Fuji Electric
Innovating Energy Technology

取扱説明書
Instruction Manual
使用说明书

多機能タッチパネル
Multi-function Keypad
多功能操作面板
"TP-A1"

日本語
ENGLISH
汉语

富士電機株式会社
Fuji Electric Co., Ltd.
富士电机株式会社

INR-SI47-1810-JEC

English Version

ENGLISH

Preface

Thank you for purchasing our multi-function keypad "TP-A1."

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

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

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

The instruction manuals, user's manual, and other related materials are subject to change without notice. Be sure to obtain the latest editions for use.

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

ENGLISH

■ Safety precautions

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

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

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

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

Operation

⚠WARNING

- Be sure to install the terminal cover or the front cover before turning the power ON. Do not remove the covers while power is applied.
  Otherwise electric shock could occur.
- Do not operate switches/buttons with wet hands.
  Doing so could cause electric shock.
- If the retry function has been selected, the inverter may automatically restart and drive the motor depending on the cause of tripping.
  (Design the machinery or equipment so that human safety is ensured after restarting.)
- If the stall prevention function has been selected, the inverter may operate at an acceleration/deceleration time or frequency different from the set ones. Design the machine so that safety is ensured even in such cases.
  Otherwise an accident could occur.
- The (STOP) key on the keypad is enabled only when "RUN/STOP keys on keypad" is selected with function code F02. Prepare an emergency stop switch separately. If you disable the STOP key priority function and enable operation by external commands, the inverter cannot be emergency-stopped by the (STOP) key on the keypad.
- If an alarm state is reset with the run signal being turned ON, a sudden start will occur. Ensure that the run signal is turned OFF beforehand.
  Otherwise an accident could occur.
- If the "Restart mode after momentary power failure" is set to "Continue to run or Restart" (Function code F14 = 3, 4, or 5), then the inverter automatically restarts running the motor when the power is recovered.
  (Design the machinery or equipment so that human safety is ensured after restarting.)
- If you set the function codes wrongly or without completely understanding the related instruction manuals and user's manual, the motor may rotate with a torque or at a speed not permitted for the machine.
  An accident or injuries could occur.
- Never touch the inverter terminals while the power is applied to the inverter even if the inverter stops.
  Doing so could cause electric shock.

⚠CAUTION

- Ensure safety before modifying the function code settings or copying them (writing into the inverter).
  Run commands (e.g., "Run forward" ***FWD***), stop commands (e.g., "Coast to a stop" ***BX***), and frequency change commands can be assigned to digital input terminals. Depending upon the assignment states of those terminals, modifying or copying the function code settings may cause a sudden motor start or an abrupt change in speed.
- Ensure safety before modifying customizable logic related function code settings (U codes and related function codes), copying them (writing into the inverter), or turning ON the "Cancel customizable logic" terminal command ***CLC***. Depending upon the settings, such modification, copying or cancellation of the customizable logic may change the operation sequence to cause a sudden motor start or an unexpected motor operation.
  An accident or injuries could occur.

Wiring

⚠WARNING

- Do not operate the switches/buttons with wet hands.
  Doing so could cause electric shock.
- Before opening the cover of the inverter to mount the multi-functional keypad, turn OFF the inverter and wait for at least five minutes for models of 22 kW or below, or ten minutes for models of 30 kW or above. Further, make sure that the LED monitor is turned OFF, the charger indicator is OFF, and the DC link bus voltage between the terminals P (+) and N (-) has dropped below the safe voltage level (+25 VDC), using a circuit tester or another appropriate instrument.
  Otherwise electric shock could occur.
- In general, sheaths of the control signal wires are not specifically designed to withstand a high voltage (i.e., reinforced insulation is not applied). Therefore, if a control signal wire comes into direct contact with a live conductor of the main circuit, the insulation of the sheath might break down, which would expose the signal wire to a high voltage of the main circuit. Make sure that the control signal wires will not come into contact with live conductors of the main circuit.
  Otherwise, an accident or electric shock could occur.

Disposal

⚠CAUTION

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

Others

⚠WARNING

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

ENGLISH

GENERAL PRECAUTIONS

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

How this manual is organized

This manual is made up of Chapters 1 through 4.

Chapter 1 BEFORE USE

This chapter describes the acceptance inspection and lists the inverters the multi-function keypad is designed to interface with.

Chapter 2 INSTALLATION AND INTERCONNECTION

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

Chapter 3 OPERATION USING THE MULTI-FUNCTION KEYPAD

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

Chapter 4 SPECIFICATIONS

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

Icons

The following icons are used throughout this manual.



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

This icon indicates a reference to more detailed information.

Table of Contents

Preface i
■ Safety precautions i
How this manual is organized iii

Chapter 1 BEFORE USE 1-1
1.1 Acceptance Inspection 1-1
1.2 Inverters with which the Multi-function Keypad Interfaces 1-1

Chapter 2 INSTALLATION AND INTERCONNECTION 2-1
2.1 Parts Required for Connection 2-1
2.2 Mounting the Multi-function Keypad 2-2

Chapter 3 OPERATION USING THE MULTI-FUNCTION KEYPAD 3-1
3.1 Names and Functions of Keypad Components 3-1
3.2 Overview of Operation Modes 3-5
3.3 Running Mode 3-6
3.3.1 Monitoring the running status 3-6
3.3.2 Setting up frequency 3-10
3.3.3 Running/stopping the motor 3-11
3.3.4 Jogging (inching) the motor (Available only in FRENIC-Ace) 3-12
3.3.5 Switching between the remote and local modes 3-12
3.3.6 Changing from keypad operation to external signal (terminal block) operation 3-13
3.3.7 Monitoring light alarms 3-13
3.4 Programming Mode 3-14
3.5 Notes (Difference between multi-function keypad and remote keypad) 3-17
3.5.1 Operation method (Function code F02) 3-17
3.5.2 Remote and local modes 3-17

Chapter 4 SPECIFICATIONS 4-1
4.1 General Specifications 4-1
4.2 Communication Specifications 4-2
4.3 Transmission Specifications 4-2

ENGLISH

Chapter 1 BEFORE USE

1.1 Acceptance Inspection

Unpack the package and check the following:

(1) The package contains a multi-function keypad and its instruction manual (this book).

(2) There have been no problems during transportation. In particular, no parts are damaged or have fallen out of place nor are there any dents on the body.

(3) The multi-function keypad has a label of the model name "TP-A1" ("TP-A1-E2C") on the back as shown in Figure 1.1.

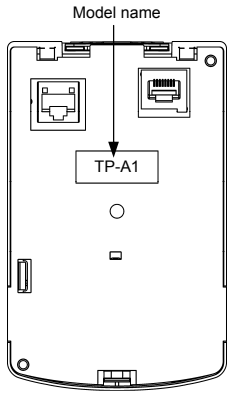


Figure 1.1 Back of Multi-function Keypad

The multi-function keypad is available in two models--"TP-A1" and "TP-A1-E2C." The languages supported by those models differ as listed below.

Model	Language
TP-A1	English, Chinese, Japanese, German, French, Spanish, Italian, Russian, Greek, Turkish, Malay, Vietnamese, Thai, Indonesian, Polish, Czech, Swedish, Portuguese, and Dutch
TP-A1-E2C	English, Chinese, and Japanese

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

1.2 Inverters with which the Multi-function Keypad Interfaces

The multi-function keypad interfaces with the following Fuji inverters:

FRENIC series	Type of inverter *1	Keypad model	Remarks
FRENIC-HVAC FRENIC-AQUA	FRN□□□AR1□-□□ FRN□□□AQ1□-□□	TP-A1	The keypad is available for all of these inverter types.
		TP-A1-E2C	The keypad is available for all of these inverter types.
FRENIC-Ace	FRN□□□E2□-□□	TP-A1	The keypad is not available. *2
		TP-A1-E2C	The keypad is available for all of these inverter types.

