Service Manual for U.H.E.

Ultra High Efficiency Water Heaters

UHE60T125E*(NA,XA)(2)
UHE60T150E*(NA,XA)(2)
UHE60T199E*(NA,XA)(2)
UHE100T150E*(NA,XA)(2)
UHE100T199E*(NA,XA)(2)
UHE100T250E*(NA,XA)(2)
UHE100T300E*(NA,XA)(2)
UHE100T399E*(NA,XA)(2)
(*) Denotes Warranty Years

Troubleshooting Guide and Instructions for Service

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.

LAARS® Heating Systems Company
A subsidiary of BRADFORD WHITE® Corporation

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U.H.E. Series Commercial Gas Ultra High Efficiency Water Heaters

Table of Contents

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.

How to Use This Manual

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.

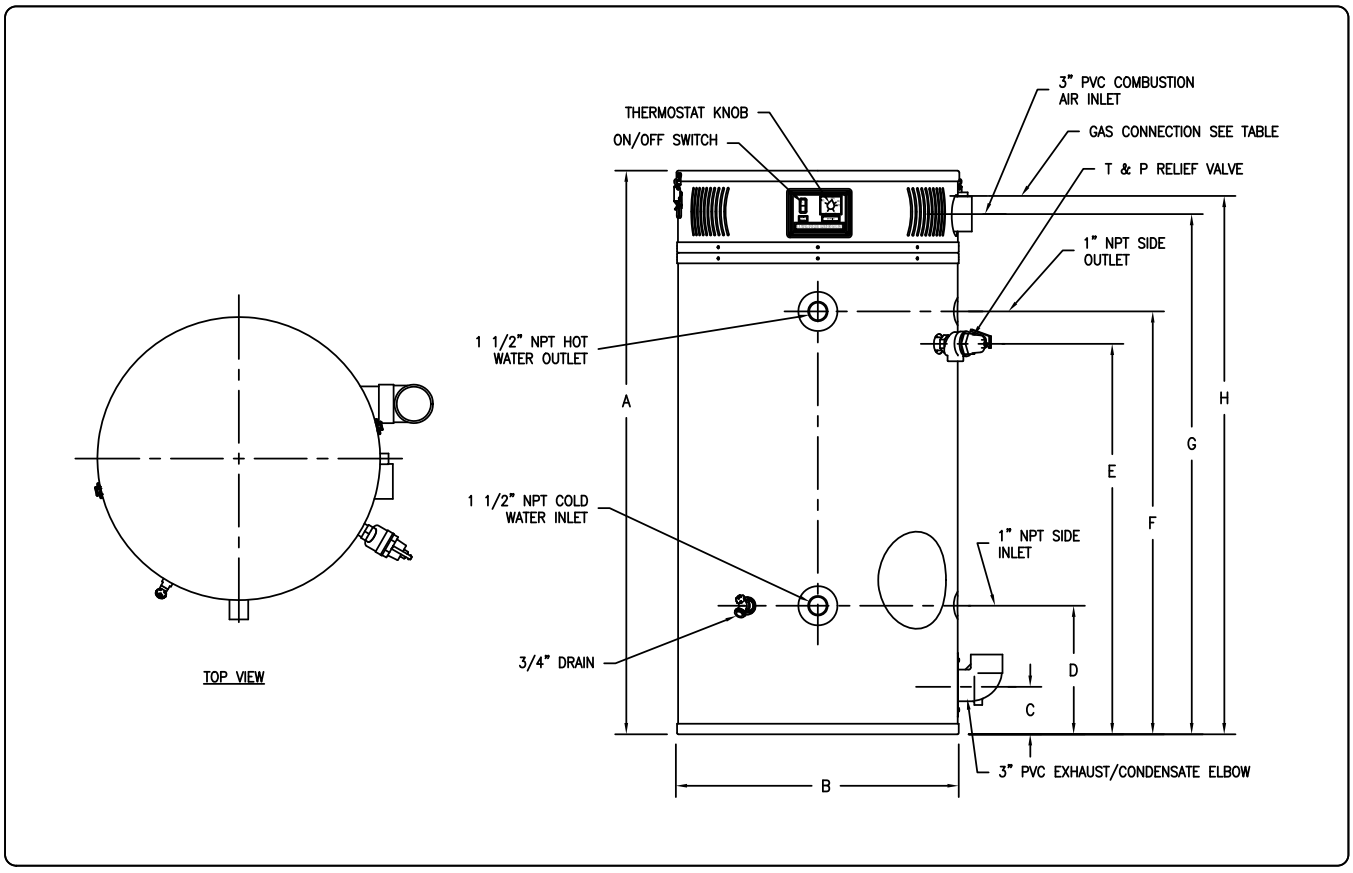
In some difficult to diagnose conditions, it may be necessary to isolate the heater from the vent system to determine root cause.

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



			Recovery GPH at Degree Rise					DIMENSIONS (INCHES)												
Model No	Input Rate BTU/h	1st Hr Del Gal @ 100°F Rise	40°F	100°F	140°F	Stg Cap U.S. Gal	Therm Eff %	A Ht	B Dia	C Flr to Vent Outlet	D Flr to Inlet Wtr Conn	E Flr to T&P Valve Conn	F Flr To Outlet Wtr Conn	G Flr. To Air Intake	H Flr to Gas Conn	Front Wtr Conn Dia	Space Heating Conn Dia	Gas Conn Dia (NPT)	T&P Valve Open (NPT)	Shpg Wt (lbs)
UHE60T125	125,000	187	363.6	145.5	103.9	60	96.0	57	28 ¼	5	13	40	42 ¼	52 ½	53 ½	1 ½	1	¾	¾	570
UHE60T150	150,000	211	422.7	169.1	120.8	60	93.0	57	28 ¼	5	13	40	42 ¼	52 ½	53 ½	1 ½	1	¾	¾	570
UHE60T199	199,999	265	557.6	223	158	60	92.0	57	28 ¼	5	13	40	42 ¼	52 ½	53 ½	1 ½	1	¾	¾	570
UHE100T150	150,000	250	450.5	180.2	129	100	99.1	77 5/8	28 ¼	5	13	60	62 ¼	73 1/8	74 ¾	1 ½	1	¾	¾	900
UHE100T199	199,999	309	597	238.8	171	100	98.5	77 5/8	28 ¼	5	13	60	62 ¼	73 1/8	74 ¾	1 ½	1	¾	¾	900
UHE100T250	250,000	364	734.8	293.9	210	100	97.0	77 5/8	28 ¼	5	13	60	62 ¼	73 1/8	74 ¾	1 ½	1	¾	¾	900
UHE100T300	300,000	405	836.4	334.5	239	100	92.0	77 5/8	28 ¼	5	13	60	62 ¼	73 1/8	74 ¾	1 ½	1	¾	¾	900
UHE100T399	399,999	521	1,127	451	322	100	93.0	77 5/8	28 ¼	5	13	60	62 ¼	73 1/8	73 ¼	1 ½	1	1	1	950

Specifications

Power supply	Dedicated 120 VAC, 60 Hz, 15A, GFI
Gas Supply	Minimum 1" NPT for UHE100T399, all others ¾" NPT (schedule 40 black iron pipe recommended)
Approved Gas Type	Natural or Propane. Unit must match gas type supplied.
Gas Pressure (Nat & L.P.)	14.0" W.C. maximum static, 4.5" W.C. minimum running (recommend 7.0" W.C. min running)
Venting System	Power vent, balanced direct vent or unbalanced direct vent. See vent tables on page 7
Approved Vent Materials	PVC, CPVC or ABS
Minimum Clearance for Servicing	18" from top, 24" from front, 4" sides and rear.
Maximum Water Supply Pressure	150 PSI
Thermostat Sensor	11,900 Ohms @ 70°F, ECO opens @ 201°F Max., ECO close @ 100°F Min.
Temperature Dial	Min. set point 5400-6600 ohms, Max set point 0-50 ohms.
Thermostat Board	Max temp 180°F, Min temp 91°F, 24VAC, 60Hz max.
Ignition Module	See page 9
Transformer	120VAC primary, 24VAC secondary, 40VA.
Hot Surface Igniter	120VAC, 30-120 ohms @ room temperature.
Flame Sensor Output	Minimum 1 micro amp, Typical range 4 to 7 micro amps.
Gas Valve	Negative regulation, 24 VAC, ½" PSI max., 4.5" W.C. Minimum running inlet.
Vent Safety Switch	Normally closed, opens @ 350°F, manual reset.
Blocked Vent Pressure Switch	24VAC, normally closed, opens when pressure increases to +2.70 W.C.
Blower	120VAC, 60Hz, .6-1 amps, 6400 RPM.
Combustion Levels	CO2: 10-11%, CO: less then 0.04 percent (400 PPM) air free

Specifications

Vent Tables

Balanced Direct Vent Systems PVC, CPVC		
Total length of intake piping and exhaust piping added together must not exceed "Maximum Combined Length" Shown below		
Maximum Combined Length (feet)		
Model Number	**3"**	**4"**
UHE60T125, UHE100T150	**120'**	**170'**
UHE60T150, UHE100T199	**100'**	**150'**
UHE60T199	**80'**	**130'**
UHE100T250	**80'**	**130'**
UHE100T300	**60'**	**110'**
UHE100T399	**50'**	**100'**
Unbalanced Direct Vent Systems Air intake CAN NOT exceed exhaust by more than 30 feet		

Power Vented Systems PVC, CPVC		
Total length of exhaust piping must not exceed "Maximum Vent Length" Shown below		
Maximum Vent Length (feet)		
Model Number	**3"**	**4"**
UHE60T125, UHE100T150	**120'**	**170'**
UHE60T150, UHE100T199	**100'**	**150'**
UHE60T199	**80'**	**130'**
UHE100T250	**80'**	**130'**
UHE100T300	**60'**	**110'**
UHE100T399	**50'**	**100'**

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.

Sequence of Operation

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.

9. Blower post purge (15 seconds).

Sequence of Operation

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 veturi 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:

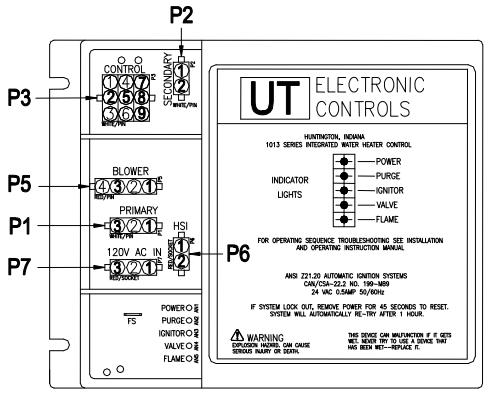
- Ignition & heating functions in response to thermostat.
- Hot surface ignition using a microprocessor to control timing, flame sensing using flame rectification & ignition retries.
- Monitoring of system pressure switches and limit switches.
- Control of gas valve, inducer motor, and hot surface igniter 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.

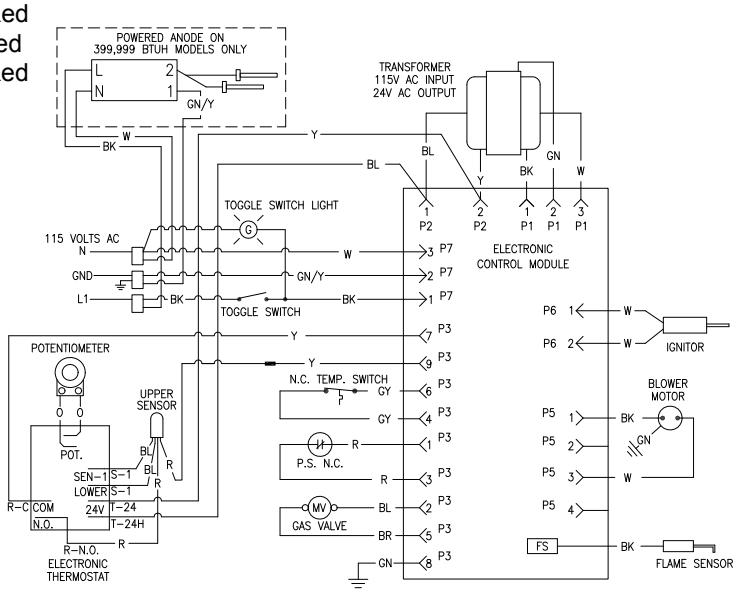
Control Outputs:

- Inducer motor
- Hot surface igniter
- Gas valve
- Status indicator LEDs
  - Power - Green
  - Purge - Red
  - Igniter - Red
  - Valve - Red
  - Flame - Red



