Chapter 9

TROUBLESHOOTING

This chapter describes troubleshooting procedures to be followed when the inverter malfunctions or detects an alarm or a light alarm condition. First check whether an alarm code or "light alarm" indication is displayed, and then proceed to the respective troubleshooting item.

Contents

9.1 Protective Functions

The FRENIC-HVAC/AQUA series of inverters has various protective functions as listed below to prevent the system from going down and reduce system downtime. The protective functions marked with ● in the table are disabled by factory default. Enable them according to your needs.

The protective functions include, for example, the "heavy alarm" detection function which, upon detection of an abnormal state, displays the alarm code on the LCD monitor and causes the inverter to trip, the "light alarm" detection function which displays the alarm code but lets the inverter continue the current operation, and other warning signal output functions.

If any problem arises, understand the content of the protective functions listed below and follow the procedures given in Sections 9.2 and onwards for troubleshooting.

Protective function	Description	Related function code
"Heavy alarm" detection	This function detects an abnormal state, displays the corresponding alarm code, and causes the inverter to trip. The "heavy alarm" codes are check-marked in the "Heavy alarm" object column in Table 9.1. For details of each alarm code, see the corresponding item in the troubleshooting. The inverter can store and display the last ten alarm codes and the date on which they occurred (when realtime clock function enabled), and detailed information on each relevant part for the past four alarms.	H98
●"Light alarm" detection	This function detects abnormal states, and allows operation to continue without tripping the inverter while displaying and outputting warnings. It is possible to define which abnormal states should be categorized as a "light alarm". See the "light alarm" codes in Table 9.1. See Section 9.3.2 for details on how to check and release light alarms.	H181 H182 H183 H184
Stall prevention	When the output current exceeds the current limiter level (F44) during acceleration/ deceleration or constant speed running, this function decreases the output frequency and controls increases in output current to avoid an overcurrent trip.	F44
● Overload prevention control	Before the inverter trips due to a heat sink overheat (OH1) or inverter overload (OLU), this function decreases the output frequency to reduce the load.	H70
● Automatic deceleration (Anti-regenerative control)	If regenerative energy returned exceeds the inverter's braking capability, this function automatically increases the deceleration time or controls the output frequency to avoid an overvoltage trip.	H69 H76
● Deceleration characteristics (Excessive regenerative energy proof braking capability)	During deceleration, this function increases the motor energy loss and decreases the regenerative energy returned to avoid an overvoltage trip (OV).	H71
● Reference loss detection	This function detects a reference frequency loss (due to a broken wire, etc.), continues the inverter operation at the previously specified frequency, and issues the "Command loss detected" signal ***REF OFF***.	E65
Automatic lowering of carrier frequency	Before the inverter trips due to an abnormal ambient temperature or output current, this function automatically lowers the carrier frequency to mitigate inverter loss and avoid a trip.	H98
● Dew condensation prevention	Even when the inverter is in stopped state, this function feeds DC current across the motor at certain intervals to raise the motor temperature and prevent dew condensation.	J21
Motor overload early warning	When the inverter output current reaches the specified level, this function issues the "Motor overload early warning" signal **OL** before the thermal overload protection function causes the inverter to trip for motor protection.	E34 E35
● Auto-reset	When the inverter has stopped because of a trip, this function allows the inverter to automatically reset alarms and restart itself. (The number of retries and the latency between stop and reset can be specified.)	H04 H05
● Forced stop	Upon receipt of the forced stop command ***STOP***, this function interrupts the run and other commands currently applied in order to forcedly decelerate the inverter to a stop.	H56
Surge protection	This function protects the inverter from a surge voltage invaded between main circuit power lines and the ground.	--

9.2 Before Proceeding with Troubleshooting

⚠WARNING⚠

If any of the protective functions has been activated, first remove the cause. Then, after checking that the all run commands are set to OFF, release the alarm. If the alarm is released while any run commands are set to ON, the inverter may supply the power to the motor, running the motor.

Injury may occur.

- Even though the inverter has interrupted power to the motor, if the voltage is applied to the main circuit input terminals L1/R, L2/S and L3/T, voltage may be output to inverter output terminals U, V, and W.
- Turn OFF the power, and after at least ten minutes have elapsed, use a multimeter or similar instrument to ensure that the DC link bus voltage between the terminals P (+) and N (-) has dropped to a safe level (+25 VDC or below).

Electric shock may occur.

Follow the procedure below to solve problems.

(1) Is the inverter correctly wired?
Refer to Chapter 2, Section 2.10 "Connection Diagram".

(2) Is an alarm code displayed on the LCD monitor?

- If alarm code displayed — Go to Section 9.3.
- Abnormal motor operation — Go to Section 9.4.1.
- Problems with inverter settings — Go to Section 9.4.2.
- If Other than an Alarm Code is Displayed — Go to Section 9.5.

If any problems persist after the above recovery procedure, contact your Fuji Electric representative.

9.3 If an Alarm Code Appears on the Monitor

9.3.1 Alarm Codes

Table 9.1 Abnormal States Detectable ("Heavy Alarm" and "Light Alarm" Objects)

Code	Name	"Heavy alarm" objects	Retry registration objects	"Light alarm" objects	Remarks	Ref. page
OC1, OC2, OC3	Instantaneous overcurrent	√	√	--		9-5
EF	Earth fault	√	--	--	200 V class series of 22 kW or above 400 V class series of 45 kW or above	9-5
OV1, OV2, OV3	Overvoltage	√	√	--		9-6
LV	Undervoltage	√	√	--		9-6
LiN	Input phase loss	√	--	--		9-7
OPL	Output phase loss	√	--	--		9-8
OH1	Heat sink overheat	√	√	--		9-8
OH2	External alarm	√	√	√		9-9
OH3	Inverter internal overheat	√	√	√		9-9
OH4	Motor protection (PTC thermistor)	√	√	--		9-9
FUS	Fuse blown	√	--	--	200 V class series of 90 kW 400 V class series of 110 kW or above	9-10
PbF	Charger circuit fault	√	--	--	200 V class series of 22 kW or above 400 V class series of 45 kW or above	9-10
OL1	Overload of motors 1	√	√	√		9-11
OLU	Inverter overload	√	√	--		9-11
Er1	Memory error	√	--	--		9-12
Er2	Keypad communications error	√	--	--		9-12
Er3	CPU error	√	--	--		9-13
Er4	Option communications error	√	--	√		9-13
Er5	Option error	√	--	√		9-13
Er6	Operation protection	√	--	--		9-13
Er7	Tuning error	√	--	--		9-14
Er8 ErP	RS-485 communications error (COM port 1) RS-485 communications error (COM port 2)	√	--	√		9-15
ErF	Data saving error during undervoltage	√	--	--		9-16
ErH	Hardware error	√	--	--		9-16
CoF	Power input disconnect detection	√	--	√		9-16
ECL	Customizable logic error	√	--	--		9-17
ECF	Enable circuit error	√	--	--		9-17
PV1, PV2	PID control 1, 2 feedback error detection	√	--	√		9-17
PVA, PVb, PVC	External PID control 1, 2, 3 feedback error detection	√	--	√		9-18
Pdr	Drought protection	√	--	√		9-18
roC	Control of maximum starts per hour	√	--	√		9-19
PoL	End of curve protection	√	--	√		9-19
rLo	Anti jam	√	--	--		9-20
FoL	Filter clogging error	√	--	√		9-20

Table 9.1 Abnormal States Detectable ("Heavy Alarm" and "Light Alarm" Objects) (continued)

Code	Name	"Heavy alarm" objects	Retry registration objects	"Light alarm" objects	Remarks	Ref. page
LoK	Password protection	√	--	--		9-21
Err	Mock alarm	√	--	--		9-21
FAL	DC fan locked	--	--	√	200 V class series IP00: 55 kW or above IP21: 22 kW or above IP55: 5.5 kW or above 400 V class series P00: 110 kW or above IP21: 45 kW or above IP55: 11 kW or above	--
OL	Motor overload early warning	--	--	√		--
OH	Heat sink overheat early warning	--	--	√		--
LiF	Lifetime alarm	--	--	√		--
rEF	Reference command loss detected	--	--	√		--
UTL	Low torque output	--	--	√		--
PTC	PTC thermistor activated	--	--	√		--
rTE	Inverter life (Cumulative motor run time)	--	--	√		--
CnT	Inverter life (Number of startups)	--	--	√		--
PA1, PA2	PID control 1, 2 warning output	--	--	√		--
PAA, PAb, PAC	External PID control 1, 2, 3 warning output	--	--	√		--
SLA	Mutual operation slave inverter alarm	--	--	√		--
Lob	Low battery	--	--	√		9-21
dtL	Data information loss	--	--	√		9-21
Fod	Forced operation	--	--	--		--

[1] OCn Instantaneous overcurrent

Problem The inverter momentary output current exceeded the overcurrent level.

OC1 Overcurrent occurred during acceleration.
OC2 Overcurrent occurred during deceleration.
OC3 Overcurrent occurred during running at a constant speed.

