

Diagnostics



Warning! Do not attempt any measurement, parts replacement or other service procedure not described in this manual. Such action will void the warranty, may endanger correct operation, and increase downtime and expense.



Warning! All electrical installation and maintenance work described in this chapter should only be undertaken by qualified service personnel. The Safety instructions on the first pages of this manual must be followed.

Diagnostic displays

The drive detects error situations and reports them using:

- The green and red LED on the body of the drive
- The status LED on the control panel (if the HVAC control panel is attached to the drive)
- The control panel display (if the HVAC control panel is attached to the drive)
- The Fault Word and Alarm Word parameter bits (parameters 0305 to 0309). See *Group 03: ACTUAL SIGNALS* on page 1-87.

The form of the display depends on the severity of the error. You can specify the severity for many errors by directing the drive to:

- Ignore the error situation.
- Report the situation as an alarm.
- Report the situation as a fault.

Red – faults

The drive signals that it has detected a severe error, or fault, by:

- Enabling the red LED on the drive (LED is either steady on or blinking).
- Setting an appropriate bit in a Fault Word parameter (0305 to 0307).
- Overriding the control panel display with the display of a fault code.
- Stopping the motor (if it was on).

The fault code on the control panel display is temporary. Pressing any of the following buttons removes the fault message: MENU, ENTER, UP button or DOWN button. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

Flashing green – alarms

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something “unusual.” In these situations, the drive:

- Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors).
- Sets an appropriate bit in an Alarm Word parameter (0308 or 0309). See *Group 03: ACTUAL SIGNALS* on page 1-87 for the bit definitions.
- Overrides the control panel display with the display of an alarm code and/or name.

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

Correcting faults

The recommended corrective action for faults is:

- Use the *Fault listing* table below to find and address the root cause of the problem.
- Reset the drive. See *Fault resetting* on page 1-287.