IGNITION MODULE

WIRING DIAGRAM



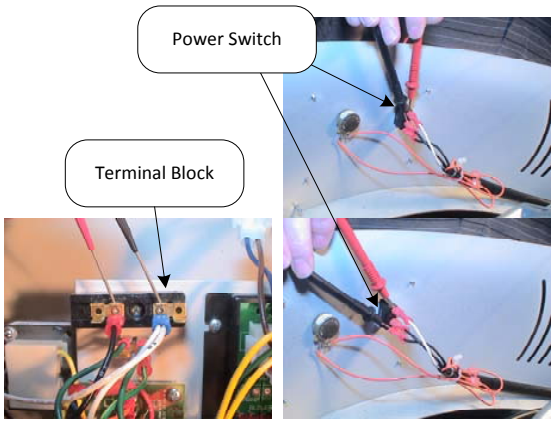
Troubleshooting
System Observation

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

Is front panel power switch light on, indicating power?
- N → Position front panel power switch to "ON" position.
- Y →

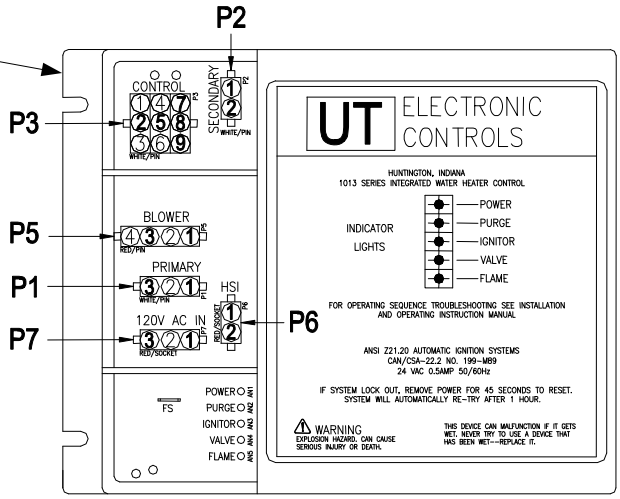
Is there 120VAC across switch? (see photo at right)
- Y → Light burned out, replace switch.
- N →

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?
- N → Refer to ignition module illustration, is there 120VAC going to module at locations **P7(1)** and **P7(3)**?
  - Y → 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)**?
      - N → Replace transformer. (see page 35)
      - Y →
    - N → Replace ignition module. (see page 24)
  - N → Replace ignition module. (see page 24)
- Y →

IGNITION MODULE



Is ignition module power and flame light flashing?
- Y → Supply voltage polarity is incorrect.
- N →

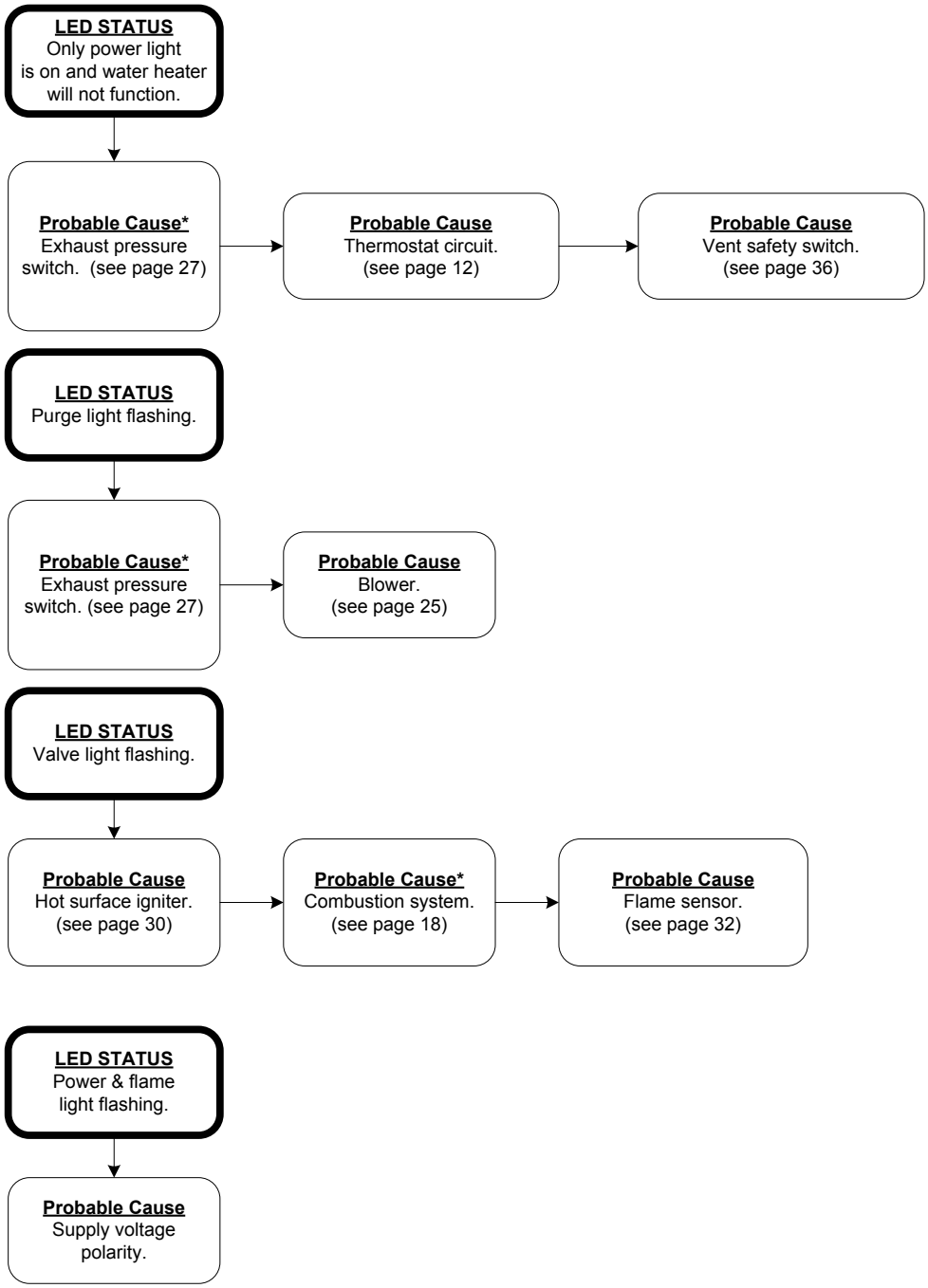
Reset heater by interrupting power. → Reestablish power and Adjust thermostat to call for heat, tank must be cold. → Allow heater to run through heating cycle. → Did heater complete heating cycle and did blower post purge?
- N → See next page
- Y → System is OK.

Troubleshooting

LED status & probable cause
For models with Hot Surface Ignition

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.



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.

Rotate temperature dial to highest setting.

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

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. Restore power to heater. Did heater cycle on?
- N → See page 14
- Y

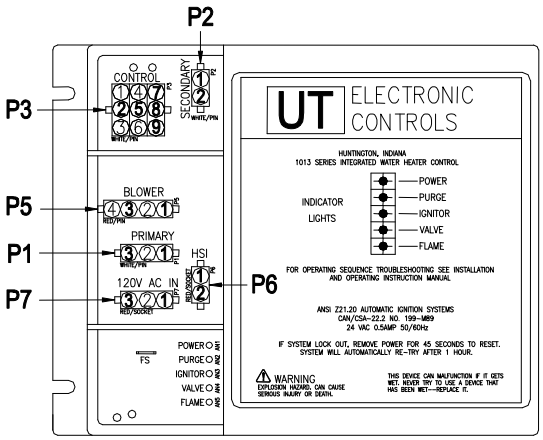
Check thermostat sensor for proper resistance (OHMS) across blue wires. (See page 13) Are readings correct? (see photo at right)
- N → Replace thermostat sensor. (see page 12)
- Y

Check sensor harness continuity. Is there continuity?
- N → Replace harness.
- Y

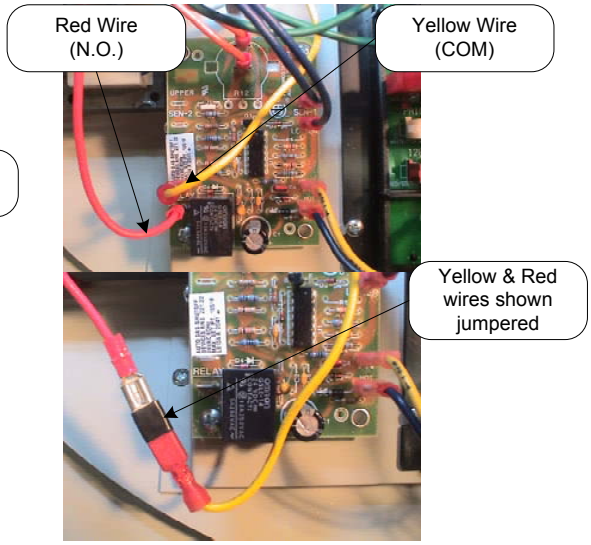
Check temperature dial for proper resistance (OHMS) (See Appendix B, temperature dial resistance) Are readings correct? (see photo at right)
- N → Replace temperature dial (potentiometer). (see page 16)
- Y

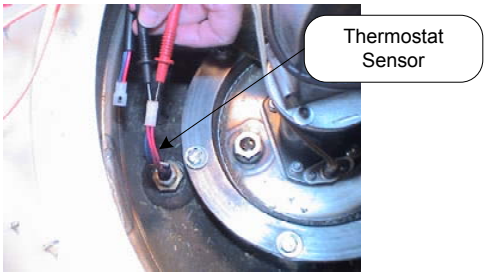
Check temperature dial harness continuity. Is there continuity?
- N → Replace harness.
- Y

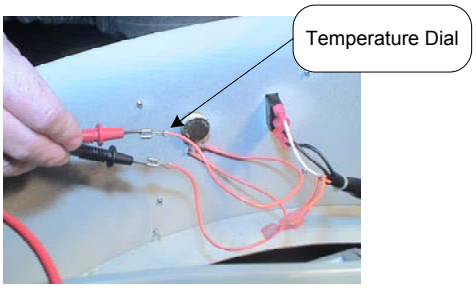
Replace thermostat circuit board. (see page 15)



IGNITION MODULE







SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

APPENDIX - A
Sensor Resistance at Various Temperatures

Be Careful When Making Voltage Measurements or Jumping Terminals
Not to Damage or Deform Connectors or Connector Pins.

Draw Water From The T&P Valve. Compare Temperature With Temperature Ohms Chart Below.

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.

In Degrees F										
°F	0	1	2	3	4	5	6	7	8	9
40	26109	25400	24712	24045	23399	22771	22163	21573	21000	20445
50	19906	19383	18876	18383	17905	17440	16990	16553	16128	15715
60	15314	14925	14548	14180	13823	13477	13140	12812	12494	12185
70	11884	11592	11308	11032	10763	10502	10248	10000	9760	9526
80	9299	9078	8862	8653	8449	8250	8057	7869	7685	7507
90	7333	7165	7000	6839	6683	6531	6383	6238	6098	5961
100	5827	5697	5570	5446	5326	5208	5094	4982	4873	4767
110	4663	4562	4464	4368	4274	4183	4094	4006	3922	3839
120	3758	3679	3602	3527	3453	3382	3312	3244	3177	3112
130	3048	2986	2925	2866	2808	2752	2697	2643	2590	2538
140	2488	2439	2391	2344	2298	2253	2209	2166	2124	2083
150	2043	2004	1966	1928	1891	1856	1820	1786	1753	1720
160	1688	1656	1625	1595	1566	1537	1509	1481	1454	1427
170	1402	1376	1351	1327	1303	1280	1257	1235	1213	1191
180	1170	1150	1129	1110	1090	1071	1053	1035	1017	999
190	982	965	949	933	917	901	886	871	857	842
200	828	814	801	788	775	762	749	737	725	713

APPENDIX - B
Temperature Dial Resistance

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

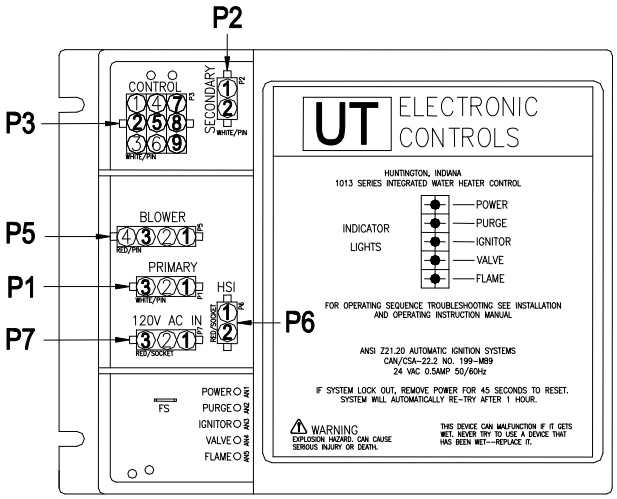
Be Careful When Making Voltage Measurements or Jumping Terminals
Not to Damage or Deform Connectors or Connector Pins.

SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

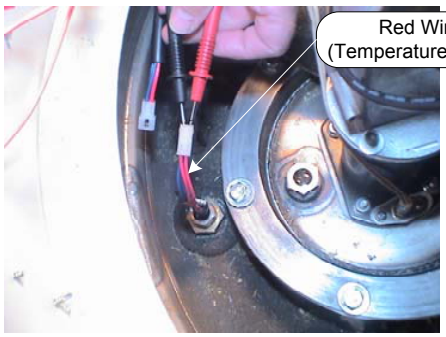
Thermostat circuit. (continued from page 12)

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

Refer to ignition module illustration, Is there 120VAC between **P1(1)** and **P1(3)**?
- N → Refer to ignition module illustration, Is there 120VAC between **P7(3)** and **P7(1)**?
  - N → Check AC source to determine why there is no power.
  - Y → Replace ignition module. (see page 34)
- Y → Refer to ignition module illustration, Is there 22 - 27VAC between **P2(1)** and **P2(2)**?
  - N → Replace transformer. (see page 35)
  - 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)
      - Y → Replace thermostat circuit board. (see page 15)



IGNITION MODULE



SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

Thermostat Board Replacement Procedure

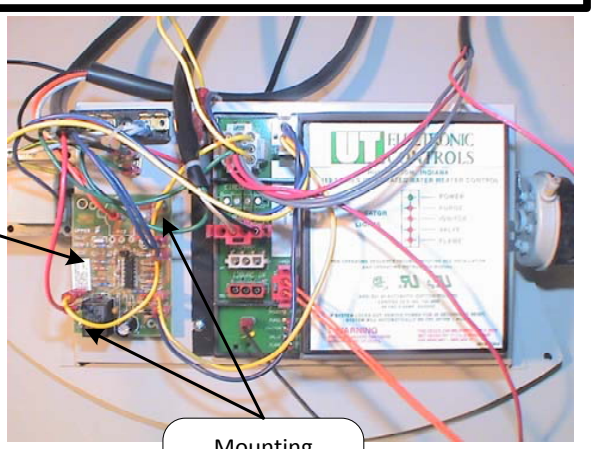
⚠ WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

Step 1. Position main power switch to “OFF”

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

Step 3. Un-latch 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.

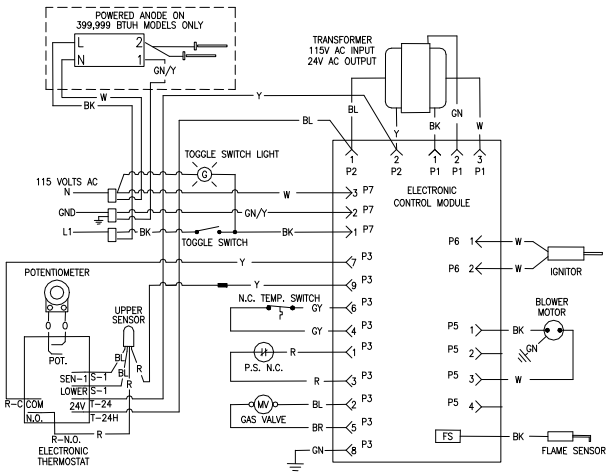
Step 6. Remove the two screws (Phillips head screw driver) that secure thermostat board to control panel.

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.



WIRING DIAGRAM

SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

Thermostat Potentiometer Replacement Procedure

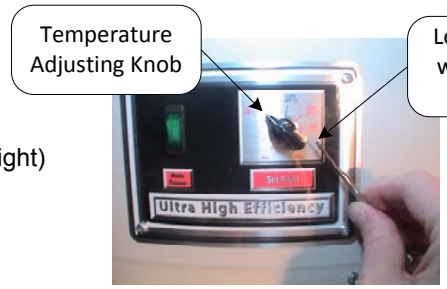
⚠ WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

Step 1. Position main power switch to "OFF"

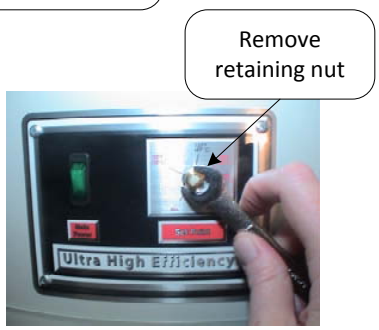
Step 2. Disconnect (unplug) water heater from 120 volt power source.

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

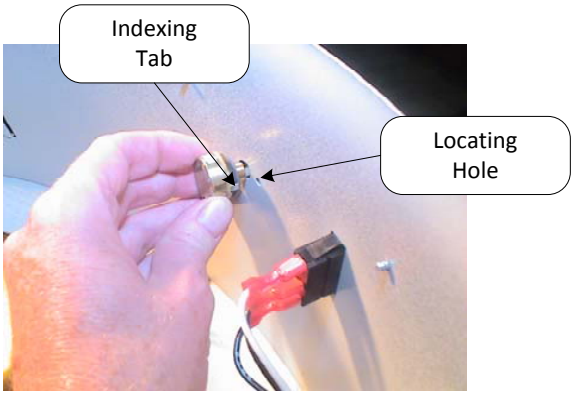
Step 4. Loosen set screw of adjusting knob (small blade screw driver) and remove adjusting knob from potentiometer. (see photos at right)

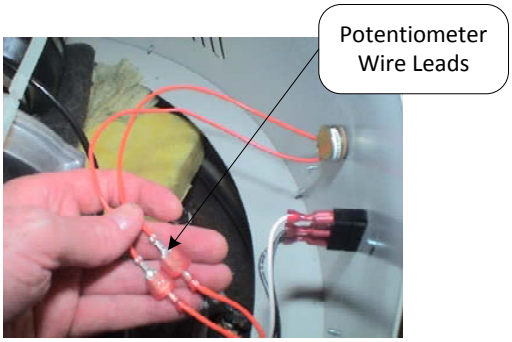


Step 5. Remove retaining nut (½" wrench) and washer from potentiometer. (see photos at right)



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.

SERVICE PROCEDURE UHE-I
Thermostat Circuit Testing and Replacement

Thermostat Sensor (Thermistor) Replacement Procedure

⚠ 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”

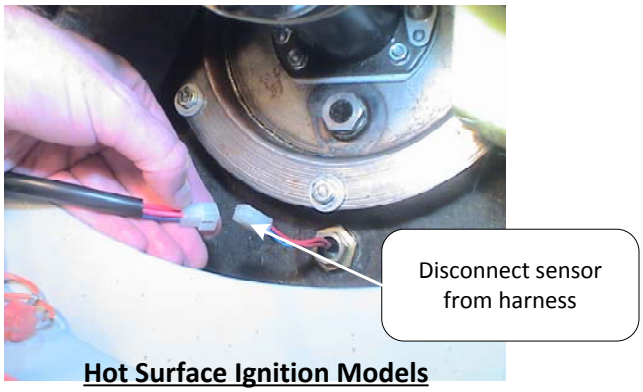
Step 2. Disconnect (unplug) water heater from 120 volt power source.

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

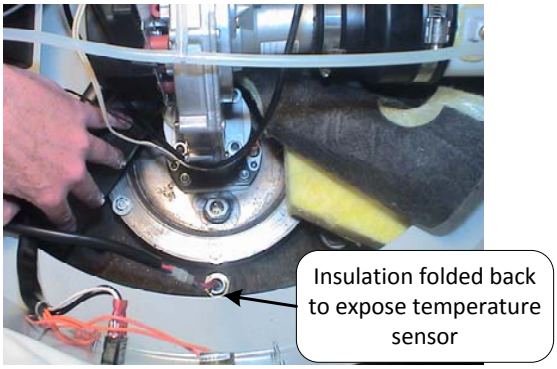
Step 4. Un-latch and remove top surround cover from top of heater.

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).



Hot Surface Ignition Models



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.

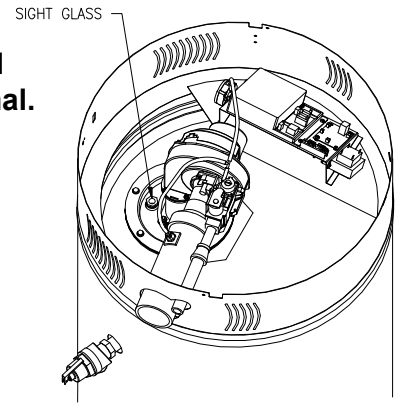
Step 9. Fold insulation back into place. Be sure there are no wires in contact with burner.

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.

SERVICE PROCEDURE UHE-II
Combustion System Testing and Replacement

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.



<u>Note:</u> On higher input models using metal fiber mesh burner (serial number "CK" and later) a red glow from the burner surface is normal.

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

N → Reconfigure gas supply piping

Y

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?

N → Inadequately sized regulator.

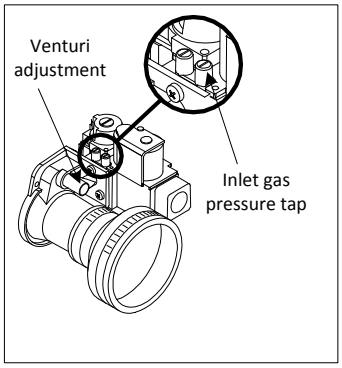
Y → Adjust gas supply regulator

Y

Does inlet gas pressure drop more than 2" W.C. during burner ignition?

Y → (back to Is gas supply pressure regulator adjustable to maintain proper and stable setting?)

N



⚠ WARNING
Removing screw from inlet gas pressure tap will immediately allow gas to flow from pressure tap.

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

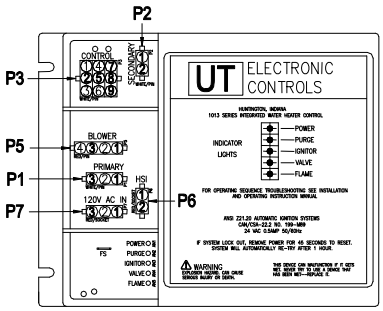
Do you see the igniter glowing through burner site glass during the warm up period?

N → 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).

N → Replace ignition module. (see page 34)

Y

Y



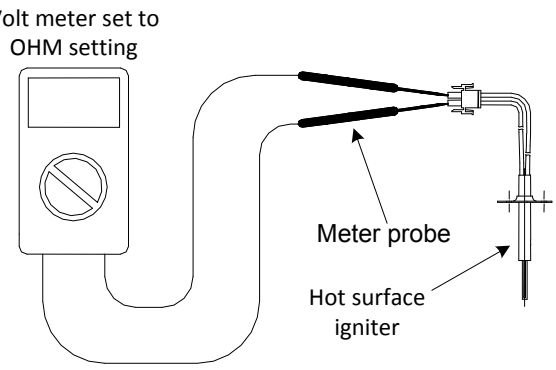
<u>IGNITION MODULE</u>

Is igniter resistance less than 150 Ohms (cold)? (see check igniter illustration)

N → Replace hot surface igniter. (see page 30)

Y

Proceed to next page

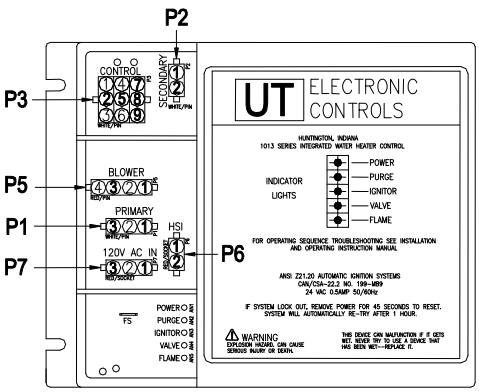


<u>CHECK IGNITER RESISTANCE</u>

SERVICE PROCEDURE UHE-II
Combustion System Testing and Replacement

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.



IGNITION MODULE

Continued from previous page

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)

N → Replace ignition module. (see page 34)

Y

Can you hear or feel gas valve energize?

N → Replace Rectifier harness and/or gas valve. (see page 24)

Y

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

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

N → Check for obstruction at inlet of gas valve. Is inlet free of obstruction?

N → Clear obstruction

N → Inspect burner tube, (see page 22)

Y → Call for technical support

Y

Does flame LED on the module light and stay lit?

Y → Does burner operate normaly until thermostat is satisfied?

N → Y → System OK

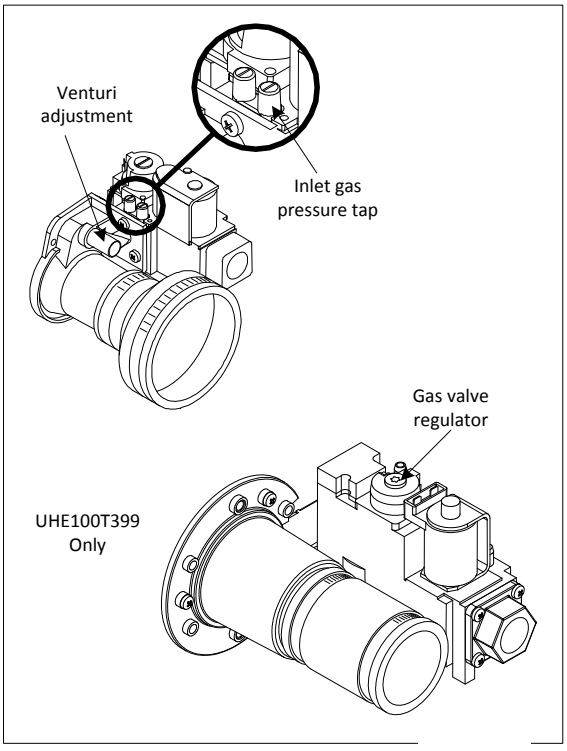
N

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

Y → System OK

N

Replace flame sensor (see page 32)



SERVICE PROCEDURE UHE-II
Combustion System Testing and Replacement

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

Combustion System Removal Procedure

⚠ 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".

