These instructions are to be stored next to the boiler for reference purposes.

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

WARNING
If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

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.
• Immediately call your gas supplier from a nearby 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 gas supplier.

AVERTISSEMENT
Assurez-vous de bien suivres les instructions données dans cette notice pour réduire au minimum le risque d’incendie ou d’explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d’essence ni d’autres vapeurs ou liquides inflammables dans le voisinage de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:
• Ne pas tenter d’allumer d’appareils.
• Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dansle bâtiment où vous êtes.
• Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
• Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le sservice des incendies.

L’installation et l’entretien doivent être assurés par un installateur ou un service d’entretien qualifié ou par le fournisseur de gaz.
# U.H.E. Series Commercial Gas
## Ultra High Efficiency Water Heaters

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<td>Glossary of Terms</td>
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U.H.E. Series Commercial Gas
Ultra High Efficiency Water Heaters

Introduction

The LAARS heating system Ultra High Efficiency Water Heater is designed to
deliver a remarkable thermal efficiency rating in a quiet running unit with venting
options that allow for installation flexibility. Several technologically advanced
design features are incorporated in the design that will require additional
knowledge on the part of the qualified service provider. The information in this
manual will instruct service and maintenance professionals on the function, proper
diagnosis and repair of LAARS Heating System Ultra High Efficiency Water
Heater.

The LAARS heating system Ultra High Efficiency Water Heater uses a low Nox
premix power burner located at the top of the water heater to direct a turbulent
flame down into a submerged combustion chamber. This turbulence causes a
thorough mixing of gas and air for optimum combustion. The combustion gases
then travel through a three pass flue system keeping the gases moving at a high
velocity. The combination of high turbulence and velocity results in an optimum
transfer of heat from the flue gases into the water.

Burner operation is controlled using an electronic ignition module. The module
monitors the status of the electronic thermostat, vent temperature limit switch, vent
system pressure switches and a flame sensor to control output voltage to blower
motor, hot surface igniter and gas valve. The module contains programming which
determines the sequence of operation and timings for purge periods, trial for
ignition, flame sensing and lockout. The module will also provide diagnostic
information to help in determining the cause of system lockouts.

The contents in this manual are detailed informational tools to assist in the proper
diagnosis of the Ultra High Efficiency Water Heater operational faults. Please read
this service manual completely and provide as much information regarding the
Ultra High Efficiency Water Heater operation and installation specific concerns.
It is intended for this manual to be used by qualified service personal for the primary purpose of troubleshooting analysis and repair of the LAARS heating system Ultra High Efficiency Water Heater. Understanding the sequence of operation section of this manual will contribute greatly to troubleshooting this product.

An “Installation Check List” is shown on page 43. Compare the installation against the installation check list to confirm all requirements are met.

An “UHE Service Report” is shown on page 44. Completing this form will assist in the troubleshooting efforts. Should you need to call for technical support, Please provide the information shown on this form to the support technician to insure accurate troubleshooting.

Troubleshooting begins with “System Observation” to determine failure mode as indicated by the LED status of the ignition module. Troubleshooting continues with “Failure Modes and Probable cause” listed on page 10 directing the service provider to a series of test procedures to determine root cause of failure. Component replacement procedures directly follow the test procedures for a given component.

In some difficult to diagnose conditions, it may be necessary to isolate the heater from the vent system to determine root cause.

Contact Technical support immediately if diagnosis is not determined using the methods described in this service manual.

### Tools Required for Service

- **Manometer:** Two types available, a liquid “U” tube type or a digital (magna-helic) type. This device is used to measure gas and/or air pressures and vacuum.

- **Multi-Meter:** A digital type is strongly recommended. This device is used to measure electrical values. The meter you select must have the capability to measure volts AC, volts DC, Amps, micro-amps and ohms.

- **Thermometer:** Used to measure water temperature. An accurate thermometer is recommended.

- **Water Pressure Gage:** Used to measure water supply pressure. Also used to determine tank pressure by adapting to the drain valve of the heater.

- **Jumper Leads:** A length of wire (12" min.) with alligator clip at both ends.

- **Various Hand Tools:** Pipe wrench, channel locks, open end wrench set, 12" crescent wrench, Allen wrench set, torx bit set, screw drivers (common & phillips), long reach (12") magnetic tip phillips head screw driver #2 tip, ¼" nut driver, pliers (common & needle nose), socket set including a 1-1/16 deep well socket, wire cutters, wire strippers, wire crimpers, torpedo level, small shop vac, step ladder, and flashlight.
### Specifications

#### Dimensions (Inches)

<table>
<thead>
<tr>
<th>Model No</th>
<th>Recovery GPH at Degree Rise</th>
<th>DIMENSIONS (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40°F</td>
<td>100°F</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>UH60T125</strong></td>
<td>125,000</td>
<td>363.6</td>
</tr>
<tr>
<td><strong>UH60T150</strong></td>
<td>150,000</td>
<td>422.7</td>
</tr>
<tr>
<td><strong>UH60T199</strong></td>
<td>199,999</td>
<td>557.6</td>
</tr>
<tr>
<td><strong>UH100T150</strong></td>
<td>150,000</td>
<td>450.5</td>
</tr>
<tr>
<td><strong>UH100T199</strong></td>
<td>199,999</td>
<td>597</td>
</tr>
<tr>
<td><strong>UH100T250</strong></td>
<td>250,000</td>
<td>734.8</td>
</tr>
<tr>
<td><strong>UH100T300</strong></td>
<td>300,000</td>
<td>836.4</td>
</tr>
<tr>
<td><strong>UH100T399</strong></td>
<td>399,999</td>
<td>1,127</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>Dedicated 120 VAC, 60 Hz, 15A, GFI</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Gas Supply</strong></td>
<td>Minimum 1” NPT for UHE100T399, all others ¾” NPT (schedule 40 black iron pipe recommended)</td>
<td></td>
</tr>
<tr>
<td><strong>Approved Gas Type</strong></td>
<td>Natural or Propane. Unit must match gas type supplied.</td>
<td></td>
</tr>
<tr>
<td><strong>Gas Pressure (Nat &amp; L.P.)</strong></td>
<td>14.0” W.C. maximum static, 4.5” W.C. minimum running (recommend 7.0” W.C. min running)</td>
<td></td>
</tr>
<tr>
<td><strong>Venting System</strong></td>
<td>Power vent, balanced direct vent or unbalanced direct vent. See vent tables on page 7</td>
<td></td>
</tr>
<tr>
<td><strong>Approved Vent Materials</strong></td>
<td>PVC, CPVC or ABS</td>
<td></td>
</tr>
<tr>
<td><strong>Minimum Clearance for Servicing</strong></td>
<td>18” from top, 24” from front, 4” sides and rear.</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Water Supply Pressure</strong></td>
<td>150 PSI</td>
<td></td>
</tr>
<tr>
<td><strong>Thermostat Sensor</strong></td>
<td>11,900 Ohms @ 70°F, ECO opens @ 201°F Max., ECO close @ 100°F Min.</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Dial</strong></td>
<td>Min. set point 5400-6600 ohms, Max set point 0-50 ohms.</td>
<td></td>
</tr>
<tr>
<td><strong>Thermostat Board</strong></td>
<td>Max temp 180°F, Min temp 91°F, 24VAC, 60Hz max.</td>
<td></td>
</tr>
<tr>
<td><strong>Ignition Module</strong></td>
<td>See page 9</td>
<td></td>
</tr>
<tr>
<td><strong>Transformer</strong></td>
<td>120VAC primary, 24VAC secondary, 40VA.</td>
<td></td>
</tr>
<tr>
<td><strong>Hot Surface Igniter</strong></td>
<td>120VAC, 30-120 ohms @ room temperature.</td>
<td></td>
</tr>
<tr>
<td><strong>Flame Sensor Output</strong></td>
<td>Minimum 1 micro amp, Typical range 4 to 7 micro amps.</td>
<td></td>
</tr>
<tr>
<td><strong>Gas Valve</strong></td>
<td>Negative regulation, 24 VAC, ½” PSI max., 4.5” W.C. Minimum running inlet.</td>
<td></td>
</tr>
<tr>
<td><strong>Vent Safety Switch</strong></td>
<td>Normally closed, opens @ 350°F, manual reset.</td>
<td></td>
</tr>
<tr>
<td><strong>Blocked Vent Pressure Switch</strong></td>
<td>24VAC, normally closed, opens when pressure increases to +2.70 W.C.</td>
<td></td>
</tr>
<tr>
<td><strong>Blower</strong></td>
<td>120VAC, 60Hz, .6-1 amps, 6400 RPM.</td>
<td></td>
</tr>
<tr>
<td><strong>Combustion Levels</strong></td>
<td>CO2: 10-11%, CO: less then 0.04 percent (400 PPM) air free</td>
<td></td>
</tr>
</tbody>
</table>
Specifications