Fault listing

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
1	OVERCURRENT	Output current is excessive. Check for and correct: <ul style="list-style-type: none"> • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). • Faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for and correct: <ul style="list-style-type: none"> • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2). • Verify that overvoltage controller is ON (using parameter 2005).
3	DEV OVERTEMP	Drive heatsink is overheated. Temperature is at or above limit. R1...R4 & R7/R8: 115 °C (239 °F) R5/R6: 125 °C (257 °F) Check for and correct: <ul style="list-style-type: none"> • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
4	SHORT CIRC	Fault current. Check for and correct: <ul style="list-style-type: none"> • A short-circuit in the motor cable(s) or motor. • Supply disturbances.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
5	RESERVED	Not used.
6	DC UNDERVOLT	Intermediate circuit DC voltage is not sufficient. Check for and correct: <ul style="list-style-type: none"> • Missing phase in the input power supply. • Blown fuse. • Undervoltage on mains.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1FLT LIMIT (3021). Check for and correct: <ul style="list-style-type: none"> • Source and connection for analog input. • Parameter settings for AI1FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2FLT LIMIT (3022). Check for and correct: <ul style="list-style-type: none"> • Source and connection for analog input. • Parameter settings for AI2FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT TEMP	Motor is too hot, based on either the drive's estimate or on temperature feedback. <ul style="list-style-type: none"> • Check for overloaded motor. • Adjust the parameters used for the estimate (3005...3009). • Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either: <ul style="list-style-type: none"> • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: <ul style="list-style-type: none"> • Communication lines and connections • Parameter 3002 PANEL COMM ERROR. • Parameters in Group 10: START/STOP/DIR and Group 11: REFERENCE SELECT (if drive operation is AUTO).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check for and correct: <ul style="list-style-type: none"> • Motor connections • Motor parameters 9905...9909
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for and correct: <ul style="list-style-type: none"> • Excessive load. • Insufficient motor power. • Parameters 3010...3012.
14	EXTERNAL FLT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXTERNAL FLT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
16	EARTH FAULT	Possible ground fault detected in the motor or motor cables. The drive monitors for ground faults while the drive is running and while the drive is not running. Detection is more sensitive when the drive is not running and can produce false positives. Possible corrections: <ul style="list-style-type: none"> • Check for/correct faults in the input wiring. • Verify that motor cable does not exceed maximum specified length. • A delta grounded input power supply and motor cables with high capacitance may result in erroneous error reports during non-running tests. To disable response to fault monitoring when the drive is not running, use parameter 3023 WIRING FAULT. To disable response to all ground fault monitoring, use parameter 3017 EARTH FAULT.
17	UNDERLOAD	Motor load is lower than expected. Check for and correct: <ul style="list-style-type: none"> • Disconnected load. • Group 37: USER LOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact your local ABB sales representative.
19	OPEX LINK	Internal fault. A communication-related problem has been detected on the fiber optic link between the OITF and OINT boards. Contact your local ABB sales representative.
20	OPEX PWR	Internal fault. Low voltage condition detected on OINT power supply. Contact your local ABB sales representative.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact your local ABB sales representative.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for and correct: <ul style="list-style-type: none"> • Missing mains phase. • Blown fuse.
23	ENCODER ERR	Not used (Available only with encoder and parameter Group 50).
23	ENCODER ERR	The drive is not detecting a valid encoder signal. Check for and correct: <ul style="list-style-type: none"> • Encoder presence and proper connection (reverse wired, loose connection, or short circuit). • Voltage logic levels are outside of the specified range. • A working and properly connected Pulse Encoder Interface Module, OTAC-01. • Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. • Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED. Check for and correct: <ul style="list-style-type: none"> • Parameter settings for 2001 and 2002. • Adequacy of motor braking torque. • Applicability of torque control. • Brake chopper and resistor.
25	RESERVED	Not used as of the publication of this manual.
26	DRIVE ID	Internal fault. Configuration Block Drive ID is not valid. Contact your local ABB sales representative.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
27	CONFIG FILE	Internal configuration file has an error. Contact your local ABB sales representative.
28	SERIAL 1 ERR	Fieldbus communication has timed out. Check for and correct: <ul style="list-style-type: none"> • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.
29	EFB CONFIG FILE	Error in reading the configuration file for the embedded fieldbus.
30	FORCE TRIP	Fault trip forced by the fieldbus. See the fieldbus User's Manual.
31	EFB 1	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual.
32	EFB 2	
33	EFB 3	
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for and correct: <ul style="list-style-type: none"> • Motor fault. • Motor cable fault. • Thermal relay fault (if used). • Internal fault.
35	OUTPUT WIRING	Possible power wiring error detected. When the drive is not running it monitors for an improper connection between the drive input power and the drive output. Check for and correct: <ul style="list-style-type: none"> • Proper input wiring – line voltage is NOT connected to drive output. • The fault can be erroneously declared if the input power is a delta grounded system and motor cable capacitance is large. This fault can be disabled using parameter 3023 WIRING FAULT.
36	INCOMP SWTYPE	The drive cannot use the software. <ul style="list-style-type: none"> • Internal Fault. • The loaded software is not compatible with the drive. • Call support representative.
37	CB OVERTEMP	Drive control board is overheated. Check for and correct: <ul style="list-style-type: none"> • Excessive ambient temperatures • Fan failure. • Obstructions in the air flow.
101	SERF CORRUPT	Error internal to the drive. Contact your local ABB sales representative and report the error number.
102	RESERVED	
103	SERF MACRO	
104	RESERVED	
105	RESERVED	

