9 TROUBLESHOOTING (SERIAL INTERFACE SPINDLE)

This chapter describes a troubleshooting of the serial interface spindle amplifier.

9.1 LIST OF SERIAL INTERFACE SPINDLE AMPLIFIER ALARMS

For troubleshooting the listed alarms, refer to 9.2 “TROUBLE SHOOTING FOR EACH ALARM”.

Alarm No.	Meanings	Description	Remedy
AL–01	Motor overheat	Detects internal motor temperature : exceeding specified temperature.	Check load status. Cool motor, then reset alarm.
AL–02	Excessive speed deviation	Detects motor speed exceeding specified speed excessively.	Check load status. Reset alarm.
AL–03	DC link section fuse blown	Detects that fuse F4 in DC link section is blown (models 30S and 40S).	Check power transistors, and so forth. Replace fuse.
AL–04	Input fuse blown. Input power open phase.	Detects blown fuse (F1 to F3), open phase or momentary failure of power (models 30S and 40S).	Replace fuse. Check open phase and power supply regenerative circuit operation.
AL–05	Control power supply fuse blown	Detects that control power supply fuse AF2 or AF3 is blown (models 30S and 40S).	Check for control power supply short circuit. Replace fuse.
AL–07	Excessive speed	Detects that motor rotation has exceeded 115% of its rated speed.	Reset alarm.
AL–08	High input voltage	Detects that switch is set to 200 VAC when input voltage is 230 VAC or higher (models 30S and 40S).	Set switch to 230 VAC.
AL–09	Excessive load on main circuit section	Detects abnormal temperature rise of power transistor radiator.	Cool radiator, then reset alarm.
AL–10	Low input voltage	Detects drop in input power supply voltage.	Correct cause, then reset alarm.
AL–11	Overvoltage in DC link section	Detects abnormally high direct current power supply voltage in power circuit section.	Correct cause, then reset alarm.
AL–12	Overcurrent in DC link section	Detects flow of abnormally large current in direct current section of power circuit.	Correct cause, then reset alarm.
AL–13	CPU internal data memory abnormality	Detects abnormality in CPU internal data memory. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–15	Spindle switch/output switch alarm	Detects incorrect switch sequence in spindle switch/output switch operation.	Check sequence.
AL–16	RAM abnormality	Detects abnormality in RAM for external data. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–18	Program ROM sum check error	Detects program ROM data error. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–19	Excessive U phase current detection circuit offset	Detects excessive U phase current detection circuit offset. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–20	Excessive V phase current detection circuit offset	Detects excessive V phase current detection circuit offset. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–24	Serial transfer data error	Detects serial transfer data error (such as NC power supply turned off, etc.)	Correct cause, then reset alarm.
AL–25	Serial data transfer stopped	Detects that serial data transfer has stopped.	Correct cause, then reset alarm.
AL–26	Disconnection of speed detection signal for Cs contouring control	Detects abnormality in speed detection signal for Cs contouring control (such as unconnected cable and adjustment error).	Correct cause, then reset alarm.

