





7 Maintenance / Troubleshooting / Repair








FAULT CODES

FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
000	Normal Operation	— — —
004	 WARNING: Short circuit in control box - output signal for Blower (Fresh air ventilation)	Short circuit or Loose connection at single wire (terminal) for fresh air ventilation (Note: Function normally not used in North America) <ul style="list-style-type: none"> • Check for short circuit between pin 16 (B1) and appropriate relay • If there is no short (or no wire attached at terminal), test ECU* and replace if necessary. • To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts, then replace the original ECU. For extra information, see page #84.
005	 WARNING: Short circuit in control box - output for security system (car alarm)	Short circuit or Loose connection at single wire (terminal) for vehicle security system (Note: Function normally not used in North America) <ul style="list-style-type: none"> • Check for short circuit between pin 15 (B1) and appropriate relay or security system input • If there is no short (or no wire attached at terminal) , test ECU* and replace if necessary. • To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts, then replace the original ECU. For extra information, see page #84.
006	 WARNING: Inexplicable atmospheric altitude information (for H-kit only).	The ECU has received improper information from Altitude sensor <ul style="list-style-type: none"> • Check the connection and installation location of the sensor • Carry out a diagnostic of Altitude sensor using EDiTH, replace if necessary • To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts, then replace the original ECU. For extra information, see page #84.
009	ADR - Shutdown	Heater shutdown was triggered by a supplementary safety feature for dangerous goods vehicle: ADR signal (Note: Function normally not used in North America) <ul style="list-style-type: none"> • Check if there is a signal at pin 13 (S1) changed from (+) to (-) or detection of (+) signal at pin 24 (S1) • If above does not resolve problem, then test ECU*. Or if necessary, replace it. • To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts, then replace the original ECU. For extra information, see page #84.
010	Over-voltage - Shutdown	Over voltage (>16V or 32V*) at ECU for minimum of 20 seconds without interruption - Heater is not allowed to run. <ul style="list-style-type: none"> • Check the voltage between terminals 1 (RED) and 10 (BROWN) at connector (B1). If voltage is >16V or 32V*, check the battery, electrical leads and vehicle charging system. *24V heater only.
011	Under Voltage - Shutdown	Under voltage (<10.2V or 20.4V* at ECU for minimum of 20 seconds without interruption - Heater is not allowed to run. <ul style="list-style-type: none"> • Check the voltage between terminals 1 (RED) and 10 (BROWN) at connector (B1). • If voltage is <10.5V or 21V*, check the battery, electrical leads and vehicle charging system. (Or start the heater after shutting down high load appliances) * for 24V heaters only. • Measure value and battery voltage should be similar. In case of voltage drop, check fuses, harness, and battery connections for corrosion, loose connections or damage.
012	Overheat sensor - Overheating Shutdown  WARNING: Risk of physical injury and burns.	The outlet air temperature at overheat sensor is greater than 120°C (AD2) and 150°C (B/D4). <div style="border: 1px solid black; padding: 2px; width: fit-content;">PLEASE NOTE!</div> The overheat sensor mainly triggers this fault when the hot air flow is severely blocked at the heater outlet. Blocked air in the heat exchanger is heated increasing its temperature beyond overheat threshold. <ul style="list-style-type: none"> • Check the duct system, make sure they are within permissible range of system rating (duct and component) according to the rating of connected heater. Remove bends or components with large guide number, if possible. • Check the duct system for any blockages (overheat sensor triggers as the air temperature reaches at 140 to 170°C threshold range that is measured at 300 mm distance from outlet of the heater). Make sure the hot air is not short circuiting back in to the heater inlet. • Make sure the operational altitude of the heater and see if the pressure sensor working or not. (Pressure sensor is mandatory for heaters operating at high altitudes for longer periods) • Carryout fuel quantity test to measure the fuel input, see page (make sure to use the quality to the fuel as specified on page 88) • Measure the resistance value (see page 89) for combination sensor (overheating and flame) at a room temperature. If higher, replace it. Make sure it is properly mounted on the heat exchanger. • If everything seems ok, then test the ECU by swapping it from similar Airtronic D2/4 heater (or replace the ECU, if necessary). For extra information, see page #84.