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
201	DSP T1 OVERLOAD	Error in the system. Contact your local ABB sales representative and report the error number.
202	DSP T2 OVERLOAD	
203	DSP T3 OVERLOAD	
204	DSP STACK ERROR	
205	RESERVED (obsolete)	
206	OMIO ID ERROR	
207	EFB LOAD ERR	
1000	PAR HZRPM LIMITS	Parameter values are inconsistent. Check for any of the following: <ul style="list-style-type: none"> • 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED. • 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ. • 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50) • 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50) • 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50) • 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
1001	PAR PFAREFNG	Parameter values are inconsistent. Check for the following: <ul style="list-style-type: none"> • 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
1002	RESERVED (Obsolete)	
1003	PAR AI SCALE	Parameter values are inconsistent. Check for any of the following: <ul style="list-style-type: none"> • 1301 AI 1 MIN > 1302 AI 1 MAX. • 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check for any of the following: <ul style="list-style-type: none"> • 1504 AO 1 MIN > 1505 AO 1 MAX. • 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check for the following: <ul style="list-style-type: none"> • $1.1 \leq (9906 \text{ MOTOR NOM CURR} * 9905 \text{ MOTOR NOM VOLT} * 1.73 / P_N) \leq 3.0$ • Where: $P_N = 1000 * 9909 \text{ MOTOR NOM POWER}$ (if units are kW) or $P_N = 746 * 9909 \text{ MOTOR NOM POWER}$ (if units are HP, e.g. in US)
1006	EXT ROMISSING	Parameter values are inconsistent. Check for the following: <ul style="list-style-type: none"> • Extension relay module not connected and • 1410...1412 RELAY OUTPUTS 4...6 have non-zero values.
1007	PAR FBUSMISSING	Parameter values are inconsistent. Check for and correct: <ul style="list-style-type: none"> • A parameter is set for fieldbus control (e.g. 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFAWOSCALAR	Parameter values are inconsistent – 9904 MOTOR CTRL MODE must be = 3 (SCALAR: SPEED), when 8123 PFA ENABLE is activated.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
1009	PAR PCU1	Parameter values for power control are inconsistent: Improper motor nominal frequency or speed. Check for both of the following: <ul style="list-style-type: none"> • $1 \leq (60 * 9907 \text{ MOTOR NOM FREQ} / 9908 \text{ MOTOR NOM SPEED}) \leq 16$ • $0.8 \leq 9908 \text{ MOTOR NOM SPEED} / (120 * 9907 \text{ MOTOR NOM FREQ} / \text{Motor Poles}) \leq 0.992$
1010	PAR PFA OVERRIDE	Both the override mode and PFA are activated at the same time. These modes are mutually incompatible, because PFA interlocks cannot be observed in the override mode.
1011	PAR OVERRIDE PARS	Override is enabled, but parameters are incompatible. Verify that 1701 is not zero, and (depending on 9904 value) 1702 or 1703 is not zero.
1012	PAR PFA IO 1	IO configuration is not complete – not enough relays are parameterized to PFA. Or, a conflict exists between Group 14, parameter 8117, NR OF AUX MOT, and parameter 8118, AUTOCHNG INTERV.
1013	PAR PFA IO 2	IO configuration is not complete – the actual number of PFA motors (parameter 8127, MOTORS) does not match the PFA motors in Group 14 and parameter 8118 AUTOCHNG INTERV.
1014	PAR PFA IO 3	IO configuration is not complete – the drive is unable to allocate a digital input (interlock) for each PFA motor (parameters 8120 INTERLOCKS and 8127 MOTORS).

Fault resetting

The ACH550 can be configured to automatically reset certain faults. Refer to parameter Group 31: Automatic Reset.



Warning! If an external source for start command is selected and it is active, the ACH550 may start immediately after fault reset.

Flashing red LED

To reset the drive for faults indicated by a flashing red LED:

- Turn off the power for 5 minutes.

Red LED

To reset the drive for faults indicated by a red LED (on, not flashing), correct the problem and do one of the following:

- From the control panel, press RESET
- Turn off the power for 5 minutes.

Depending on the value of 1604, FAULT RESET SELECT, the following could also be used to reset the drive:

- Digital input
- Serial communication

When the fault has been corrected, the motor can be started.

History

For reference, the last three fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402...0411) to aid in troubleshooting a problem. For example, parameter 0404 stores the motor speed at the time of the fault.

To clear the fault history (all of the Group 04, Fault History parameters):

1. Using the control panel in Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press UP and Down simultaneously.
4. Press SAVE.

Correcting alarms

The recommended corrective action for alarms is:

- Determine if the Alarm requires any corrective action (action is not always required).
- Use *Alarm listing* below to find and address the root cause of the problem.

Alarm listing

The following table lists the alarms by code number and describes each.