Vent Tables

| Balanced Direct Vent Systems
<table>
<thead>
<tr>
<th>PVC, CPVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of intake piping and exhaust piping added together must not exceed “Maximum Combined Length”</td>
</tr>
<tr>
<td>Shown below</td>
</tr>
<tr>
<td>Model Number</td>
</tr>
<tr>
<td>UHE60T125, UHE100T150</td>
</tr>
<tr>
<td>UHE60T150, UHE100T199</td>
</tr>
<tr>
<td>UHE60T199</td>
</tr>
<tr>
<td>UHE100T250</td>
</tr>
<tr>
<td>UHE100T300</td>
</tr>
<tr>
<td>UHE100T399</td>
</tr>
</tbody>
</table>

| Power Vented Systems
<table>
<thead>
<tr>
<th>PVC, CPVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of exhaust piping must not exceed “Maximum Vent Length”</td>
</tr>
<tr>
<td>Shown below</td>
</tr>
<tr>
<td>Model Number</td>
</tr>
<tr>
<td>UHE60T125, UHE100T150</td>
</tr>
<tr>
<td>UHE60T150, UHE100T199</td>
</tr>
<tr>
<td>UHE60T199</td>
</tr>
<tr>
<td>UHE100T250</td>
</tr>
<tr>
<td>UHE100T300</td>
</tr>
<tr>
<td>UHE100T399</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unbalanced Direct Vent Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air intake CAN NOT exceed exhaust by more than 30 feet</td>
</tr>
</tbody>
</table>

Notes:
1) Multiply the total number of 90° elbows (intake and exhaust) by 5 feet. Do not include the termination fittings or 3" condensate elbow.
2) Multiply the total number of 45° elbows (intake and exhaust) by 2 ½ feet.
3) Add this to the total length of straight pipe - intake and exhaust.
4) The sum total of all elbows and straight pipe - intake and exhaust must not exceed maximum lengths from tables above.

Example: UHE100T199
A 3" Balanced Direct vent system has 30 feet of straight exhaust pipe and 30 feet of straight intake pipe. It has 3- 90° elbows in the exhaust and 3- 90° elbows in the intake. It has 1- 45° elbow in the exhaust and 1- 45° elbow in the intake.

Therefore:
6- 90° elbows x 5 feet = 30 feet.
2- 45° elbows x 2½ feet = 5 feet.
60 feet of straight pipe + 30 feet + 5 feet = 95 feet.
System is within “Maximum Combined Length” from table above.
1. Thermostat calls for heat.
   Prior to energizing blower, ignition module checks to make sure the vent temperature switch is in the normally closed position. If the vent temperature switch is open, the control waits indefinitely for the temperature switch to close.

2. Blower energizes, pressure switch contacts are normally closed. If the pressure switch contacts are open, blower operates for up to 5 minutes waiting for contacts to close, then blower stops and flashes red PURGE LED indicating lock-out condition.

3. Blower pre-purge period (5 seconds) indicated by PURGE LED on the module.

4. Igniter warm up (18 seconds), indicated by the IGNITER LED on the module. Note: The blocked vent pressure switch must be in the normally closed position for the ignition cycle to start.

5. Trial for Ignition (4 seconds, 3 trials).
   a) Flame establishing period (2.5 seconds), gas valve and igniter on, indicated by the IGNITER and VALVE LED on the module.
   b) Burner on, flame proving period (1.5 seconds, looking for minimum of 1 micro amps), indicated by the FLAME & VALVE LED on the module.

6. Steady state operation.
   Ignition module monitors:
   - Thermostat circuit.
     - When thermostat opens, gas valve is shut down and post purge begins.
   - Safety circuit.
     - If vent temperature switch opens, gas valve is shut down, system will post purge and wait for switch to close before attempting re-ignition.
     - If the blocked vent pressure switch opens, indicating a blocked exhaust vent condition, the gas valve is shut down, blower shuts down for 30 seconds and is re-energized and system attempts re-ignition if the pressure switch is closed. Blower operates for 5 minutes to wait for pressure switch to close, then shuts off with purge light flashing (lock-out). Will restart in 1 hour to attempt to close the switch and restart ignition sequence.
   - Flame sensor circuit.
     - If flame is lost, gas valve is shut down, system will post purge and system attempts re-ignition.

7. Thermostat satisfied.

8. Burner off.

Lockout Conditions

Lockout conditions:
The system will go into lock out mode for the following reasons:
Blocked vent pressure switch contacts open:
Check for obstruction in exhaust pipe and vent terminal.
Check for blocked condensate trap or drain line. In cold climates, make sure drain is not frozen.
No ignition after 3 attempts:
   a) Check inlet and outlet gas pressures (pressure taps located on top of gas valve).
   b) Igniter resistance too high (lower resistance preferred < 150 ohms).
   c) Misadjusted venturi screw (should be 6.5 turns out from bottom).
   d) Flame sense microamp not present (1.0 microamps minimum, should be 5 microamps or more). If burner lit, check flame rod for deposits.
   e) Check burner tube condition. Refer to section UHE-III for Burner Tube Inspection and Replacement.

Ignition Module Specifications

Control Functions:
- Ignition & heating functions in response to thermostat.
- Hot surface ignition using a microprocessor to control timing, flame sensing using flame rectification & ignition retries.
- Monitoring of system pressure switches and limit switches.
- Control of gas valve, inducer motor, and hot surface igniter element based on thermostat demand and status of safety inputs.
- Diagnostic indicators to provide information on power to control and control status.
- Non-interchangeable polarized plug-in connectors for all interconnections.

Control Inputs:
- Thermostat call for heat.
- Blocked vent pressure switch (normally closed)
- Flame sensing.
- Low voltage supply.
- Line voltage supply.