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

*2 If the multi-function keypad is connected to any unsupported inverter, the message "This inverter is not supported." appears on the LCD monitor.

Chapter 2 INSTALLATION AND INTERCONNECTION

2.1 Parts Required for Installation

To install the keypad on a place other than in an inverter, the parts listed below are needed.

Parts name	Model	Remarks
Extension cable (Note 1)	CB-5S, CB-3S and CB-1S	3 types available in length of 5 m, 3 m, and 1 m.
Fixing screw	M3 × □ (Note 2)	Two screws needed. Purchase off-the-shelf ones separately.

(Note 1) When using an off-the-shelf LAN cable, use a 10BASE-T/100BASE-TX straight type cable compliant with US ANSI/TIA/EIA-568A Category 5. (Less than 20 m)

Recommended LAN cable

Manufacturer: Sanwa Supply Inc.

Model: KB-10T5-01K (1 m)

KB-STP-01K: (1 m) (Shielded LAN cable to make the inverter compliant with the EMC Directive)

(Note 2) Use the screws with a length suitable for the wall thickness. (See Figure 2.1.)

ENGLISH

2.2 Mounting the Multi-function Keypad

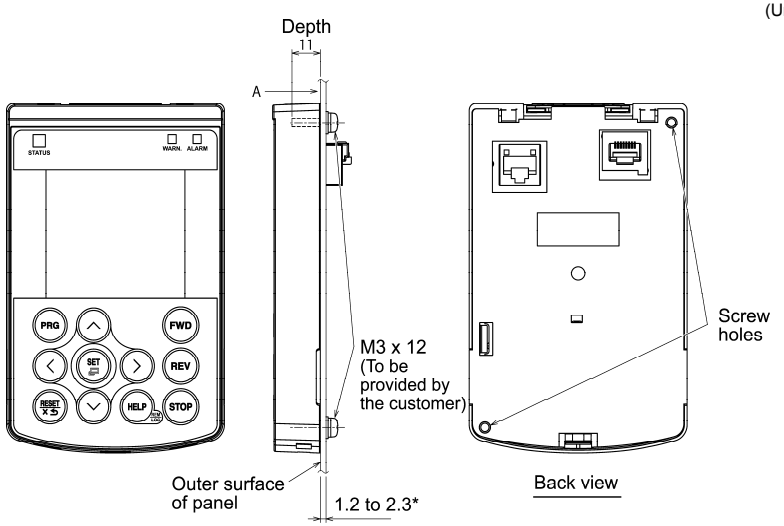
You can install and use the multi-function keypad in either of the following two ways:

- Mounting it on the panel (see Figures 2.1 to 2.3).
- Using it remotely in your hand (see Figure 2.3).

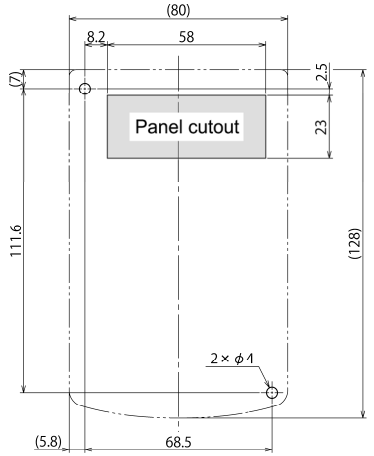
■ Mounting the multi-function keypad on the panel

(1) Cut the panel out for a single square area and perforate two screw holes on the panel wall as shown below. Make screws of an appropriate length ready for use.

(Unit: mm)



* If the thickness of the panel is outside the range specified here, use screws of an appropriate length.



Dimensions of panel cutting (viewed from A)

Figure 2.1 Location of Screw Holes and Dimension of Panel Cutout

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

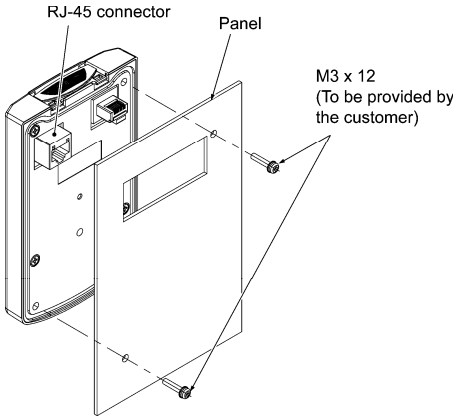


Figure 2.2 Mounting the Multi-function Keypad

(3) Using the remote operation extension cable (CB-5S, CB-3S or CB-1S) or a LAN cable (straight), interconnect the keypad and the inverter; Insert one end of the cable into the RJ-45 connector on the keypad and the other end into the RJ-45 connector (modular jack, designed for keypad connection) on the inverter.

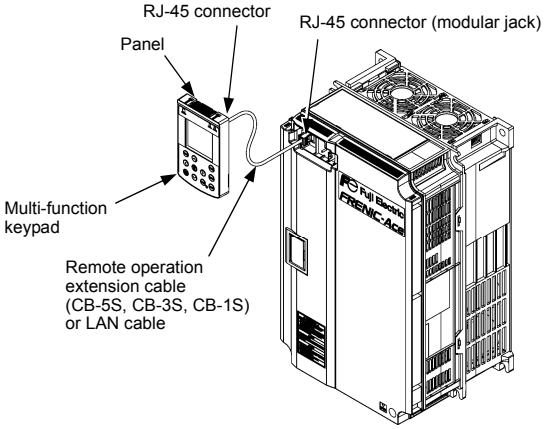


Figure 2.3 (a) FRENIC-Ace
Connecting the Multi-function Keypad to the Inverter with Remote Operation Extension Cable or an Off-the-shelf LAN Cable

ENGLISH

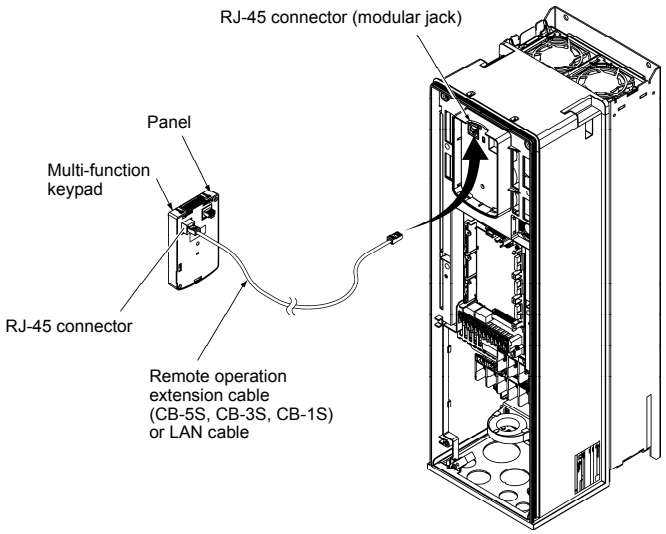


Figure 2.3 (b) FRENIC-HVAC/AQUA
Connecting the Multi-function Keypad to the Inverter with Remote Operation Extension Cable or an Off-the-shelf LAN Cable

(4) Be sure to put the front cover back into place before using the inverter.

■ Using the multi-function keypad remotely in your hand

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

Chapter 3 OPERATION USING THE MULTI-FUNCTION KEYPAD

3.1 Names and Functions of Keypad Components

The keypad allows you to run and stop the motor, monitor the running status, specify the function code data, and monitor I/O signal states, maintenance information, and alarm information.

