

9 Troubleshooting

This chapter explains how to troubleshoot a problem when inverter protective functions, fault trips, warning signals, or a fault occurs. If the inverter does not work normally after following the suggested troubleshooting steps, please contact the LSIS customer service center.

9.1 Trip and Warning

When the inverter detects a fault, it stops the operation (trips) or sends out a warning signal. When a trip or warning occurs, trip information and warning information will be briefly displayed on the keypad. Users can read the warning message at Pr.90. If two or more trips occur, the trip information with a higher priority will be displayed first on the keypad.

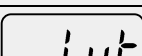
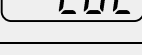
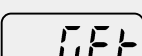
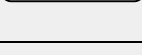
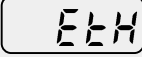
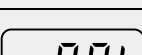
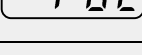
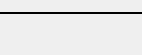
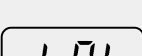
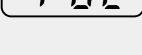
The fault conditions can be categorized as follows:

- **Level:** When the fault is corrected, the trip or warning signal disappears and the fault is not saved in the fault history.
- **Latch:** When the fault is corrected and a reset input signal is provided, the trip or warning signal disappears.
- **Fatal:** When the fault is corrected, the fault trip or warning signal disappears only after the user turns off the inverter, waits until the charge indicator light goes off, and turns the inverter on again. If the inverter is still in a fault condition after powering it on again, please contact the supplier or the LSIS customer service center.

9.1.1 Fault Trips

Protection Functions for Output Current and Input Voltage

Keypad Display	Name	Type	Description
	Over Load	Latch	Displayed when the motor overload trip is activated and the actual load level exceeds the set level. Operates when Pr.20 is set to a value other than 0.
	Under Load	Latch	Displayed when the motor underload trip is activated and the actual load level is less than the set level. Operates when Pr.27 is set to a value other than 0.

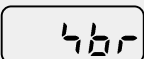
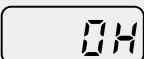
Keypad Display	Name	Type	Description
	Over Current1	Latch	Displayed when inverter output current exceeds 200% of the rated current.
	Over Voltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
	Low Voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.
	Low Voltage2	Latch	Displayed when internal DC circuit voltage is less than the specified value during inverter operation. Operates when Pr.82 is set to 1.
	Ground Trip*	Latch	Displayed when a ground fault trip occurs on the output side of the inverter and causes the current to exceed the specified value. The specified value varies depending on inverter capacity.
	E-Thermal	Latch	Displayed based on inverse time-limit thermal characteristics to prevent motor overheating. Operates when Pr.40 is set to a value other than 0.
	Out Phase Open	Latch	Displayed when a 3-phase inverter output has one or more phases in an open circuit condition. Operates when bit 1 of Pr.05 is set to 1.
	In Phase Open	Latch	Displayed when a 3-phase inverter input has one or more phases in an open circuit condition. Operates only when bit 2 of Pr.05 is set to 1.
	Inverter OLT	Latch	Displayed when the inverter has been protected from overload and resultant overheating, based on inverse time-limit thermal characteristics. Allowable overload rates for the inverter are 150% for 1 min and 200% for 4 sec. Protection is based on inverter rated capacity, and may vary depending on the device's capacity.
	No Motor Trip	Latch	Displayed when the motor is not connected during inverter operation. Operates when Pr.31 is set to 1.
	Relay Open Trip	Latch	Occurs when the DC voltage relay is not operating when power is input. The Pr-90 code must be set to 1 to operate. Detected only in 1.5/2.2/4.0kW-4 capacities.
	Over torque trip1	Latch	Occurs when the output current is higher than the level set in Ou-68. Operates when OU-67 is set to 3, 4.
	Over torque trip2	Latch	Occurs when the output current is higher than the level set in OU-71. Operates when OU-70 is set to 3, 4.
	Under torque trip1	Latch	Occurs when the output current is lower than the level set in OU-68. Operates when OU-67 is set to

Keypad Display	Name	Type	Description
			7, 8.
	Under torque trip2	Latch	Occurs when the output current is lower than the level set in OU-71. Operates when OU-70 is set to 7, 8.