Control Outputs:
- Inducer motor
- Hot surface igniter
- Gas valve
- Status indicator LEDs
  Power - Green
  Purge - Red
  Igniter - Red
  Valve - Red
  Flame - Red
Troubleshooting
System Observation

- Is front panel power switch light on, indicating power?
  - Y: Position front panel power switch to "ON" position.
  - N: Is there 120VAC across switch? (see photo at right)
    - Y: Light burned out, replace switch.
    - N: Is there 120VAC across terminal block? (see photo at right)
      - Y: Repair/replace wire harness to switch.
      - N: Determine power source problem and correct.

- Is ignition module power light on?
  - Y: Refer to ignition module illustration, is there 120VAC going to module at locations P7(1) and P7(3)?
    - Y: Replace ignition module. (see page 24)
    - N: Refer to ignition module illustration, is there 120VAC between P1(1) and P1(3)?
      - Y: Refer to ignition module illustration, is there 24VAC going to module at locations P2(1) and P2(2)?
        - Y: Replace transformer. (see page 35)
        - N: N
  - N: Is there 120VAC across terminal block? (see photo at right)
    - Y: Repair/replace wire harness to switch.
    - N: Determine power source problem and correct.

- Is ignition module power and flame light flashing?
  - Y: Supply voltage polarity is incorrect.
    - Y: Reestablish power and Adjust thermostat to call for heat, tank must be cold.
    - N: Reset heater by interrupting power.
  - N: Did heater complete heating cycle and did blower post purge?
    - Y: System is OK.
    - N: See next page

**WARNING**
120 volt potential exposure. Use caution making voltage checks to avoid personal injury.
Determine failure mode by observing flashing LED status on ignition module. LED status and probable cause shown below.

* Denotes conditions that may require the water heater to be isolated from the vent system to determine root cause.

**LED STATUS**

Only power light is on and water heater will not function.

**Probable Cause**

Exhaust pressure switch. (see page 27)

**Probable Cause**

Thermostat circuit. (see page 12)

**Probable Cause**

Vent safety switch. (see page 36)

**LED STATUS**

Purge light flashing.

**Probable Cause**

Exhaust pressure switch. (see page 27)

**Probable Cause**

Blower. (see page 25)

**LED STATUS**

Valve light flashing.

**Probable Cause**

Hot surface igniter. (see page 30)

**Probable Cause**

Combustion system. (see page 16)

**Probable Cause**

Flame sensor. (see page 32)

**LED STATUS**

Power & flame light flashing.

**Probable Cause**

Supply voltage polarity.
SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

**IMPORTANT NOTE:** This procedure assumes a cool tank

**WARNING**
120 volt potential exposure. Use caution making voltage checks to avoid personal injury.

---

1. Rotate temperature dial to highest setting.
2. Refer to ignition module illustration, Is there 24VAC between P3(7) and P3(8)?
   - **Y** OK, thermostat is calling for heat.
   - **N** Thermostat not calling
3. Turn off power to heater.
   Disconnect YELLOW and RED wires from the thermostat board at location N.O. and COM shown in photo at right. Use a jumper to connect these two wires together as shown in photo at right.
   - **Y** Restore power to heater. Did heater cycle on?
   - **N** Check thermostat sensor for proper resistance (OHMS) across blue wires. (See page 13) Are readings correct? (see photo at right)
4. Check sensor harness continuity. Is there continuity?
   - **Y** Replace harness.
   - **N** Replace thermostat sensor. (see page 12)
5. Replace temperature dial (potentiometer). (see page 16)
6. Check temperature dial harness continuity. Is there continuity?
   - **Y** Replace thermostat circuit board. (see page 15)
   - **N** Replace harness.
APPENDIX - A
Sensor Resistance at Various Temperatures

Example: If temperature of sensor is 84°F, then the resistance through the sensor would be 8449 (see shaded area).

NOTE: Sensor resistance increases as the temperature falls.

APPENDIX - B
Temperature Dial Resistance

Proper Readings Should Be 5400-6600 Ohms at Minimum Setting
And 0-50 Ohms at Maximum.

Be Careful When Making Voltage Measurements or Jumping Terminals
Not to Damage or Deform Connectors or Connector Pins.
Thermostat circuit. (continued from page 12)

Refer to ignition module illustration, is there 120VAC between P1(1) and P1(3)?

Y

Check AC source to determine why there is no power.

N

Replace ignition module. (see page 34)

Refer to ignition module illustration, is there 120VAC between P7(3) and P7(1)?

N

Replace transformer. (see page 35)

Y

Refer to ignition module illustration, is there 22 - 27VAC between P2(1) and P2(2)?

Y

Refer to ignition module illustration, is there 24VAC between P3(9) and P2(1).

N

Replace ignition module. (see page 34)

Y

Check continuity through ECO, red wires of thermostat sensor. Check at temperature less than 160°F Is there continuity? (see photo at right)

N

Check wire harness continuity. Replace thermostat sensor or wire harness as necessary. (see page 17)

N

Replace thermostat circuit board. (see page 15)

WARNING

120 volt potential exposure. Use caution making voltage checks to avoid personal injury.

IGNITION MODULE

Red Wires (Temperature Sensor)
Thermostat Board Replacement Procedure

Step 1. Position main power switch to “OFF”

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Un-latch and remove top surround cover from top of heater.

Step 4. Locate thermostat board on control panel. (see photo at right)

Step 5. Carefully disconnect all wires from thermostat board.

Note: it may be necessary to identify wires for proper re-connection.

Step 6. Remove the two screws (Phillips head screw driver) that secure thermostat board to control panel.

Step 7. Install new thermostat board to control panel using screws from step 6.

Step 8. Carefully reconnect wiring per the wire diagram below. Reconfirm wire connections are correct prior to putting heater back in service.

Step 9. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 10. Replace surround cover on top of heater.

WARNING

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

WIRING DIAGRAM
Thermostat Potentiometer Replacement Procedure

Step 1. Position main power switch to “OFF”

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Un-latch and remove top surround cover from top of heater.

Step 4. Loosen set screw of adjusting knob (small blade screw driver) and remove adjusting knob from potentiometer. (see photos at right)

Step 5. Remove retaining nut (½” wrench) and washer from potentiometer. (see photos at right)

Step 6. From inside of surround area, remove potentiometer with gasket from side of surround. Notice how indexing tab on potentiometer assembles into locating hole of surround. (see photos below)

Step 7. Disconnect potentiometer wire leads. (see photo at right)

Step 8. Install new potentiometer with gasket into side of surround. Be sure to assemble with indexing tab inserted into locating hole on side of surround (see photos above).

Step 9. Reconnect wires to potentiometer. Note: Wire leads are interchangeable with either wire.

Step 10. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 11. Replace surround cover on top of heater.

WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Thermostat Sensor (Thermistor) Replacement Procedure

Step 1. Position main power switch to “OFF”

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Drain water heater down to a point below the top of the tank.

Step 4. Un-latch and remove top surround cover from top of heater.

Step 5. Fold back insulation just in front of burner to expose temperature sensor (see photo below).

Step 6. Disconnect temperature sensor from harness (see photos at right).

Step 7. Remove temperature sensor (1-1/16" hex, deep well socket) from heater.

Note: Using a deep well socket will allow room inside socket for sensor connector and wires.

Step 8. Apply thread sealing tape or applicable thread lubricant to threads of new sensor. Install new thermostat sensor and Connect to wire harness from step 6.

