUTION

- For disposal, treat the multi-function keypad as industrial waste.  
**Otherwise injuries could occur.**

## Others

### WARNING

- Never attempt to modify the multi-function keypad or inverter.  
**Doing so could cause electric shock or injuries.**

### GENERAL PRECAUTIONS

Drawings in this manual may be illustrated without covers or safety shields for explanation of detail parts. Restore the covers and shields in the original state and observe the instructions given in the manual before starting operation.

## How this manual is organized

This manual is made up of chapters 1 through 4.

### Chapter 1 BEFORE USING THE MULTI-FUNCTION KEYPAD

This chapter describes the points to check upon delivery and lists the inverters the multi-function keypad is designed to interface with.

### Chapter 2 INSTALLATION AND INTERCONNECTION

This chapter describes how to install the multi-function keypad and how to interconnect it with an inverter.

### Chapter 3 OPERATION USING THE MULTI-FUNCTION KEYPAD


This chapter describes the operation of the inverter using the multi-function keypad. More specifically, this chapter gives an overview of the inverter's three operation modes (Running, Programming, and Alarm modes) and describes how to run and stop the inverter/motor, set function code data, monitor running status, view maintenance information and alarm data, and perform data copying.

### Chapter 4 SPECIFICATIONS

This chapter lists the general specifications such as operating environments, communication specifications and transmission specifications.

## Icons

The following icons are used throughout this manual.

 **Note** This icon indicates information which, if not heeded, can result in the product not operating to full efficiency, as well as information concerning incorrect operations and settings which can result in accidents.

 This icon indicates a reference to more detailed information.

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# Chapter 1 BEFORE USING THE MULTI-FUNCTION KEYPAD

## 1.1 Acceptance Inspection

Unpack the package and check the following:

- (1) The package contains a multi-function keypad and its instruction manual (this book).
- (2) There have been no problems during transportation. In particular, no parts are damaged or have fallen out of place nor are there any dents on the body.
- (3) The model name "TP-G1-J1" is inscribed on the back of the multi-function keypad as shown in Figure 1.1.

The multi-function keypad is available in two models--"TP-G1-J1" and "TP-G1-C1." The languages supported by those models differ as listed below.

Model	Language
TP-G1-J1	English, Japanese, German, French, Spanish, and Italian
TP-G1-C1	Chinese, Japanese, English, and Korean

If you suspect the product is not working properly or if you have any questions about your product, contact your Fuji Electric representative.

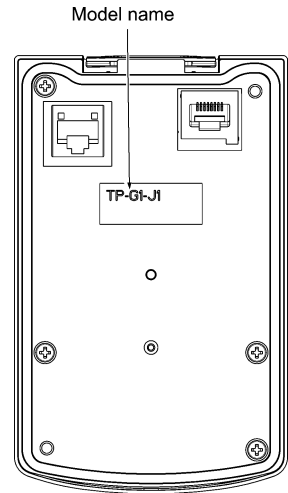


Figure 1.1 Back of Multi-function Keypad TP-G1-J1

## 1.2 Inverters with which the Multi-function Keypad Interfaces

The multi-function keypad "TP-G1-J1" interfaces with the following Fuji inverters:

FRENIC series	Type of inverter *	Remarks
FRENIC-Eco	FRN□□□F1S-□□ FRN□□□F1E-□□ FRN□□□F1H-□□	The multi-function keypad is fully supported by inverters with a ROM version F1S10300 or later. (You can check the inverter's ROM version with [MAIN] in Menu #5 "Maintenance Information" in Programming Mode.) There are restrictions on the support for the multi-function keypad by inverters with a ROM version earlier than F1S10300. For details, consult your Fuji Electric representative.
FRENIC-Multi	FRN□□□E1S-□□ FRN□□□E1E-□□	The multi-function keypad is fully supported by all of the FRENIC-Multi series of inverters.
FRENIC-MEGA	FRN□□□G1S-□□ FRN□□□G1E-□□ FRN□□□G1H-□□	The multi-function keypad is fully supported by inverters with a ROM version G1S10500 or later. (You can check the inverter's ROM version with [MAIN] in Menu #5 "Maintenance Information" in Programming Mode.) There are restrictions on the support for the multi-function keypad by inverters with a ROM version earlier than G1S10500. For details, consult your Fuji Electric representative.

\* A box (□) replaces an alphanumeric character. For the details of the inverter type identification, refer to the inverter's instruction manual, Chapter 1, Section 1.1 "Acceptance Inspection."

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## Chapter 2 INSTALLATION AND INTERCONNECTION

### 2.1 Accessories and Parts Required for Interconnection

To mount the multi-function keypad on the panel or any other device instead of an inverter, you need the following accessories and parts.

Accessories/Parts	Type or Specifications	Remarks
Remote operation extension cable (Note 1)	CB-5S, CB-3S, or CB-1S	Choice of three lengths: 5 m, 3 m, and 1 m
Screws (for mounting the multi-function keypad)	M3 × □ (Note 2)	Two screws required (to be provided by the customer)

(Note 1) Alternatively, you can use an off-the-shelf 10BASE-T/100BASE-TX LAN cable (straight type) that meets the ANSI/TIA/EIA-568A Category 5 standard (maximum length: 20 m).

(Note 2) Use the screws of the length just right for the panel. (See Figure 2.6.)



## 2.2 Mounting the Multi-function Keypad

### 2.2.1 Three ways of installation/use

You can install and/or use the multi-function keypad in one of the following three ways:

- Mounting it directly on the inverter (see Figure 2.1). (For FRENIC-Eco/MEGA only.)
- Mounting it on the panel (see Figure 2.2).
- Using it remotely in your hand (see Figure 2.3).

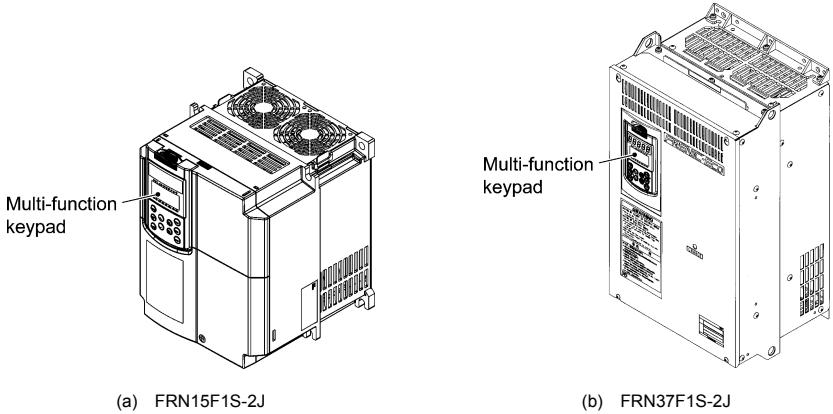


Figure 2.1 Mounting the Multi-function Keypad Directly on the Inverter

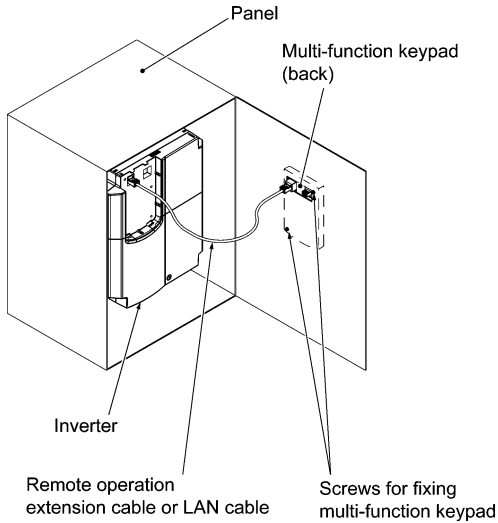


Figure 2.2 Mounting the Multi-function Keypad on the Panel

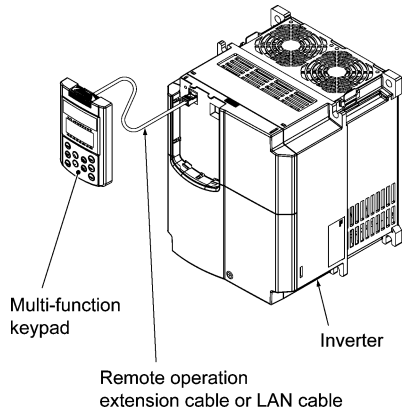


Figure 2.3 Using the Multi-function Keypad Remotely in Your Hand

## 2.2.2 Mounting the multi-function keypad

After completion of interconnection, mount the multi-function keypad using the following procedure. Be sure to turn the inverter power OFF beforehand.

### ■ Mounting the multi-function keypad directly on the inverter (For FRENIC-Eco/MEGA only)

- (1) If a remote keypad is mounted on the inverter, remove it by pulling it toward you with the hook held down as directed by the arrows in Figure 2.4.

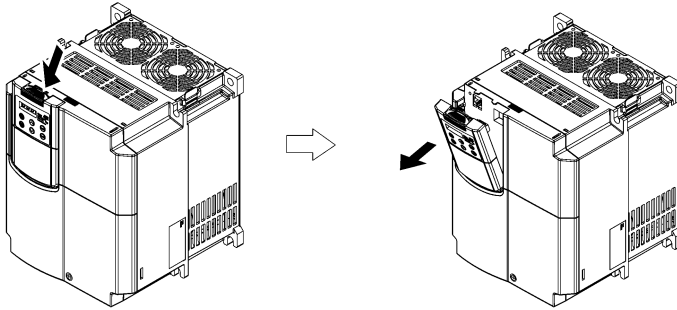


Figure 2.4 Removing the Remote Keypad

- (2) Put the multi-function keypad in the original slot while engaging its bottom latches with the holes (as shown below), and push it onto the case of the inverter (arrow ②) while holding it downward (against the terminal block cover) (arrow ①).

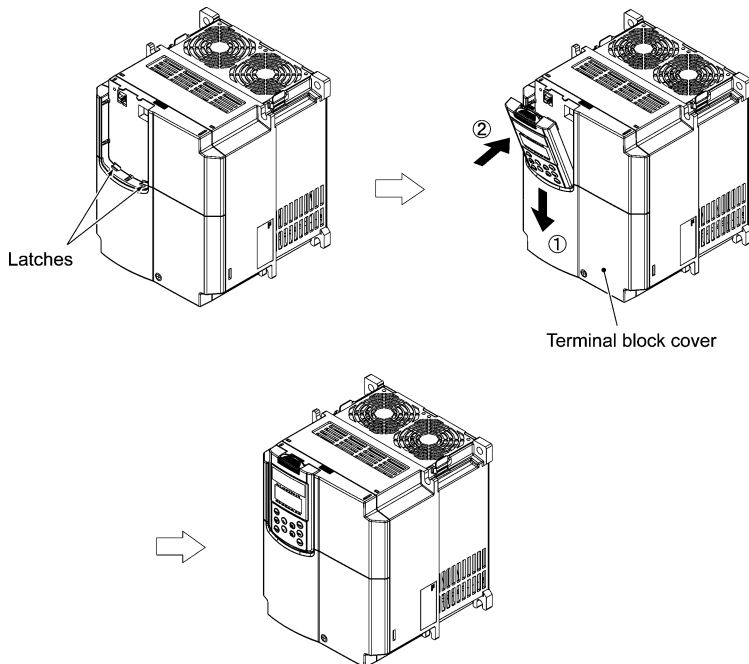


Figure 2.5 Mounting the Multi-function Keypad



- (2) Mount the multi-function keypad on the panel wall with 2 screws as shown below. (Recommended tightening torque: 0.7 N•m)

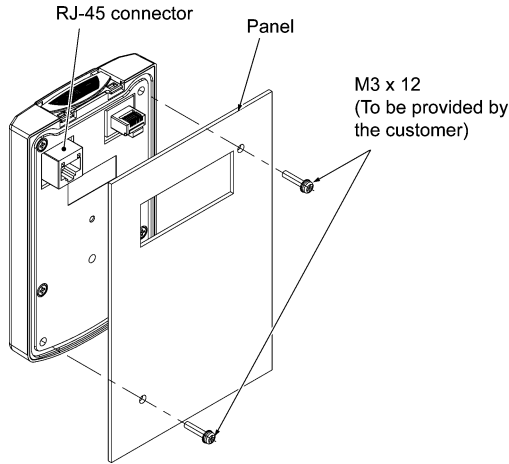


Figure 2.7 Mounting the Multi-function Keypad

- (3) If a remote keypad is mounted on the inverter, remove it (see Figure 2.4) and, using a remote operation extension cable or a LAN cable, interconnect the multi-function keypad and the inverter (insert one end of the cable into the RS-485 port with RJ-45 connector on the multi-function keypad and the other end into that on the inverter) (See Figure 2.8).

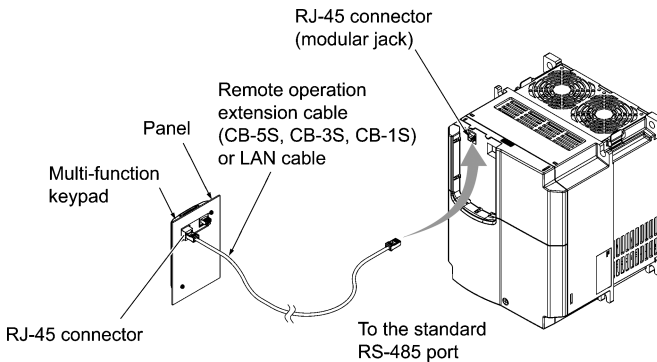


Figure 2.8 Connecting the Multi-function Keypad to the Inverter with Remote Operation Extension Cable or an Off-the-shelf LAN Cable

#### ■ Using the multi-function keypad remotely in hand

Follow step (3) of "Mounting the multi-function keypad on the panel" above.

## Chapter 3 OPERATION USING THE MULTI-FUNCTION KEYPAD






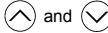






### 3.1 LED Monitor, LCD Monitor, and Keys

The keypad allows you to start and stop the motor, view various data including maintenance information and alarm information, set function codes, monitor I/O signal status, copy data, and calculate the load factor.



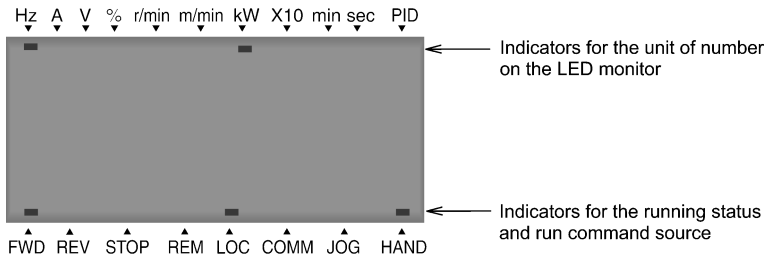
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Table 3.1 Overview of Keypad Functions

Item	Monitors and Keys	Functions
Monitors		<p>Five-digit, 7-segment LED monitor which displays the following according to the operation modes:</p> <ul style="list-style-type: none"> <li>■ In Running mode: Running status information (e.g., output frequency, current, and voltage)</li> <li>■ In Programming mode: same as above</li> <li>■ In Alarm mode: Alarm code, which identifies the cause of alarm if the protective function is activated.</li> </ul>
		<p>LCD monitor which displays the following according to the operation modes:</p> <ul style="list-style-type: none"> <li>■ In Running mode: Running status information</li> <li>■ In Programming mode: Menus, function codes and their data</li> <li>■ In Alarm mode: Alarm code, which identifies the cause of an alarm if the protective function is activated.</li> </ul>
	Indicator indexes	<p>In Running mode, these indexes show the unit of the number displayed on the 7-segment LED monitor and the running status information on the LCD monitor. For details, see the next page.</p>
Program- ming keys		Switches the operation modes of the inverter.
		Shifts the cursor to the right when entering a number.
		<p>Pressing this key after removing the cause of an alarm will switch the inverter to Running mode.</p> <p>This key is used to reset settings or screen transition.</p>
		UP and DOWN keys. These keys are used to select the setting items or change the function code data.
		<p>Function/Data key. This key switches the operation mode as follows:</p> <ul style="list-style-type: none"> <li>■ In Running mode: Pressing this key switches the information to be displayed concerning the status of the inverter (output frequency (Hz), output current (A), output voltage (V), etc.).</li> <li>■ In Programming mode: Pressing this key displays the function code and establishes the newly entered data.</li> <li>■ In Alarm mode: Pressing this key displays the details of the problem indicated by the alarm code that has appeared on the LED monitor.</li> </ul>
Operation keys		Starts running the motor (forward rotation).
		Starts running the motor (reverse rotation).
		Stops the motor.
		Holding down this key for more than 1 second toggles between local and remote modes.
LED lamp		Lights while a run command is supplied to the inverter.

Indicator Index details

Type	Item	Description (information, condition, status)
Unit of number on LED monitor	Hz	Output frequency and frequency command
	A	Output current
	V	Output voltage
	%	Calculated torque, load factor, and speed
	r/min	Preset and actual motor speeds and preset and actual load shaft speeds
	m/min	Preset and actual line speeds
	kW	Input power and motor output
	X10	Data exceeding 99,999
	min	Preset and actual constant feeding rate times
	sec	Timer
	PID	PID process value
Running status	FWD	Running in forward rotation
	REV	Running in reverse rotation
	STOP	No output frequency
Run command source	REM	Remote mode
	LOC	Local mode
	COMM	Via communication (RS-485 (standard, optional), field bus option)
	JOG	Jogging mode
	HAND	Via keypad (This item lights also in local mode.)



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### 3.2 Overview of Operation Modes

The FRENIC series of inverters feature three operation modes listed in Table 3.2.

Table 3.2 Operation Modes

Mode	Description
Running Mode	This mode allows you to enter run/stop commands in regular operation. You can also monitor the running status in real time. If a light alarm occurs, the $L - FL^*$ appears on the LED monitor. (Only in FRENIC-MEGA)
Programming Mode	This mode allows you to set function code data and check a variety of information relating to the inverter status and maintenance.
Alarm Mode	If an alarm condition arises, the inverter automatically enters the Alarm mode. In this mode, you can view the corresponding alarm code* and its related information on the LED and LCD monitors.

\* Codes that represent the causes of alarms that have been triggered by the protective function. For details, refer to "Protective Functions" in the inverter's instruction manual.

Figures 3.1 (a) and (b) show the status transition of the inverter between these three operation modes.

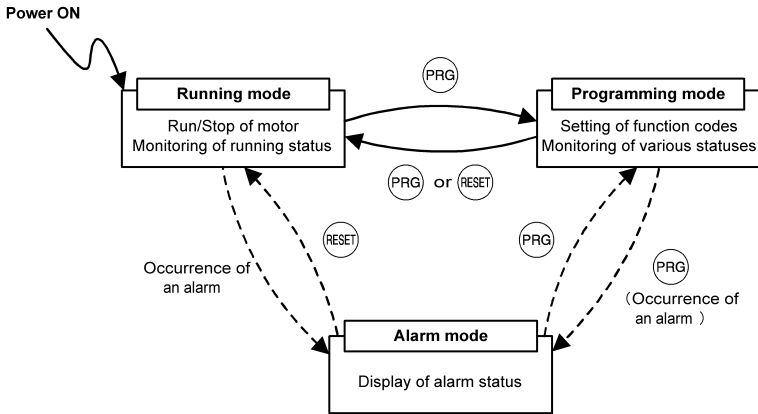


Figure 3.1 (a) Status Transition between Operation Modes in FRENIC-Eco/Multi

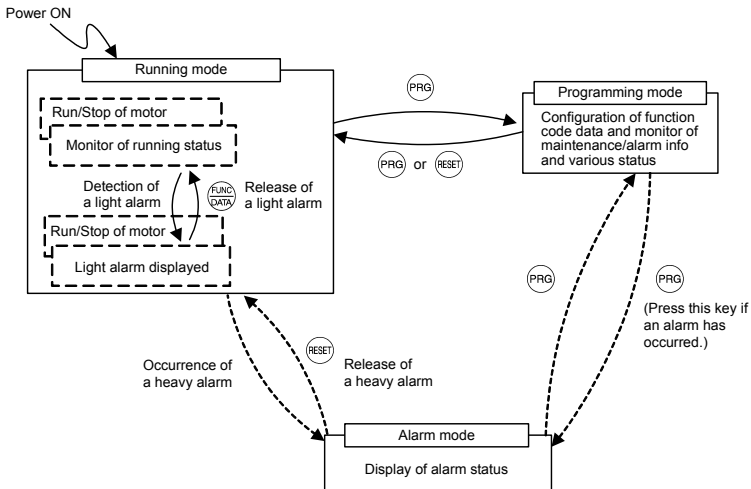


Figure 3.1 (b) Status Transition between Operation Modes in FRENIC-MEGA (With light alarm added.)