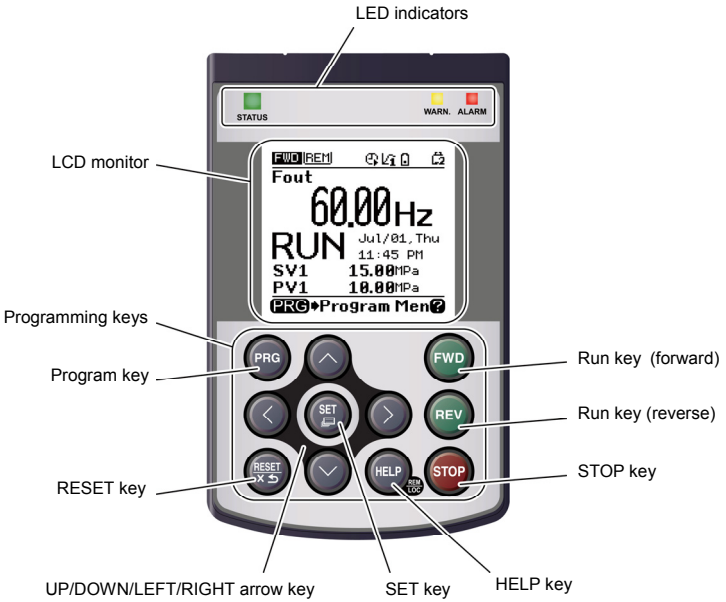


Figure 3.1 Names and Functions of Keypad Components

1. LED indicators: These indicators show the current running status of the inverter.	Refer to Table 3.1.
2. LCD monitor: This monitor shows the following various information about the inverter according to the operation modes.	Refer to Figure 3.2 and Table 3.3.
3. Keys: These keys are used to perform various inverter operations.	Refer to Table 3.2.

Table 3.1 Indication of LED Indicators

LED Indicators	Indication	
STATUS (Green)	Shows the inverter running state.	
	Flashing	No run command input (Inverter stopped)
	ON	Run command input
WARN. (Yellow)	Shows the light alarm state.	
	OFF	No light alarm has occurred.
	Flashing /ON	A light alarm has occurred.
ALARM (Red)	Shows the alarm state (heavy alarm).	
	OFF	No heavy alarm has occurred.
	Flashing	A heavy alarm has occurred.

ENGLISH

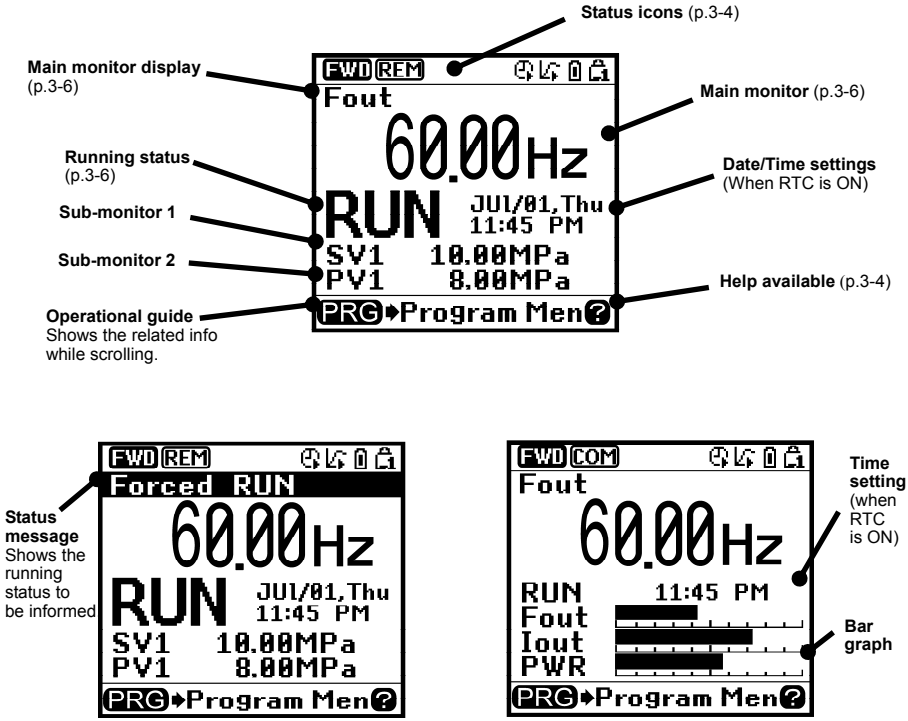
Table 3.2 Overview of Keypad Functions

Keys		Functions
Program key		This key switches the operation modes between Running mode/Alarm mode and Programming mode.
RESET key		Reset key which works as follows according to the operation modes. ■ In Running mode: This key cancels the screen transition. ■ In Programming mode: This key resets the alarm states and switches to Programming mode. ■ In Alarm mode: This key discards the settings being configured and cancels the screen transition.
UP/DOWN/ LEFT/RIGHT arrow key		UP/DOWN key which works as follows according to the operation modes. ■ In Running mode: These keys switch to the digital reference frequency and PID command modification screen (when commands from the keypad are enabled). ■ In Programming mode: These keys display multiple alarms and alarm history. ■ In Alarm mode: These keys select menu items, change data, and scroll the screen.
		These keys move the cursor to the digit of data to be modified, shift the setting item, and switch the screen.
SET key		Set key which works as follows according to the operation modes. ■ In Running mode: Pressing this key switches to the selection screen of the LCD monitor content. ■ In Programming mode: Pressing this key switches to the alarm detailed information screen. ■ In Alarm mode: Pressing this key established the selected items and data being changed.
HELP key		Pressing this key calls up the HELP screen according to the current display state. Holding it down for 2 seconds toggles between the remote and local modes.
Run key (forward)		Pressing this key starts running the motor in the forward rotation (when a run command from the keypad is enabled).
Run key (reverse)		Pressing this key starts running the motor in the reverse rotation (when a run command from the keypad is enabled).
STOP key		Pressing this key stops the motor (when a run command from the keypad is enabled or the STOP key priority is selected).

■ **LCD monitor**

The LCD monitor shows various information of the inverter according to the operation modes.

< Screen sample in Running mode >



< Screen sample in Alarm mode >

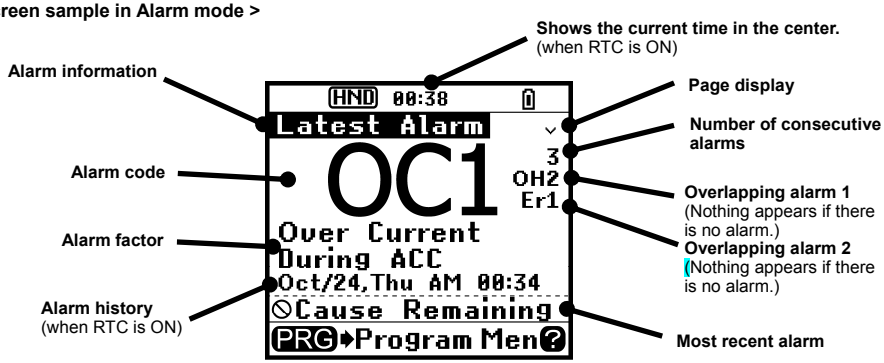


Figure 3.2 Screen Samples In Running and Alarm Modes

ENGLISH

Table 3.3 Icons on the LCD Monitor

Status icons that show the running status, run command sources and various icons

FWD	Running status (rotation direction)	Running forward
REV		Running reverse
HND	Run command source	Keypad
REM		External terminals
LOC		Keypad in local mode
COM		Communications link
	Timer operation	Running under timer control (Timer enabled and run command entered)
		• Stopped under timer control (Timer enabled and run command entered) • PID control being canceled (during running or stop) • Pause date (during running or stop)
		Timer enabled, real-time clock normal, no run command entered (except during canceling)
		Timer operation specified and real-time clock info lost (running prohibited) All of terminals [TM1] to [TM4] are OFF (running prohibited)
	PID operation (Internal PID)	Internal PID configured and PID1 being selected (This icon appears even a run command is OFF.)
		Internal PID configured and PID2 being selected (This icon appears even a run command is OFF.)
		PID operation stopped temporarily, e.g., due to slow flowrate (Run command being ON)
		PID operation canceled (including boost)
	Battery state	Battery connected and sufficiently charged.
		Battery not connected or low battery charge
	Password protection state	Inverter being locked (Force to stop, Inoperable)
		Locked with password 2 (Access to function codes is prohibited.)
		Locked with password 1 (Function code data change is prohibited.)
		Lock being released (Password being canceled)

Running status

STOP	Running status	No run command entered or inverter stopped
RUN		Run command entered or during inverter output

HELP that displays help information corresponding to the current screen

	Help available
(flashing)	Help being displayed

Tip LCDs have temperature characteristics. The low temperature slows down the LCD response; the high temperature makes the screen contrast high so that contrast adjustment may be needed.