Step 9. Fold insulation back into place. Be sure there are no wires in contact with burner.

Step 10. Restore 120 volt power supply and water supply to water heater, check and repair any leaks found. Confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 11. Replace surround cover on top of heater.
Observe burner operation through the sight glass located on the combustion insert mounting flange. Normal burner operation should ignite smoothly, without evidence of coughing or huffing upon ignition. The burner flame should be a blue flame near the burner surface in a uniform flame pattern. Occasional yellow or white streaks are normal.

**Note:** On higher input models using metal fiber mesh burner (serial number “CK” and later) a red glow from the burner surface is normal.

---

**SERVICE PROCEDURE UHE-II**

Combustion System Testing and Replacement

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With manometer, check inlet gas pressure. Is it stable between 7” & 14” W.C. static? (heater not running) (see illustrations at right)

- **N**
  - Does inlet gas pressure drop more than 2” W.C. during burner ignition?
    - **Y**
      - **WARNING**
        - Removing screw from inlet gas pressure tap will immediately allow gas to flow from pressure tap.
      - Replace ignition module. (see page 34)
    - **N**
      - Volt meter set to OHM setting
      - Meter probe
      - Hot surface igniter
      - CHECK IGNITER RESISTANCE
        - Replace hot surface igniter. (see page 30)
        - Proceed to next page

- **Y**
  - Is gas supply pressure regulator adjustable to maintain proper and stable setting?
    - **N**
      - Adjust gas supply regulator
    - **Y**
      - Reconfigure gas supply piping
      - Inadequately sized regulator.

---

**WARNING**

120 volt potential exposure. Use caution making voltage checks to avoid personal injury.

---

Verify Minimum Gas Supply Piping Requirements of:
Minimum 1” NPT for UHE100T399, all others use ¾” NPT. (Schedule 40 black Iron Pipe recommended).

---

Refer to ignition module illustration below, is there 120VAC across terminals P6(1) and P6(2)? (Note: Igniter LED must be lit during this check).

---

- **Y**
  - Do you see the igniter glowing through burner site glass during the warm up period?
    - **N**
      - Volt meter set to OHM setting
      - Meter probe
      - Hot surface igniter
      - CHECK IGNITER RESISTANCE
        - Replace hot surface igniter. (see page 30)
    - **Y**
      - Proceed to next page

---

With manometer, check inlet gas pressure. Is it stable between 7” & 14” W.C. static? (heater not running) (see illustrations at right)

- **N**
  - Is gas supply pressure regulator adjustable to maintain proper and stable setting?
    - **Y**
      - Adjust gas supply regulator
    - **N**
      - Reconfigure gas supply piping
      - Inadequately sized regulator.

---

Note: On higher input models using metal fiber mesh burner (serial number “CK” and later) a red glow from the burner surface is normal.
Observe burner operation through the sight glass located on the combustion insert mounting flange. Normal burner operation should ignite smoothly, without evidence of coughing or huffing upon ignition. The burner flame should be a blue flame near the burner surface in a uniform flame pattern. Occasional yellow or white streaks are normal.

**WARNING**
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

**SERVICE PROCEDURE UHE-II**
Combustion System Testing and Replacement

Refer to ignition module illustration below, is there 24VAC between P3(2) and P3(5) (blue and brown wires) during the flame establishing period? (Note: Valve LED must be lit during this check)

- **Y** Replace ignition module. (see page 34)
- **N** Replace Rectifier harness and/or gas valve. (see page 24)

Can you hear or feel gas valve energize?

- **N** Replace Rectifier harness and/or gas valve. (see page 24)
- **Y** Install Rectifier harness and/or gas valve (see page 22)

Turn VENTURI set screw clockwise until its bottomed out. Turn screw counter-clockwise 6-½ turns from bottom (see illustration below). Note: UHE100T399 models do not have a venturi screw. The gas regulator setting should be 1 - 1 ¼ turns out from bottom.

- **Y** Check for obstruction at inlet of gas valve. Is inlet free of obstruction?
- **N** Replace flame sensor (see page 32)

Does burner light smoothly, without evidence of coughing or huffing?

- **Y** Call for technical support
- **N** Check flame sensor, Is there 1 to 5 micro amps (min.) during 1.5 second flame proving period? (see page 32)

Does flame LED on the module light and stay lit?

- **Y** System OK
- **N** Replace flame sensor (see page 32)

**IGNITION MODULE**

Check flame sensor, Is there 1 to 5 micro amps (min.) during 1.5 second flame proving period? (see page 32)

Does burner operate normally until thermostat is satisfied?

- **Y** System OK
- **N** Replace flame sensor (see page 32)

**WARNING**
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

**IGNITION MODULE**

Continued from previous page
Combustion System Removal Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Turn off gas supply to water heater.

Step 4. Un-latch and remove surround cover from top of heater.

Step 5. From the gas valve, disconnect the gas connection, PVC venting, Silicone tubing and wire harness.

Step 6. Disconnect wire harnesses flame sensor and Blower. Disconnect wire harness from hot surface igniter.

Step 7. Remove the 5 bolts (½” socket) holding the burner mounting insert in place.

Step 8. Carefully remove combustion assembly with gasket from water heater.

Step 9. See next page for combustion system installation procedure.

⚠️ WARNING

Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

⚠️ WARNING

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

- Gas valve wire harness
- Gas connection
- PVC vent connection
- Burner mounting insert
- Burner tube
- Burner mounting insert gasket
- Burner mounting screw (Total of 5)
Combustion System Replacement Procedure

Step 1. Fully inspect burner mounting insert gasket for the following:
   a) Tears  d) Dirt or debris
   b) Missing material  e) Other imperfections that would inhibit proper seal
   c) Cracks

If gasket is NOT affected by any of the above, gasket replacement is not required.

Step 2. Install combustion assembly using new gasket or fully inspected gasket from step 1.
   Secure combustion assembly at the burner mounting insert using screws from step 6 on previous page. Tighten screws evenly.

Step 3. Reconnect wire harnesses to hot surface igniter, flame sensor, blower and gas valve.

Step 4. Reconnect PVC venting, gas supply and silicone tubing to gas valve. Turn on gas supply to heater and check for gas leaks, repair any gas leaks found.

Step 5. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 6. Replace surround cover on top of water heater.
SERVICE PROCEDURE UHE-III
Burner Tube Inspection and Replacement

WARNING
Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

Burner Tube Removal Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Turn off gas supply to water heater.

Step 4. Un-latch & remove surround cover from top of heater.

Step 5. From the gas valve, disconnect the gas connection, PVC venting, wire harness and silicone tubing.

Step 6. Disconnect wire harness from blower assembly.

Step 7. Remove the two screws holding each the hot surface igniter and flame sensor in place (long reach magnetic Phillips screw driver). Carefully remove hot surface igniter and flame sensor from combustion assembly.

Step 8. Remove the 4 nuts (7/16” wrench) holding the burner transition in place. Lift the blower/gas valve transition assembly from burner mounting insert, remove gasket and set aside.

Step 9. Remove burner tube from burner mounting insert. See next page for burner tube inspection procedure.

WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Burner Tube Inspection

Step 1. Inspect burner tube as follows (BSI ceramic fiber mesh burner, water heaters prior to serial number “CK”):
   a) Visually inspect ceramic fiber mesh, mesh should be uniform in appearance without large gaps, tears or fraying. Mesh should have uniform pattern allowing for unrestricted gas flow.
   b) Gently squeeze burner tube, Burner tube should feel firm without any soft areas around the sides or at the bottom.
   c) Visually inspect inside burner tube, Burner tube should be intact with no areas of deterioration. Ports should be free of any debris.

   Inspect burner tube as follows (Acotech metal fiber mesh burner, water heaters with “CK” serial number or later).
   a) Outer fiber mesh should be uniform with no tears or deterioration.

Step 2. If burner tube is affected by any of the above, replacement is required. Refer to burner tube replacement procedure below.

Burner Tube Replacement Procedure

Note: New metal fiber mesh burner (Acotech) is the replacement burner for the BSI ceramic fiber sock burner. The length of burner will not be the same as the previous BSI burner. Provide the model and serial number for the correct replacement burner.

Step 1. Fully inspect burner flange gaskets, igniter and flame sensor gaskets for the following:
   a) Tears d) Dirt or debris
   b) Missing material e) Other imperfections that would inhibit proper seal
   c) Cracks

   If gaskets are NOT affected by any of the above, gasket replacement is not required.

Step 2. Install burner tube with gaskets into burner mounting insert. Be sure gasket surfaces are free of debris.

Step 3. Reconnect the blower/gas valve/transition assembly to burner mounting insert. Secure using nuts from step 8 on previous page.

Step 4. Carefully reinstall flame sensor with gasket and hot surface igniter with gasket and secure with screws from step 7 on previous page. Reconnect wire harnesses to sensor and igniter.

Step 5. Reconnect wire harnesses to blower motor and to gas valve.

Step 6. Reconnect PVC venting, gas supply and silicone tubing to gas valve. Turn on gas to heater and check for gas leaks, repair any gas leaks found.

Step 7. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 8. Replace surround cover on top of water heater.
Gas Valve Replacement Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. Turn off gas supply to water heater.

Step 4. Un-latch & remove surround cover from top of heater.

Step 5. From the gas valve, disconnect the gas connection, PVC venting, wire harness and silicone tubing.

Step 6. Remove the 2 gas valve mounting screws (Torx bit) located at the 11:00 O-clock & 5:00 O-clock position on the venturi mounting flange and remove gas valve from water heater.

Step 7. Remove any residual gasket material from blower and venturi mounting flange.


Step 9. Reconnect PVC venting, gas supply, silicone tubing & wire harness to gas valve. Turn on gas supply to heater and check for gas leaks, repair any gas leaks found.

Step 10. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 11. Replace surround cover on top of water heater.

WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Service Procedure UHE-V
Blower Testing and Replacement

Does blower energize?

Y

Refer to ignition module/ control board illustration. Is there 120VAC between P5(1) and P5(3)?

N

Replace ignition module/ control board.

N

Determine power source problem and correct

Is there 120VAC across the white and black wires at the terminal block?

N

Check amp draw through BLACK wire lead of blower motor. Is there .6 to 3.0 amps?

Y

Is Blower wheel secured to blower motor shaft?

N

Call technical support.

N

Replace blower. (see "Blower Replacement Procedure")

Y

Refer to ignition module/ control board illustration. Is there 120VAC between P5(1) and P5(3)?

N

Hot Surface Ignition Models ONLY: Refer to ignition module, is there 24 VAC between P3(7) and ground?

Y

Thermostat not calling for heat. (see page 12)

N

Correct safety circuit problem per safety circuit trace (see page 27).

Y

N

Hot Surface Ignition Models: Are safety circuits in normal position?

Y

Replace ignition module/ control board.

N

Checking for 120VAC (Black & White Wires)

Is there 120VAC across the white and black wires at the terminal block? (see photo at right)

N

Repair/replace wire harness.

Y

Replace blower. (see page 25)

Call technical support.

Y

120VAC check at Terminal Block

Black wire leading to blower motor looped through amprobe.

120VAC check at Terminal Block (Black & White Wires)
**Blower Replacement Procedure**

**Step 1.** Position main power switch to “OFF”.

**Step 2.** Disconnect (unplug) water heater from 120 volt power source.

**Step 3.** Turn off gas supply to water heater.

**Step 4.** Un-latch & remove surround cover from top of heater.

**Step 5.** Disconnect wire harness from blower.

**Step 6.** Disconnect intake vent and gas supply from gas valve assembly.

**Step 7.** Remove the 2 gas valve mounting screws (Torx bit) located at the 11:00 O-clock & 5:00 O-clock position on the venturi mounting flange.

**Step 8.** Remove the 4 blower flange mounting screws (5/32 Allen wrench) and remove blower from transition flange.

**Step 9.** Remove any residual gasket material from venturi mounting flange and transition flange.

**Step 10.** Install new blower with new gasket provided. Secure blower in place using screws from step 8.

**Step 11.** Reconnect gas valve assembly to blower with new gasket provided. Secure gas valve in place using screws from step 7.

**Step 12.** Reconnect intake vent and gas line to gas valve assembly and check for gas leaks repair any leaks found.

**Step 13.** Reconnect wire harness to blower assembly, restore 120 volt power supply & Gas supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instructions located in the installation and operating instruction manual.

**Step 14.** Replace surround cover on top of water heater.

---

**WARNING**

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Sequence of operation:
The blocked vent pressure switch monitors the pressure in the exhaust tube. The switch contacts are normally closed and will not open unless there is a blockage in the exhaust venting or terminal (snow, ice, debris). If the blocked vent pressure switch contacts open after the thermostat initiates the blower, the blower will remain on for to 5 minutes waiting for the contacts to close. If the contacts remain open, the blower will stop and the PURGE LED will flash for hot surface ignition models.

Note: HOT SURFACE IGNITION MODELS ONLY - The blocked vent pressure switch must be used with the revised ignition control, identified with a yellow label.

**LED Status**
Only power LED is on, or Purge LED flashing.

**Safety Circuit Trace**

1. **Does blower energize?**
   - **Y**
   - Call technical support.
   - **N**
   - **Does heater function?**
     - **Y**
     - **Verify proper switch operation.** (see page 36)
     - **N**
     - **Is there continuity through GREY wire leads of heater side safety circuit harness?** (see photo below)
     - **N**
     - **Y**
   - **Check PURGE LED status.**
     - **On within 5 minutes?**
       - **Y**
       - **Pressure switch is OK.**
       - **N**
       - **Flashing after 5 minutes? Error code 29 again?**
         - **N**
         - **Call for technical support.**
         - **Y**
         - **Check blower for proper operation.** (see page 25)
           - **Is blower OK?**
             - **N**
             - **Correct blower problem.** (see page 25)
             - **Y**
             - Refer to "Check Collector Pressure." (see next page)
   - **N**
   - **Is there continuity through RED wire leads of heater side safety circuit harness?** (see photo below)
     - **N**
     - **Y**
     - **Check PURGE LED status on ignition module. Flashing after 45 seconds?**
       - **Y**
       - **Replace exhaust pressure switch.** (see page 29)
       - **N**
     - **Replace vent safety switch.** (see page 37)
   - **Y**
   - **Safety Circuit OK, (see page 36)**

**WARNING**
120 volt potential exposure. Use caution making voltage checks to avoid personal injury.

**WARNING**
Make sure exhaust collector compartment is not overheating (350°F) before resetting vent safety switch. If there is evidence the collector compartment is overheating, CALL TECHNICAL SUPPORT.
Check Exhaust Tube Pressure

With monometer, take a reading at the exhaust tube pressure tap location. Is value negative (-) or slightly positive (see illustration below).