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FAULT CODES... Continuation

FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
013	Flame sensor - Overheating shutdown  WARNING: Risk of physical injury and burns.	Flame sensor signals temperature at heat exchanger is greater than 280 °C (D2) and 290 °C (B/D4). PLEASE NOTE! The flame sensor mainly triggers this fault when the mass air flow is severely blocked (> 25% app.) at the heater inlet. Due to lack of air in the heater, the heat exchanger exerts most of the heat from combustion chamber so its temperature may increase beyond flame sensor threshold. Such issue may also arise at high altitudes (low air density) if the heater is not connected with pressure sensor. <ul style="list-style-type: none"> • Measure the resistance (see page 89) of the Combination sensor (Flame) at room temperature (20°C). Replace if it is out of specified range (see page 91) • Carry out additional troubleshooting steps as provided in Fault 12.
014	Overheating - Shutdown (difference evaluation)  WARNING: Risk of physical injury and burns.	Temperature difference between the flame sensor and overheat sensor is too high PLEASE NOTE! The main causes of such fault is the high altitude operation without pressure sensor, improper installation of sensors (up side down position of the combo sensor), and damaged or failed sensors. <ul style="list-style-type: none"> • Inspect the combo sensors (overheat and flame sensor) installation and check their resistance values, replace if necessary (sensor values are available on page 89). • Carry out additional troubleshooting steps as provided in Fault code 12.
015	Too many overheats - Heater lock out  WARNING: Risk of physical injury and burns	Heater is overheated repetitively (code 12 or 14), and ECU is probably locked out for safety reasons. Repetitive overheats are mainly caused by lack of airflow, blocked air duct, defective sensors. <ul style="list-style-type: none"> • Unlock the ECU using one of the diagnostic units, see diagnostic procedure on page 72. • Carry out troubleshooting steps as provided in Fault 12.
017	Overheat (ECU) - Shutdown  WARNING: Risk of physical injury and burns	Temperature threshold is exceeded and ECU failed to recognize a fault 012/013. ECU has triggered lock out procedure. PLEASE NOTE! Fault 017 converts in to Fault 015 if the heater is restarted. <ul style="list-style-type: none"> • Carry out troubleshooting steps as provided in fault 012, 015.
018	Glow plug - Start energy too low	Glow pin energy too low at the start <ul style="list-style-type: none"> • Carry out troubleshooting steps as provided in Fault 020, 021.
019	Glow plug - Ignition energy too low	The operating energy of the glow pin is too low at during ignition process <ul style="list-style-type: none"> • Carry out troubleshooting steps as provided in Fault 020, 021.
020	Glow pin - Interruption  WARNING: Risk of electrical shock, physical injury and burns.	Resistance of the glow pin is out of range(open circuit). To remove a glow pin, please refer the Disassembly/assembly of the heater on page 91. <ul style="list-style-type: none"> • Carry out a visual inspection of the glow pin and harness for any damage or deformation. • Check the Glow pin resistance at room temperature (20°C) <ul style="list-style-type: none"> - 12V airtronic 2/4 heater : 0.42 Ω - 0.7 Ω - 24V airtronic 2/4 heater : 1.2 Ω - 2.0 Ω • Measure the current draw of the glow pin in installed condition (disconnect the connector from the controller and apply voltage from separate DC power source and measure the current intensity after 40 seconds) <ul style="list-style-type: none"> - 12V airtronic 2/4 heater : Apply 8.5 V : 9A (+/- 1.5) - 24V airtronic 2/4 heater : Apply 18.5 V : 4A (+/- 0.5) • If the test value is OK, then check the harness for continuity. If not, then replace the glow pin. • If all tests are OK, then test the ECU* or replace it if necessary. PLEASE NOTE! <ul style="list-style-type: none"> • The glow pin is irreparably damaged if the voltage values are exceeded for current draw test. Such test is recommended for dealers only. • Necessary precautions must be taken to prevent electrical shock, or burns. • Ensure the DC power source has adequate short circuit resistance * To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts without fault, only then replace the original ECU. For extra information, see page #84.

