Troubleshooting Guide

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1 Key to Symbols and Safety Instructions

1.1 Key to Symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important information

This symbol indicates important information where there is no risk to people or property.

1.2 Safety

Please read all instruction in the manual and retain all manuals for future reference.

**WARNING:**
- Untrained personnel (homeowners) may only clean and replace filters and replace fuses as required by basic maintenance. All other operations, including installation, repair, and service must be performed by a qualified installer, service agency, or the gas supplier.

**WARNING:** FIRE OR EXPLOSION HAZARD
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS:
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Leave the building immediately.
  - Immediately call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

**WARNING:**
- Do not use this furnace if any part has been under water. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. A qualified service agent must inspect the furnace and replace all gas controls, control system parts, and electrical parts that have been wet, or the furnace if deemed necessary.

**WARNING:** FIRE OR EXPLOSION HAZARD
- The furnace is designed and approved for use with Natural Gas and Propane (LP) Gas ONLY.
- DO NOT BURN ANY LIQUID FUEL OR SOLID FUEL IN THIS FURNACE.
- Burning any unapproved fuel will result in damage to the furnace’s heat exchanger, which could result in Fire, Personal Injury, and/or Property Damage.
**WARNING: FOLLOW ALL SAFETY CODES**
- Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes as well as the current editions of the National Fuel Gas Code (NFGC) NFPA 54/ANSI Z223.1 and the National Electrical Code (NEC) NFPA 70.

**WARNING: FIRE, EXPLOSION**
- Check entire gas assembly for leaks after lighting this appliance.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in the Installation, Operation, and Maintenance Manual.

**WARNING: FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISONING HAZARD**
- Failure to follow this warning could result in dangerous operation, serious injury, death, or property damage. Improper installation, adjustment, alteration, maintenance, or use could cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified service agency, local gas supplier, or your distributor for information or assistance.

**WARNING: FIRE HAZARD**
- The furnaces must be kept free and clear of insulating materials. Inspect surrounding area to ensure insulation material is at a safe distance when installing furnaces or adding insulation materials. Insulation materials may be combustible. Maintain a 1 in. clearance from combustible materials to supply air ductwork for a distance of 36 in. horizontally from the furnace. See NFPA 90B or local code for further requirements.
- These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring. In downflow installations, field supplied floor base MUST be used when installed on combustible materials and wood flooring. Special base is not required when this furnace is installed on industry standard Coil Assembly matching correct furnace width.

**WARNING: FIRE HAZARD**
- These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring. In downflow installations, field supplied floor base MUST be used when installed on combustible materials and wood flooring. Special base is not required when this furnace is installed on industry standard Coil Assembly matching correct furnace width.

**CAUTION: CUT HAZARD**
- Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing furnaces.
2 Troubleshooting

WARNING: FIRE, EXPLOSION AND ASPHYXIATION HAZARD

- Installation and service must be performed by a qualified service agency or the gas supplier.

Refer to the troubleshooting charts and associated figures on the following pages for assistance in determining the source of unit operational problems. The diagnostic LED blinks to assist in troubleshooting the unit. The number of blinks refers to a specific code.

2.1 Electrostatic Discharge (ESD) Precautions

NOTICE:

- Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace control and the person at the same electrostatic potential these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.

2. Firmly touch a clean unpainted metal surface of the furnace away from the control. Any tools held in a person's hand during grounding will be discharged.

3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e. do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.

4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

2.2 Resetting From Lockout

Furnace lockout results when a furnace is unable to achieve ignition after three attempts. Refer to the troubleshooting chart on the following pages for assistance in determining the source of unit operational problems. The red diagnostic LED blinks to assist in troubleshooting the unit. If the furnace is in "lockout" it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.