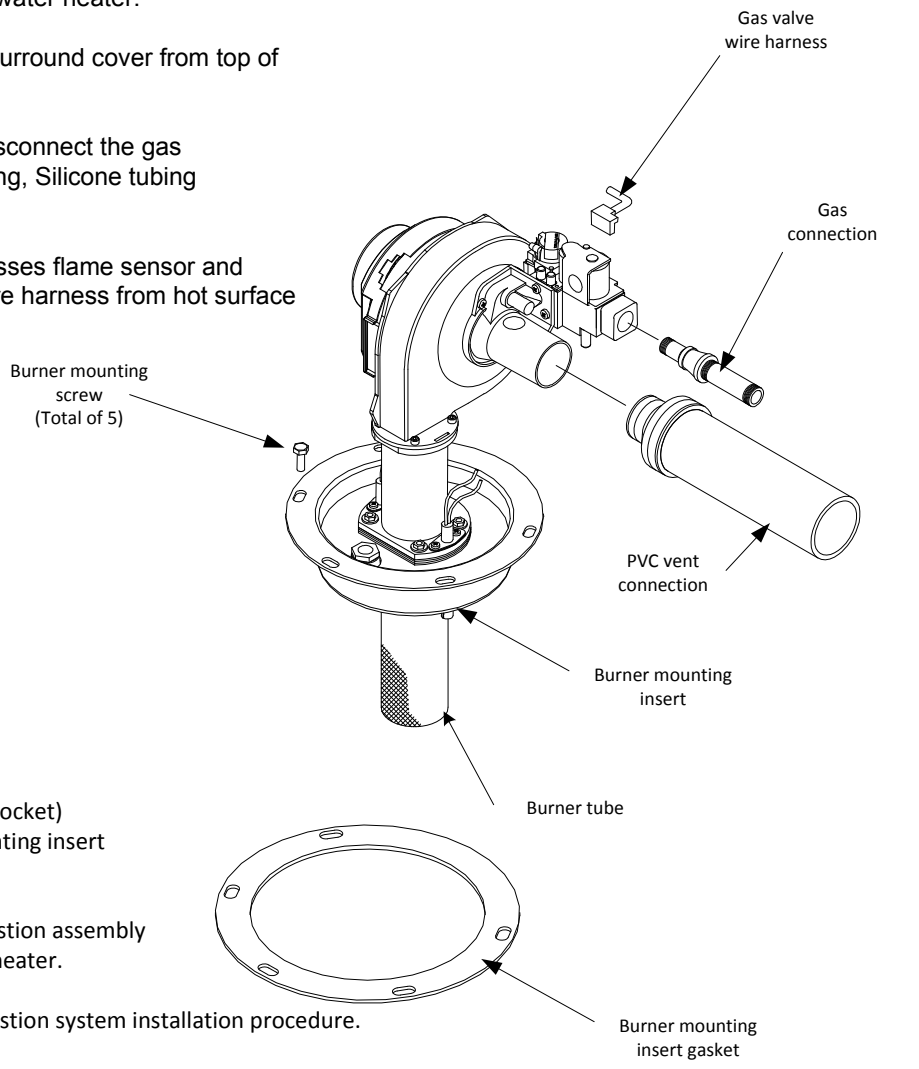
Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. 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.

SERVICE PROCEDURE UHE-II
Combustion System Testing and Replacement

Combustion System Replacement Procedure

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

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

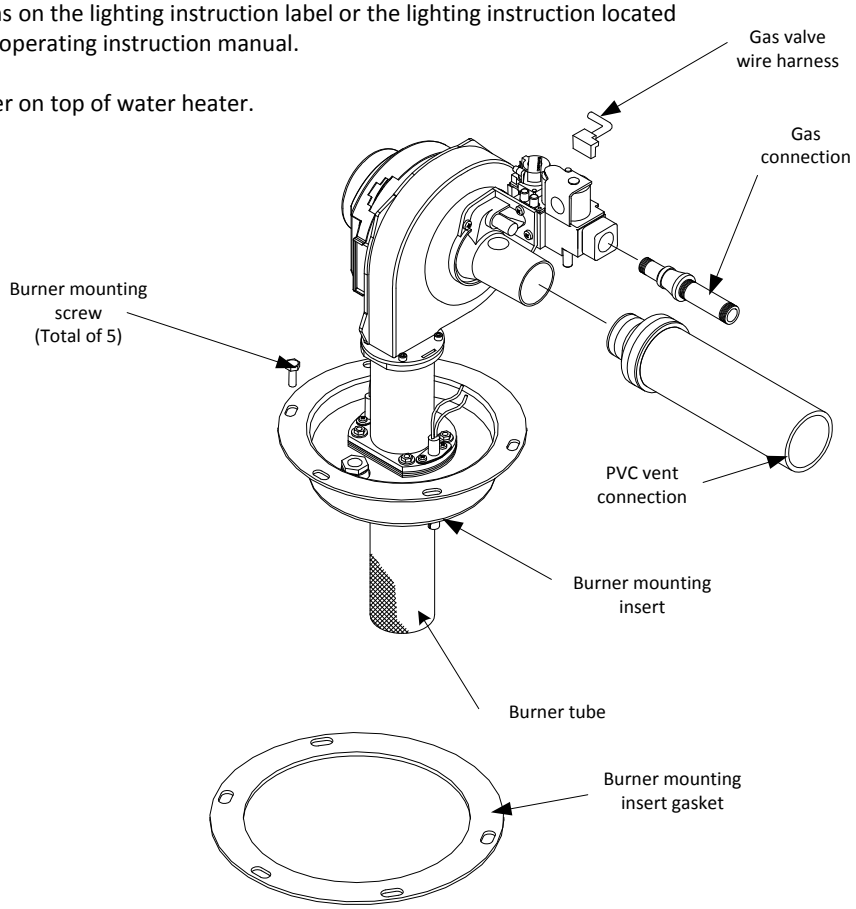
Step 2. Install combustion assembly using new gasket or fully inspected gasket from step 1. Secure combustion assembly at the burner mounting insert using screws from step 6 on previous page. Tighten screws evenly.

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

⚠ 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".

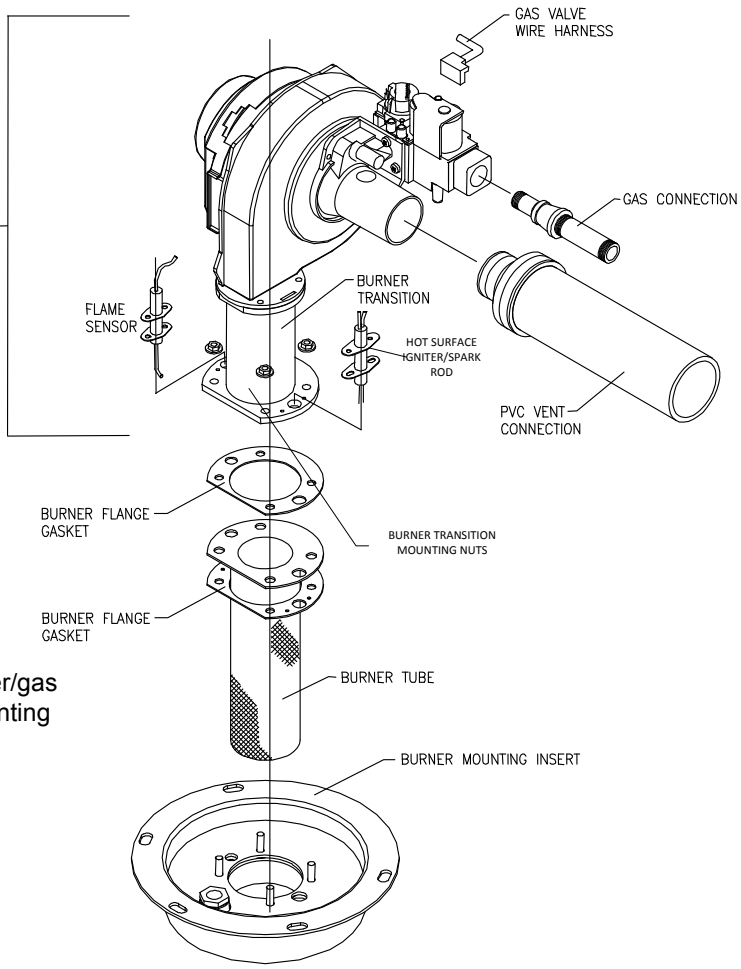
Step 2. Disconnect (unplug) water heater from 120 volt power source.

Step 3. 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.

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 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
b) Missing material
c) Cracks
d) Dirt or debris
e) Other imperfections that would inhibit proper seal

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.

Service Procedure UHE-IV
Gas Valve Replacement

Gas Valve Replacement Procedure

⚠ 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.

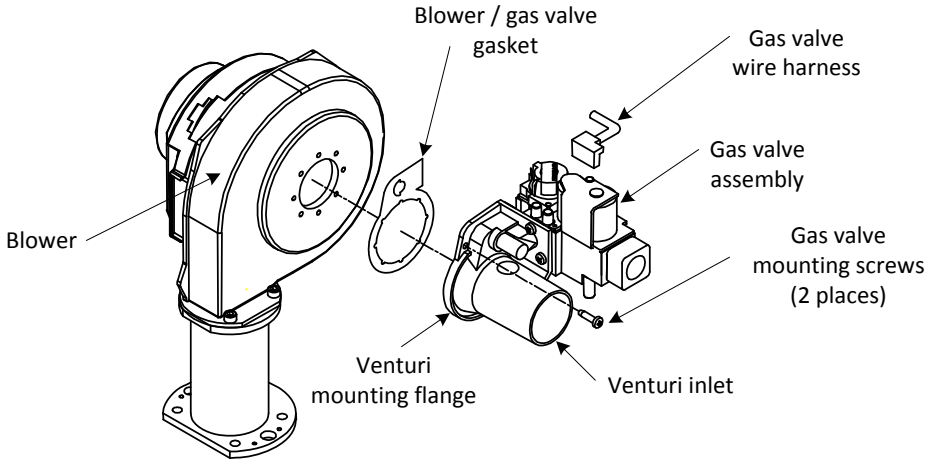
Step 3. Turn off gas supply to water heater.

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 8. Install new gas valve with new gasket provided. Secure gas valve in place using screws from step 6.

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.

Service Procedure UHE-V
Blower Testing and Replacement

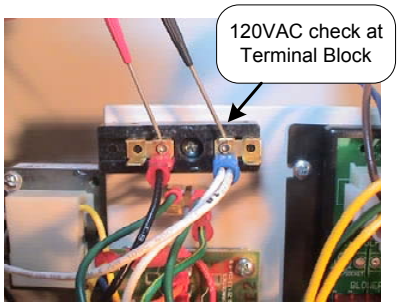
Does blower energize?

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

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 → Determine power source problem and correct

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?

N → Thermostat not calling for heat. (see page 12)

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

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

Y → Replace ignition module/ control board.

Y → 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?

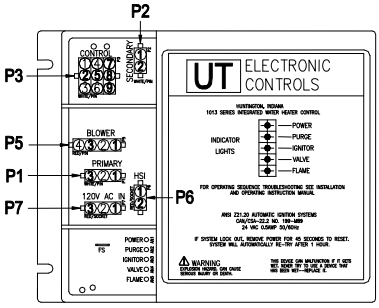
Y → Call technical support.

N → Replace blower. (see "Blower Replacement Procedure")

Y → Is there 120VAC across the white and black wires at the blower? (see photo at right)

N → Repair/replace wire harness.

Y → Replace blower. (see page 25)



IGNITION MODULE

Service Procedure UHE-V
Blower Testing and Replacement

Blower Replacement Procedure

⚠ 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. Turn off gas supply to water heater.

