

### **Important Product Safety Information** **Refractory Ceramic Fiber Product**

#### **Warning:**

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures above 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

#### **AVOID Breathing Fiber Particulates and Dust**

#### **Precautionary Measures:**

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
  2. Long sleeved, loose fitting clothing
  3. Gloves
  4. Eye Protection
- Take steps to assure adequate ventilation.
  - Wash all exposed body areas gently with soap and water after contact.
  - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
  - Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

#### **First Aid Procedures:**

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

## WARNING

**Service on this boiler should be undertaken only by trained and skilled personnel from a qualified service agency. Inspections should be performed at intervals specified in this manual. Maintain manual in a legible condition.**

**Keep boiler area clear and free of combustible materials, gasoline and other flammable vapors and liquids.**

**Do not place any obstructions in boiler room that will hinder flow of combustion and ventilation air.**

- A. General.** Inspection and service should be conducted annually. Turn off electrical power and gas supply while conducting service or maintenance. Follow instructions TO TURN OFF GAS TO APPLIANCE. See Figure 14.

## CAUTION

**Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.**

**B. Inspect Vent System.**

1. Remove obstructions in vent pipe and chimney.
2. Remove soot accumulations with wire brush and vacuum.
3. Repair or replace deteriorated vent pipe and vent accessories.
4. Provide proper support. Repair sags, particularly in horizontal sections.
5. Repair leaking joints.

**C. Inspect Boiler Flue Passages** for blockage or soot accumulation.

1. Remove vent pipe, vent damper and blocked vent switch.
2. Remove sheet metal screws securing Jacket Top Panel. Remove Top Panel.
3. Remove screws securing Canopy to Section Assembly. Remove Canopy.
4. Using flashlight, examine all flue passageways.
  - a. If passageways are free of soot and obstruction, replace canopy, secure and seal.
  - b. If passageways need cleaning, remove burners as described in Paragraph D. Using long handle wire or bristle flue brush and vacuum, brush flueways thoroughly from top of boiler.
5. Install new gasket material (See Section XI: Repair Parts). Install canopy.
6. Install Jacket Top Panel, Blocked Vent Switch, Vent Damper, and vent pipe.

**D. Clean Main Burners and Firebox.**

1. To remove burners for cleaning, changing orifices, or repairs:
  - a. Remove Jacket Front Panel.
  - b. Disconnect pilot tubing at gas valve.
  - c. Disconnect 3-wire plug at the gas valve.
  - d. Remove wires to flame roll-out switch.
  - e. Remove the burner access panel.
  - f. Mark the location of the pilot main burner on the manifold if the marking on manifold is missing or obliterated.
  - g. Hold burner at throat. Lift front of burner to clear orifice. Burner which holds pilot can only be removed by lifting the burner adjacent to its right first.
2. Brush top of burners with a soft bristle brush. Vacuum burners.
3. Check orifices. Drilled passageways must be free of lint or dirt.
4. Vacuum tip of Pilot Burner.
5. Clean firebox by vacuuming. Exercise care not to damage base insulation.
6. Install burners by reversing procedure used to remove burners. Make sure burner with pilot assembly is in same location as original installation. Check burners to see that they are located properly in slot at rear of burner tray. Reinstall burner access panel. Reconnect flame roll-out switch wires, pilot gas supply, thermocouple lead or pilot lead.
7. Connect pilot gas supply, igniter/sensor wire, and ground wire at Boiler Control.
8. Install Burner Access Panel. Connect Flame Rollout Switch wires.

**E. Check Operation.** Follow steps C through J from Section VII: System Start-up and Checkout.

**F. Lubrication.** There are no parts requiring lubrication by service technician or owner. Circulator bearings are water lubricated.

## X. Troubleshooting

### A. BEFORE TROUBLESHOOTING

The following pages contain troubleshooting tables for use in diagnosing control problems. When using these tables the following should be kept in mind:

1. This information is only meant to be used by a professional heating technician as an aid in diagnosing boiler problems.
2. In general, these tables assume that there are no loose or miswired electrical connections. Before using these tables inspect all electrical connections on the boiler to make sure that they are tight. Also, check the wiring on the boiler against the wiring diagram in Figures 9 and 10. Ensure that incoming 120 Vac power polarity is correct and that the boiler is properly grounded. Further, ensure that the control power supply is 24 VAC (minimum 18 VAC to maximum 30 VAC) and polarity is correct.
4. All controls on the CG-E Series are tested at least once in the manufacturing process and a defective control or component is generally the least likely cause. Before replacing a component, try to rule out all other possible causes.
5. When checking voltage across wiring harness pins be careful not to insert the meter probes into the pins. Doing so may damage the pin, resulting in a loose connection when the harness is reconnected.