3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat for 1 - 20 sec.
3 Error Flash Codes

3.1 No Flash and No Fan (System Does Not Start Normally)

Troubleshooting Chart

Start

Are there any loose wires or wrong connections? Yes → Correct wiring according to wiring diagram

No → Is there power to the unit? Yes → Is the door switch working properly? Yes → Replace the door switch

No → Is the transformer working properly? Yes → Is the blower access door closed or fixed properly? Yes → Ensure the blower access door is closed properly

No → Replace the transformer

No → Is there a blown fuse? Yes → Replace the fuse

No → Replace the control board

Yes → Is there a call for heat? Yes, Heating → Replace the control board

Yes, Fan Only → Replace the control board

No → Is there a call for fan? Yes → Is there power to the circulating fan motor? Yes → Replace the circulating fan motor

No → Check the thermostat settings and/or replace the thermostat

Is the transformer sending 18-31V signals? Yes → Replace the transformer

See Figure 3

See Figure 4

See Figure 5

See Figure 6

See Figure 7

Leave “Park” terminal unused.
No Flash and No Fan (System Does Not Start Normally)

Figures & Tables

**Figure 1**
1. Check for 115Vac power supply between L1 and common terminal.

**Figure 2**
1. Power off.
2. Press in the door switch.
3. Use a multi-meter to measure the resistance. If it is 0 Ω, then the door switch is ok.

**Figure 3**
1. Check for 18-31Vac power between these 2 terminals with multi-meter.

**Figure 4**
1. Check for 18-31Vac power between “R” & “C” terminals with multi-meter.
1. Check for 18-31Vac power between "W/W1" & "C" terminals with multi-meter

**Figure 5**

1. Check for 18-31Vac power between "G" & "C" terminals with multi-meter

**Figure 6**

1. Check for 18-31Vac power between Hi-heat/lo-heat/hi-cool/lo-cool and COM with multi-meter
2. Check for 115Vac power supply between CIRC-H and N with multi-meter

**Figure 7**
3.2 7 Flashes (System Lock-Out due to Failed Ignition)
8 Flashes (System Lock-Out due to too Many Flame Dropouts)

Troubleshooting Chart

- Start
- Are there any loose wires or wrong connections? Yes → Correct wiring according to wiring diagram
  No → Unit should work normally

- Does the unit show 1 LED flash after restart? Yes → Replace the ignitor
  No → Replace the PCB Board

- Is the ignitor “glowing” red/orange? Yes → Is there power to the ignitor? See Figure 9
  No → Is the ignitor working properly? See Figure 8

- Is there a flame? (visual check) Yes
  No → Is there a signal to the gas valve? See Figure 10

- Does the manifold gas pressure meet the requirement? Yes → Are orifices blocked or clogged? (check burner)
  No → Is the wire grounded properly? See Figure 11

- Is the flame sensor dirty or broken? Yes → Clean with steel wool or replace the flame sensor
  No → Remove the blockage

- Adjust gas valve to ensure it meets gas pressure requirement

- Replace the gas valve if the pressure cannot be adjusted

- Adjust the inlet gas pressure

- Check incoming gas supply quality

- Adjust gas valve if the inlet gas pressure is not meeting the requirement

- The flame sense signal should be 1-6 microamps.
7 Flashes (System Lock-Out due to Failed Ignition)
8 Flashes (System Lock-Out due to too Many Flame Dropouts)

Figures & Tables

Figure 8
1. Check for 9-17Ω between these two terminals with multi-meter.

Figure 9
1. Check for 115Vac power supply between IG and IGN with multi-meter during preheating sequence.

Figure 10
1. Check for 18-31Vac power between "M/HI"&"C" terminals with a multi-meter.

Figure 11
1. Check for proper grounding (green wire).

Table 1  Manifold Gas Pressure
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<td>Propane Gas</td>
<td>10 in. W.C.</td>
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Table 2  Inlet Gas Supply Pressure
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<td>Minimum: 4.5 in. W.C.</td>
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<tr>
<td></td>
<td>Maximum: 10.5 in. W.C.</td>
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<tr>
<td>Propane Gas</td>
<td>Minimum: 11.0 in. W.C.</td>
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<tr>
<td></td>
<td>Maximum: 13.0 in. W.C.</td>
</tr>
</tbody>
</table>
3.3 2 Flashes (Low Fire Pressure Switch Stuck Closed)

Troubleshooting Chart

This error could also be caused by a blocked vent. Check vent for obstructions. If a vent is blocked, unit's safety protection logic will turn off unit.
2 Flashes (Low Fire Pressure Switch Stuck Closed)

Figures

1. Check for ∞ resistance between these two terminals with multi-meter.

Figure 12

Figure 13
3.4 3 Flashes (Low Pressure Switch Stuck Open)
6 Flashes (Pressure Switch Cycle Lockout)
13 Flashes (High Pressure Switch Stuck Open)