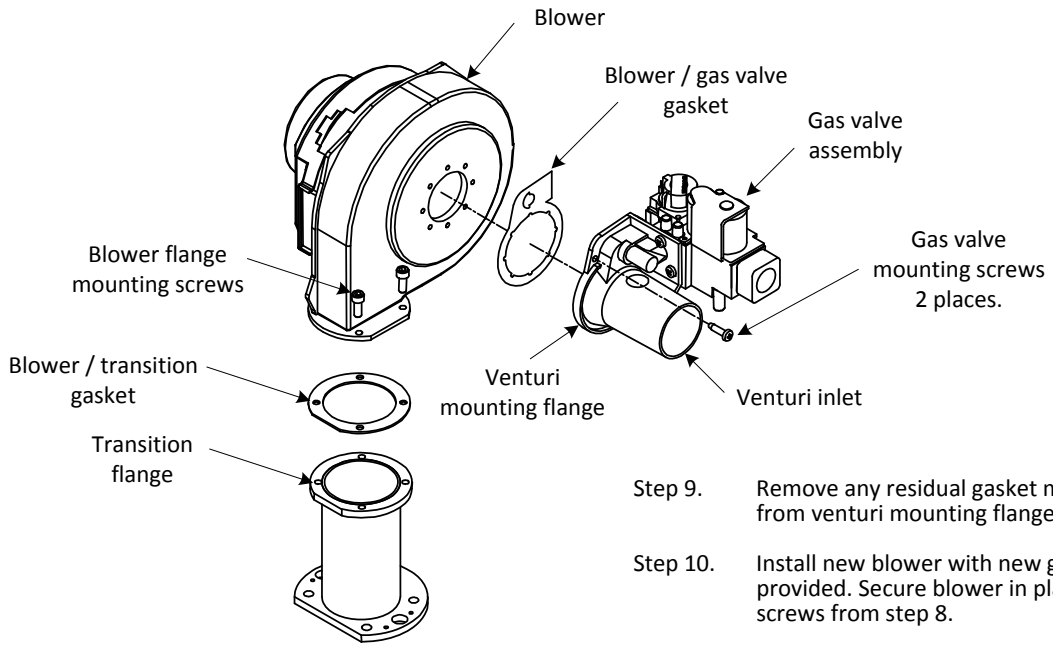
Step 4. Un-latch & remove surround cover from top of heater.

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.

Service Procedure UHE-VI

Exhaust Pressure Switch Testing and Replacement

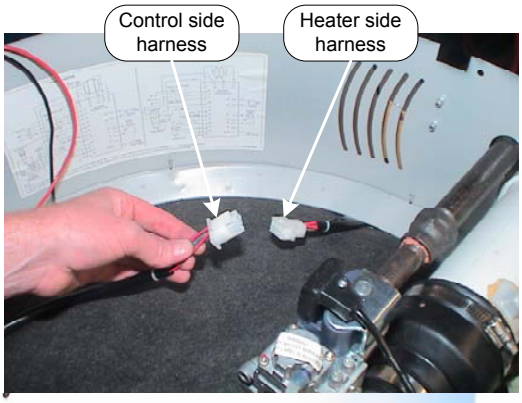
Sequence of operation:
The blocked vent pressure switch monitors the pressure in the exhaust tube. The switch contacts are normally closed and will not open unless there is a blockage in the exhaust venting or terminal (snow, ice, debris). If the blocked vent pressure switch contacts open after the thermostat 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.

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

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

Does blower energize?
- N → Is there continuity Through GREY wire leads of heater side safety circuit harness? (see photo below)
  - Y → Is there continuity through RED wire leads of heater side safety circuit harness? (see photo below)
    - N → Safety Circuit OK, (see page 36)
    - Y → Check PURGE LED status on ignition module, Flashing after 45 seconds?
      - Y → Replace exhaust pressure switch (see page 29)
  - N → Depress reset button on vent safety switch. Is there continuity across high limit switch? (see photo below)
    - Y → Does heater function?
      - N → Call technical support.
      - Y → Verify proper switch operation. (see page 36)
    - N → Replace vent safety switch. (see page 37)
- 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)

Safety Circuit Trace



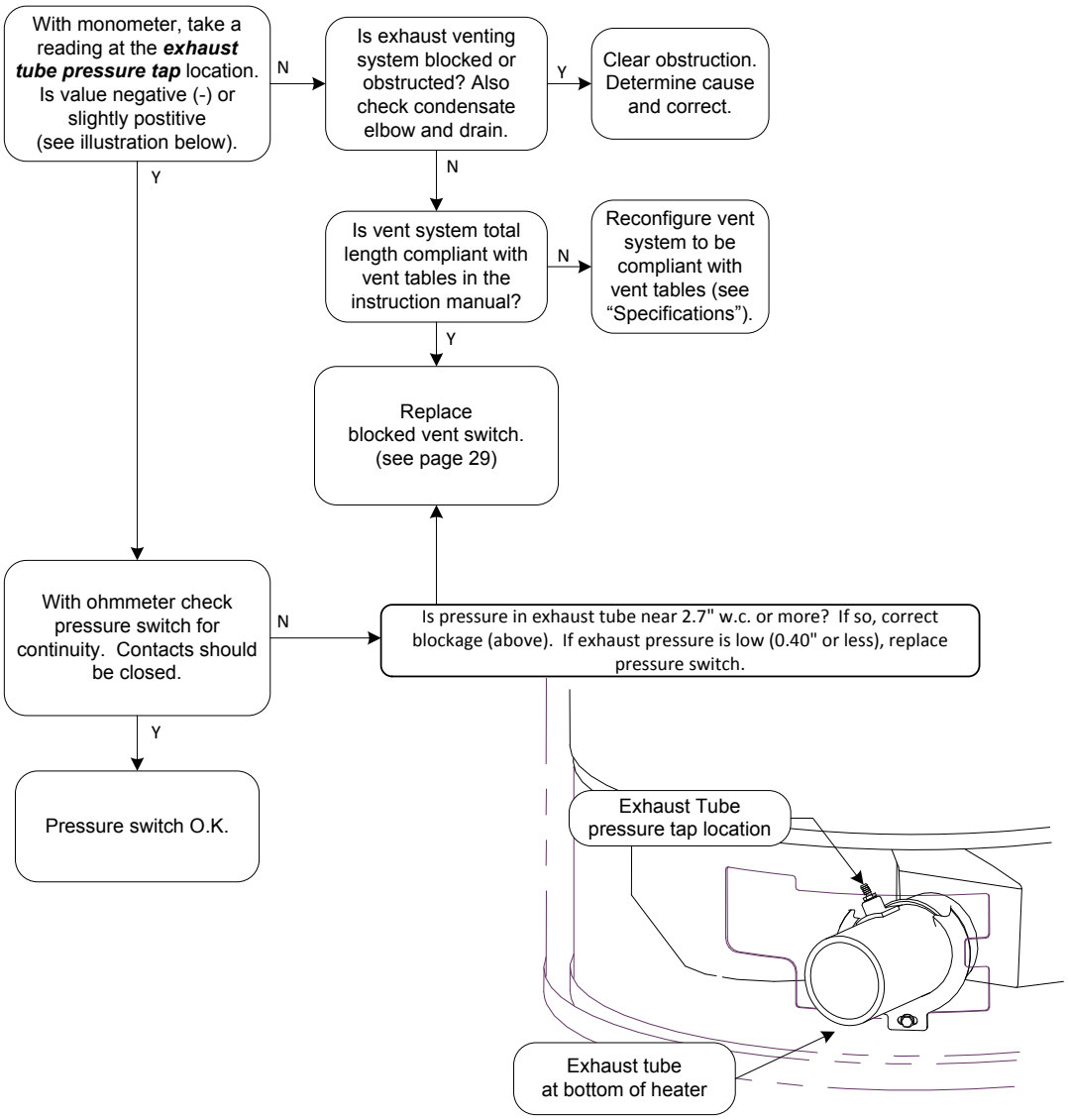
Note: HOT SURFACE IGNITION MODELS ONLY - The blocked vent pressure switch must be used with the revised ignition control, identified with a yellow label.

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.

Service Procedure UHE-VI

Exhaust Pressure Switch Testing and Replacement

Check Exhaust Tube Pressure

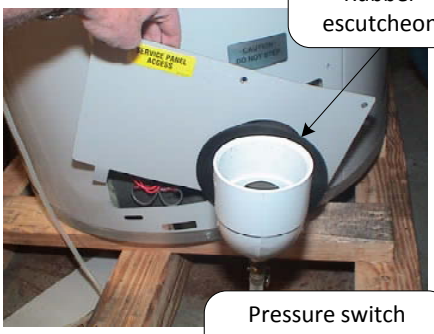


Service Procedure UHE-VI
Exhaust Pressure Switch Testing and Replacement

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.

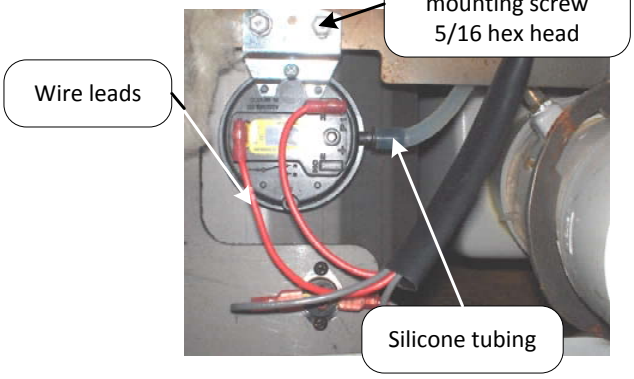


Step 3. Remove screws from service panel access cover (¼" nut driver) and remove cover from heater. (see photos at right)

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.

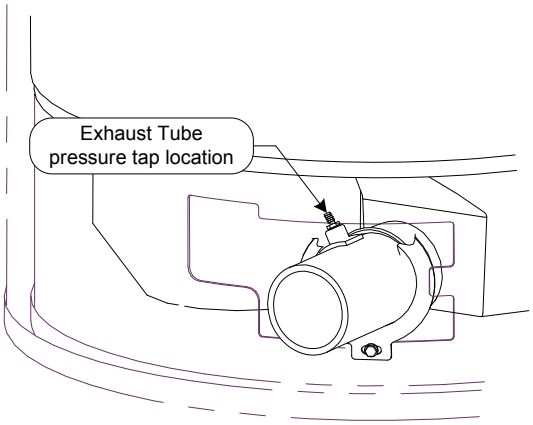
Step 6. Assemble new pressure switch to heater using screws from step 5.



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

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

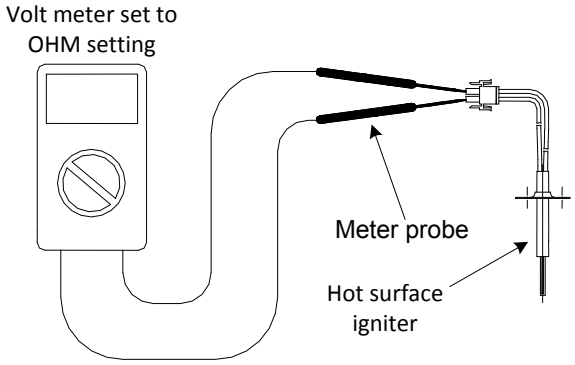
Is igniter resistance less than 150 Ohms (cold)? (see "check igniter resistance" below)

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).

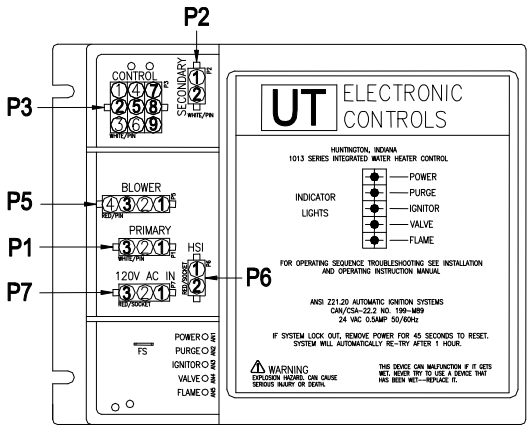
Y → Check harness connection from igniter to ignition module.

N → Replace hot surface igniter (see page 30)

N → Replace ignition module. (see page 34)



CHECK IGNITER RESISTANCE



IGNITION MODULE

Service Procedure UHE-VII
Hot Surface Igniter Testing and Replacement

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.

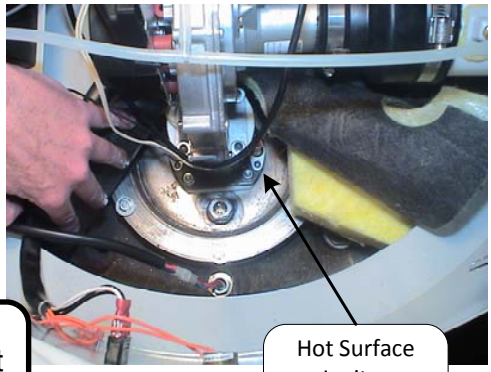
⚠ WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

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.

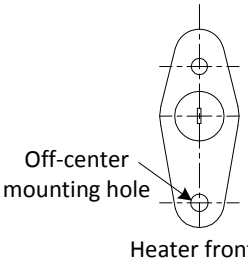
Step 7. Remove any residual gasket material from transition base flange.