Possible Causes	What to Check and Suggested Measures
(1) The inverter output lines were short-circuited.	Disconnect the wiring from the inverter output terminals ([U], [V] and [W]) and measure the interphase resistance of the motor wiring. Check if the resistance is too low. ➔ Remove the short-circuited part (including replacement of the wires, relay terminals and motor).
(2) Ground faults have occurred at the inverter output lines.	Disconnect the wiring from the output terminals ([U], [V] and [W]) and perform a Megger test. ➔ Remove the grounded parts (including replacement of the wires, relay terminals and motor).
(3) Overload.	Measure the motor current with a measuring device to trace the current trend. Then, use this data to judge if the trend is over the calculated load value for your system design. ➔If the load is too heavy, reduce it or increase the inverter capacity.
	Trace the current trend and check if there are any sudden changes in the current. ➔ If there are any sudden changes, make the load fluctuation smaller or increase the inverter capacity. ➔ Enable instantaneous overcurrent limiting (H12 = 1).
(4) Excessive torque boost specified. (when F37 = 0, 1, 3, or 4)	Check whether decreasing the torque boost (F09) decreases the output current but does not stall the motor. ➔ If no stall occurs, decrease the torque boost (F09).
(5) The acceleration/ deceleration time was too short.	Check that the motor generates enough torque required during acceleration/deceleration. That torque is calculated from the moment of inertia for the load and the acceleration/deceleration time. ➔ Increase the acceleration/deceleration time (F07, F08, E10 through E15, and H56). ➔ Enable the current limiter (F43) and torque limiter (F40, F41, E16, and E17). ➔ Increase the inverter capacity.
(6) Malfunction caused by noise.	Check if noise control measures are appropriate (e.g., correct grounding and routing of control and main circuit wires). ➔ Implement noise control measures. For details, refer to Appendix A. ➔ Enable the Auto-reset (H04). ➔ Connect a surge absorber to magnetic contactor's coils or other solenoids (if any) causing noise.

[2] EF Earth fault

Problem An earth fault current flowed from the output terminal of the inverter.

Possible Causes	What to Check and Suggested Measures
(1) An earth fault occurred at the inverter output terminal(s).	Disconnect the wiring from the output terminals ([U], [V], and [W]) and perform a Megger test. ➔ Remove the earthed parts (including replacement of the wires, relay terminals and motor).

[3] OVn Overvoltage

Problem The DC link bus voltage was over the detection level of overvoltage.

OV1 Overvoltage occurred during acceleration.
OV2 Overvoltage occurred during deceleration.
OV3 Overvoltage occurred during running at constant speed.

Possible Causes	What to Check and Suggested Measures
(1) The power supply voltage exceeded the inverter's specification range.	Measure the input voltage. ➔ Decrease the voltage to within the specified range.
(2) A surge current entered the input power supply.	In the same power line, if a phase-advancing capacitor is turned ON/OFF or a thyristor converter is activated, a surge (momentary large increase in the voltage or current) may be caused in the input power. ➔ Install an AC reactor.
(3) The deceleration time was too short for the moment of inertia for load.	Recalculate the deceleration torque based on the moment of inertia for the load and the deceleration time. ➔ Increase the deceleration time (F08, E11, E13, E15, and H56). ➔ Enable the automatic deceleration (anti-regenerative control) (H69), or deceleration characteristics (H71). ➔ Enable torque limiter (F40, F41, E16, E17, and H73). ➔ Set the rated voltage (at base frequency) (F05) to "0" to improve the braking capability.
(4) The acceleration time was too short.	Check if the overvoltage alarm occurs after rapid acceleration. ➔ Increase the acceleration time (F07, E10, E12, and E14). ➔ Select the S-curve pattern (H07).
(5) Braking load was too heavy.	Compare the braking torque of the load with that of the inverter. ➔ Set the rated voltage (at base frequency) (F05) to "0" to improve the braking capability.
(6) Malfunction caused by noise.	Check if the DC link bus voltage was below the protective level when the overvoltage alarm occurred. ➔ Implement noise control measures. For details, refer to Appendix A. ➔ Enable the auto-reset (H04). ➔ Connect a surge absorber to magnetic contactor's coils or other solenoids (if any) causing noise.
(7) Excessive high-frequency current from outside (Occurred during stoppage after turning ON main power.)	Prevent the inflow of high-frequency current. ➔ Apply control measures at the high-frequency current side. ➔ In some instances, this can be improved by removing the E1 and E2 screws. In this case, the EMC filter will no longer function, and the inverter will no longer conform to EMC standards. Please contact Fuji Electric if these screws are removed.

[4] LV Undervoltage

Problem DC link bus voltage has dropped below the undervoltage detection level.

Possible Causes	What to Check and Suggested Measures
(1) A momentary power failure occurred.	➔ Release the alarm. ➔ If you want to restart running the motor without treating this condition as an alarm, set F14 to "3," "4," or "5," depending on the load type.
(2) The power to the inverter was switched back to ON too soon (when F14 = 1).	Check if the power to the inverter was switched back to ON while the control power was still alive. (Check whether the LEDs on the keypad light.) ➔ Turn the power ON again after all LEDs on the keypad go off.

Possible Causes	What to Check and Suggested Measures
(3) The power supply voltage did not reach the inverter's specification range.	Measure the input voltage. ➔ Increase the voltage to within the specified range.
(4) Peripheral equipment for the power circuit malfunctioned, or the connection was incorrect.	Measure the input voltage to find which peripheral equipment malfunctioned or which connection is incorrect. ➔ Replace any faulty peripheral equipment, or correct any incorrect connections.
(5) Any other loads connected to the same power supply have required a large starting current, causing a temporary voltage drop.	Measure the input voltage and check the voltage fluctuation. ➔ Reconsider the power supply system configuration.
(6) Inverter's inrush current caused the power voltage drop because the power supply transformer capacity was insufficient.	Check if the alarm occurs when a molded case circuit breaker (MCCB), residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) or magnetic contactor (MC) is turned ON. ➔Reconsider the capacity of the power supply transformer.

[5] Lin Input phase loss

Problem Input phase loss occurred, or interphase voltage unbalance rate was large.

Possible Causes	What to Check and Suggested Measures
(1) Breaks in wiring to the main power input terminals.	Measure the input voltage. ➔ Repair or replace the main circuit power input wires or input devices (MCCB, MC, etc.).
(2) The screws on the main power input terminals are loosely tightened.	Check if the screws on the main power input terminals have become loose. ➔ Tighten the terminal screws to the recommended torque.
(3) Interphase voltage unbalance between three phases was too large.	Measure the input voltage. ➔ Connect an AC reactor (ACR) to lower the voltage unbalance between input phases. ➔ Increase the inverter capacity.
(4) Overload cyclically occurred.	Measure the ripple wave of the DC link bus voltage. ➔ If the ripple is large, increase the inverter capacity.
(5) Single-phase voltage was input to the three-phase input inverter.	Check the inverter type. ➔ Apply three-phase power. The FRENIC-HVAC/AQUA of three-phase input cannot be driven by single-phase power.

Tip The input phase loss protection can be disabled with the function code H98 (Protection/Maintenance Function).

[6] OPL Output phase loss

Problem Output phase loss occurred.

Possible Causes	What to Check and Suggested Measures
(1) Inverter output wires are broken.	Measure the output current. ➔ Replace the output wires.
(2) The motor winding is broken.	Measure the output current. ➔ Replace the motor.
(3) The terminal screws for inverter output were not tight enough.	Check if any screws on the inverter output terminals have become loose. ➔ Tighten the terminal screws to the recommended torque.
(4) A single-phase motor has been connected.	➔ Single-phase motors cannot be used. Note that the FRENIC-HVAC/AQUA only drives three-phase induction motors.

[7] OH1 Heat sink overheat

Problem Temperature around heat sink has risen abnormally.

Possible Causes	What to Check and Suggested Measures
(1) Temperature around the inverter exceeded the inverter's specification range.	Measure the temperature around the inverter. ➔ Lower the temperature around the inverter (e.g., ventilate the panel where the inverter is mounted).
(2) Ventilation path is blocked.	Check if there is sufficient clearance around the inverter. ➔ Change the mounting place to ensure the clearance.
	Check if the heat sink is not clogged. ➔ Clean the heat sink.
(3) Cooling fan's airflow volume decreased due to the service life expired or failure.	Check the cumulative run time of the cooling fan. (See Chapter 5, Section “5.6.4.4 Viewing Maintenance Information”.) ➔ Replace the cooling fan.
	Visually check whether the cooling fan rotates normally. ➔ Replace the cooling fan.
(4) Overload.	Measure the output current. ➔ Reduce the load (e.g. Use the heat sink overheat early warning (E20 through E27) or the overload early warning (E34) and reduce the load before the overload protection is activated.). ➔ Decease the motor sound (carrier frequency) (F26). ➔ Enable the overload prevention control (H70).

