Chapter 3
OPERATION USING THE KEYPAD

This chapter describes inverter keypad operation.

Contents

3.1 Name and Function of Each Keypad Part

The keypad allows you to run and stop the inverter, display various data, configure function code data, monitor I/O signal states, and display maintenance information and alarm information.

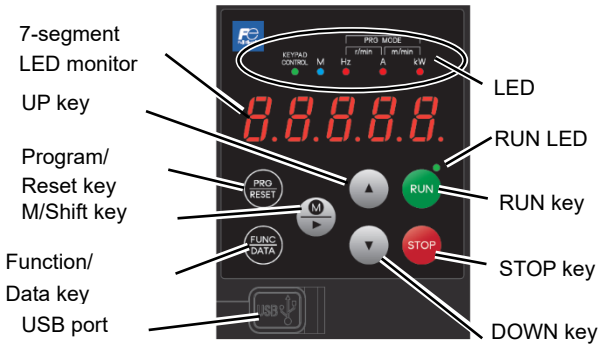


Fig. 3.1-1 Keypad external appearance and name of each part

Table 3.1-1 Names of each keypad part and overview of functions

Item	Display and keys	Function overview
LED monitor		Five-digit, 7-segment LED monitor which displays the following content based on the operation mode. ■ In Running mode: Running status information (e.g., output frequency, current, and voltage) Changes to the status display (see Chapter 3.3.2) when not in the normal running status. Changes to the light alarm display (see Chapter 3.3.3) when a light alarm occurs. ■ In Programming mode: Menus, function codes and their data ■ In Alarm mode: Alarm code, which identifies the alarm factor that has activated the protective function.
Operation keys		Program/Reset key which switches the operation modes of the inverter. ■ In Running mode: Pressing this key switches the inverter to Programming mode. ■ In Programming mode: Pressing this key switches the inverter to Running mode. ■ In Alarm mode: Pressing this key after removing the alarm factor resets the alarm and switches back to Running mode.
		Function/Data key which switches the operations you want to do in each mode as follows: ■ 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.) ■ In Programming mode: Pressing this key displays the function code or establishes data. ■ In Alarm mode: Pressing this key displays the details of the problem indicated by the alarm code that has come up on the LED monitor.
		Press to run the motor (when performing keypad operation).
		Press to stop the motor (when performing keypad operation).
		Press these keys to select the setting items and change the function code data displayed on the LED monitor.
		■ In Running mode: Functions assigned with function code E70 can be used. Hold down (for 1 second) to turn the function ON and OFF. The function is always OFF when the power is turned ON. Refer to “3.3.8 Switching between local and remote modes” for details. ■ In Programming mode While menu displayed: Jumps to the next menu number. While function code displayed: Jumps to the displayed number +10. While setting numerical values: Moves the cursor digit to the right. ■ In Alarm mode: The alarm detailed information number shifts +10.

Item	Display and keys	Function overview
LED indicators	RUN (green)	Lights when running with a run command entered by the RUN key, by terminal command "FWD" or "REV", or through the communications link.
	KEYPAD CONTROL (green)	Lights up when the keypad RUN key is valid as a run command. In Programming and Alarm modes, however, pressing this key cannot run the inverter even if this indicator lights. The LED blinks every second while in local mode.
	M (blue)	Indicates the signal selected with function code E71. Refer to Chapter 5 "5.3.2 E codes (terminal functions)" for details.
	Unit LEDs (3 red LEDs)	Unit: Hz, A, kW, r/min and m/min These three LED indicators identify the unit of numeral displayed on the LED monitor in Running mode by combination of lit and unlit states of them. Refer to "3.3.1 Operating State Monitor" for details.
		While the inverter is in Programming mode, ■Hz the LEDs of Hz and kW light. □A After changing to Programming mode, the 2 LEDs on the left and right light up. (● Hz ○ A ● kW)
USB port		The inverter and PC can be connected with a USB cable. The connector shape at the inverter side is a miniB type.

■ LED monitor

In Running mode, the LED monitor displays running status information (output frequency, current or voltage); in Programming mode, it displays menus, function codes and their data; and in Alarm mode, it displays an alarm code which identifies the alarm factor that has activated the protective function.

If one of LED5 through LED1 is blinking, it means that the cursor is at this digit, allowing you to change it.

LED5 LED4 LED3 LED2 LED1

Fig. 3.1-2 7-segment LED monitor (LED2 is blinking)

Table 3.1-2 7-segment LED monitor display

Character	7-segment	Character	7-segment	Character	7-segment	Character	7-segment
0	0	9	9	I *	l or I	R	r
1	1	A	A	J	J	S	S
2	2	B	b	K	P	T *	t or t
3	3	C *	C or c	L	L	U *	U or u
4	4	D	d	M	n	V *	U or u
5	5	E	E	N	n	W	W
6	6	F	F	O *	0 or o	X	H
7	7	G *	G or g	P	P	Y	y
8	8	H *	H or h	Q	q	Z	Z
Special characters and symbols (numbers with decimal point, minus and underscore)							
0. to 9.	0. to 9.	-	-	_	_	-	-
		[	C	]	J	%	o/o
		:	c	;	L	^	^

*: Upper case and lower case characters are used based on the displayed content.

3.2 Overview of Operation Modes

FRENIC-MEGA is equipped with the following three operation modes.

Table 3.2-1 Operation modes

Operation mode	Description
Running Mode	When powered ON, the inverter automatically enters this mode. This mode allows you to specify the reference frequency, PID command value and etc., and run/stop the motor with the RUN/STOP keys. The running status can also be monitored in real time. Changes to the status display (see 3.3.2) when not in the normal running status. Changes to the light alarm display (see 3.3.3) when a light alarm occurs.
Programming Mode	This mode allows you to configure 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 Alarm mode in which you can view the corresponding alarm code* and its related information on the LED monitor. * Alarm code: Indicates the cause of the alarm condition. For details, first see “Table 6.1-1 Abnormal States Detectable (“Heavy Alarm” and “Light Alarm” Objects)” in Chapter 6 “6.1 Protective Function” , and then read the troubleshooting information for each alarm.

Fig. 3.2-1 below shows the status transition of the inverter between these three operation modes.

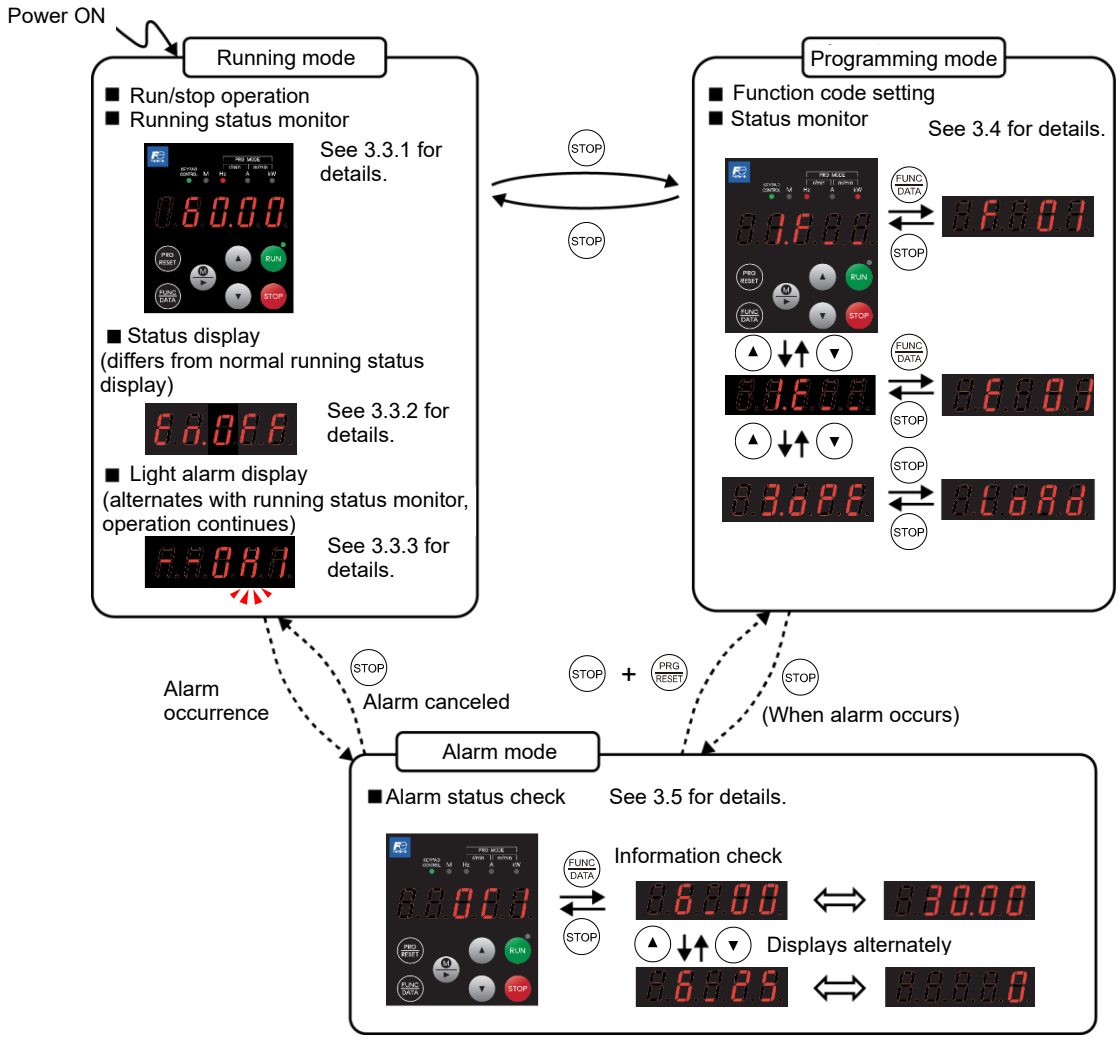


Fig. 3.2-1 Status transition between operation modes

Tip

Simultaneous keying

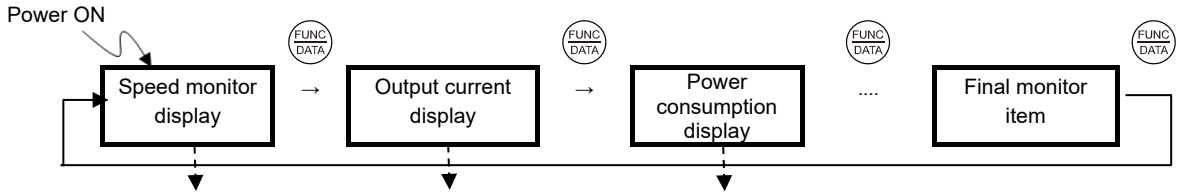
Simultaneous keying means pressing two keys at the same time. The simultaneous keying operation is expressed by a “+” letter between the keys throughout this manual.

For example, the expression "STOP + PRG/RESET keys” stands for pressing the PRG/RESET key with the STOP key held down.

3.3 Running Mode

3.3.1 Operating State Monitor

In running mode, the items in Table 3.3-1 below can be monitored. The monitor items set with function code E43 are displayed immediately after turning the power on. Press the FUNC/DATA key to switch between monitor items.



Tip By holding down the FUNC/DATA key, the display returns to the speed monitor display.

Table 3.3-1 Monitor items

Monitor item	Monitor example	LED indication	Unit	Meaning of displayed value	Data for E43
Speed monitor	Function code E48 specifies what to be displayed on the LED monitor and LED indicators.				0
Output frequency 1 (before slip compensation)	50.00	●Hz ○A ○kW	Hz	Frequency actually being output	(E48 = 0)
Output frequency 2 (after slip compensation)	50.00	●Hz ○A ○kW	Hz	Frequency actually being output	(E48 = 1)
Frequency specified by frequency command when alarm occurred	50.00	●Hz ○A ○kW	Hz	Indicated value = Reference frequency (Hz)	(E48 = 2)
Motor speed	1500	●Hz ●A ○kW	min^{-1}	Indicated value = Output frequency (Hz) × $\frac{120}{P01}$	(E48 = 3)
Load shaft speed	300.0	●Hz ●A ○kW	min^{-1}	Indicated value = Output frequency (Hz) x E50	(E48 = 4)
Line speed	300.0	○Hz ●A ●kW	m/min	Indicated value = Output frequency (Hz) x E50	(E48 = 5)
Constant feeding rate time	50	○Hz ○A ○kW	min	Indicated value = $\frac{E50}{\text{Output frequency (Hz)} \times E39}$	(E48 = 6)
Speed (%)	50.0	○Hz ○A ○kW	%	Indicated value = $\frac{\text{Output frequency (Hz)}}{\text{Max. frequency}} \times 100$	(E48 = 7)
Line speed (after acceleration/ deceleration)	1800.	○Hz ○A ○kW	m/min	Line speed setting value after calculating acceleration/deceleration with d166 to d168 for line speed set with E48 = 5	(E48=8)
Line speed (after winding diameter compensation)	1800.	○Hz ○A ○kW	m/min	Roll frequency setting value compensated with winding diameter calculation result for line speed set with E48 = 5	(E48=9)
Output current when alarm occurred.	12.34	○Hz ●A ○kW	A	Current output from the inverter in RMS	3
Power consumption	10.25	○Hz ○A ●kW	kW	Input power to the inverter	9
Calculated torque *1	50	○Hz ○A ○kW	%	Motor output torque in % (Calculated value)	8
Output voltage *2	200U	○Hz ○A ○kW	V	Output voltage (RMS) of the inverter	4

Table 3.3-1 Monitor items (cont.)