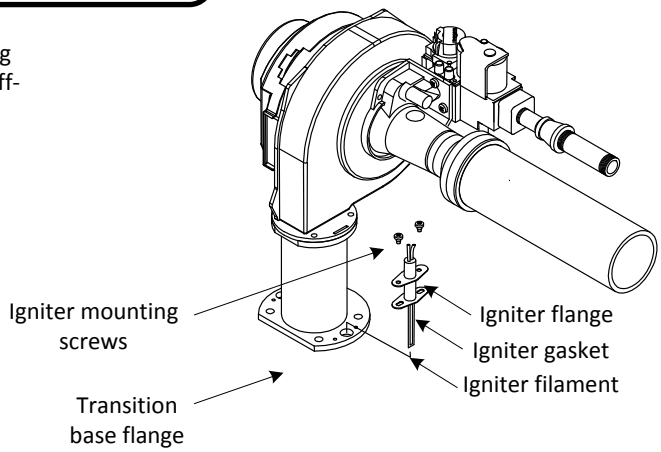


Note:
New replacement igniter will not have a shield over element. Handle carefully to prevent breakage.

Note:
Do not handle igniter element or allow foreign material to come in contact with element.

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.

Service Procedure UHE-VIII
Flame Sensor Testing and Replacement

Flame Sensor Testing Procedure

⚠ 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

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?

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

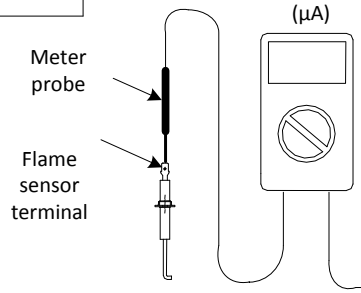
Y → Is flame sensor free of oxidation?

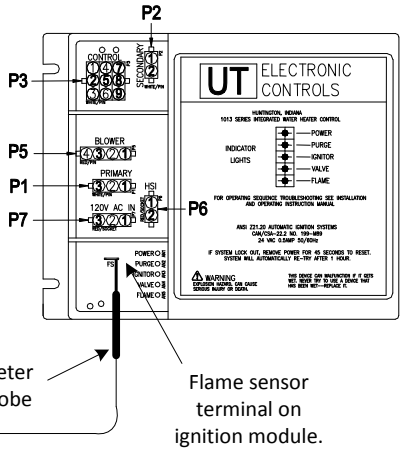
N → Clean or replace flame sensor with emery cloth. (see page 33)

Y → Is ceramic of flame sensor cracked?

Y → Replace flame sensor. (see page 33)

N → Call for technical support





Service Procedure UHE-VIII
Flame Sensor Testing and Replacement

Flame Sensor Replacement Procedure

Step 1. Position main power switch to "OFF"

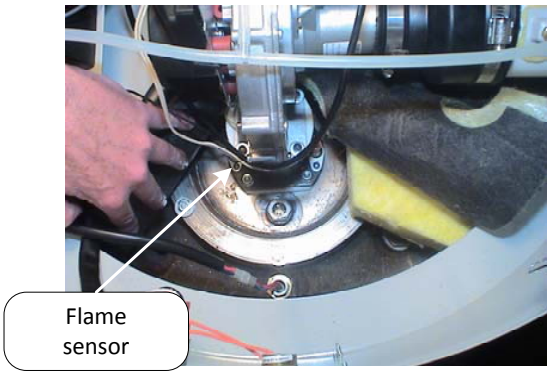
Step 2. Disconnect (unplug) water heater from 120 volt power source.

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

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

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

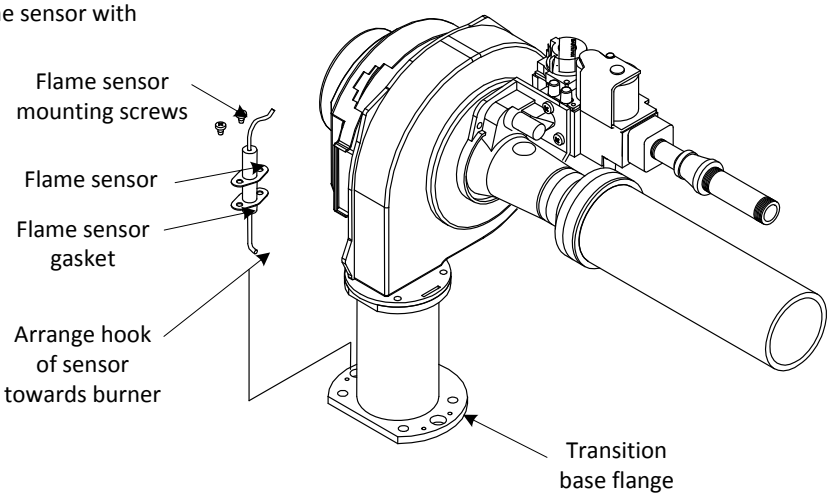
Step 5. Disconnect wire lead from flame sensor.



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.

Service Procedure UHE-IX
Ignition Module/Control Board Replacement

Ignition Module Replacement Procedure

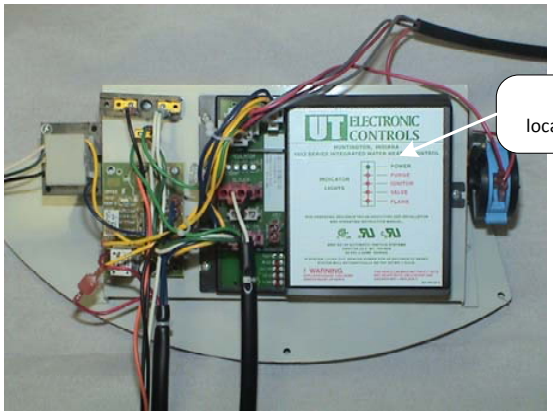
⚠ WARNING
120 volt potential exposure. Isolate the appliance and reconfirm power is disconnected using a multi-meter.

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 water heater.

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



Note: Replacement hot surface ignition module works on all UHE models prior to and later than “CF” serial numbers. Direct spark ignition models use a different control board (detailed in following section).

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.

Service Procedure UHE-X
Transformer Replacement

Transformer Replacement Procedure

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

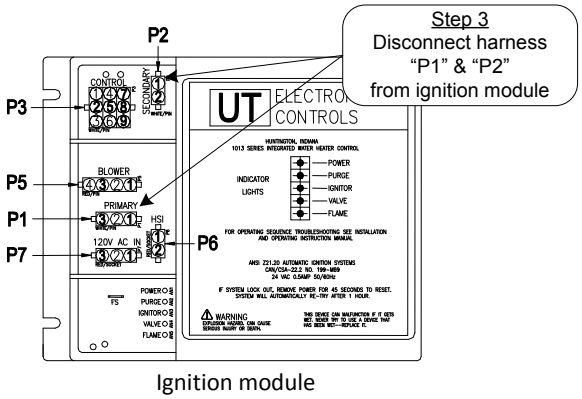
Step 1. Position main power switch to “OFF”.

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

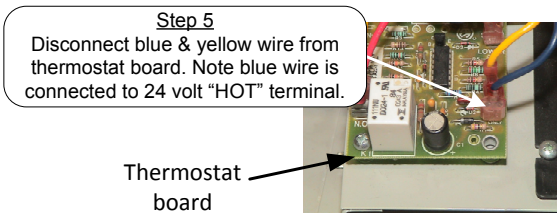
Step 3. Un-latch & remove surround cover from top of water heater.

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)



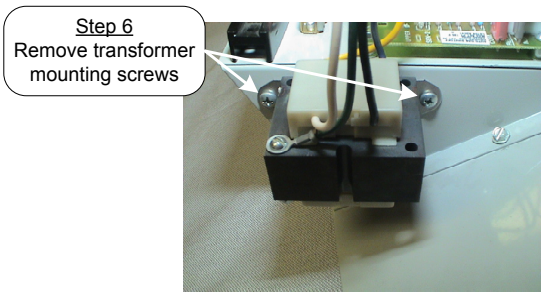
Ignition module



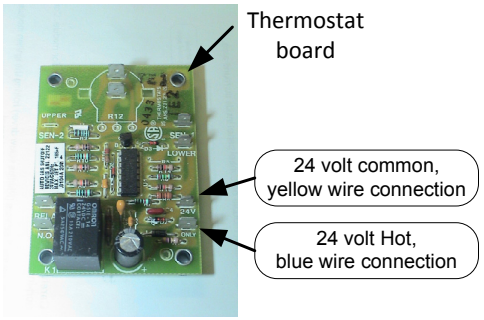
Step 6. Remove the 2 screws (short Phillips screw driver) holding the transformer in place and remove transformer from control panel. (see photo below)

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)



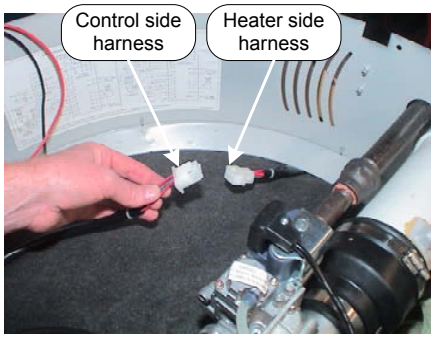
Step 10. Restore 120 volt power supply to water heater and confirm proper operation following the lighting instructions on the lighting instruction label or the lighting instruction located in the installation and operating instruction manual.

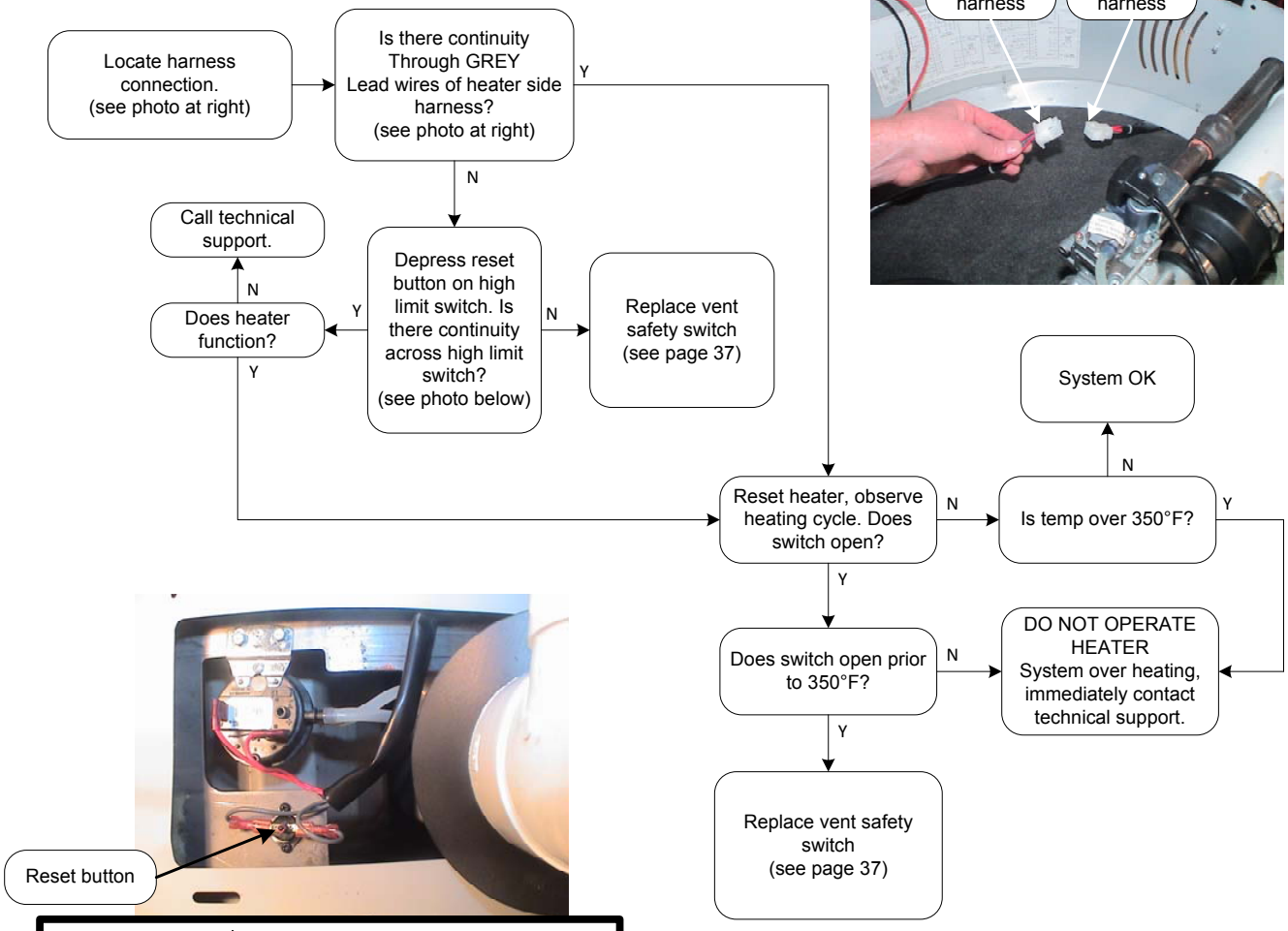
Step 11. Replace surround cover on top of water heater.

