Honeywell Modulation Motor
used on CEI hot oil heaters

On the Fireye flame monitor mounted in the heater’s control panel, look for these error messages:

**M-D Limit open** (Low fire limit): Check position of cam (Figure 2). Check plug to limit switch (Figure 3).

**D-8 Limit open** (High fire limit) (older units): Message normal at beginning of start up sequence until cam rotates to close switch. If message remains after 90° actuation of mod motor, check position of cam (Figure 2). Check plug to limit switch (Figure 3).

**M-8 Limit open** (High fire limit) (newer units): Message normal at beginning of start up sequence until cam rotates to close switch. If message remains after 90° actuation of mod motor, check position of cam (Figure 2). Check plug to limit switch (Figure 3).

Unit will start out with M-D limit made (low fire switch in closed position) then actuate to close high fire switch (D-8)/(M-8). Message on Fireye will read Stanby D-8 Limit Open at start of cycle. This message will go away once limit is made. (*If limit is not made Fireye will display M-8/D-8 Limit open). High fire purge cycle will last for 1 minute. Mod motor will then actuate back to low fire (M-D) and close low fire limit switch to begin low fire purge cycle for 30 seconds. (**If M-D limit is not made Fireye will display M-D

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*SHOCK HAZARD. High voltage is present on certain terminals and wires inside the main control panel, inside the mod motor and inside the burner panel. Touching them will cause death or serious injury.*

Do not work on these components unless you are a qualified technician familiar with the hazards of electricity. Some circuits in the main control panel may receive power from remote sources. Thus, the breaker operator on the door may not deenergize all exposed live parts.

Always use a voltage tester to make sure there is no voltage on the terminals or bare wires you may touch.
At end of low fire purge cycle, burner will go to PTFI phase and pilot will light. Flame signal will be detected by Fireye flame scanner (Usually 25 to 80 flame strength). Unit will then move to MTFI sequence for main flame detection. After ten seconds of MTFI unit will go to Auto flame sequence at which point burner control will be transferred to temperature controller and away from Fireye. At this point the unit will also modulate to high fire.

In normal operation, heater will run in high fire until it reaches 15 degrees F above the set point. At this point it will modulate to low fire. At 25 degrees F above the set point, the burner will shut down. Unit will relight when temperature drops to 10 degrees F below the set point. At this point the purge cycle will begin and the heater will relight.

**M-D Limit Open** signifies that Low fire limit is not being made. Adjust outer cam (Figure 2) until limit is made (Two clicks UP toward limit switch). Reset Fireye and re-start unit. Also check plug harness connections on micro switches. If unit actuates 90° and Fireye still shows open and switch is being made, the connection to switch could be loose.

**D-8/M-8 Limit Open** signifies that High fire limit is not being made. Message will appear at beginning of purge cycle as the mod motor is driving to high fire purge. If message is being seen once mod motor has actuated 90°, adjust inner cam (Figure 2) until limit is made (Two clicks Down toward limit switch). At this point purge cycle should begin again and countdown will continue.
Lockout D-8 Limit Closed signifies that High fire limit is staying closed when it should be open. Adjust cam (Figure 2) as needed. May also signify possible issue with micro-switch within controller.

Lockout M-D Limit Closed signifies that Low fire limit is staying closed when it should be open. Adjust cam (Figure 2) as needed. May also signify possible issue with micro-switch within controller.

Adjustments to cams can be made using flat-head screwdriver. Cams will click when turned and can move in either direction without risk of damage. Adjust cam 2 “clicks” into made position of switch.

**Figure 6.** High fire cam and low fire cam.

**Figure 7.** Honeywell modulation motor cams and switches.
Section 2  **Testing Mod Motor and Resistor Board**

Check for power at terminal 49 (M on newer units) in the heater's control panel (Figure 9 and Figure 10) to verify power is going to mod motor. If 120 volts AC, continue with steps below.