[8] OH2 External alarm

Problem External alarm was inputted (***THR***).
(when the "Enable external alarm trip" ***THR*** has been assigned to any of digital input terminals)

Possible Causes	What to Check and Suggested Measures
(1) An alarm function of external equipment was activated.	Check the operation of external equipment. ➔ Remove the cause of the alarm that occurred.
(2) Wrong connection or poor contact in external alarm signal wiring.	Check if the external alarm signal wiring is correctly connected to the terminal to which the "Enable external alarm trip" terminal command ***THR*** has been assigned (Any of E01 through E07, E98, and E99 should be set to "9."). ➔ Connect the external alarm signal wire correctly.
(3) Incorrect setting of function code data.	Check whether the "Enable external alarm trip" terminal command ***THR*** has been assigned to an unavailable terminal (with E01 through E07, E98, or E99). ➔ Correct the assignment.
	Check whether the normal/negative logic of the external signal matches that of the ***THR*** command specified by any of E01 through E07, E98, and E99. ➔ Ensure the matching of the normal/negative logic.

[9] OH3 Inverter internal overheat

Problem Temperature inside the inverter has exceeded the allowable limit.

Possible Causes	What to Check and Suggested Measures
(1) The ambient temperature exceeded the inverter's specification limit.	Measure the ambient temperature. ➔ Lower the temperature around the inverter (e.g., ventilate the panel where the inverter is mounted).
(2) The airflow generated by the internal fan has dropped because the fan lifetime has been reached or because a fault has occurred.	Visually check whether the internal fan is functioning normally. ➔ Replace the internal fan.
(3) The power is turned ON too often	Reduce the number of times the power is turned ON/OFF (guide: 1/hour or less)

[10] OH4 Motor protection (PTC thermistor)

Problem Temperature of the motor has risen abnormally.

Possible Causes	What to Check and Suggested Measures
(1) The temperature around the motor exceeded the motor's specification range.	Measure the temperature around the motor. ➔ Lower the temperature.
(2) Cooling system for the motor defective.	Check if the cooling system of the motor is operating normally. ➔ Repair or replace the cooling system of the motor.
(3) Overload.	Measure the output current. ➔ Reduce the load (e.g. Use the heat sink overheat early warning (E01 through E09) or the overload early warning (E34) and reduce the load before the overload protection is activated.). (In winter, the load tends to increase.) ➔ Lower the temperature around the motor.

Possible Causes	What to Check and Suggested Measures
(4) The activation level (H27) of the PTC thermistor for motor overheat protection was set inadequately.	Check the PTC thermistor specifications and recalculate the detection voltage. ➔ Modify the data of function code H27.
(5) Settings for the PTC thermistor are improper.	Check the setting of the thermistor mode selection (H26) and the slider position of the terminal [C1] property switch SW5. ➔ Change the H26 data in accordance with the thermistor used and set the SW5 to the PTC position.
(6) Excessive torque boost specified. (F09)	Check whether decreasing the torque boost (F09) does not stall the motor. ➔ If no stall occurs, decrease the F09 data.
(7) The V/f pattern did not match the motor.	Check if the base frequency (F04) and the rated voltage at base frequency (F05) match the values on the motor's nameplate. ➔ Match the function code data with the values on the motor's nameplate.
(8) Incorrect setting of function code data.	Although no PTC thermistor is used, the thermistor mode is enabled (H26). ➔ Set the H26 data to "0" (Disable).

[11] FUS Fuse blown

Problem The fuse inside the inverter blew.

Possible Causes	What to Check and Suggested Measures
(1) The fuse blew due to short-circuiting inside the inverter.	Check whether there has been any excess surge or noise coming from outside. ➔ Take measures against surges and noise. ➔ Have the inverter repaired.

[12] PbF Charger circuit fault

Problem The magnetic contactor for short-circuiting the charging resistor failed to work.

Possible Causes	What to Check and Suggested Measures
(1) The control power was not supplied to the magnetic contactor intended for short-circuiting the charging resistor.	Check that, in normal connection of the main circuit (not a connection via the DC link bus), the connector (CN R) on the power printed circuit board (power PCB) is not inserted to NC. ➔ Insert the connector (CN R) to FAN.
	Check whether you quickly turned the circuit breaker ON and OFF to confirm safety after cabling/wiring. ➔ Wait until the DC link bus voltage has dropped to a sufficiently low level and then release the current alarm. After that, turn ON the power again. (Do not turn the circuit breaker ON and OFF quickly.) (Turning ON the circuit breaker supplies power to the control circuit to the operation level (lighting the LEDs on the keypad) in a short period. Immediately turning it OFF even retains the control circuit power for a time, while it shuts down the power to the magnetic contactor intended for short-circuiting the charging resistor since the contactor is directly powered from the main power. Under such conditions, the control circuit can issue a turn-on command to the magnetic contactor, but the contactor not powered can produce nothing. This state is regarded as abnormal, causing an alarm.)

[13] OL1 Overload of motor 1

Problem Electronic thermal protection for motor activated.

Possible Causes	What to Check and Suggested Measures
(1) The electronic thermal characteristics do not match the motor overload characteristics.	Check the motor characteristics. ➔ Reconsider the data of function codes (P99, F10 and F12). ➔ Use an external thermal relay.
(2) Activation level for the electronic thermal protection was inadequate.	Check the continuous allowable current of the motor. ➔ Reconsider and change the data of function code F11.
(3) The specified acceleration/ deceleration time was too short.	Recalculate the acceleration/deceleration torque and time needed for the load, based on the moment of inertia for the load and the acceleration/deceleration time. ➔ Increase the acceleration/ deceleration time (F07, F08, E10 through E15, and H56).
(4) Overload.	Measure the output current. ➔ Reduce the load (e.g. Use the overload early warning (E34) and reduce the load before the overload protection is activated.). (In winter, the load tends to increase.)
(5) Excessive torque boost specified (F09)	Check whether decreasing the torque boost (F09) does not stall the motor. ➔ If no stall occurs, decrease the F09 data.

[14] OLU Inverter overload

Problem Temperature inside inverter has risen abnormally.

Possible Causes	What to Check and Suggested Measures
(1) Temperature around the inverter exceeded the inverter's specification range.	Measure the temperature around the inverter. ➔ Lower the temperature (e.g., ventilate the panel where the inverter is mounted).
(2) Excessive torque boost specified (F09)	Check whether decreasing the torque boost (F09) does not stall the motor. ➔ If no stall occurs, decrease the F09 data.
(3) The specified acceleration/ deceleration time was too short.	Recalculate the acceleration/deceleration torque and time needed for the load, based on the moment of inertia for the load and the acceleration/deceleration time. ➔ Increase the acceleration/deceleration time (F07, F08, E10 through E15, and H56).
(4) Overload.	Measure the output current. ➔ Reduce the load (e.g., Use the overload early warning (E34) and reduce the load before the overload protection is activated.). (In winter, the load tends to increase.). ➔ Decrease the motor sound (Carrier frequency) (F26). If the carrier frequency is high, output must be reduced. For details, refer to "2.6 Derating of Rated Output Current." ➔ Enable overload prevention control (H70).
(5) Ventilation paths are blocked.	Check if there is sufficient clearance around the inverter. ➔ Change the mounting place to ensure the clearance.
	Check if the heat sink is not clogged. ➔ Clean the heat sink.

Possible Causes	What to Check and Suggested Measures
(6) Cooling fan's airflow volume decreased due to the service life expired or failure.	Check the cumulative run time of the cooling fan. (See Chapter 5, Section "5.6.4.4 Viewing Maintenance Information".) ➔ Replace the cooling fan.
	Visually check that the cooling fan rotates normally. ➔ Replace the cooling fan.
(7) The wires to the motor are too long, causing a large leakage current from them.	Measure the leakage current. ➔ Insert an output circuit filter (OFL).

[15] Er1 Memory error

Problem Error occurred in writing the data to the memory in the inverter.

Possible Causes	What to Check and Suggested Measures
(1) When writing data (especially initializing or copying data), the inverter was shut down so that the voltage to the control PCB has dropped.	Initialize the function code data with H03 (= 1). After initialization, check if pressing the (RESET) key releases the alarm. ➔ Revert the initialized function code data to their previous settings, then restart the operation.
(2) Inverter affected by strong electrical noise when writing data (especially initializing or copying data).	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of control and main circuit wires). Also, perform the same check as described in (1) above. ➔ Implement noise control measures. Revert the initialized function code data to their previous settings, then restart the operation.
(3) The control PCB failed.	Initialize the function code data by setting H03 to "1," then reset the alarm by pressing the (RESET) key and check that the alarm goes on. ➔ The control PCB (on which the CPU is mounted) is defective. Contact your Fuji Electric representative.

[16] Er2 Keypad communications error

Problem A communications error occurred between the standard keypad or the multi-function keypad and the inverter.

Possible Causes	What to Check and Suggested Measures
(1) Broken communications cable or poor contact.	Check continuity of the cable, contacts and connections. ➔ Re-insert the connector firmly. ➔ Replace the cable.
(2) Connecting many control wires hinders the front cover from being mounted, lifting the keypad.	Check the mounting condition of the front cover. ➔ Use wires of the recommended size (0.75 mm^2) for wiring. ➔ Change the wiring layout inside the unit so that the front cover can be mounted firmly.
(3) Inverter affected by strong electrical noise.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of communication cables and main circuit wires). ➔ Implement noise control measures. For details, refer to Appendix A.
(4) A keypad failure occurred.	Replace the keypad with another one and check whether a keypad communications error (Er2) occurs. ➔ Replace the keypad.