### 3.3 Running Mode

When the inverter is turned ON, it automatically enters Running mode in which you can:

- [ 1 ] Configure the frequency command and PID commands
- [ 2 ] Run or stop the motor,
- [ 3 ] Monitor the running status (e.g., output frequency, output current),
- [ 4 ] Jog (inch) the motor,
- [ 5 ] Switch between the remote and local modes, and
- [ 6 ] Monitor light alarms.

#### 3.3.1 Configuring the frequency command and PID commands

You can configure the frequency command and PID commands with the  $\triangle$  and  $\nabla$  keys on the keypad.



It is possible to display or configure the reference frequency as load shaft speed and other converted values of the mechanical system with function code E48. To configure the reference frequency while monitoring the motor speed, load shaft speed, or speed (%), set the E48 data to 3, 4, or 7, respectively, as listed in Table 3.8 "Items Monitored."

#### ■ Configuring the frequency command

Using  $\triangle$  and  $\nabla$  keys (F01 = 0 (factory default) or 8)

- (1) Set function code F01 at "0" or "8" ( $\triangle$  /  $\nabla$  keys on keypad). This cannot be done when the keypad is in Programming mode or Alarm mode. To enable frequency setting using the  $\triangle$  and  $\nabla$  keys, first place the keypad in Running mode.
- (2) Press the  $\triangle$  or  $\nabla$  key. The 7-segment LED monitor displays the frequency command and the LCD monitor displays the related information including the operation guide, as shown in Figure 3.2.

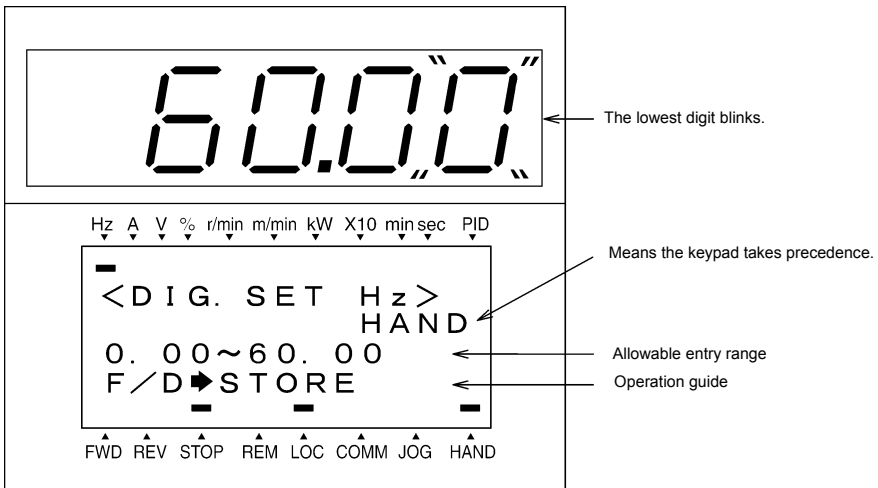


Figure 3.2 Example of Frequency Command Configuring Screen

- (3) To change the frequency command, press the  $\triangle$  or  $\nabla$  key again. The new setting can be saved into the inverter's internal memory.



- The frequency command setting will be saved either automatically by turning the main power OFF or only by pressing the **FUNC DATA** key. You can choose either way using function code E64. (Available in FRENIC-Eco/MEGA)
- When you start accessing the frequency command or any other parameter with the **▲** and **▼** keys, the lowest digit on the display will blink and start changing. As you are holding down the key, blinking will gradually move to the upper digit places and the upper digits will be changeable.
- Pressing the **SHIFT** key moves the changeable digit place (blinking) and thus allows you to change upper digits easily.
- By setting function code C30 at "0" (Enable **▲** / **▼** keys on the keypad) and selecting frequency command 2 as a frequency command source, you can also access the frequency command in the same manner using the **▲** and **▼** keys.
- If you have set function code F01 at "0" (**▲** / **▼** keys on keypad) but have selected a frequency command source other than frequency 1 (i.e., frequency 2, via communications, or as a multi-frequency), then you cannot use the **▲** or **▼** key for changing the frequency command even if the keypad is in Running mode. Pressing either of these keys will just display the currently selected frequency command.
- Setting function code F01 at "8" (**▲** / **▼** keys on keypad) enables the balanceless-bumpless switching. When the frequency command source is switched to the keypad from any other source, the inverter inherits the current frequency that has applied before switching, providing smooth switching and shockless running. (Available in FRENIC-MEGA)
- When the frequency command source is other than the digital reference setting, the LCD monitor displays the following.

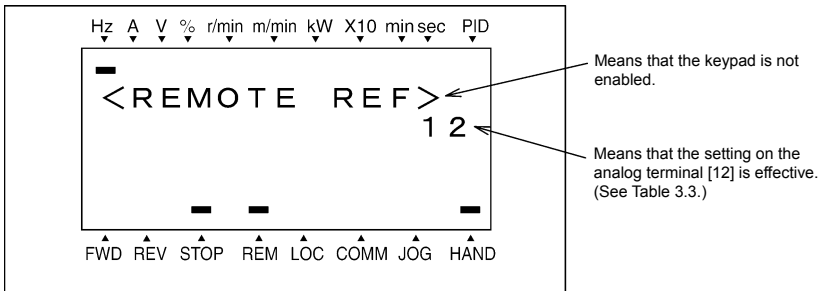


Table 3.3 lists the available command sources and their symbols.

Table 3.3 Available Command Sources

Symbol	Command source	Symbol	Command source	Symbol	Command source
HAND	Keypad	MULTI	Multi-frequency	PID-HAND	PID keypad command
12	Terminal [12]			PID-P1	PID command 1 (Analog command)
C1	Terminal [C1]	RS485-1	RS-485 (Port 1) *1	PID-P2	PID command 2 (Analog command)
12 + C1	Terminal [12] + Terminal [C1]	RS485-2	RS-485 (Port 2) *2	PID-U/D	PID UP/DOWN command
V2	Terminal [V2]	BUS	Bus option	PID_LINK	PID communications command
U/D	UP/DOWN control	LOADER	Inverter support software "FRENIC loader"	PID+MULTI	PID multi-frequency command

\*1 Refers to COM port 1 which is the RJ-45 connector on the inverter.

\*2 Refers to COM port 2 which is on the terminal block of the inverter (FRENIC-MEGA) or on that of the option card (FRENIC-Eco/Multi).

## ■ Make settings under PID process control

To enable PID process control, you need to set function code J01 at "1" or "2."

Under the PID control, the items that can be accessed with the  $\triangle$  and  $\nabla$  keys are different from those under regular frequency control, depending upon the current LED monitor setting. If the LED monitor is set to the speed monitor, the item accessible is a manual speed command (frequency command); if it is set to any other data, the item accessible is a PID process command.

 Refer to the inverter's user's manual for details on the PID control.

### Configuring the PID process command with the $\triangle$ and $\nabla$ keys

- (1) Set function code J02 at "0" ( $\triangle$  /  $\nabla$  keys on keypad).
- (2) Set the LED monitor to something other than the speed monitor (E43 = 0) while the keypad is in Running mode. You cannot modify the PID process command with the  $\triangle$  and  $\nabla$  keys while the keypad is in Programming mode or Alarm mode. To enable the modification of the command with the  $\triangle$  and  $\nabla$  keys, first switch to Running mode.
- (3) Press the  $\triangle$  or  $\nabla$  key. The 7-segment LED monitor displays the PID process command and the LCD monitor displays the related information including the operation guide, as shown in Figure 3.3.

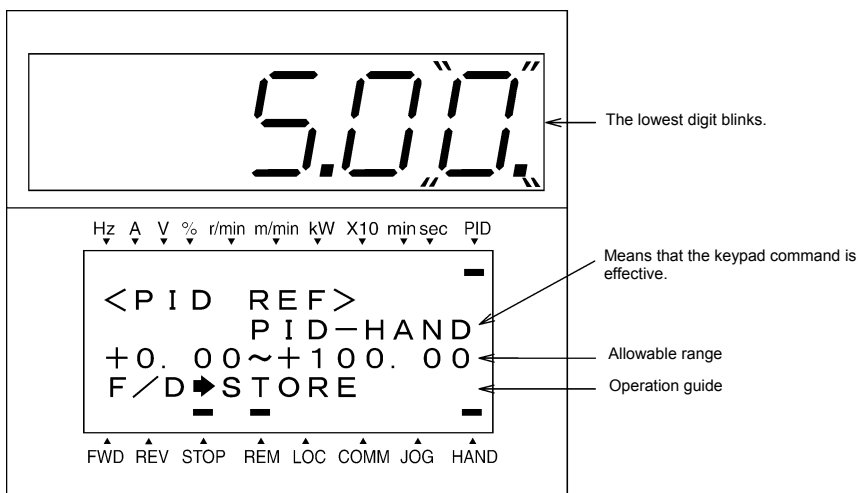

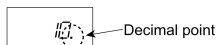


Figure 3.3 Example of PID Process Command Configuring Screen

 **Tip** On the LED monitor, the decimal point of the lowest digit is used to characterize what is displayed. The decimal point of the lowest digit blinks when a PID process command is displayed; the decimal point lights when a PID feedback amount is displayed.



- (4) To change the PID process command, press the  $\triangle$  or  $\nabla$  key again. The new setting can be saved into the inverter's internal memory.



- The PID process command will be saved either automatically by turning the main power OFF or only by pressing the key. You can choose either way using function code E64. (Available in FRENIC-Eco/MEGA)
- Even if multi-frequency is selected as a PID process command (**SS4** or **SS8** = ON), you still can set the process command using the keypad.
- When function code J02 is set to any value other than "0," pressing the or key displays, on the LED monitor, the PID process command currently selected, while you cannot change the setting. The LCD monitor displays the following.

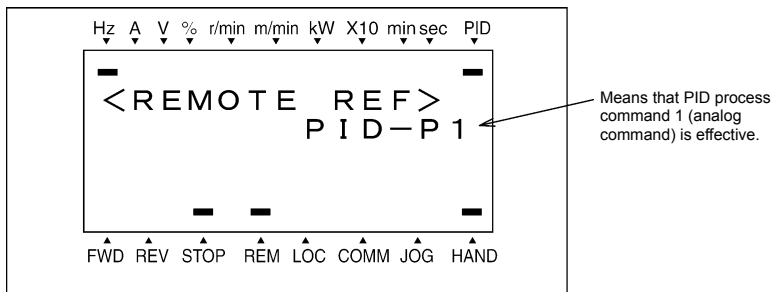


Table 3.4 PID Process Command Manually Set with and Keys and Requirements

PID control (Mode selection) J01	PID control (Remote command SV) J02	LED Monitor E43	Multi-frequency <b>SS4, SS8</b>	With  and  keys
1 or 2	0	Other than 0	ON or OFF	PID process command <u>by keypad</u>
	Other than 0			PID process command <u>currently selected</u>

### Configuring the frequency command with the and keys under PID control

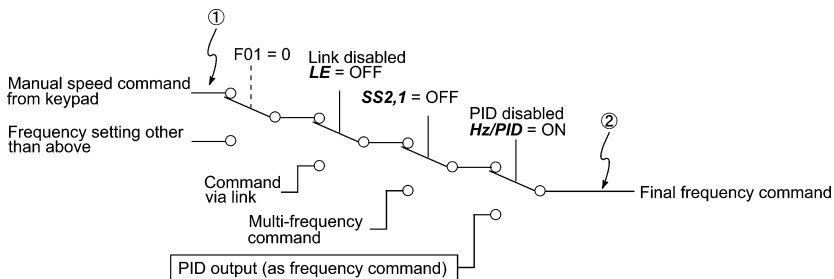
When function code F01 is set at "0" ( / keys on keypad) and frequency command 1 (Frequency setting via communications link: Disabled; Multi-frequency setting: Disabled; PID control: Disabled) is selected as a manual speed command, you can modify the frequency setting using the and keys if you specify the LED monitor as the speed monitor while the keypad is in Running mode.

Note that you cannot modify the frequency setting using the and keys while the keypad is in Programming mode or Alarm mode. To enable the modification of the frequency setting using the and keys, first switch to Running mode. These conditions are summarized in Table 3.5 and the figure below. Table 3.5 shows the combinations of the parameters, while the figure below illustrates how the manual speed command ① entered via the keypad is translated to the final frequency command ②.

The setting and viewing procedures are the same as those for usual frequency setting.

Table 3.5 Speed (Frequency) Command Manually Specified with and Keys and Requirements

Frequency command 1 (F01)	Frequency setting via communications link	Multi-frequency setting	PID control disabled	Display during  /  key operation
0	Disabled	Disabled	PID enabled	PID output (as final frequency command)
			Disabled	Manual speed command <u>by keypad</u> (frequency setting)
Other than the above			PID enabled	PID output (as final frequency command)
			Disabled	Manual speed command <u>currently selected</u> (frequency setting)



### ■ Make settings under PID dancer control

To enable the PID dancer control, you need to set function code J01 at "3."

Under the PID control, the items that can be accessed with the  $\triangle$  and  $\nabla$  keys are different from those under the regular frequency control, depending upon the current LED monitor setting. If the LED monitor is set to the speed monitor, the item accessible is a primary frequency command; if it is set to any other data, the item accessible is a PID dancer position command.

#### Configuring the PID dancer position command with the $\triangle$ and $\nabla$ keys

- (1) Set function code J02 at "0" ( $\triangle$  /  $\nabla$  keys on keypad).
- (2) Set the LED monitor to something other than the speed monitor (E43 = 0) when the inverter is in Running mode. You cannot modify the PID dancer position command with the  $\triangle$  and  $\nabla$  keys while the keypad is in Programming mode or Alarm mode. To enable the modification of the command, first switch to Running mode.
- (3) Press the  $\triangle$  or  $\nabla$  key. The 7-segment LED monitor displays the PID dancer position command and the LCD monitor displays the related information including the operation guide, as shown in Figure 3.4.

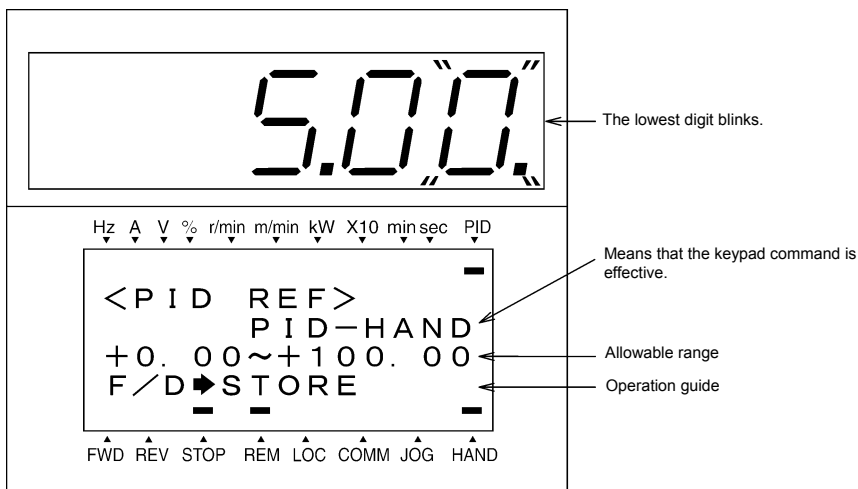
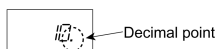


Figure 3.4 Example of PID Dancer Position Command Configuring Screen

**Tip** On the LED monitor, the decimal point of the lowest digit is used to characterize what is displayed. The decimal point of the lowest digit blinks when a PID dancer position command is displayed; the decimal point lights when a PID feedback amount is displayed.



(4) To change the PID dancer position command, press the  $\triangle$  or  $\nabla$  key again. The new setting can be saved into the inverter's internal memory as function code J57 data. It is retained even if you temporarily switch to another PID command source and then go back to the via-keypad PID command. Furthermore, you can directly configure the command with function code J57.



- Even if multi-frequency is selected as a PID dancer position command (**SS4** or **SS8** = ON), you still can set the command using the keypad.
- When function code J02 is set to any value other than "0," pressing the  $\triangle$  or  $\nabla$  key displays, on the LED monitor, the PID dancer position command currently selected, while you cannot change the setting. The LCD monitor displays the same as for the PID process control.

Table 3.6 Primary Frequency Command Specified with  $\triangle$  and  $\nabla$  Keys and Requirements

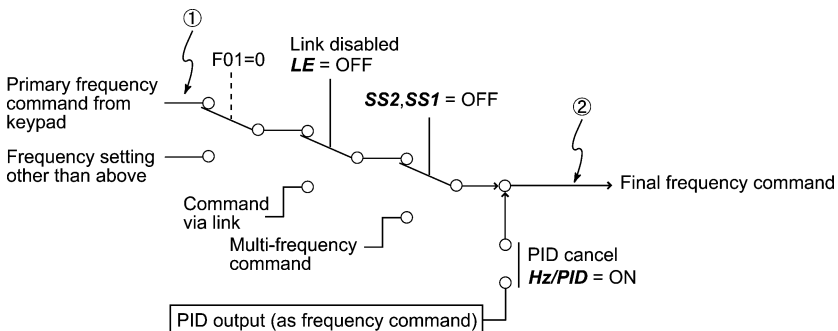
PID control (Mode selection) J01	PID control (Remote command SV) J02	LED Monitor E43	Multi-frequency <b>SS4, SS8</b>	With $\triangle$ and $\nabla$ keys
3	0	Other than 0	ON or OFF	PID command <u>by keypad</u>
	Other than 0			PID command <u>currently selected</u>

■ Configuring the primary frequency command with the  $\triangle$  and  $\nabla$  keys under PID dancer control

When function code F01 is set at "0" ( $\triangle$  /  $\nabla$  keys on keypad) and frequency command 1 (Frequency setting via communications link: Disabled; Multi-frequency setting: Disabled) is selected as a primary frequency command, you can modify the primary frequency command using the  $\triangle$  and  $\nabla$  keys if you specify the LED monitor as the speed monitor while the keypad is in Running mode.

Note that you cannot modify the primary frequency command using the  $\triangle$  and  $\nabla$  keys while the keypad is in Programming mode or Alarm mode. To enable the modification of the frequency setting, first switch to Running mode. The figure below shows how the primary frequency command ① entered via the keypad is translated to the final frequency command ②.


The setting procedure is the same as that for usual frequency setting.



### 3.3.2 Running or stopping the motor

By factory default, pressing the **(FWD)** key starts running the motor in the forward direction and pressing the **(STOP)** key decelerates the motor to stop. The **(REV)** key is disabled. You can run or stop the motor using the keypad only in Running mode and Programming mode.

To run the motor in reverse direction or to run the motor in reversible mode, change the setting of function code F02.

 For details of function code F02, refer to the inverter's instruction manual, Chapter 5 "FUNCTION CODES."

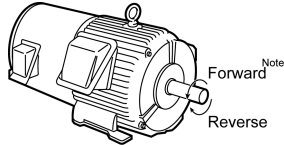


Figure 3.5 Rotational Direction of Motor

Note) The rotational direction of IEC-compliant motor is opposite to the one shown above.

#### ■ Displaying the running status on the LCD monitor

##### (1) When function code E45 (LCD monitor item selection) is set at "0"

The LCD monitor displays the running status, the rotational direction, and the operation guide.

(The lower indicators show the running status and run command source. For the upper ones, see Section 3.3.3.)

