WEIL-McLAIN

HE and VHE (Series 3) Hot Surface Ignition (HSI) System

Control Supplement

USING CONTROL SYSTEMS BY:
WHITE-RODGERS
FENWAL
HONEYWELL

MODEL HE

MODEL VHE

FOR NATURAL OR PROPANE GAS-FIRED BOILERS

Part No. 550-141-518/0387WP
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**IMPORTANT:** When calling or writing about the boiler, PLEASE GIVE THE MODEL, SERIES, AND C.P. NUMBER, located on boiler rating plate.

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HOT SURFACE IGNITION SYSTEM
(WHITE-RODGERS SYSTEM SHOWN)

INDIVIDUAL COMPONENTS SHOWN ON PAGE 4
Section I: Components

120/24V 40 VA TRANSFORMER AND DPST CIRCULATOR RELAY
FIGURE 1

PRESSURE SWITCH
FIGURE 2

THERMAL FUSE ELEMENT (TFE)
FIGURE 3

WHITE-RODGERS IGNITION CONTROL
(Powers gas valve, ignitor, and flame sensor)
FIGURE 4

FENWAL IGNITION CONTROL
(Powers gas valve and ignitor)
FIGURE 5

HONEYWELL IGNITION CONTROL
(Powers gas valve and ignitor)
FIGURE 6

WHITE-RODGERS FLAME SENSOR
(Used with W-R ignition control to sense flame during main burner run cycle)
FIGURE 7

GAS COCK KNOB

GAS VALVE
(Incorporates redundant solenoid valve, step-opening pressure regulator, and main valve operator)
FIGURE 8

IGNITOR
(Heats to light main burners)
FIGURE 9
WHITE-RODGERS HOT SURFACE IGNITION SYSTEM

1. Thermostat closes, activating relay CR (through pressure switch). Contacts CR1 and CR2 close:
   a) CR2 activates: circulator
      blower through limit switch
   b) CR1 provides by-pass around pressure switch to prove its operation.

2. Pressure switch proves safe air flow, and switches to NO position, allowing 24 VAC through TFE to ignition control.

3. 45-second igniter heat-up.

4. 7-second trial for ignition:
   a) Valve opens—low fire position
   b) Flame rectification proves.
   c) Power to ignitor off.
   d) Main valve switches to high fire position.

5. After thermostat is satisfied, CR is deactivated:
   a) CR2 opens turning off blower and circulator.
   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.

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**SCHEMATIC WIRING DIAGRAM**

**LADDER WIRING DIAGRAM**

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**WARNING**

Electric shock hazard. Can cause severe injury or death. Disconnect power source before installing and/or servicing.

**NOTES:**
1. All wiring must be installed in accordance with the requirements of the national electrical code and any additional state or local code requirements having jurisdiction.
2. Refer to control component instruction sheets packed with boiler for application information.
3. If any of the original wire must be replaced, use 90°C thermoplastic or equivalent.
4. All safety circuit wiring must be N.E.C. Class 1.
5. Gas valve terminals:
   - White-Rodgers—1 and 2
   - Honeywell—TR and TH

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<table>
<thead>
<tr>
<th>THERMOSTAT HEAT ANTICIPATOR SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HE</strong></td>
</tr>
<tr>
<td>WATER</td>
</tr>
</tbody>
</table>

WEIL-McLAIN

Michigan City, Indiana 46360
A Marley Company

Part Number 550-141-476/0387WM

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5
FENWAL HOT SURFACE IGNITION SYSTEM

1. Thermostat closes, activating relay CR (through pressure switch). Contacts CR1 and CR2 close:
   a) CR2 activates: circulator blower through limit switch
   b) CR1 provides by-pass around pressure switch to prove its operation.

2. Pressure switch proves safe air flow, and switches to NO position, allowing 24 VAC through TFE to ignition control.

3. 45-second igniter heat-up.

4. 6.8-second trial for ignition:
   a) Valve opens—low fire position
   b) Power to ignitor off.
   c) Flame rectification proves.
   d) Main valve switches to high fire position.

5. After thermostat is satisfied, CR is deactivated:
   a) CR2 opens turning off blower and circulator.
   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.

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WARNING

Electric shock hazard. Can cause severe injury or death. Disconnect power source before installing and/or servicing.

NOTES

1. All wiring must be installed in accordance with the requirements of the national electrical code and any additional state or local code requirements having jurisdiction.

2. Refer to control component instruction sheets packed with boiler for application instructions.

3. If any of the original wire must be replaced, use 90°C thermoplastic or equivalent.

4. All safety circuit wiring must be N.E.C. Class 1.

5. Gas valve terminals: White—Rogers—1 and 2 Honeywell—TR and TH.

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THERMOSTAT HEAT ANTICIPATOR SETTING

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

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HE and VHE Series 3 Schematic and Ladder Wiring Diagrams. FENWAL Hot Surface Ignition System. Applicable for natural or propane gas-fired, forced hot water boilers.