Service Procedure UHE-XI
Vent Safety Switch Testing and Replacement

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.





⚠ 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.

Service Procedure UHE-XI
Vent Safety Switch Testing and Replacement

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 6. Install new switch using screws from step 5.

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.

Service Procedure UHE-XII
Anode/Flue Baffle Inspection and Replacement

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.

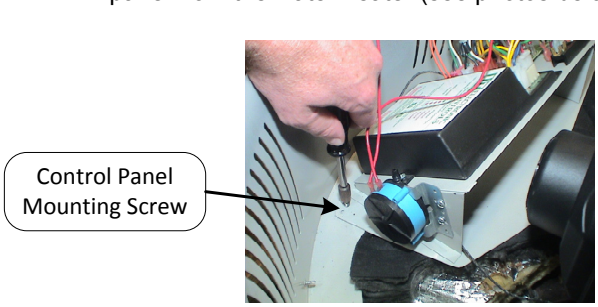
Step 1. Position main power switch to "OFF".

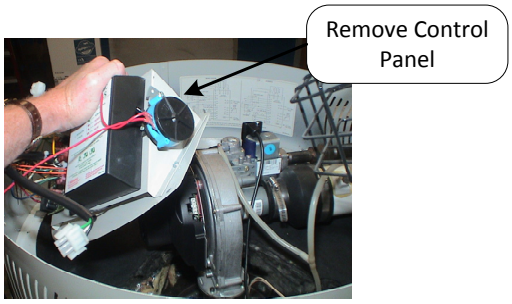
Step 2. Disconnect (Unplug) water heater from 120 Volt power source.

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.

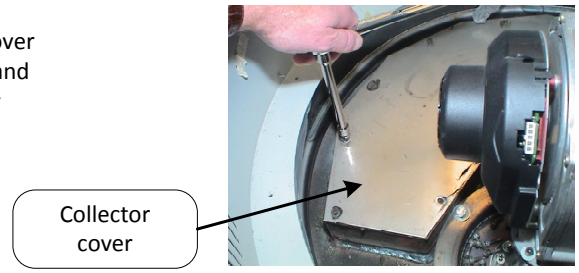
Step 5. Remove the three control panel mounting screws (¼" nut driver) and remove control panel from the water heater (see photos below).

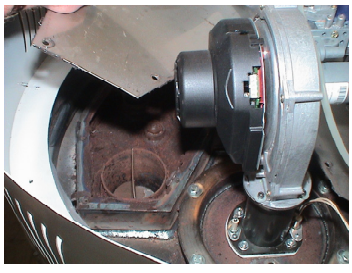




Step 6. Completely remove insulation (two pieces) from top of heater to expose collector cover

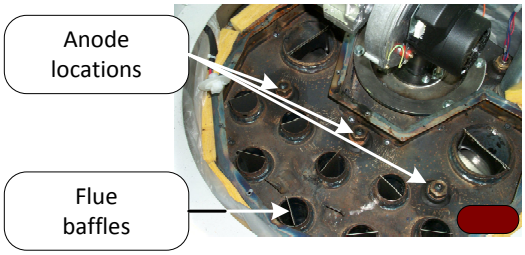
Step 7. Remove all collector cover screws (5/16" socket) and remove collector cover (see photos at right).





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.

Service Procedure UHE-XII

Anode/Flue Baffle Inspection and Replacement

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 Andoes & 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.

Service Procedure UHE-XII
Anode/Flue Baffle Inspection and Replacement

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.

Service Procedure UHE-XII

Powered Anode Replacement for UHE100T399 only

Powered Anode Replacement UHE100T399 models only

⚠ WARNING

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

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.

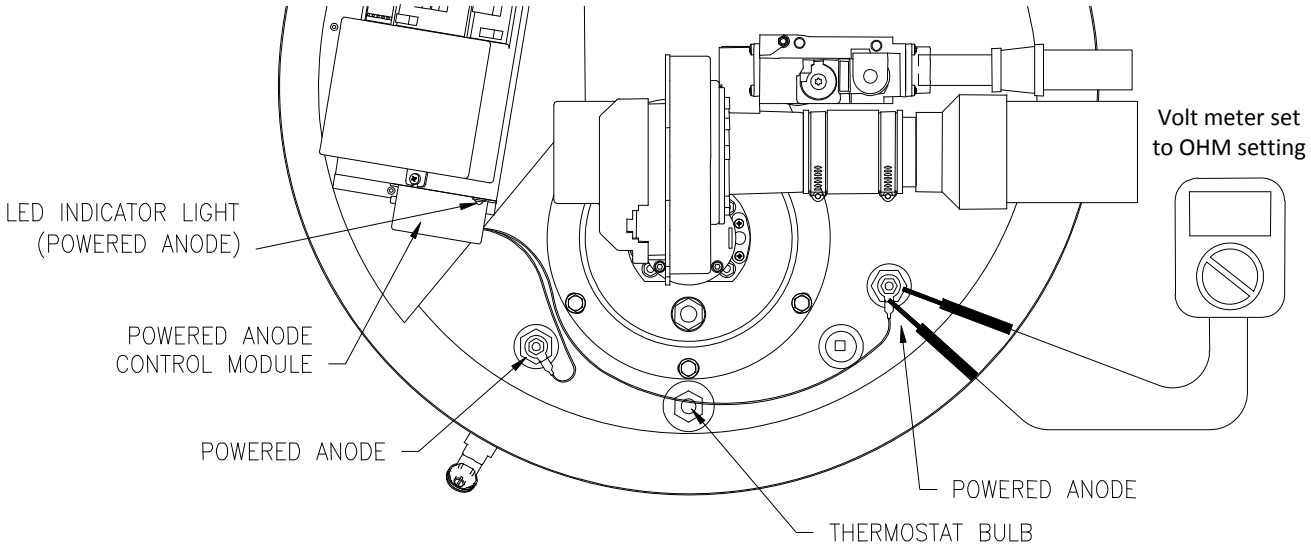
Step 1. Check the power supply or wire connections to the powered anode control.

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.



Service Procedure UHE-XII
Anode/Flue Baffle Inspection and Replacement

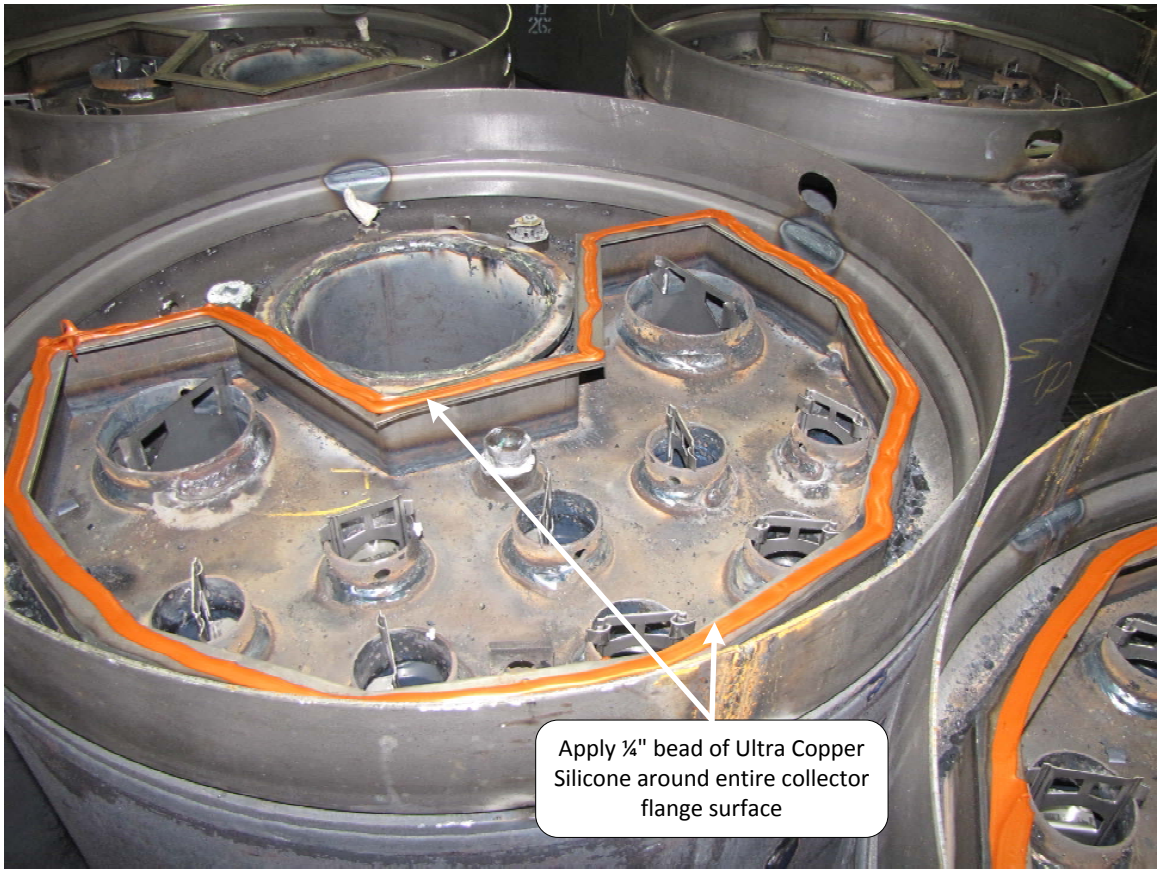
Collector Cover Installation Procedure

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.



Water Heater Installation Check List

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		
Total length of intake piping and exhaust piping added together must not exceed "Maximum Combined Length" Shown below		
Maximum Combined Length (feet)		
Model Number	**3"**	**4"**
UHE60T125, UHE100T150	120'	170'
UHE60T150, UHE100T199	100'	150'
UHE60T199	80'	130'
UHE100T250	80'	130'
UHE100T300	60'	110'
UHE100T399	50'	100'

Power Vented Systems PVC, CPVC		
Total length of exhaust piping must not exceed "Maximum Vent Length" Shown below		
Maximum Vent Length (feet)		
Model Number	**3"**	**4"**
UHE60T125, UHE100T150	120'	170'
UHE60T150, UHE100T199	100'	150'
UHE60T199	80'	130'
UHE100T250	80'	130'
UHE100T300	60'	110'
UHE100T399	50'	100'

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.

U.H.E. Series Heater Service Report

Date _____

Service Provider _____ **Model Number** _____

Phone Number _____ **Serial Number** _____

Venting (PVC, CPVC):

Vent size 3" or 4" _____

Intake 90's (qty) _____ Intake 45's (qty) _____ Length of straight pipe (intake) _____

Exhaust 90's (qty) _____ Exhaust 45's (qty) _____ Length of straight pipe (exhaust) _____

Gas Line:

Size & material _____

Distance from meter to water heater _____

Gas Pressure:

Static _____

Running Inlet _____

Manifold _____

Venturi:

Setting from Bottom in Turns _____

Electrical:

Line Voltage _____ Low Voltage _____ Polarity _____

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:

Size & Material _____

Length _____

Is trap provided Y or N

Exhaust Collector Pressure:

Positive Inches W.C. _____

Combustion:

CO2 _____ CO _____

Installation Site Name & Address:

