WEIL-McLAIN
MODELS HE (Series 2) AND VHE (Series 2)

NATURAL GAS-FIRED
INDUCED DRAFT BOILERS

SUPPLEMENTAL INSTRUCTIONS
WITH WHITE-RODGERS CYCLE-PILOT® SYSTEM FOR NATURAL GAS-FIRED BOILERS

MODEL HE (Series 2)

MODEL VHE (Series 2)

NATURAL GAS

Part No. 550-141-422/0983WP
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HE (Series 2) and VHE (Series 2)
Base Assembly Parts Description
With White-Rodgers Cycle-Pilot®
For Natural Gas Firing

<table>
<thead>
<tr>
<th>FIGURE NO.</th>
<th>MODEL NO.</th>
<th>HE &amp; VHE 3</th>
<th>HE &amp; VHE 4</th>
<th>HE &amp; VHE 5</th>
<th>HE &amp; VHE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PART DESCRIPTION</td>
<td>QTY.</td>
<td>PART NO.</td>
<td>QTY.</td>
<td>PART NO.</td>
</tr>
<tr>
<td>3</td>
<td>Relite Control</td>
<td>1</td>
<td>511-330-111</td>
<td>1</td>
<td>511-330-111</td>
</tr>
<tr>
<td>7</td>
<td>Gas Valve Assembly</td>
<td>1</td>
<td>511-044-288</td>
<td>1</td>
<td>511-044-288</td>
</tr>
<tr>
<td></td>
<td>Orifice, Main Burner Natural Gas No. 47 Drill</td>
<td>4</td>
<td>560-528-992</td>
<td>6</td>
<td>560-528-992</td>
</tr>
</tbody>
</table>

■ Not Shown.

NOTE: PARTS LISTED ABOVE ARE FOR BOILERS FIRED WITH NATURAL GAS ONLY. FOR ADDITIONAL PARTS COMMON TO NATURAL AND PROPANE GASES REFER TO BOILER MANUAL.

IMPORTANT: When calling or writing about the boiler, PLEASE GIVE THE MODEL, SERIES, AND C.P. NUMBERS, located on the boiler.

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HE (Series 2) and VHE (Series 2)
WHITE-RODGERS CYCLE-PILOT® IGNITION SYSTEM COMPONENTS
FOR NATURAL GAS FIRING

TRANSFORMER
FIGURE 1

PRESSURE SWITCH
FIGURE 2

5059 RELITE CONTROL
FIGURE 3

PRE-PURGE TIMER
FIGURE 5

CHECKING FOR ENERGIZED PILOT
SOLENOID COIL. MAGNETIC PULL
MEANS COIL IS "ON".
FIGURE 9

NOTE: When gas cock is positioned over
black line on collar around knob, pilot will cycle
on and off but main burner gas will not flow.

36C84 GAS COCK KNOB
FIGURE 6

36C84 GAS VALVE
FIGURE 7

FLAME SENSOR SOCKET
FIGURE 10

THERMAL FUSE ELEMENT (TFE)
FIGURE 4

E50 PILOT BURNER ASSY.
FIGURE 8

3098 MERCURY FLAME SENSOR
FIGURE 11

(1)
BOILER EQUIPMENT COMPONENTS
BLOWER MOTOR
120/60/1, 3450 RPM permanent split capacitor motor with capacitor start and internal overload protection provides rotation of induced draft fan.

FAN (BLOWER WHEEL)
Develops induced draft to supply combustion air to boiler.

PRE-PURGE TIMER
Provides 30 second pre-purge prior to pilot ignition.

HIGH TEMPERATURE LIMIT CONTROL
In the event of high boiler water temperature, shuts down fan and burners but allows circulator to run as long as there is a call for heat from thermostat.

PRESSURE SWITCH
Detects pressure differential across fixed metering orifice to prove air flow through boiler.

COMBINATION PRESSURE AND TEMPERATURE GAUGE
Provides readings of boiler water pressure and temperature.

COMBINATION RELAY RECEPTACLE, JUNCTION BOX AND TRANSFORMER
120/24 VOLT 40 VA transformer provides low voltage for control circuit. Relay receptacle for plug-in circulator relay. Terminal strip for control circuit wiring.

PLUG-IN CIRCULATOR RELAY
Provides contact to energize circulator and fan and contact to prove operation of pressure switch.