Troubleshooting Chart

- **Start**
- Are there any loose wires or wrong connections?
  - Yes: Correct wiring according to the wiring diagram
  - No
- Is the pressure switch closed?
  - Yes: Replace the PCB Board
  - No
- Is there blockage in the pressure hose or is the hose loose?
  - Yes: Remove blockage or fix the pressure hose
  - No
- Is there blockage in the exhaust pipe?
  - Yes: Remove blockage in the exhaust pipe
  - No
- Is the pressure at the pressure switch correct?
  - Yes: Replace the pressure switch
  - No: Replace the inducer
3 Flashes (Low Pressure Switch Stuck Open)
6 Flashes (Pressure Switch Cycle Lockout)
13 Flashes (High Pressure Switch Stuck Open)

Figures

The pressure switch that you are checking in this step depends on the number of LED flashes. Refer to the specific flashes and their descriptions above.

- High fire pressure switch
- Low fire pressure switch
- Overflow pressure switch

Figure 14

1. Check for 0 Vac between these two terminals with multi-meter.

Figure 15

1. Check pressure hose for proper operating condition.
   Check for proper hose connections.
   Check and remove any blockages in the hose.

Figure 16

Check to see if the pressure at pressure switch is correct by removing the hose and measuring with a manometer.
(1) Low Pressure Switch Set Point: 0.55 in. WC
(2) High Pressure Switch Set Point: 1.1 in. WC

Figure 17
3.5 4 Flashes (Limit/Rollout Switch Open Less than 5 Mins)
5 Flashes (Limit/Rollout Switch Open More than 15 Mins)
11 Flashes (Limit/Rollout Switch Open from 5 to 15 Mins)

Troubleshooting Chart

- **Start**
- **Are there any loose wires or wrong connections?**
  - Yes: Correct wiring according to wiring diagram
  - No: Turn off the equipment for 10 minutes to ensure sufficient cooling off period. Measure the resistance between two leads on the limit switches
- **Are the limit switches working properly? See Figure 18 & 19.**
  - Yes: Replace the (chamber/fan mounted) Limit Switch
  - No: Replace the PCB Board
- **Is there blockage in the exhaust pipe?**
  - Yes: Remove blockage in the exhaust pipe
  - No: Is there blockage in the exhaust pipe?
    - Yes: After manual reset of the limit switch (by pressing the button on switch), is the error still present once the system starts up?
    - Yes: Replace the Inducer
    - No: Replace the Rollout Switch
- **Are (chamber/fan mounted) limited switches in right models? See Table 3**
  - Yes: Replace the Limit Switch
  - No: Is the circulating fan motor turning on after 30s delay?
    - Yes: Replace the circulating fan motor
    - No: Is there power to the circulating fan motor? See Figure 7
      - Yes: Replace the circulating fan motor
      - No: Replace the PCB Board
- **Is there blockage on the filter?**
  - Yes: Clean/Replace the filter
  - No: Is the circulating fan motor speed correctly set? See Tables 4 & 5
    - Yes: Check the airflow duct for blockage
    - No: Correct the circulating fan motor speed or replace the motor if necessary.

- **"SW2" is used for the fan delay after burner starts.**
- **Verify that the temperature rise is between 40-55°F.**

Data subject to change
4 Flashes (Limit/Rollout Switch Open Less than 5 Mins)
5 Flashes (Limit/Rollout Switch Open More than 15 Mins)
11 Flashes (Limit/Rollout Switch Open from 5 to 15 Mins)

Figures & Tables

1. Chamber mounted limit switch (behind the gas valve)
2. Fan mounted limit switch (side of blower fan, behind PCB board)

Figure 18

1. Rollout limit switch locations.

Figure 20

1. Check for 0 resistance between these two terminals with multi-meter.

Make sure to do this check on both chamber and fan mounted limit switches.

Figure 19

Bosch Model | BGH96M060B3A | BGH96M080B3A | BGH96M080C4A | BGH96M100C5A | BGH96M100D5A | BGH96M120D5A
--- | --- | --- | --- | --- | --- | ---
Rollout switch - resettable | | | | 300 | | |
Inlet High Temperature Limit switch - fixed | Off/On | °F | 150/120 | 130/100 | 150/120 | 150/120 | 150/120

Table 3

Data subject to change
## Table 4  Air Delivery - CFM (Without Filter) * **

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</tbody>
</table>

* A filter is required for each return air inlet. This table shows the airflow performance without a filter. To determine airflow performance with a filter, if a 3/4 inch (19 mm) washable media filter is used, assume an additional 0.1 in. WC available external static pressure.