**Table 3: Troubleshooting Using the Control's LED**

<b>Flashing LED</b>	<b>Fault Condition</b>
POWER Steady 1 Hz flash Flash code 2 Flash code 3 Flash code 4 Flash code 5 Flash code 6	Reverse polarity of 115 VAC supply voltage Faults internal to microprocessor (RAM, ROM, etc.) Unused Unused Water thermistors disagree Gas valve outputs in improper state
POWER + TSTAT/CIRC	48 volts on Thermostat circuit
DAMPER	Damper switch opened after it had been proved closed. Continues flashing until demand for heat removed or Damper switch proven closed in ignition sequence.
POWER + DAMPER	Damper switch stuck open or closed (control in damper switch lockout)
LIMIT	Fault detected in temperature sensing hardware
FLAME	Flame loss, or flame not sensed during trial for ignition. Continues flashing until either flame is established or demand for heat is removed.
POWER + FLAME	Flame sensed without call for heat or out of sequence during ignition trial.

### Lockouts

1. Lockout from internal hardware faults (listed above under POWER) automatically resets after the hardware fault has not been present for 60 minutes. Lockouts from internal hardware faults may not be manually reset except by removing power from the control.
2. Lockout from damper switch failing to close within 45 seconds automatically resets after 60 minutes. Lockout may be manually reset by opening the thermostat for more than 2 but less than 20 seconds.

## B. USE CONTROL LEDS TO DIRECT TROUBLESHOOTING EFFORTS

If the control detects an error, the LEDs will flash. Use the LEDs to identify the boiler problem and corrective action in the table below. If LEDs are not flashing, proceed to Paragraph C:

Flashing LEDs	Status	Recommended Corrective Action
Blank	Boiler or Control is not powered	No 120 Vac Power at boiler, check breaker and wiring between breaker panel and boiler
POWER Steady 1 Hz flash	Line Voltage Reversed	Reverse polarity of 115 VAC supply voltage.
POWER Flash Code 2	Microprocessor Failure	Cycle power to control. Replace control if problem persists.
POWER Flash Code 5	Water thermistors disagree	Confirm sensor is fully in well. If secure and good condition, replace sensor.
POWER Flash Code 6	Gas Valve Outputs in improper state	Flame sensed during pre-purge (before gas valve signaled open). Check the gas valve for proper operation. Replace gas valve if problem persists.
POWER + TSTAT/CIRC	Thermostat Input Higher than Threshold	Check thermostat wiring.
DAMPER	Damper Switch opened after proven closed	LEDs continue flashing until demand for heat is removed or damper switch proven closed in ignition sequence.
POWER + DAMPER	Damper Failed to Open	Atmospheric Damper End Switch failed to close (end switch contacts stuck open). Refer to Troubleshooting Section, C4.
POWER + DAMPER	Damper Failed to Close	<p>Damper open. Voltage should not be present on P6-5. Control, vent damper or wire harness is defective. While the POWER + DAMPER LEDs flash on the control, perform the following tasks:</p> <ul style="list-style-type: none"> <li>• Remove the call for heat (adjust thermostat or remove wire from TT terminals).</li> <li>• Check for 24Vac between P6-5 and ground.</li> <li>• If voltage not present, attempt to start boiler again.</li> <li>• If 24Vac is present, unplug the vent damper harness from control.</li> <li>• With wire harness unplugged, check for 24Vac between P6-5 (on Control) and ground.</li> <li>• If voltage present, replace the control.</li> <li>• If voltage not present, failed vent damper or wiring harness.</li> <li>• Check wiring harness for shorts or mis-wiring. Replace if defective.</li> <li>• If harness not defective, replace vent damper.</li> </ul>
LIMIT	Temperature Sensor Failure	<p>Temperature sensor or interface failure (open or short connection, increased connection resistance, dual sensor mismatch) or control hardware failure.</p> <ul style="list-style-type: none"> <li>- Check sensor is securely attached to control P7 connector.</li> <li>- Check sensor wire is not damaged.</li> <li>- If secure and in good condition, replace sensor.</li> <li>- If problem persists, replace control.</li> </ul>
FLAME	Flame Current Lower than Threshold	Flame loss, or flame not sensed during trial for ignition. Continues flashing until either flame is established or demand for heat is removed. Check pilot assembly. Refer to Troubleshooting Section, C5.
POWER + FLAME	Flame Sensed Out of Normal Sequence	Flame sensed out of normal sequence (before opening gas valve or after closing gas valve). Check the gas valve for proper operation.

## C. USE STATUS LEDS TO GUIDE TROUBLESHOOTING

The control LEDs will light to indicate status. Use these LEDs to identify the boiler problem in the table below:

### 1. Boiler and Circulator Off

LED / Status	Recommended Corrective Action
- POWER Standby Burner off Circulator off	<p>The boiler has not detected a call for heat</p> <p>Check that the thermostat:</p> <ul style="list-style-type: none"><li>- When a thermostat call for heat is detected control TSTAT/CIRC LED will be lit.</li><li>- Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for loose connection.</li></ul> <p>Check the DHW demand:</p> <ul style="list-style-type: none"><li>- When a domestic call for heat is detected control TSTAT/CIRC LED will be lit.</li><li>- Make sure the DHW aquastat contact is closed. Check for loose connection.</li></ul>