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FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
021	Glow pin - Overload  WARNING: Risk of electrical shock, physical injury and burns.	<ul style="list-style-type: none"> Resistance value of the glow pin is out of range (short circuit). To remove a glow pin, please refer the disassembly/assembly of the heater on page 91. Check glow pin and electrical leads for continuity, replace if necessary. Remove the glow pin and start the heater, if code 020 appears then replace the glow pin, if code 021 still appears then inspect the electrical connections or replace the ECU if necessary. Carry out troubleshooting procedure as provided in Fault 020.
022	Glow plug - Short circuit down stream of +Ub or transistor error	Short circuit at (+) output signal or transistor error <ul style="list-style-type: none"> Check the glow pin harness for connections, if OK then test ECU Also, carry out troubleshooting steps as provided in Fault 020, 021
025	Diagnostic wire - Short circuit	Short circuit at diagnostic line to (+) battery voltage <div style="border: 1px solid black; padding: 2px; display: inline-block;">PLEASE NOTE!</div> Fault code can not be displayed until it has been corrected. <ul style="list-style-type: none"> Carry out inspection of the diagnostic cable for connections, damages, and continuity if OK then test ECU heater is connected with incompatible diagnostic device. Improper function from diagnostic device
031	Blower motor - Open circuit (interruption)  WARNING: Risk of electrical shock and physical injury.	Open circuit or high resistance at blower motor connection: <ul style="list-style-type: none"> Check the lead and connector to the blower motor for continuity, replace the motor if necessary If the motor is OK, then check the ECU, replace* if necessary. * To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts without fault, only then replace the original ECU. For extra information, see page #84. Additional troubleshooting procedure, please measure current draw and speed of the blower motor as described in fault 32
032	Blower motor - Short Circuit (overload)  WARNING: Risk of electrical shock and physical injury.	Overload at the blower motor due to jammed impeller (due to frost, salt, carbon or improper alignment); fix the jam or replace the motor if necessary. To remove blower motor, please refer the Disassembly/assembly of the heater on page 93. <ul style="list-style-type: none"> Remove the blower connection from ECU, and start the heater. If fault 31 (open circuit) appears, then carry out blower testing procedure. Or if, fault 32 (short circuit) persists, then test ECU* or replace it if necessary. Measure the current draw and speed of blower motor at testing voltage: Testing Voltage: <ul style="list-style-type: none"> For 12V Airtronic 2/4 heater : Apply 10 V For 24V Airtronic 2/4 heater : Apply 18 V Current Draw: <ul style="list-style-type: none"> If the current intensity is > 6.5 A, replace the blower motor If the current intensity is < 6.5 A, check the connections, and test ECU or replace it if necessary. Airtronic 2: Blower speed <ul style="list-style-type: none"> If measured speed is < 5000 rpm (+/- 25%), then replace the blower motor. If measured speed is > 5000 rpm (+/- 25%), then test the ECU or replace it, if necessary. Airtronic 4: Blower speed <ul style="list-style-type: none"> If measured speed is < 4400 rpm (+/- 25%), then replace the blower motor If measured speed is > 4400 rpm (+/- 25%), then test the ECU or replace it, if necessary. Measure the air gap between combustion air intake wheel cast iron base using feeler gauge: if gap is Airtronic 2: 0.35 mm+/-0.02, replace the blower motor assembly if necessary. Airtronic 4: 0.30 mm+/-0.02, replace the blower motor assembly if necessary. Due to excessive ice built up or heavy carbon particulates at the outlet of combustion fan could increase the resistance and eventually overload the motor. Therefore, sometimes by simply cleaning the surface area of the blower motor could also help removing the fault. For excessive speed fluctuations: Carry out blower motor inspection. Check the magnet on the blower fan or hull sensor on the ECU. If everything seem OK, then test ECU* or replace it if necessary. <div style="border: 1px solid black; padding: 2px; display: inline-block;">PLEASE NOTE!</div> <ul style="list-style-type: none"> Operating voltage and test voltage of the blower motor are different. Use non contact tachometer for speed measurements The blower motor is irreparably damaged if the testing voltage values are exceeded. Necessary precautions must be taken to prevent electrical shock, or burns. Ensure the DC power source has adequate short circuit resistance * To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts without fault, only then replace the original ECU. For extra information, see page #84.