[17] Er3 CPU error

Problem A CPU error (e.g. erratic CPU operation) occurred.

Possible Causes	What to Check and Suggested Measures
(1) Inverter affected by strong electrical noise.	Check if appropriate noise control measures have been implemented (e.g. correct grounding and routing of signal wires, communications cables, and main circuit wires). ➔ Implement noise control measures.

[18] Er4 Option communications error

Problem A communications error occurred between the option card and the inverter.

Possible Causes	What to Check and Suggested Measures
(1) There was a problem with the connection between the option card and the inverter.	Check whether the connector on the option card is properly engaged with that of the inverter. ➔ Reload the option card into the inverter.
(2) Strong electrical noise.	Check whether appropriate noise control measures have been implemented (e.g. correct grounding and routing of signal wires, communications cables, and main circuit wires). ➔ Implement noise control measures.

[19] Er5 Option error

An error detected by the option card. Refer to the instruction manual of the option card for details.

[20] Er6 Operation protection

Problem An incorrect operation was attempted.

Possible Causes	What to Check and Suggested Measures
(1) The STOP key was pressed when H96 = 1 or 3.	Check that the STOP key was pressed when a run command had been entered from the input terminal or through the communications port. ➔ If this was not intended, check the setting of H96.
(2) The start check function was activated when H96 = 2 or 3.	Check that any of the following operations has been performed with a run command being entered. - Turning the power ON - Releasing the alarm - Switching the enable communications link ***LE*** operation ➔ Review the running sequence to avoid input of a Run command when this error occurs. If this was not intended, check the setting of H96. (Turn the run command OFF before releasing the alarm.)
(3) The forced stop digital input ***STOP*** was turned OFF.	Check that turning the ***STOP*** OFF decelerated the inverter to stop. ➔ If this was not intended, check the settings of E01 through E07 for terminals [X1] through [X7].

[21] Er7 Tuning error

Problem Auto-tuning failed.

Possible Causes	What to Check and Suggested Measures
(1) A phase was missing (There was a phase loss) in the connection between the inverter and the motor.	➔ Properly connect the motor to the inverter.
(2) V/f or the rated current of the motor was not properly set.	Check whether the data of function codes (F04, F05, H50 through H53, P02, and P03) matches the motor specifications.
(3) The wiring length between the inverter and the motor was too long.	Check whether the wiring length between the inverter and the motor exceeds 50 m. (Inverters with a small capacity are greatly affected by the wiring length.) ➔ Review, and if necessary, change the layout of the inverter and the motor to shorten the connection wire. Alternatively, minimize the wiring length without changing the layout. ➔ Disable both auto-tuning and auto-torque boost (set data of F37 to "1").
(4) The rated capacity of the motor was significantly different from that of the inverter.	Check whether the rated capacity of the motor is three or more ranks lower, or two or more ranks higher than that of the inverter. ➔ Replace the inverter with one with an appropriate capacity. ➔ Manually specify the values for the motor parameters P06, P07, and P08. ➔ Disable both auto-tuning and auto-torque boost (set data of F37 to "1").
(5) The motor was a special type such as a high-speed motor.	➔ Disable both auto-tuning and auto-torque boost (set data of F37 to "1").
(6) A tuning operation involving motor rotation (P04 = 2 or 3) was attempted while the brake was applied to the motor.	➔ Specify the tuning that does not involve the motor rotation (P04 = 1). ➔ Release the brake before tuning that involves the motor rotation (P04 = 2 or 3).

For details of tuning errors, refer to Chapter 5, Section 5.7.9 "Function code basic settings and tuning < 2 >, ■ Tuning errors."

Preparation before running the motor for a test – Setting function code data."

[22] Er8 RS-485 communications error (COM port 1)
ErP RS-485 communications error (COM port 2)

Problem A communications error occurred during RS-485 communications.

Possible Causes	What to Check and Suggested Measures
(1) Communications conditions of the inverter do not match that of the host equipment.	Compare the settings of the y codes (y01 to y10, y11 to y20) with those of the host equipment. ➔ Correct any settings that differ.
(2) Even though no-response error detection time (y08, y18) has been set, communications is not performed within the specified cycle.	Check the host equipment. ➔ Change the settings of host equipment software or disable the no-response error detection (y08, y18 = 0).
(3) The host equipment did not operate due to defective software, settings, or defective hardware.	Check the host equipment (e.g., PLCs and personal computers). ➔ Remove the cause of the equipment error.
(4) The RS-485 converter did not operate due to incorrect connections and settings, or defective hardware.	Check the RS-485 converter (e.g., check for poor contact). ➔ Change the various RS-485 converter settings, reconnect the wires, or replace hardware with recommended devices as appropriate.
(5) Broken communications cable or poor contact.	Check the continuity of the cables, contacts and connections. ➔ Replace the cable.
(6) Inverter affected by strong electrical noise.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of communications cables and main circuit wires). ➔ Implement noise control measures. ➔ Implement noise reduction measures on the host side. ➔ Replace the RS-485 converter with a recommended insulated one.
(7) Terminating resistor not properly configured.	Check that the inverter serves as a terminating device in the network. ➔ Configure the terminating resistor switch(es) (SW2/SW3) for RS-485 communication correctly. (That is, turn the switch(es) to ON.)

[23] ErF Data saving error during undervoltage

Problem The inverter failed to save data such as the frequency commands and PID commands (which are specified through the keypad), or the output frequencies modified by the ***UP***/***DOWN*** terminal commands when the power was turned OFF.

Possible Causes	What to Check and Suggested Measures
(1) During data saving performed when the power was turned OFF, the voltage fed to the control PCB dropped in an abnormally short period due to the rapid discharge of the DC link bus.	Check how long it takes for the DC link bus voltage to drop to the preset voltage when the power is turned OFF. ➔ Remove whatever is causing the rapid discharge of the DC link bus voltage. After pressing the (RESET) key and releasing the alarm, return the data of the relevant function codes (such as the frequency commands and PID commands (specified through the keypad) or the output frequencies modified by the ***UP***/***DOWN*** terminal commands) back to the original values and then restart the operation.
(2) Inverter operation affected by strong electrical noise when the power was turned OFF.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of control and main circuit wires). ➔ Implement noise control measures. After pressing the (RESET) key and releasing the alarm, return the data of the relevant function codes (such as the frequency commands and PID commands (specified through the keypad) or the output frequencies modified by the ***UP***/***DOWN*** terminal commands) back to the original values and then restart the operation.
(3) The control circuit failed.	Check if ErF occurs each time the power is turned ON. ➔ The control PCB (on which the CPU is mounted) is defective. Contact your Fuji Electric representative.

[24] ErH Hardware error

Problem The LSI on the power printed circuit board malfunctions.

Possible Causes	What to Check and Suggested Measures
(1) The inverter capacity setting on the control printed circuit board is wrong.	It is necessary to set the inverter capacity correctly. ➔ Contact your Fuji Electric representative.
(2) Data stored in the power printed circuit board memory is corrupted.	It is necessary to replace the power printed circuit board. ➔ Contact your Fuji Electric representative.
(3) The control printed circuit board is misconnected to the power printed circuit board.	It is necessary to replace the power or control printed circuit board. ➔ Contact your Fuji Electric representative.

[25] CoF Power input disconnect detection

Problem Power input disconnect is detected.

Possible Causes	What to Check and Suggested Measures
(1) The current signal input to [C1] has fallen to 2 mA or less.	Check the main inverter unit connection and wiring and transmission-side equipment. Review function code (H91) data.

[26] ECL Customizable logic error

Problem An ECL occurred due to a customizable logic setting error.

Possible Causes	What to Check and Suggested Measures
(1) The customizable logic operation selection setting was changed during operation.	Check whether the customizable logic operation selection (function code U00) was changed during operation. ➔ Do avoid potential hazards, do not change the customizable logic operation selection during operation.

[27] ECF Enable circuit error

Problem A circuit error was detected when diagnosing the enable circuit status.

Possible Causes	What to Check and Suggested Measures
(1) Interface board contact defect	Check whether the interface board is securely attached to the unit. ➔ The alarm will be cleared by turning ON the power again.
(2) Enable circuit logic error	Check whether outputs from safety switches and so on are input to both terminals EN1 and EN2 with the same logic (High/High or Low/Low). ➔ The alarm will be cleared by turning ON the power again.
(3) An enable circuit (safety stop circuit) fault (single fault) was detected.	If unable to clear the error with the above procedures, the inverter condition is abnormal. ➔ Contact Fuji Electric.

[28] PVn PID feedback wire break

Problem: The PID feedback wire is broken.

