Chapter 6: Maintenance and Troubleshooting

Chapter 6

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Maintenance and Inspections

Modern AC drives are based on solid state electronics technology, including ICs, resistors, capacitors, transistors, cooling fans, relays, etc. These components have a limited life under normal operation. Preventive maintenance is required to operate the drive in its optimal condition, and to ensure a long life. We recommend that a qualified technician perform a regular inspection of the drive. Some items should be checked once a month, and some items should be checked yearly.

NOTE: All inspections should be accomplished with Safety in mind with due and required caution. Some of these Inspection items may require the Drive to be powered down, while others may require power to be applied. Proper safety precautions including the use of PPE are/may be required. Please review cautionary statements in each section

Monthly Inspection

Check the following items at least once a month.

1) *Make sure the motors are operating as expected.*
2) *Make sure the drive installation environment is normal.*
3) *Make sure the enclosure and drive cooling systems are operating as expected.*
4) *Check for irregular vibrations or sounds during operation.*
5) *Make sure the motors are not overheating during operation.*
6) *Check the input voltage to the drive and make sure the voltage is within the operating range. Check the voltage with a voltmeter.*

Annual Inspection

Check the following items once annually.

1) *Check the torque of the drive power and control terminal screws and tighten if necessary. They may loosen due to vibration or changing temperatures.*
2) *Make sure the conductors and insulators are not corroded or damaged.*
3) *Check the resistance of cable insulation with a megohmmeter.*
4) *Clean off any dust and dirt with a vacuum cleaner. Pay special attention to cleaning the ventilation ports and PCBs. Always keep these areas clean. Accumulation of dust and dirt in these areas can cause unforeseen failures.*
5) *Recharge the capacitors of any drive that is in storage or is otherwise unused.*

CAUTION: Do not run an insulation resistance test (Megger) on the control circuit as it may result in damage to the product.

Recharge Capacitors (for drives not in service)

Recharge the DC link before using any drive that has not been operated within a year:

1) *Disconnect the motor from the drive.*
2) *Apply input power to the drive for 2 hours.*

If the drive is stored or is otherwise unused for more than a year, the drive's internal DC link capacitors should be recharged before use. Otherwise, the capacitors may be damaged when the drive starts to operate. We recommend recharging the capacitors of any unused drive at least once per year.

CAUTION: Disconnect AC power and ensure that the internal capacitors have fully discharged before inspecting the drive! Wait at least two minutes after all display lamps have turned off.

- ☑ *Wait 5 seconds after a fault has been cleared before performing reset via keypad or input terminal.*
- ☑ *When the power is off after 5 minutes for ≤ 30HP models, please confirm that the capacitors have fully discharged.*
- ☑ *Only qualified personnel can install, wire and maintain drives. Please take off any metal objects, such as watches and rings, before operation. And only insulated tools are allowed.*
- ☑ *Never reassemble internal components or wiring.*
- ☑ *Make sure that installation environment complies with regulations without abnormal noise, vibration and odor.*

Recommended Inspection Schedules

Before the check-up, always turn off the AC input power and remove the cover. Wait at least 10 minutes after all display lamps have gone.

Ambient environment

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
Check the ambient temperature, humidity, vibration and see if there are any dust, gas, oil or water drops	Visual inspection and measurement with equipment with standard specification	X		
If there are any dangerous objects	Visual inspection	X		

Voltage

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
Check if the voltage of main circuit and control circuit is correct	Measure with multimeter with standard specification	X		

Digital Keypad Display

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
Is the display clear for reading	Visual inspection	X		
Any missing characters	Visual inspection	X		

Mechanical parts

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any abnormal sound or vibration	Visual and audible inspection	X		
If there are any loose screws	Tighten the screws	X		
If any part is deformed or damaged	Visual inspection	X		
If there is any color change due to overheating	Visual inspection	X		
If there is any dust or dirt	Visual inspection	X		

Main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there are any loose or missing screws	Tighten or replace the screw	X		
If any drive or wiring insulation is deformed, cracked, damaged or has changed color due to overheating or aging	Visual inspection **NOTE: Ignore any color change of copper plate**		X	
If there is any dust or dirt	Visual inspection		X	

Terminals and wiring of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If the terminal color or the placement has changed due to overheating	Visual inspection		X	
If the wiring insulation is damaged or there has been a color change	Visual inspection		X	
If there is any damage	Visual inspection	X		

DC capacity of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any liquid leaking, color change, crack or deformation	Visual inspection	X		
If the capacitor safety vent is bulging or inflated.	Visual inspection	X		
Measure static capacity when required (if drive overloads/faults during normal operation)	Measure with multimeter with standard specification	X		