Alarm No.	Meanings	Description	Remedy
AL–27	Position coder signal disconnection	Detects abnormality in position coder signal (such as unconnected cable and parameter setting error).	Correct cause, then reset alarm.
AL–28	Disconnection of position detection signal for Cs contouring control	Detects abnormality in position detection signal for Cs contouring control (such as unconnected cable and adjustment error).	Correct cause, then reset alarm.
AL–29	Short-time overload	Detects that overload has been continuously applied for some period of time (such as restraining motor shaft in positioning).	Correct cause, then reset alarm.
AL–30	Input circuit overcurrent	Detects overcurrent flowing in input circuit.	Correct cause, then reset alarm.
AL–31	Speed detection signal disconnection motor restraint alarm	Detects that motor cannot rotate at specified speed (but rotates at very slow speed or has stopped). (This includes checking of speed detection signal cable.)	Correct cause, then reset alarm.
AL–32	Abnormality in RAM internal to LSI for serial data transfer	Detects abnormality in RAM internal to LSI for serial data transfer. This check is made only when power is turned on.	Correct cause, then reset alarm.
AL–33	Insufficient DC link section charging	Detects insufficient charging of direct current power supply voltage in power circuit section when magnetic contactor in amplifier is turned on (such as open phase and defective charging resistor).	Correct cause, then reset alarm.
AL–34	Parameter data setting beyond allowable range of values	Detects parameter data set beyond allowable range of values.	Set correct data.
AL–35	Excessive gear ratio data setting	Detects gear ratio data set beyond allowable range of values.	Set correct data.
AL–36	Error counter over flow	Detects error counter overflow.	Correct cause, then reset alarm.
AL–37	Speed detector parameter setting error	Detects incorrect setting of parameter for number of speed detection pulses.	Set correct data.
AL–39	Alarm for indicating failure in detecting 1-rotation signal for Cs contouring control	Detects 1-rotation signal detection failure in Cs contouring control.	Make signal adjustment. Check cable shield status.
AL–40	Alarm for indicating 1-rotation signal for Cs contouring control not detected	Detects that 1-rotation signal has not occurred in Cs contouring control.	Make 1-rotation signal adjustment.
AL–41	Alarm for indicating failure in detecting position coder 1-rotation signal.	Detects failure in detecting position coder 1-rotation signal.	Make signal adjustment for signal conversion circuit. Check cable shield status.
AL–42	Alarm for indicating position coder 1-rotation signal not detected	Detects that position coder 1-rotation signal has not occurred.	Make 1-rotation signal adjustment for signal conversion circuit.
AL–43	Alarm for indicating disconnection of position coder signal for differential speed mode	Detects that main spindle position coder signal used for differential speed mode is not connected yet (or is disconnected).	Check that main spindle position coder signal is connected to connector CN12.
AL–46	Alarm for indicating failure in detecting position coder 1-rotation signal in thread cutting operation.	Detects failure in detecting position coder 1-rotation signal in thread cutting operation.	Make 1-rotation signal adjustment for signal conversion circuit. Check cable shield status.
AL–47	Position coder signal abnormality	Detects incorrect position coder signal count operation.	Make signal adjustment for signal conversion circuit. Check cable shield status.
AL–48	Position coder 1-rotation signal abnormality	Detects that occurrence of position coder 1-rotation signal has stopped.	Make 1-rotation signal adjustment for signal conversion circuit.

Alarm No.	Meanings	Description	Remedy
AL–49	The converted differential speed is too high.	Detects that difference between a spindle speed and another spindle speed has exceeded allowable limit in differential speed mode.	Calculate differential speed by multiplying speed of other spindle by gear ratio. Check if calculated value is not greater than maximum speed of motor.
AL–50	Excessive speed command calculation value in spindle synchronization control	Detects that speed command calculation value exceeded allowable range in spindle synchronization control.	Calculate motor speed by multiplying specified spindle speed by gear ratio. Check if calculated value is not greater than maximum speed of motor.
AL–51	Undervoltage at DC link section	Detects that DC power supply voltage of power circuit has dropped (due to momentary power failure or loose contact of magnetic contactor).	Correct cause, then reset alarm.
AL–52	ITP signal abnormality I	Detects abnormality in synchronization signal (ITP signal) with CNC (such as loss of ITP signal).	Correct cause, then reset alarm.
AL–53	ITP signal abnormality II	Detects abnormality in synchronization signal (ITP signal) with CNC (such as loss of ITP signal).	Correct cause, then reset alarm.
AL–54	Overload current alarm	Detects that excessive current flowed in motor for long time.	Check if overload operation or frequent acceleration/deceleration is performed.
AL–55	Power line abnormality in spindle switching/output switching	Detects that switch request signal does not match power line status check signal.	Check operation of magnetic contractor for power line switching. Check if power line status check signal is processed normally.

9.2 TROUBLESHOOTING FOR EACH ALARM

AL–01 Motor overheat

Item	Cause of trouble	Check procedure	Remedy
1	Defective fan motor of motor	Check if fan motor is rotating.	Replace fan motor.
2	Overload operation	Check cutting conditions and how tools are worn. Check load meter for cutting.	Review cutting conditions and tools.
3	Dirty motor cooling system	Check motor cooling system for dirt.	Clean motor cooling system with an air gun or vacuum cleaner.
4	Disconnection or loose contact of motor overheat signal line	Check signal line connection status.	Connect signal line correctly.