PV1 PID control 1 feedback error

PV2 PID control 2 feedback error

Possible Causes	What to Check and Suggested Measures
(1) The PID feedback signal wire is broken.	Check whether the PID feedback signal wires are connected correctly. ➔ Check whether the PID feedback signal wires are connected correctly. Or, tighten up the related terminal screws. ➔ Check whether any contact part bites the wire sheath.
(2) PID feedback related circuit affected by strong electrical noise.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of signal wires, communication cables, and main circuit wires). ➔ Implement noise control measures. ➔ Separate the signal wires from the main power wires as far as possible.
(3) The function code setting is not appropriate.	The PID control feedback error upper limit (J129, J229) settings are too high. ➔ Review the set feedback value.
	The PID control feedback error lower limit (J130, J230) settings are too low. ➔ Review the set feedback value.

[29] PVn External PID feedback wire break

Problem: The PID feedback wire is broken.

PVA External PID control 1 feedback error

PVB External PID control 2 feedback error

PVC External PID control 3 feedback error

Possible Causes	What to Check and Suggested Measures
(1) The PID feedback signal wire is broken.	Check whether the PID feedback signal wires are connected correctly. ➔ Check whether the PID feedback signal wires are connected correctly. Or, tighten up the related terminal screws. ➔ Check whether any contact part bites the wire sheath.
(2) PID feedback related circuit affected by strong electrical noise.	Check if appropriate noise control measures have been implemented (e.g., correct grounding and routing of signal wires, communication cables, and main circuit wires). ➔ Implement noise control measures. ➔ Separate the signal wires from the main power wires as far as possible.
(3) The function code setting is not appropriate.	The external PID control feedback error upper limit (J529, J629, J679) settings are too high. ➔ Review the set feedback value.
	The external PID control feedback error lower limit (J530, J630, J680) settings are too low. ➔ Review the set feedback value.

[30] Pdr Dry pump protection

Problem Drought conditions were detected during PID control.

Possible Causes	What to Check and Suggested Measures
(1) The water level in the water tank has dropped to the drought position.	Check whether the water level in the water tank is sufficient. ➔ Check whether the correct amount of water is being supplied to the water tank. ➔ Check whether the motor-operated value is closed.
(2) Water is leaking from the pipes or pump system.	Check whether water is leaking from the pump system or from around the pipes. ➔ Check whether water is leaking from the pump itself. ➔ Check for cracks in the pipes and so on, and check whether water is leaking from the connections between pipes. Increase the tightening at the pipe connections.
(3) The function code setting is not appropriate.	Check whether the drought protection (detection current) (J177, J277) setting is too high. ➔ Review the set current value.
	Check whether the drought protection (deviation) (J178, J278) setting is too small. ➔ Review the set amount of deviation.

Possible Causes	What to Check and Suggested Measures
(4) The function code setting for the flow sensor is not appropriate. (This applies only when drought protection (flow sensor) (J179, J279) is set to "1: Operate".)	A flow sensor has not been assigned to digital input or analog input. ➔ If inputting a flow sensor signal by digital input, assign a "flow sensor" to E01 through E07, E98, and E99. ➔ If inputting a flow sensor signal by analog input, assign a "flow sensor" to E61 through E63.
	If inputting a flow sensor signal by digital input, check whether the ***FS*** logic and external signal logic (positive and negative) set at E01 through E07, E98, and E99 matches. ➔ Set the logic correctly.
	If inputting a flow sensor signal by analog input, the flow sensor OFF level (J165) is too high. ➔ Review the set OFF level setting.
(5) The flow sensor signal wiring is damaged.	Check whether the flow sensor signal wire is connected properly. ➔ Check whether the flow sensor signal wire is connected properly. Or alternatively, tighten the screws. ➔ Check whether the connection coating is caught.

[31] roC Control of maximum starts per hour

Problem A PID control insufficient water stoppage occurred frequently.

Possible Causes	What to Check and Suggested Measures
(1) PID feedback signal wire contact defect	Check whether the PID feedback signal wire is connected properly. ➔ Check whether the PID feedback signal wire is connected properly. Or alternatively, tighten the screws. ➔ Check whether the connection coating is caught.
(2) An accumulator (hydraulic regeneration) fault occurred due to such reasons as the lifetime being reached.	Check the accumulator parts. ➔ Replace the accumulator.

[32] PoL End of curve protection

Problem A large water quantity condition was detected during PID control.

Possible Causes	What to Check and Suggested Measures
(1) The PID feedback signal wiring is damaged.	Check whether the PID feedback signal wire is connected properly. ➔ Check whether the PID feedback signal wire is connected properly. Or alternatively, tighten the screws. ➔ Check whether the connection coating is caught.
(2) There is insufficient pump capacity or there are not enough pumps.	Check whether the required amount of supply water is being supplied properly. ➔ Increase the number of pumps. ➔ Increase the pump capacity.
(3) The function code setting is not appropriate.	Check whether the large water quantity protection (detection current) (J183) setting is too low. ➔ Review the set current value.
	Check whether the large water quantity protection (deviation) (J184) setting is too small. ➔ Review the set amount of deviation.

Possible Causes	What to Check and Suggested Measures
(4) The function code setting for the flow sensor is not appropriate. (This applies only when drought protection (flow sensor) (J179, J279) is set to "1: Operate".)	If inputting a flow sensor signal by digital input, check whether the ***FS*** logic and external signal logic (positive and negative) set at E01 through E07, E98, and E99 matches. ➔ Set the logic correctly.
	If inputting a flow sensor signal by analog input, the flow sensor ON level (J165) is too low. ➔ Review the set ON level setting.

[33] rLo Anti jam

Problem Impurities became trapped in the pump impeller, and an overcurrent was detected.

Possible Causes	What to Check and Suggested Measures
(1) Impurities are trapped in the pump impeller.	Check for any impurities in the suction side water tank or well. ➔ Check for any impurities inside the pump. ➔ Eliminate any impurities from the water tank or well as best as possible.
(2) A pump fault occurred due to such reasons as the lifetime being reached.	Check the pump parts. ➔ Check whether an abnormal noise is being emitted by the pump. ➔ Check whether the pump bearings are overheating.

[34] FoL Filter clogging error

Problem An overload condition was detected during PID control.

Possible Causes	What to Check and Suggested Measures
(1) The filter of the fan being driven by the inverter is clogged with dust.	Check whether the fan filter is clogged with dust. ➔ Check whether the filter is clogged with dust. ➔ Clean or replace the filter.
(2) A fault occurred in the fan being driven by the inverter due to the fan's service life expired, etc.	Check the fan parts. ➔ Check whether an abnormal noise is being emitted by the fan. ➔ Check whether the fan bearings are overheating.
(3) The function code setting is not appropriate.	Check whether the filter clogging (load resistance current) (J190) setting is too low. ➔ Check the set current value.
	Check whether the filter clogging (load resistance PV signal) (J191) setting is too low. ➔ Check the set feedback value.

[35] LoK Password protection (inverter lock)

Problem An incorrect user password was entered more than the specified number of times.

Possible Causes	What to Check and Suggested Measures
(1) User password 1 or 2 was entered incorrectly more than the specified number of times.	Delete the password setting. ➔ Delete the password with the all clear command (PRG >5 > 2 >10). When doing so, all inverter settings will also be initialized simultaneously. Reset the password. ➔ To clear the Lok alarm while retaining the inverter settings, notify Fuji Electric and append the clear application number (PRG > 5 > 8). We will ensure that no illegal operations have been performed, and then issue an alarm clear code.

[36] Err Mock alarm

Problem The LCD displays the alarm *err*.

Possible Causes	What to Check and Suggested Measures
(1) The STOP + SET keys were held down for more than 5 seconds.	➔ To escape from this alarm state, press the RESET key.
(2) H45 was set to "1".	➔ Press the RESET key to reset

[37] Lob Low battery

Problem The voltage in the battery used to protect date information is low.

Possible Causes	What to Check and Suggested Measures
(1) Battery connector contact defect	Check whether the battery is securely attached to the connector on the unit board. ➔ If normal battery voltage is detected, the cause of the problem will be cleared, and resetting will be possible.
(2) Battery degradation, battery defect	Check whether the battery is degraded. ➔ Replace the battery with a new one.

[38] dtL Date information loss

Problem Date information set in the inverter was lost.

Possible Causes	What to Check and Suggested Measures
(1) It was not possible to protect the date information when the inverter power was turned OFF.	Check whether the date information protection battery is properly connected. ➔ Check the battery connection, and then reset the date.
(2) The date information is abnormal.	The clock function in this product is programmed to run until 23:59:59 on December 31, 2099. The date count will be stopped if this date is exceeded. ➔ Set the correct date again.

Tip To stop using the clock function (realtime clock), perform "Realtime clock initialization (H03=10)".

9.3.2 If the "Light Alarm" Indication Appears

When an error is detected and the error is determined to be a light alarm, operation can be continued without tripping the inverter while outputting a warning (display and general purpose output terminal).

If a light alarm occurs, the WARN. LED starts flashing, and the light alarm factor is displayed on the screen.

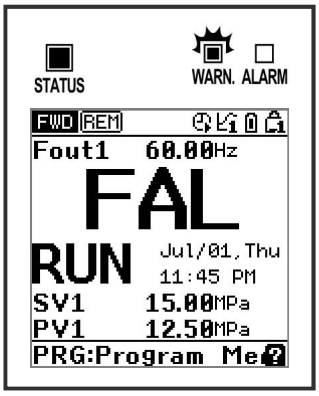


Fig. 9.1 Light alarm display example

If a light alarm occurs, a light alarm “L-ALM” is output to the multi-purpose output terminal (It is necessary to assign a light alarm “L-ALM” (data = 98) to function codes E20 through E24, and E27.)