WEIL-McLAIN
Michigan City, Indiana 46360
A Marley Company

Part Number 550-141-474/0387WM
HONEYWELL HOT SURFACE IGNITION SYSTEM

1. Thermostat closes, activating relay CR (through pressure switch). Contacts CR1 and CR2 close:
   a) CR2 activates: circulator
      blower through limit switch
   b) CR1 provides by-pass around pressure switch to prove its operation.

2. Pressure switch proves safe air flow, and switches to NO position, allowing 24 VAC through TFE to ignition control.

3. 45-second igniter heat-up.

4. 6-second trial for ignition:
   a) Valve opens—low fire position
   b) Power to igniter off.
   c) Flame rectification proves.
   d) Main valve switches to high fire position.

5. After thermostat is satisfied, CR is deactivated:
   a) CR2 opens turning off blower and circulator.
   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

LADDER WIRING DIAGRAM

NOTES:
1. All wiring must be installed in accordance with the requirements of the national electrical code and any additional state or local code requirements having jurisdiction.
2. Refer to control component instruction sheets packed with boiler for application information.
3. If any of the original wire must be replaced, use 90°C thermoplastic or equivalent.
4. All safety circuit wiring must be N.E.C. Class 1.
5. Gas valve terminals:
   White-Rodgers—1 and 2
   Honeywell—TR and TH.

| THERMOSTAT HEAT ANTICIPATOR SETTING |
| SYSTEM  | HE  | VHE |
| WATER   | 0.40 AMPS | 0.40 AMPS |

WARNING
Electric shock hazard. Can cause severe injury or death. Disconnect power source before installing and/or servicing.

HE and VHE Series 3 Schematic and Ladder Wiring Diagrams.
HONEYWELL Hot Surface Ignition System. Applicable for natural or propane gas-fired, forced hot water boilers.

WEIL-McLAIN
Michigan City, Indiana 46360
A Marley Company
Part Number 550-141-472/0387WM
Section III: Troubleshooting Procedure

DANGER

NEVER jumper (by-pass) Thermal Fuse Element (TFE) 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.

CAUTION

Access panel must be in position during boiler operation to prevent momentary flame rollout on ignition of main flame, which can melt thermal fuse element. Never jumper thermal fuse.

A. Before trouble shooting:
   1. Have a voltmeter capable of checking 120 VAC, 24 VAC and a continuity tester.
   2. Is 120 VAC power supply available to the boiler (minimum 102 VAC, maximum 132 VAC)?
   3. Is 24VAC at the secondary side of the control transformer?
   4. Have an inclined manometer with a range of 0–2.0" W.C.

B. Visually check for following conditions:
   1. Ignitor does not glow—see Tables I, II, & IV.
   2. No main burner ignition—see Table V.
   3. Main burners come on and drop out—see Table VI.

SPECIAL SERVICE TIPS

IGNITOR
1. Unplug ignitor and remove entire bracket assembly for service.
2. Ignitor is fragile. Handle with care.
3. Attach ignitor and ignitor shield to ignitor bracket before installing.

GAS VALVE
1. Install gas valve with arrow in direction of gas flow.

IGNITION CONTROL
1. Make sure ground wire is attached per wiring diagram. Good grounding is extremely important for proper flame rectification.
CHECKING THE PRESSURE DIFFERENTIAL SWITCH

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

1. Remove sensing tube at front of pressure switch (closest to you as you face the boiler).
2. Install a "T" into sensing tube. Run another piece of tubing from the "T" to the pressure switch.
3. Attach third leg of the "T" to suction side of an inclined manometer.
4. Remove sensing tube at the rear of pressure switch.
5. Install a "T" into sensing tube. Run another piece of tubing from the "T" to the pressure switch.
6. Attach third leg of the "T" to pressure side of the manometer.
7. Close manual main gas valve and set thermostat to call for heat. Blower will run but main burners will not ignite.
8. Check for 24 VAC between normally open terminal on pressure switch and terminal C on transformer (Figures 1 and 2).
9. If manometer reading is at least 1.5 inches water column pressure, but there is not 24 V across N.O. terminal on pressure switch and terminal C, replace pressure switch.
10. If reading is lower than 1.5" W.C. look for the following causes:
   a) Blockage in sensing tube.
   b) Obstruction in 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 block assembly.
   g) Blockage in flue 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. Reset system by turning on and off main electrical switch.

FIGURE 10
TABLE II—BLOWER WILL NOT OPERATE, BUT CIRCULATOR DOES OPERATE

| Momentarily bypass high temperature limit switch. Does blower motor run? |
|-----------------------------|----------------|
| Yes                         | No             |

After checking setting replace limit control.

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

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

Does blower motor hum?

| Yes                          | No                           |

Correct wiring.

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

Replace blower motor.