### 2. Circulator is On, But Boiler is Off

LED / Status	Recommended Corrective Action
- POWER - TSTAT/CIRC Circulator Pre-purge Burner off Circulator on	<p>The boiler is warm and circulator is providing residual boiler heat to building:</p> <p>Check boiler temperature</p> <ul style="list-style-type: none"><li>- The boiler will not start until boiler water temperature is 15°F less than the Setpoint</li><li>- If boiler water temperature is higher than 140° F, boiler start will be delayed until water temperature drops below 140°F.</li></ul>

### 3. Circulator is On But Damper is Not Open

LED / Status	Recommended Corrective Action
- POWER - TSTAT/CIRC Limit Open	<p>Waiting for Limit to Open.</p> <ul style="list-style-type: none"><li>- Check Blocked Vent Switch, in the event of a blocked vent or poor draft condition, the blocked vent switch will open interrupting power to control P4-1. The main burners will be extinguished immediately and the circulator will remain on until the thermostat is turned off. The source of blockage must be corrected by trained and skilled personnel from a qualified service agency before resetting switch. Blocked Vents are caused by a collapsed chimney resulting in full or partial blockage, chimney cross sectional area too small, height insufficient or cold chimney causing sustained poor draft. Always follow the recommendations in Section I, Figure 1 and Section IV: Venting.</li><li>- Check Flame Rollout Switch, in the event of excessive blockage of the boiler section flue passageways is developed the flame rollout switch will open interrupting power to control P4-1. The main burners will be extinguished immediately and the circulator will remain on until the thermostat is turned off. If the flame rollout switch is activated, do not attempt to place the boiler in operation. The source of the blockage must be corrected and the identical flame rollout switch replaced by trained and skilled personnel from a qualified service agency.</li><li>- Check External Limit.</li></ul>

#### 4. Circulator is On But Damper is Not Open

LED / Status	Recommended Corrective Action
<ul style="list-style-type: none"><li>- POWER</li><li>- TSTAT/CIRC</li><li>- LIMIT</li></ul> Damper Failed to Open	<p>The control is waiting for the damper to open. Damper end switch has failed to close (end switch contact is stuck open). Combustion can never take place unless the damper blade is in the fully open position. Check the following:</p> <ul style="list-style-type: none"><li>- Confirm if control terminal "P6 - 5" (yellow wire) is energized.</li><li>- Check for loose connection between control and vent damper, check damper harness.</li><li>- Check for obstruction in path of damper</li><li>- When damper is open (end switch closed) control terminal "P6 – 2" should receive power from the vent damper.</li><li>- Place jumper between control terminal P6-5 and P6-2. If DAMPER LED does not light, replace control.</li><li>- Defective harness or vent damper.</li></ul>

#### 5. Circulator is On, Damper is Open But Boiler Fails to Start

LED / Status	Description
<ul style="list-style-type: none"><li>- POWER</li><li>- TSTAT/CIRC</li><li>- LIMIT</li><li>- DAMPER</li></ul> Retry / Recycle Delay	<p>The Boiler is in "Retry Delay":</p> <ul style="list-style-type: none"><li>- The burner failed to light (no flame signal). After a 5 minute delay, Control will attempt to light the burner again. There is no limit to the number of retries.</li></ul> <p>Recycle Delay</p> <ul style="list-style-type: none"><li>- The burner loses flame during running mode. Immediately, Control will attempt to light the burner again. If flame is lost 5 times within the same call for heat, the control locks out for one hour before retrying ignition.</li></ul>

## 5. Circulator is On, Damper is Open But Boiler Fails to Start (continued)

LED / Status	Recommended Corrective Action
- POWER - TSTAT/CIRC - LIMIT - DAMPER Retry / Recycle Delay	<b>1. No Spark</b> a. Can you hear sparking? - If there is no spark noise replace the control. b. If you can hear spark noise check the following: - Loose connection in ignition cable or ground wire - Continuity of ignition cable - Break in ignition cable insulation - Loose ground connection - Break in pilot ceramic insulator - Incorrect pilot spark gap
	<b>2. No Pilot Flame</b> a. If pilot does not light check the following: - All manual gas valves are open - Supply tubing is not plugged, kinked or leaking - Gas line pressures are good - Gas line is purged of air - Pilot orifice is not plugged (pilot gas is flowing) - Condensate quenching pilot <b>Note:</b> It may be necessary to recycle the "call for heat" more than once to clear the pilot supply tubes of air. b. If no gas flow check the following: - 24 volts across PV and MV/PV at gas valve, if voltage ok replace defective gas valve - Check for break in wiring harness to gas valve - 24 volts across control connector P4-6 and P4-7, if no voltage at control replace defective control
	<b>3. Spark does Not Stop When Pilot Lights</b> If the spark does not stop when the pilot lights check the following: - Loose connection in ignition cable or ground wire - Continuity of ignition cable - Clean flame rod - Pilot electrode porcelain cracked - Pilot flame covers flame rod and is steady and blue, if not adjust pilot flame - Low gas pressure at gas valve inlet - Defective control
	<b>4. Main Flame Does Not Light</b> If the main burners do not light check the following: - Check orifice size and/or blockage - 24 volts across control terminals P4-5 and P4-7? If no voltage while in defective control. - 24 volts across MV and MV/PV at gas valve? Check for break in wiring harness to gas valve - Defective gas valve