Light alarm operations can be selected with function codes H181 through H182. The available "light alarm" codes are check-marked in the "Light alarm" object column in Table 9.1.

To display the "light alarm" factor and escape from the light alarm state, follow the instructions below.

■ Checking the light alarm content.

1) Press the PRG key to enter Programming mode.

2) Select program mode (PRG) > 4(Alarm Info) > 2(Warning History) to check the light alarm content. Light alarm codes are displayed in order of new alarms first. Refer to Table 9.1 for details on the codes.

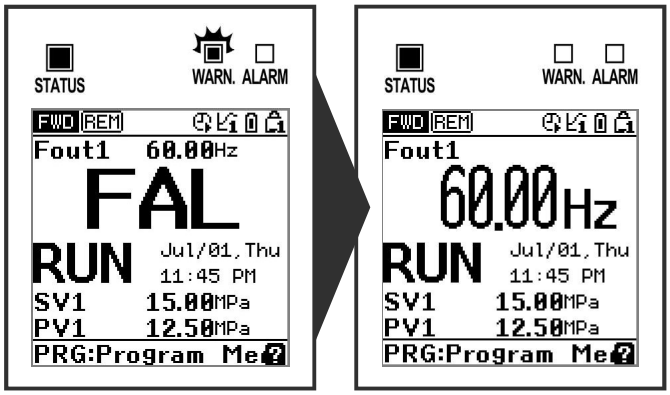
■ Releasing the light alarm

1) Eliminate the cause of the light alarm in accordance with the troubleshooting procedure applicable to the light alarm content (code) checked in the maintenance information. Refer to the “Ref. page” in Table 9.1 for information on troubleshooting and explanations.

2) After confirming the light alarm, clear the alarm display. To return to the normal state, either press the RESET key in the operating mode status similar to the same procedure used to release the alarm, enter multi-purpose input terminal alarm reset command ***RST***, or enter the alarm reset command by communication.
If the light alarm factor is successfully eliminated, the WARN. LED turns OFF, the light alarm code displayed at the screen changes to the normal display, and multi-purpose output ***L-ALM*** also turns off.
If unable to successfully eliminate the light alarm factor (e.g., when a DC fan lock is detected), the WARN. LED turns ON, and the light alarm code displayed on the screen and multi-purpose output ***L-ALM*** remain ON (factor elimination reserved). When the light alarm factor is later eliminated, the WARN. LED turns OFF automatically, the light alarm code displayed on the screen changes to the normal display, and multi-purpose output ***L-ALM*** also turns OFF.

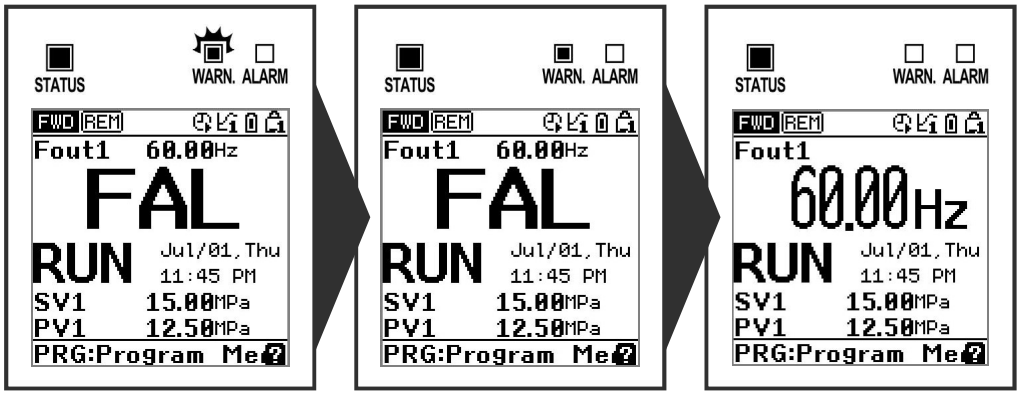
■ Light alarm release operation and LCD display

1) If releasing the light alarm after the factor has been eliminated



Light alarm (no factor) Released (normal display)

2) If the factor is eliminated after first releasing the light alarm



Light alarm (factor exists)Light alarm release reservation (factor exists) Released (normal display)

9.4 Nothing appears on the monitor

9.4.1 Abnormal motor operation

[1] The motor does not rotate.

Possible Causes	What to Check and Suggested Measures
(1) No power supplied to the inverter.	Check the input voltage and interphase voltage unbalance. ➔ Turn ON a molded case circuit breaker (MCCB), a residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) or a magnetic contactor (MC). ➔ Check for voltage drop, phase loss, poor connections, or poor contacts, and fix them if necessary. ➔ If only the auxiliary control power input is supplied, also supply the main power to the inverter.
(2) No forward/reverse operation command was inputted, or both the commands were inputted simultaneously (external signal operation).	Check the input status of the forward/reverse command with Menu "I/O Checking" using the keypad. ➔ Input a run command. ➔ Set either the forward or reverse operation command to off if both commands are being inputted. ➔ Correct the run command source. (Set F02 data to "1.") ➔ Correct the assignment of commands ***FWD*** and ***REV*** with function codes E98 and E99. ➔ Connect the external circuit wires to control circuit terminals [FWD] and [REV] correctly. ➔ Make sure that the sink/source slide switch (SW1) on the control printed circuit board (control PCB) is properly configured.
(3) No indication of rotation direction (keypad operation).	Check the input status of the forward/reverse rotation direction command with Menu "I/O Checking" using the keypad. ➔ Input the rotation direction (F02 = 0), or select the keypad operation with which the rotation direction is fixed (F02 = 2 or 3).
(4) The inverter could not accept any run commands from the keypad since it was in Programming mode.	Check which operation mode the inverter is in, using the keypad. ➔ Shift the operation mode to Running mode and enter a run command.
(5) A run command with higher priority than the one attempted was active, and the run command was stopped.	Referring to the block diagram of the frequency command block (refer to Chapter 7), check the higher priority run command with Menu "Data Checking" and Menu "I/O Checking" using the keypad. ➔ Correct any incorrect function code data settings (in H30, y98, etc.) or cancel the higher priority run command.
(6) No analog frequency command input.	Check whether the analog frequency command (reference frequency) is correctly inputted, using Menu #4 "I/O Checking" on the keypad. ➔ Connect the external circuit wires to terminals [13], [12], [11], [C1], and [V2] correctly. ➔ When the terminal [C1] is used, check the slider position of the terminal [C1] property switch (SW5) and the setting of the thermistor mode selection (H26).

Possible Causes	What to Check and Suggested Measures
(7) The reference frequency was below the starting or stop frequency.	Check that a reference frequency has been entered correctly, using Menu "I/O Checking" on the keypad. ➔ Set the reference frequency at the same or higher than that of the starting and stop frequencies (F23 and F25). ➔ Reconsider the starting and stop frequencies (F23 and F25), and if necessary, change them to the lower values. ➔Inspect the external frequency command potentiometers, signal converters, switches, and relay contacts. Replace any ones that are faulty. ➔ Connect the external circuit wires to terminals [13], [12], [11], [C1], and [V2] correctly.
(8) A frequency command with higher priority than the one attempted was active.	Check the higher priority run command with Menu "Data Checking" and Menu "I/O Checking" using the keypad, referring to the block diagram of the frequency command block (refer to Chapter 7). ➔ Correct any incorrect function code data (e.g. cancel the higher priority run command).
(9) The upper and lower frequencies for the frequency limiters were set incorrectly.	Check the data of function codes F15 (Frequency limiter (High)) and F16 (Frequency limiter (Low)). ➔ Change the settings of F15 and F16 to the correct ones.
(10) The coast-to-stop command was effective.	Check the data of function codes E01 through E07, E98, and E99 and the input signal status, using Menu "I/O Checking" on the keypad. ➔ Release the coast-to-stop command setting.
(11) Broken wires, incorrect connection or poor contact with the motor.	Check the wiring (Measure the output current). ➔ Repair the wires to the motor, or replace them.
(12) Overload	Measure the output current. ➔ Reduce the load (In winter, the load tends to increase.)
	Check whether any mechanical brake is activated. ➔ Release the mechanical brake, if any.
(13) Torque generated by the motor was insufficient.	Check that the motor starts running if the value of torque boost (F09) is increased. ➔ Increase the value of torque boost (F09) and try to run the motor.
	Check the data of function codes F04, F05, H50, H51, H52 and H53. ➔ Change the V/f pattern to match the motor's characteristics.
	Check that the motor switching signal (motor selection) is correct and the data of function codes matches each motor. ➔ Correct the motor switching signal. ➔ Modify the function code data to match the connected motor.
	Check whether the reference frequency is below the slip-compensated frequency of the motor. ➔ Change the reference frequency so that it becomes higher than the slip-compensated frequency of the motor.