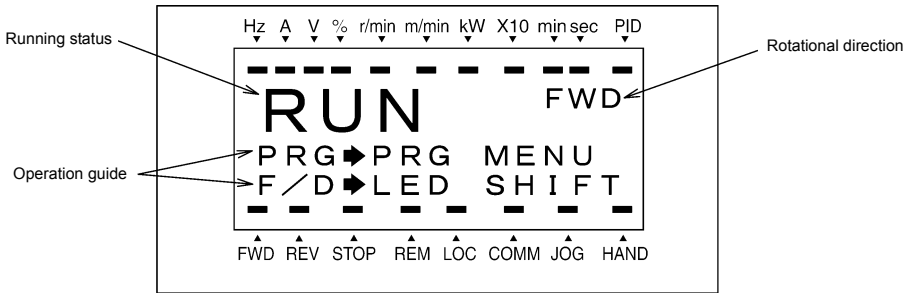


Figure 3.6 Display of Running Status

The running status and the rotational direction are displayed as listed in Table 3.7.

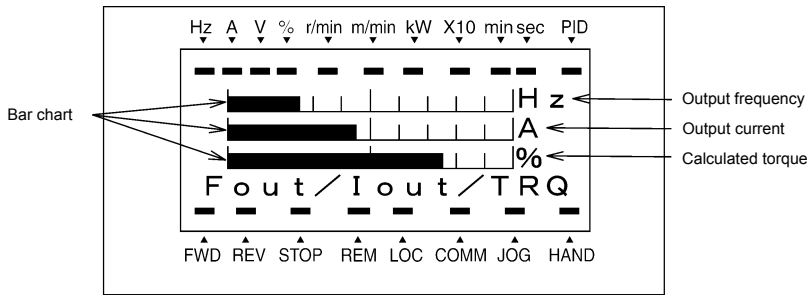
Table 3.7 Running Status and Rotational Direction

Status/Direction	Display	Meaning
Running status	RUN STOP	A run command is present or the inverter is driving the motor. A run command is not present and the inverter is stopped.
Rotational direction	FWD REV Blank	Forward rotation being commanded. Reverse rotation being commanded. The inverter is stopped.

##### (2) When function code E45 (LCD monitor item selection) is set at "1"

The LCD monitor displays the output frequency, output current, and calculated torque in a bar chart.

(The lower indicators show the running status and run command source. For the upper ones, see Section 3.3.3.)



The full scale (maximum value) for each parameter is as follows:

- Output frequency: Maximum frequency
- Output current: 200% of inverter's rated current
- Calculated torque: 200% of rated torque generated by motor

Figure 3.7 Bar Chart

### 3.3.3 Monitoring the running status on the LED monitor

The items listed below can be monitored on the 7-segment LED monitor. Immediately after the power is turned ON, the monitor item specified by function code E43 is displayed.

Pressing the  $\frac{RUN}{STOP}$  key in Running mode switches between monitor items in the sequence shown in Table 3.8. The "Monitor page #" column shows the monitor page of items supported by each inverter model.

Table 3.8 Items Monitored

Monitored Items on the LED Monitor	Example	Unit	Meaning of Displayed Value	Function code E43	Monitor page #		
					Eco	Multi	MEGA
Speed Monitor	Function code E48 specifies what to be displayed.			0	0 Some items are not displayed depending on the inverter model. For details, refer to the inverter's instruction manual.		
Output frequency (before slip compensation)	50.00	Hz	Frequency actually being output (Hz)	(E48=0)			
Output frequency (after slip compensation)	50.00	Hz	Frequency actually being output (Hz)	(E48=1)			
Reference frequency	50.00	Hz	Frequency actually being output (Hz)	(E48=2)			
Motor speed	1500	r/min	Output frequency (Hz) $\times \frac{120}{P01}$	(E48=3)			
Load shaft speed	300.0	r/min	Output frequency (Hz) $\times$ E50	(E48=4)			
Line speed	300.0	r/min	Output frequency (Hz) $\times$ E50	(E48=5)			
Constant feeding rate time	50	min	$\frac{E50}{\text{Output frequency (Hz)} \times E39}$	(E48=6)			
Speed (%)	50.0	%	$\frac{\text{Output frequency (Hz)}}{\text{Maximum frequency (Hz)}} \times 100$	(E48=7)			
Output current	12.34	A	Output of the inverter in current in rms	3	8		
Input Power	10.25	kW	Input power to the inverter	9	9		
Calculated torque	50	%	Motor output torque in % (Calculated value)	8	10		



Table 3.8 Items Monitored (Continued)

Monitored Items on the LED Monitor	Example	Unit	Meaning of Displayed Value	Function code E43	Monitor page #		
					Eco	Multi	MEGA
Output voltage	200	V	Output of the inverter in voltage in rms	4	11		
Motor output	9.85	kW	Motor output in kW	16	12		
Load factor	50	%	Load rate of the motor in % with the rated output being at 100%	15	13		
PID command (Note 1)	10.00	—	PID command/feedback amount transformed to that of physical value of the object to be controlled.	10	14		
PID feedback amount (Note 1)	9.00	—	Refer to the function codes E40 and E41 for details.	12	15		
PID output (Note 1)	100.0	%	PID output in % with the maximum output frequency (F03) being at 100%	14	16		
Analog input monitor (Note 2)	82.00	—	Analog input to the inverter converted per E40 and E41 Refer to the function codes E40 and E41 for details.	17	18	-	18
Timer (for timer operation) (Note 3)	50	s	Remaining time when the timer operation is enabled	13	-	17	-
Current position pulse	100	pulse	Current position pulse for use under positioning control	21	-	19	-
Position deviation pulse	100	pulse	Position deviation pulse for use under positioning control	22	-	20	-
Torque current (Note 4)	48	%	Torque current command value or calculated torque current	23	-	-	21
Exciting current magnetic flux command (Note 4)	50	%	Magnetic flux command value	24	-	-	22
Input watt-hour	100.0	kWh	$\frac{\text{Input watt - hour (kWh)}}{100}$	25	-	-	23

The LCD monitor (given below) shows information related to the item shown on the LED monitor. The monitor item on the LED monitor can be switched by pressing the  key.

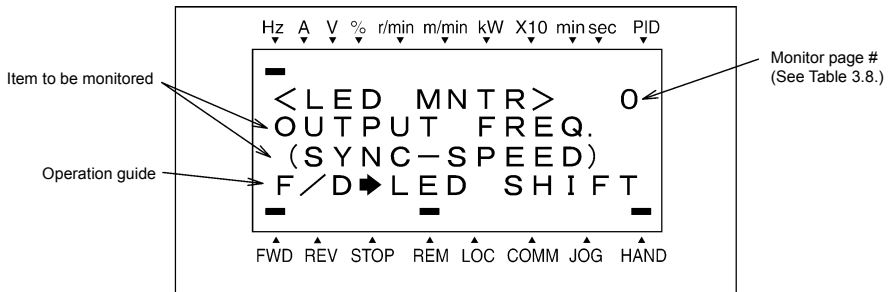



Figure 3.8 LCD Monitor Sample Detailed for the LED Monitor Item

- (Note 1) These PID related items appear only when the inverter drives the motor under the PID control specified by function code J01 (= 1, 2 or 3). When a PID command or PID output is displayed, the dot at the lowest digit on the LED monitor blinks; when a PID feedback amount is displayed, it is lit.
- (Note 2) This item appears only when the analog input monitor is enabled by any of function codes E61 to E63 (Select terminal function).
- (Note 3) This item appears only when the timer operation is enabled by function code C21 (data = 1).
- (Note 4) If the V/f control is selected, a zero (0) is displayed.


### 3.3.4 Jogging (inching) the motor (Available in FRENIC-Multi/MEGA)

To start jogging operation, perform the following procedure.



(1) Make the inverter ready to jog with the steps below.

- 1) Switch the inverter to Running mode (see Section 3.2).
- 2) Press the "STOP +  keys" simultaneously. The lower indicator above the "JOG" index comes ON.




- Function code C20 specifies the jogging frequency. H54 and H55 (H55 is available only in FRENIC-MEGA) specify the acceleration and deceleration times, respectively. These three function codes are exclusive to jogging operation. Specify each function code data, if needed.
- Using the input terminal command "Ready for jogging" **JOG** switches between the normal operation state and ready-to-jog state.
- Switching between the normal operation state and ready-to-jog state with the "STOP +  keys" is possible only when the inverter is stopped.

(2) Jog the motor.

While the  or  key is held down, the motor continues jogging. Releasing the key decelerates the motor to stop.

(3) Make the inverter exit from the ready-to-jog state and return to the normal operation state.

Press the "STOP +  keys" simultaneously. The lower indicator above the "JOG" index goes OFF.










### 3.3.5 Switching between the remote and local modes (Available in FRENIC-Eco/MEGA)


The inverter can be operated either in remote mode or in local mode. In remote mode, which applies to normal operation, the inverter is driven under the control of the data settings held in it, whereas in local mode, which applies to maintenance operation, it is separated from the system and is driven manually under the control of the keypad.

- Remote mode: The run and speed command sources are determined by source switching signals including function codes, run command 2/1 switching signal, and communications link operation signal. The keypad cannot be used as a command source.
- Local mode: The keypad is enabled as a run and speed command source, regardless of the settings specified by function codes. The keypad takes precedence over run command 2/1 switching signal, communications link operation signal or other command sources.

The table below lists the run command sources using the keypad in the local mode.

Table 3.9 Run Commands from the Keypad in the Local Mode

Data for F02	Run command sources
0: Keypad	You can run or stop the motor using the  ,  , and  keys on the keypad.
1: External signal	
2: Keypad (forward)	You can run or stop the motor using the  and  keys on the keypad. You can run the motor in forward direction only. (The  key is disabled.)
3: Keypad (reverse)	You can run or stop the motor using the  and  keys on the keypad. You can run the motor in reverse direction only. (The  key is disabled.)


Holding down the  key for at least one second switches between the remote and local modes.

The mode can be switched also by an external digital input signal. To enable the switching, you need to assign **LOC** to one of the digital input terminals, which means that the commands from the keypad are given precedence (one of function codes E01 to E09, E98, or E99 must be set to "35").

You can confirm the current mode on the indicators (REM: Remote mode; LOC: Local mode).

When the mode is switched from Remote to Local, the frequency settings in the remote mode are automatically inherited. Further, if the inverter is in Running mode at the time of the switching from Remote to Local, the run command is automatically turned ON so that all the necessary data settings will be carried over. If, however, there is a discrepancy between the settings on the keypad and those in the inverter itself (e.g., switching from reverse rotation in the remote mode to forward rotation in the local mode using the keypad that is for forward rotation only), the inverter automatically stops.

The paths of transition between remote and local modes depend on the current mode and the value (ON/OFF) of **LOC**, the signal giving precedence to the commands from the keypad, as shown in the state transition diagram shown in Figure 3.9.

 For further details on how to set run commands and frequency commands in remote and local modes, refer to the drive command related section in the inverter's user's manual, "BLOCK DIAGRAMS FOR CONTROL LOGIC."

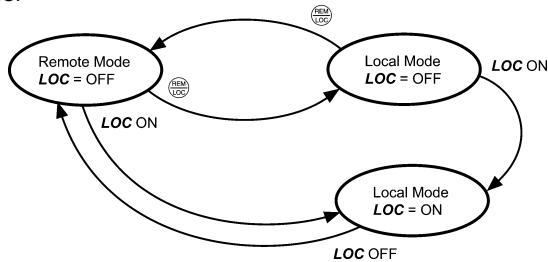


Figure 3.9 Transition between Remote and Local Modes

### 3.3.6 Monitoring light alarms (Available only in FRENIC-MEGA)

The FRENIC-MEGA identifies abnormal states in two categories--Heavy alarm and Light alarm. If the former occurs, the inverter immediately trips; if the latter occurs, the inverter shows the **L-AL** on the LED monitor and blinks the "L-ALARM" indication in the operation guide area on the LCD monitor but it continues to run without tripping.

Which abnormal states are categorized as a light alarm ("Light alarm" object) should be defined with function codes H81 and H82 beforehand.

Assigning the **LALM** signal to any one of the digital output terminals with any of function codes E20 to E24 and E27 (data = 98) enables the inverter to output the **LALM** signal on that terminal upon occurrence of a light alarm.

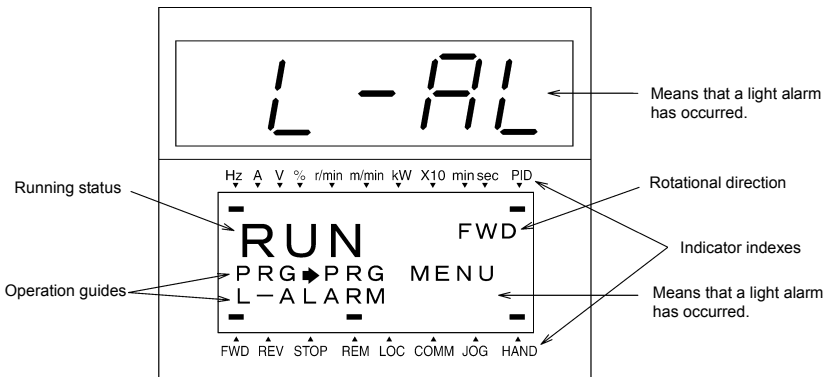



Figure 3.10 Display of Light Alarm

 For details of the light alarm factors, refer to the FRENIC-MEGA Instruction Manual, Chapter 6 "TROUBLESHOOTING."

### ■ How to check a light alarm factor

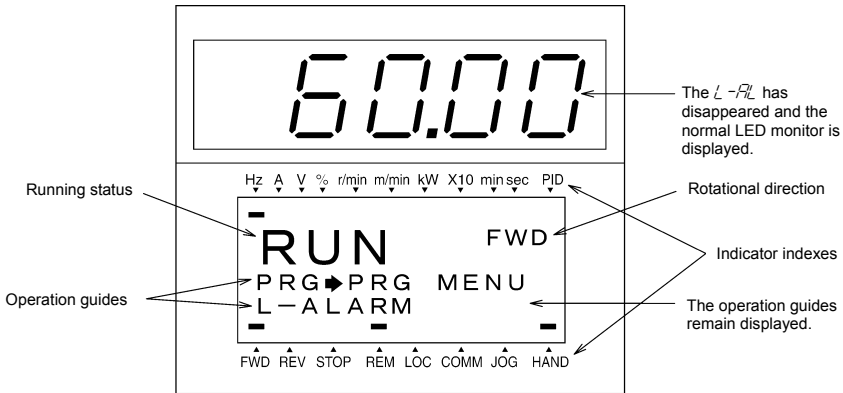
If a light alarm occurs,  $L-F/L$  appears on the LED monitor. To check the current light alarm factor, enter Programming mode by pressing the (PRG) key and select LALM1 on Menu #5 "Maintenance Information." For details of the menu transition of the maintenance information, refer to Section 3.4.6 "Reading maintenance information."

It is also possible to check the factors of the last three light alarms by selecting LALM2 (last) to LALM4 (3rd last).

### ■ How to remove the current light alarm

After checking the current light alarm factor, to switch the LED monitor from the  $L-F/L$  indication state back to the running status display (e.g., output frequency), press the (FWD) key in Running mode.

If the light alarm factor has been removed, the "L-ALARM" disappears and the **LALM** output signal turns OFF. If not (e.g. DC fan lock), the  $L-F/L$  on the LED monitor disappears (normal monitoring becomes available), the "L-ALARM" remains displayed on the LCD monitor, and the **LALM** output signal remains ON.



### 3.4 Programming Mode

Programming mode allows you to set and check function code data and monitor maintenance information and input/output (I/O) signal status. The functions can be easily selected with a menu-driven system. Table 3.10 lists menus available in Programming mode.

Table 3.10 Menus Available in Programming Mode

Menu #	Menu	Main functions	Refer to:
0	Quick Setup	Displays only basic function codes pre-selected.	3.4.2
1	Data Setting	Allows you to view and change the setting of the function code you select. (Note)	3.4.1
2	Data Checking	Allows you to view and change a function code and its setting (data) on the same screen. Also this allows you to check the function codes that have been changed from their factory defaults.	3.4.3
3	Drive Monitoring	Displays the running information required for maintenance or test running.	3.4.4
4	I/O Checking	Displays external interface information.	3.4.5
5	Maintenance Information	Displays maintenance information including cumulative run time.	3.4.6
6	Alarm Information	Displays four latest alarm codes. Also this allows you to view the information on the running status at the time the alarm occurred.	3.4.7
7	Alarm Cause	Displays the cause of the alarm.	3.4.8
8	Data Copying	Allows you to read or write function code data, as well as verifying it.	3.4.9
9	Load Factor Measurement	Allows you to measure the maximum output current, average output current, and average braking power.	3.4.10
10	User Setting	Allows you to add or delete function codes covered by Quick Setup.	3.4.11
11	Communication Debugging	Allows you to confirm the data of function codes for communication (S, M, W, X, and Z codes).	3.4.12

(Note) The 0 codes for options appear only when the corresponding option(s) is mounted on the inverter.

Figure 3.11 shows the transitions between menus in Programming mode.

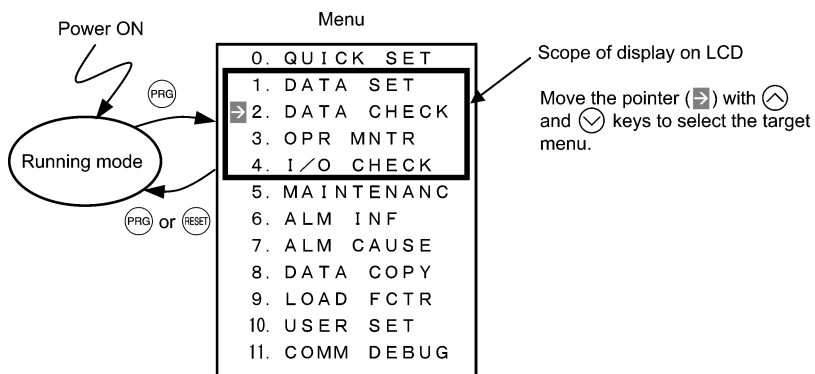


Figure 3.11 Menu Transition in Programming Mode

If no key is pressed for approx. 5 minutes, the inverter automatically goes back to Running mode and turns the backlight OFF.

### 3.4.1 Setting function codes -- Menu #1 "Data Setting" --

Menu #1 "Data Setting" in Programming mode allows you to set function codes for making the inverter functions match your needs.

The function codes available differ depending upon the inverter model.

Table 3.11 Function Code List

Function Code Group	Function	Description
F code (Fundamental functions)	Fundamental functions	Functions concerning basic motor running
E code (Extension terminal functions)	Terminal functions	Functions concerning the selection of operation of the control circuit terminals; Functions concerning the display on the LED monitor
C code (Control functions of frequency)	Control functions	Functions associated with frequency settings
P code (Motor 1 parameters)	Motor 1 parameters	Functions for setting up characteristics parameters (such as capacity) of the 1st motor
H code (High performance functions)	High-level functions	Highly added-value functions; Functions for sophisticated control
A code (Motor 2 parameters)	Motor 2 parameters	Functions for setting up characteristics parameters (such as capacity) of the 2nd motor
b code (Motor 3 parameters)	Motor 3 parameters	Functions for setting up characteristics parameters (such as capacity) of the 3rd motor
r code (Motor 4 parameters)	Motor 4 parameters	Functions for setting up characteristics parameters (such as capacity) of the 4th motor
J code (Application functions 1)	Application functions 1	Functions for applications such as PID control
J code (Application functions 2)	Application functions 2	Functions for applications such as speed control
y code (Link functions)	Link functions	Functions for controlling communications
o code (Option functions)	Optional functions	Functions for optional features (Note)

(Note) The o codes appear only when the corresponding option(s) is mounted on the inverter.

#### ■ Function codes requiring simultaneous keying

To modify the data for function code F00 (data protection), H03 (data initialization), or H97 (clear alarm data), simultaneous keying of "STOP" + "△" keys or "STOP" + "▽" keys is required.

#### ■ Changing, validating, and saving function code data when the invert is running

Some function codes can be modified while the inverter is running, whereas others cannot. Further, depending on the function code, modifications may or may not become effective immediately. For details, refer to the "Change when running" column in Section 5.1 "Function Code Tables" in Chapter 5 of the inverter's instruction manual.

**Basic configuration of screens**

Figure 3.12 shows the LCD screen transition for Menu #1 "Data Setting."