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FAULT CODES... Continuation

FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
033	Blower motor - speed outside tolerance or short circuit after negative  WARNING: Risk of electrical shock and physical injury.	Overload at the blower motor due to jammed impeller (due to frost, salt, carbon or improper alignment); fix the jam or replace the motor if necessary. To remove blower motor, please refer the Disassembly/assembly of the heater on page 93. If speed deviation > 10% from operating value for longer than 30 seconds, then ECU triggers the fault. <ul style="list-style-type: none"> • High torque required by stiff or jammed blower fan leads to overload at the motor and current draw increases beyond range; therefore, sometimes ECU registers code 032 because of similar root causes. • To test the blower motor, follow troubleshooting procedure as provided in fault 031.
034	Blower output signal - Short circuit after battery voltage or transistor error	Signal issue due to defective transistor in ECU or short circuit after negative cable <ul style="list-style-type: none"> • Check the blower harness and connections • If everything seems OK, then test ECU* or replace it if necessary
047	Fuel Metering Pump - (Overload) Short Circuit	The Fuel metering pump resistance value is out of the range (Low resistance); Remove the FMP and carry out test. <ul style="list-style-type: none"> • Disconnect the FMP, if ECU gives fault 048, then check the FMP resistance, or replace if necessary; if the fault 047 persists, then check the wire harness, connector and ECU. • To test FMP, follow troubleshooting procedure as provided in fault 048
048	Fuel metering pump - (Interruption) Open Circuit	The Fuel metering pump resistance value is out of the range (high resistance); Remove the FMP and carry out test. <ul style="list-style-type: none"> • Measure FMP resistance at room temperature for 12V heaters: 9.5 (+/- 0.5) Ω; for 24V heaters: 36 (+/- 1.8) Ω, replace if necessary. • Check the supply lead, connector and wire harness, replace if necessary. • If everything seems OK, then test ECU* or replace it if necessary
048	Metering Pump - Short circuit to battery voltage	Short circuit to the battery voltage or signal issue from ECU. <ul style="list-style-type: none"> • Carry out inspection of FMP wire harness for connections and continuity • If everything seems OK, then test the ECU or replace it if necessary.
050	Too many failed start attempts - Operating Lock out	Too many start attempts (maximum 255) or overheats triggered ECU to lock the heater, under which heater would not start unless any active and stored faults are deleted. <ul style="list-style-type: none"> • Use one of the diagnostic tools mentioned on page 72 and follow the procedure to retrieve the fault and Unlock the ECU.
051	Faulty flame recognition - at start up	At start, if the resistance value of the flame sensor is detected > 1274 Ω (>70°C), then the start attempt is delayed and blower is activated for cool down (cold blower) for 15 mins. If the resistance value (temperature) does not fall below aforementioned value within 15 mins, the ECU triggers the heater shut down with fault 051. If the temperature decrease within acceptable level, the heater will proceed with normal start up procedure. <ul style="list-style-type: none"> • Check the resistance of the flame sensor at room temperature. (the test values are available on page 89) • If everything seems OK, then test ECU* or replace it if necessary
052	Flame Cut Out - (Safety time exceeded) at start up	Flame is not detected within required time during start up. Number of failed start attempts could lock the ECU under fault 50. <ul style="list-style-type: none"> • Check the intake and exhaust systems for blockages by dirt, salt, condensation. (maintain the total 90° bends from intake to exhaust pip no more than 3 or 270°) • Measure fuel quantity test (see page 88)* and check pump angle (15 to 35°). Check the fuel line for air bubbles or contaminants. For fuel quantity test procedure, please refer (see page 88). • At high altitudes >1500 m, connect high altitude sensor for proper heater operation (stabilize the fuel/air ratio). • Remove carbon, dirt or foreign particles from combustion chamber and run the heater using kerosene for 30 mins. max thereafter. • Check the flame sensor value at room temperature (see page 89). • For fresh installation and first time heater start up require fuel priming which could cause 52. • Check the air gap between the blower motor fan and cast iron housing, see fault 032. • Check the Glow pin resistance and replace the glow pin screen, also clean the vent hole (a small channel connecting to the blower air inlet to the flame chamber) • Check the flame chamber and replace if its shape is elongated due to thermal stresses. • Replace the ECU*, if necessary. <p>For further information on carboning issue, please see page 87. Also, for disassembly/assembly of the heater, please see page 91.</p>