[2] The motor rotates, but the speed does not increase.

Possible Causes	What to Check and Suggested Measures
(1) The maximum frequency currently specified was too low.	Check the data of function code F03 (Maximum frequency). ➔ Correct the F03 data.
(2) The data of frequency limiter (High) currently specified was too low.	Check the data of function code F15 (Frequency limiter (High)). ➔ Correct the F15 data.
(3) The reference frequency currently specified was too low.	Check that the reference frequency has been entered correctly, using Menu #4 "I/O Checking" on the keypad. ➔ Increase the reference frequency. ➔ Inspect the external frequency command potentiometers, signal converters, switches, and relay contacts. Replace any ones that are faulty. ➔ Connect the external circuit wires to terminals [13], [12], [11], [C1], and [V2] correctly.
(4) A frequency command (e.g., multi-frequency or via communications) with higher priority than the one attempted was active and its reference frequency was too low.	Check the data of the relevant function codes and what frequency commands are being received, through Menu "Data Setting," Menu "Data Checking" and Menu "I/O Checking," on the keypad by referring to the block diagram of the frequency command (refer to Chapter 7). ➔ Correct any incorrect data of function codes (e.g. cancel the higher priority frequency command).
(5) The acceleration time was too long or too short.	Check the data of function codes F07, E10, E12, and E14 (Acceleration time). ➔ Change the acceleration time to match the load.
(6) Overload.	Measure the output current. ➔ Reduce the load.
	Check whether any mechanical brake is activated. ➔ Release the mechanical brake.
(7) Function code settings do not agree with the motor characteristics.	If auto-torque boost or auto-energy saving operation is specified, check whether the data of P02, P03, P06, P07, and P08 agree with the parameters of the motor. ➔ Perform auto-tuning of the inverter for the motor to be used.
(8) The output frequency does not increase due to the current limiter operation.	Make sure that F43 (Current limiter (Mode selection)) is set to "2" and check the data of F44 (Current limiter (Level)). ➔ Correct the F44 data. Or, if the current limiter operation is not needed, set F43 to "0" (disabled).
	Decrease the value of torque boost (F09), then run the motor again and check if the speed increases. ➔ Adjust the value of the torque boost (F09).
	Check the data of function codes F04, F05, H50, H51, H52 and H53 to ensure that the V/f pattern setting is right. ➔ Match the V/f pattern setting with the motor ratings.
(9) The output frequency does not increase due to the torque limiter operation.	Check whether data of torque limiter related function codes (F40, F41, E16 and E17) is correctly configured and the "Select torque limiter level" terminal command ***TL2***/***TL1*** is correct. ➔ Correct data of F40, F41, E16 and E17 or reset them to the factory defaults (disable). ➔ Set the ***TL2***/***TL1*** correctly.
(10) Bias and gain incorrectly specified.	Check the data of function codes F18, C50, C32, C34, C37, C39, C42, and C44. ➔ Readjust the bias and gain to appropriate values.

[3] The motor runs in the opposite direction to the command.

Possible Causes	What to Check and Suggested Measures
(1) Wiring to the motor is incorrect.	Check the wiring to the motor. ➔ Connect terminals U, V, and W of the inverter to the U, V, and W terminals of the motor, respectively.
(2) Incorrect connection and settings for run commands and rotation direction commands ***FWD*** and ***REV***.	Check the data of function codes E98 and E99 and the connection to terminals [FWD] and [REV]. ➔ Correct the data of the function codes and the connection.
(3) A run command (with fixed rotational direction) from the keypad is active, but the rotational direction setting is incorrect.	Check the data of function code F02 (Run command). ➔ Change the data of function code F02 to "2: RUN / STOP keys on keypad (forward)" or "3: RUN / STOP keys on keypad (reverse)."
(4) The rotation direction specification of the motor is opposite to that of the inverter.	The rotation direction of IEC-compliant motors is opposite to that of incompliant motors. ➔ Switch the ***FWD***/***REV*** signal setting.

[4] Speed fluctuation or current oscillation (e.g., hunting) occurs during running at constant speed.

Possible Causes	What to Check and Suggested Measures
(1) The frequency command fluctuates.	Check the signals for the frequency command with Menu #4 "I/O Checking" using the keypad. ➔ Increase the filter constants (C33, C38, and C43) for the frequency command.
(2) An external frequency command potentiometer is used for frequency setting.	Check that there is no noise in the control signal wires from external sources. ➔ Isolate the control signal wires from the main circuit wires as far as possible. ➔ Use shielded or twisted wires for control signals.
	Check whether the external frequency command potentiometer is malfunctioning due to noise from the inverter. ➔ Connect a capacitor to the output terminal of the potentiometer or set a ferrite core on the signal wire. (Refer to Chapter 2.)
(3) Frequency switching or multi-frequency command was enabled.	Check whether the relay signal for switching the frequency command is chattering. ➔ If the relay contact is defective, replace the relay.
(4) The wiring length between the inverter and the motor is too long.	Check whether auto-torque boost, auto-energy saving operation, or dynamic torque vector control is enabled. ➔ Perform auto-tuning of the inverter for every motor to be used. ➔ Disable the automatic control systems by setting F37 to "1" (Constant torque load) and F42 to "0" (V/f control with slip compensation active), then check that the motor vibration stops. ➔ Make the output wires as short as possible.
(5) The machinery is hunting due to vibration caused by low rigidity of the load. Or the current is irregularly oscillating due to special motor parameters.	Once disable all the automatic control systems such as auto torque boost, auto energy saving operation, overload prevention control, current limiter, torque limiter, automatic deceleration (anti-regenerative control), auto search for idling motor speed, slip compensation, dynamic torque vector control, online tuning, and then check that the motor vibration comes to a stop. ➔ Disable the functions causing the vibration. ➔ Readjust the output current fluctuation damping gain (H80).
	Check that the motor vibration is suppressed if you decrease the level of F26 (Motor sound (Carrier frequency)) or set F27 (Motor sound (Tone)) to "0." ➔ Decrease the carrier frequency (F26) or set the tone to "0" (F27 = 0).

[5] Grating sound is heard from the motor or the motor sound fluctuates.

Possible Causes	What to Check and Suggested Measures
(1) The specified carrier frequency is too low.	Check the data of function codes F26 (Motor sound (Carrier frequency)) and F27 (Motor sound (Tone)). ➔ Increase the carrier frequency (F26). If the carrier frequency is set too high, current derating is required. For details, refer to Section 2.6 "Derating of Rated Output Current." ➔ Change the setting of F27 to appropriate value.
(2) The ambient temperature of the inverter was too high (when automatic lowering of the carrier frequency was enabled by H98).	Measure the temperature inside the panel where the inverter is mounted. ➔ If it is over 40°C, lower it by improving the ventilation. ➔ Lower the temperature of the inverter by reducing the load. (For fans or pumps, decrease the frequency limiter value (F15).) **Note:** If you disable H98, an OH1, OH3, or OLU alarm may occur.
(3) Resonance with the load.	Check the machinery mounting accuracy or check whether there is resonance with the mounting base. ➔ Disconnect the motor from the machinery and run it alone, then find where the resonance comes from. Upon locating the cause, improve the characteristics of the source of the resonance. ➔ Adjust the settings of C01 (Jump frequency 1) to C04 (Jump frequency (Hysteresis width)) so as to avoid continuous running in the frequency range causing resonance.

[6] The motor does not accelerate or decelerate within the specified time.

Possible Causes	What to Check and Suggested Measures
(1) The inverter runs the motor with S-curve or curvilinear pattern.	Check the data of function code H07 (Acceleration/deceleration pattern). ➔ Select the linear pattern (H07 = 0). ➔ Shorten the acceleration/deceleration time (F07, E10 through E15).
(2) The current limiting operation prevented the output frequency from increasing (during acceleration).	Make sure that F43 (Current limiter (Mode selection)) is set to "2: Enable during acceleration and at constant speed," then check that the setting of F44 (Current limiter (Level)) is reasonable. ➔ Readjust the setting of F44 to appropriate value, or disable the function of current limiter with F43. ➔ Increase the acceleration/deceleration time (F07, F08, E10 through E15).
(3) The automatic deceleration (Anti-regenerative control) is enabled during deceleration.	Check the data of function code H69 (Automatic deceleration (Mode selection)). ➔ Increase the deceleration time (F08, E11, E13, and E15).
(4) Overload.	Measure the output current. ➔ Reduce the load (For fans or pumps, decrease the frequency limiter value (F15).) (In winter, the load tends to increase.)
(5) Torque generated by the motor was insufficient.	Check that the motor starts running if the value of the torque boost (F09) is increased. ➔ Increase the value of the torque boost (F09).
(6) An external frequency command potentiometer is used for frequency setting.	Check that there is no noise in the control signal wires from external sources. ➔ Isolate the control signal wires from the main circuit wires as far as possible. ➔ Use shielded or twisted wires for control signals. ➔ Connect a capacitor to the output terminal of the potentiometer or set a ferrite core on the signal wire. (Refer to Chapter 2.)