Monitor item	Monitor example	LED indication	Unit	Meaning of displayed value	Data for E43
Motor output *3	9.85	○Hz ○A ●kW	%	Motor output (kW)	16
Load factor *4	50L	○Hz ○A ○kW	%	Load factor of the motor in % as the rated output being at 100%	15
PID output *5, *6	10.00.	○Hz ○A ○kW	-	PID command/feedback amount converted to a physical quantity of the object to be controlled (e.g. temperature) Refer to function codes J106 and J107 for details.	10
PID feedback value*5, *7	9.00.	○Hz ○A ○kW	-		12
PID deviation*5, *7	1.00.	○Hz ○A ○kW		PID command value and PID feedback value deviation converted into physical quantities of the object to be controlled	29
PID output *5, *6	100.0.	○Hz ○A ○kW	%	PID output in % as the maximum frequency (F03) being at 100%	14
Timer *10	50	○Hz ○A ○kW	s	Remaining time for timer operation	13
Analog input monitor *8	82.00	○Hz ○A ○kW	-	An analog input to the inverter in a format suitable for a desired scale. Refer to the following function codes. Terminal [12]: C59, C60 Terminal [C1] (C1 function): C65, C66 Terminal [C1] (V2 function): C71, C72	17
Command position*11	765 4321.	○Hz ○A ○kW	-	Alternate display of 4 higher order digits (with sign) and 4 lower order digits	21
Positioning deviation*11	765 4321.	○Hz ○A ○kW	-	Alternate display of 4 higher order digits (with sign) and 4 lower order digits	22
Position control start position*11	765 4321.	○Hz ○A ○kW	-	Alternate display of 4 higher order digits (with sign) and 4 lower order digits (with sign) for position when run command ON or when POS-SET enabled with user value	27
Stop target position*11	765 4321.	○Hz ○A ○kW	-	Alternate display of 4 higher order digits (with sign) and 4 lower order digits (with sign) for stop target position with user value	28
Torque current *9	48	○Hz ○A ○kW	%	Torque current command value or calculated torque current	23
Magnetic flux command *9	50	○Hz ○A ○kW	%	Magnetic flux command value	24
Input watt-hour	100.0	○Hz ○A ○kW	kWh	Indicated value = $\frac{\text{Input watt-hour (kWh)}}{100}$	25
Winding diameter*12	54321	○Hz ○A ○kW	mm	Winding diameter calculation result display for constant surface speed control	26
Torque bias	25	○Hz ○A ○kW	%	Torque bias value display	30
Estimated inertia acceleration/ deceleration time conversion value	1.234	○Hz ○A ○kW	s	Display of estimated inertia result in logic acceleration/deceleration time See function code P24.	31
Customizable logic output*13	82.00	○Hz ○A ○kW	-	Display of output content for specific customizable logic step See function codes U98, U99.	32

● ON, ○ OFF

*1 Calculated torque 100% is equal to the motor rated torque. For the calculation formula of the motor rated torque, refer to E.2 “Calculated formula” (1) in Appendix E “Conversion from SI Units.”

*2 If displaying the output voltage, U is displayed as the last digit on the LED monitor to denote the unit for V (volts).

*3 When the LED monitor displays the motor output, the unit LED indicator “kW” blinks.

*4 When the LED monitor displays the load factor, the 7-segment letter L in the lowest digit stands for “%”.

*5 These PID related items appear only under the PID control specified by function code J01 (= 1, 2 or 3).

*6 When the LED monitor displays a PID command or its output amount, the dot (decimal point) attached to the lowest digit of the 7-segment letter blinks.

*7 When the LED monitor displays a PID feedback amount, the dot (decimal point) attached to the lowest digit of the 7-segment letter lights.

*8 The analog input monitor appears only when the analog input monitor function is assigned to one of the analog input terminals by one of function codes E61 to E63 (= 20). Specify the unit with C58, C64 and C70.

*9 Displays 0 (zero) under V/f control.

*10 Displays (function code C21 = 3) only if performing timer operation.

*11 Displays when the position control function is enabled.

*12 Displays only if constant surface speed control is enabled with d41 = 1.

*13 Displays only if U00 = 1 and U98 ≠ 0.

Tip The monitoring signals for the monitor items such as keypad output frequency and output current can be filtered with function code E42 (LED display filter). If the display varies unstably so as to be hard to read due to load fluctuation or other causes, increase this filter time constant.
(🕮 Function code E42)

3.3.2 Status display

Changes to the status display when not in the normal running status while in Running mode.

For example, this applies if the BX (coast to stop) command is entered and the motor is stopped with a run command entered, or if the inverter output differs from the command while restarting after a momentary power failure or during output limiting.

Depending on the applicable status, only the status code may appear on the LED monitor, or the running state monitor (frequency display, etc.) and status code may display alternately.

Table 3.3-2 Status display items

Status code	Content	Display method
En.OFF	A run command has been entered while either or both of the [EN1] and [EN2] terminals remain OFF.	Status code only
idLE	A run command has been entered while the BX command remains ON.	Status code only
P.FAiL	The restart after momentary power failure function is running.	Displays alternately
rEtrY	The retry unction is running.	Displays alternately
FirE	The forced run function is running.	Displays alternately
LinE	Operation has changed to grid operation with the grid operation switching function.	Status code only
HEAt	The condensation prevention function is running.	Status code only
iOL	The current limiting function, torque limiting function, and anti-regenerative function are running, and the inverter output frequency is limited.	Displays alternately
oLP	The overload prevention function is running.	Displays alternately
SLEEP	The inverter has been stopped automatically by the PID control slow flowrate stopping function.	Displays alternately
rot	The rotation direction limiting function is running.	Status code only
F.StoP	The forced stop function is running, and the motor has decelerated to a stop.	Displays alternately
Abort	The PID tuning operation was interrupted for some reason.	Displays alternately
Pid-t	Tuning operation is being performed with the PID tuning function.	Displays alternately
bAtrY	The motor is running in the battery operation status.	Displays alternately
E-Ld	An overload was detected with the overload detection function.	Displays alternately

Tip The status display can be disabled if unnecessary. (🕮 Function code K08)

3.3.3 Monitoring light alarms

The FRENIC-Ace identifies abnormal states in two categories--Heavy alarm and Light alarm. If a light alarm occurs, the running status monitor (frequency display, etc.) and light alarm code* display alternately on the LED monitor.

Which abnormal states are categorized as a light alarm (“Light alarm” object) should be defined with function codes H81, H82, and H83 beforehand. Furthermore, by assigning the light alarm “L-ALM” (data = 98) to a general-purpose output terminal, “L-ALM” signals are out to that terminal when a light alarm occurs.

* -- is added to the first 2 digits of the alarm code.
Example) “--OH 1” is displayed if cooling fin overheating OH 1 is assigned to a light alarm.

Running status monitor display

← Displays alternately →

Light alarm display

For details of the light alarm objects, refer to Chapter 6 “TROUBLESHOOTING.”

■ Checking the content of past light alarms

The content of light alarms in 5_37 (Light alarm content (previous)) to 5_39 (Light alarm content (3rd last)).

For details on the menu transition of the maintenance information, refer to “3.4.5 Reading maintenance information “Maintenance Information: 5.CHE ”.

■ Resetting light alarms

Refer to function codes H81, H82, and H83, and Chapter 6 “6.4 If a Light Alarm Code is Displayed” , and eliminate the cause of the light alarm.

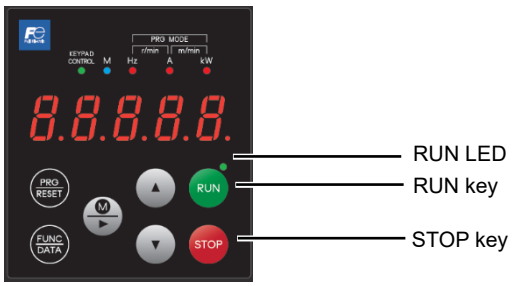
Once the cause has been eliminated, the light alarm code will no longer be displayed, and the general-purpose output “L-ALM” will also turn OFF.

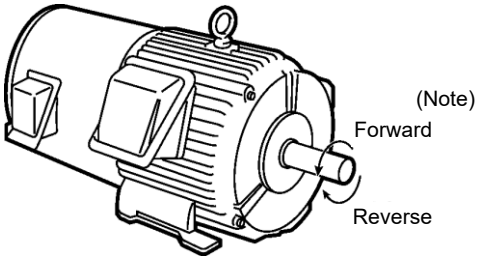
3.3.4 Running or stopping the motor with the keypad

By factory default, pressing the RUN key starts running the motor in the forward direction and pressing the STOP key decelerates the motor to stop. The RUN key is enabled only in Running mode.

When the inverter is running, the RUN LED lights.

To run the motor in the reverse direction or to run it reversibly, change the data of function code F02 to “3” or “0,” respectively.





Note: The rotation direction of IEC-compliant motors is opposite to the one shown above.

Table 3.3-3 Operation relationship between function code F02 “Run, Operation” and “RUN key”

Data for F02	Motor rotation direction
0	In the direction commanded by terminal [FWD] or [REV]
1	Disable key (The motor is driven by terminal [FWD] or [REV] command.)
2	In the forward direction
3	In the reverse direction

Tip If the motor cannot be run or stopped even by pressing the RUN/STOP key at such times as when function code F02 = 1 , or if running and stopping the motor with RS-485 communication, display “3.3.10 Display when keypad operation disabled (command source display)” for 2 seconds.

3.3.5 Setting the reference frequency with the keypad

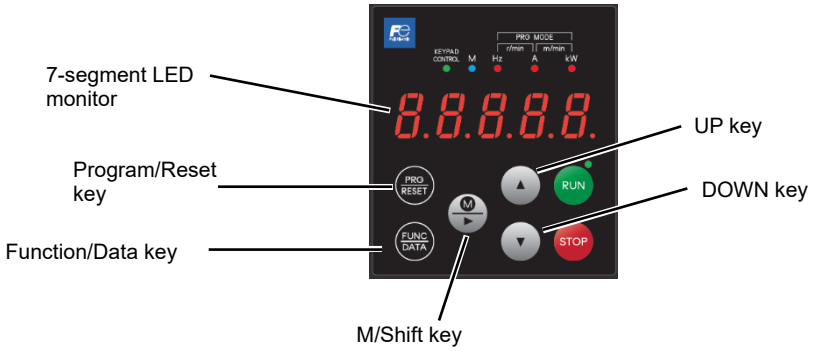
The frequency setting can be specified using the keypad ▲/▼ keys. The set frequency can also display the load rotation speed, etc. based on the E48 setting.

Setting the frequency with the keypad (F01 = 0 (factory default) or 8)

(1) Set function code F01 to “0” (keypad operation using ▲/▼ keys) or “8” (keypad operation using ▲/▼ keys, balanceless/bumpless). Frequency setting with the keypad is disabled in Programming or Alarm mode. To enable it, switch to Running mode. When the keypad is set to Programming or Alarm mode, the ▲/▼ keys are disabled to modify the reference frequency. You need to switch to Running mode to enable frequency setting with the ▲/▼ keys.

(2) By pressing the ▲/▼ key, the set frequency is displayed, and the rightmost digit flashes.

(3) By pressing the ▲/▼ keys again, it is possible to change the reference frequency. The new setting can be saved into the inverter’s internal memory.



Tip

- In order to perform setting such as reference frequency, press ▲/▼ once and when the least significant digit flashes, push down the M key, and then, the flashing digit will move. Therefore, it is possible to change the large numerical number easily.
- Holding down the ▲/▼ key changes data in the least significant digit and generates a carry.
- The reference frequency can 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. (The factory default is “0” (Automatic saving when main power is turned OFF)).
- While the function code F01 data is set to “0” or “8”, when a setting method other than frequency setting 1 (frequency setting 2, communication, multistep frequency, etc.) is selected as the frequency setting, it is not possible to change the reference setting with the ▲/▼ keys even if the keypad is in running mode. In this case, display “3.3.10 Display when keypad operation disabled (command source display)” for 2 seconds.
- By setting function code F01 data to “8: Keypad operation using ▲/▼ keys (with balanceless/bumpless)” balanceless/bumpless is enabled.

  Balanceless-bumpless switching refers to the function that makes the inverter inherit the current frequency that has applied before the frequency command source is switched to the keypad from any other source, providing smooth switching and shockless running. By using this function, even if the frequency setting method is switched, it is possible to perform operation without shock.

3.3.6 Setting PID commands with the keypad

PID commands can be set with the ▲ and ▼ keys on the keypad.

[1] Settings under PID process control

To enable the PID process control, you need to set the J01 data to “1” or “2.”

Under the PID control, the items that can be specified or checked with ▲ and ▼ 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 (E43 = 0), the item accessible is a manual speed command (reference frequency); if it is set to any other, the item is a PID process command.

Setting the PID process command with ▲ and ▼ keys

(1) Set function code J02 to “0” (▲/▼ keys on keypad).

(2) Set the LED monitor to other than the speed monitor (E43=0) in keypad Running mode. When the keypad is in Programming or Alarm mode, you cannot modify the PID process command with the ▲/▼ key. To make it possible for PID process commands to be set using the ▲/▼ keys, switch to running mode.

(3) Press the ▲/▼ key to display the PID process command. The lowest digit and its decimal point blink on the LED monitor.

(4) To change the PID process command, press the ▲/▼ key again. The new setting can be saved into the inverter’s internal memory.

Tip

- The PID process command can 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.
- Even if multistep frequency is selected as a PID command (***PID-SS1*** or ***PID-SS2*** = ON), it is possible to set a PID command using the keypad.
- When function code J02 is set to any value other than “0,” pressing the ▲/▼ key displays, on the LED monitor, the PID command currently selected, but does not allow any change.
- On the LED monitor, the decimal point of the lowest digit is used to discriminate the PID related data from the reference command. The decimal point blinks or lights when a PID command or PID feedback amount is displayed, respectively.

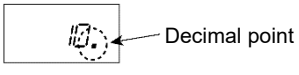


Table 3.3-4 PID process command manually set with ▲/▼ key and requirements

PID control (Mode selection) J01	PID control (Remote command SV) J02	LED monitor E43	PID control multistage command ***PID-SS1, PID-SS2***	With ▲/▼ key
1 or 2	0	Other than 0	ON or OFF	PID process command with keypad
	Other than 0			PID process command currently selected

Setting up the reference frequency with ▲ and ▼ keys under PID process control

When function code F01 is set to "0" (▲/▼ keys on keypad) and frequency setting 1 is selected as a manual speed command (when disabling the frequency setting command via communications link, multistep frequency command, and PID control), switching the LED monitor to the speed monitor in Running mode enables you to modify the reference frequency with the ▲ and ▼ keys.