Y

Is exhaust venting system blocked or obstructed? Also check condensate elbow and drain.

N

Y

Clear obstruction. Determine cause and correct.

N

Is vent system total length compliant with vent tables in the instruction manual?

Y

Replace blocked vent switch. (see page 29)

N

Reconfigure vent system to be compliant with vent tables (see "Specifications").

Y

With ohmmeter check pressure switch for continuity. Contacts should be closed.

N

Pressure switch O.K.

Y

Is pressure in exhaust tube near 2.7" w.c. or more? If so, correct blockage (above). If exhaust pressure is low (0.40" or less), replace pressure switch.

Exhaust Tube pressure tap location

Exhaust tube at bottom of heater
Exhaust Pressure Switch Replacement Procedure

Step 1. Position main power switch to “OFF” position.

Step 2. Loosen adhesive backed rubber escutcheon from service panel access cover and slide escutcheon back along exhaust pipe to allow for removal of cover.

Step 3. Remove screws from service panel access cover (¼” nut driver) and remove cover from heater. (see photos at right)

Step 4. Disconnect silicone tubing and wire leads from pressure switch. (see photos at right)

Step 5. Remove pressure switch mounting screws (5/16” wrench) and remove pressure switch.

Step 6. Assemble new pressure switch to heater using screws from step 5.

Step 7. Reconnect wire leads. Note: wire leads are interchangeable with either terminal.

Step 8. Reconnect silicone tubing to pressure switch as follows:

   a) Exhaust pipe tubing connects to single tap located on switch

Step 9. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instructions located in the installation and operating instruction manual.

Step 10. Reinstall service panel access cover and rubber escutcheon.
Service Procedure UHE-VII
Hot Surface Igniter Testing and Replacement

Hot surface Igniter Testing Procedure

- Is igniter resistance less than 150 Ohms (cold)? (see "check igniter resistance" below)
  - Y: Refer to ignition module illustration below, is there 120VAC across terminals P6(1) and P6(2)? (Check during igniter warm up period, indicated by the igniter LED glowing on the ignition module).
  - N: Replace hot surface igniter (see page 30)

- Y: Check harness connection from igniter to ignition module.
  - N: Replace ignition module. (see page 34)

**WARNING**
120 volt potential exposure. Use caution making voltage checks to avoid personal injury. Igniter may be too hot to handle, take necessary precautions.

Volt meter set to OHM setting

Meter probe
Hot surface igniter

CHECK IGNITER RESISTANCE

IGNITION MODULE
Hot surface Igniter Replacement Procedure

Step 1. Position main power switch to “OFF”
Step 2. Disconnect (unplug) water heater from 120 volt power source.
Step 3. Un-latch & remove surround cover from top of heater.
Step 4. Fold back insulation in front of combustion assembly to expose hot surface igniter. (see photo at right)
Step 5. Disconnect igniter wire leads from ignition module.
Step 6. Remove the 2 igniter mounting screws (magnetic tip, long reach Phillips screw driver) and remove igniter and gasket from transition base flange.
Step 7. Remove any residual gasket material from transition base flange.
Step 8. Install new igniter with new gasket provided using screws from step 5. Arrange igniter flange with off-center hole towards front of heater.
Step 9. Reconnect igniter wire harness.
Step 10. Fold insulation back into place. Be sure no wires are in contact with burner flange.
Step 11. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instructions located in the installation and operating instruction manual.
Step 12. Replace surround cover on top of water heater.

**WARNING**

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

**Note:**
New replacement igniter will not have a shield over element. Handle carefully to prevent breakage.

**Note:**
Do not handle igniter element or allow foreign material to come in contact with element.
Flame Sensor Testing Procedure

Refer to illustration below, is there a minimum of 1 micro amp during 1.5 second flame proving period?

Y  Refer to ignition module/control board illustration. (24 volts should maintain beyond the 1.5 second flame proving period.) Is there 24 volts AC at locations P3(2) & P3(5)?

Y  Flame sensing circuit OK

N  With flame sensor Disconnected from ignition module, check continuity to ground. Is there continuity to ground?

Y  Replace flame sensor with gasket and/or wire lead. (see page 33)

N  Call for technical support

N  Remove flame sensor from water heater. Check continuity from tip of flame sensor to end of wire lead. Is there continuity?

Y  Is flame sensor free of oxidation?

Y  Clean or replace flame sensor with emery cloth. (see page 33)

N  Replace flame sensor. (see page 33)

N  Is ceramic of flame sensor cracked?

Y  Replace flame sensor. (see page 33)

N  Is ceramic of flame sensor cracked?

WARNING
120 volt potential exposure. Use caution making voltage checks to avoid personal injury. Flame sensor may be too hot to handle, take necessary precautions.

Volt meter set to Micro amps setting (µA)

Meter probe

Flame sensor terminal

Meter probe

Flame sensor terminal on ignition module.
Flame Sensor Replacement Procedure

Step 1. Position main power switch to “OFF”
Step 2. Disconnect (unplug) water heater from 120 volt power source.
Step 3. Un-latch & remove surround cover from top of heater.

Step 4. Fold back insulation in front of combustion assembly to expose flame sensor. (see photo at right)
Step 5. Disconnect wire lead from flame sensor.

Step 6. Remove the 2 sensor mounting screws (magnetic tip, long reach Phillips screw driver) and remove flame sensor & gasket from transition base flange.
Step 7. Remove any residual gasket material from transition base flange.

Step 8. Install new flame sensor with new gasket provided using screws from step 6. Arrange flame sensor with hook towards burner.

Step 9. Reconnect flame sensor wire.
Step 10. Fold insulation back into place. Be sure no wires are in contact with burner flange.

Step 11. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instructions located in the installation and operating instruction manual.
Step 12. Replace surround cover on top of water heater.

WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Ignition Module Replacement Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Disconnect (Unplug) water heater from 120 Volt power source.

Step 3. Un-latch & remove surround cover from top of water heater.

Step 4. Locate Ignition module on control panel inside surround area. (see photo below)

Step 5. Carefully disconnect all wire harness connection to ignition module. Connection are non-interchangeable to insure proper reinstallation.

Step 6. Remove the 3 screws (Phillips screw driver) holding the ignition module in place and remove ignition module from control panel.

Step 7. Install new ignition module and secure in place with screws from step 6.

Step 8. Carefully reconnect all wire harness connection to ignition module. Connection are non-interchangeable to insure proper reinstallation.

Step 9. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 10. Replace surround cover on top of water heater.
Transformer Replacement Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Disconnect (Unplug) water heater from 120 Volt power source.

Step 3. Un-latch & remove surround cover from top of water heater.

Step 4. **For Hot Surface Ignition models**, refer to ignition module illustration below. Disconnect wire harness P1 labeled “PRIMARY” and P2 labeled “SECONDARY” from ignition module.

Step 5. Disconnect secondary leads (blue & yellow wire) from thermostat board. Note the blue wire is connected to 24 volt “HOT” terminal. (see photo below)

Step 6. Remove the 2 screws (short Phillips screw driver) holding the transformer in place and remove transformer from control panel. (see photo below)

Step 7. Install new transformer and secure in place with screws from step 6.