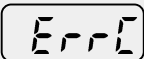
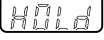
* The Ground Trip (GFT) feature is not provided in products under 4.0 kW except for 4.0 kW 200 V and 2.2 kW 200 V. An over current trip (OCT) or over voltage trip (OVT) may occur during low resistance grounding.

Protection Functions Using Abnormal Internal Circuit Conditions and External Signals

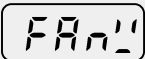
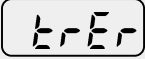
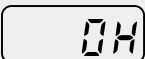
Keypad Display	Name	Type	Description
	Over Heat	Latch	Displayed when the temperature of the inverter heat sink exceeds the specified value.
	Over Current2	Latch	Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.
	External Trip	Latch	Displayed when an external fault signal is provided by the multi-function terminal. Set one of the multi-function input terminals at In.65–69 to 4 (External Trip) to enable external trip.
	BX	Level	Displayed when the inverter output is blocked by a signal provided from the multi-function terminal. Set one of the multi-function input terminals at In.65–69 to 5 (BX) to enable input block function.
	H/W-Diag	Fatal	Displayed when an error is detected in the memory (EEPROM), analog-digital converter output (ADC Off Set), or CPU watchdog (Watch Dog-1, Watch Dog-2). • EEP Err: An error in reading/writing parameters due to keypad or memory (EEPROM) fault. • ADC Off Set: An error in the current sensing circuit (U/V/W terminal, current sensor, etc.).
	NTC Open	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
	Fan Trip	Latch	Displayed when an error is detected in the cooling fan. Set Pr.79 to 0 to activate fan trip (for models below 22 kW capacity).

Keypad Display	Name	Type	Description
	Pre-PID Fail	Latch	Displayed when pre-PID is operating with functions set at AP.34–AP.36. A fault trip occurs when a controlled variable (PID feedback) is measured below the set value and the low feedback continues, as it is treated as a load fault.
	Ext-Brake	Latch	Operates when the external brake signal is provided by the multi-function terminal. Occurs when the inverter output starting current remains below the set value at Ad.41. Set either OU.31 or OU.32 to 35 (BR Control).
	Overheat Pre Alarm	Latch	When the user has set Pr-78 to 2: Free-Run or 3: Dec, pre-overheating warning trip of inverter occurs if the inverter temperature exceeds the temperature set by the user in Pr-77.

Protection Functions for Communication Options

Keypad Display	Name	Type	Description
	Lost Command	Level	Displayed when a frequency or operation command error is detected during inverter operation by controllers other than the keypad (e.g., using a terminal block and a communication mode). Operates when Pr.12 is set to a value other than 0.
 	IO Board Trip	Latch	Displayed when the I/O board or external communication card is not connected to the inverter or there is a bad connection.
			Displayed when the  error code continues for more than 5 sec. (‘Errc’ -> ‘-rrc’ -> ‘E-rc’ -> ‘Er-c’ -> ‘Err-’ -> ‘- -rc’ -> ‘Er-’ -> ‘- - - -’ -> ‘Errc’ -> ...)
	Option Trip-1	Latch	Displayed when a communication error is detected between the inverter and the communication board. Occurs when the communication option card is installed.

9.1.2 Warning Messages

Keypad Display	Name	Description
	Over Load	Displayed when the motor is overloaded. Operates when Pr.17 is set to 1. To operate, select 5. Set the digital output terminal or relay (OU.31 or OU.33) to 5 (Over Load) to receive overload warning output signals.
	Under Load	Displayed when the motor is underloaded. Operates when Pr.25 is set to 1. Set the digital output terminal or relay (OU.31 or OU.33) to 7 (Under Load) to receive underload warning output signals.
	INV Over Load	Displayed when the overload time equivalent to 60% of the inverter overheat protection (inverter IOLT) level, is accumulated. Set the digital output terminal or relay (OU.31 or OU.33) to 6 (IOL) to receive inverter overload warning output signals.
	Lost Command	Lost command warning alarm occurs even with Pr.12 set to 0. The warning alarm occurs based on the condition set at Pr.13– 15. Set the digital output terminal or relay (OU.31 or OU.33) to 13 (Lost Command) to receive lost command warning output signals. If the communication settings and status are not suitable for P2P, a Lost Command alarm occurs.
	Fan Exchange	An alarm occurs when the value set at Pr-86 is less than the value set at Pr-87. To receive fan exchange output signals, set the digital output terminal or relay (OU.31 or OU.33) to 37 (Fan Exchange).
	Fan Warning	Displayed when an error is detected from the cooling fan while Pr.79 is set to 1. Set the digital output terminal or relay (OU.31 or OU.33) to 8 (Fan Warning) to receive fan warning output signals.
	DB Warn%ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at Pr.66.
	Retry Tr Tune	Operates when dr.9 is set to 4. The warning alarm occurs when the motor's rotor time constant (Tr) is either too low or too high.
	Overheat Pre Alarm	When the user has set Pr-78 to 1: Warning, pre-overheating warning of inverter occurs if the inverter temperature exceeds the temperature set by the user in Pr-77.