AL–02 Excessive speed deviation

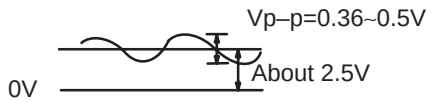
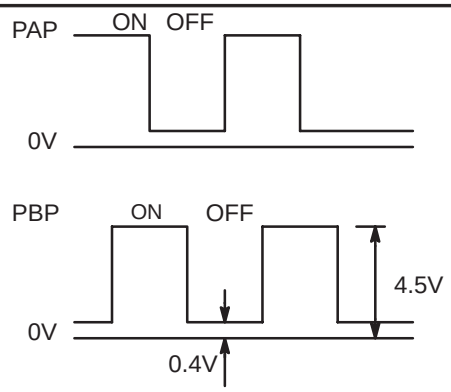
Item	Cause of trouble	Check procedure	Remedy
1	Overload operation (overload)	Check with load meter.	Review cutting conditions and tools.
2	Defective transistor module	Check if transistor collector-emitter is open.	Replace transistor module.
3	Fuse for protecting driver on PCB blown or not inserted correctly (disconnection, loose contact, etc.)	Check if fuses F3A to F3M (models 1S to 26S) or FA to FG (models 30S and 40S) are blown or removed.	Insert fuses firmly. Replace any blown fuse.
4	Speed feedback signal abnormality	Check level of speed feedback signal.	Check motor speed detector and signal cable connection.
5	Wiring failure (disconnection, loose contact, etc.)	Check that cables are connected correctly.	

NOTE

How to check the speed feedback signal

Observe the speed feedback signal with an osciloscope after turning on power and setting the rotation command off (motor stopped and drive power set off).

Observe the test points indicated below, while turning the motor slowly by hand.

Test point	Normal wave form
PA–0V	
PB–0V	Same as above
RA–0V	DC2.5V±0.2V
RB–0V	Same as above
PAA–0V PBA–0V (CW rotation)	 Check that the ON/OFF duty cycle is 50%. (The PAP and PBP signals are inverted in CCW direction.)

AL–03 Blown fuse in DC link section

This alarm indicates that the fuse (F4) in the DC link section is blown. In this case, the transistor module may have failed.

AL–04 Input fuse blown Input power open phase

Item	Cause of trouble	Check procedure	Remedy
1	High impedance on AC power supply side. Example: Two transformers are connected in series, or variable autotransformer is connected.	Alarm No. 04 is on only at time of deceleration from high speed operation. Alarm No. 04 can be on when F1 to F3 are not blown.	Change power supply to one with low impedance. There may be loose connection of input power cable Example: Open phase due to screws not tightened firmly
2	Defective transistor module		Replace transistor module and fuse.
3	Defective diode module or thyristor module	Disconnect diode modules DM1 to DM3 and thyristor modules SM1 to SM3, then check A-K connection with multimeter. (Defective modules are usually short-circuited.)	Replace defective part. Replace blown fuse.
4	Defective surge absorber or capacitor	Check surge absorbers Z1 to Z3 and capacitors C4 to C6.	Replace defective part. Replace blown fuse.
5	When input fuse is not blown	Check if Item 1 is applicable.	When Item 1 is not applicable, replace PCB.

AL–05 Control power supply fuse blown

Item	Cause of trouble	Check procedure	Remedy
1	Defective PCB	Check AC input voltage. See (5) above.	Replace PCB.
2	Abnormal power supply voltage		

AL–07 Excessive speed (Detection by digital value)

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect setting of parameter for number of speed feedback pulses (No. 6511)	Check if number of speed feedback pulses matches parameter setting.	Set correct value in parameter.

NOTE
See Chapter 6.

AL–08 High input voltage

Item	Cause of trouble	Check procedure	Remedy
1	AC power supply voltage 10% higher than rated voltage.	Check power supply voltage.	
2	Incorrect setting of toggle switch for voltage switching.	Check power supply voltage.	Change setting from 200V to 230V.

AL–09 Heat sink is overheated

Item	Cause of trouble	Check procedure	Remedy
1	Cooling fan is defective.	Check if fan is rotating.	Replace fan.
2	Overload operation.	Check load by using a load meter.	Re-examine the cutting condition.
3	Dusty and dirty.		Clean using compressed air or vacuum cleaner.