ASME SAFETY PRESSURE RELIEF VALVE
Provides safety discharge in the event boiler water pressure exceeds 30 PSIG.

FILL-TROL SYSTEM (TYPES P-HE AND P-VHE ONLY)
Includes compression tank with permanent air cushion and combination manual shut-off valve, check valve, pressure reducing valve and strainer for automatic filling and maintaining minimum system pressure.

AUTOMATIC AIR VENT (TYPES P-HE AND P-VHE ONLY)
Vents air from boiler built-in air eliminator tapping.

GAS VALVE
Incorporates a pilot/redundant solenoid valve, integral pressure switch to sense incoming gas pressure, pressure regulator, main valve operator and socket to accept plug-in Mercury Flame Sensor.

MERCURY FLAME SENSOR
Consists of sensing bulb, capillary tube and diaphragm filled with mercury and connected to SPDT switch. Heat from pilot vaporizes mercury causing diaphragm to snap switch.

RELITE CONTROL
Provides spark to light pilot.

PILOT BURNER ASSEMBLY
Includes spark ignition pilot with mercury flame sensing probe.

THERMAL FUSE ELEMENT (TFE)
Provides safety shutdown of burners and pilot if flame is not contained in firebox.

DRAIN VALVE
Used to drain boiler if necessary.

CIRCULATOR
Provides forced water circulation to hot water heating system.

SEQUENCE OF OPERATION
Referring to Ladder Diagram, Page 5.
1. Thermostat closes, activating relay CR (through pressure switch). Contacts CR1 and CR2 close:
   a) CR2 activates circulator.
   b) Blower is activated through limit switch.
   c) CR1 provides a bypass around pressure switch to prove its operation.
2. When adequate draft is proven by pressure switch, the 30 second pre-purge timer starts.
3. After a 30 second delay, 24 VAC is provided to terminals:
   a) T2 on relite control which starts spark.
   b) L on gas valve which opens pilot valve.
4. Pilot ignites:
   a) Flame conduction stops spark from relite.
   b) Mercury flame sensor opens main gas valve and pressure switch in gas valve holds pilot open.
5. After thermostat is satisfied, CR is deactivated:
   a) CR2 opens turning off blower and pump.
   b) CR1 opens turning off gas flow.
6. As air flow from blower reduces pressure, switch changes to normally closed position.
7. Boiler is now in "off" cycle.
SCHEMATIC WIRING DIAGRAM

CAUTION

DISCONNECT POWER SOURCE BEFORE INSTALLING AND/OR SERVICING UNIT.

NOTES:
1. All wiring must be installed in accordance with the requirements of the National Electrical Code and any additional national, state, or local code requirements having jurisdiction.
2. All safety circuit wiring must be N.E.C. Class 1.
3. Refer to Control Components Instructions Sheets packed with the boiler for application information.
4. Use only 90° C. Thermoplastic Wire, or equivalent, if any of the original wire must be replaced.

THERMOSTAT HEAT ANTICIPATOR SETTING

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HE and VHE</td>
<td>0.40 AMPS.</td>
</tr>
</tbody>
</table>

LADDER WIRING DIAGRAM


WEIL-McLAIN
Michigan City, Indiana 46360
A Marley Company
TROUBLE SHOOTING PROCEDURE

DANGER

NEVER jumper out (by-pass) the Thermal Fuse Element (T1E) or any other safety device (except for momentary testing as outlined in Trouble Shooting Tables). A fire causing property damage and/or personal injury could result.

A. Before starting the trouble shooting procedure, be sure of the following:

1. You have a voltmeter capable of checking 120 VAC, 24 VAC and a continuity tester.
2. That 120 VAC power supply is available to the boiler (minimum 102 VAC, maximum 132 VAC).
3. That there is 24 VAC at the secondary side of the control transformer.
4. You have an inclined manometer with a range of 0–2.0” W.C.

CHECKING THE PRESSURE DIFFERENTIAL SWITCH

Note: Make sure boiler water temperature is 100°F or cooler before beginning procedure.

1. Remove the sensing tube at the front of the pressure switch (closest to you as you face the boiler). Refer to Figure 12.
2. Install a "T" into the sensing tube and another piece of tubing from the "T" to the pressure switch.
3. Attach the third leg of the "T" to the suction side of an inclined manometer.
4. Remove the sensing tube at the rear of the pressure switch.
5. Install a "T" into the sensing tube and another piece of tubing from the "T" to the pressure switch.
6. Attach the third leg of the "T" to the pressure side of the manometer.
7. Close the manual main gas valve and set thermostat to call for heat. Blower will run but pilot and main burners will not ignite.