Resistor of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any peculiar odor or insulation cracks due to overheating	Visual inspection, odor	X		
If there is any disconnection or discoloration	Visual inspection	X		
If the connection is damaged	Measure with a multimeter with standard specifications	X		

Transformer and reactor of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any abnormal vibration or peculiar odor	Visual, audible inspection and odor	X		

Magnetic contactor and relay of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there are any loose screws	Visual and audible inspection	X		
If the contact works correctly	Visual inspection	X		

Printed circuit board and connector of main circuit

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there are any loose screws and connectors	Tighten the screws and press the connectors firmly in place		X	
If there is any peculiar odor and/or color change	Visual and odor inspection		X	
If there is any crack, damage, deformation or corrosion	Visual inspection		X	
If there is any liquid leakage or deformation in capacity	Visual inspection		X	

Cooling fan of cooling system

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any abnormal sound or vibration	Visual, audible inspection and turn the fan with hand (turn off the power before operation) to see if it rotates smoothly	X		
If there is any loose screw	Tighten the screw	X		
If there is any color change due to overheating	Change the fan	X		

Ventilation channel of cooling system

Check Items	Methods and Criteria	Maintenance Period		
		Daily	Half Year	One Year
If there is any obstruction in the heat sink, air intake or air outlet	Visual inspection		X	

Please use a clean lint free cloth for cleaning and use a dust cleaner to remove dust when necessary.

Storage and Disposal

Storage

If you are not using the product for an extended period, store it in the following way:

- *Store the product in the same environmental conditions as specified for operation.*
- *When storing the product for a period longer than 3 months, store it between 10˚C and 30˚C, to prevent depletion of the electrolytic capacitor.*
- *Do not expose the drive to snow, rain, fog, or dust.*
- *Package the drive in a way that prevents contact with moisture. Keep the moisture level below 70% in the package by including a desiccant, such as silica gel.*
- *Do not leave drive in a humid or dusty environment.*

Disposal

When disposing of the product, categorize it as general industrial waste. The product contains materials that can be recycled. Please consider the environment, energy, and resources and recycle unused products. The packing materials and all metal parts can be recycled. Although plastic can also be recycled, it can be incinerated under controlled conditions in some regions.

CAUTION: If the product is left in a prolonged state without a flow of current, the condenser will deteriorate due to its characteristics. To prevent the deterioration of the electrolytic capacitor, turn on the drive power at least once a year and apply current for 30-60 seconds. Run the device under no-load conditions.

Troubleshooting

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

Fault Trips and Warnings

When the drive detects a fault, it stops the operation (trips) or sends out a warning signal. When a trip or warning occurs, the keypad displays the information briefly. Users can read the warning message at Pr.90. When more than two trips occur at roughly the same time, the keypad displays the higher priority fault trip information.

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 drive, waits until the charge indicator light goes off, and turns the drive on again. If the the drive is still in a fault condition after powering it on again, please contact AutomationDirect customer support.*
- ***nOn****: Displays when no fault is present.*

Fault Trips

Protection Functions for Output Current and Input Voltage

Reference page 3-3 for the LED display letter codes. The characters displayed on the drive LED display do not appear exactly as the letters in the "Keypad Display" column.

Fault Trips: Protection Functions for Output Current and Input Voltage			
Keypad Display	**Name**	**Type**	**Description**
olt	Overload	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.
ult	Underload	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.
oct	Overcurrent	Latch	Displayed when drive output current exceeds the specified value.
ovt	Overvoltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
lvt	Low voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.
lv2	Low voltage2	Latch	Displayed when internal DC circuit voltage is less than the specified value during drive operation. Operates when Pr.82 is set to 1.
gft	Ground Trip*	Latch	Displayed when a ground fault trip occurs on the output side of the drive and causes the current to exceed the specified value. The specified value varies depending on drive capacity. (Note: For 230V 5hp/7hp products, check if there is an input phase loss when GFT occurs.)
eth	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.
pot	Out phase open	Latch	Displayed when a 3-phase drive output has one or more phases in an open circuit condition. Operates when bit 1 of Pr.5 is set to 1.
ipo	In phase open	Latch	Displayed when a 3-phase drive input has one or more phases in an open circuit condition. Operates only when bit 2 of Pr.5 is set to 1.
iol	Drive OLT	Latch	Displayed when the drive has been protected from overload and resultant overheating, based on inverse time-limit thermal characteristics. Allowable overload rates for the drive are 150% for 1 min and 200% for 4 sec (120% for 1 minute, 200% for 2 seconds with low load). Protection is based on drive rated capacity, and may vary depending on the device's capacity.
nmt	No motor trip	Latch	Displayed when the motor is not connected during drive operation. Operates when Pr.31 is set to 1.
rot	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 460V 2hp, 3hp, and 5hp capacities.