A hierarchy exists among those screens that are shifted in the order of "menu screen," "function code list screen," and "function code data modification screens."

On the modification screen of the target function code, you can modify or check its data.

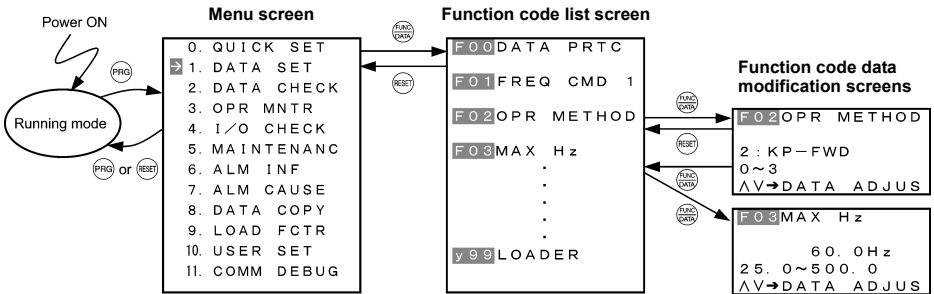
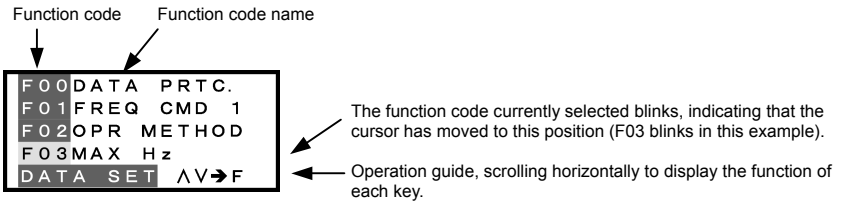


Figure 3.12 Configuration of Screens for "DATA SET"

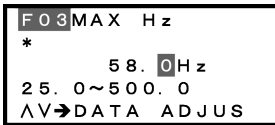
**Screen samples for changing function code data**

The "function code list screen" shows function codes, their names, and operation guides.



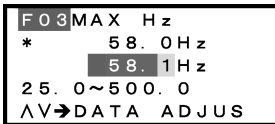
The "function code data modification screen" shows the function code, its name, its data (before and after change), allowable entry range, and operation guides.

<Before change>



Function code #, name  
 \*: Function code that has been changed from factory default  
 Data  
 Allowable entry range  
 Operation guide

<Changing data>



Data before change  
 Data being changed

Figure 3.13 Screen Samples for Changing Function Code Data

## Basic key operation

This section will give a description of the basic key operation, following the example of the function code data changing procedure shown in Figure 3.14.

This example shows you how to change function code F03 data (maximum frequency) from 58.0 Hz to 58.1 Hz.

- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the **(PROG)** key to enter Programming mode. The menu for function selection will be displayed.
- (2) Using the **(▲)** and **(▼)** keys, move the pointer **(▶)** to "1. DATA SET" and then press the **(FUNC DATA)** key, which will display a list of function codes.
- (3) Use the **(▲)** and **(▼)** keys to select the desired function code group (in this example, F03:), and press the **(FUNC DATA)** key, which will display the screen for changing the desired function code data.
- (4) Change the function code data by using the **(▲)** and **(▼)** keys. Pressing the **(SHIFT X)** key causes the blinking digit place to shift (cursor shifting) (The blinking digit can be changed).
- (5) Press the **(FUNC DATA)** key to establish the function code data.

The data will be saved in the memory inside the inverter. The display will return to the function code list, then move to the next function code (in this example, F04).

If you press the **(RESET)** key before the **(FUNC DATA)** key, the change made to data of the function code is cancelled. The data reverts to the previous value, the screen returns to the function code list, and the function code (F03) reappears.

- (6) Press the **(RESET)** key to go back to the menu from the function code list.

```

    ▶ 0. QUICK SET
      1. DATA SET
      2. DATA CHECK
      3. OPR MNTR
    ▲▼MENU SHIF▼
  
```

Select the desired menu by moving the pointer **(▶)** with **(▲)** / **(▼)** key.

```

    0. QUICK SET
    ▶ 1. DATA SET
      2. DATA CHECK
      3. OPR MNTR
    ▲▼MENU SHIF▼
  
```

Press **(FUNC DATA)** key to establish the desired menu.

```

    F00DATA PRTC.
    F01FREQ CMD 1
    F02OPR METHOD
    F03MAX Hz
    DATA SET ▲▼F
  
```

Press **(RESET)** key to go back to Menu.

```

    F00DATA PRTC.
    F01FREQ CMD 1
    F02OPR METHOD
    F03MAX Hz
    DATA SET ▲▼F
  
```

Select desired function code by moving the cursor with **(▲)** / **(▼)** key.

```

    F03MAX Hz
    *
      58. 0Hz
    25. 0~500. 0
    ▲▼DATA ADJUS
  
```

Press **(FUNC DATA)** key to establish the desired function code.

```

    F03MAX Hz
    *
      58. 0Hz
      58. 1Hz
    25. 0~500. 0
    ▲▼DATA ADJUS
  
```

Press **(▲)** / **(▼)** key to change function code data.

Press **(FUNC DATA)** key to establish the function code data.

Press **(RESET)** key to cancel change of data.


Figure 3.14 Changing Function Code Data



### 3.4.2 Setting up function codes quickly using Quick Setup -- Menu #0 "Quick Setup" --

Menu #0 "QUICK SET" in Programming mode allows you to quickly set up a fundamental set of function codes that you specify beforehand. Whereas at shipment from factory, only a set of function codes predetermined as quick setup items is registered, you can add or delete some function codes using "10. USER SET." The set of function codes covered by Quick Setup is held in the inverter (not the keypad). Therefore, if you mount your keypad onto another inverter, the set of function codes held in the new inverter is subject to Quick Setup. If necessary, you may copy the set of function codes subject to Quick Setup using the copy function (Menu #8 "Data Copying").

If you perform data initialization (function code H03), the set of function codes subject to Quick Setup will be reset to the factory default.


 For the list of function codes subject to Quick Setup by factory default, refer to the inverter's instruction manual, Chapter 5 "FUNCTION CODES."

The LCD screen transition from Menu #0 is the same as with Menu #1 "Data Setting."

#### Basic key operation

Same as the basic key operation for Menu #1 "Data Setting."

### 3.4.3 Checking changed function codes -- Menu #2 "Data Checking" --

Menu #2 "Data Checking" in Programming mode allows you to check function codes (together with their data) that have been changed. The function codes whose data have been changed from factory defaults are marked with \*. By selecting a function code and pressing the  key, you can view or change its data.

The LCD screen transition from Menu #2 is the same as with Menu #1 "Data Setting," except for the different screen listing function codes as shown below.

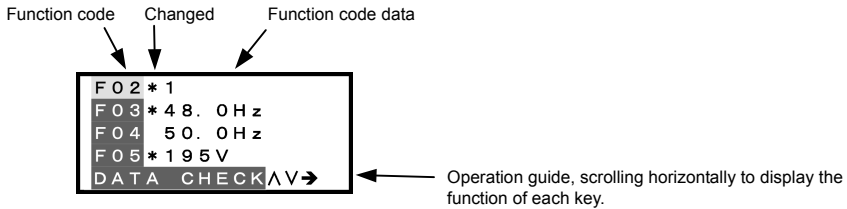


Figure 3.15 Function Code List Screen

#### Basic key operation

Same as the basic key operation for Menu #1 "Data Setting."

### 3.4.4 Monitoring the running status -- Menu #3 "Drive Monitoring" --

Menu #3 "Drive Monitoring" in Programming mode allows you to check the running status during maintenance and test running.

Available function codes differ depending on the inverter model.

Table 3.12 Drive Monitoring Display Items

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
1	Output frequency	Fot1	Output frequency (before slip compensation)	√	√	√
	Output frequency	Fot2	Output frequency (after slip compensation)	-	√	√
	Output current	Iout	Output current	√	√	√
	Output voltage	Vout	Output voltage	√	√	√
2	Calculated torque	TRQ	Calculated output torque generated by motor	√	√	√
	Frequency command	Fref	Frequency command	√	√	√
	Running direction	FWD REV (Blank)	Forward Reverse Stopped	√	√	√
	Current limit	IL	Current limiting	√	√	√
	Undervoltage Voltage limit	LU VL	Undervoltage detected Voltage limiting	√	√	√
	Torque limit	TL	Torque limiting	-	√	√
	Speed limit	SL RL	Speed limiting Rotation direction limiting	-	-	√
	Motor selected	M1-M4	Motor 1 to 4	-	-	√
3	Drive control	VF DTV VF-SC VC-SL VC-PG	V/f control without slip compensation Dynamic torque vector control V/f control with slip compensation Vector control without speed sensor Vector control with speed sensor	-	-	√
	Motor speed	SYN	$(\text{Output frequency Hz}) \times \frac{120}{P01}$	√	√	√
	Load shaft speed	LOD	Output frequency (Hz) × Function code E50	√	√	√
	Line speed	LIN	Output frequency (Hz) × Function code E50	√	√	√
4	Constant peripheral speed control monitor	LSC	Actual peripheral speed under constant peripheral speed control	-	-	√
	PID command	SV	The PID command and PID feedback amount are displayed after conversion to the virtual physical values (e.g., temperature or pressure) of the object to be controlled using the function code E40 and E41 data (PID display coefficients A and B).  Display value = (PID command or feedback amount) × (Coefficient A - B) + B	√	√	√
	PID feedback amount	PV		√	√	√
PID output value	MV	PID output value, displayed in % (assuming the maximum frequency (F03) as 100%).	√	√	√	

Table 3.12 Drive Monitoring Display Items (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
5	Torque limit value A	TLA	Driving torque limit value A (based on motor rated torque)	-	√	√
	Torque limit value B	TLB	Driving torque limit value B (based on motor rated torque)	-	√	√
	Reference torque bias	TRQB	Reserved ("----" appears.)	-	-	-
6	Current position pulse	P	Current position pulse for positioning control	-	√	√
	Stop position target pulse	E	Stop position target pulse for positioning control	-	√	√
	Position deviation pulse	dP	Position deviation pulse for positioning control	-	√	√
	Positioning control status	MODE	Positioning control status	-	√	√
7	Motor temperature	NTC	Temperature detected by the NTC thermistor built in the motor (VG motor)	-	-	√
	Ratio setting	Rati	When this setting is 100%, the LED monitor shows 1.00.	-	-	√
	Magnetic flux command value	FLUX	Flux command value in %.	-	-	√
	Deviation in SY synchronous operation	SY-d	Deviation in SY synchronous operation	-	-	√
8	4-multiplied current position pulse	P4	Current position pulse for positioning control	-	-	√
	4-multiplied stop position target pulse	E4	Stop position target pulse for positioning control	-	-	√
	4-multiplied position deviation pulse	dP4	Position deviation pulse for positioning control	-	-	√
	Positioning control status	MODE	Positioning control status	-	-	√

### Basic key operation

- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the (PRG) key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "3. OPR MNTR" by moving the pointer → with the (▲) and (▼) keys.
- (3) Press the (FNC DATA) key to display the screen (by one page) for Operation Monitor.
- (4) Select the page for the desired item by using the (▲) and (▼) keys and confirm the running status information for the desired item.
- (5) Press the (RESET) key to go back to the menu.

Figure 3.16 shows an example of the LCD screen transition starting from Menu #3 "Drive Monitoring."

```

->0. QUICK SET
 1. DATA SET
 2. DATA CHECK
 3. OPR MNTR
^V->MENU SHIF^V

```

Select desired menu by moving the pointer **->** with **^** / **v** key.

```

0. QUICK SET
 1. DATA SET
 2. DATA CHECK
->3. OPR MNTR
^V->MENU SHIF^V

```

Press **PARAM** key to establish the desired menu.

```

Fot 1= 60.99Hz
Fot 2= 61.99Hz
Iout= 8.49A
Vout= 199.0V
OPR MNTR 1/8 ^V

```

Output frequency (before slip compensation)  
Output frequency (after slip compensation)  
Output current  
Output voltage

1/8: Page # in operation guide  
^V means that this page continues to the next page.

```

^ / v

```

```

TRQ = 99%
Fref = 60.00Hz
FWD I L L U
M1 V F
OPR MNTR 2/8 ^

```

Calculated torque  
Frequency command  
Running status  
(See Table 3.12.)

```

^ / v

```

```

SYN= 1800 r/min
LOD= 60.00 r/min
LIN= 60.00m/min
LSC= 60.00m/min
OPR MNTR 3/8 ^

```

Motor speed  
Load shaft speed  
Line speed  
Constant peripheral speed control monitor

```

^ / v

```

```

SV = +0.00
PV = +0.00
MV = +0.0
OPR MNTR 4/8 ^

```

PID command  
PID feedback amount  
PID output value

```

^ / v

```

```

TLA = 999%
TLB = 999%
TRQB= ---%
OPR MNTR 5/8 ^

```

Torque limit value A  
Torque limit value B  
Reserved.

```

^ / v

```

```

P = 500000p
E = 750000p
dP = 250000p
MODE: 0 STOP
OPR MNTR 6/8 ^

```

Current position pulse  
Stop position target pulse  
Position deviation pulse  
Positioning control status

```

^ / v

```

```

NTC =      85°C
Rati =    0.00%
FLUX =    100%
SY-d =     999
OPR MNTR 7/8 ◆

```

Motor temperature  
 Ratio setting  
 Magnetic flux command value  
 Deviation in SY synchronous operation



```

P4 = 2000000 p
E4 = 3000000 p
dP4 = 1000000 p
MODE : 0 STOP
OPR MNTR 8/8 ▲

```

4-multiplied current position pulse  
 4-multiplied stop position target pulse  
 4-multiplied position deviation pulse  
 4-multiplied positioning control status  
 ▲: End of page

#### Common operation items

To access the target data, switch to the desired page using the and keys.

▼: This page continues to the next page.

◆: This page is continued from the previous page and continues to the next page.

▲: This page is continued from the previous page.

Figure 3.16 Screen Transition for "OPR MNTR"

### 3.4.5 Checking I/O signal status -- Menu #4 "I/O Checking" --

Menu #4 "I/O CHECK" in Programming mode allows you to check the digital and analog input/output signals coming in/out of the inverter. This menu is used to check the running status during maintenance or test run.

Available function codes differ depending on the inverter model.

Table 3.13 I/O Check Items

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
1	Input signals at the control circuit terminal block	FWD, REV, X1 - X9, EN  Note)	Shows the ON/OFF state of the input signals at the control circuit terminal block. (Highlighted when short-circuited; normal when open)  Note) The number of applicable terminals differs depending on the inverter model. For details, refer to the inverter's instruction manual.	√	√	√
2	Input signals via communications link	FWD, REV, X1 - X9, XF, XR, RST  Note)	Input information for function code S06 (communication) (Highlighted when 1; normal when 0)  Note) The number of applicable terminals differs depending on the inverter model. For details, refer to the inverter's instruction manual.	√	√	√
3	Output signals	Y1 - Y4, Y5, 30ABC  Note)	Output signal information  Note) The number of applicable terminals differs depending on the inverter model. For details, refer to the inverter's instruction manual.	√	√	√
4	I/O signals (hexadecimal)	Di	Input signal at the control circuit terminal block (in hexadecimal)	√	√	√
		Do	Output signal (in hexadecimal)	√	√	√
		LNK	Input signal via communications link (hexadecimal)	√	√	√
5	Analog input signals	12	Input voltage at terminal [12]	√	√	√
		C1	Input current at terminal [C1]	√	√	√
		V2	Input voltage at terminal [V2]	√	√	√
6	Analog output signals  Note) Symbols and output formats differ depending on the inverter model.	FMA FMA FMP FMP	Output voltage at terminal [FMA] Output current at terminal [FMA] Average output voltage at terminal [FMP] Pulse rate at terminal [FMP]	√*	√	√*
		FMA FMA FMI	Output voltage at terminal [FMA] Output current at terminal [FMA] Output current at terminal [FMI]	√*	-	-
		FM1 FM1 FM2 FM2	Output voltage at terminal [FM1] Output current at terminal [FM1] Output voltage at terminal [FM2] Output current at terminal [FM2]	-	-	√*
7	I/O signals of digital input and output interface cards (option)	Di-o	Input signal of option card in hexadecimal	-	√	√
		Do-o	Output signal of option card in hexadecimal	-	√	√
	Pulse train input	X7	Pulse count signal of pulse train input at terminal [X7]	-	-	√

\* Some screens differ depending on the specifications even on the same inverter models.

Table 3.13 I/O Check Items (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
8	PG pulse rate	P1	Pulse rate (p/s) of the A/B phase signal fed back from the reference PG	-	√	√
		Z1	Pulse rate (p/s) of the Z phase signal fed back from the reference PG	-	√	√
		P2	Pulse rate (p/s) of the A/B phase signal fed back from the slave PG	-	√	√
		Z2	Pulse rate (p/s) of the Z phase signal fed back from the slave PG	-	√	√
9	I/O signals of analog input/output interface cards (option)	32	Input voltage at terminal [32] (option)	-	-	√
		C2	Input current at terminal [C2] (option)	-	-	√
		A0	Output voltage at terminal [A0] (option)	-	-	√
		CS	Output current at terminal [CS] (option)	-	-	√

### **Basic key operation**









- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "4. I/O CHECK" by moving  with the  and  keys.
- (3) Press the  key to display the screen (by one page) for I/O Checking.
- (4) Select the page for the desired item by using the  and  keys and confirm the I/O check data for the desired item.
- (5) Press the  key to go back to the menu.

Figure 3.17 shows an example of the LCD screen transition starting from Menu #4 "I/O Checking."

```

->0. QUICK SET
  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  ^V->MENU SHIF v
  
```

Select the desired menu by moving the pointer **->** with **^** / **v** key.

```

  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
->4. I/O CHECK
  ^V->MENU SHIF ◆
  
```

Press **FUNC** key to establish the desired menu.

```

  TRM X2 X6 --
  FWD X3 X7 --
  REV X4 X8 --
  X1 X5 X9 EN
  I/O CHECK 1/9 v
  
```

### Input signals at the control circuit terminal block

Highlighted when short-circuited  
Normal when open

Note: The number of applicable terminals differs depending on the inverter model.

```

  ^ / v
  
```

### Input signals via communications link

(See Note 1 on page 3-30.)

Highlighted when 1  
Normal when 0

Note: The number of applicable terminals differs depending on the inverter model.

```

  LNK X2 X6 XF
  FWD X3 X7 XR
  REV X4 X8 RST
  X1 X5 X9 --
  I/O CHECK 2/9 ◆
  
```

### Output signals

Highlighted when ON  
Normal when OFF

Note: The number of applicable terminals differs depending on the inverter model.

```

  ^ / v
  
```

```

  Y1 Y5 --
  Y2 30ABC --
  Y3 --
  Y4
  I/O CHECK 3/9 ◆
  
```

### I/O signals (hexadecimal) (See Note 2 on page 3-30.)

Input signals at the control circuit terminal block

Output signal

Input signals via communications link (See Note 1 on page 3-30.)

```

  ^ / v
  
```

```

  Di = 0000H
  Do = 0000H
  LNK = 0000H
  I/O CHECK 4/9 ◆
  
```

### Analog input signals

Input voltage at terminal [I2]

Input current at terminal [C1]

Input voltage at terminal [V2]

```

  ^ / v
  
```

```

  I2 = +0.0V
  C1 = 0.0mA
  V2 = +0.0V
  I/O CHECK 5/9 ◆
  
```

### Analog output signals\*

Output voltage at terminal [FMA]

Output current at terminal [FMA]

Average output voltage at terminal [FMP]

Pulse rate at terminal [FMP]

```

  ^ / v
  
```

```

  FMA = 0.0V
  FMA = 0.0mA
  FMP = 0.0V
  FMP = 0p/s
  I/O CHECK 6/9 ◆
  
```

\* Some screens differ depending upon the specifications even on the same inverter models. (See Table 3.13.)



```

D i - o = 0 0 0 0 H
D o - o = 0 0 0 0 H
X 7 =    - - - - k p / s
I / O  CHECK 7 / 9 ◆

```

#### I/O signals (option) (in hex.)

(See Note 2 on the next page.)