8. Check for 24 VAC between normally open terminal on pressure switch and terminal C on transformer (Figure 1 and 2).
9. If the reading on the manometer is at least 1.8 inches water column pressure, but there is not 24 V across N.O. terminal on pressure switch and terminal C, replace the pressure switch.
10. If the reading is lower than 1.8” W.C. look for the following causes:
   a. Blockage in sensing tube.
   b. Obstruction in the blower housing outlet.
   c. Loose blower wheel on motor shaft.
   d. Blower motor not at proper RPM.
   e. Blower back plate not sealed properly.
   f. Blockage in the block assembly.
   g. Blockage in the fuel pipe or termination.
11. When pressure reading is proper and pressure switch is operating properly, remove "T"'s and re-install sensing tubes to the pressure switch.
TABLE I—BLOWER AND CIRCULATOR WILL NOT OPERATE

Is there 24V at terminals R & C? (Figure 1)

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

Is circuit breaker thrown or fuse blown at service disconnect?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

- Replace transformer after checking for loose connections
- Reset circuit breaker or replace fuse

Is there 24V at terminals G & C? (Figure 1)

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

Is CR relay pulling in? (See Figure 1)

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

- Replace pressure switch
- Replace thermostat after making sure thermostat is set for call for heat
- Replace CR relay
- Check for loose connections at CR2 contact

TABLE II—BLOWER WILL NOT OPERATE, BUT CIRCULATOR DOES OPERATE

Momentarily bypass high temperature limit switch. Does blower motor run?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

After checking setting, replace limit control

Is 120 VAC available to motor/limit circuit in the junction box?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Correct wiring.

Check for bound blower wheel, shipping restraint removal or bad motor capacitor.

Does blower motor hum?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Replace blower motor.
TABLE III—CIRCULATOR WILL NOT OPERATE, BUT BLOWER DOES OPERATE

<table>
<thead>
<tr>
<th>Is there 120V at the circulator wiring connections?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

- Check for loose connections.
- Replace circulator.

TABLE IV—NO SPARK AT PILOT—BLOWER & CIRCULATOR BOTH OPERATE

<table>
<thead>
<tr>
<th>Is 24VAC between Terminal C on relay/transformer (Figure 1) and normally open contact on air pressure switch? (Figure 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

- After at least 45 seconds is 24 VAC between Terminal C on relay/transformer (Figure 1) and each terminal on 30 sec. pre-purge timer? (Figure 5)
  - Yes
  - No

  - Check for proper differential air pressure. (See Figure 12). Is reading more than 1.8" W.C.?
    - Yes
    - No

  - Is 24 VAC present between Terminal C on relay/transformer (Figure 1) and each terminal on TFE? (Figure 4)
    - No
    - Yes

  - Check wiring then replace 30 second pre-purge timer. (Figure 5)
    - Replace pressure switch
    - Refer to Step 10, Page 8 and correct problem.

  - Check wiring then replace TFE and pressure switch (Figures 2 and 4).

**CAUTION**
NEVER REPLACE TFE WITHOUT REPLACING PRESSURE SWITCH

**DANGER**
NEVER JUMPER OUT (BY-PASS) TFE

<table>
<thead>
<tr>
<th>Is 24 VAC across spade terminals on Reite control? (Figure 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

- Remove electrode cable from Reite control and attempt to draw a high voltage arc from Reite control to ground. Does Reite control spark to ground? (See Figure 3).
  - Yes
  - No

- Check/replace pilot burner/ignition electrode assembly.
- Replace Reite control.
- Check wiring.
TABLE V—SPARK IS PRESENT—PILOT WILL NOT LIGHT

- **Make sure all gas cocks and gas shut-off valves are open. Is the gas cock knob on the 36C84 valve in the “on” position? (Figure 6)**
  - **Yes**
  - **No**

- **Is incoming pressure at least 5.0”?**
  - **Yes**
  - **No**
    - **Move gas cock knob to the “ON” position. (Figure 6)**