9.2 Troubleshooting Fault Trips

When a fault trip or warning occurs due to a protection function, refer to the following table for possible causes and remedies.

Items	Cause	Remedy
OLT	The load is greater than the motor's rated capacity.	Replace the motor and inverter with models that have increased capacity.
	The set value for the overload trip level (Pr.21) is too low.	Increase the set value for the overload trip level.
ULT	There is a motor-load connection problem.	Replace the motor and inverter with models with lower capacity.
	The set value for underload level (Pr.29, Pr.30) is less than the system's minimum load.	Reduce the set value for the underload level.
OCT	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The inverter supplied an output while the motor was idling.	Operate the inverter after the motor has stopped or use the speed search function (Cn.60).
	The mechanical brake of the motor is operating too fast.	Check the mechanical brake.
	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.
OVT	Deceleration time is too short for the load inertia (GD2).	Increase the deceleration time.
	A generative load occurs at the inverter output.	Use the braking unit.
	The input voltage is too high.	Determine if the input voltage is above the specified value.
	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.
LVT	The input voltage is too low.	Determine if the input voltage is below the specified value.
	A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.).	Increase the power capacity.
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.

Items	Cause	Remedy
LV2	The input voltage has decreased during operation.	Determine if the input voltage is below the specified value.
	An input open-phase has occurred when input voltage is low.	Check the input wiring.
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.
GFT	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.
ETH	The motor has overheated.	Reduce the load or operation frequency.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The set value for electronic thermal protection is too low.	Set an appropriate electronic thermal prevention (ETH) level.
	The inverter has been operated at low speed for an extended duration.	Replace the motor with a model that supplies extra power to the cooling fan.
POT	The magnetic contactor on the output side has a connection fault.	Check the magnetic contactor on the output side.
	The output wiring is faulty.	Check the output wiring.
IPO	The magnetic contactor on the input side has a connection fault.	Check the magnetic contactor on the input side.
	The input wiring is faulty.	Check the input wiring.
	The DC link capacitor needs to be replaced.	Replace the DC link capacitor. Contact the retailer or the LSIS customer service center.
IOLT	The load is greater than the rated motor capacity.	Replace the motor and inverter with models that have increased capacity.
	The torque boost level is too high.	Reduce the torque boost level.
OHT	There is a problem with the cooling system.	Determine if a foreign object is obstructing the air inlet, outlet, or vent.
	The inverter cooling fan has been operated for an extended period.	Replace the cooling fan.
	The ambient temperature is too high.	Keep the ambient temperature below 50°C.

Items	Cause	Remedy
OC2	Output wiring is short-circuited.	Check the output wiring.
	There is a fault with the electronic semiconductor (IGBT).	Do not operate the inverter. Contact the retailer or the LSIS customer service center.
	A ground fault has occurred in the inverter output wiring.	Check the output wiring.
	The motor insulation is damaged.	Replace the motor.
NTC	The ambient temperature is too low.	Keep the ambient temperature above -10°C .
	There is a fault with the internal temperature sensor.	Contact the retailer or the LSIS customer service center.
FAN	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
	The cooling fan needs to be replaced.	Replace the cooling fan.

9.3 Other Faults

When a fault other than those identified as fault trips or warnings occurs, refer to the following table for possible causes and remedies.