Input signal  
Output signal  
Pulse rate signal

```

P 1 =    - - - - p / s
Z 1 =    - - - - p / s
P 2 =    - - - - p / s
Z 2 =    - - - - p / s
I / O  CHECK 8 / 9 ◆

```

#### PG pulse rate (option)

A/B phase signal from reference PG

Z phase signal from reference PG

A/B phase signal from slave PG

Z phase signal from slave PG

```

3 2 =    - - - - V
C 2 =    - - - - mA
A 0 =    - - - - V
C S =    - - - - mA
I / O  CHECK 9 / 9 ▲

```

#### Analog I/O signals (option)

Input voltage at terminal [32]

Input current at terminal [C2]

Output voltage at terminal [A0]

Output current at terminal [CS]

#### Common operation items

To access the target data, switch to the desired page using the  $\uparrow$  and  $\downarrow$  keys.

▼: This page continues to the next page.

◆: This page is continued from the previous page and continues to the next page.

▲: This page is continued from the previous page.

Figure 3.17 Screen Transition for "I/O CHECK"

**Note 1 Input status at terminals via communications link**

Input commands sent via RS-485 communications or other communications options can be displayed in two ways depending on setting of the function code S06: "Display with ON/OFF of the LED segment" or "In hexadecimal format." The content to be displayed is basically the same as that for the control I/O signal terminal status display; however, (XF), (XR), and (RST) are added as inputs. Note that under communications control, I/O display is in normal logic (Active-ON) (using the original signals that are not inverted).

**Note 2 I/O status (hexadecimal)**

Each I/O terminal is assigned to one of the 16 binary bits (bit 0 through bit 15). The bit to which no I/O terminal is assigned is considered to have a value of "0." The I/O status is thus collectively expressed as a four-digit, hexadecimal number (0 through F) as shown in Table 3.14.

Digital input terminals [FWD] and [[REV] are assigned to bits 0 and 1, [X1] through [X9] to bits 2 through 10, and [EN] to bit 11, respectively. Each bit assumes a value of "1" when the corresponding signal is ON and a value of "0" when it is OFF. For example, when signals [FWD] and [X1] are ON while all the other signals are OFF, the status is expressed as "0005H."

Digital output terminals [Y1] through [Y4] are assigned to bits 0 through 3. Each is given a value of "1" when it is short-circuited to [CMY], or a value of "0" when its circuit to [CMY] is open. The status of relay output terminal [Y5A/C] is assigned to bit 4, which assumes a value of "1" when the contact between [Y5A] and [Y5C] is closed. The status of relay output terminal [30A/B/C] is assigned to bit 8, which assumes a value of "1" when the contact between [30A] and [30C] is closed or "0" when the contact between [30B] and [30C] is closed. For example, when terminal [Y1] is ON, terminals [Y2] through [Y4] are OFF, the contact between [Y5A] and [Y5C] is opened, and the link between 30A and 30C is closed, the status is expressed as "0101H."

As in the control I/O signal terminal status display, the ON/OFF status of each input/output terminal signal of a digital input and output interface cards (option) is expressed in hexadecimal notation.

Digital input terminals [I1] through [I16] on a digital input interface card (option) are assigned to 16 binary bits (bit 0 through bit 15). Each bit assumes a value of "1" when the corresponding signal is ON and a value of "0" when it is OFF. Digital output terminals [O1] through [O8] on a digital output interface card (option) are assigned to eight binary bits (bit 0 through bit 7).

Table 3.14 Hexadecimal Notation

Data Displayed		Highest digit												Lowest digit			
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input signal		(RST)	(XR)	(XF)	-	[EN]	[X9]	[X8]	[X7]	[X6]	[X5]	[X4]	[X3]	[X2]	[X1]	[REV]	[FWD]
Output signal		-	-	-	-	-	-	[30A/B/C]	-	-	-	[Y5A/C]	[Y4]	[Y3]	[Y2]	[Y1]	
Option	DI	[I16]	[I15]	[I14]	[I13]	[I12]	[I11]	[I10]	[I9]	[I8]	[I7]	[I6]	[I5]	[I4]	[I3]	[I2]	[I1]
	DO	-	-	-	-	-	-	-	-	[O8]	[O7]	[O6]	[O5]	[O4]	[O3]	[O2]	[O1]
Example (input)	Binary	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Hex	0005H															

-: unassigned

\* (XF), (XR), (RST) are for communications.

Refer to "Note 1 Input status at terminals via communications link" above.

### 3.4.6 Reading maintenance information -- Menu #5 "Maintenance Information" --

Menu #5 "MAINTENANC" in Programming mode allows you to view information necessary for performing maintenance on the inverter.

Available function codes differ depending on the inverter model.

Table 3.15 Display Items for Maintenance

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
1	Cumulative run time	TIME	Shows the cumulative run time during which the inverter was powered ON. When the total time exceeds 65,535 hours, the counter will be reset to 0 and the count will start again.	√	√	√
	DC link bus voltage	EDC	Shows the DC link bus voltage of the inverter's main circuit.	√	√	√
	Max. temperature inside the inverter	TMPI	Shows a maximum temperature inside the inverter every hour.	√	-	√
	Max. temperature of heat sink	TMPF	Shows the maximum temperature of the heat sink every hour.	√	√	√
2	Max. effective current	Imax	Shows the maximum current in rms every hour.	√	√	√
	Capacitance of the DC link bus capacitor	CAP	Shows the current capacitance of the DC link bus capacitor as % of the capacitance at factory shipment. Refer to the inverter's instruction manual, Chapter 7 "MAINTENANCE AND INSPECTION" for details.	√	√	√
	Cumulative motor run time	MTIM	Shows the cumulative run time of the motor. When the count exceeds 65,535 hours (FRENIC-Eco/Multi) or 99,990 hours (FRENIC-MEGA), the counter will be reset to 0 and the count will start again.	√	√	√
	Remaining time before the next maintenance for motor 1 Note 1)	REMT1	Shows the time remaining before the next maintenance, which is estimated by subtracting the cumulative run time of motor 1 from the maintenance interval specified by H78.	-	-	√
3	Cumulative run time of electrolytic capacitor on the printed circuit board	TCAP	Shows the product of the cumulative time of voltage being applied to the electrolytic capacitor on the printed circuit board and a coefficient determined by the environmental condition. A time to be used as a guide for replacement timing of the capacitor is indicated in brackets. For details, refer to the inverter's instruction manual, Chapter 7 "MAINTENANCE INSPECTION."	√	√	√
	Cumulative run time of the cooling fan	TFAN	Shows the cumulative run time of the cooling fan. This counter does not work when the cooling fan ON/OFF control (function code H06) is enabled and the fan stops. A time to be used as a guide for replacement timing of the cooling fan is indicated in brackets. For details, refer to the inverter's instruction manual, Chapter 7 "MAINTENANCE INSPECTION."	√	√	√
4	Count of startups Note 1)	NST	Shows the total count of startups of the motor (count of times when the run command for the inverter was turned ON). When the total time exceeds 65,535 hours, the counter will be reset to 0 and the count will start again.	√	√	√
	Input watt-hour Note 2)	Wh	Shows the input watt-hours of the inverter. Upon exceeding 1,000,000 kWh, the count goes back to 0.	√	√	√

Table 3.15 Display Items for Maintenance (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
4	Input watt-hour data Note 2)	PD	Shows the input watt-hour data as input watt-hour (kWh) x function code E51. (The range of display is 0.001 to 9,999. Values exceeding 9,999 are expressed as 9,999.)	√	√	√
	Remaining startup times before the next maintenance for motor 1 Note 1)	REMN1	Shows the start-up times remaining before the next maintenance, which is estimated by subtracting the number of start-ups from the preset start-up count for maintenance specified by H79. The display method is the same as for REMT1 above.	-	-	√
5	Count of RS-485 errors (COM port 1) Note 3)	NRR1	Shows the total number of errors that have occurred in RS-485 communication (COM port 1) since first power ON.	√	√	√
	RS-485 error content (COM port 1) Note 3), Note 4)		Shows the latest error that has occurred in RS-485 communication (COM port 1) in a code.	√	√	√
	Count of RS-485 errors (COM port 2) Note 3)	NRR2	Shows the total number of errors that have occurred in RS-485 communication (COM port 2) since first power ON.	√	√	√
	RS-485 error content (COM port 2) Note 3), Note 4)		Shows the latest error that has occurred in RS-485 communication (COM port 2) in a code.	√	√	√
	Count of option errors	NRO	Shows the cumulative count of errors detected during optional communication with option installed.	√	√	-
	Option error code		Shows the latest error that has been detected during optional communication in a code.	√	√	-
6	ROM version of the inverter	MAIN	Shows the ROM version of the inverter as a 4-digit code.	√	√	√
	ROM version of the keypad	KP	Shows the ROM version of the keypad as a 4-digit code.	√	√	√
7	ROM version of option 1	OP1	Shows the ROM version of the option connected to the A-port as a 4-digit code.	√	√	√
	ROM version of option 2	OP2	Shows the ROM version of the option connected to the B-port as a 4-digit code.	-	-	√
	ROM version of option 3	OP3	Shows the ROM version of the option connected to the C-port as a 4-digit code.	-	-	√
8	Temperature inside the inverter (real-time value)	TMPIM	Shows the current temperature inside the inverter.	-	-	√
	Temperature of heat sink (real-time value)	TMPFM	Shows the current temperature of the heat sink inside the inverter.	-	-	√
	Lifetime of DC link bus capacitor (elapsed hours)	CAPEH	Shows the cumulative time during which a voltage is applied to the DC link bus capacitor. When the main power is shut down, the inverter automatically measures the discharging time of the DC link bus capacitor and corrects the elapsed time. The display method is the same as that for TCAP above.	-	-	√
	Lifetime of DC link bus capacitor (remaining hours)	CAPRH	Shows the remaining lifetime of the DC link bus capacitor, which is estimated by subtracting the elapsed time from the lifetime (10 years). The display method is the same as that for TCAP above.	-	-	√

Table 3.15 Display Items for Maintenance (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
9	Cumulative run time of motor 1	MTIM1	Shows the content of the cumulative power-ON time counter of the 1st motor. When the count exceeds 99,990, the counter will be reset to "0" and start over again.	-	-	√
	Cumulative run time of motor 2	MTIM2	Shows the content of the cumulative power-ON time counter of the 2nd motor. The display method is the same as that for MTIM1 above.	-	-	√
	Cumulative run time of motor 3	MTIM3	Shows the content of the cumulative power-ON time counter of the 3rd motor. The display method is the same as that for MTIM1 above.	-	-	√
	Cumulative run time of motor 4	MTIM4	Shows the content of the cumulative power-ON time counter of the 4th motor. The display method is the same as that for MTIM1 above.	-	-	√
10	Number of startups	NST1	Shows the content of the 1st motor startup counter (i.e., the number of run commands issued). Counter range: 0 to 65,535 times When the count exceeds 65,535, the counter will be reset to "0" and start over again.	-	-	√
	Number of startups 2	NST2	Shows the content of the 2nd motor startup counter (i.e., the number of run commands issued). The display method is the same as for NST1 above.	-	-	√
	Number of startups 3	NST3	Shows the content of the 3rd motor startup counter (i.e., the number of run commands issued). The display method is the same as for NST1 above.	-	-	√
	Number of startups 4	NST4	Shows the content of the 4th motor startup counter (i.e., the number of run commands issued). The display method is the same as for NST1 above.	-	-	√
11	Light alarm (Latest)	LALM1	Shows the factor of the latest light alarm as an alarm code. For details, refer to the inverter's instruction manual, Chapter 6, Section 6.1 "Protective Functions."	-	-	√
	Light alarm (Last)	LALM2	Shows the factor of the last light alarm as an alarm code. For details, refer to the inverter's instruction manual, Chapter 6, Section 6.1 "Protective Functions."	-	-	√
	Light alarm (2nd last)	LALM3	Shows the factor of the 2nd last light alarm as an alarm code. For details, refer to the inverter's instruction manual, Chapter 6, Section 6.1 "Protective Functions."	-	-	√
	Light alarm (3rd last)	LALM4	Shows the factor of the 3rd last light alarm as an alarm code. For details, refer to the inverter's instruction manual, Chapter 6, Section 6.1 "Protective Functions."	-	-	√

Table 3.15 Display Items for Maintenance (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
12	Count of option 1 communications errors	NROA	Shows the total number of errors that have occurred in the option connected to the A-port.	-	-	√
	Option 1 communications error code		Shows the code of the error that has occurred in the option connected to the A-port.	-	-	√
	Count of option 2 communications errors	NROB	Shows the total number of errors that have occurred in the option connected to the B-port.	-	-	√
	Option 2 communications error code		Shows the code of the error that has occurred in the option connected to the B-port.	-	-	√
	Count of option 3 communications errors	NROC	Shows the total number of errors that have occurred in the option connected to the C-port.	-	-	√
	Option 3 communications error code		Shows the code of the error that has occurred in the option connected to the C-port.	-	-	√

Note 1) Available for the 1st motor only even if the inverter has the motor switching function.

Note 2) To reset the input watt-hour and input watt-hour data to 0, set function code E51 to "0.000."

Note 3) "COM port 1" is on the inverter; "COM port 2" is on the terminal block (FRENIC-MEGA) or on the option card (FRENIC-Eco/Multi).

Note 4) For details of error contents, refer to the RS-485 Communication User's Manual.

### **Basic key operation**









- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "5. MAINTENANC" by moving the pointer  with the  and  keys.
- (3) Press the  key to display the screen (by one page) for Maintenance.
- (4) Select the page for the desired item by using the  and  keys and confirm the Maintenance data for the desired item.
- (5) Press the  key to go back to the menu.

Figure 3.18 shows an example of the LCD screen transition starting from Menu #5 "MAINTENANC."

```

->0. QUICK SET
  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  ^V->MENU SHIF^V
  
```

Select the desired menu by moving the pointer **->** with **^** / **^** key.

```

  2. DATA CHECK
  3. OPR MNTR
  4. I/O CHECK
  ->5. MAINTENANC
  ^V->MENU SHIF^V
  
```

Press **FAN DATA** key to establish the desired menu.

```

  TIME = 14 h
  EDC = 493 V
  TMP I = 38 °C
  TMP F = 88 °C
  MAINTENANCE 1 ^V
  
```

Cumulative run time  
DC link bus voltage  
Max. temperature inside the inverter  
Max. temperature of heat sink

```

  ^ / ^
  
```

```

  I max = 0.00 A
  CAP = 0.0%
  MTIM = 14 h
  REMT 1 = 10000 h
  MAINTENANCE 2 ^V
  
```

Max. effective current  
Capacitance of the DC link bus capacitor  
Cumulative motor run time  
Remaining time before the next maintenance for motor 1

```

  ^ / ^
  
```

```

  TCAP = 10 h
        (87000 h)
  TFAN = 30 h
        (87000 h)
  MAINTENANCE 3 ^V
  
```

Cumulative run time of electrolytic capacitor (reference)  
Cumulative run time of the cooling fan (reference)

```

  ^ / ^
  
```

```

  NST = 0
  Wh = 999900 kWh
  PD = 2265
  REMN 1 = 10000
  MAINTENANCE 4 ^V
  
```

Number of startups  
Input watt-hour  
Input watt-hour data  
Remaining start-up times before the next maintenance for motor 1

```

  ^ / ^
  
```

```

  NRR 1 = 13 78
  NRR 2 = 25 77
  NRO = 11 72
  MAINTENANCE 5 ^V
  
```

Error count & content for COM port 1  
Error count & content for COM port 2  
Error count & error code for option communication

```

  ^ / ^
  
```

```

  MAIN = 0000
  KP = 0000
  MAINTENANCE 6 ^V
  
```

#### ROM version

ROM version of the inverter  
ROM version of the keypad

```

  ^ / ^
  
```

```

OP 1 = 0000
OP 2 = 0000
OP 3 = 0000
MAINTENANCE7◆

```

### ROM version (option)

Option 1 (A-port)

Option 2 (B-port)

Option 3 (C-port)



```

TMPIM= 50°C
TMPFM= 80°C
CAPEH=10000h
CAPRH=10000h
MAINTENANCE8◆

```

Temperature inside the inverter

Temperature of the heat sink

Lifetime of DC link bus capacitor (elapsed hours)

Life time of DC link bus capacitor (remaining hours)



```

MTIM1=10000h
MTIM2=10000h
MTIM3=10000h
MTIM4=10000h
MAINTENANCE9◆

```

Cumulative run time of motor 1

Cumulative run time of motor 2

Cumulative run time of motor 3

Cumulative run time of motor 4



```

NST1 = 0
NST2 = 10000
NST3 = 10000
NST4 = 10000
MAINTENANCE10◆

```

Number of startups

Number of startups 2

Number of startups 3

Number of startups 4



```

LALM1=OH2
LALM2=OH3
LALM3=OL1
LALM4=OL2
MAINTENANCE11◆

```

Light alarm (Latest)

Light alarm (Last)

Light alarm (2nd last)

Light alarm (3rd last)



```

NROA= 11 XX
NROB= 11 XX
NROC= 11 XX
MAINTENANCE12▲

```

### Count of errors & error code

Option 1 (A-port)

Option 2 (B-port)

Option 3 (C-port)

### Common operation items

To access the target data, switch to the desired page using the and keys.

▼: This page continues to the next page.

◆: This page is continued from the previous page and continues to the next page.

▲: This page is continued from the previous page.

Figure 3.18 Screen Transition for "MAINTENANC"



### 3.4.7 Reading alarm information -- Menu #6 "Alarm Information" --

Menu #6 "ALM INF" in Programming mode allows you to view the information on the four most recent alarm conditions that triggered protective functions (in alarm code and the number of occurrences). It also shows the status of the inverter when the alarm condition arose.

Available alarm information differs depending on the inverter model.

#### Basic configuration of screens

Figure 3.19 shows the LCD screen transition for Menu #6 "Alarm Information."

A hierarchy exists among those screens that are shifted in the order of "menu screen," "alarm list screen," and "Detailed alarm info screens."

On the "alarm list screen," you can view the current alarm and alarm history; on the "detailed alarm info screen," the information on the inverter running status at the time the alarm occurred.

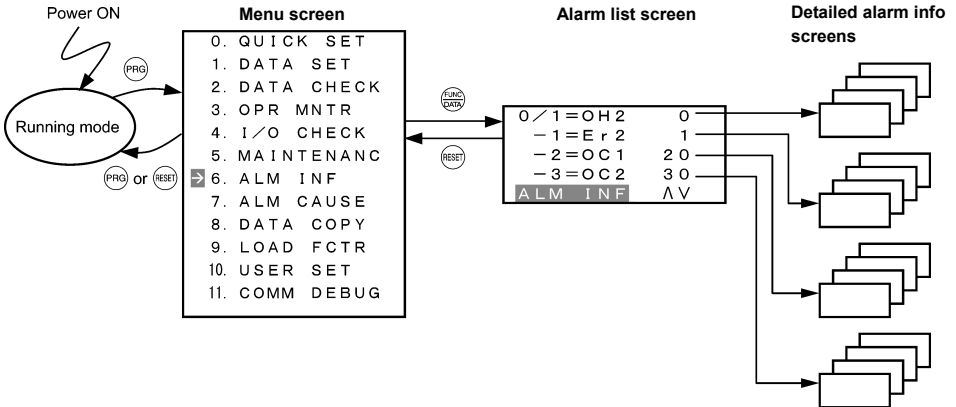
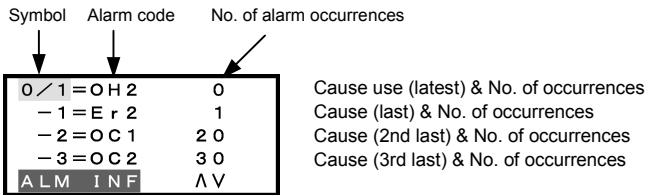


Figure 3.19 Configuration of Screens for "ALM INF"

#### Screen samples for viewing alarm info

The alarm list screen shows the current alarm and alarm history.



Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
-	Alarm history (latest)	0/1	Alarm code and the number of occurrences	√	√	√
	Alarm history (last)	-1	Alarm code and the number of occurrences	√	√	√
	Alarm history (2nd last)	-2	Alarm code and the number of occurrences	√	√	√
	Alarm history (3rd last)	-3	Alarm code and the number of occurrences	√	√	√

On the "detailed alarm info screen," you can view the information on the inverter running status at the time an alarm occurred. Table 3.16 lists the alarm information displayed on the LCD monitor for "ALM INF."

Table 3.16 Alarm Information Displayed

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
1	Output frequency	Fot1	Output frequency (before slip compensation)	√	√	√
	Output current	Iout	Output current	√	√	√
	Output voltage	Vout	Output voltage	√	√	√
	Calculated torque	TRQ	Motor output torque	√	√	√
2	Frequency command	Fref	Frequency command	√	√	√
	Running direction	FWD REV (Blank)	Forward Reverse Stopped	√	√	√
	Current limit	IL	Current limiting	√	√	√
	Undervoltage Voltage limit	LU VL	Undervoltage detected Voltage limiting	√	√	√
	Torque limit	TL	Torque limiting	-	√	√
	Cumulative run time	TIME	Shows the cumulative power-ON time of the inverter. When the total time exceeds 65,535 hours, the display will be reset to 0 and the count will start again.	√	√	√
	Speed limit	SL RL	Speed limiting Rotation direction limiting	-	-	√
	Motor selected	M1-M4	Motor 1 to 4	-	-	√
Drive control	VF DTV VF-SC VF-SL VC-PG	V/f control without slip compensation Dynamic torque vector control V/f control with slip compensation Vector control without speed sensor Vector control with speed sensor	-	-	√	
3	Number of startups	NST	Shows the cumulative count of times the motor has been started (the inverter run command has been issued). When the total count exceeds 65,535, the display will be reset to 0 and the count will start again.	√	√	√
	DC link bus voltage	EDC	Shows the DC link bus voltage of the inverter's main circuit.	√	√	√
	Temperature inside the inverter	TMPI	Shows the temperature inside the inverter.	√	-	√
	Max. temperature of heat sink	TMPP	Shows the maximum temperature of the heat sink.	√	√	√
4	Input signals at the control circuit terminal block	TRM	ON/OFF status of input signals of the terminals [FWD], [REV], [X1] to [X9], [EN] (Highlighted when short-circuited; normal when open)  Note) The number of applicable terminals differs depending on the inverter model. For detail, refer to the inverter's instruction manual.	√	√	√

Table 3.16 Alarm Information Displayed (Continued)

Page # in ope. guide	Item	Symbol	Description	Eco	Multi	MEGA
5	Input signals via communications link	LNK	ON/OFF status of input signals for function code S06 (Communication). [FWD], [REV], [X1] to [X9], (XF), (XR), (RST) (Highlighted when 1; normal when 0)  Note) The number of applicable terminals differs depending on the inverter model. For details refer to the inverter's instruction manual.	√	√	√
6	Output signals	-	Output signals to the terminals [Y1] to [Y4], [Y5A/C], [30A/B/C]  Note) The number of applicable terminals differs depending on the inverter model. For details, refer to the inverter's instruction manual.	√	√	√
7	Overlapping alarm 1	3	Simultaneously occurring alarm codes (1) ("----" is displayed if no alarms have occurred.)	√	√	√
	Overlapping alarm 1	2	Simultaneously occurring alarm codes (2) ("----" is displayed if no alarms have occurred.)	√	√	√
	Error sub-code	SUB	Secondary error code for the alarm.	√	√	√
	Detected speed	SPEED	Detected speed	-	-	√

**Note** The information of the first alarm is saved as "Alarm history (last)" (Symbol: -1), and that of the latest alarm is retained as "Alarm history (latest)" (Symbol: 0/1).

### **Basic key operation**













- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "6. ALM INF" by moving the pointer  with the  and  keys.
- (3) Press the  key to get the Alarm list screen, which displays information on the four most recent alarm conditions (alarm code and the number of occurrences for each alarm condition).
- (4) Select the alarm condition to be displayed, by using the  and  keys.
- (5) Press the  key to display the alarm code on the LED Monitor and the screen (by one page) for the status data at the time of the alarm on the LCD Monitor.
- (6) Select the page for the desired item by using the  and  keys and confirm the status data for the desired item.
- (7) Press the  key to go back to the alarm list. Press the  key again to go back to the menu.

Figure 3.20 shows an example of the LCD screen transition starting from Menu #6 "Alarm Information."

```

->0. QUICK SET
  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  ^V->MENU SHIF^V
  
```

⬆ / ⬇

```

  3. OPR MNTR
  4. I/O CHECK
  5. MAINTENANC
->6. ALM INF
  ^V->MENU SHIF^V
  
```

FUNC DATA

RESET

```

0/1=OH2    0
-1=Er2    0
-2=OC1    40
-3=OC2    20
ALM INF    ^V
  
```

⬆ / ⬇

```

0/1=OH2    0
-1=Er2    0
-2=OC1    40
-3=OC2    20
ALM INF    ^V
  
```

FUNC DATA

RESET

```

Fot1= 54.32Hz
Iout=  8.49A
Vout=  199V
TRQ=   99%
ALM INF1/7 ^V
  
```

⬆ / ⬇

```

Fref= 60.00Hz
FWD IL LU
TIME=  14h
SLM1 DTV
ALM INF2/7 ◆
  
```


⬆ / ⬇


```

NST =  124
EDC =  199V
TMP I=  44°C
TMP F=  89°C
ALM INF3/7 ◆
  
```


⬆ / ⬇

Select the desired menu by moving the pointer → with ⬆ / ⬇ key.

Press  key to establish the desired menu.

Alarm cause (latest) and no. of occurrences  
 Alarm cause (last) and no. of occurrences  
 Alarm cause (2nd last) and no. of occurrences  
 Alarm cause (3rd last) and no. of occurrences  
 Press  key to go back to Menu.

Select desired alarm for viewing the detailed information by moving the cursor with ⬆ / ⬇ key.

Press  key to establish the desired alarm info.

Output frequency  
 Output current  
 Output voltage  
 Calculated torque

Frequency command  
 Running direction/status  
 Cumulative run time  
 Running status  
 (See Table 3.16)

Number of startups  
 DC link bus voltage  
 Temperature inside the inverter  
 Max. temperature of heat sink

Figure 3.20 Screen Transition for "ALM INF"

TRM	X 2	X 6	--
<b>FWD</b>	X 3	X 7	--
REV	X 4	X 8	--
X 1	X 5	X 9	EN
ALM	INF	4 / 7	◆

### Input signals at the control circuit terminal block

Highlighted when short-circuited;  
Normal when opened

Note: The number of applicable terminals differs depending on the inverter model.



LNK	X 2	X 6	X F
<b>FWD</b>	X 3	X 7	X R
REV	X 4	X 8	R S T
X 1	X 5	X 9	EN
ALM	INF	5 / 7	◆

### Input signals via communications link

Highlighted when 1;  
Normal when 0

Note: The number of applicable terminals differs depending on the inverter model.



<b>Y 1</b>	Y 5	--	
Y 2	3 0 A B C	--	
Y 3		--	
Y 4		--	
ALM	INF	6 / 7	◆

### Output signals

Highlighted when ON;  
Normal when OFF

Note: The number of applicable terminals differs depending on the inverter model.



3	----		
2	----		
SUB	= 0		
SPEED	= - 2 0 0 0 0		
ALM	INF	7 / 7	▲

Overlapping alarm 2  
Overlapping alarm 1  
Error sub-code  
Detected speed

### Common operation items

To access the target data, switch to the desired page using the and keys.

▼: This page continues to the next page.

◆: This page is continued from the previous page and continues to the next page.

▲: This page is continued from the previous page.

Figure 3.20 Screen Transition for "ALM INF" (Continued)

### 3.4.8 Viewing cause of alarm -- Menu #7 "Alarm Cause" --

Menu #7 "ALM CAUSE" in Programming mode allows you to view the information on the four most recent alarm conditions that triggered protective functions (in alarm code and the number of occurrences). It also shows the cause of each alarm.

#### Basic configuration of screens

Figure 3.21 shows the LCD screen transition for Menu #7 "Alarm Cause."

A hierarchy exists among those screens that are shifted in the order of "menu screen," "alarm list screen," and "detailed alarm code screens."

On the "detailed alarm code screen" of the target function code, you can view the cause of alarms.

The alarm list screen is the same as that for Menu #6 "Alarm Information."

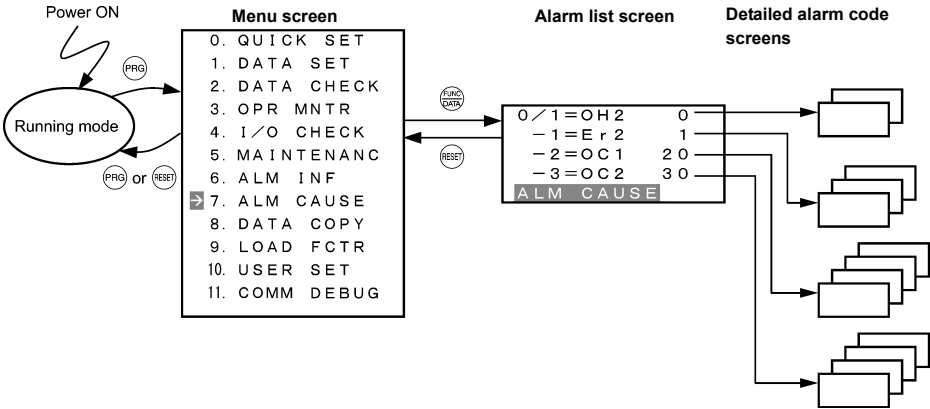


Figure 3.21 Configuration of Screens for "ALM CAUSE"

#### Basic key operation

- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the **PRG** key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "7. ALM CAUSE" by moving the pointer **→** with the **▲** and **▼** keys.
- (3) Press the **FLDG DATA** key to get the Alarm list screen, which displays information on the four most recent alarm conditions (alarm code and the number of occurrences for each alarm condition).
- (4) Select the alarm condition to be displayed, by using the **▲** and **▼** keys.
- (5) Press the **FLDG DATA** key to display the alarm code on the LED Monitor and the screen for the cause of the alarm (can be more than 1 page) on the LCD Monitor.
- (6) Press the **▲** or **▼** key to view the previous or next page.
- (7) Press the **RESET** key to go back to the alarm list. Press the **RESET** key again to go back to the menu.

Figure 3.22 shows the LCD screen transition starting from Menu #7 "Alarm Cause."

```

->0. QUICK SET
  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  ^V->MENU SHIF v
  
```

^ / v

Select the desired menu by moving the pointer → with ^ / v key.

```

  4. I/O CHECK
  5. MAINTENANC
  6. ALM INF
  ->7. ALM CAUSE
  ^V->MENU SHIF ◆
  
```

FUNC DATA

RESET

Press key to establish the desired menu.

```

0/1=OH2      0
-1=Er 2      1
-2=OC 1      40
-3=OC 2      20
ALM CAUSE
  
```

Alarm cause (latest) and no. of occurrences  
 Alarm cause (last) and no. of occurrences  
 Alarm cause (2nd last) and no. of occurrences  
 Alarm cause (3rd last) and no. of occurrences  
 Press key to go back to Menu.

^ / v

```

0/1=OH2      0
-1=Er 2      1
-2=OC 1      40
-3=OC 2      20
ALM CAUSE
  
```

FUNC DATA

RESET

Press key to establish the desired alarm cause page.

```

KP CONNECTOR
WIRING
INVERTER UNIT
KEYPAD
ALM CAUSE v
  
```

Alarm cause (1st page)

Press key to go back to alarm list screen.

^ / v

Press ^ / v key to check all alarm causes.

```

WIRING
INVERTER UNIT
KEYPAD
ELEC NOISE
ALM CAUSE ▲
  
```

Alarm cause (2nd page)

#### Common operation items

To access the target data, switch to the desired page using the ^ and v keys.

v: This page continues to the next page.

◆: This page is continued from the previous page and continues to the next page.

▲: This page is continued from the previous page.

Figure 3.22 Screen Transition for "ALM CAUSE"

### 3.4.9 Data copying -- Menu #8 "Data Copying" --

Menu #8 "Data Copying" in Programming mode provides various copy functions.

The multi-function keypad can hold three sets of function code data in its internal memory so that it can be used with three different inverters. The copy function includes "Read," "Write," and "Verify" functions, which can be used as follows.

- Reading function code data out of an inverter for which function codes are already configured and then writing such function code data altogether into another inverter.
- Copying the function code data saved in the inverter memory into the keypad memory for backup.
- Saving function code data in the multi-function keypad as master data--saving more than one set of function code data in the multi-function keypad and writing a set of data suited to the machinery into the target inverter.

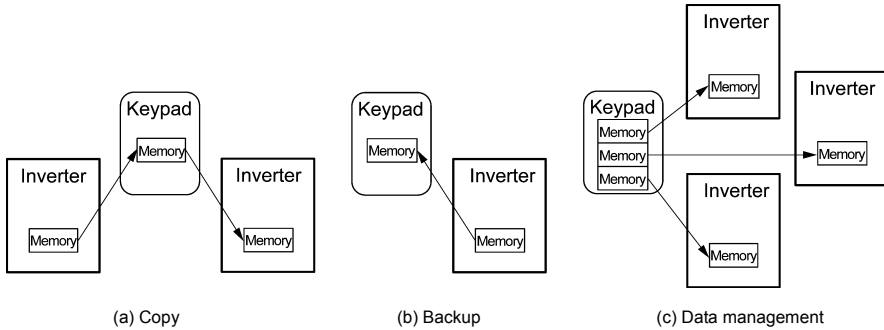


Table 3.17 lists the menu of copy function by the multi-function keypad.

Table 3.17 List of DATA COPY Operations

Operation	Description
Read: Read data	Reads out function code data from the inverter and stores it into the internal memory of the keypad.
Write: Write data	Writes the data held in the selected memory area of the keypad into the inverter.
Verify: Verify data	Verifies the data held in the keypad's internal memory against the function code data in the inverter.
Check: Check data	Checks the model information (format) and function code data held in the three memory areas of the keypad.
Protect: Protect data	Protects the function code data saved in the internal memory of the keypad, preventing the data from overwrite.

Items that can be copied by this function are:

- Function code data
- Function code items subject to quick setup, and
- Digital frequency command and PID commands.



### Basic configuration of screens

Figure 3.23 shows the LCD screen transition for Menu #8 "Data Copying."

A hierarchy exists among those screens that are shifted in the order of "menu screen," "copy function list screen," and "data selection screen."

On the "data selection screen," you can select the target memory in the multi-function keypad and the desired copy function to proceed.

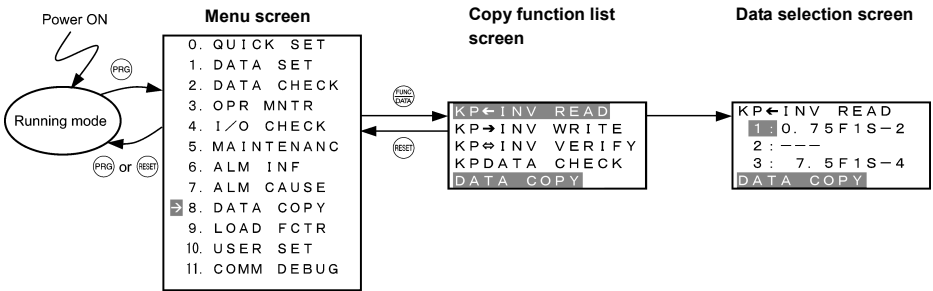
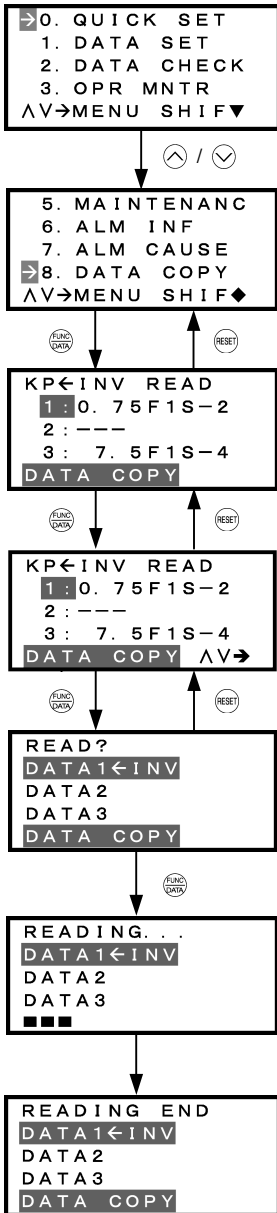


Figure 3.23 Configuration of Screens for "DATA COPY"

**(1) Read operation**



Select the desired menu by moving the pointer **→** with **↑** / **↓** key.

Press **F1/DC** key to establish the desired menu.

**List of data copy operations**

Select the desired operation by moving the cursor with **↑** / **↓** key.

Press **F1/DC** key to establish the desired operation.

**Data selection screen**

Select the desired data by moving the cursor with **↑** / **↓** key.

To go back to List of data copy operations, press **RESET** key.

Press **F1/DC** key to establish the desired data.

**Confirmation screen**

If "Read" is actually performed, the data read out from the inverter will overwrite the data held in this memory area in the keypad. If OK, press **F1/DC** key.

To go back to Data selection screen, press **RESET** key.

Press **F1/DC** key to start Read operation.

**"In progress" screen**

A bar indicating progress appears in the bottom.

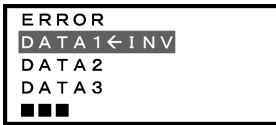
Upon completion, Completion screen automatically appears.

**Completion screen**

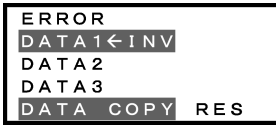
Indicates that Read operation has completed successfully.

To go back to List of data copy operations, press **RESET** key.

Figure 3.24 Screen Transition for "READ"



If you press (PRG) / (RESET) key during Read operation, the operation under way will be aborted, and this Error screen will appear. (Note) Once aborted, all the data held in the keypad's memory would be deleted.



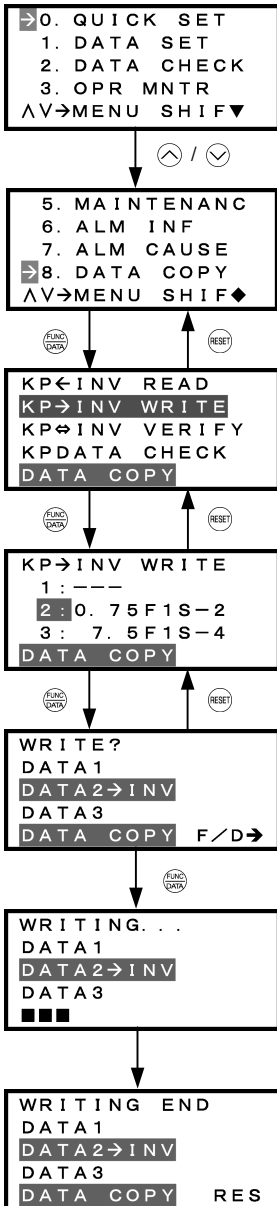
If a communication error is detected between the keypad and the inverter, this Error screen will appear.

Figure 3.25 Error Screens for "READ"



If an ERROR screen or an ERROR Ver. Screen appears during operation, press the (RESET) key to reset the error condition. When Reset is complete, the screen will go back to List of data copy operations.

## (2) Write operation



Select the desired menu by moving the pointer **→** with **↑** / **↓** key.

Press **FUNC DATA** key to establish the desired menu.

### List of data copy operations

Select the desired operation by moving the cursor with **↑** / **↓** key.

Press **FUNC DATA** key to establish the desired operation.

### Data selection screen

Select the desired data by moving the cursor with **↑** / **↓** key.

To go back to List of data copy operations, press **RESET** key.

Press **FUNC DATA** key to establish the desired data.

### Confirmation screen

If "Write" is actually performed, the selected data will overwrite the data held in the inverter. If OK, press **FUNC DATA** key.