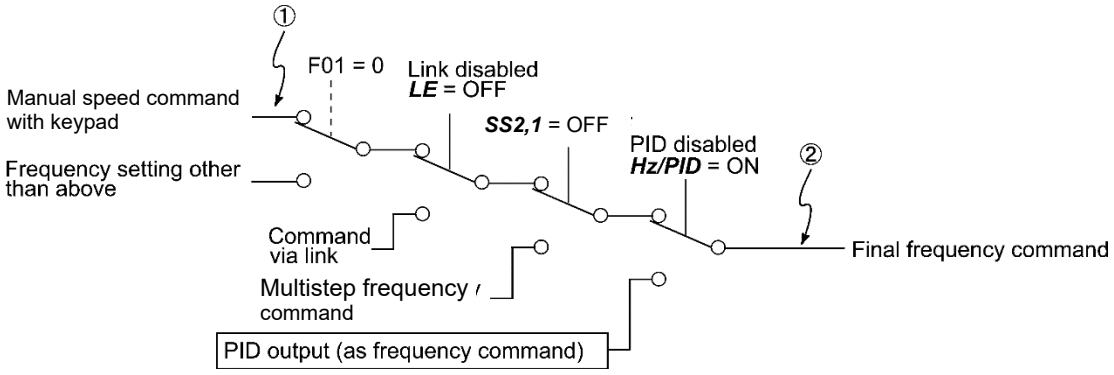
However, when the keypad is set to Programming or Alarm mode, the ▲ and ▼ keys are disabled to modify the reference frequency. You need to switch to Running mode to enable frequency setting with the ▲ and ▼ keys. Table 3.3-5 below lists the combinations of the commands. Table 3.3-5 illustrates how the manual speed command entered via the keypad is translated to the final frequency command.

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

In the case of conditions other than the above, the following is displayed by pressing the ▲/▼ keys.

Table 3.3-5 Manual speed (frequency) command specified with ▲/▼ keys and required settings

PID control (Mode selection) J01	LED monitor E43	Frequency setting 1 F01	Multistep frequency ***SS2***	Multistep frequency ***SS1***	Select link operation ***LE***	Cancel PID control ***Hz/PID***	Pressing ▲/▼ keys controls:
1 or 2	0	0	OFF	OFF	OFF	ON (PID disabled)	Manual speed command (frequency) set with keypad
		Other than above					Manual speed command (frequency) currently selected
		Not required				OFF (PID enabled)	PID output (as final frequency command)



[2] Settings under PID dancer control

To enable the PID dancer control, you need to set the J01 data to “3.”

Under the PID control, the items that can be specified or checked with ▲ and ▼ 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 (E43 = 0), the item accessible is the primary frequency command; if it is set to any other, the item is the PID dancer position set point.

Setting the PID dancer position set point with the ▲ and ▼ keys

(1) Set function code J02 to “0” (▲/▼ keys on keypad).

(2) Set the LED monitor to other than the speed monitor (E43=0) in keypad Running mode. When the keypad is in Programming or Alarm mode, you cannot modify the PID dancer position set point with the ▲/▼ key. To enable PID commands using the ▲/▼ keys, switch to running mode.

(3) Press the ▲/▼ key to display the PID dancer position set point. The lowest digit and its decimal point blink on the LED monitor.

(4) To change the PID dancer position set point, press the ▲/▼ key again. The set PID command is saved internally as function code J57, and after switching to another PID command setting method, commands are saved even after returning to the PID command with the keypad. Furthermore, you can directly configure the command with function code J57.

Tip

- Even if multistep frequency is selected as a PID command (***PID-SS1*** or ***PID-SS2*** = ON), it is possible to set a PID command using the keypad.
- When function code J02 is set to any value other than “0,” pressing the ▲/▼ key displays, on the LED monitor, the PID command currently selected, but does not allow any change.
- On the LED monitor, the decimal point of the lowest digit is used to discriminate the PID related data from the reference command. The decimal point blinks or lights when a PID command or PID feedback amount is displayed, respectively.

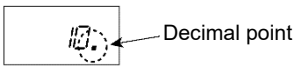


Table 3.3-6 PID command manually set with ▲/▼ key and required settings

PID control (Mode selection) J01	PID control (Remote command SV) J02	LED monitor E43	PID control multistage command ***PID-SS1***, ***PID-SS2***	With ▲/▼ key
3	0	Other than 0	ON or OFF	PID command with keypad
	Other than 0			PID command currently selected

Setting up the primary frequency command with ▲ and ▼ keys under PID dancer control

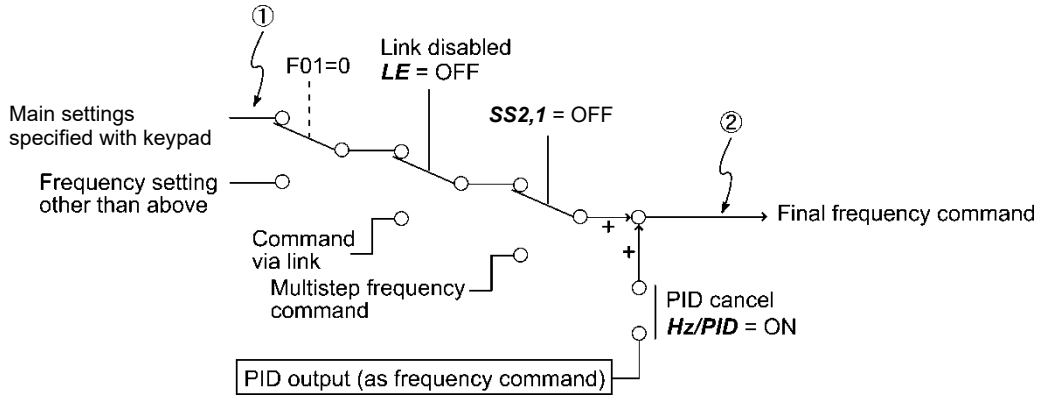
When function code F01 is set to "0" (▲/▼ keys on keypad) and frequency setting 1 is selected as a main setting (when disabling the frequency setting command via communications link, multistep frequency command, and PID control), switching the LED monitor to the speed monitor in Running mode enables you to modify the main setting with the ▲/▼ keys. When the keypad is set to Programming or Alarm mode, changes to the main settings cannot be made with the ▲/▼ keys. Switch to Running mode. Table 3.3-7 below lists the combinations of the commands. Table 3.3-7 illustrates how main setting command (1) entered with the keypad is translated to final frequency command (2).

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

In the case of conditions other than the above, the following is displayed by pressing the ▲/▼ keys.

Table 3.3-7 Main settings (frequency settings) specified with ▲/▼ keys and required settings

PID control (Mode selection) J01	LED monitor E43	Frequency setting 1 F01	Multistep frequency ***SS2***	Multistep frequency ***SS1***	Select link operation ***LE***	Cancel PID control ***Hz/PID***	Pressing ▲/▼ keys controls:
3	0	0	OFF	OFF	OFF	ON (PID disabled)	Main settings (frequency settings) specified with keypad
		Other than above					Primary command (frequency) currently selected
		Not required				OFF (PID enabled)	PID output (as final frequency command)



3.3.7 Jogging operation

This section provides the procedure for jogging the motor.

(1) Make the inverter ready to jog by following the steps below. The LED monitor should display JoG.

- Set the operation mode to Running mode. (See “3.2 Overview of Operation Modes”.)
- Press the STOP + ▲ keys simultaneously. The LED monitor displays the jogging frequency for approximately one second and then displays JoG again.

Tip

- Function codes C20, H54 and H55 specify the jogging frequency and acceleration/deceleration time, respectively. Use these function codes exclusively for the jogging operation with your needs.
- Alternatively, using the input terminal command ***JOG*** (“Ready for jogging”) switches between the normal operation state and ready-to-jog state.
- Switching between the normal operation state and read-to-jog state with the STOP +▲ keys is possible only when the inverter is stopped.

(2) Jogging the motor.

- Hold down the keypad RUN key during which the motor continues jogging. To decelerate to stop the motor, release the RUN key.

(3) Exiting the ready-to-jog state and returning to the normal operation state.
Press the STOP + ▲ keys simultaneously.

Refer to function codes E01 to E09 in Chapter 5 “5.3.2 E codes (terminal functions)” for details.

3.3.8 Switching between local and remote modes

When performing normal operation, the motor runs in the remote mode with the operation method set at the inverter, and when performing maintenance, it is possible to switch to the local mode used for performing operation with the keypad. In local mode, the inverter is isolated from the system. In this mode, the inverter is run, and the necessary work is carried out by performing all operations from the keypad.

· Remote mode: Run and frequency commands are selected by function codes or source switching signals except LOC ("Select local (keypad) command").

· Local mode: The command source is the keypad, regardless of the settings specified by function codes. The keypad takes precedence over the settings specified by communications link operation signals. If the (RUN)/(STOP) is pressed while in remote mode, "3.3.10 Display when keypad operation disabled (command source display)" is displayed for 2 seconds.
The KEYPAD CONTROL LED blinks once every second while in local mode.

The table below shows the input procedures of run commands from the keypad in the local mode.

F02 data	Input procedures of run commands from keypad
0: Keypad operation (Rotation direction input: Terminal block)	Pressing the keypad (RUN) key runs the motor in the direction specified by command FWD or REV assigned to terminal [FWD] or [REV], respectively. Pressing the (STOP) key stops the motor. The rotation direction is specified with terminals [FWD] and [REV].
1: External signal	Pressing the keypad (RUN) key runs the motor in the direction specified by command FWD or REV assigned to terminal [FWD] or [REV], respectively. Pressing the (STOP) key stops the motor. No specification of the motor rotation direction is required. However, the motor cannot be rotated in the reverse direction if only forward rotation is specified.
2: Keypad operation (forward rotation)	
3: Keypad operation (reverse rotation)	Pressing the keypad (RUN) key runs the motor in the direction specified by command FWD or REV assigned to terminal [FWD] or [REV], respectively. Pressing the (STOP) key stops the motor. No specification of the motor rotation direction is required. However, the motor cannot be rotated in the forward direction if only reverse rotation is specified.

The following two methods can be used to switch between remote mode and local mode.

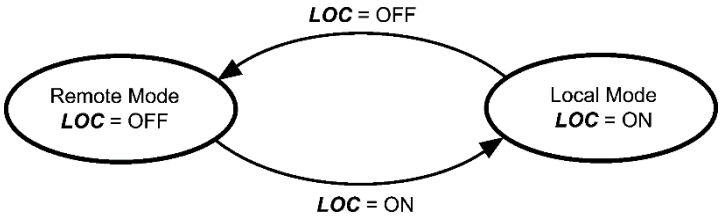
1. Assign data = 35 "LOC" to function code E70, and hold down the (▶) key on the keypad.
2. Assign data = 35 "LOC" to any of the function codes E01 to E09, E98, or E99, and turn on the applicable digital input terminal.

Switching from remote to local mode automatically inherits the frequency settings used in remote mode.

If the motor is running at the time of the switching from remote to local, the keypad run command will be automatically turned ON so that all the necessary data settings will be carried over.

If, however, there is a discrepancy between the settings used in remote mode and ones made on the keypad (e.g., switching from the reverse rotation in remote mode to the forward rotation only in local mode), the inverter automatically stops.

Status transition and the operation status differ based on the remote/local status, and the local (keypad) command selection "LOC" signal combination. Also, refer to above table for details.



Transition between remote and local modes by LOC

3.3.9 Changing the M/Shift key function

When in Running mode, various functions can be assigned to the M/Shift key in the same way as digital input terminals based on the function code E70 setting. The switching between remote and local modes described in the previous section is one of these functions.

The factory default setting is 100 (no functions).

Refer to the description of function code E70 in Chapter 5 “5.3.2 E codes (terminal functions)” for details.

3.3.10 Display when keypad operation disabled (command source display)

When the RUN/STOP key or ▲/▼ key is pressed in running mode (monitor item display), the command source is displayed for 2 seconds if these operations are disabled.

However, in such cases as where keypad key information reading is enabled with customizable logic, the command source will not display if the RUN/STOP key or ▲/▼ key is being used for another function.

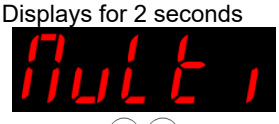
Table 3.3-8 Display when run/stop operation is disabled with RUN/STOP key

Displayed content	Reason for operation being disabled	Displayed content	Reason for operation being disabled
di	Terminal block input	bus	Bus option input
rS.Ch2	RS-485 port 2 input	Ldr	FRENIC Loader input

Table 3.3-9 Display when frequency change operation disabled with ▲/▼ key

Displayed content	Reason for operation being disabled	Displayed content	Reason for operation being disabled
AI.I2	Voltage input (terminal [12])	PuLSE	Pulse train input
AI.C1	Current input (terminal [C1])	rS.Ch2	RS-485 port 2 input
I2-C1	Voltage + current input (terminal [12] + [C1])	bus	Bus option input
AI.U2	Voltage input (terminal [V2])	Ldr	FRENIC Loader input
AI.U3	Voltage input (terminal [V3])	Mult1	Multistep frequency input
uP-dn	UP/DOWN (terminal [X1 X9])	PId	PID control input
Ptn	Pattern operation	nonE	No command source
di	OPC-DI (option) input		

Displays for 2 seconds



By pressing the ▲/▼ key during multistep frequency operation, “Mult1”, meaning multistep frequency input, displays for 2 seconds.

Fig. 3.3-1 Display example in which ▲/▼ operation is disabled

3.4 Programming Mode

The Programming mode provides you with the following functions--setting and checking function code data, monitoring maintenance information and checking input/output (I/O) signal status. The functions can be easily selected with the menu-driven system. Table 3.4-1 below lists menus available in Programming mode. The leftmost digit (numerals) of each letter string on the LED monitor indicates the corresponding menu number and the remaining digits indicate the menu contents.

When the inverter enters Programming mode from the second time on, the menu selected last in Programming mode will be displayed.