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FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
053 054 055 056	Flame cutout in the "POWER" control stage "HIGH" control stage "MEDIUM" control stage "LOW" control stage	The heater has ignited (flame detected) and signals flame cutout during operational stages. <ul style="list-style-type: none"> For troubleshooting, see fault 052.
057	Flame Cutout - Start up (H-kit heaters only)	Heater has extinguished during start up prior to power mode. <ul style="list-style-type: none"> Check the combustion air and exhaust pipe Measure if sufficient fuel is provided. Carry out fuel quantity test. Follow steps provided in fault 052
060	External temperature sensor - Interruption (open circuit)	External temperature sensor detects a value beyond its range (high resistance $R > 3K \Omega$ = open circuit); Remove temperature sensor (For removal procedure of the temperature sensor, please see page 92) and check connections. <ul style="list-style-type: none"> Measure the sensor at room temperature see test value on page 89, and replace if necessary. If everything seems OK, then test ECU* or replace it if necessary.
061	Short circuit - external	Temperature sensor detects a value beyond its range (low resistance, $R < 800 \Omega$ = short circuit); Remove the sensor (please see procedure on page 92) and check the connections. <ul style="list-style-type: none"> Remove the Temperature sensor from connection and turn on the heater, if code 060 appears then check the sensor resistance or replace it if necessary; if code 061 persists, then check the connections, and ECU, replace if necessary. If everything seems OK, then test ECU* or replace it if necessary.
062	Set point control - Open circuit (interruption)	ECU detects the temperature set point value is out of range ($> 3 K \Omega$) and determines open circuit. Under such condition, the heater will operate in High mode only. <ul style="list-style-type: none"> Activate the controller (digimax, easy start timer. etc) prior to start up diagnosis through Functional check (EDiTH) Measure resistance between pin 6 and 7 at B1 (thermostat and rheostat only) see test value on page ... The set point value for mini controller, digimax controller, Easy start timer can be tested using the functional test (EDiTH) Carry out inspection of the set point wires (Grey/red and brown/white) for any visible damage. If everything seems OK, then test the ECU or replace it if necessary.
063	Set point control - Short circuit (Overload)	ECU detects the temperature set point value is out of range ($< 800 \text{ ohms}$) and determines short circuit. Under such condition, the heater starts in the ventilation mode, and only blower motor will function. <ul style="list-style-type: none"> Disconnect the set point wire from the controller, and restart the heater. If the heater starts with fault 062 and operates in High mode, then test the controller. If fault 063 reappears, then carry out inspection of the set point control wire (Grey/red and brown/white) and test the ECU, replace it if necessary. Measure resistance between pin 6 and 7 at B1 (thermostat and rheostat only) see test value on page 89. The set point value for mini controller, digimax controller, Easy start timer can be tested using the functional test (EDiTH) If everything seems OK, then test the ECU or replace it if necessary.
064	Flame sensor - Open circuit	The Flame sensor detects a value beyond its range (high resistance $R > 3 K \Omega$ = open circuit); Remove flame sensor (For removal procedure of the temperature sensor, please page 92) and check connections. <ul style="list-style-type: none"> Measure the sensor at room temperature (see test value on page 47) and replace if necessary. If everything seems OK, then test the ECU or replace it if necessary.
065	Flame Sensor- Short circuit (overload)	The Flame sensor detects a value beyond its range (low resistance, $R < 500 \Omega$ = short circuit); Remove the sensor (please see procedure on page 92) and check the connections. <ul style="list-style-type: none"> Remove the Flame sensor from connection and turn on the heater, if code 064 appears then check the sensor resistance or replace it if necessary; if code 065 persists, then check the connections, and test the ECU, replace if necessary.
071	Overheat sensor - Open circuit	The Overheat sensor detects a value beyond its range (high resistance $R > 1600 \Omega$ = open circuit); Remove overheat sensor (For removal procedure of the temperature sensor, please see page 92) and check connections. <ul style="list-style-type: none"> Measure the sensor at room temperature see test value on page 89, and replace if necessary. If everything seems OK, then test the ECU or replace it if necessary.