To go back to Data selection screen, press **RESET** key.

Press **FUNC DATA** key to start Write operation.

### "In progress" screen

A bar indicating progress appears in the bottom.

Upon completion, Completion screen automatically appears.

### Completion screen

Indicates that Write operation has completed successfully.



To go back to List of data copy operations, press **RESET** key.

Figure 3.26 Screen Transition for "WRITE"

```

ERROR
DATA 1
DATA 2→INV
DATA 3
■■■

```

If you press  or  key during Write operation, the operation under way will be aborted, and this Error screen will appear. (Note) Updating of the function code data in the inverter is incomplete, with some of it remaining old. Do not run the inverter in this state. Before running the inverter, redo the writing or perform initialization.

```

ERROR
DATA 1
DATA 2→INV
DATA 3
DATA COPY RES

```

For safety considerations, the following situations are treated as an error:

- No valid data is found in the keypad's memory. (No Read operation has been performed since factory shipment; or, a Read operation has been cancelled or aborted.)
- The data held in the keypad's memory has an error.
- There is a mismatch in inverter's model number.
- A Write operation has been performed while the inverter is running.
- The inverter is data-protected.
- The Write enable for keypad command **WE-KP** is OFF.



```

ERROR Ver.
DATA 1
DATA 2→INV
DATA 3
DATA COPY RES

```

The function code data held in the keypad is incompatible with that in the inverter. (Either data may be non-standard; or a version upgrade performed in the past may have made the keypad or the inverter incompatible. Contact your Fuji Electric representative.)

Figure 3.27 Error Screens for "WRITE"

 If an ERROR screen or an ERROR Ver. Screen appears during operation, press the  key to reset the error condition. When Reset is complete, the screen will go back to List of data copy operations.

### (3) Verify operation

```

->0. QUICK SET
  1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  ^V->MENU SHIF v
  
```

Select the desired menu by moving the pointer **->** with **^** / **v** key.

```

  5. MAINTENANC
  6. ALM INF
  7. ALM CAUSE
->8. DATA COPY
  ^V->MENU SHIF ◆
  
```

Press **FUNC DATA** key to establish the desired menu.

```

  KP<-INV READ
  KP->INV WRITE
  KP<->INV VERIFY
  KPDATA CHECK
  DATA COPY
  
```

#### List of data copy operations

Select the desired operation by moving the cursor with **^** / **v** key.

```

  KP<->INV VERIFY
  1 : 0. 75F1S-2
  2 : ---
  3 : 7. 5F1S-4
  DATA COPY
  
```

Press **FUNC DATA** key to establish the desired operation.

```

  KP<->INV VERIFY
  1 : 0. 75F1S-2
  2 : ---
  3 : 7. 5F1S-4
  DATA COPY
  
```

#### Data selection screen

Select data to be verified by moving the cursor with **^** / **v** key.

To go back to List of data copy operations, press **RESET** key.

```

  KP<->INV VERIFY
  1 : 0. 75F1S-2
  2 : ---
  3 : 7. 5F1S-4
  DATA COPY
  
```

Press **FUNC DATA** key to establish the desired data.

```

  VERIFY?
  DATA1<->INV
  DATA2
  DATA3
  DATA COPY F/D->
  
```

#### Confirmation screen

If OK, press **FUNC COPY** key.

To go back to Data selection screen, press **RESET** key.

```

  VERIFY?
  DATA1<->INV
  DATA2
  DATA3
  DATA COPY F/D->
  
```

Press **FUNC DATA** key to start Verify operation.

```

  VERIFYING...
  DATA1<->INV
  DATA2
  DATA3
  ■■■
  
```

#### "In progress" screen

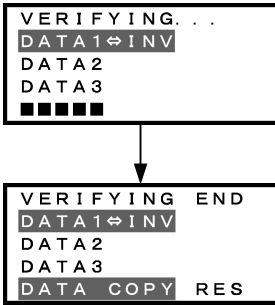
A bar indicating progress appears in the bottom.

```

  ERROR DATA1
  F01 FREQ CMD 1
  KP 1
  INV 0
  
```

When a mismatch is found, the Verify operation is halted, with the function code and its data displayed on the LCD Monitor. To resume the Verify operation from the next function code, press **FUNC DATA** key again.

To resume Verify, press **FUNC DATA** key.



### "In progress" screen

A bar indicating progress appears in the bottom.

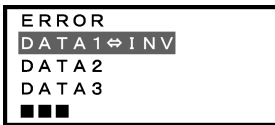
Upon completion, Completion screen automatically appears.

### Completion screen

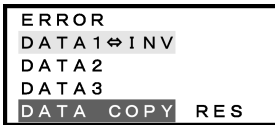
Indicates that Verify operation has completed successfully.

To go back to List of data copy operations, press key.

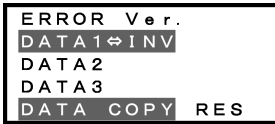
Figure 3.28 Screen Transition for "VERIFY"



If you press / key during Verify operation, the operation under way will be aborted, and this Error screen will appear. (Note)



If the keypad does not have any valid data, this Error screen will appear. (Note)



The function code data held in the keypad is incompatible with that in the inverter. (Either data may be non-standard; or a version upgrade performed in the past may have made the keypad or the inverter incompatible. Contact your Fuji Electric representative.)

Figure 3.29 Error Screen for "VERIFY"

**Note** If an ERROR screen or an ERROR Ver. Screen appears during operation, press the key to reset the error factor. When Reset is complete, the screen will go back to List of data copy operations.

**(4) Check operation**

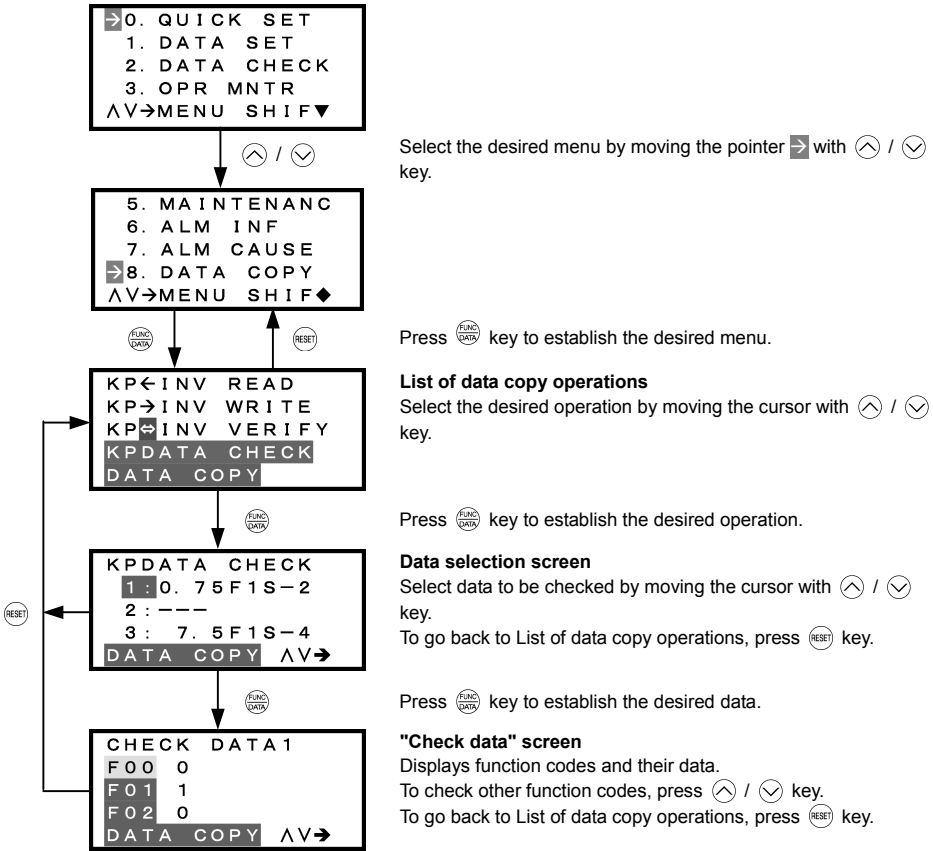
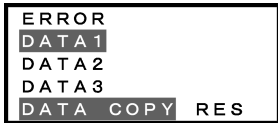


Figure 3.30 Screen Transition for "DATA CHECK"



If no valid data is found in the keypad, this Error screen will appear. (Note)

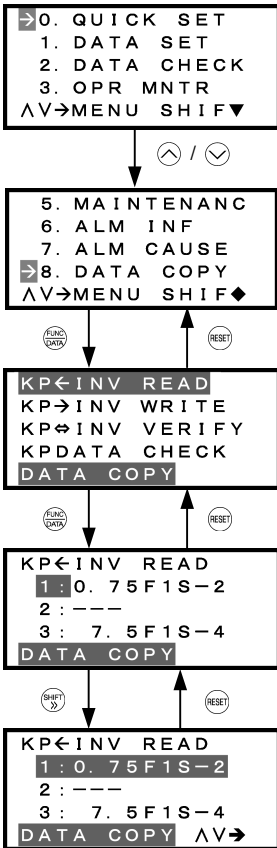
Figure 3.31 Error Screen for "DATA COPY"

**Note** If an ERROR screen appears during operation, press the **RESET** key to reset the error factor. When Reset is complete, the screen will go back to List of data copy operations.



### (5) Data protect operation

Perform the operation for function code protection on the "KP←INV READ" screen.



Select the desired menu by moving the pointer → with / key.

Press key to establish the desired menu.

#### List of data copy operations

Select the "KP←INV READ" by moving the cursor with / key.

Press key to establish the desired operation.

#### Data selection screen

Select the desired data by moving the cursor with / key.

To go back to List of data copy operations, press key.

Press key for more than five seconds.

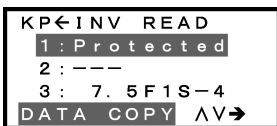
#### Completion screen

The data number and inverter type are highlighted, which indicates the selected data is protected.

To go back to List of data operations, press key.

(Note) To release the data protection, press the key for more than five seconds in the same procedure shown above. The screen returns to the normal state (not highlighted), which indicates the selected data is not protected.

Figure 3.32 Screen Transition for "DATA PROTECT"



In the process of DATA READ operation, selecting protected data and pressing the causes the screen to display the "Protected" (indicating that the data cannot be copied) and return to the normal state.

Figure 3.33 Warning Against Selecting Protected Data

### 3.4.10 Measuring load factor -- Menu #9 "Load Factor Measurement" --

Menu #9 "LOAD FCTR" in Programming mode allows you to measure the maximum output current, the average output current, and the average braking power. There are two types of measurement modes as listed below.

Table 3.18 Measurement Modes

Measurement Mode	Description
Limited duration measurement mode	Measuring load factors for a limited duration (hours).
Start-to-stop measurement mode	Measuring load factors from the start to stop of running.

**Note** If the "start to stop" mode is entered while the inverter is running, the measurement takes place until it is stopped. If the "start to stop" mode is entered while the inverter is stopped, the measurement will take place from the next start of running until it is stopped.

#### ( 1 ) Limited duration measurement mode

##### **Basic key operation**












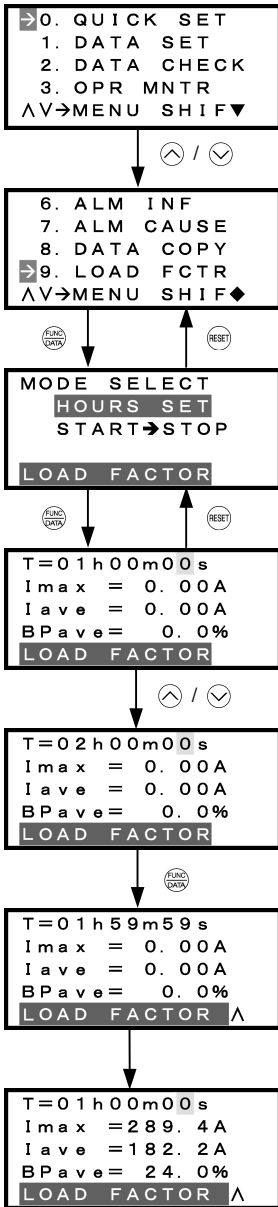
- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "9. LOAD FCTR" by moving the pointer  with the  and  keys.
- (3) Press the  key to get the measurement mode selection screen.
- (4) Select the "HOURS SET" mode by moving the pointer  with the  and  keys.
- (5) Press the  key to establish the measurement mode. Then specify the measurement duration (default: 1 hour). For details, refer to the screen transition in Figure 3.34.
- (6) Press the  key to start the measurement.
- (7) Press the  key to go back to the menu.

Figure 3.34 shows an example of the LCD screen transition starting from Menu #9 "Load Factor Measurement."



Select the desired menu by moving the pointer → with ▲ / ▼ key.

Press (F.LOAD DATA) key to establish the desired menu.

#### Mode selection screen

Select the desired measurement mode by moving the cursor with ▲ / ▼ key.

Press (F.LOAD DATA) key to establish the desired measurement mode.

#### Measurement duration specification (Default: 1 hour)

To go back to Mode selection, press (RESET) key.

Set the duration by using ▲, ▼, and (SHIFT) keys.

Press (F.LOAD DATA) key to establish the duration and start measurement.

#### Measurement in progress (remaining time displayed)

When the measurement is in progress, the remaining time is displayed and counting down.

Pressing the (F.LOAD DATA) key during measurement forcibly terminates the measurement.

When the measurement duration has elapsed, the measurement stops with the results displayed.

#### Measurement complete

Max. output current (The preset measurement duration reverts to the default.)  
 Average output current  
 Average braking power

Figure 3.34 Screen Transition for "LOAD FCTR" (Limited duration measurement mode)

## ( 2 ) Start-to-stop measurement mode

### Basic key operation











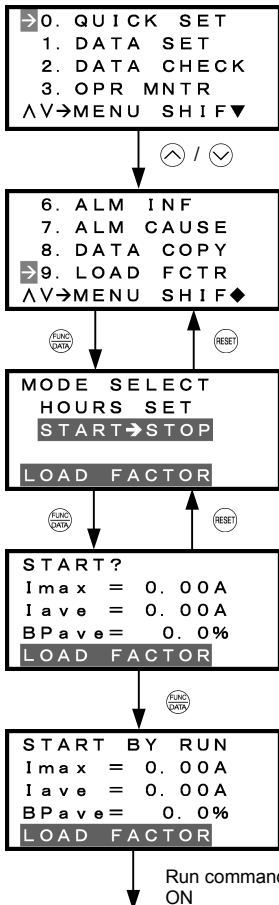



- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "9. LOAD FCTR" by moving the pointer  with the  and  keys.
- (3) Press the  key to get the measurement mode selection screen.
- (4) Select the "START→STOP" mode by moving the pointer  with the  and  keys.
- (5) Press the  key to establish the measurement mode. The start-to-stop measurement mode requires the entry of a run command. For details, refer to the screen transition in Figure 3.35.
- (7) Press the  key to go back to the menu.



Figure 3.35 shows an example of the LCD screen transition starting from Menu #9 "Load Factor Measurement."




Select the desired menu by moving the pointer  with  /  key.


Press  key to establish the desired menu.


#### Mode selection screen


Select the desired measurement mode ("START→STOP" in this example) by moving the cursor with  /  key.

Press  key to establish the desired measurement mode.

#### Confirmation screen

If OK, press  key.

To go back to Mode selection, press  key.

Press  key to signal "Ready."

#### Waiting for run command (Standby for measurement)

Upon receiving a run command, the measurement will start.

If a run command has already been received, this screen will be skipped.

Measurement will start upon receiving a run command.

```


EXECUTING . . .
I m a x = 0 . 0 0 A
I a v e = 0 . 0 0 A
B P a v e = 0 . 0 %
LOAD FACTOR
  
```



STOP / FUNC DATA

```

END
I m a x = 2 8 9 . 4 A
I a v e = 1 8 2 . 2 A
B P a v e = 2 4 . 0 %
LOAD FACTOR
  
```

### Measurement in progress

The measurement will continue until the inverter is stopped. To discontinue the measurement, press  key.

Pressing the  /  key stops the measurement.

### Measurement complete

Max. output current  
Average output current  
Average braking power

(When the measurement completes, the results are displayed.)




To go back to Mode selection, press  key.


Figure 3.35 Screen Transition for "LOAD FCTR" ("START→STOP" mode)



### Going back to Running mode

While the measurement of the load factor is in progress, you can go back to the running mode by pressing the  key (or, to the Mode selection screen by pressing the  key).

In these cases, the measurement of the load factor will continue. You can go back to "9. LOAD FCTR" and confirm, on the Mode selection screen, that the measurement is in progress.

After the measurement has ended, you can view the results of the measurement by pressing the  key on the Mode selection screen.

Screen when the measurement is in progress

```

MODE SELECT
*HOURS SET
START→STOP
EXECUTING . . .
LOAD FACTOR
  
```



The results of the measurement will be deleted when the inverter is powered OFF.

### 3.4.11 Changing function codes covered by Quick setup -- Menu #10 "User Setting" --

Menu #10 "USER SET" in Programming mode allows you to change the set of function codes that are covered by Quick setup.

#### Basic key operation











- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the  key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "10. USER SET" by moving the pointer  with the  and  keys.
- (3) Press the  key to get the list of function codes.
- (4) Select the function codes to be added or deleted, by moving the pointer  with the  and  keys.
- (5) Press the  key to perform the addition or deletion.
- (6) Press the  key to go back to the menu.

Figure 3.36 shows the LCD screen transition starting from the "10. USER SET" menu.

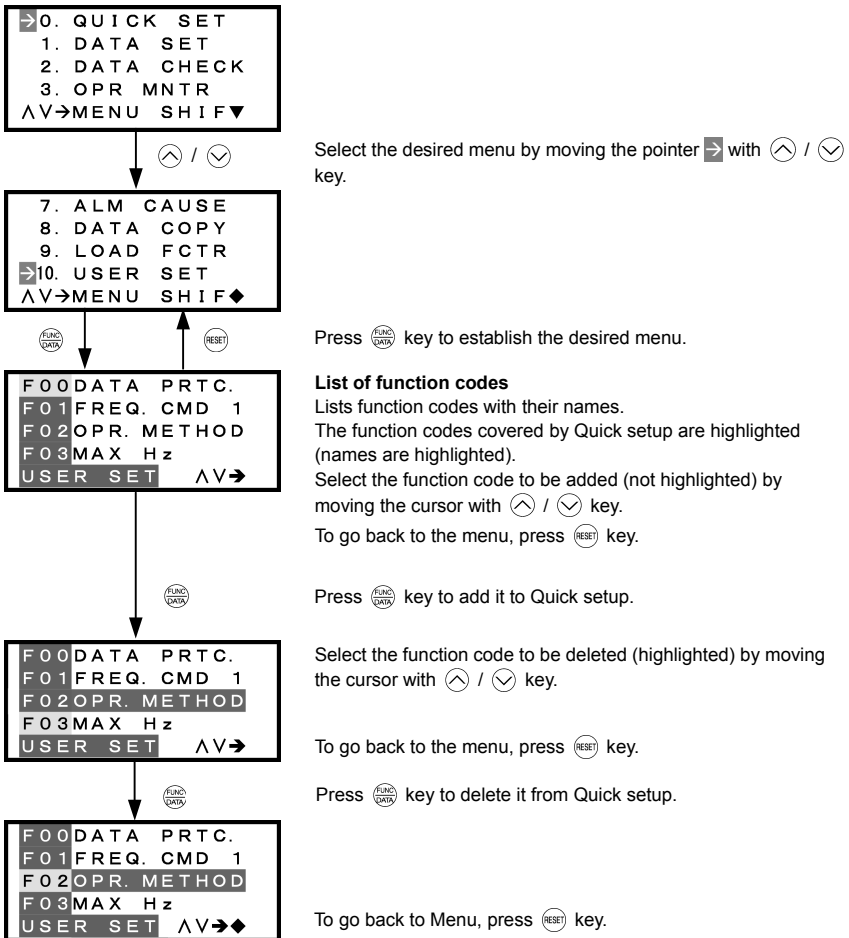


Figure 3.36 Screen Transition for Changing Function Codes Covered by Quick Setup

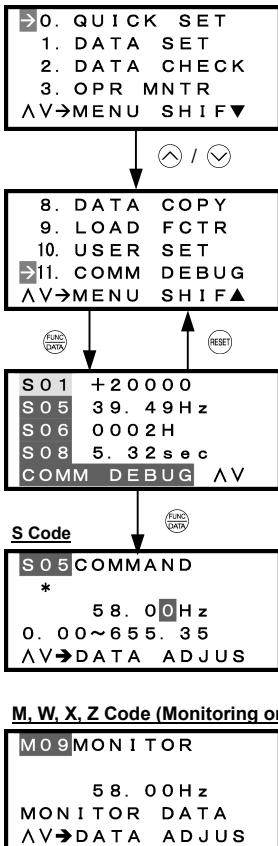
### 3.4.12 Performing communication debugging -- Menu #11 "Communication Debugging" --

Menu #11 "Communication Debugging" in Programming mode allows you to view the data of communication-related function codes (S, M, W, X, and Z codes) to help debug programs for communication with host equipment.