Table 3.4-1 Menus available in programming mode

Menu #	Menu	LED monitor indication	Main function		Ref.
1	"Data Setting"	1.F--	F codes (Basic functions)	Function codes can be displayed and changed.	Section 3.4.1
		1.E--	E codes (Extension terminal functions)		
		1.C--	C codes (Control functions)		
		~ (Omitted) ~			
		1.o--	o codes (optional functions)		
2	"Data Checking"	2.rEP	Displays only function codes that have been changed from their factory defaults. The function code data can be referenced and changed.		Section 3.4.2
3	Run monitor	3.oPE	Displays the running information required for maintenance or test runs.		Section 3.4.3
4	I/O check	4.I/O	Displays external interface information.		Section 3.4.4
5	"Maintenance Information"	5.CHE	Displays maintenance information including cumulative run time.		Section 3.4.5
6	Alarm Information	6.AL	Alarm codes for the past four alarms can be displayed, and operating information at the time each alarm occurred can be referenced.		Section 3.4.6
7	Data copy	7.CPY	Function code data can be read, written, and verified.		Section 3.4.7
8	Destination setting	8.dESt	Sets the region (overseas) in which the product is used. This is not used for machines for use in Japan.		-
9	Communication monitor	9.S-- 9.Addr 9.dAtA	Codes communicated back and forth between the host device can be monitored, and communication commands can be entered. Refer to the "RS-485 Communication User's Manual" for details.		
0	Favorites	0.FnC	Only function codes selected by users can be referenced or changed.		

Tip Enter Programming mode at the keypad to display the menu. Change the menu with the ▲ and ▼ keys, and select the desired menu item with the FUNC DATA key. Once the entire menu has been cycled through, the display returns to the first menu item.
Press the ▶ key to proceed to the next menu number.

3.4.1 Setting function codes “Data Setting: 1.F_ _ to 1.P_ _”

Menu number 1 “Data Setting” (1.F_ _ through 1.o_ _) in Programming mode allows you to configure all function codes. The Fig. 3.4-1 is shown in “Data Setting” menu transition and function code data change procedure.

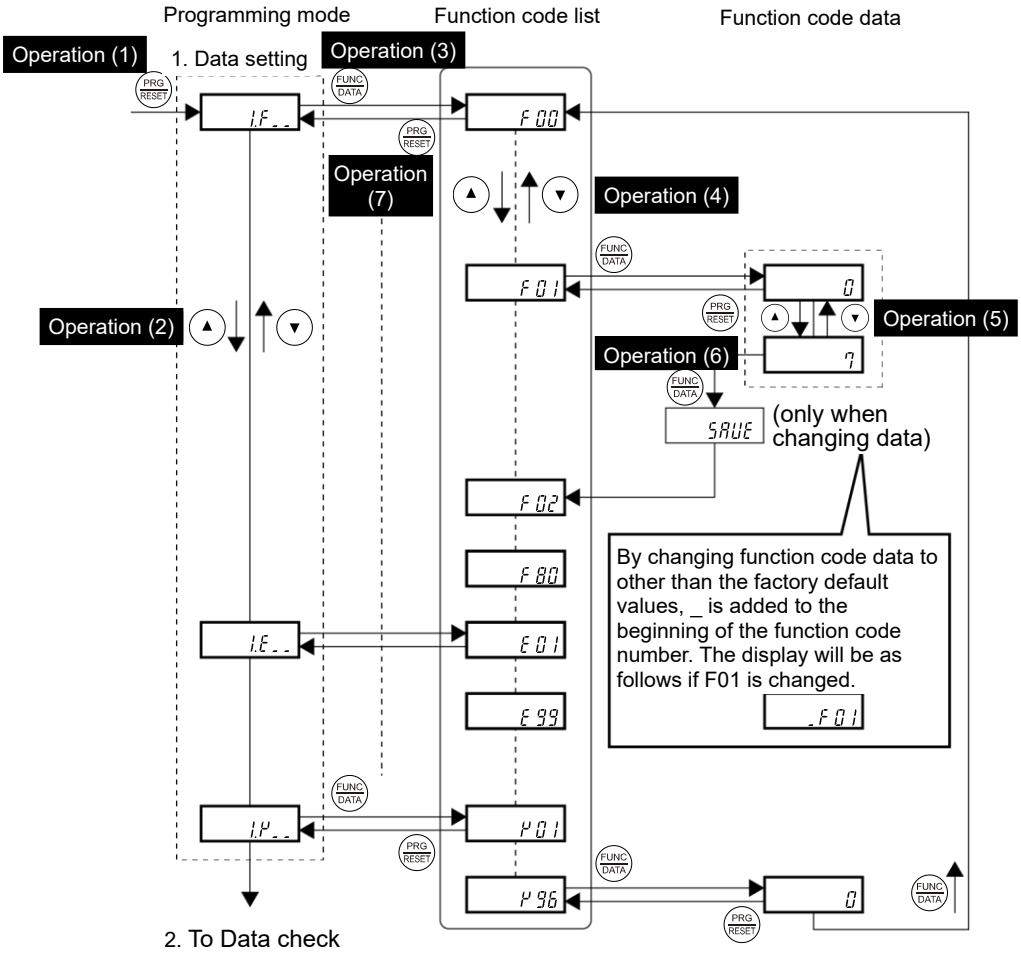


Fig. 3.4-1 “Data Setting” menu transition and function code data change procedure

Basic key operation

Operation (1) Turn the inverter ON. It automatically enters Running mode in which you press the PRG/RESET key to switch to Programming mode. The function selection menu appears.

Operation (2) Use the ▲ and ▼ keys to select the desired function code group from the choices 1.F_ _ to 1.P_ _. Press the SHIFT key to jump to “2. Data Checking”.

Operation (3) Press the FUNC/DATA key to proceed to a list of function codes for the selected function code group.

Operation (4) Use the ▲ and ▼ keys to display the desired function code, then press the FUNC/DATA key.

Data for the relevant function code appears.
Press the SHIFT key to skip to the function code number +10. When the end is reached, the display returns to the beginning of the same function code group.

Operation (5) Change the function code data using the ▲ and ▼ keys.

Operation (6) Press the FUNC/DATA key to establish the function code data.

SAVE appears, and the data will be saved in the memory inside the inverter. After that, the display will return to the function code list and then move to the next function code.
Pressing the PRG/RESET key instead of the FUNC/DATA key cancels the change made to the data. The data reverts to the previous value, the display returns to the function code list, and the original function code reappears.

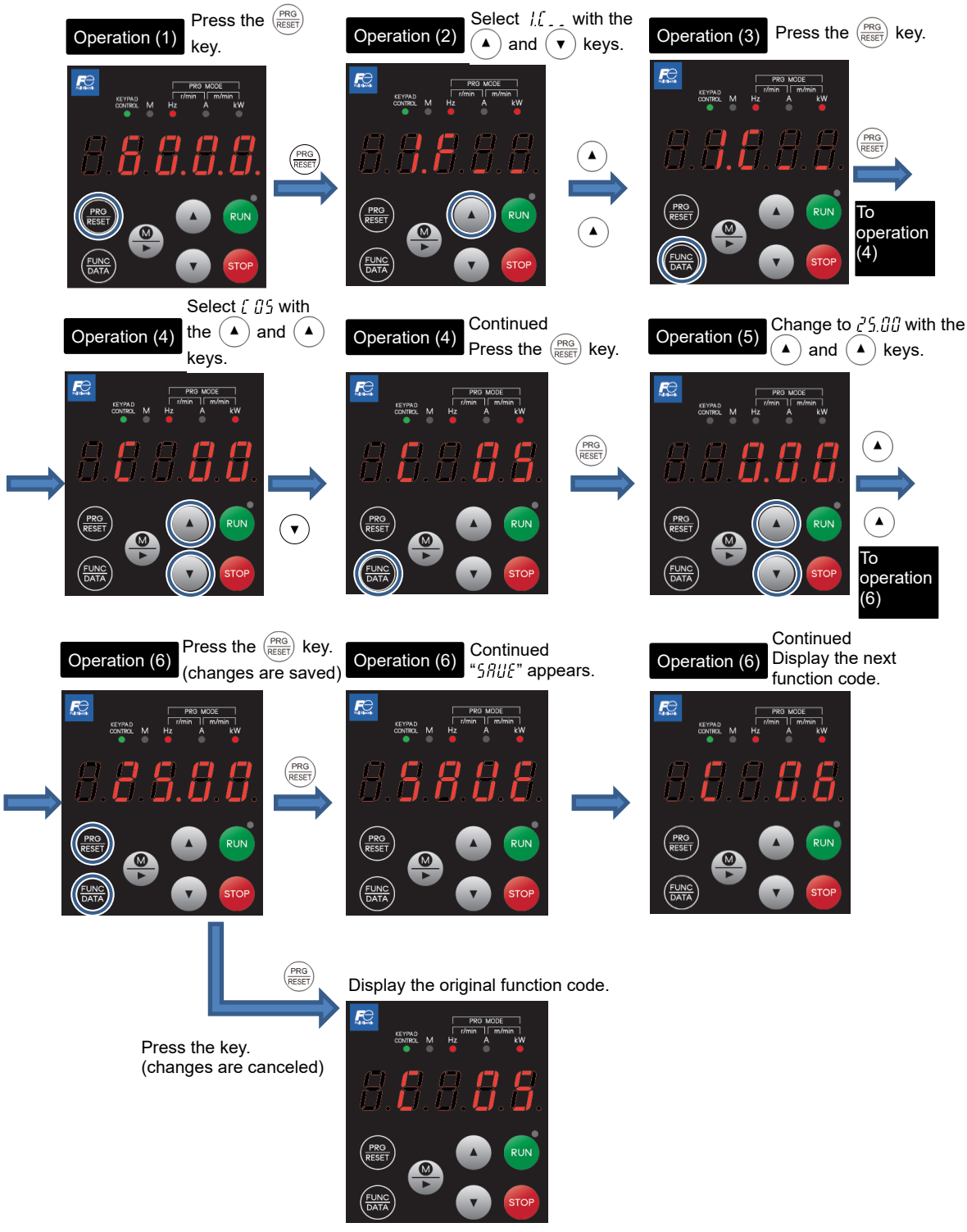
Operation (7) Press the PRG/RESET key to return to the menu from the function code list.

Tip When changing function code data, pressing the key once blinks the least significant digit. After that, each time the key is pressed, the cursor moves to the next higher digit where data can be changed. This cursor movement allows you to easily move the cursor to the desired digit and change the data in higher digits. This cursor movement allows you to easily move the cursor to the desired digit and change the data in higher digits.

Frequently used function codes can be registered in “Favorites”. Refer to section "3.4.8 Setting “Favorites” function code data” for details.

Operation example: Operating procedure when changing C05 (multistep frequency 1) from 0.00 to 25.00

The following screens correspond to previous operations (1) to (6).



3.4.2 Checking changed function codes “Data Checking: 2.rEF”

Changed function codes can be checked at “Data Checking: 2.rEF” in menu number 2 of Programming mode. Only the function codes whose data has been changed from the factory defaults are displayed on the LED monitor. You can refer to the function code data and change it again if necessary. Changed function codes are displayed at the beginning.

The menu transition in “Data Checking” is the same as the one in Menu number 1 “Data Setting.”

3.4.3 Monitoring the running status "Drive Monitoring: 3.oPE"

Menu number 3 "Drive Monitoring: 3.oPE" is used to monitor the running status during maintenance and test running. The monitor number and symbol are displayed alternately every 1 second.

Table 3.4-2 "Drive Monitoring" display items

Monitor No.	Symbol	Item	Unit	Description
3.00	FOUt 1	Output frequency 1	Hz	Output frequency before slip compensation when alarm occurred
3.01	FOUt2	Output frequency 2	Hz	Output frequency after slip compensation
3.02	1 OUt	Output current when alarm occurred.	A	Output current when alarm occurred.
3.03	UOUt	Output voltage when alarm occurred	V	Output voltage when alarm occurred
3.04	tr9	Calculated motor output torque when alarm occurred	%	Motor output torque in % (Calculated value)
3.05	FrEF	Frequency specified by frequency command when alarm occurred	Hz	Frequency specified by frequency command when alarm occurred
3.06	rOt	Rotation direction	N/A	Displays the current rotation direction when alarm occurred F: forward, r: reverse, ----: stop
3.07	StAt 1	Running status	N/A	Indicates the running status. Refer to "Displaying running status (3.07 and running status 2 (3.23 " on the next page for details.
3.08	SYnc	Motor rotation speed	r/min	Display value = 120 × (Output frequency Hz) / (No. of motor poles)
3.09	LoAd	Load shaft speed	r/min	Display value = (Output frequency Hz) × Function code E50 / Function code E39
3.10	SU	PID process command	N/A	Virtual physical value (e.g., temperature or pressure) of the object to be controlled, which is converted from the PID command value using function code J106 and J107 data (PID display Maximum scale/ minimum scale) Display value = (PID command value (%)) / 100 * (Max. scale - Min. scale) + Min. scale If PID control is disabled, "----" appears.
3.11	PU	PID feedback amount	N/A	Virtual physical value (e.g., temperature or pressure) of the object to be controlled, which is converted from the PID feedback amount using function codeJ106 and J107 data (PID display Maximum scale/ minimum scale) Display value = (PID feedback value (%)) / 100 * (Max. scale - Min. scale) + Min. scale If PID control is disabled, "----" appears.
3.12	tL-A	Torque limit value A	%	Driving torque limit value A (based on motor rated torque)
3.13	tL-b	Torque limit value B	%	Braking torque limit value B (based on motor rated torque)

Table 3.4-2 “Drive Monitoring” display items (cont.)