Note Icons to be displayed differ depending upon the applied inverter and function code data settings.

3.2 Overview of Operation Modes

The keypad features the following three operation modes:

■ Running mode: After 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 FWD / REV / STOP keys.

It is also possible to monitor the running status in real time.

■ 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 this mode, you can view the corresponding alarm code* and its related information on the LCD monitor.

* Alarm code: Indicates the cause of the alarm condition. For details, refer to the protective function detailed in the FRENIC-HVAC/AQUA User's Manual, Chapter 9 or FRENIC-Ace User's Manual, Chapter 6, and in the detailed PDF version of the multi-function keypad instruction manual, Section 3.4.5 "Reading alarm information."

Figure 3.3 shows the status transition of the inverter between these three operation modes. If the inverter is turned ON, it automatically enters Running mode, making it possible to start or stop the motor.

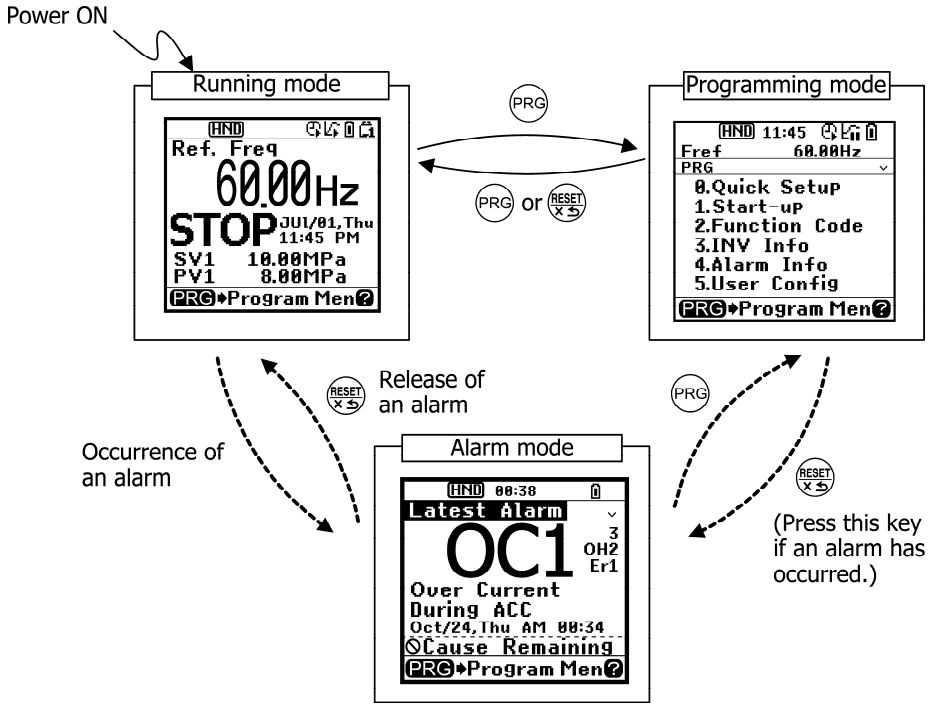


Figure 3.3 Status Transition between Operation Modes

ENGLISH

3.3 Running Mode

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

(1) Monitor the running status (e.g., output frequency and output current),
(2) Configure the reference frequency and PID commands, etc.,
(3) Run/stop the motor,
(4) Switch between remote and local modes
(5) Switch the operation from the keypad to the one by external signals (terminal block), and
(6) Monitor light alarms

3.3.1 Monitoring the running status

In Running mode, the items listed below can be monitored. Immediately after the inverter is turned on, the monitor item specified by the display item selection function***1** is displayed. Press the (SET) key to switch between monitor items.

*1 Function code K10 for the FRENIC-HVAC/AQUA series
Function code E43 for the FRENIC-Ace series

Table 3.4 Monitoring Items (Selectable anytime)

Monitor names	Sub-monitor	Unit	Meaning of displayed value	HVAC/AQUA	Ace	Function code data	
						K10	E43
Speed monitor	The speed monitor selection function***2** specifies what to be displayed on the main monitor.					0	0
Output frequency	Fout1	Hz	Frequency (before slip compensation) actually being output	Y	Y	(K11 = 1)	(E48 = 0)
Output frequency (primary)	Fout2	Hz	Frequency (after slip compensation) actually being output	Y	Y	(K11 = 2)	(E48 = 1)
Reference frequency	Fref	Hz	Reference frequency being set	Y	Y	(K11 = 3)	(E48 = 2)
Motor speed	Sync	r/min	Output frequency (Hz) x $\frac{120}{P01}$	Y	Y	(K11 = 4)	(E48 = 3)
Load shaft speed	Load	r/min	Output frequency (Hz) × K30	Y	-	(K11 = 5)	
			Output frequency (Hz) × E50	-	Y		(E48 = 4)
Line speed	Line	m/min	Output frequency (Hz) × K30	N	-	-	
			Output frequency (Hz) × E50	-	Y		(E48 = 5)
Constant feeding rate time	Feed	min	$\frac{E50}{\text{Output frequency (Hz)} \times E39}$	N	Y	-	(E48 = 6)
Speed (%)	SPD	%	$\frac{\text{Output frequency}}{\text{Maximum frequency}} \times 100$	Y	Y	(K11 = 8)	(E48 = 7)
Output current	Iout	A	Current output from the inverter in RMS	Y	Y	13	3
Output voltage	Vout	V	Voltage output from the inverter in RMS	Y	Y	14	4
Calculated torque	TRQ	%	Motor output torque in % (Calculated value)	Y	Y	18	8
Input power	PWR	kW	Input power to the inverter	Y	Y	19	9
PID command (final) (Note 1)	SV	J105	PID command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J105.	N	Y	-	10
PID feedback value (Note 1)	PV	J105		N	Y	-	12

*2 Function code K11 for the FRENIC-HVAC/AQUA series
Function code E48 for the FRENIC-Ace series

Table 3.4 Monitoring Items (Selectable anytime) (Continued)

Monitor names	Sub-monitor	Unit	Meaning of displayed value	HVAC/AQUA	Ace	Function code data	
						K10	E43
Timer count in seconds (Note 2)	Timer	s	Remaining time for the timer operation enabled.	N	Y	-	13
PID output (Note 1)	MV	%	PID output in %, assuming the maximum frequency (F03) as 100%	N	Y	-	14
Load factor	LOF	%	Load factor of the motor in % as the rated output being at 100%	Y	Y	25	15
Motor output	MPW	kW	Motor output in kW	Y	Y	26	16
Analog input monitor (Note 3)	AMon	Unit specified for each terminal	Shows an analog input to the inverter in a format suitable for a desired scale. Refer to the function codes below. Terminal [12]: C59, C60 Terminal [C1]: C65, C66 Terminal [V2]: C71, C72	Y	Y	27	17
Current position pulse (Note 4)	P.PLS	pulse	Shows the current position pulse for positioning control.	N	Y	-	21
Position deviation pulse (Note 4)	d.PLS	pulse	Shows the position deviation pulse for positioning control.	N	Y	-	22
Torque current (Note 5)	TRQI	%	Shows the torque current command value or calculated torque current.	N	Y	-	23
Exciting current magnetic flux command (Note 5)	Flux	%	Shows the magnetic flux command value.	N	Y	-	24
Input watt-hour	Wh	–	$\frac{\text{Input watt-hour (kWh)}}{100}$				
			Refer to function code K31 for details.	Y	-	35	
			Refer to function code E51 for details.	-	Y		25

(Note 1) These items appear when J01 (PID control) ≠ 0. The , which indicates that the internal PID is selected, is displayed on the status icon field.