Alarm Code	Display	Description
2001	OVERCURRENT	Current limiting controller is active. Check for and correct: <ul style="list-style-type: none"> • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). • Faulty motor, motor cables or connections.
2002	OVERVOLTAGE	Over voltage controller is active. Check for and correct: <ul style="list-style-type: none"> • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2).
2003	UNDERVOLTAGE	Under voltage controller is active. Check for and correct: <ul style="list-style-type: none"> • Undervoltage on mains.
2004	DIR LOCK	The change in direction being attempted is not allowed. Either: <ul style="list-style-type: none"> • Do not attempt to change the direction of motor rotation, or • Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Fieldbus communication has timed out. Check for and correct: <ul style="list-style-type: none"> • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.

Alarm Code	Display	Description
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check: <ul style="list-style-type: none"> • Input source and connections • Parameter that sets the minimum (3021) • Parameter that sets the Alarm/Fault operation (3001)
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check: <ul style="list-style-type: none"> • Input source and connections • Parameter that sets the minimum (3022) • Parameter that sets the Alarm/Fault operation (3001)
2008	PANEL LOSS	Panel communication is lost and either: <ul style="list-style-type: none"> • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: <ul style="list-style-type: none"> • Communication lines and connections • Parameter 3002 PANEL LOSS. • Parameters in Groups 10 START/STOP/DIR and 11: REFERENCE SELECT (if drive operation is AUTO).
2009	DEVICE OVERTEMP	Drive heatsink is hot. This alarm warns that a DEVICE OVERTEMP fault may be near. R1...R4 & R7/R8: 100 °C (212 °F) R5/R6: 110 °C (230 °F) Check for and correct: <ul style="list-style-type: none"> • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
2010	MOT OVERTEMP	Motor is hot, based on either the drive's estimate or on temperature feedback. This alarm warns that a Motor Underload fault trip may be near. Check: <ul style="list-style-type: none"> • Check for overloaded motor. • Adjust the parameters used for the estimate (3005...3009). • Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check: <ul style="list-style-type: none"> • Motor and drive ratings match (motor is NOT undersized for the drive) • Settings Group 37: USER LOAD CURVE
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013 (note 1)	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. <ul style="list-style-type: none"> • To control automatic reset, use parameter Group 31: AUTOMATIC RESET.
2014 (note 1)	AUTOCHANGE	This alarm warns that the PFA autochange function is active. <ul style="list-style-type: none"> • To control PFA, use parameter Group 81: PFA CONTROL

Alarm Code	Display	Description
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start the following: <ul style="list-style-type: none"> Any motor (when Autochange is used), The speed regulated motor (when Autochange is not used).
2016	Reserved	
2017	OFF BUTTON	Note 1.
2018 (note 1)	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. <ul style="list-style-type: none"> To control PID sleep, use parameters 4022...4026 or 4122...4126.
2019	ID RUN	Performing ID run.
2020	OVERRIDE	This alarm warns that the Override function is active, which may start the motor.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. <ul style="list-style-type: none"> To control Start Enable 1 function, use parameter 1608. To correct, check: <ul style="list-style-type: none"> Digital input configuration. Communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. <ul style="list-style-type: none"> To control Start Enable 2 function, use parameter 1609. To correct, check: <ul style="list-style-type: none"> Digital input configuration. Communication settings.
2023	EMERGENCY STOP	Emergency stop activated.
2024	ENCODER ERROR	The drive is not detecting a valid encoder signal. Check for and correct: <ul style="list-style-type: none"> Encoder presence and proper connection (reverse wired, loose connection, or short circuit). Voltage logic levels are outside of the specified range. A working and properly connected Pulse Encoder Interface Module, OTAC-01. Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).
2025	FIRST START	Signals that a the drive is performing a First Start evaluation of motor characteristics. This is normal the first time the motor is run after motor parameters are entered or changed. See parameter 9910 (MOTOR ID RUN) for a description of motor models.
2026	RESERVED	Not used.
2027	USER LOAD CURVE	This alarm warns that the condition defined by parameter 3701 USER LOAD C MODE has been valid longer that half of the time difined by 3703 USER LOAD C TIME.
2028	START DELAY	Shown during the Start delay. See parameter 2113 START DELAY.

Note 1. Even when the relay output is configured to indicate alarm conditions (e.g. parameter 1401 RELAY OUTPUT 1 = 5 (ALARM) or 16 (FLT/ALARM)), this alarm is not indicated by a relay output.