Monitor No.	Symbol	Item	Unit	Description
3_14	rAtio	Ratio setting	%	When this setting is 100%, the LED monitor shows 1.00 time of the value to be displayed. If no ratio setting is selected, “- - - -” appears.
3_15	LinE	Line speed	m/min	Display value = (Output frequency Hz) × Function code E50 / Function code E39
3_16	LSC	Peripheral speed	m/min	The constant surface speed control winding speed is displayed.
3_17	E	Stop target position	N/A	Refer to Chapter 5 “5.3.8 [7] Positioning control with pulse counter.”
3_18	P	Current position	N/A	
3_19	dP	Position deviation	N/A	
3_20	PoS.Md	Position control status monitor	N/A	
3_21	nU	PID output value	%	Displays the PID output value. (100% at maximum frequency) If PID control is disabled, “- - - -” appears.
3_22	FLUk	Flux command value	%	Magnetic flux command value.
3_23	StAt2	Running status 2	N/A	Refer to “Displaying running status (3_07 and running status 2 (3_23 ” for details.
3_24	ntc	Motor temperature	°C	Temperature detected with NIC thermistor built in to the motor (VG motor) “- - - -” appears if no NIC thermistor connection has been set.
3_25	SY-d	Master-follower operation deviation	deg	Displays the current angle deviation. Refer to Chapter 5 “5.3.9 [2] Master-follower operation.”
3_29	PG-Fb	PG feedback value	Hz	Displays the frequency detected by the PG in Hz regardless of the control method.
3.32	trg.b	Torque bias command	%	Displays the selected torque bias command value.
3_34	dt-Ld	Load detection monitor		Displays momentary detected loads. Refer to Chapter 5 “5.1.1 Hoist function” for details.
3.35	Lin-i	Constant surface speed control line speed setting value	m/min	Displays the [Motor setting speed *winding diameter ratio].
3.36	Lin-o	Constant surface speed control line speed output	m/min	Displays the [Motor output speed *winding diameter ratio].
3_50	P-rEF	Command (master) side AB phase pulse rate	kp/s	Displays the pulse rate input to the PG AB-phase used as the command (master) side.
3_51	C-rEF	Command (master) side Z-phase pulse rate	p/s	Displays the pulse rate input to the PG Z-phase used as the command (master) side.
3_52	P-Fb	Feedback (follower) side AB-phase pulse rate	kp/s	Displays the pulse rate input to the PG AB-phase used as the feedback (follower) side.
3_53	C-Fb	Feedback (follower) side Z-phase pulse rate	p/s	Displays the pulse rate input to the PG Z-phase used as the feedback (follower) side.

■ **Displaying running status (3-07) and running status 2 (3-23)**

To display the running status and running status 2 in hexadecimal format, each state has been assigned to bits 0 to 15 as listed in Table 3.4-3 and Table 3.4-4 respectively. Table 3.4-5 shows the relationship between each of the status assignments and the LED monitor display.

Table 3.4-6 shows the conversion table from binary to hexadecimal.

Table 3.4-3 Running status (3-07) bit assignment

Bit	Symbol	Content	Bit	Symbol	Content
15	BUSY	"1" when function code data is being written.	7	VL	"1" under voltage limiting control.
14	WR	Always "0."	6	TL	"1" under torque limiting control.
13		Always "0."	5	NUV	"1" when the DC link bus voltage is higher than the under voltage level.
12	RL	"1" when communication is enabled (when ready for run and frequency commands via communications link).	4	BRK	"1" during braking.
11	ALM	"1" when an alarm has occurred.	3	INT	"1" when the inverter output is shut down.
10	DEC	"1" during deceleration.	2	EXT	"1" during DC braking.
9	ACC	"1" during acceleration.	1	REV	"1" during running in the reverse direction.
8	IL	"1" under current limiting control.	0	FWD	"1" during running in the forward direction.

Table 3.4-4 Running status 2 (3-23) bit assignment

Bit	Symbol	Content	Bit	Symbol	Content
15	-	Drive motor type 0000: induction motor 1000: synchronous motor	7	-	Speed limiting (under torque control)
14			6	-	(Not used)
13			5	-	Motor selection 00: Motor 1 01: Motor 2 10: Motor 3 11: Motor 4
12			4		
11	-	(Not used)	3	-	Control method 0000: V/f control with slip compensation inactive 0001: Dynamic torque vector control 0010: V/f control with slip compensation active 0011: V/f control with sensor 0100: V/f control with sensor and auto torque boost 0101: Sensorless vector control 0110: Vector control for IM with sensor 1010: Torque control (sensorless vector control) 1011: Torque control (vector control with sensor)
10			2		
9			1		
8			0		

Table 3.4-5 Running status display example

LED No.		LED 4				LED 3				LED 2				LED 1			
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Symbol		BUSY	WR	RL		ALM	DEC	ACC	IL	VL	TL	NUV	BRK	INT	EXT	REV	FWD
Display example	Binary	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1
	Hexadecimal on the LED monitor	LED5 LED4 LED3 LED2 LED1 															

Table 3.4-6 Running status display example
(Synchronous motor assigned to motor 4, motor running under vector control with sensor)

LED No.		LED 4				LED 3				LED 2				LED 1			
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Symbol		-				-				-	-	-		-			
Display example	Binary	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
	Hexadecimal on the LED monitor	LED5 LED4 LED3 LED2 LED1 															

■ **Hexadecimal expression**

A 4-bit binary number can be expressed in hexadecimal format (hexadecimal digit). The Table 3.4-7 below shows the correspondence between the two notations.

Table 3.4-7 Binary and hexadecimal conversion

Binary				Hexadecimal	Binary				Hexadecimal
0	0	0	0	0	1	0	0	0	8
0	0	0	1	1	1	0	0	1	9
0	0	1	0	2	1	0	1	0	A
0	0	1	1	3	1	0	1	1	b
0	1	0	0	4	1	1	0	0	c
0	1	0	1	5	1	1	0	1	d
0	1	1	0	6	1	1	1	0	E
0	1	1	1	7	1	1	1	1	F

3.4.4 Checking I/O signal status “I/O Checking: 4.1.0”

Using menu number 4 “I/O Checking: 4.1.0” displays the I/O status of external signals including digital and analog I/O signals without using a measuring instrument. External signals that can be displayed are digital input/output signals and analog input/output signals.

Table 3.4-8 shows “I/O Checking” items, and Fig. 3.4-2 below shows “I/O Checking” menu transition.
The monitor number and symbol are displayed alternately every 1 second.

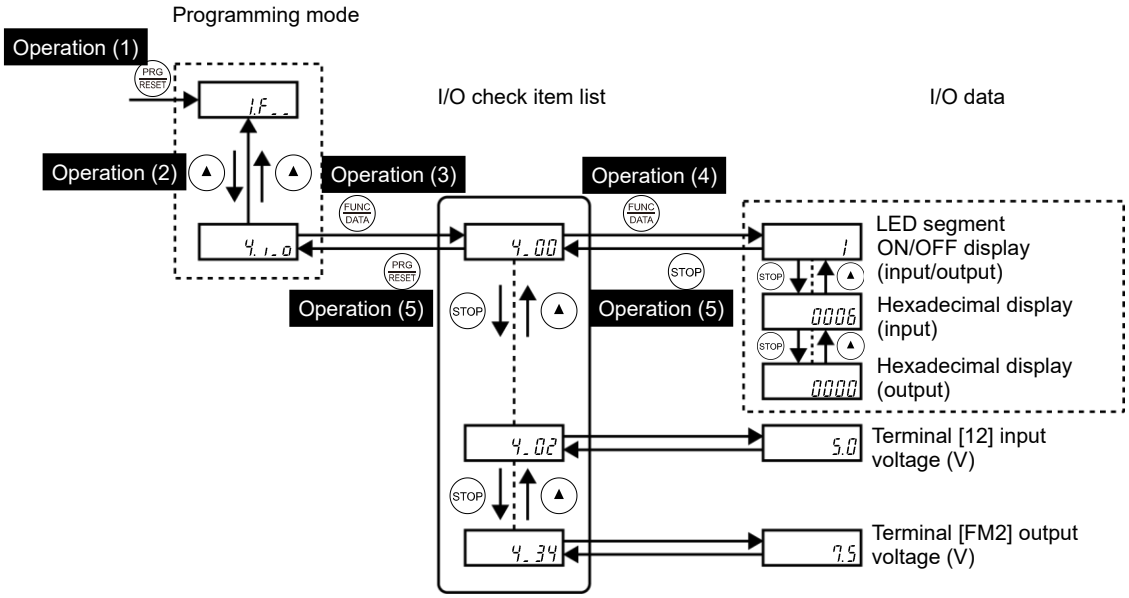


Fig. 3.4-2 “I/O Checking” menu transition

Basic key operation

Operation (1) Turn the inverter ON. It automatically enters Running mode in which you press the PRG/RESET key to switch to Programming mode. The function selection menu appears.

Operation (2) Use the ▲ and ▲ keys to select "I/O Checking" (4. I_O).
Press the M/▶ key to skip in menu number units.

Operation (3) Press the PRG/RESET key to proceed to a list of I/O checking items (e.g., 4_00).

Operation (4) Use the ▲ and ▲ keys to display the desired I/O checking item, then press the PRG/RESET key.
Press the M/▶ key to skip the to the I/O checking item +10. When the end is reached, the display returns to the beginning of the same function code group.
The corresponding I/O checking data appears. For the item 4_00 or 4_01, using the ▲ and ▲ keys switches the display method between the segment display (for external signal information in Table 3.4-9) and hexadecimal display (for I/O signal status in Table 3.4-10).

Operation (5) Press the PRG/RESET key to return to the list of I/O checking items. Press the PRG/RESET key again to return to the menu.

Table 3.4-8 “I/O Checking” items

Monitor No.	Symbol	Item	Unit	Description
4_00	d io.t	I/O signals on the control circuit terminals	-	Displays the ON/OFF state of the digital I/O terminals. Refer to “Displaying control I/O signal terminals” on the next page for details.
4_01	d io.L	I/O signals on the control circuit terminals under communications control	-	Displays the ON/OFF state of the digital I/O terminals that received a command via RS-485 or field bus option. Refer to “Displaying control I/O signal terminals” and “Displaying control I/O signal terminals under communications control” from the next page onward for the display content.
4_02	I2-in	Input voltage on terminal [12]	V	Displays the input voltage (with sign) on terminal [12] in volts (V). (with sign)
4_03	C1-in	Input current on terminal [C1] (C1 function)	mA	Displays the input current on terminal [C1] (C1 function) in milliamperes (mA).
4_04	FM1.U	Terminal [FM1] output voltage	V	Displays the output voltage for terminal [FM1] in volts (V). (with sign)
4_05	FMP.U	Output voltage on terminal [FMP]	V	Displays the output voltage for terminal [FMP] in volts (V).
4_06	FMP.P	Output frequency on terminal [FMP]	p/s	Displays the output pulse rate per unit of time on terminal [FMP] in (p/s).
4_07	U2-in	Input voltage on terminal [V2]	V	Displays the input voltage (with sign) on terminal [V2] in volts (V).
4_08	FM1.i	Output current on terminal [FM1]	mA	Displays the output current on terminal [FM1] in milliamperes (mA).
4_09	FM2.i	Output current on terminal [FM2]	mA	Displays the output current on terminal [FM2] in milliamperes (mA).
4_10	d io.oP	Option control circuit terminal (I/O)	-	Displays the ON/OFF state of the digital input/output terminals for the digital interface card (option). Refer to “Displaying control I/O signal terminals on optional digital interface cards” on page 3-30 for the display content.
4_11	PULSE	Terminal [X6] and [X7] pulse input monitor	-	Displays the number of pulse train signal pulses input to terminals [X6] and [X7].
4_13	Pt.Ch1	PT detected temperature (Ch.1)	°C	Displays the PT option Ch.1 temperature in (°C).
4_14	Pt.Ch2	PT detected temperature (Ch.2)	°C	Displays the PT option Ch.2 temperature in (°C).
4_15	PG.P1	PG pulse rate (A/B phase signal from the reference PG)	kp/s	Displays the AB phase pulse rate (kp/s) at the Ch1 (XA, XB terminal) side PG.
4_16	PG.Z1	PG pulse rate (Z phase signal from the reference PG)	p/s	Displays the Z phase pulse rate (p/s) at the Ch1 (XZ terminal) side PG.
4_17	PG.P2	PG pulse rate (A/B phase signal from the slave PG)	kp/s	Displays the AB phase pulse rate (kp/s) at the Ch2 (YA, YB terminal) side PG.
4_18	PG.Z2	PG pulse rate (Z phase signal from the slave PG)	p/s	Displays the Z phase pulse rate (p/s) at the Ch2 (YZ terminal) side PG.

Monitor No.	Symbol	Item	Unit	Description
4_20	32-in	Input voltage on terminal [32]	V	Displays the input voltage on terminal [32] on the analog interface card (AIO option) in volts (V).
4_21	C2-in	Input current on terminal [C2]	mA	Displays the input current on terminal [C2] on the analog interface card (AIO option) in milliamperes (mA).
4_22	Ao.U	Output voltage on terminal [AO]	V	Displays the output voltage on terminal [AO] on the analog interface card (AIO option) in volts (V).
4_23	CS.i	Output current on terminal [CS]	mA	Displays the output current on terminal [CS] on the analog interface card (AIO option) in milliamperes (mA).
4_24	CL-tM	Customizable logic timer monitor	-	Monitors the timer or counter value in the customizable logic specified by U91.
4_33	U3-in	Terminal [C1] (V3 function) input voltage	V	Displays the input voltage for terminal [C1] (V3 function) in volts (V). (with sign)
4_34	FM2.U	Terminal [FM2] output voltage	V	Displays the output voltage for terminal [FM2] in volts (V). (with sign)
4_35	CS2.i	Option terminal [CS2] output current	mA	Displays the output current (mA) for terminal [CS2] on the analog interface card (option).
4_36	Pntc	PTC/NTC terminal input voltage	V	Displays the input voltage for terminal [V2] (PTC/NTC function) in volts (V).