(Note 2) This item appears only when timer operation is enabled (Function code C21).

(Note 3) The analog input monitor appears only when it is assigned to terminal [12], [C1] or [V2] with any of E61 to E63 (data = 20). Specify the display unit with C58, C64 or C70.

(Note 4) These items appear only when positioning control is enabled, e.g., by assigning the ***S/R*** function ("Start/reset") to any input terminal.

(Note 5) These items appear only when vector control is enabled (Function code F42).

ENGLISH

The following monitor items appear only when the related PID control or external PID control is enabled. Items being disabled cannot be displayed.

Table 3.5 Monitoring Items (Selectable when PID control or external PID control is enabled)

Monitor names	Sub-monitor	Unit	Meaning of displayed value	HVAC/ AQUA	Ace	Function code data for K10, E43
PID command (Note 6)	SV	J105 J205	PID command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J105 or J205.	Y	N	50
PID feedback value (Note 6)	PV	J105 J205		Y	N	51
PID output (Note 6)	MV	%	PID output in %, assuming the maximum frequency (F03) as 100%	Y	N	52
PID control 1 command (Note 7)	SV1	J105	PID control 1 command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J105.	Y	N	53
PID control 1 feedback value (Note 7)	PV1	J105		Y	N	54
PID control 2 command (Note 7)	SV2	J205	PID control 2 command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J205.	Y	N	55
PID control 2 feedback value (Note 7)	PV2	J205		Y	N	56
External PID control 1 command (final) (Note 8)	E. SVF	J505 J605	PID command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J505 or J605.	Y	N	60
External PID control 1 feedback value (final) (Note 8)	E. PVF	J505 J605		Y	N	61
External PID control 1 output (Note 8)	E. MV1	%	External PID output in %, assuming the PID output as 100%	Y	N	62
External PID control 1 manual command (Note 9)	E. MU1	%	External PID manual command in %, assuming the manual command value as 100%	Y	N	63
External PID control 1 command (Note 10)	E. SV1	J505	PID command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J505.	Y	N	64
External PID control 1 feedback value (Note 10)	E. PV1	J505		Y	N	65
External PID control 2 command (Note 11)	E. SV2	J605	PID command and its feedback converted into physical quantities of the object to be controlled. The display unit can be selected with Function code J605.	Y	N	70
External PID control 2 feedback value (Note 11)	E. PV2	J605		Y	N	71
External PID control 2 output (Note 11)	E. MV2	%	External PID output in %, assuming the PID output as 100%	Y	N	72
External PID control 2 manual command (Note 12)	E. MU2	%	External PID manual command in %, assuming the manual command value as 100%	Y	N	73

Table 3.5 Monitoring Items (Selectable when PID control or external PID control is enabled) (Continued)

Monitor names	Sub-monitor	Unit	Meaning of displayed value	HVAC/ AQUA	Ace	Function code data for K10, E43
External PID control 3 command (Note 13)	E. SV3	J655	PID command and its feedback converted into physical quantities of the object to be controlled.	Y	N	80
External PID control 3 feedback value (Note 13)	E. PV3	J655	The display unit can be selected with Function code J655.	Y	N	81
External PID control 3 output (Note 13)	E. MV3	%	External PID output in %, assuming the PID output as 100%	Y	N	82
External PID control 3 manual command (Note 14)	E. MU3	%	External PID manual command in %, assuming the manual command value as 100%	Y	N	83

(Note 6) These items appear when J101 (PID control 1) or J201 (PID control 2) ≠ 0. The LV_1 or LV_2 appears on the status icon field, indicating that the internal PID is selected.

(Note 7) These items appear when:
- J101 (PID control 1) or J201 (PID control 2) ≠ 0
- J101 or J104 (PID control 1) ≠ 0

(Note 8) These items appear when J501 (External PID control 1) ≠ 0.

(Note 9) This item appears when J501 (External PID control 1) ≠ 0 and ***%/EPID1*** ("Cancel external PID control 1") is assigned to any digital input terminal.

(Note 10) These items appear when J501 or J504 (External PID control 1) ≠ 0.

(Note 11) These items appear when J601 (External PID control 2) ≠ 0.

(Note 12) This item appears when J601 (External PID control 1) ≠ 0 and ***%/EPID2*** ("Cancel external PID control 2") is assigned to any digital input terminal.

(Note 13) These items appear when J651 (External PID control 3) ≠ 0.

(Note 14) This item appears when J651 (External PID control 3) ≠ 0 and ***%/EPID3*** ("Cancel external PID control 3") is assigned to any digital input terminal.

3.3.2 Setting up reference frequency

You can set up the desired reference frequency by using ⏶ and ⏷ keys on the keypad. It is also possible to set up the frequency command as load shaft speed, motor speed or speed (%) by setting the speed monitor selection function.*2

*2 Function code K11 for the FRENIC-HVAC/AQUA series
Function code E48 for the FRENIC-Ace series

■ Setting up a frequency command

Using the keypad (F01 = 0 (factory default) or 8)

(1) Set function code F01 to "0" or "8" (⏶ / ⏷ keys on keypad).
If the keypad is in Programming or Alarm mode, switch it to Running mode in which it is possible to set up a frequency command using the ⏶ / ⏷ keys.

(2) Press the ⏶ / ⏷ key to display the current reference frequency. The lowest digit blinks.

(3) To change the reference frequency, press the ⏶ / ⏷ key again. The new setting can be saved into the inverter's internal memory.

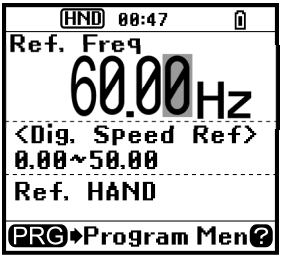


Figure 3.4 Setting up Frequency Command (display sample)

Tip

- The reference frequency will be saved either automatically by turning the main power OFF or only by pressing the SET key. You can choose either way using function code E64.
- When you start specifying the reference frequency or any other parameter with the ⏶ / ⏷ key, the least significant digit on the display blinks; that is, the cursor lies in the least significant digit. Holding down the ⏶ / ⏷ key changes data in the least significant digit and generates a carry, while the cursor remains in the least significant digit.
  Using the ⏴ / ⏵ key moves the cursor (blinking) between digits, making change to the large value easily.
- Setting F01 data to "8" (⏶ / ⏷ keys on keypad) enables the balanceless-bumpless switching. When the frequency command source is switched to the keypad from any other source, the inverter inherits the current frequency that has applied before switching, providing smooth switching and shockless running.

Using analog input (F01 = 1 to 3, or 5)

- Applying the gain and bias to analog inputs (voltage inputs to terminals [12] and [V2], and current input to terminal [C1]) enables the frequency to be set within an arbitrary range (frequency vs. analog input level).
  (Refer to the descriptions of F18, C32, C37, C42, C61, and C67.)
- Noise reduction filters are applicable to these analog inputs.
  (Refer to the descriptions of C33, C38 and C43.)
- The normal/inverse operation for the frequency command 1 setting (F01) can be selected with function code C53 and be switched between them with the terminal command ***IVS*** assigned to any of the digital input terminals.
  (Refer to the descriptions of E01 through E07.)