Step 8. Reconnect wire harness P1 & P2, connections are non-interchangeable to insure proper reconnection.

Step 9. Reconnect blue & yellow wire leading from the P2 connection on ignition module to thermostat board. Note the blue wire must connect to the 24 volt “HOT” terminal. (see photo at right)

Step 10. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 11. Replace surround cover on top of water heater.

**WARNING**

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.
Sequence of operation:
With the thermostat calling for heat, prior to energizing blower, the ignition module checks the vent safety switch for normal switch position of normally closed. If the vent safety switch contacts are open, (not in normal position), the ignition module waits indefinitely for contact to close, The vent safety switch must be manually reset to close the switch contacts.

**WARNING**
120 volt potential exposure. Use caution making voltage checks to avoid personal injury.

Make sure exhaust collector compartment is not overheating (350°F) before resetting vent safety switch. If there is evidence the collector compartment is overheating, CALL TECHNICAL SUPPORT.
Vent Safety Switch Replacement Procedure

Step 1. Position main power switch to “OFF”.

Step 2. Loosen adhesive backed rubber escutcheon from service panel access cover and slide escutcheon back along exhaust pipe to allow for removal of cover (see photos at right).

Step 3. Remove screws from service panel access cover (¼” nut driver) and remove cover from heater (see photos at right).

Step 4. Disconnect wire leads from vent safety switch (see photo at right).

Step 5. Remove the 2 switch mounting screws (Phillips screw driver) and nuts (5/16 wrench) and remove switch from heater.


Step 7. Reconnect wire leads. Note: wire leads are interchangeable with either switch terminal.

Step 8. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 9. Reinstall service panel access cover and rubber escutcheon.
Disassembly Procedure for Access to Anodes & Flue Baffles

**WARNING**

Heater components may be **HOT** when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

**WARNING**

120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

**Step 1.** Position main power switch to “OFF”.

**Step 2.** Disconnect (Unplug) water heater from 120 Volt power source.

**Step 3.** Un-latch & remove surround cover from top of heater.

**Step 4.** Disconnect wire harnesses to allow for removal of control panel. Note: Where ever possible, rather than disconnecting at the control panel, follow wire harness away from control panel and disconnect at control component location.

**Step 5.** Remove the three control panel mounting screws (¼” nut driver) and remove control panel from the water heater (see photos below).

**Step 6.** Completely remove insulation (two pieces) from top of heater to expose collector cover.

**Step 7.** Remove all collector cover screws (5/16” socket) and remove collector cover (see photos at right).

**Step 8.** Photo 44 shows heater with collector cover removed allowing access to anode rods and flue baffles.

a) for anode service, see page 39.
   b) for flue baffle service, see page 40.
   c) for powered anode service, see page 41.

**Note:** UHE100T399 models have only 1 anode rod under the 2nd pass collector cover.
Anode inspection and replacement

WARNING
Heater components and stored water may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

Step 1. Turn off water supply and drain water heater.

Step 2. Disassemble water heater per “Disassembly Procedure for Access to Anodes & Flue Baffles”.

Step 3. Locate and remove anode rods from heater (1-1/16 hex socket).

Step 4. Visually inspect anode rod. Anode rod should show signs of depletion, this is normal. If the depletion is ½ of the original diameter (approximately ¾” diameter), replacement is recommended. If any of the steel core of the anode is exposed, replacement is recommended.

Step 5. Upon completion of inspection or subsequent replacement, apply thread sealing tape or other thread compound to threads of anode and reinstall into heater. Restore water supply and check for and repair any leaks found.

Step 6. Reinstall collector cover per “Collector Cover Installation Procedure”.

Step 7. Reinstall collector insulation and control panel, reconnect control panel wire harnesses.

Step 8. Restore 120 volts to water heater and verify proper heater operation following the instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 9. Replace surround cover on top of water heater.
Flue baffle inspection and replacement

**WARNING**

Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

Step 1. Disassemble heater per “Disassembly Procedure for Access to Anodes & Flue Baffles”.

Step 2. Remove flue baffles from heater (pliers) (8 two inch baffles & 2 four inch baffles).

Step 3. Visually inspect flue baffles. Flue baffles should show signs of oxidation, this is normal. If the oxidation has deteriorated any portion of the flue baffle, replacement is recommended. If any restrictors are missing, replacement is recommended.

Step 4. Upon completion of inspection or subsequent replacement, reinstall flue baffles into heater.

Step 5. Reinstall collector cover per “Collector Cover Installation Procedure” see page 42.

Step 6. Reinstall collector insulation and control panel, reconnect control panel wire harnesses.

Step 7. Restore 120 volts to water heater and verify proper heater operation following the instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

Step 8. Replace surround cover on top of water heater.
The powered anode control module is located on the right vertical side of the control panel inside the surround panel. The control has a LED indicator light to show the status of operation. When the tank is filled with water and the power supply is on to the water heater, the light should have a steady green glow to indicate that protection current is flowing and operating normally. If the indicator light is not glowing, the power supply to the water heater or powered anode system is disconnected.

Step 1. Check the power supply or wire connections to the powered anode control.

Step 2. Indicator light diagnostic codes:
   a) If the control is flashing red, then there is a malfunction with the powered anode system. Make sure there are no bare spots in the wire insulation to the powered anode rods.

Step 3. Check all electrical connections. The powered anode rods are insulated from the water heater tank in the bushing.
   a) With an ohmeter, check continuity between the powered anode terminal and the bushing. There should not be continuity. If there is continuity, replace the powered anode assembly.
Collector Cover Installation Procedure

Step 1. Remove old silicone from top surface of collector flange and collector cover.

Step 2. Apply ¼" bead of Ultra Copper Silicone around entire collector flange surface. Allow caulk to "cure" for 10 minutes.

Step 3. Carefully reinstall collector cover, tighten screws evenly.

Step 4. Allow a minimum of 6 hours before putting heater back in service.
**Product Handling** - Carefully uncrate the heater. Move in place with a hand truck (Do not use the venting pipes for handles).

**Electrical Requirements** - Make sure there is 120 volts line voltage. Line voltage must be properly polarized. Adequate ground supplied to the heater.

**Venting Requirements** - All venting must stay within the required lengths and diameter (see table below). Proper support of the venting pipe is a MUST (every 5ft vertical and 3ft horizontal). Termination must be located to prevent re-circulation of flue gases. Medium to long sweep 90° elbows or straight exhaust terminal coupling recommended.

**Gas Requirements** - Gas piping sized adequately, ¾” or larger to heater or 1” or larger for UHE100T399 models. Install a properly sized regulator (if unknown, assure an adequate volume of gas is available). 7” W.C. is required when the unit is running. Gas pressure must stay below 14” W.C. static pressure. Pressure drops between static pressure and operating flow should be less than 3” W.C.

**Condensate Requirements** - Condensate line needs to slope to a drain at a minimum of ¼” per foot. Make sure the condensate line does not have the potential to freeze. If using more than one heater and using a common condensate line, make sure the condensate line is properly sized.

**Service/Mechanical Room** - Provide adequate space for servicing heater. Leave room to get to the top and bottom pressure switches as well as enough overhead room to remove the anode rods for servicing (18” min.).