■ Displaying control I/O signal terminals

The status of control I/O signal terminals can be displayed in two ways: with ON/OFF of each LED segment and in hexadecimal. Displaying the **I/O signal status with ON/OFF of each LED segment**Displaying I/O signal status in hexadecimal notation

• Displaying the I/O signal status with ON/OFF of each LED segment

As shown in Table 3.4-9 below and the figure below, each of segments “a” to “dp” on LED1 and LED2 light up when the corresponding digital input terminal circuit ([FWD], [REV], [X1] to [X9], [EN1] and [EN2]) is closed (ON); it goes OFF when it is open (OFF). Segments “a” to “e” on LED3 light up when the circuit between output terminal [Y1] to [Y4] and terminal [CMY], and between [Y5A] and [Y5C] is closed, respectively; it goes OFF when the circuit is open. Segment “a” on LED4 is for terminals [30A/B/C]. This segment lights up when [30C] is short-circuited with [30A], and goes OFF when the circuit is open.

Tip If all terminal signals are OFF (open), segment “g” on all segments (LED1 to LED5) will light up (“- - - -”).

Table 3.4-9 Display of I/O signal status with ON/OFF of each LED segment

Segment	LED4	LED 3	LED 2	LED 1
a	[30A/B/C]	[Y1-CMY]	[X7]	[FWD]
b	-	[Y2-CMY]	[X8]	[REV]
c	-	[Y3-CMY]	[X9]	[X1]
d	-	[Y4-CMY]	[EN1]	[X2]
e	-	[Y5A-Y5C]	[EN2]	[X3]
f	-	-	(XF) *	[X4]
g	-	-	(XR) *	[X5]
dp	-	-	(RST) *	[X6]

–: No corresponding control circuit terminal exists.

* (XF), (XR), and (RST) are assigned for communications control. Refer to “Displaying control I/O signal terminals under communications control” on the next page.

● Displaying I/O signal status in hexadecimal notation

Each I/O terminal is assigned to 16-digit binary bit 0 to bit 15. Unassigned bits are interpreted as “0.” Allocated bit data is displayed on the LED monitor as four hexadecimal digits (0 to F).

On the FRENIC-MEGA, digital input terminals [FWD] and [REV] are assigned to bits 0 and 1, respectively, and terminals [X1] to [X9] are assigned to bits 2 to 6. The bit is set to “1” when the corresponding input terminal is short-circuited (ON), and it is set to “0” when the terminal is open (OFF). For example, when [FWD] and [X1] are ON (short-circuited) and all the others are OFF (open), 00005 is displayed on LED5 to LED1.

Digital output terminals [Y1] to [Y4] are assigned to bits 0 to 3. Each bit is set to “1” when the circuit between [Y1] to [Y4] and [CMY] is short-circuited (ON), and “0” when it is open (OFF). The status of contact output terminals [30A/B/C] and [Y5A/C] is assigned to bits 8 and 9. It is set to “1” when the circuit between [30A] and [30C] is closed, and “0” when the circuit between [30A] and [30C] is open. For example, if [Y1] is ON, [Y2] is OFF, and the circuit between [30A] and [30C] is closed, “00 10 1” is displayed on LED4 to LED1.

The terminals assigned to bits 0 to 15 and Display of I/O signal status in hexadecimal notation (example) are shown in Table 3.4-10.

Table 3.4-10 Display of I/O signal status in hexadecimal notation (example)

LED No.		LED 4				LED 3				LED 2				LED 1			
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input terminal		(RST) *	(XR) *	(XF) *	EN2	EN1	Y9	Y8	Y7	X6	X5	X4	X3	X2	X1	REV	FWD
Output terminal		-	-	-	-	-	-	-	30A/B/C	-	-	-	Y5A/C	Y4	Y3	Y2	Y1
Example	Binary	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	Hexadecimal on the LED monitor	LED5 LED4 LED3 LED2 LED1 															

–: No corresponding control circuit terminal exists.

* (XF), (XR), and (RST) are assigned for communications control. Refer to "Displaying control I/O signal terminals under communications control" given below.

■ Displaying control I/O signal terminals under communications control

Under communications control, input commands (function code S06) sent via RS-485 or other optional communications can be displayed in two ways: "with ON/OFF of each LED segment" and "in hexadecimal." 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, the I/O display is in normal logic (using the original signals not inverted)

📖 For details about input commands sent through the communications link, refer to the "RS-485 Communication User's Manual" or the instruction manual of communication-related options as well.

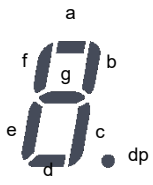
■ Displaying control I/O signal terminals on optional digital interface cards

The LED monitor can also show the signal status of the terminals on the optional digital interface cards, same as the signal status of the control circuit terminals.

The following table lists the assignment of digital I/O signals to the LED segments.

Table 3.4-11 Display of I/O Signal Status with ON/OFF of each LED segment
(Digital interface cards)

LED5 LED4 LED3 LED2 LED1



Segment	LED4	LED 3	LED 2	LED 1
a	-	O1	I9	I1
b	-	O2	I10	I2
c	-	O3	I11	I3
d	-	O4	I12	I4
e	-	O5	I13	I5
f	-	O6	-	I6
g	-	O7	-	I7
dp	-	O8	-	I8

LED No.	LED 4				LED 3				LED 2				LED 1			
Bit	14	13	12	12	11	10	9	8	7	6	5	4	3	2	1	0
Input terminal	-	-	I13	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1
Output terminal	-	-	-	-	-	-	-	-	O8	O7	O6	O5	O4	O3	O2	O1

3.4.5 Reading maintenance information "Maintenance Information: 5.CHE"

Menu number 5 "Maintenance Information: 5.CHE" contains information necessary for performing maintenance on the inverter. The menu transition in "Maintenance Information" is same as that in Menu #3 "Drive Monitoring." (Refer to Section 3.4.3 .)

The monitor number and symbol are displayed alternately every 1 second.

Basic key operation

(1) Turn the inverter ON. It automatically enters Running mode in which you press the PRG/RESET key to switch to Programming mode. The function selection menu appears.

(2) Use the ▲ and ▲ keys to display "Maintenance Information" (5.chE).
Press the M key to skip in menu number units.

(3) Press the PRG/RESET key to proceed to the list of maintenance items (e.g., 5_00).

(4) Use the ▲ and ▲ keys to display the desired maintenance item, then press the PRG/RESET key.
The data of the corresponding maintenance item appears.
Press the M key to skip to maintenance information +10. When the end is reached, the display returns to the first maintenance item.

(5) Press the PRG/RESET key to return to the list of maintenance items. Press the PRG/RESET key again to return to the menu.

Table 3.4-12 "Maintenance Information" display items

Monitor No.	Symbol	Item	Displayed content
5_00	t.nE	Cumulative run time	Displays the content of the cumulative power-ON time counter of the inverter. Counter range: 0 to 65,535 hours Display range: Upper 2 digits and lower 3 digits are displayed alternately. Example: 0 ↔ 535 h (535 hours) 65 ↔ 535 h (65,535 hours) The lower 3 digits are displayed with h (hour). When the count exceeds 65,535, the counter will be reset to "0" and start over again.
5_01	Edc	DC link bus voltage	Displays the DC link bus voltage of the inverter main circuit. Unit: V (volts)
5_02	t.nAH	Max. temperature inside the inverter	Displays the maximum temperature inside the inverter for every hour. Unit: °C (Temperatures below 20 °C are displayed as 20 °C.) 15 kW or lower models are not equipped with an internal temperature sensor, and therefore "- - - - -" is displayed.
5_03	tF.nAH	Max. temperature of heat sink	Displays the maximum temperature of the inverter heat sink for every hour. Unit: °C (Temperatures below 20 ºC are displayed as 20 ºC.)
5_04	i.nAH	Max. effective output current	Displays the maximum current in RMS for every hour. Unit: A (amperes)
5_05	CAP	Capacitance of the DC link bus capacitor	Displays the current capacitance of the DC link bus capacitor (reservoir capacitor) in %, based on the capacitance when shipping as 100%. Refer to Chapter 7 MAINTENANCE AND INSPECTION for details. Display: %

Table 3.4-12 “Maintenance Information” display items (cont.)

Monitor No.	Symbol	Item	Displayed content
5_06	tM.Pb.C	Cumulative run time of electrolytic capacitors on the printed circuit boards	Displays the content of the cumulative run time counter of the electrolytic capacitors on the printed circuit boards, which is calculated by multiplying the cumulative run time count by the coefficient based on the surrounding temperature condition. Counter range: 0 to 99,990 hours Display range: 0 to 99990 When the count exceeds 99,990 hours, the counter stops and the LED monitor remains at 99990.
5_07	tM.FAn	Cumulative run time of cooling fan	Displays the content of the cumulative run time counter 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. The display method is the same as for 5_06 above.
5_08	no.M1	Number of startups	Displays the content of the motor 1 startup counter (i.e., the number of run commands issued). Counter range: 0 to 65,535 times Display range: 0 to 65535 When the count exceeds 65,535 times, the counter will be reset to “0” and start over again.
5_09	WH	Input watt-hour	Displays the input watt-hour for the inverter. Display range: 0.001 to 9999 Input watt-hour = Displayed value x 100 kWh To reset the integrated input watt-hour and its data, set function code E51 to “0.000.” When the input watt-hour exceeds 999,900 kWh, the counter will be reset to “0.”
5_10	P.dAt	Input watt-hour data	Displays the value expressed by “input watt-hour (1.000=100 kWh) x E51 The function code E51 setting range is 0.000 to 9,999. Unit: None (Display range: 0.001 to 9999. The count cannot exceed 9999. (Fixed at 9999) Depending on the value of integrated input watt-hour data, the decimal point on the LED monitor shifts to show it within the LED monitors’ resolution. To reset the integrated input watt-hour data, set function code E51 to “0.000.”
5_11	ch1.nE	Number of RS-485 communications errors (COM port 1)	Displays the total number of errors that have occurred in RS-485 communication (COM port 1, connection to keypad) after the power is turned ON. Once the count exceeds 9999, the counter will be reset to “0.”
5_12	ch1.Er	Content of RS-485 communications error (COM port 1)	Displays the latest error that has occurred in RS-485 communication (COM port 1) in decimal. For error contents, refer to the “RS-485 Communication User’s Manual.”
5_13	oPA.nE	Number of option errors 1	Displays the total number of errors that have occurred in the option installed in the A-Port. Once the count exceeds 9999, the counter will be reset to “0.”
5_14	AA in	Inverter ROM version	Displays the inverter's ROM version as a 4-digit code.

Table 3.4-12 “Maintenance Information” display items (cont.)

Monitor No.	Symbol	Item	Displayed content
5_16	KEYPd	Keypad ROM version	Displays the keypad ROM version as a 4-digit code.
5_17	ch2.nE	Number of RS-485 communications errors (COM port 2)	Displays the total number of errors that have occurred in RS-485 communication (COM port 2, connection to terminal block) after the power is turned ON. Once the count exceeds 9999, the counter will be reset to “0.”
5_18	ch2.Er	Content of RS-485 communications error (COM port 2)	Displays the latest error that has occurred in RS-485 communication (COM port 2, connection to terminal block) in decimal. For error contents, refer to the “RS-485 Communication User’s Manual.”
5_19	oP-A	Option ROM version 1	Displays the version of the optional ROM installed in the A-Port in 4 digits. If the option has no ROM, “----” appears on the LED monitor.
5_20	oP-b	Option ROM version 2	Displays the version of the optional ROM installed in the B-Port in 4 digits. If the option has no ROM, “----” appears on the LED monitor.
5_21	oP-C	Option ROM version 3	Displays the version of the optional ROM installed in the C-Port in 4 digits. If the option has no ROM, “----” appears on the LED monitor.
5_23	tN.M1	Cumulative run time for motor 1	Displays the content of the cumulative power-ON time counter for motor 1. Counter range: 0 to 99,990 hours Display range: 0 to 99990 When the count exceeds 99,990 hours, the counter will be reset to “0” and start over again.
5_24	t-int	Temperature inside the inverter□ (real-time value)	Displays the current temperature inside the inverter. Unit: °C There is no internal air temperature sensor on 15 kW or lower models, and therefore “-----” is displayed.
5_25	t-Fin	Temperature of heat sink □ (real-time value)	Displays the current temperature of the inverter heat sink. Unit: °C
5_26	tN.CAP	Lifetime of DC link bus capacitor□ (elapsed hours)	Displays 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 for 5_06 above.
5_27	rt.CAP	Service life of DC link bus capacitor (remaining time)	Displays the remaining lifetime of the DC link bus electrolytic capacitor, which is estimated by subtracting the elapsed time from the lifetime (10 years). The display method is the same as for 5_06 above.
5_27	tN.M2	Cumulative run time for motor 2	Displays the content of the cumulative power-ON time counter of motor 2. The display method is the same as for 5_23 above.

Table 3.4-12 “Maintenance Information” display items (cont.)

Monitor No.	Symbol	Item	Displayed content
5_29	tM.M3	Cumulative run time for motor 3	Displays the content of the cumulative power-ON time counter of motor 3. The display method is the same as for 5_23 above.
5_30	tM.M4	Cumulative run time for motor 4	Displays the content of the cumulative power-ON time counter of motor 4. The display method is the same as for 5_23 above.
5_31	rt.M1	Remaining hours before the next maintenance 1	Displays the hours remaining before the next maintenance, which is estimated by subtracting the cumulative run time of motor 1 from the maintenance interval specified by H78. (This function applies to motor 1 only.) Display range: 0 to 99990
5_32	no.M2	Startup count for motor 2	Displays the content of the motor 2 startup counter (i.e., the number of run commands issued). The display method is the same as for 5_08 above.
5_33	no.M3	Startup count for motor 3	Displays the content of the motor 3 startup counter (i.e., the number of run commands issued). The display method is the same as for 5_08 above.
5_34	no.M4	Startup count for motor 4	Displays the content of the motor 4 startup counter (i.e., the number of run commands issued). The display method is the same as for 5_08 above.
5_35	rno.M1	Remaining startup times before the next maintenance 1	Displays the number of startups remaining until the next maintenance, which is estimated by subtracting the number of startups from the preset startup count for maintenance specified by H79. (This function applies to motor 1 only.) The display method is the same as for 5_08 above.
5_36	LALM1	Light alarm factor (Latest)	Displays the factor of the latest light alarm as an alarm code. For details, refer to Chapter 6 “6.1 Protective Functions.”
5_37	LALM2	Light alarm factor (Last)	Displays the factor of the last light alarm as an alarm code. For details, refer to Chapter 6 “6.1 Protective Functions”.
5_38	LALM3	Light alarm factor (2nd last)	
5_39	LALM4	Light alarm factor (3rd last)	
5_40	oPA.Er	Option error factor 1	Displays the content of errors that have occurred in the option installed in the A-Port.
5_41	oPb.nE	Number of option errors 2	Displays the total number of errors that have occurred in the option installed in the B-Port. Once the count exceeds 9999, the counter will be reset to “0.”
5_42	oPb.Er	Option error factor 2	Displays the content of errors that have occurred in the option installed in the B-Port.
5_43	oPC.nE	Number of option errors 3	Displays the total number of errors that have occurred in the option installed in the C-Port. Once the count exceeds 9999, the counter will be reset to “0.”
5_44	oPC.Er	Option error factor 3	Displays the content of errors that have occurred in the option installed in the C-Port.