** The manufacturer default fan settings are based on model, refer to Table 24.
### Table 5  Air Delivery - CFM (Without Filter) *

<table>
<thead>
<tr>
<th>Furnace size</th>
<th>Return-air inlet</th>
<th>Speed</th>
<th>External static pressure (in. WC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CFM</td>
<td>0.1</td>
</tr>
<tr>
<td>100C</td>
<td>Bottom or Sides</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>100D</td>
<td>Bottom or Sides</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-L</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>120D</td>
<td>Bottom or Sides</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mid-L</td>
<td></td>
</tr>
</tbody>
</table>

---

**A filter is required for each return air inlet. This table shows the airflow performance without a filter. To determine airflow performance with a filter, if a 3/4 inch (19 mm) washable media filter is used, assume an additional 0.1 in. WC available external static pressure.**

**The manufacturer default fan settings are based on model, refer to Table 24.
3.6 9 Flashes (Incorrect Polarity of L1/L2)

Troubleshooting Chart

Correct the wire connection (black and white wire) according to wiring diagram.

See Figure 23.

Figures

Figure 23
3.7 Rapid Flashes (Low Flame) 

Troubleshooting Chart

Start

Is the manifold gas pressure requirement being met? See Table 1

Yes

Is the flame sensor dirty or broken?

Yes

Clean with steel wool or replace the Flame Sensor

No

Is the PCB Board grounded properly? See Figure 11

Yes

Properly ground the PCB Board

No

Are orifices blocked or clogged? (check burners)

Yes

Remove the blockage

No

Replace the PCB Board

No

Is the manifold gas pressure requirement being met? See Table 1

No

Is the inlet gas pressure requirement being met? See Table 2

Yes

Adjust the gas valve to ensure manifold gas pressure meets the required values

No

Replace the gas valve if the pressure cannot be adjusted

No

Adjust the inlet gas pressure

No

Replace the PCB Board
Appendix A - Sequence of Operation

Two Stage Controller Logic

A1. There are two heating modes:
   A1.1 Low Fire Heating Mode: Only W1 signal
   A1.2 High Fire Heating Mode: Both W1 and W2 signal

If you are using a single stage thermostat, only a W1 signal will be sent. In this scenario, the furnace will upstage from low to high fire via a timing sequence. The time delay is set via the S1-1 & S1-2 dip switches on the control board.

A2. If the furnace fails to ignite, there is a separate logic for the re-ignition sequence.
A1 Heating Modes
A1.1 Low Fire Heating Mode Logic (only W1 signal):

1. When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for 15s.

2. Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for 17s.

3. After preheating, gas valve opens and the burners light. The ignitor will turn off after 3s.

4. There is 30s time delay before blower motor starts.

5. The system is working properly.

6. When there is no call for heat (no W1 call) and no flame is sensed, post-purge begins. This will last for 15s.

7. There is a fan delay to dissipate heat in the system. This time depends on the dip switch S1-3 & S1-4. The default time is 180s.
A1.2 High Fire Heating Mode Logic (W1+W2 Signal):

1. When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for 15s.

2. Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for 17s.

3. After preheating, gas valve opens and the burners light. The ignitor will turn off after 3s.

4. Before gas valve, inducer, pressure switch turn to high stage, there is a 5s delay.

4 + 5. There is a time delay of 30s before blower motor starts.

5. The system is working properly in high stage.

6. When there is no call for heat, there is a time delay before inducer shuts down. This will last for 15s.

8. The blower motor will run at high speed for 30s for fan delay.

9. There is a fan delay to dissipate heat in the system. This time depends on the dip switch S1-3 & S1-4. The default time is 180s.
A2 Ignition Failure and Reignition Sequence

If the furnace fails to ignite, there is a separate logic for the re-ignition sequence:

1. When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for **15s**.

2. Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for **17s**.

3. After preheating, gas valve opens and the burners light. The ignitor will turn off after **3s**.

4. The gas valve will open for **4s** if there is no flame.

5. The inducer will run at high speed for **60s**.

6. Test of low pressure switch.

7. Preheating occurs for **27s**.

8. After preheating, gas valve opens. The ignitor will turn off after **3s**. After two failed ignition attempts, system will lock out.