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

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

Check for loose connections

Replace circulator.
## TABLE IV—IGNITOR WILL NOT GLOW—BLOWER & CIRCULATOR BOTH OPERATE

**NOTE:** CHECK FOR LOCKOUT BEFORE PROCEEDING. OPEN THERMOSTAT, THEN CLOSE FOR NEW CALL FOR HEAT.

### Diagram

**120/240V 40 VA TRANSFORMER AND DPST CIRCULATOR RELAY**

**FIGURE 1**

**Pressure Switch**

**FIGURE 2**

**Thermal Fuse Element (TFE)**

**FIGURE 3**

### Flowchart

1. **Is 24VAC between Terminal C on relay/transformer (Figure 1) and normally open contact on air pressure switch? (Figure 2)**
   - **Yes**
   - **No**

   - **Check for proper differential air pressure. Is reading more than 1.5 W.C.?**
     - **Yes**
     - **No**

     - **Replace pressure switch.**
     - **Refer to Step 10, Page 9 and correct problem.**

   - **Is 24VAC present between Terminal C on relay/transformer (Figure 1) and each terminal on TFE? (Figure 3)**
     - **No**
     - **Yes**

     - **Check wiring then replace TFE**

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

   - **For White-Rodgers ignition control:**
     - Is 24VAC across Terminals TH & TR on ignition control and line voltage across Terminal IGN and ground on case?
   - **For Fenwal Ignition control:**
     - Disconnect harness from control. At harness plug, is 24VAC across "power" (yellow) and "ground" (green) and line voltage across "LI" (black) and "L2" (white)?
   - **For Honeywell Ignition control:**
     - Is 24VAC across Terminals 25V and 25V (Grnd) on ignition control and line voltage across Terminals L1 and L2?

   - **Yes**
   - **No**

   - **Is line voltage across terminals at molex plug from control to ignitor?**
     - **Yes**
     - **No**

     - **Check wiring.**

   - **Check/replace ignitor and ignitor wiring**
   - **Replace ignition control after checking wiring harness continuity.**
### TABLE V—IGNITOR GLOWS, MAIN BURNERS WILL NOT LIGHT

**WHILE IGNITOR GLOWS**
- For White-Rodgers ignition control:
  - Is 24VAC across terminals "MV"?  
  - Is 24VAC across terminals "Valve"?
- For Honeywell ignition control:
  - Is 24VAC across terminals "Valve"?
- For Fenwal ignition control:
  - Disconnect harness from control, At harness plug, is 24VAC across "Valve" (blue) and "Ground" (green)?

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

- Is 24VAC across gas valve terminals?
  - No
  - Yes

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

- Replace ignition control
- Replace valve
- Replace wiring
- Turn gas cock knob to "ON" position

### TABLE VI—IGNITOR GLOWS—MAIN BURNERS LIGHT, THEN SHUT DOWN

- White-Rodgers:
  - Is flame sensor grounded or damaged, or lead insulation touching case?
- Honeywell or Fenwal:
  - Go to "No" Response

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

- Replace as necessary
- 120VAC wiring between hot and neutral must be correct. Is 120VAC between black wire in boiler junction box and ground (water pipe)?

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

- Check for proper differential air pressure. (See Figure 10.) Is reading more than 1.5" W.C.?

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

- Check/rewire as necessary
- Attach ground wire
- Replace ignition control
- Refer to Step 10, Page 9.
## PARTS LIST

**NOTE:** CONTROLS ARE INTERCHANGEABLE UNLESS OTHERWISE NOTED.

<table>
<thead>
<tr>
<th>FIG. NO.</th>
<th>PART DESCRIPTION</th>
<th>VENDOR/PART NUMBER</th>
<th>WEIL-McLAIN PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STEP-OPENING GAS VALVES: NATURAL PROPANE</td>
<td>WHITE-RODGERS 36C74-215</td>
<td>511-044-320 ■</td>
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<tr>
<td></td>
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<td>HONEYWELL VR8450P2111</td>
<td>511-044-315 ■</td>
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<td>WHITE-RODGERS 36C74-227</td>
<td>511-044-322 ■</td>
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<td>HONEYWELL VR8450P2137</td>
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<td>2</td>
<td>IGNITION CONTROL</td>
<td>WHITE-RODGERS 50D47-170</td>
<td>511-330-129 ■</td>
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<tr>
<td>3</td>
<td>FLAME SENSOR  *</td>
<td>WHITE-RODGERS 760-802</td>
<td>511-330-192 ■</td>
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<td>5</td>
<td>WIRING HARNESS  *</td>
<td>WHITE-RODGERS F115-0100</td>
<td>591-391-808</td>
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<tr>
<td>2</td>
<td>IGNITION CONTROL</td>
<td>FENWAL 05-212225-103</td>
<td>511-330-128 ■</td>
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<td>WIRING HARNESS  *</td>
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<td>2</td>
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<td>4</td>
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<td>WHITE-RODGERS 767A-350</td>
<td>511-330-191 ■</td>
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<td>NORTON 201</td>
<td>511-330-190</td>
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<td>6</td>
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<td>WEIL-McLAIN</td>
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<td>7</td>
<td>IGNITOR SHIELD</td>
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<td>8</td>
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<td>—6</td>
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<td>450-030-647</td>
</tr>
</tbody>
</table>

* Items are interchangeable as groups only. Flame sensor is only used with White-Rodgers.
■ Can be purchased at local supply house or distributor.