Table 3.4-12 “Maintenance Information” display items (cont.)

Monitor No.	Symbol	Item	Displayed content
5_47	oPA.id	Option A type	Displays the type of option installed in the A-Port. See Table 3.4-13 for the display content.
5_48	oPb.id	Option B type	Displays the type of option installed in the B-Port. See Table 3.4-13 for the displayed content.
5_49	oPC.id	Option C type	Displays the type of option installed in the C-Port. See Table 3.4-13 for the displayed content.
5_50	brP.M	Maximum regenerative load factor value	Displays the maximum value when the 5_51 inverter power is ON. The value returns to 0 when the inverter power is turned OFF.
5_51	brP	Regenerative load factor	Displays the regenerative load factor in 100 s intervals. The value is calculated and updated every 100 s while the inverter power is ON.
5_52	db.on.M	Maximum braking resistor operation frequency value	Displays the maximum value when the 5_53 inverter power is ON. The value returns to 0 when the inverter power is turned OFF.
5_53	db.on	Braking resistor operation frequency	Displays the braking resistor operation frequency (time ratio) in 100 s intervals. The value is calculated and updated every 100 s while the inverter power is ON.
5_54	thr.db	Breaking resistor thermal overload relay operation value	Displays the thermal overload relay operation value percentage at the current time. A dBH alarm occurs at 100%.
5_55	thr.tr	Inverter thermal overload relay operation value 1	Displays the thermal overload relay operation value percentage at the current time. An OLU alarm occurs at 100%.
5_56	thr.PC	Inverter thermal overload relay operation value 2	Displays the thermal overload relay operation value percentage at the current time. An OLU alarm occurs at 100%.
5_57	thr.73	Inverter thermal overload relay operation value 3	Displays the thermal overload relay operation value percentage at the current time. An OLU alarm occurs at 100%.
5_58	iGbt	IGBT life expectancy	Estimates the IGBT life expectancy from changes in IGBT temperature, and displays the remaining times as a percentage. Can be displayed/output as light alarm iGb or L iF. A light alarm occurs if less than 10%. Display range: 0 to 100%

Table 3.4-13 Option type display list

Displayed content	Option type
- - - - -	Not connected
PG	OPC-PG
PG2.3	OPC-PG2
PMPG	OPC-PMPG / OPC-PG22
d I	OPC-DI
do	OPC-DO
A Io	OPC-AIO
PdP	OPC-PDP2
dEV	OPC-DEV
CoP	OPC-COP2
CCL	OPC-CCL
tL	OPC-TL
SY	OPC-SX

3.4.6 Reading alarm information "Alarm Information: 6.AL"

Menu number 6 "Alarm Information: 6.AL" shows the causes of the past 4 alarms with an alarm code. Further, it is also possible to display alarm information that indicates the status of the inverter when the alarm occurred. Fig. 3.4-3 lists " "Alarm Information" menu transition". The menu transition in "Table 3.4-14" is shown in "Alarm Information" display content.

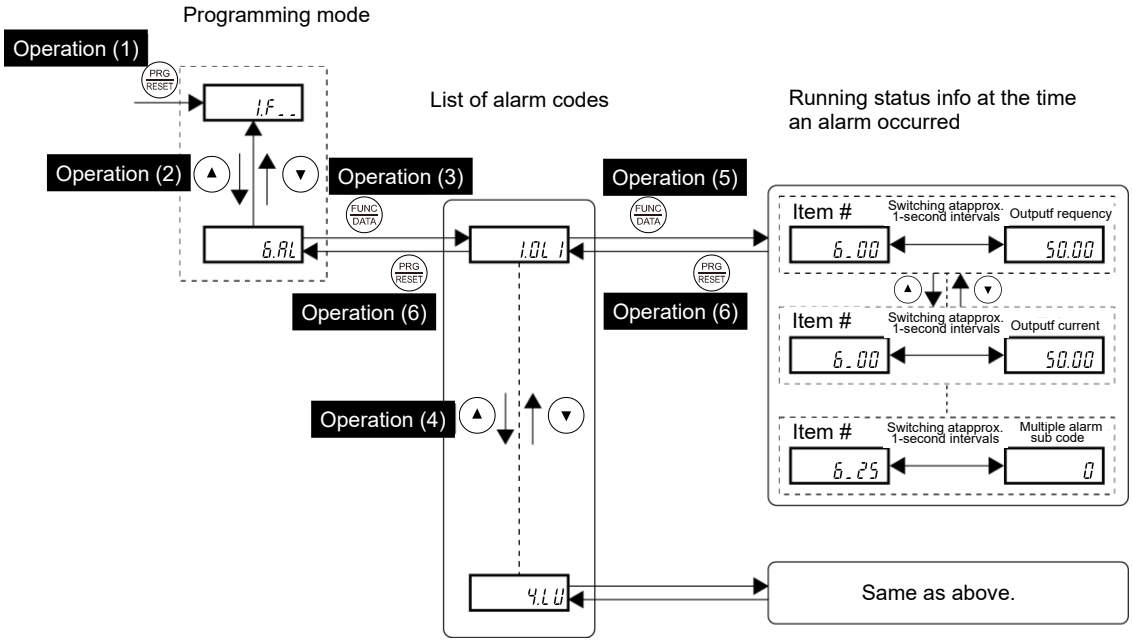


Fig. 3.4-3 "Alarm Information" menu transition

Basic key operation

Operation (1) Turn the inverter ON. It automatically enters Running mode in which you press the PRG RESET key to switch to Programming mode. The function selection menu appears.

Operation (2) Use the ▲ or ▲ key to display "Alarm Information" (6.AL).
Press the M key to skip in menu number units.

Operation (3) Press the FUNC DATA key to proceed to the list of alarm codes (e.g., 1.0L 1).
In the list of alarm codes, the alarm information for the last 4 alarms is saved as an alarm history.

Operation (4) Each time the ▲ or ▲ key is pressed, the last 4 alarms are displayed beginning with the most recent one in the order "1.", "2.", "3.", "4.".
By pressing the M key, the display returns to the latest alarm history.

Operation (5) Press the FUNC DATA key with an alarm code being displayed.
The monitor number (e.g. 6-00) and the inverter status information (e.g. Output frequency) at the time of the alarm occurrence alternately appear at approx. 1-second intervals. Pressing the ▲/▲ keys displays other monitor numbers (e.g., 6-01) and the status information (e.g., Output current) for that alarm code.
By pressing the FUNC DATA key at this time, the display can be switched between the monitor number and symbol.

Operation (6) Press the PRG RESET key to return to the list of alarm codes. Press the PRG RESET key again to return to the menu.

Table 3.4-14 “Alarm Information” display content

Monitor No.	Symbol	Displayed content	Description
6.00	FouT1	Output frequency	Output frequency before slip compensation when alarm occurred
6.01	iout	Output current when alarm occurred.	Output current when alarm occurred. Unit: A (amperes)
6.02	Vout	Output voltage when alarm occurred	Output voltage when alarm occurred Unit: V (volts)
6.03	trq	Calculated motor output torque when alarm occurred	Calculated motor output torque when alarm occurred
6.04	FrEF	Frequency specified by frequency command when alarm occurred	Frequency specified by frequency command when alarm occurred
6.05	rot	Rotation direction	Displays the current rotation direction when alarm occurred. F: forward, r: reverse, -----: stop
6.06	StAt1	Running status	Running status in 4-digit hexadecimal format Refer to “Displaying running status (3 07 and running status 2 (3 23 ” in “3.4.3 Monitoring the running status “Drive Monitoring: 3.oPE ” on page 3-23 for details.
6.07	tiME	Cumulative run time	Displays the content of the cumulative power-ON time counter of the inverter when alarm occurred. Counter range: 0 to 65,535 hours Display range: 0 to 65535 When the count exceeds 65,535, the counter will be reset to “0” and start over again.
6.08	no.St	Number of startups	Displays the content of the motor startup counter (i.e., the number of run commands issued) when alarm occurred. Counter range: 0 to 65,535 times Display range: 0 to 65535 When the count exceeds 65,535, the counter will be reset to “0” and start over again.
6.09	Edc	DC link bus voltage	Displays the DC link bus voltage of the inverter main circuit. Unit: V (volts)
6.10	t-int	Temperature inside the inverter	Displays the temperature of the inverter heat sink when alarm occurred. Unit: °C
6.11	t-Fin	Max. temperature of heat sink	Displays the temperature of the inverter heat sink when alarm occurred. Unit: °C

Table 3.4-14 “Alarm Information” display content (cont.)

Monitor No.	Symbol	Displayed content	Description
6_12	dio	Terminal I/O signal status (displayed with ON/OFF of LED segments)	Refer to “Table 3.4-9 Display of I/O signal status with ON/OFF of each LED segment” and “Table 3.4-10 Display of I/O signal status in hexadecimal notation (example)” in “3.4.4 Checking I/O signal status “I/O Checking: 4.1_0 .”
6_13	di-H	Terminal input signal status (in hexadecimal)	
6_14	do-H	Terminal output signal status (in hexadecimal)	
6_15	no.AL	No. of consecutive occurrences	Shows how many times the same alarm has occurred consecutively.
6_16	oLAP1	Multiple alarm 1	Simultaneously occurring alarm code (1) (“----” is displayed if no alarm has occurred.)
6_17	oLAP2	Multiple alarm 2	Simultaneously occurring alarm code (2) (“----” is displayed if no alarm has occurred.)
6_18	dioL	Terminal I/O signal status under communications control (displayed with the ON/OFF of LED segments)	Displays the ON/OFF state of the digital I/O terminals under RS-485 communications control when alarm occurred. Refer to “Displaying control I/O signal terminals under communications control” in “3.4.4 Checking I/O signal status “I/O Checking: 4.1_0 ”for the display content.
6_19	diL-H	Terminal input signal status under communications control (in hexadecimal)	
6_20	doL-H	Terminal output signal status under communications control (in hexadecimal)	
6_21	Sub	Error sub code	Secondary error code for an alarm.
6_22	StAt2	Running status 2	Displays running status 2 in 5-digit hexadecimal format. Refer to "Table 3.4-4 Running status 2 (3_23) bit assignment" in “3.4.3 Monitoring the running status “Drive Monitoring: 3.oPE ” for details.
6_23	SPEEd	Detected value	Displays the detected speed value when alarm occurred.
6_24	StAt3	Running status 3	Displays running status 3 in 5-digit hexadecimal format. Refer to “Table 3.4-15 Running Status 3 (6_24) bit assignment " below for details.
6_25	Sub.o1	Multiple alarm sub code	Secondary error code for a multiple alarm

Note When the same alarm occurs repeatedly in succession, the alarm information for the first and the most recent occurrences will be preserved and the information for other occurrences in-between will be discarded. The number of consecutive occurrences will be preserved as the first alarm information.

Table 3.4-15 Running Status 3 (d.24) bit assignment

Bit	Symbol	Content	Bit	Symbol	Content
15	-	Always “0.”	7	FAN	“1” when the fan is in operation.
14	ID2	“1” when current 2 is detected.	6	KP	1 when keypad operation being performed
13	IDL	“1” when low current is detected.	5	OL	“1” when a motor overload early warning is issued.
12	ID	“1” when current is detected.	4	IPF	“1” during auto-restarting after momentary power failure.
11	OLP	“1” under overload prevention control.	3	SWM2	“1” when motor 2 is selected.
10	LIFE	“1” when a lifetime early warning is issued.	2	RDY	“1” when the inverter is ready to run.
9	OH	“1” when a heat sink overheat early warning is issued.	1	FDT	“1” when frequency is detected.
8	TRY	“1” during auto-resetting.	0	FAR	“1” when a frequency arrival signal is issued.

3.4.7 Copying data "Data Copying: 7.CPY"

Data copying is used when reading function code data from the inverter and saving it in the TP-E2 keypad provided or in the multifunction keypad (TP-A2SW option), when writing function code data to another inverter, or when comparing function code data saved to the keypad with function code data set in the inverter.

In addition, using menu number 7 allows you to store the running status information in the keypad, detach the keypad from the inverter, connect it to a PC running FRENIC Loader at an office or off-site place, and check the inverter running status without removing the inverter itself.

To store the inverter running status information in the keypad, use "Read data" (rEAd) or "Read inverter running information" (chEc) function. For details on how to connect the keypad to a PC and check the inverter running status information stored in the keypad, refer to the FRENIC Loader Instruction Manual.

Table 3.4-4 below shows the menu transition in menu number 7 "Data Copying." The TP-E2 keypad can store function code data for a single inverter.