Note

- To input bipolar analog voltage (0 to ±10 VDC) to terminals [12] and [V2], set C35 and C45 data to "0." Setting C35 and C45 data to "1" enables the voltage range from 0 to +10 VDC and interprets the negative polarity input from 0 to -10 VDC as 0 V.
- A reference frequency can be specified not only as frequency (Hz) but also as any other menu item, depending on the setting of function code K11 (= 4, 5, or 8) or E48 (= 3, 4, 5, or 6).

3.3.3 Running/stopping the motor

FRENIC-HVAC/AQUA series

By factory default, pressing the FWD or REV key starts running the motor in the forward or reverse direction, respectively. Pressing the STOP key decelerates the motor to a stop.

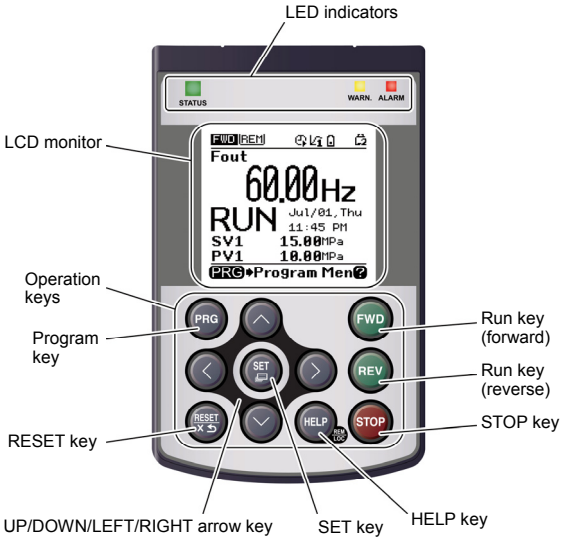
Running/stopping the motor from the keypad is possible in Running or Programming mode.

FRENIC-Ace series

By factory default, pressing the FWD key starts running the motor in the forward direction. Pressing the STOP key decelerates the motor to a stop. The REV key is disabled.

Running/stopping the motor from the keypad is possible in Running or Programming mode.

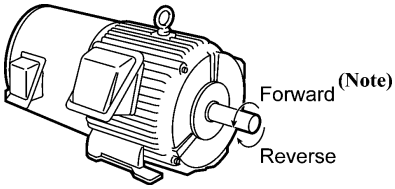
To run the motor in the reverse direction or to run it in the reversible mode, change the setting of function code F02.



■ **Operational relationship between function code F02 (Operation method) and FWD / REV key**

Table 3.6 Motor Rotation Direction Specified by F02

Data for F02	Motor rotation direction
0	FWD key: Forward direction REV key: Reverse direction (Factory default of the FRENIC-HVAC/AQUA series)
1	FWD and REV keys disabled (The motor is driven via terminals [FWD] and [REV].)
2	Forward direction (Factory default of the FRENIC-Ace series)
3	Reverse direction



(Note) The rotation direction of IEC-compliant motors is opposite to that of the motor shown here.

For details of function code F02, refer to the inverter's Instruction Manual, Chapter 6 "FUNCTION CODES."

ENGLISH

3.3.4 Jogging (inching) the motor (Available only in FRENIC-Ace)

To start jogging operation, perform the following procedure.

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

1) Switch the inverter to Running mode (see Section 3.2).
2) Press the "STOP + ▲ keys" simultaneously.

Tip

- Function code C20 specifies the jogging frequency. H54 and H55 specify the acceleration and deceleration times, respectively. These three function codes are exclusive to jogging operation. Configure each function code, if needed.
- 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 ready-to-jog state with the "STOP + ▲ keys" is possible only when the inverter is stopped.

(2) Jog the motor.

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

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

Press the "STOP + ▲ keys" simultaneously.

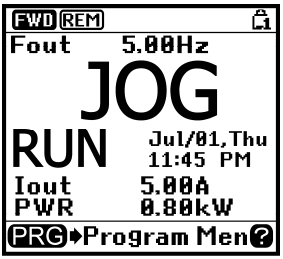


Figure 3.5 Screen Sample in Jogging Operation

3.3.5 Switching between the remote and local modes

The inverter is available in either remote or local mode.

In remote mode, run and frequency command sources are selected by function codes. In local mode, the command sources specified from the keypad are enabled, regardless of the settings made by function codes.

📖 For details, refer to Section 3.5.2 "Remote and local modes."

Holding down the HELP key on the keypad for 2 seconds or more switches between remote and local modes.

Switching these modes is also possible by a digital input signal provided from the outside of the inverter. You need to assign ***LOC*** ("Select local (keypad) operation") as a digital input signal to any of digital input terminals.

(📖 Refer to E01 through E07.)

Tip The current mode can be checked by the status icons. The HND / REM / COM is displayed in remote mode and the LOC, in local mode.

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 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-only rotation in local mode), the inverter automatically stops.

3.3.6 Changing from keypad operation to external signal (terminal block) operation

By factory default, both the run commands (FWD / REV / STOP key) and frequency commands are sourced from the keypad. This section provides other external command source samples--an external potentiometer (variable resistor) as a frequency command source and external run switches as run forward/reverse command sources.

Set up those external sources using the following procedure.

(1) Configure the function codes as listed below.

Function code	Name	Data	Factory default
F01	Frequency command 1	1: Analog voltage input to terminal [12]	0
F02	Operation method	1: External digital input signal	0 (FRENIC-HVAC/AQUA) 2 (FRENIC-Ace)
E98	Terminal [FWD] function	98: Run forward command ***FWD***	98
E99	Terminal [REV] function	99: Run reverse command ***REV***	99

Note If terminals [FWD] and [REV] are ON, the F02 data cannot be changed. First turn those terminals OFF and then change the F02 data.

(2) Wire the potentiometer to terminals across [13], [12], and [11].

(3) Connect the run forward switch between terminals [FWD] and [CM] and the run reverse switch between [REV] and [CM].

(4) To start running the inverter, rotate the potentiometer to give a voltage to terminal [12] and then turn the run forward or reverse switch ON (short-circuit).

📖 For precautions in wiring, refer to the FRENIC-HVAC/AQUA or FRENIC-Ace User's Manual, Chapter 2.

ENGLISH

3.3.7 Monitoring light alarms

The inverter identifies abnormal states in two categories--Heavy alarm and Light alarm. If the former occurs, the inverter immediately trips; if the latter occurs, the inverter displays an alarm code (showing an alarm factor) on the LCD monitor and flashes the WARN. LED but it continues to run without tripping.

Which alarm factors are categorized as light alarms ("Light alarm" object) should be defined with function codes*3 beforehand.

*3 Function codes H181, H182, H183 and H184 for the FRENIC-HVAC/AQUA series
Function code H81 and H82 for the FRENIC-Ace series

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

📖 For the light alarm objects, refer to the "Abnormal States Detectable ("Heavy Alarm" and "Light Alarm" Objects) given in the FRENIC-HVAC/AQUA User's Manual (Chapter 9) and the FRENIC-Ace User's Manual (Chapter 6).