Possible Causes	What to Check and Suggested Measures
(7) The output frequency is limited by the torque limiter.	Check whether data of torque limiter related function codes (F40, F41, E16 and E17) is correctly configured and the ***TL2***/***TL1*** terminal command ("Select torque limiter level 2/1") is correct. ➔ Correct the data of F40, F41, E16 and E17 or reset them to the factory defaults. ➔ Set the ***TL2***/***TL1*** correctly. ➔ Increase the acceleration/deceleration time (F07, F08, E10 through E15).
(8) The specified acceleration or deceleration time was incorrect.	Check the terminal commands ***RT1*** and ***RT2*** for acceleration/ deceleration times. ➔ Correct the ***RT1*** and ***RT2*** settings.

[7] The motor does not restart even after the power recovers from a momentary power failure.

Possible Causes	What to Check and Suggested Measures
(1) The data of function code F14 is either "0," "1," or "2."	Check if an undervoltage trip (LV*)* occurs. ➔ Change the data of function code F14 (Restart mode after momentary power failure (Mode selection)) to "3," "4," or "5."
(2) The run command remains OFF even after the power has been restored.	Check the input signal with Menu "I/O Checking" using the keypad. ➔ Check the power recovery sequence with an external circuit. If necessary, consider the use of a relay that can keep the run command ON.
	In 3-wire operation, the power to the control printed circuit board (control PCB) has been shut down once because of a long momentary power failure time, or the "Enable 3-wire operation" signal ***HOLD*** has been turned OFF once. ➔ Change the design or the setting so that a run command can be issued again within 2 seconds after the power has been restored.

[8] The motor abnormally heats up.

Possible Causes	What to Check and Suggested Measures
(1) Excessive torque boost specified.	Check whether decreasing the torque boost (F09) decreases the output current but does not stall the motor. ➔ If no stall occurs, decrease the torque boost (F09).
(2) Continuous running in extremely slow speed.	Check the running speed of the inverter. ➔ Change the speed setting or replace the motor with a motor exclusively designed for inverters.
(3) Overload.	Measure the inverter output current. ➔ Reduce the load (For fans or pumps, decrease the frequency limiter value (F15).) (In winter, the load tends to increase.)

[9] The motor does not run as expected.

Possible Causes	What to Check and Suggested Measures
(1) Incorrect setting of function code data.	Check that function codes are correctly configured and no unnecessary configuration has been done. ➔ Configure all the function codes correctly.
	Make a note of function code data currently configured and then initialize all function code data using H03. ➔ After the above process, reconfigure function codes one by one, checking the running status of the motor.
(2) The forced operation function is in use.	Check whether the set function code is correct, or whether an unnecessary setting has been specified. ➔ Check the forced operation selection (H116) setting. ➔ Check the digital input terminal forced operation command ***FMS***.

9.4.2 Problems with inverter settings

[1] Nothing appears on the LCD monitor.

Possible Causes	What to Check and Suggested Measures
(1) No power (neither main power nor auxiliary control power) supplied to the inverter.	Check the input voltage and interphase voltage unbalance. ➔ Turn ON a molded case circuit breaker (MCCB), a residual-current-operated protective device (RCD)/earth leakage circuit breaker (ELCB) (with overcurrent protection) or a magnetic contactor (MC). ➔ Check for voltage drop, phase loss, poor connections, or poor contacts and fix them if necessary.
(2) The keypad was not properly connected to the inverter.	Check whether the keypad is properly connected to the inverter. ➔ Remove the keypad, put it back, and see whether the problem recurs. ➔ Replace the keypad with another one and check whether the problem recurs.
	When running the inverter remotely, ensure that the extension cable is securely connected both to the keypad and to the inverter. ➔ Disconnect the cable, reconnect it, and see whether the problem recurs. ➔ Replace the keypad with another one and check whether the problem per recurs.

[2] Connecting... display

Problem The “Connecting...” display does not change.

Possible Causes	What to Check and Suggested Measures
(1) The keypad is poorly connected.	Check the remote operation extension cable conductance. ➔ Replace the remote operation extension cable conductance.

[3] “This inverter is not supported.” display

Problem “This inverter is not supported.” is displayed and the keypad turns ON and OFF repeatedly.

Possible Causes	What to Check and Suggested Measures
(1) The keypad and inverter are not compatible.	Check the keypad and inverter compatibility. ➔ Connect a keypad that is compatible with the inverter.

[4] “USB Connected.” display

Problem “USB Connected.” is displayed and operation is not possible.

Possible Causes	What to Check and Suggested Measures
(1) A USB cable is connected to the inverter.	The inverter has been set to USB communication mode by connecting it to the computer via a USB cable. ➔ If not necessary to connect to the computer, disconnect the USB cable.

[5] Menu cannot be selected./Menu does not display.

Problem A mark appears at some menu items, and they cannot be selected. Menu items do not display.

Possible Causes	What to Check and Suggested Measures
(1) A user password has been set, thus enabling protection.	Check whether a password has been set. ➔ Delete the password at PRG > 5(User Config) > 2(Password). Refer to Chapter 5, Section 5.6.6.2 for details on how to delete the password.
(2) These menu items are password protected (inverter lock).	With Lok alarm "password protection (inverter lock)", many menu items are restricted to prevent tampering with the inverter. ➔ Cancel the LoK alarm. Refer to [34] in Section 9.3.1 for details on how to cancel the alarm.

[6] Data of function codes cannot be changed.

Possible Causes	What to Check and Suggested Measures
(1) An attempt was made to change function code data that cannot be changed when the inverter is running.	Check if the inverter is running with Menu "Drive Monitoring" using the keypad and then confirm whether the data of the function codes can be changed when the motor is running by referring to the function code tables. ➔ Stop the motor then change the data of the function codes.
(2) The data of the function codes is protected.	Check the data of function code F00 (Data Protection). ➔ Change the F00 data from "Enable data protection" (1 or 3) to "Disable data protection" (0 or 2).
(3) The ***WE-KP*** terminal command ("Enable data change with keypad") is not entered, though it has been assigned to a digital input terminal.	Check the data of function codes E01 through E09, E98 and E99 and the input signal status with Menu "I/O Checking" using the keypad. ➔ Input a ***WE-KP*** command through a digital input terminal.
(4) The SET key was not pressed.	Check whether you have pressed the SET key after changing the function code data. ➔ Press the SET key after changing the function code data. Ensure that "Writing…" appears on the screen.
(5) Terminal commands "FWD" and "REV" are on. (Data for function codes F02, E01 through E07, E98, and E99 cannot be changed.)	Either one of the ***FWD*** and ***REV*** terminal commands is turned ON. ➔ Turn OFF both ***FWD*** and ***REV***.

Possible Causes	What to Check and Suggested Measures
(6) The function code is not applicable to quick setup. (The function code to be changed does not display.)	Check whether Quick Setup (PRG > 0) is open. This menu displays only specific function codes that have been selected beforehand. ➔ Change the relevant function code at PRG > 2(Function code) > 1(Data Set). All function codes appear in this menu. ➔ Add the function code for which quick setup is to be performed at PRG > 5(User Config) > 1(Select Q.Setup). (Display the function code and then change the data.)
(7) Function code settings are protected with a password. (It is not possible to display the Function Code Settings screen.)	Check whether a password has been set. ➔ Delete the password at PRG > 5(User Config) > 2(Password). Refer to Chapter 5, Section 5.6.6.2 for details on how to delete the password.
(8) The code cannot be changed at the Function Code Settings screen. ("Change this in dedicated menus." appears.)	Settings cannot be changed from function codes for which dedicated menus exist (T codes, certain K codes). ➔ Display function codes and change data at the dedicated menus for PRG > 1(Start-up) > 3(Date/Time) Clock Setting or function code PRG > 2(Function Code) > 5(Timer Setup) Timer Operation.
(9) Terminal command ***RST*** is ON. (Function code P04 data cannot be changed.)	Check the data for function codes E01 through E07, E98, and E99, and use the keypad to check the input status by performing an I/O check from the menu. ➔ Turn OFF the digital input terminal alarm reset command ***RST***.

9.5 If Other than an Alarm Code is Displayed

[1] – – – – (center bar) appears

Problem A center bar (– – – –) appeared on the LCD monitor.

Possible Causes	What to Check and Suggested Measures
(1) With the PID being enabled (J01 = 1, 2, or 3), you disabled PID control (J01 = 0) when the LCD monitor had been set to display the PID command or PID feedback amount by pressing the SET key.	Make sure that when you wish to view a PID command or a PID feedback amount, J01 (PID control) is not set to "0: Disable." ➔ Set J01 to "1: Enable (Process control normal operation)," "2: Enable (Process control inverse operation)," or "3: Enable (Dancer control)."
(2) The keypad was poorly connected.	Prior to proceed, check that pressing the PRG key does not change the display on the LCD monitor. Check continuity of the extension cable for the keypad used in remote operation. ➔ Replace the cable.

[2] OVER+ / OVER- Display

Problem The display data exceeds the maximum number of display digits. (OVER+: positive value, OVER-: negative value)

Possible Causes	What to Check and Suggested Measures
(1) The display data has overflowed.	Please verify the settings of the corresponding function.