AL–10 Input power voltage drops

This alarm indicates abnormally low AC power voltage (–15% or less). This alarm may be generated even during momentary power failures.

AL–11 Overvoltage of DC link circuit (Regenerative circuit is faulty…Regeneration failure)

Item	Cause of trouble	Check procedure	Remedy
1	High power impedance.		Examine AC power specification.
2	PCB is defective.		Replace PCB.
3	Defective transistor module (TM1).		Replace transistor module.

AL–12 Overcurrent flows to DC link circuit

Item	Cause of trouble	Check procedure	Remedy
1	Output terminals or internal circuit of motor is shorted.	Check connections.	
2	Transistor module is defective.	Check the transistor module.	Replace transistor module.
3	PCB is defective.		Replace PCB.

AL–13 CPU internal data memory alarm

Replace PCB .

AL–16 RAM abnormality

Item	Cause of trouble	Check procedure	Remedy
1	External data memory (RAM) defective		Replace memory (RAM).
2	PCB defective		Replace PCB.

AL–18 Program ROM sum check error

Item	Cause of trouble	Check procedure	Remedy
1	Program memory data (ROM) defective	Compare data displayed when power is turned ON with ROM labels.	Replace program memory (ROM).

AL–19 Excessive U phase current detection circuit offset

Item	Cause of trouble	Check procedure	Remedy
1	A/D converter defective		Replace A/D converter.
2	U-phase current detector circuit defective	After power is turned on, check if offset voltage on check terminal IU is beyond range of about ±100 mV.	Replace PCB.
3	Loose contact of connectors between PCB and power circuit	Check connector connection between PCB and power circuit.	Ensure that PCB and power circuit are securely connected with each other.

AL–20 Excessive V phase current detection circuit offset

Item	Cause of trouble	Check procedure	Remedy
1	V-phase current detector circuit defective	After power is turned on, check if offset voltage on check terminal IV is beyond range of about ±100 mV.	Replace PCB.
2	Loose contact of connectors between PCB and power circuit	Check connector connection between PCB and power circuit.	Ensure that PCB and power circuit are securely connected with each other.

AL–24 Serial transfer data error

AL–25 Serial data transfer stopped

Item	Cause of trouble	Check procedure	Remedy
1	CNC power supply is OFF	Check that CNC power is ON.	Turn CNC power ON.
2	Defective optical cable for serial data transmission	Check that optical cable is fitted securely to the connector. Check that the cable is not broken. Check that transmission/reception surfaces of the cable are clean.	Connect securely. Replace optical cable. Clean optical cable transmission/reception surfaces.
3	Defective data transmission/reception elements in LSI used in serial data transmission		Replace LSI. Replace PCB.

AL–26 Disconnection of speed detection signal for Cs contouring control

Item	Cause of trouble	Check procedure	Remedy
1	Signal level of spindle motor for Cs contouring control is invalid.	Check the signal, and if necessary adjust to the normal level using the variable resistor for signal level adjustment in the preamp.	
2	Signal line of spindle motor for Cs contour control is defective	Check that signal cable is connected securely to connector. Check that signal cable is not broken.	Connect signal cable securely. Replace signal cable.
3	Defective detector circuit for Cs contour control		Replace detector circuit.
4	Incorrect parameter setting	Check that the parameter setting does not indicate that the Cs contour control detector is used when actually it is not.	Parameter CAXIS1 = 0 No. 4001#5

AL–27 Position coder signal disconnection

Item	Cause of trouble	Check procedure	Remedy
1	Position coder signal line defective	Check that signal cable is connected securely to connector. Check that signal cable is not broken.	Connect signal cable securely. Replace signal cable.
2	Incorrect parameter setting	Check that the parameter setting does not indicate that the position coder signal is used when actually it is not.	Parameter MRDY2 = 0 No. 4001#2

AL–28 Disconnection of position detection signal for Cs contouring control

Item	Cause of trouble	Check procedure	Remedy
1	Signal level of spindle detector for Cs axis control is defective	Check the signal level, and if necessary adjust to the normal level using the variable resistor for signal level adjustment in the preamp.	
2	Signal line of spindle detector for Cs axis control is defective	Check that signal cable is connected securely to connector. Check that signal cable is not broken.	Connect signal cable securely. Replace signal cable.
3	Defective detector circuit for Cs axis control		Replace detector circuit.