Fault Trips: Protection Functions for Output Current and Input Voltage			
Keypad Display	**Name**	**Type**	**Description**
otd1	Over torque trip 1	Latch	Occurs when the output current is higher than the level set in Ou.68. Operates when OU.67 is set to 3, 4.
otd2	Over torque trip 2	Latch	Occurs when the output current is higher than the level set in OU.71. Operates when OU.70 is set to 3, 4.
utd1	Under torque trip 1	Latch	Occurs when the output current is lower than the level set in OU.68. Operates when OU.67 is set to 7, 8.
utd2	Under torque trip 2	Latch	Occurs when the output current is lower than the level set in OU.71. Operates when OU.70 is set to 7, 8.
**ACG drives rated for 5hp or less (except for 230V 3hp and 5hp) do not support the ground fault trip (GFT) feature. Therefore, an over current trip (OCT) or over voltage trip (OVT) may occur when there is a low-resistance ground fault.*			

Protection Functions Using Abnormal Internal Circuit Conditions and External Signals

Fault Trips: Protection Functions Using Abnormal Internal Circuit Conditions and External Signals			
Keypad Display	**Name**	**Type**	**Description**
oht	Overheat	Latch	Displayed when the tempertature of the drive heat sink exceeds the specified value.
oc2	Overcurrent2	Latch	Displayed when the DC circuit in the drive detects a specified level of excessive, short circuit current.
ext	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	BX	Level	Displayed when the drive 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.
hwt	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	NTC Open	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
fan	Fan Trip	Latch	Displayed when an error is detected in the cooling fan. Set Pr.79 to 0 to activate fan trip.
pid	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.
xbr	Ext-Brake	Latch	Operates when the external brake signal is provided by the multi-function terminal. Occurs when the drive output starting current remains below the set value at Ad.41. Set either OU.31 or OU.32 to 35 (BR Control).
oh	Overheat pre alarm	Latch	When the user has set Pr.78 to 2: Free-Run or 3: Dec, pre-overheating warning trip of drive occurs if the drive temperature exceeds the temperature set by the user in Pr.77.

Protection Functions for Communications Options

Fault Trips: Protection Functions for Communications Options			
Keypad Display	**Name**	**Type**	**Description**
lor	Lost Command	Level	Displayed when a frequency or operation command error is detected during drive operation by controllers other than the keypad (e.g., using a terminal block and a communication mode). Activate by setting Pr.12 to any value other than 0.
iot hold	IO Board Trip	Latch	Displayed when the I/O board or external communication card is not connected to the drive or there is a bad connection.
errc			Displayed when the "HOLd" error code continues for more than 5 seconds. ('Errc' -> '-rrc' -> E-rc' -> 'Er-c' -> 'Err-' -> '- -rc' -> 'Er- -' -> '- - - -'-> 'Errc' -> ...)
opt	Option Trip-1	Latch	Displayed when a communication error is detected between the drive and the communication board. Occurs when the communication option card (ACG-ET2) is installed.

Warning Codes

Warning Codes		
Keypad Display	**Name**	**Description**
olw	Overload	Displayed when the motor is overloaded. Operates when Pr.17 is set to 1. To operate, select 5. Set the Digital output relay (OU.31 or OU.33) to 5 (Over Load) to receive overload warning output signals.
ulw	Underload	Displayed when the motor is underloaded. Operates when Pr.25 is set to 1. Set the Digital output relay (OU.31 or OU.33) to 7 (Under Load) to receive underload warning output signals.
iolw	INV Overload	Displayed when the overload time equivalent to 60% of the drive overheat protection (drive IOLT) level, is accumulated. Set the Digital output relay (OU.31 or OU.33) to 6 (IOL) to receive drive overload warning output signals.
lcw	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 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.
efan	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 relay (OU.31 or OU.33) to 37 (Fan Exchange).
fanw	Fan Warning	Displayed when an error is detected from the cooling fan while Pr.79 is set to 1. Set the Digital output relay (OU.31 or OU.33) to 8 (Fan Warning) to receive fan warning output signals.
dbw	DB Warn %ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at Pr.66.
trer	Retry Tr Tune	Tr tune error warning alarm is activated 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.
oh	Overheat pre alarm	When the user has set Pr.78 to 1: Warning, pre-overheating warning of drive occurs if the drive temperature exceeds the temperature set by the user in Pr.77.
slp	PID Sleep	When the PID operation enters sleep mode, a warning occurs.

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.