---

### Vent tables

#### Balanced Direct Vent Systems
**PVC, CPVC**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>3”</th>
<th>4”</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHE60T125, UHE100T150</td>
<td>120’</td>
<td>170’</td>
</tr>
<tr>
<td>UHE60T150, UHE100T199</td>
<td>100’</td>
<td>150’</td>
</tr>
<tr>
<td>UHE60T199</td>
<td>80’</td>
<td>130’</td>
</tr>
<tr>
<td>UHE100T250</td>
<td>80’</td>
<td>130’</td>
</tr>
<tr>
<td>UHE100T300</td>
<td>60’</td>
<td>110’</td>
</tr>
<tr>
<td>UHE100T399</td>
<td>50’</td>
<td>100’</td>
</tr>
</tbody>
</table>

#### Power Vented Systems
**PVC, CPVC**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>3”</th>
<th>4”</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHE60T125, UHE100T150</td>
<td>120’</td>
<td>170’</td>
</tr>
<tr>
<td>UHE60T150, UHE100T199</td>
<td>100’</td>
<td>150’</td>
</tr>
<tr>
<td>UHE60T199</td>
<td>80’</td>
<td>130’</td>
</tr>
<tr>
<td>UHE100T250</td>
<td>80’</td>
<td>130’</td>
</tr>
<tr>
<td>UHE100T300</td>
<td>60’</td>
<td>110’</td>
</tr>
<tr>
<td>UHE100T399</td>
<td>50’</td>
<td>100’</td>
</tr>
</tbody>
</table>

#### Unbalanced Direct Vent Systems
Air intake CAN NOT exceed exhaust by more than 30 feet

Note: each 3” & 4” 90° Elbow is equivalent to 5 feet of straight pipe.
Note: each 3” & 4” 45° Elbow is equivalent to 2.5 feet of straight pipe.

---
**Date**

**Service Provider**  ____________________________  **Model Number**  ____________________________

**Phone Number**  ____________________________  **Serial Number**  ____________________________

**Venting (PVC, CPVC):**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent size 3” or 4”</td>
<td>________</td>
</tr>
<tr>
<td>Intake 90’s (qty)</td>
<td>________</td>
</tr>
<tr>
<td>Intake 45’s (qty)</td>
<td>________</td>
</tr>
<tr>
<td>Exhaust 90’s (qty)</td>
<td>________</td>
</tr>
<tr>
<td>Exhaust 45’s (qty)</td>
<td>________</td>
</tr>
</tbody>
</table>

Length of straight pipe:
- Intake: ________
- Exhaust: ________

**Gas Line:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Size &amp; Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size &amp; Material</td>
<td>________</td>
</tr>
<tr>
<td>Distance from meter to water heater</td>
<td>________</td>
</tr>
</tbody>
</table>

**Gas Pressure:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Size &amp; Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td>________</td>
</tr>
<tr>
<td>Running Inlet</td>
<td>________</td>
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</tbody>
</table>

**Venturi:**

Setting from Bottom in Turns: ________

**Electrical:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Size &amp; Material</th>
</tr>
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<tbody>
<tr>
<td>Line Voltage</td>
<td>________</td>
</tr>
<tr>
<td>Low Voltage</td>
<td>________</td>
</tr>
<tr>
<td>Polarity</td>
<td>________</td>
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</tbody>
</table>

Igniter Resistance: ________

Flame Sense Micro -Amps: ________

Spark Gap: ________

LED Flashing:  Y or N  Which One(s): ________

Error Codes on Control Display (Direct Spark Ignition System Only): ____________________________

**Condensate Line:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Size &amp; Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size &amp; Material</td>
<td>________</td>
</tr>
<tr>
<td>Length</td>
<td>________</td>
</tr>
</tbody>
</table>

Positive Inches W.C.: ________

Is trap provided:  Y or N

**Combustion:**  

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>________</td>
</tr>
<tr>
<td>CO</td>
<td>________</td>
</tr>
</tbody>
</table>

**Installation Site Name & Address:**

______________________________
______________________________
______________________________

**Installation Site Contact Name & Phone Number:**

______________________________
______________________________
______________________________
Customer must specify complete model number and serial number when ordering service parts.
Customer must specify complete model number and serial number when ordering service parts.
Customer must specify complete model number and serial number when ordering service parts.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C</td>
<td>Electronic Control Module</td>
</tr>
<tr>
<td>2C</td>
<td>Screw 8-32 x 1/2</td>
</tr>
<tr>
<td>3C</td>
<td>Control Mounting Panel</td>
</tr>
<tr>
<td>4C</td>
<td>Thermostat PC Board</td>
</tr>
<tr>
<td>5C</td>
<td>Transformer 120VAC x 24VAC x 40VA</td>
</tr>
<tr>
<td>6C</td>
<td>Terminal</td>
</tr>
<tr>
<td>7C</td>
<td>Terminal Strip</td>
</tr>
<tr>
<td>8C</td>
<td>Power Cord</td>
</tr>
<tr>
<td>9C</td>
<td>Control Wire Harness</td>
</tr>
<tr>
<td>10C</td>
<td>Thermostat Wire Harness</td>
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<tr>
<td>11C</td>
<td>Rectifier Harness (specify model)</td>
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<tr>
<td>12C</td>
<td>Blower Wire Harness (specify model)</td>
</tr>
<tr>
<td>13C</td>
<td>Power Switch Wire Harness</td>
</tr>
<tr>
<td>14C</td>
<td>Flame Sensor Wire Harness</td>
</tr>
<tr>
<td>15C</td>
<td>Powered Anode Control Harness (399 only)</td>
</tr>
<tr>
<td>16C</td>
<td>Powered Anode Harness (399 only)</td>
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<tr>
<td>17C</td>
<td>Powered Anode Control (399 only)</td>
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<tr>
<td>Abbreviation</td>
<td>Term</td>
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<tr>
<td>AC</td>
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<tr>
<td>BTU/H</td>
<td>British Thermal Units</td>
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<tr>
<td>CO</td>
<td>Carbon Monoxide</td>
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<tr>
<td>CO2</td>
<td>Carbon Dioxide</td>
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<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>DSI</td>
<td>Direct Spark Ignition</td>
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<tr>
<td>ECO</td>
<td>Energy Cut Off</td>
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<tr>
<td>GFI</td>
<td>Ground fault interrupt</td>
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<tr>
<td>GPM</td>
<td>Gallons per Minute</td>
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<tr>
<td>HSI</td>
<td>Hot Surface Igniter</td>
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<tr>
<td>Hz</td>
<td>Hertz</td>
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<tr>
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<td>Light Emitting Diode</td>
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<tr>
<td>NOx</td>
<td>Oxides of Nitrogen</td>
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<td>National Pipe Thread</td>
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<td>PSI</td>
<td>Pounds per Square Inch</td>
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<tr>
<td>RPM</td>
<td>Revolutions per Minute</td>
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<tr>
<td>VA</td>
<td>Volt Amps</td>
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<tr>
<td>VAC</td>
<td>Volts Alternating Current</td>
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<tr>
<td>W.C.</td>
<td>Inches of Water Column</td>
</tr>
<tr>
<td>°C</td>
<td>Degrees Centigrade</td>
</tr>
<tr>
<td>°F</td>
<td>Degrees Fahrenheit</td>
</tr>
<tr>
<td>µA</td>
<td>Micro Amp</td>
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</table>

NOTES

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