- **Is 3098 Mercury Flame Sensor plugged into gas valve? (Figure 11)**
  - **Yes**
  - **No**
    - If all gas cocks are open, contact the gas supplier. The 36C84 series valve requires a minimum of 5.0” W.C. inlet. (Figure 7)
    - **Firmly seat 3098 Flame Sensor into gas valve socket. (Figures 10-11)**

- **Place a steel rule or small screwdriver blade across the top of the pilot solenoid coil. Is a magnetic pull felt? (Figure 9)**
  - **Yes**
  - **No**

- **Is gas present at the pilot burner? (Use a match taped to a long screwdriver or a pilot lighter to manually light pilot.) (Figure 8)**
  - **Yes**
  - **No**
    - **Check wiring to gas valve.**

- **Check for ignition sparks between the electrode tip and the sensing bulb. Does spark occur in the middle of the pilot gas stream.**
  - **Yes**
  - **No**
    - **Check for blocked pilot orifice or tubing. (Figure 8). If orifice and tubing are clear, replace gas valve. (Figure 7)**

- **Check for physical damage to the pilot burners/electrode or debris near electrode. With a manually lit pilot flame, check the position of the tip of the ignition electrode. The tip should be in the soft blue portion of the pilot flame so that a spark to the pilot head will ignite pilot gas. On an ignition trial does the gas sputter past the spark? (See Figure 8)**
  - **Yes**
  - **No**

- **Check for weak ignition spark, spark occurring at locations other than ignition electrode, high drafts across pilot burner, and damaged pilot burner assembly. (Figure 8)**
  - **Yes**
  - **No**

- **Decrease pilot gas pressure. Remove pilot adjust cover screw and rotate adjust screw counterclockwise to decrease gas pressure (Figure 7)**
  - **Attempt to increase pilot gas pressure by removing pilot adjust cover-screw and rotating pilot adjust screw clockwise. If pilot flame size does not increase, check for high drafts across pilot burner. (Figure 10)**
### TABLE VI—SPARK WILL NOT SHUT-OFF AFTER PILOT FLAME IS ESTABLISHED

<table>
<thead>
<tr>
<th>Is electrode tip in pilot flame?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

**Reposition electrode so that flame completely surrounds electrode tip.**

<table>
<thead>
<tr>
<th>Is Relite Control (Figure 3) grounded thru metal standoff mounting-rings?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

**Scrape paint to bare metal to properly ground mounting standoff.**

<table>
<thead>
<tr>
<th>Does continuity exist between electrode tip and 1/4&quot; spade connector on ignition cable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

**Inspect junction of ignition cable and ceramic insulator. Cable is attached with a push-on connector. Firmly push cable into ceramic. Does continuity now exist between electrode tip and end of ignition cable?**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

**Re-test operation and put back in service.**

**Remove corrosion or provide a separate ground lead, as necessary, to insure continuity exists between pilot burner and Relite standoff mounting-rings.**

**Replace electrode cable assembly.**

**Replace Relite Control (Figure 3).**
TABLE VII—PILOT LIGHTS—NO MAIN BURNER IGNITION

- Is gas cock on 36C84 valve in "ON" position? (Figure 6)
  - Yes
  - No
    - Unplug flame sensor from gas valve. Does pilot remain lit? (Figures 10–11)
      - Yes
      - No
        - Move valve on "ON" position and cycle system. (Figure 6)
        - Insert a short jumper wire between holes 2 and 4 on the gas valve socket. CAUTION: This should energize the main valves Does the main valve come on? (Figure 10)
          - Yes
          - No
            - Replace gas valve.
            - Check for partially open gas cocks. Contact the gas supplier. The 36C84 valve requires an inlet pressure 5.0" W.C. for proper operation. (Figure 6)
              - Is incoming gas pressure at least 5" W.C.?
                - Yes
                - No
                  - Replace gas valve.
                  - Replace 36C84 gas valve. (Figure 7)
                    - Is incoming gas pressure at least 5.0" W.C.? (Figure 7)
                      - Yes
                      - No
                        - Replace flame sensor. (Figure 11)
                          - Check for poor connections between flame sensor plug and gas valve socket.
                            - Does continuity exist between sockets 2 and 4 on flame sensor receptacle? (Figure 10)
                              - Yes
                              - No
                                - Replace flame sensor. (Figure 11)
                                  - Replace 36C84 gas valve. (Figure 7)