#### Basic key operation

- (1) When the inverter is powered ON, it automatically enters Running mode. In Running mode, press the (PRG) key to enter Programming mode. The menu for function selection will be displayed.
- (2) Select "11. COMM DEBUG" by moving the pointer → with the (▲) and (▼) keys.
- (3) Press the (FUNC/DATA) key to get the list of communication-related function codes.
- (4) Select the function code, by moving the pointer → with the (▲) and (▼) keys.
- (5) Press the (FUNC/DATA) key to check or change the function code.
- (6) Press the (RESET) key to go back to the menu.

Figure 3.37 shows the LCD screen transition starting from the "11. COMM DEBUG" menu.



Select the desired menu by moving the pointer → with (▲) / (▼) key.

Press (FUNC/DATA) key to establish the desired menu.

#### List of communication-related function codes

Lists function codes with their names.

Select the function by moving the cursor with (▲) / (▼) key.

To go back to the menu, press (RESET) key.

Press (FUNC/DATA) key to establish the desired menu.

#### Function code # and name

(\*: Data exists (≠ 0))

Data

Range

Operation guide

Data can be changed by pressing (▲) / (▼) key.

#### M, W, X, Z Code (Monitoring only)

#### Function code # and name

Data

Operation guide

Reference only (Cannot be changed)

Figure 3.37 Screen Transition for Communication Debugging

### 3.5 Alarm Mode

When a protective function is triggered, resulting in an alarm, the inverter automatically enters the alarm mode, displaying the alarm code on the LED Monitor and the details of the alarm on the LCD Monitor as shown below.

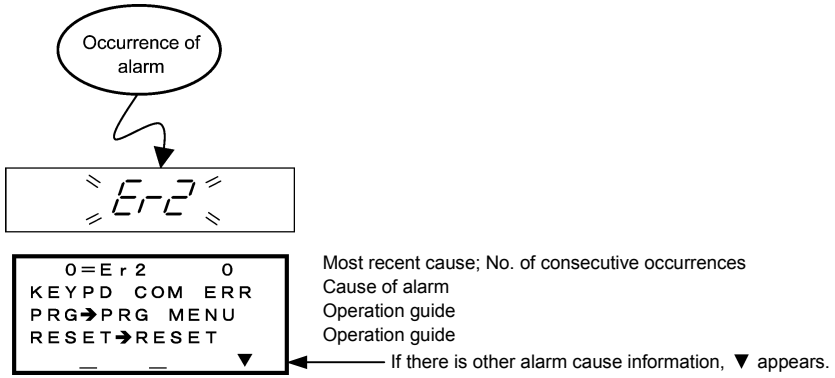
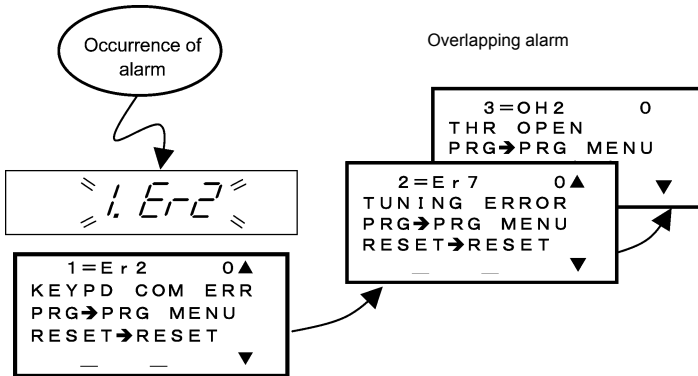


Figure 3.38 Without Non-overlapping Alarm

If more than one alarm (overlapping alarm) occurs, the display appears as shown below. You can check the overlapping alarms.





If overlapping alarms occur, the most recent cause appears as "1 = alarm code," not as "0 = alarm code."

Figure 3.39 With Overlapping Alarm



Also, you can view the alarm history.

In addition to the most recent (current) alarm, you can view three recent alarms and any overlapping alarms by using the  and  keys while the most recent one is being displayed.

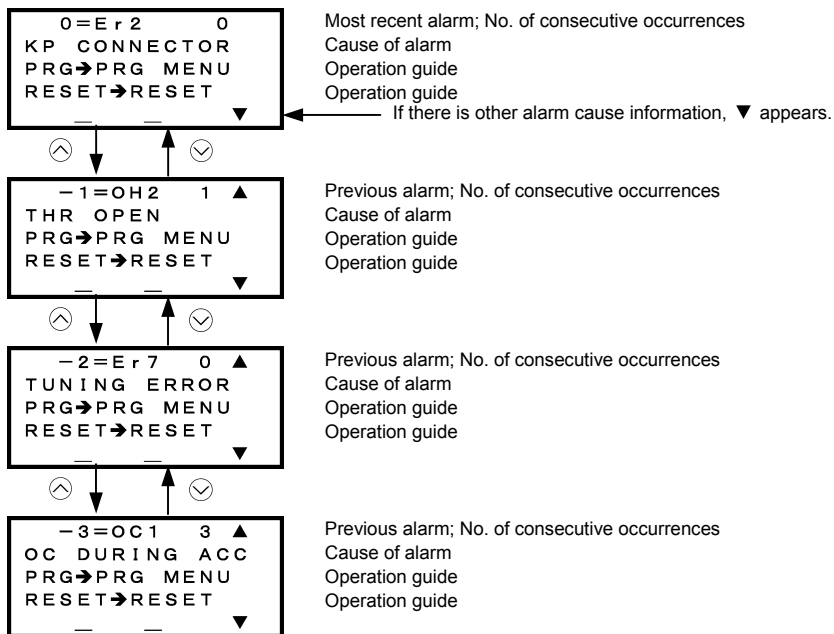


Figure 3.40 Switching of Display of Overlapping Alarm History

■ Display of running status information at the time of alarm (Note 1 in Figure 3.41)

By pressing the **FUNC DATA** key while an alarm code is displayed, you can view the output frequency, output current, and other data concerning the running status. The data you can view is the same as with "6. ALM INF." Use the **▲** and **▼** keys for scrolling pages within the menu.

Also, while a past alarm code is displayed, you can view the inverter running status at the occurrence of the displayed alarm.

Pressing the **PRG** key or **RESET** key with the running status information being displayed will switch back to the display of the alarm code.

■ Transition to Programming mode (Note 2 in Figure 3.41)

To change function code data for investigating alarm causes or removing alarm factors, press the **PRG** key while alarm information is displayed. Then the inverter enters the Programming mode, in which you can use a variety of features including function code data change.

■ Resetting alarm (Note 3 in Figure 3.41)

When you remove the cause of the alarm and press the **RESET** key, the alarm condition will be reset, and the inverter will go back to the Running mode.

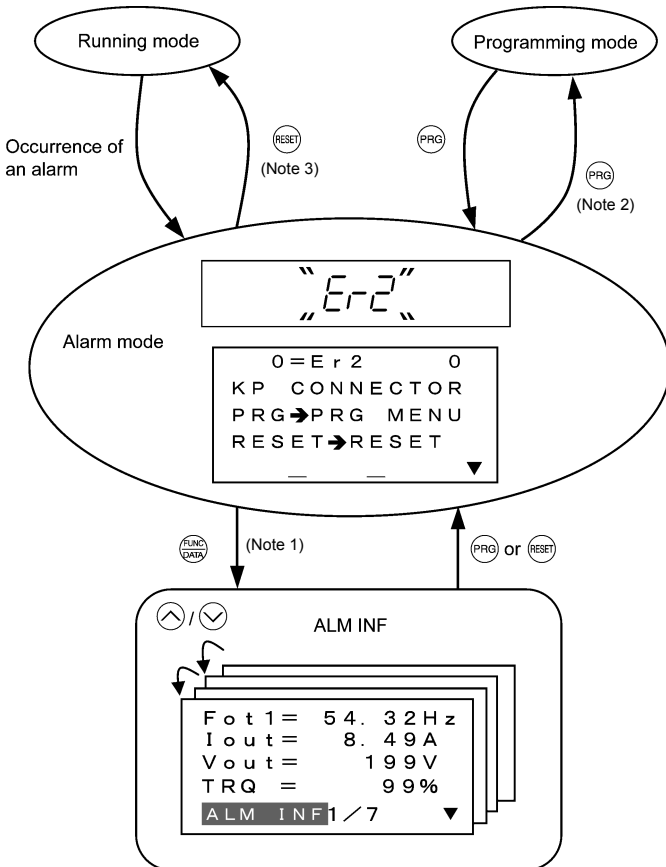



Figure 3.41 Screen Transition in/from Alarm Mode




### 3.6.6 Auto-tuning

To get the most out of the performance built into the inverter, auto-tuning the motor is required. There are the following types of auto-tuning--"tuning with the motor stopped," "tuning while the motor is running," and "tuning required depending on the drive mode." Select the proper auto-tuning type referring to the inverter's instruction manual.


#### Auto-tuning procedure

Set function code P04 at "1," "2," or "3" and then press the  key.

```
P 0 4 M 1 - T U N
O : I N A C T I V E
0 ~ 3
Λ V → D A T A   A D J U S
```

Press  key to select data "1," "2," or "3" preset to function code P04.

```
P 0 4 M 1 - T U N
O : I N A C T I V E
1 : A T - S T O P
0 ~ 3
Λ V → D A T A   A D J U S
```

Press  key to select the tuning mode.

```
P 0 4 M 1 - T U N
1 : A T - S T O P

S T A R T   B Y   R U N
C O M M A N D
```

Waiting for a run command.

Turn ON the run command.

Give the specific run command, Run forward or Run reverse. (Note 1)

```
P 0 4 M 1 - T U N
1 : A T - S T O P

E X E C U T I N G . . .
```

Tuning the motor parameters. (Note 2)

End of tuning

```
P 0 4 M 1 - T U N
1 : A T - S T O P

C L O S E   B Y   R U N
C O M M A N D   O F F
```


Turn OFF the run command.

Upon turning OFF the run command (while the run command given by the keypad or the link operation is automatically turned OFF) the lead-through ends the tuning process, and moves to the next function code.

```
P 0 6 M 1 - I 0
P 0 7 M 1 - % R 1
P 0 8 M 1 - % X
P 0 9 M 1 - S L P   D R V
Λ V → C O D E   S H I F T
```

**Note:** Function codes displayed differ depending on the inverter model.

Figure 3.42 Menu Transition for Auto-tuning

(Note 1) The factory default is "Run forward" for the  key on the keypad. To tune the motor parameters in the reverse direction, change setting of the function code F02.

- (Note 2)
- In tuning while the motor is running (P04 = 2), the inverter accelerates the motor up to around 50% of the base frequency, starts tuning of motor parameters, and decelerates to stop the motor after the end of tuning.
  - In tuning while the motor is running (P04 = 3), the inverter accelerates the motor up to around 50% of the base frequency, starts tuning of motor parameters, and decelerates to stop the motor. Then it performs the same operation again for the second round of tuning. Be careful, at that time, that the inverter automatically accelerates.
- Time required for auto-tuning differs depending on the tuning method specified by P04 and the motor capacity. For details, refer to the inverter's instruction manual, Section 4.1 "Running the Motor for a Test."

### 3.7 Measuring the capacitance of DC link bus capacitor

Each part of the inverter has its own service life that will vary according to the environmental and operating conditions.

As a function to judge the service life of parts, the inverter can measure the capacitance of the DC link bus capacitor, and issue an alarm when the measured value is 85% or lower of the initial capacitance at shipment. The inverter obtains the capacitance of DC link bus capacitor by measuring the discharging time of the capacitor and calculating the capacitance value based on the measured value.

The discharging time of the DC link bus capacitor depends largely on the inverter's internal load conditions, e.g. options attached or ON/OFF of digital I/O signals. If actual load conditions are so different from the ones at which the initial/reference capacitance is measured that the measurement result falls out of the accuracy level required, then the inverter does not perform measuring. For details, refer to the inverter's instruction manual, Chapter 7 "MAINTENANCE AND INSPECTION."

The initial capacitance at shipment (reference capacitance) is usually measured with a remote keypad mounted. If the inverter is used with a multi-function keypad mounted and measures the capacitance for life prediction, set up the reference capacitance using the following procedure.

----- Reference capacitance setup procedure -----


- 1) Set function code H98 (Protection/maintenance function) to enable the user to specify the judgment criteria for the service life of the DC link bus capacitor (Bit 3 = 1) (refer to function code H98).
- 2) Turn OFF all run commands.
- 3) Make the inverter ready to be turned OFF under ordinary operating conditions.
- 4) Set both function codes H42 (Capacitance of DC link bus capacitor) and H47 (Initial capacitance of DC link bus capacitor) to "0000."
- 5) Turn OFF the inverter, and the following operations are automatically performed.

The inverter measures the discharging time of the DC link bus capacitor and saves the result in function code H47 (Initial capacitance of DC link bus capacitor).

The conditions under which the measurement has been conducted will be automatically collected and saved. During the measurement, ". . . ." will appear on the LED monitor.

- 6) Turn ON the inverter again.

Confirm that H42 (Capacitance of DC link bus capacitor) and H47 (Initial capacitance of DC link bus capacitor) hold right values. Shift to Menu #5 "Maintenance Information" and confirm that the relative capacitance (ratio to full capacitance) is 100%.

 **Note** If the measurement has failed, "0001" is entered into both H42 and H47. Remove the factor of the failure and conduct the measurement again.

Hereafter, each time the inverter is turned OFF, it automatically measures the discharging time of the DC link bus capacitor if the above conditions are met. Periodically check the relative capacitance of the DC link bus capacitor (%) with Menu #5 "Maintenance Information" in Programming mode.

**Note** The condition given above produces a rather large measurement error. If this mode gives you a lifetime alarm, set H98 (Maintenance operation) back to the default setting (Bit 3 (Select life judgment threshold of DC link bus capacitor) = 0) and conduct the measurement under the condition at the time of factory shipment.

**Note** If the multi-function keypad is mounted, the inverter does not measure the discharging time automatically since the inverter's conditions are different from the ones applied at shipment.

# Chapter 4 SPECIFICATIONS

## 4.1 General Specifications

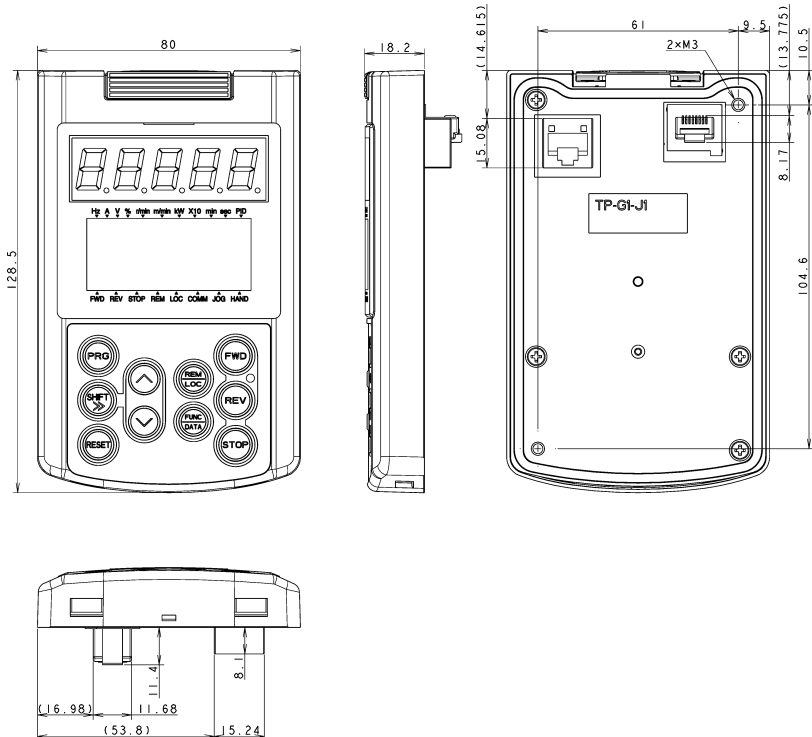
Table 4.1 summarizes the general specifications of the multi-function keypad "TP-G1-J1."

Table 4.1 General Specifications

Item	Specifications	Remarks
Enclosure	Front side: IP40; Rear side: IP20	
Environment	Indoor only. Shall be free from corrosive gases, flammable gases, dust, and direct sunlight.	
Ambient temperature (during operation)	-10 to +50°C	
Ambient humidity (during operation)	5 to 95% RH (no condensation)	
Altitude	1000 m or below	
Vibration	3 mm (max.) : 2 Hz to less than 9 Hz 9.8 m/s <sup>2</sup> : 9 Hz to less than 20 Hz 2 m/s <sup>2</sup> : 20 Hz to less than 55 Hz 1 m/s <sup>2</sup> : 55 Hz to less than 200 Hz	
Ambient temperature (during storage)	-25 to +65°C	
Ambient humidity (during storage)	5 to 95% RH (no condensation)	
External dimensions	See the figure below.	
Mass	129 g	

### ■ External dimensions

(Unit: mm)



ENGLISH

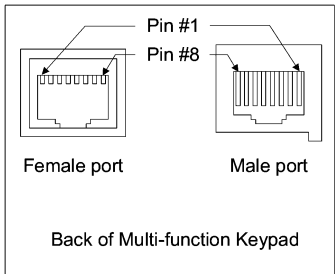
## 4.2 Communication Specifications

Tables 4.2 and 4.3 summarize the communication specifications.

Table 4.2 Hardware Specifications

Item	Specifications	Remarks
No. of inverters connected	One inverter for one multi-function keypad	
Connection cable	Shall meet the US ANSI/TIA/EIA-568A Category 5 standard (10BASE-T/100BASE-TX, straight).	The remote operation extension cable is available as an option (CB-5S, CB-3S, or CB-1S, depending on the distance).
Maximum communication distance	20 m	
Connector	RJ-45 connector	See Table 4.3.

Table 4.3 RJ-45 Connector Pin Assignment

Pin #	Signal name	Description	Remarks
1, 8	Vcc	DC power source for the multi-function keypad (5 V)	 <p>Female port                      Male port</p> <p>Back of Multi-function Keypad</p>
2, 7	GND	Reference potential	
3, 6	NC	Unassigned (reserved)	
4	DX -	RS-485 communication data ( - )	
5	DX +	RS-485 communication data ( + )	

**Note** SW3 for the terminating resistor on the control circuit board in the inverter must be set to OFF (open).

## 4.3 Transmission Specifications

Table 4.4 summarizes the transmission specifications.

Table 4.4 Transmission Specifications

Item	Specifications	Remarks
Area code	No need to specify.	There is no need to specify function codes y01 through y10 for RS-485 communication, which will be ignored anyway.
Communications protocol	Modbus-RTU	
Synchronization system	Start-stop	
Communication system	Half-duplex	
Communication speed (Baud rate)	19200 bps	
Parity	Even parity	
Stop bit length	1 bit	
Error checking	CRC-16	



**多機能タッチパネル / Multi-function Keypad  
"TP-G1-J1"**

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**取扱説明書 / Instruction Manual**

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Fuji Electric FA Components & Systems Co., Ltd.

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The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of Multi-function keypad "TP-G1-J1" for the FRENIC-Eco/Multi/MEGA series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

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