AL–29 Short–time overload

Item	Cause of trouble	Check procedure	Remedy
1	Overloaded operation (Overload)	Use loadmeter to check that a load close to the load resistance limit is not imposed continuously for 30 seconds or more.	Re-examine cutting conditions and tools.

AL–30 Input circuit overcurrent

Item	Cause of trouble	Check procedure	Remedy
1	Defective of power transistor used for power	Check power transistor.	Replace power transistor.
2	Defective of power regeneration circuit		Replace PCB.

AL–31 Speed detection signal disconnection motor restraint alarm

Item	Cause of trouble	Check procedure	Remedy
1	Motor constrained	Check that nothing is preventing the motor from accelerating.	Remove cause.
2	Defective motor speed feedback signal	Check signal waveform. (Alarm No. 2)	Remove cause.
3	Defective motor speed feedback signal cable	Check that cable is connected securely to connector. Check that cable is not broken.	Connect cable securely. Replace cable.

AL–32 Abnormality in RAM internal to LSI for serial data transfer

Item	Cause of trouble	Check procedure	Remedy
1	Defective LSI used in serial data transmission		Replace LSI. Replace PCB.

AL–33 Insufficient DC link section charging

Item	Cause of trouble	Check procedure	Remedy
1	Defective relay used in DC link recharging.Disconnection of resistor used in limiting re-charge current	Check relevant parts.	Replace amp.

AL–34 Parameter data setting beyond allowable range of values

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect parameter setting	Check if specified parameter value is beyond allowable range of values.	Specify value within allowable range.

AL–34 and F–XXX are alternately displayed in the spindle amplifier indicator section if an AL–34 alarm is raised.
"XXX" indicates the data number internal to the spindle for a parameter where a value beyond the allowable range is specified.

AL–35 Excessive gear ratio data setting

Item	Cause of trouble	Check procedure	Remedy
1	Parameter data of gear ratio and position gain are too large.	Check gear ratio and position gain data.	Change to suitable values.

AL–37 Speed detector parameter setting error

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect setting of parameter for number of speed feedback pulses (No. 6511)	Check if number of speed feedback pulses matches parameter setting.	Set correct value in parameter.

AL–39 Alarm for indicating failure in detecting 1–rotation signal for Cs contouring control

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect data ROM type for Cs contouring control detector circuit, or incorrect setting	Check data ROM type for Cs contouring control detector circuit and setting.	Install correct type of ROM. Perform setting correctly.
2	Low level of Cs contouring control feedback signal, or noise on same feedback signal	Check feedback signal level and also check if feedback signal waveform includes noise.	Adjust feedback signal. Check shielding status.

AL–40 Alarm for indicating 1–rotation signal for Cs contouring control not detected

Item	Cause of trouble	Check procedure	Remedy
1	No occurrence of 1-rotation signal among Cs contouring control feedback signals, or 1-rotation signal offset adjustment error	Check 1-rotation signal among Cs contouring control feedback signals.	Make 1-rotation signal offset adjustment. Check cables.

AL–41 Alarm for indicating failure in detecting position coder 1–rotation signal

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect setting of parameter for number of position coder signal pulses (No. 4003#4,6,7).	Check number of position coder signal pulses and parameter setting.	Set correct value in parameter.
2	Incorrect amplitude and offset of position coder feedback signal, or noise on same feedback signal.	Check feedback signal level and also check if feedback signal waveform includes noise.	Adjust feedback signal. Check shielding status.

AL–47 Position coder signal abnormality

Item	Cause of trouble	Check procedure	Remedy
1	Incorrect setting of parameter for number of position coder signal pulses (No. 4003#4,6,7).	Check number of position coder signal pulses and parameter setting.	Set correct value in parameter.
2	Incorrect amplitude and offset of position coder feedback signal, or noise on same feedback signal.	Check feedback signal level and also check if feedback signal waveform includes noise.	Adjust feedback signal. Check shielding status.