■ How to reset a light alarm

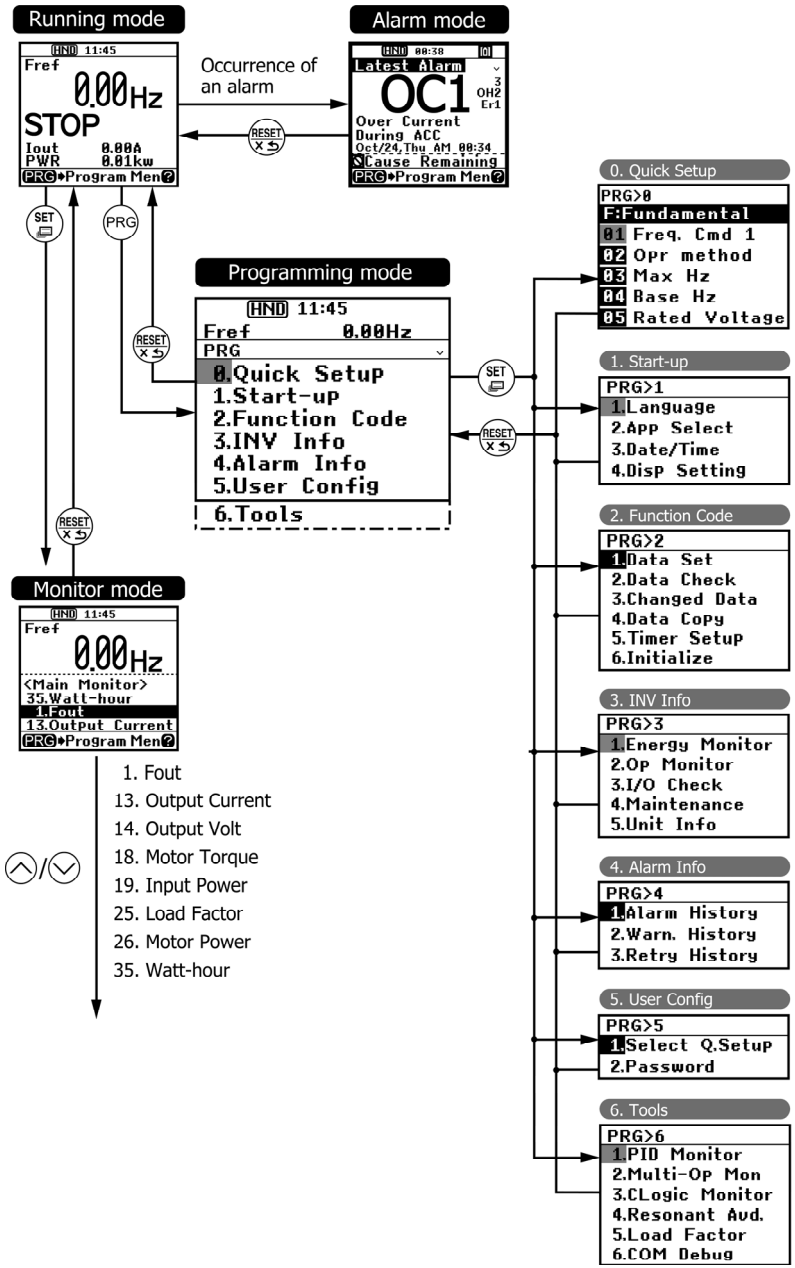
If the light alarm factor has been removed, pressing the RESET key turns the WARN. LED and ***LALM*** signal OFF. If not, pressing the RESET key changes the WARN. LED from flashing to ON and then the LED automatically goes OFF the moment the light alarm factor is removed.

■ How to check a light alarm factor

If a light alarm occurs, an alarm code appears on the LCD monitor. To check the current light alarm factor, enter Programming mode by pressing the PRG key and select "2. Light Alarm History" of "4. Alarm Info." It is possible to check the factors of the last six light alarms (the last four light alarms for the FRENIC-Ace).

3.4 Programming Mode

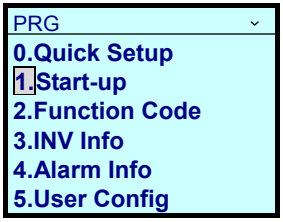
Programming mode allows the setting and confirmation of function codes, and monitoring of maintenance-related and input/output (I/O) terminal information, as well as other functions. A menu format is used to enable simple function selection. The menu transition for programming mode is shown below.



Basic Screen Configuration

■ Main menu screen

Pressing the PRG key when the running mode screen is displayed will show the main menu screen.



Use the ▲ and ▼ keys to choose the desired menu item from the main menu screen.

■ Hierarchy display

The hierarchical structure for each screen is "Main menu" ⇒ "Sub-menu" ⇒ "Detailed menu" ⇒ "Data revision screen". Make each menu selection to move to the data revision screen.

Explanation of designation

In this manual, the menu transition of Programming mode ⇒ Main menu item 1, "Start-up" ⇒ Sub-menu item 3, "Date/Time" ⇒ Detailed menu item 2, "Adjust" will be shown as PRG > 1(Start-up) > 3(Date/Time) > 2(Adjust).

Menu types are shown in Table 3.7.

Table 3.7 Programming Mode Menus

Main Menu	Sub-Menu		Hierarchy Display	Principal Functions	FRENIC-AQUA	FRENIC-HVAC	FRENIC-Ace
0. Quick Setup: Shows only frequently used function codes.							
	—	—	PRG>0		Y	Y	Y
1. Start-up: Sets functions for initial settings.							
	1	Language	PRG>1>1	Sets language to be displayed on LCD monitor.	Y	Y	Y
	2	Select application	PRG>1>2	Allows individual initialization of function codes that are grouped by application.	Y	Y	Y
	3	Set clock	PRG>1>3	Allows setting of date, time and daylight saving time. Date and time display format can also be changed.	Y	Y	N
	4	Set display	PRG>1>4	Selects content to be displayed on LCD screen.	Y	Y	Y
2. Function Code: Setting screens related to function codes, such as setting/copying function code data.							
	1	Set data	PRG>2>1	Allows function code data to be displayed/changed.	Y	Y	Y
	2	Confirm data	PRG>2>2	Allows confirmation of function code settings.	Y	Y	Y
	3	Confirm revised data	PRG>2>3	Allows confirmation of function code changes from factory-default settings.	Y	Y	Y
	4	Copy data	PRG>2>4	Reads, writes and verifies function code data.	Y	Y	Y
	5	Timer for scheduled operation	PRG>2>5	Sets up the running conditions of scheduled operation.	Y	Y	N
	6	Initialize data	PRG>2>6	Restores function code data values to factory default settings.	Y	Y	Y

ENGLISH

Table 3.7 Programming Mode Menus (Continued)

Main Menu	Sub-Menu		Hierarchy Display	Principal Functions	FRENIC-AQUA	FRENIC-HVAC	FRENIC-Ace
3. INV Info: Allows monitoring of inverter operational status.							
	1	Power monitor	PRG>3>1	Monitors the input watt-hour.	Y	Y	N
	2	Operation monitor	PRG>3>2	Displays the running information.	Y	Y	Y
	3	I/O check	PRG>3>3	Displays external interface information.	Y	Y	Y
	4	Maintenance information	PRG>3>4	Displays the cumulative run time and other information to be used for maintenance.	Y	Y	Y
	5	Unit information	PRG>3>5	Allows you to check the inverter type, serial number and ROM number.	Y	Y	Y
4. Alarm Info: Displays alarm information.							
	1	Alarm history	PRG>4>1	Lists alarm history (newest + 9 previous). Detailed information can be confirmed for the four most recent occurrences.	Y	Y	N
				Lists alarm history (newest + 3 previous). Detailed information can be confirmed for the four most recent occurrences.	N	N	Y
	2	Light alarm (Warning) history	PRG>4>2	Lists light alarm history (newest + 5 previous).	Y	Y	N
				Lists light alarm history (newest + 3 previous).	N	N	Y
	3	Retry history	PRG>4>3	Displays retry history (two instances).	Y	Y	Y
5. User Config: Allows any settings to be made.							
	1	Quick setup selection	PRG>5>1	Allows function codes to be added to or deleted from the "0. Quick Setup" display.	Y	Y	Y
	2	Password	PRG>5>2	Allows setting to prevent inverter function code access or data revision.	Y	Y	N
6. Tools: Various functions							
	1	PID monitor	PRG>6>1	Allows status of PID controls 1 and 2 and external PID controls 1, 2 and 3 to be monitored. (PV, SV, MV, etc.)	Y	Y	Y
	2	Unit number control monitor	PRG>6>2	Allows confirmation of the operational status on the pump number control.	Y	N	N
	3	CLogic monitor	PRG>6>3	Previews and debugs customized logic.	Y	Y	Y
	4	Resonance prevention	PRG>6>4	During operation, allows jump frequency to be set while confirming resonance status.	Y	Y	Y
	5	Load factor measurement	PRG>6>5	Allows measurement of the operational status of the maximum output current and average output current.	Y	Y	Y
	6	COM debug	PRG>6>6	Allows monitoring and setting of communication-specific function codes (S, M, W, W1, W2, W3, X, X1, Z).	Y	Y	Y

Tip Non-supported functions are displayed with a ⃠ mark instead of the sub-menu number.