**TASK: Transformer Power Verification**

1. Check for incoming voltage to transformer. Black and white wires (120 volts AC). (Figure 11).

2. Check secondary transformer voltage out T1 and T2. (Two brown wires should be getting 24 volts AC). (Figure 11).

3. If secondary voltage is not correct, replace transformer or motor.

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### Troubleshooting — Specific Problems

<table>
<thead>
<tr>
<th>Problem / Symptom</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mod Motor does not drive to high fire or Mod Motor drives to high fire and will not return to low fire</td>
<td>Incorrect dip switch settings</td>
<td>Correct – see Resister Board manual RB</td>
</tr>
<tr>
<td></td>
<td>Defective Resistor Board</td>
<td>Check resistance across R(-) &amp; B – should be 237 Ohms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check resistance across R(-) &amp; W(+) – should be 66.5 Ohms</td>
</tr>
<tr>
<td>Mod Motor does not move</td>
<td>Internal damage to the motor gears</td>
<td>Remove top cover and inspect gear teeth. If gears are damaged, replace motor.</td>
</tr>
<tr>
<td></td>
<td>Loose wires</td>
<td>Check and tighten all wire connections</td>
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</tbody>
</table>

*Figure 8. Troubleshooting table.*
**TASK: Resistor Board Check**

1. Disconnect power to allow removal of resistor board (Figures 12 and 13). Document which wires land on respective terminals. Remove all wires from terminal strip on resistor board. Remove resistor board.

2. Ensure dip switches on resistor board are set correctly. Set switches according to Figure 15.

3. Check resistance across terminals $R(-)$ & $B$ (Figure 14). Resistance should be 237 ohms.

4. Check resistance across terminals $R(-)$ & $W(+)$. Resistance should be 66.5 ohms.

5. If resistance measurements are not correct replace resistor board. *(NOTE: New style resistor board is a drop-in replacement for the old style.)*

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**Figure 11.** Transformer wiring.

**Figure 12.** Old style and new style resistor boards.

**Figure 13.** Resistor board and terminal strip.
**TASK: Check Motor Action**

1. With power still disconnected and resistor board removed, connect a jumper from T1 terminal to one of the transformer brown wires. Connect another jumper from T2 terminal to the other brown wire at the transformer. (Figure 16)

2. With power reconnected to Mod motor. Place jumper between terminals R(−) to B

   **(CAUTION: T1, T2 and the transformer brown wires will have voltage)**

   The motor should turn 90°.

3. Remove jumper from R(−) to B. Standard motor action is 90% approx. The motor should turn 90°.

4. If the damper is not in the original closed position when the heater is off or the jumper is removed, connect jumper from R(−) to W(+) in order to make the motor drive back to the closed position. Remove jumper after the motor is in closed position.

5. If the motor does not actuate 90 degrees full open or close to the off position on the heater, replace the motor.

6. Remove all jumpers from the Motor with power disconnected.

7. Remove all jumpers from the spade terminals.

   **These same steps can be followed to set cams for low and high fire switches. Apply jumpers to set high fire cam when unit drives 90°.**

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**Section 3 Cam Operation**

Adjustable cams actuate the auxiliary switches. These cams may be set to actuate the switches at any angle within the stroke of the motor.

Motors with factory-added auxiliary switches are shipped in the closed position: fully counterclockwise, as viewed from the power end.

The goal is to set the outer auxiliary switch cam to depress the **Low Fire** switch when the Mod Motor is in the **fully closed** position (Figure 17) and set the inner auxiliary switch cam to depress the **High Fire** switch when the motor is in the **fully open** position. (Figure 18).

**TASK: Setting Cam Positions**

1. Using an 1/8” in. straight-blade screwdriver, with the Mod Motor in the fully closed position, adjust the outer blue cam so the fast rise portion of the cam is two (2) notches (clicks) into the **LOW FIRE** switch.

2. Jumper spade terminals R(−) to B and drive the Mod Motor to the fully open position. (Figure 19).

3. Adjust the inner blue cam so the fast rise portion of the cam is two (2) notches (clicks) into the **HIGH FIRE** switch.
Figure 18. High fire switch depressed when mod motor is in fully open position.

Figure 19. Using jumpers to drive the mod motor to the fully-open position.

CEI Replacement Part Numbers

<table>
<thead>
<tr>
<th>Part Description</th>
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<tbody>
<tr>
<td>Honeywell Modulation Motor</td>
<td>0304006</td>
</tr>
<tr>
<td>Resistor Board</td>
<td>0304007</td>
</tr>
</tbody>
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