Items	Cause	Remedy
Parameters cannot be set.	The inverter is in operation (driving mode).	Stop the inverter to change to program mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load

Items	Cause	Remedy
		level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.
	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the minimum frequency.
	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so resume operation normally.
	Motor torque is too low.	Change the operation modes (V/F, IMSensorless). If the fault remains, replace the inverter with a model with increased capacity.
The motor rotates in the opposite direction to the command.	The wiring for the motor output cable is incorrect.	Determine if the cable on the output side is wired correctly to the phase (U/V/W) of the motor.
	The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect.	Check the forward/reverse rotation wiring.
The motor only rotates in one direction.	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
	The reverse rotation signal is not provided, even when a 3-wire sequence is selected.	Check the input signal associated with the 3-wire operation and adjust as necessary.
The motor is overheating.	The load is too high.	Reduce the load. Increase Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the inverter with models with appropriate capacity for the load.

Items	Cause	Remedy
	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.
	The phase-to-phase voltage of the motor is insufficient.	Use a motor that can withstand phase-to-phase voltages surges greater than the maximum surge voltage.
		Only use motors suitable for applications with inverters.
		Connect the AC reactor to the inverter output (set the carrier frequency to 2 kHz).
	The motor fan has stopped or the fan is obstructed with debris.	Check the motor fan and remove any foreign objects.
The motor stops during acceleration or when connected to load.	The load is too high.	Reduce the load.
		Replace the motor and the inverter with models with appropriate capacity for the load.
The motor does not accelerate. /The acceleration time is too long.	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load. Increase the acceleration time. Check the mechanical brake status.
	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor properties and the inverter parameter are incorrect.	Change the motor related parameters.
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	Change the stall prevention level.
	Starting torque is insufficient.	Change to vector control operation mode. If the fault remains, replace the inverter with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and inverter with models that have increased capacity.
	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.

Items	Cause	Remedy
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor deceleration time is too long even with Dynamic Braking (DB) resistor connected.	The deceleration time is set too long.	Change the setting accordingly.
	The motor torque is insufficient.	If motor parameters are normal, it is likely to be a motor capacity fault.
	Replace the motor with a model with increased capacity.	Replace the inverter with a model that has increased capacity.
Operation is difficult in underload applications.	The carrier frequency is too high.	Reduce the carrier frequency.
	Over-excitation has occurred due to an inaccurate V/F setting at low speed.	Reduce the torque boost value to avoid over-excitation.
While the inverter is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	Change the carrier frequency to the minimum value.
		Install a micro surge filter in the inverter output.
When the inverter is operating, the earth leakage breaker is activated.	An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation.	Connect the inverter to a ground terminal.
		Check that the ground resistance is less than 100Ω for 200 V inverters and less than 10Ω for 400 V inverters.
		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Reduce the carrier frequency.
		Make the cable length between the inverter and the motor as short as possible.

Items	Cause	Remedy
The motor vibrates severely and does not rotate normally.	The voltage between phases is badly balanced.	Check the input voltage and balance the voltage.
		Check and test the motor's insulation.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the operating frequency.
	Resonance occurs between the motor's natural frequency and the inverter's output frequency.	Slightly increase or decrease the carrier frequency.
		Use the frequency jump function to avoid the frequency band where resonance occurs.
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (In.07).
	The wiring length between the inverter and the motor is too long.	Ensure that the total cable length between the inverter and the motor is less than 200 m (50 m for motors rated 3.7 kW or lower).
The motor does not come to a complete stop when the inverter output stops.	It is difficult to decelerate sufficiently, because DC braking is not operating normally.	Adjust the DC braking parameter.
		Increase the set value for the DC braking current.
		Increase the set value for the DC braking stopping time.
The output frequency does not increase to the frequency reference.	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
	The frequency reference is exceeding the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the frequency reference.
	Because the load is too heavy, the stall prevention function is working.	Replace the inverter with a model that has increased capacity.
The cooling fan does not rotate.	The control parameter for the cooling fan is set incorrectly.	Check the control parameter setting for the cooling fan.
The motor stops in case of lightning.	The product may be reset or a trip (OCT, OC2, OVT) may occur due to lightning.	Restart after checking the peripheral devices of the inverter.