_____

_____

_____

_____

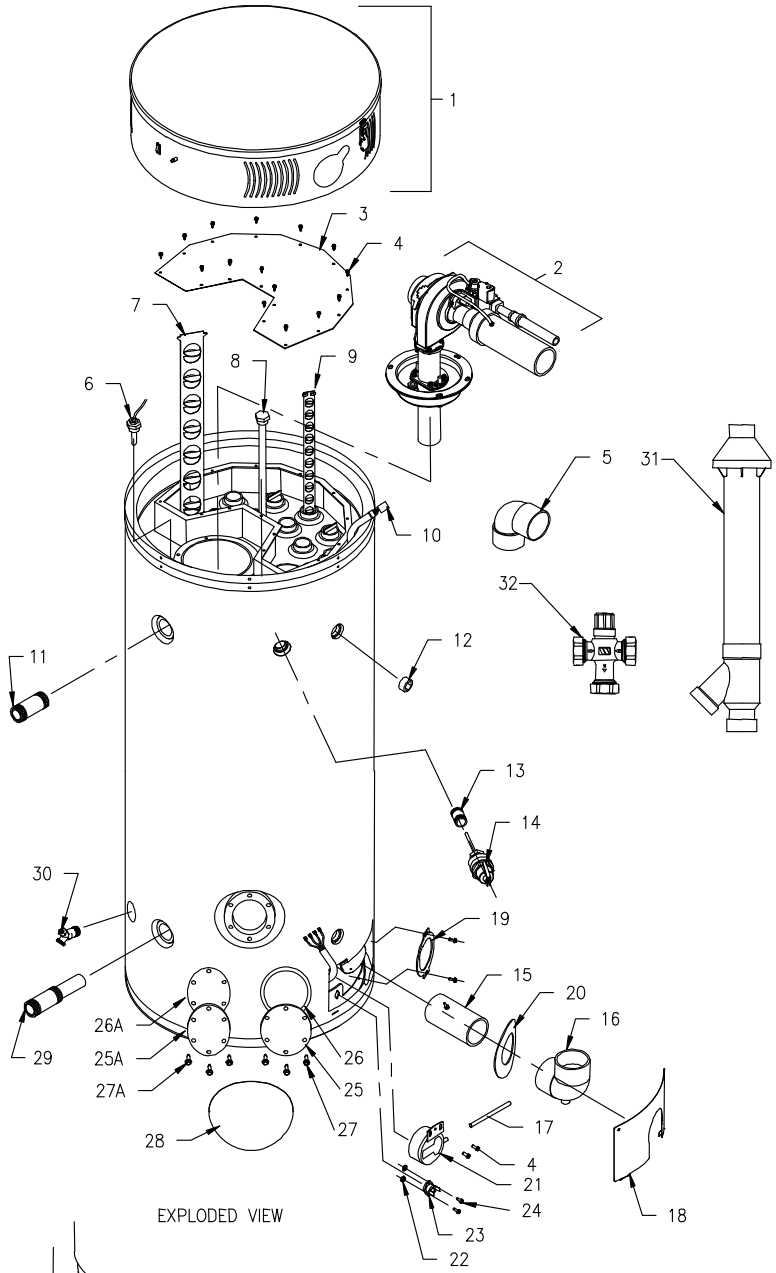
Installation Site Contact Name & Phone Number

_____

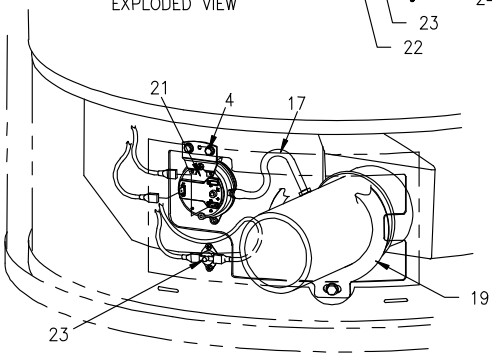
_____

_____

Parts List



EXPLODED VIEW



EXHAUST SERVICE AREA DETAIL
(ASSEMBLED)

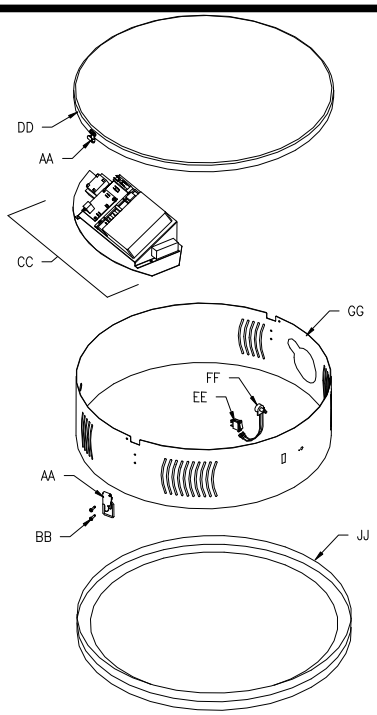
1	Combustion Surround Assy.
2	Burner Assy (specify model)
3	2nd Pass Top Collector Cover
4	Screw 10-16 x 3/4
5	Vent Termination Elbow
6	Thermostat Sensor Probe
7	Baffle 4" Flue (specify model)
8a	Anode Rod Assy
8b	Powered Anode (for UHE100T399)
9	Baffle 2" Flue
10	Wire Harness Service Panel
11	Plastisert Nipple 1-½" NPT
12	Plug
13	Nipple
14	T&P Relief Valve
15	Exhaust Pipe (PVC) w/Hose Barb (except UHE100T399)
16	Condensate Trap Elbow (specify model)
17	Silicone Hose
18	Outer Door Service Panel (specify model)
19	Vent Pipe Support Bracket (except UHE100T399)
20	NSF Escutcheon
21	Exhaust Pressure Switch
22	Nuts
23	Collector Temperature Limit Switch
24	Screw 6-32x 3/8
25	Cleanout Access Cover
26	Cleanout Gasket
27	Screw 5/16-18 x ¾ HH Grade 5
28	Cleanout Cover
29	Cold Water Inlet (Hydrojet) Assy.
30	No Handle Brass Drain Valve
31	Concentric Vent System (optional)
32	ASSE Approved Mixing Valve (optional)

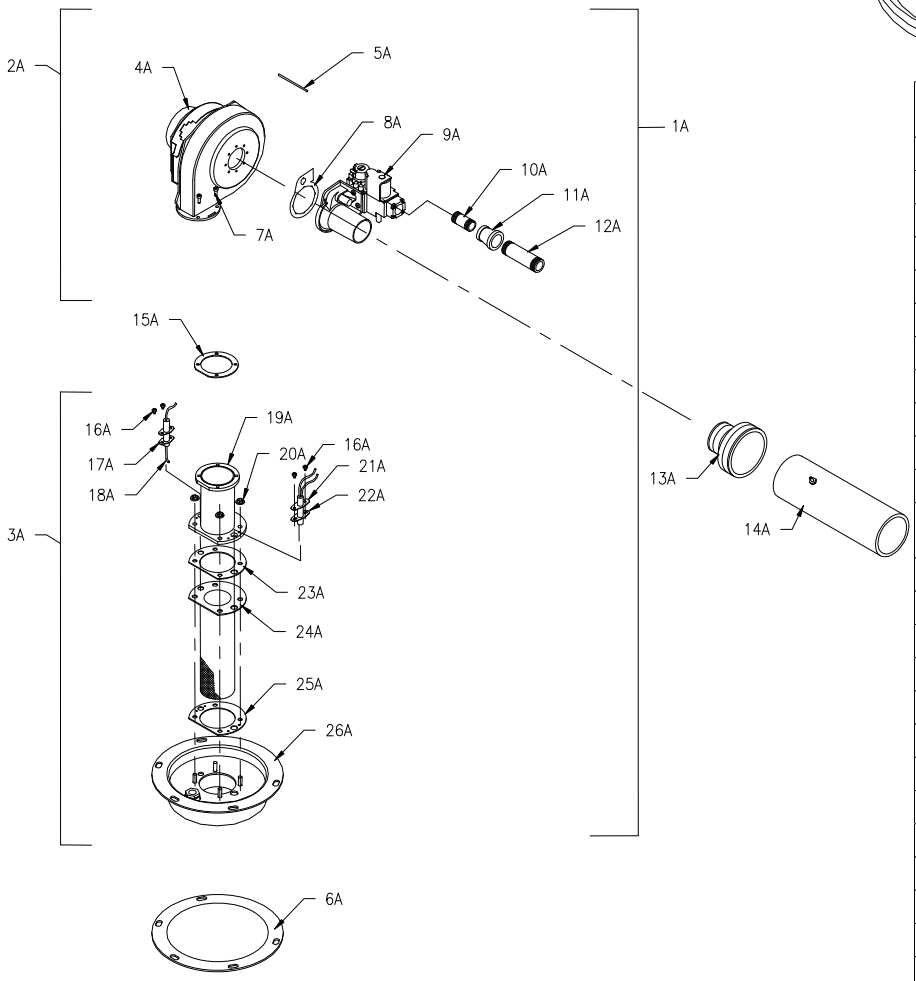
Customer must specify complete model number and serial number when ordering service parts.

Parts List

AA	Latch Assy
BB	Screw 8-32 x ½ RHCR
CC	Ignition Control Assy
DD	Jacket Head
EE	Main Power Switch
FF	Potentiometer
GG	Combustion Surround
JJ	Surround Base

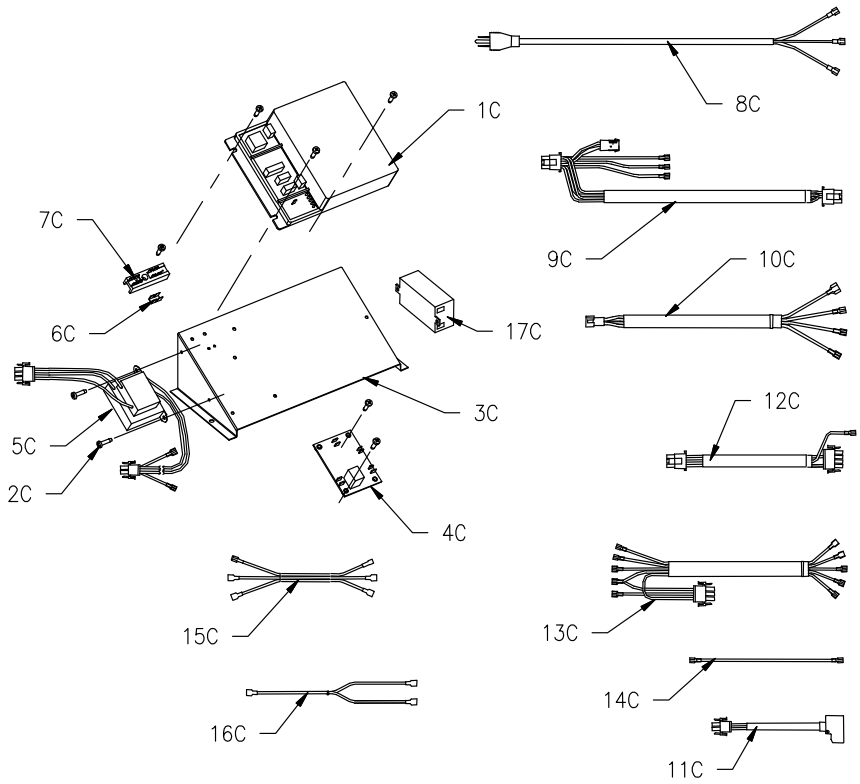
Customer must specify complete model number and serial number when ordering service parts.





1A	Combustion Surround Assy. (specify model)
2A	Blower Gas Valve Assy (specify model)
3A	Burner Assy (specify model)
4A	Blower EBM (specify model)
5A	Silicone Hose
6A	Burner Mounting Insert Gasket
7A	Screw 10-32 x3/4
8A	Gasket & Screw
9A	Gas Valve (specify model)
10A	Nipple (specify model)
11A	Reducer (specify model)
12A	Nipple (specify model)
13A	2" dia. Flex Reducer (or PVC reducer for 399)
14A	Inlet (PVC)
15A	Gasket Blower Transition (specify model)
16A	Screw 8-32 x ¼ RHCR
17A	Gasket Flame Sensor
18A	Flame Sensor
19A	Transition Tube
20A	Nut Hex Washer
21A	Gasket Hot Surface Igniter
22A	Hot Surface Igniter
23A	Burner Mounting Gasket
24A	Burner Tube
25A	Burner Mounting Gasket
26A	Burner Mounting Insert

Parts List



1C	Electronic Control Module
2C	Screw 8-32 x 1/2
3C	Control Mounting Panel
4C	Thermostat PC Board
5C	Transformer 120VAC x 24VAC x 40VA
6C	Terminal
7C	Terminal Strip
8C	Power Cord
9C	Control Wire Harness
10C	Thermostat Wire Harness
11C	Rectifier Harness (specify model)
12C	Blower Wire Harness (specify model)
13C	Power Switch Wire Harness
14C	Flame Sensor Wire Harness
15C	Powered Anode Control Harness (399 only)
16C	Powered Anode Harness (399 only)
17C	Powered Anode Control (399 only)

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

Glossary of Terms

AC	Alternating Current
BTU/H	British Thermal Units
CO	Carbon Monoxide
CO2	Carbon Dioxide
DC	Direct Current
DSI	Direct Spark Ignition
ECO	Energy Cut Off
GFI	Ground fault interrupt
GPM	Gallons per Minute
HSI	Hot Surface Igniter
Hz	Hertz
LED	Light Emitting Diode
NOx	Oxides of Nitrogen
NPT	National Pipe Thread
PSI	Pounds per Square Inch
RPM	Revolutions per Minute
VA	Volt Amps
VAC	Volts Alternating Current
W.C.	Inches of Water Column
°C	Degrees Centigrade
°F	Degrees Fahrenheit
µA	Micro Amp

NOTES

LAARS Heating Systems Company
A subsidiary of BRADFORD WHITE Corporation

800.900.9276 • Fax 800.559.1583 ***(Customer Service, Service Advisors)***
20 Industrial Way, Rochester, NH 03867 • 603.335.6300 • Fax 603.335.3355 ***(Applications Engineering)***
1869 Sismet Road, Mississauga, Ontario, Canada L4W 1W8 • 905.238.0100 • Fax 905.366.0130
www.Laars.com