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FAULT CODE	FAULT DESCRIPTION	CAUSES / REPAIR
072	Short circuit - Overheat sensor	The Overheat sensor detects a value beyond its range (low resistance, $R < 95 \Omega$ = short circuit); Remove the sensor (please see procedure on page 92) and check the connections. <ul style="list-style-type: none"> Remove the Overheat sensor from connection and turn on the heater, if code 071 appears then check the sensor resistance or replace it if necessary; if code 072 reappears, then check the connections, and test the ECU, replace if necessary.
072	ECU - Defect - Overheat threshold detection error	Overheating threshold value is not detected by ECU <ul style="list-style-type: none"> Inspect combo sensors for damage If everything seems OK, then test the ECU or replace it if necessary.
090	ECU - Defect (internal fault)	<ul style="list-style-type: none"> Disconnect the power source from the heater for 10 seconds and reconnect, then test heater again. Test the ECU or replace it if necessary.
091	External interference voltage	Error in controller from interference voltage from vehicle network possible causes: poor batteries, poor battery charges, other interference sources; eliminate interference voltages**. ** Disconnect the heater from power for 10 seconds by disconnecting the 8 pin connector at the heater or pull main harness fuse, then reconnect and test it again. If the problem persists test the heater using an external power source other than the vehicle (known good battery only) These faults are common to a bad power supply, attached charger or dead cell in a battery.
092 093 094 095 096 097 098	ECU - Defect (ROM error) ECU - Defect (internal) ECU - Defect (EEPROM error) ECU - Defect (Internal) ECU - Defect (Internal temperature sensor) ECU - Defect (Internal) ECU - Defect (Internal)	<ul style="list-style-type: none"> Disconnect the power source from the heater for 10 seconds and reconnect, then test heater again. test the ECU or replace it if necessary. To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts without fault, only then replace the original ECU. For extra information, see page #84. <p>PLEASE NOTE! For fault 096, The heater can operate with external temperature sensor.</p>
099	Too many resets in sequence - Transistor error in ECU	A short term voltage drops from power source due to any reason ($< 5V$ for 12V and $< 7V$ for 24V heater); possible causes: low batteries, charges, other sources of interference, eliminate interference voltages. Internal faults detected in microprocessor/memory. Internal failure. Replace control unit.

* To test ECU, swap it with newer ECU from similar heater and restart the heater. If heater starts without fault, only then replace the original ECU. Before replacing the original ECU, reconfirm its bad condition (wrong fault codes, inactivity, wrong status) by retesting it on the same heater; if the secondary test result is consistent (bad ECU), then replace the original ECU.

PLEASE NOTE! For codes starting with 9x (e.g.91,93), try to put a good known working battery. Be sure to have the engine off and any equipment as well. Try to restart heater and check for any codes. This has to be done before/prior replacing the ECU. All fault codes and description are only applicable for new style ECU.

WARNING - SAFETY:

Before performing the diagnostic and repair on the heater, always have minimum required tools and protective equipments as provided on page 5.

AIR PRESSURE /HIGH ALTITUDE SENSOR FAULT CODE DISPLAY

FAULT CODE	FAULT DESCRIPTION	COMMENTS / REMEDIAL ACTION
00	No faults —	
11	Communication loss	Interruption of the diagnostics cable between the control box (heater) and the air pressure sensor <ul style="list-style-type: none"> Check wiring and plug-in connections.
12	No altitude adjustment	Control box (heater) does not support altitude operation with the air pressure sensor. <ul style="list-style-type: none"> Use a control box (heater) which supports altitude adjustment
13	Air pressure sensor fault	The air pressure sensor is defective <ul style="list-style-type: none"> Replace the air pressure sensor