Troubleshooting Fault Trips			
Type	**Name**	**Cause**	**Remedy**
OLT	***Over Load***	The load is greater than the motor's rated capacity.	Ensure that the motor and drive have appropriate capacity ratings.
		The set value for the overload trip level (Pr.21) is too low.	Increase the set value for the overload trip level.
ULT	***Under Load***	There is a motor-load connection problem.	Replace the motor and drive 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	***Over Current1***	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.
		The drive load is greater than the rated capacity.	Replace the drive with a model that has increased capacity.
		The drive supplied an output while the motor was idling.	Operate the drive 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 drive output wiring.	Check the output wiring.
		The motor insulation is damaged.	Replace the motor.
OVT	***Over Voltage***	Deceleration time is too short for the load inertia (GD2).	Increase the deceleration time.
		A generative load occurs at the drive 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 drive output wiring.	Check the output wiring.
		The motor insulation is damaged.	Replace the motor.
LVT	***Low Voltage***	The input voltage is too low.	Determine if the input voltage is below the specificed 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.
LV2	***Low Voltage2***	The input voltage has decreased during the operation.	Determine if the input voltage is above the specified value.
		An input phase-loss has occurred.	Check the input wiring.
		The power supply magnetic contactor is faulty.	Replace the magnetic contractor.
GFT	***Ground Trip***	A ground fault has occurred in the drive output wiring.	Check the output wiring.
		The motor insulation is damaged.	Replace the motor.

Troubleshooting Fault Trips			
Type	**Name**	**Cause**	**Remedy**
ETH	***E-Thermal***	The motor has overheated.	Reduce the load or operation frequency.
		The drive load is greater than the rated capacity.	Replace the drive with a model that has increased capacity.
		The set value for electronic thermal protection is too low.	Set an appropriate electronic thermal level.
		The drive 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	***Output Phase Open***	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	***Input Phase Open***	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 AutomationDirect Customer Support.
IOL	***Drive OLT***	The load is greater than the rated motor capacity.	Replace the motor and drive with models that have increased capacity.
		The torque boost level is too high.	Reduce the torque boost level.
OHT	***Over Heat***	There is a problem with the cooling system.	Determine if a foreign object is obstructing the air inlet, outlet, or vent.
		The drive cooling fan has been operated for an extended period.	Replace the cooling fan.
		The ambient temperature is too high.	Keep the ambient temperature below 40°C.
OC2	***Over Current2***	Output wiring is short-circuited.	Check the output wiring.
		There is a fault with the electronic semiconductor (IGBT).	Do not operate the drive. Contact AutomationDirect Customer Support.
NTC	***NTC Open***	The ambient temperature is too low.	Keep the ambient temperature above -10°C.
		There is a fault with the internal temperature sensor.	Contact AutomationDirect Customer Support.
FAN	***FAN Trip / FAN Warning***	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
		The fan connector is not connected.	Connect the fan connector.
		The fan connector needs to be replaced.	Replace the fan connector.

Troubleshooting 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.

Troubleshooting Other Faults		
Type	**Cause**	**Remedy**
Parameters cannot be set.	The drive is in operation (run mode).	Stop the drive 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 drive.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load 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 in dr.9 (V/F, IM Sensorless). If the fault remains, replace the drive 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 drive 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.

Troubleshooting Other Faults		
Type	**Cause**	**Remedy**
The motor is overheating.	The load is too heavy.	Reduce the load.
		Increase the Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the drive with models with appropriate capacity for the load.
	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 apllications with drives.
		Connect an AC reactor to the drive 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 drive with models with capacity appropriate for the load.
The motor does not accelerate or the acceleration time is too long.	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load and 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 drive 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 is still not corrected, replace the drive with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and drive with models with 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.
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.
	The load is higher than the internal torque limit determined by the rated current of the drive.	Replace the drive with a model with 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 drive is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the drive.	Change the carrier frequency to the minimum value.
		Install a micro surge filter in the drive output.

Troubleshooting Other Faults		
Type	**Cause**	**Remedy**
When the drive is operating, the earth leakage breaker is activated.	An earth leakage breaker will interrupt the supply if current flows to ground during drive operation.	Connect the drive to a ground terminal.
		Check that the ground resistance is less than 100Ω for 230V drives and less than 10Ω for 460V drives.
		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the drive.
		Lower the carrier frequency.
		Make the cable length between the drive and the motor as short as possible.
The motor vibrates severely and does not rotate normally.	Phase-to-phase voltage of 3-phase power source is not 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 carrier frequency.
	Resonance occurs between the motor's natural frequency and the drive'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.7).
	The wiring length between the drive and the motor is too long.	Ensure that the total cable length between the drive and the motor is less than 200m (50m for motors rated 3hp or lower).
The motor does not come to a complete stop when the drive 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 drive with a model with 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.