3.5 Notes (Difference between multi-function keypad and remote keypad)

In addition to the multi-function keypad (TP-A1-□□, this product), a remote keypad is also available. Be careful with the operational differences between those keypads.

3.5.1 Operation method (Function code F02)

The multi-function keypad has the (FWD), (REV), (STOP) keys so that no rotation direction command is required while the remote keypad has the (RUN) and (STOP) keys.

Data for F02	Run command source
0: Keypad	Enable the (FWD) / (REV) / (STOP) keys to run and stop the motor.
1: External signals	Enable terminal command ***FWD*** and ***REV*** to run and stop the motor
2: Keypad (Forward rotation)	Enable (FWD) / (STOP) keys to run and stop the motor. Note that this run command enables only the forward rotation (The (REV) key is disabled.)
3: Keypad (Reverse rotation)	Enable (REV) / (STOP) keys to run and stop the motor. Note that this run command enables only the reverse rotation (The (FWD) key is disabled.)

3.5.2 Remote and local modes

The multi-function keypad has the (HELP) key. Holding it down for 2 seconds or more switches between remote and local modes.

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

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

Data for F02	Run command source
0: Keypad	Enable the (FWD) / (REV) / (STOP) keys to run and stop the motor.
1: External signals	Enable terminal command ***FWD*** and ***REV*** to run and stop the motor
2: Keypad (Forward rotation)	Enable (FWD) / (STOP) keys to run and stop the motor. Note that this run command enables only the forward rotation (The (REV) key is disabled.)
3: Keypad (Reverse rotation)	Enable (REV) / (STOP) keys to run and stop the motor. Note that this run command enables only the reverse rotation (The (FWD) key is disabled.)

For details, refer to Section 3.3.5 "Switching between the remote and local modes."

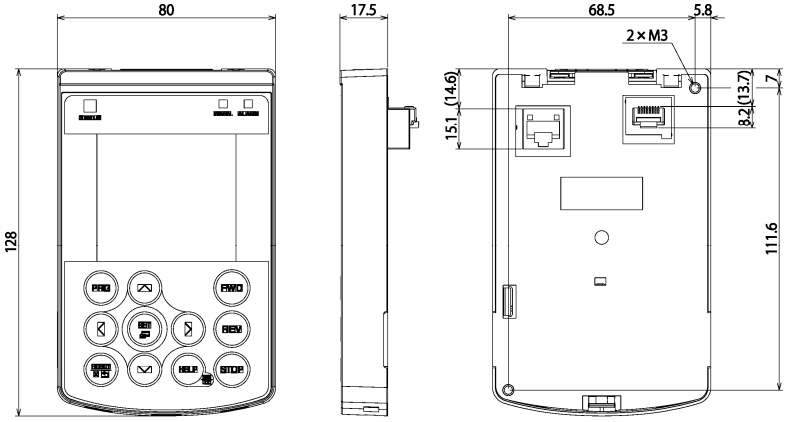
Chapter 4 SPECIFICATIONS

4.1 General Specifications

Table 4.1 General Specifications

Item	Specifications	Remarks
Ingress protection	IP40: Front side IP20: Back side	
Site location	The product must not be exposed to dust, direct sunlight, corrosive gases, flammable gases, oil mist, vapor or water drops. (Pollution degree 2 (IEC/EN 60664-1)) The atmosphere can contain a small amount of salt. (0.01 mg/cm^2 or less per year) The product must not be subjected to sudden changes in temperature that will cause condensation to form.	
Ambient temperature	-10 to +50°C	
Ambient humidity	5 to 95% RH (No condensation)	
Altitude	1000 m or less	
Vibration	3 mm (Amplitude): 2 to less than 9 Hz 10 m/s^2: 9 to less than 200 Hz	
Storage temperature	-25 to +70°C	
Storage humidity	5 to 95% RH (No condensation)	
External dimensions	Refer to the figures below	
Mass	120 g	

■ **External dimensions**



(Unit: mm)

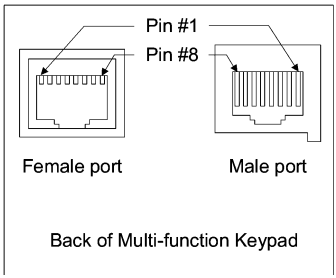
4.2 Communication Specifications

Tables 4.2 and 4.3 summarize the communication specifications.

Table 4.2 Hardware Specifications

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

Table 4.3 RJ-45 Connector Pin Assignment

Pin #	Signal name	Description	Remarks
1, 8	Vcc	DC power source for the multi-function keypad (5 V)	
2, 7	GND	Reference potential	
3, 6	NC	Unassigned (reserved)	
4	DX -	RS-485 communication data (-)	
5	DX +	RS-485 communication data (+)	

Note FRENIC-HVAC/AQUA series: Turn off the terminating resistor switch SW3 at the RS-485 communications port of the inverter unit.

FRENIC-Ace series: Turn off the terminating resistor switch SW2 at the RS-485 communications port of the inverter unit.

4.3 Transmission Specifications

Table 4.4 summarizes the transmission specifications.

Table 4.4 Transmission Specifications

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

MEMO

多機能タッチパネル / Multi-function Keypad / 多功能操作面板
"TP-A1"

取扱説明書 / Instruction Manual / 使用说明书

初 版　2013 年 11 月
First Edition, November 2013
第 1 版　2013 年 11 月

富士電機株式会社
Fuji Electric Co., Ltd.
富士电机株式会社

● この取扱説明書の一部または全部を無断で複製・転載することはお断りします。
● この説明書の内容は将来予告なしに変更することがあります。
● 本書の内容については，万全を期して作成いたしましたが，万一ご不審の点や誤り，記載もれなど，お気づきの点がありましたら，ご連絡ください。
● 運用した結果の影響については，上項にかかわらず責任を負いかねますのでご了承ください。

The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of Multi-function keypad "TP-A1" for the FRENIC-HVAC/AQUA/Ace series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will Fuji Electric Co., Ltd. be liable for any direct or indirect damages resulting from the application of the information in this manual.

● 严禁擅自复制、转载本使用说明书的部分或全部内容。
● 本说明书的内容今后可能有所变动，恕不另行通知。
● 本说明书记载的内容力图详尽，如果发现任何疑点、错误或遗漏等，请联系本公司。
● 本公司对使用结果造成的影响概不负责，敬请谅解。

富士電機株式会社 パワエレ機器事業本部 ドライブ事業部
〒141-0032　東京都品川区大崎一丁目 11 番 2 号（ゲートシティ大崎イーストタワー）
URL http://www.fujielectric.co.jp/

Fuji Electric Co., Ltd.
Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome, Shinagawa-ku, Tokyo 141-0032, Japan
URL http://www.fujielectric.com/

富士电机株式会社
日本东京都 141-0032 品川区大崎一丁目 11 番 2 号（Gate City 大崎东塔）
网址 http://www.fujielectric.com.cn/

2013-11 (K13/K13) 01CM