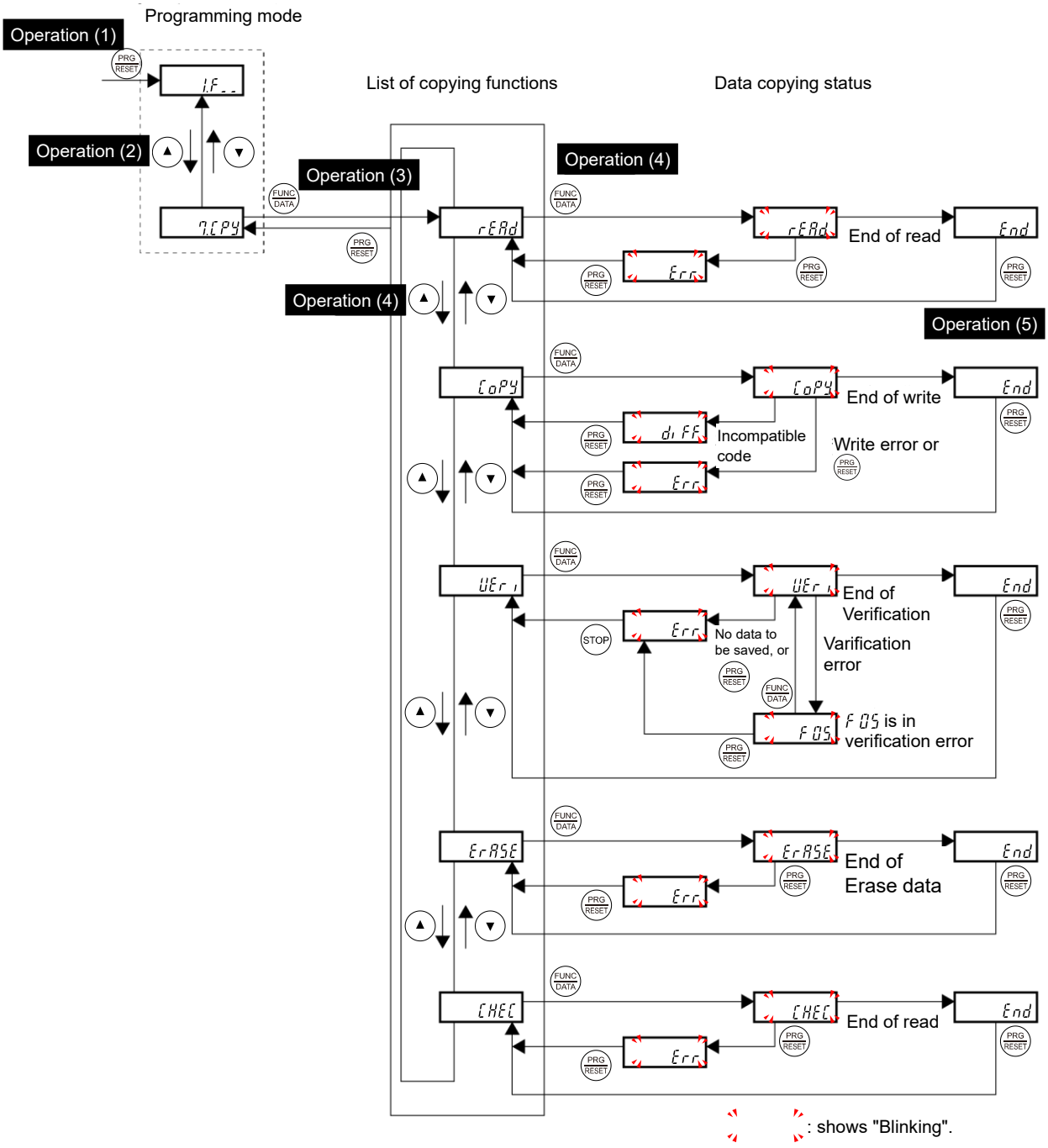


Table 3.4-4 "Data Copying" status transition

If "Err" or "d iFF" appears, refer to "■ If unable to copy".

Basic key operation

Operation (2) Turn the inverter ON. It automatically enters Running mode in which you press the PRG/RESET key to switch to Programming mode. The function selection menu appears.

Operation (2) Use the ▲ and ▲ keys to display "Data Copying" (7.CPY).
Press the ▶ key to skip in menu number units.

Operation (2) Press the FUNC/DATA key to proceed to the list of data copying functions (e.g., "rEAd").

Operation (2) Use the ▲ and ▲ keys to select the desired function, then press the FUNC/DATA key to execute the selected function.
(e.g., "rEAd" will blink.)

Operation (2) When the selected function has been completed, "End" appears. Press the PRG/RESET key to return to the list of data copying functions. Press the PRG/RESET key again to return to the menu.

Details on each of the data copy functions using the TP-E2 keypad provided are shown below.

Table 3.4-16 List of data copying functions

LED indication	Function	Description
rEAd	Read data	Reads the function code data out of the inverter memory and stores it in the keypad memory. Also reads out inverter's current running status information which can be checked by FRENIC Loader, such as information of I/O, system, alarm, and running status. Pressing the PRG/RESET key during a read operation (when "rEAd" is blinking) immediately aborts the operation and displays err (blinking). By canceling, all data stored in the keypad memory is cleared.
CoPY	Write data	Writes data stored in the keypad memory into the inverter memory. If you press the PRG/RESET key during a write operation (when "CoPY" is blinking), the write operation that is under way will be forcibly aborted and "Err" will appear (blinking). Inverter function code data prior to forcibly aborting will be incompletely changed. Do not run the inverter in this condition. Instead, perform initialization or rewrite the entire data. If unable to copy, refer to "Reading maintenance **information** "Maintenance Information: 5.CHE " on page 3-31. When copying is finished, the operation will be automatically verified. Displays the function code that was not been copied when copying in case that the voltage and capacity are different.
VEr 1	Verify data	Verifies (compares) the data stored in the keypad memory with that in the inverter's memory. If any mismatch is detected, the verify operation will be aborted, with the function code that differs displayed blinking. Pressing the FUNC/DATA key again resumes verification from the next function code. Pressing the PRG/RESET key during a verify operation (when "VEr 1" is blinking) immediately aborts the operation and displays "Err" (blinking). "Err" appears blinking also when the keypad does not contain any valid data.
ErASE	Erase data	Clears all data stored in the keypad memory. This does not impact inverter function code data.
CHEC	Read inverter running information	Reads out inverter's current running status information that can be checked by FRENIC Loader, such as information of I/O, system, alarm, and running status, excluding function code data. Use this command when the function code data saved in the keypad should not be overwritten and it is necessary to keep the previous data. Pressing the PRG/RESET key during a read operation (CHEC blinking) immediately aborts the operation and displays "Err" (blinking).

Table 3.4-17 List of data copying functions (cont.)

LED indication	Function	Description
PrOF	Enable Data protection	Enables the protection of data stored in the keypad memory. Data cannot be read or erased from the keypad. Data writing, verification, and inverter operating information reading are possible. Upon pressing the FUNC DATA key the inverter immediately displays "Err".

Tip If "Err" is blinking, press the PRG RESET key to cancel.
If "diFF" is blinking, it is possible to continue by pressing the FUNC DATA key, but expanded function code data is not changed.

■ Data protection

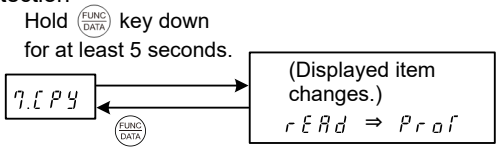
You can protect data saved in the keypad from unexpected modifications. By enabling the data protect function, "rEAd" and "ErASE" in the data copy function list change to "PrOF", and data reading and keypad data erasure from the inverter are prohibited.

To enable or disable the data protection, follow the next steps.

(1) Select the "Data Copying" (7.CPY) on the function selection menu in Programming mode.
(2) When "Data Copying" (7.CPY) is displayed, holding the FUNC DATA key down for at least 5 seconds alternates data protection status between enabled or disabled.

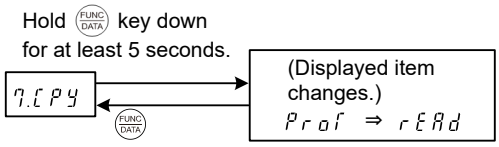
Note For switching the data protection status, be sure to hold the FUNC DATA key down for at least 5 seconds. Once the key is released within 5 seconds, press the PRG RESET key to go back to the 7.cPY display and perform the keying operation again.

- Enabling the disabled data protection



When "Data Copying" (7.CPY) is displayed, holding down the FUNC DATA key for at least 5 seconds shows "rEAd" for 5 seconds and then switches to "PrOF", enabling data protection.

- Disabling the enabled data protection



When "Data Copying" (7.CPY) is displayed, holding down the FUNC DATA key for at least 5 seconds shows "PrOF" for 5 seconds and then switches to "rEAd", disabling data protection.

The following are restrictions and special notes concerning “Data Copying.”

■ **If unable to copy**

Check whether the “err” or “dIFF” display is blinking.

(1) When the “Err” display is blinking (write error), the following causes are conceivable.

- No data has been saved to the keypad memory. (If data has not been read even once since the product was shipped, or was canceled while data was being read)
- There is a problem with the data saved to the keypad memory.
- The inverter model is different.
- Data was written while the inverter was running.
- Inverter data is protected (function code F00 = 1).
- The permit editing command “WE-KP” is OFF.
- Data reading was attempted when data protection was enabled.

(2) When the “dIFF” display is blinking, the following cause is conceivable.

- If the inverter type is the same:

  When writing data from a new ROM version to an inverter with an old ROM version, “diff” appears if there is no data compatibility. (This error does not occur if writing data from an old ROM version to an inverter with a new ROM version.) Copying can be continued by pressing the FUNC DATA key. In this case, data is not copied to added function codes by upgrading, but compatibility is retained and data is copied to existing function codes.

- If the inverter type differs for special specification products, etc.

  Data with no compatibility will be copied, and therefore data copying should not be performed.

3.4.8 Setting “Favorites” function code data “Favorites: 0.FnC”

Menu number 0 “Favorites” in Programming mode allows you to display only those function codes in “Favorites”, and make changes to function code data. There is no limit to the number of function code data items that can be registered.

Registering and deleting “Favorites”

By pressing the (M) and (FUNC DATA) keys simultaneously while the number of the function code to be registered in “Favorites” is displayed in menu number 1 “Data Setting”, the function code data is registered in “Favorites”.

The following example describes the procedure for registering and deleting F01 frequency setting 1 in “Favorites”.

By pressing the (M) and (FUNC DATA) keys simultaneously while F01 is displayed, the bar at the top indicating that data has been registered is displayed on the left of the function code. Performing the same operation again deletes the registered data from “Favorites”, and the top bar disappears.

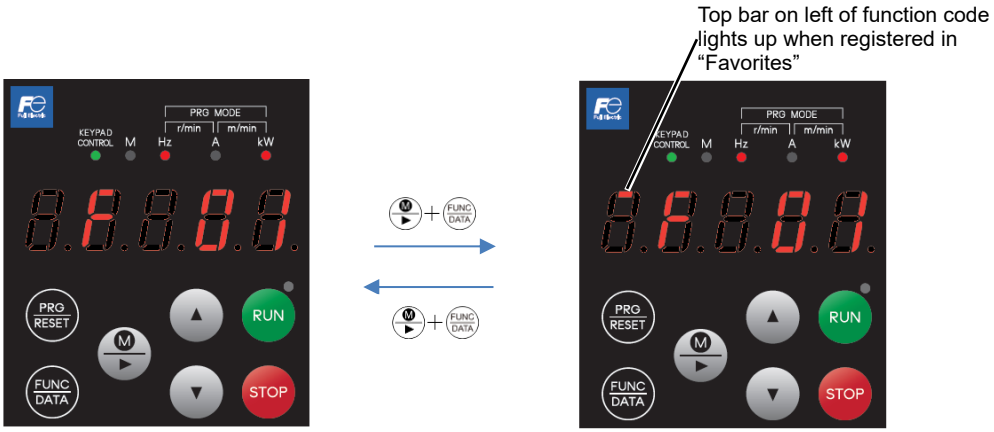


Fig. 3.4-5 Registering and displaying favorites

By copying data with the keypad, function codes registered in favorites can also be copied.

By writing “13” for H03, all registered function codes can be deleted.

3.5 Alarm Mode

If an abnormal condition arises, the protective function is invoked and issues an alarm, then the inverter automatically enters Alarm mode. At the same time, an alarm code appears on the LED monitor.

3.5.1 Releasing the alarm and switching to Running mode

Remove the cause of the alarm and press the PRG/RESET key to release the alarm and return to Running mode. The alarm can be removed using the PRG/RESET key only when the alarm code is displayed.

3.5.2 Displaying the alarm history

It is possible to display the most recent 3 alarm codes in addition to the one currently displayed. Previous alarm codes can be displayed by pressing the ▲/▲ key while the current alarm code is displayed.

3.5.3 Displaying the status of inverter at the time of alarm

When the alarm code is displayed, you may check various running status information when the alarm occurred (output frequency and output current, etc.) by pressing the FUNC/DATA key. The monitor item number and data for each running status information will be displayed alternately.

Further, you can view various information items on the running status of the inverter using the ▲/▲ key. The information displayed is the same as for menu number 6 “Alarm Information” in Programming mode. Refer to Table 3.4-14 in “3.4.6 Reading alarm information “Alarm Information: 6.AL .”

Pressing the PRG/RESET key while the running status information is displayed returns to the alarm code display.

Note When the running status information is displayed after removal of the alarm cause, pressing the PRG/RESET key twice returns to the alarm code display and releases the inverter from the alarm state. This means that the motor starts running if a run command has been received by this time.

3.5.4 Switching to Programming mode

You can also switch to Programming mode by pressing "STOP + PRG/RESET keys” simultaneously with the alarm displayed, and modify the function code data.

3.6 USB Port

There is a USB cable connection port (miniB) on the front of the keypad. To connect the USB cable, open the connection port cover and connect the cable as shown below.

Connect the inverter directly to a PC with the USB cable. FRENIC Loader allows the user to edit, check, and manage inverter function codes, and perform remote operations such as monitoring data while the inverter is running, and starting and stopping the inverter. The running status and alarms, etc. can also be monitored.

Refer to the “FRENIC Loader Instruction Manual” for details on how to use FRENIC Loader.

Furthermore, the keypad can be temporarily used as memory media. Write the inverter running status to the keypad, disconnect the keypad, and then connect it to a PC with the USB cable at a location other than the workplace such as an office. Function code data and the inverter running status read with FRENIC Loader can be edited, set, and checked.

Refer to section “3.4.8 Copying data” for details on saving data