



## TROUBLESHOOTING

**There is excellent literature on our website: *heatec.com*. Look under *TEC-NOTE*. You will find our newest heater manual. This is full of information (complete with great pictures) on our heaters. You will find pictures of all the controls and limit devices in the limit circuit. We have *TEC-NOTES* on our pre-heaters and tanks as well as other products.**

### Ask the Right Questions

1. What is the model and serial number? If you don't know, how old is it? Give description.
2. Is it a FIREYE flame monitor?
3. If so, what is showing on the display?
4. What is the LOCKOUT message? If you do not know, push scroll until you see LOCKOUT HISTORY (there will be an arrow pointing to the right) then press mode once. You will then get your last LOCKOUT message. Continue to press SCROLL to get your last 6 LOCKOUT messages. You will also get each burner cycle and burner hour in which the lockout occurred.
5. What type fuel are you using for your main flame?
6. Do you have a gas pilot?

**HEATEC, INC.**

P.O. BOX 7260 • CHATTANOOGA, TN 37407

5200 WILSON ROAD • CHATTANOOGA, TN 37410



## **LOCKOUT STANDBY 13-3 FVES (Fuel Valve End Switch)**

1. Do not to panic, (NO SMOKING or OPEN FLAMES) but close the manual hand valves in the gas train now! There could be a serious problem. The main gas valve could be open and putting raw gas in the heater. DO NOT try to restart the heater. NEVER JUMPER THIS!!
2. Do a leak test.
3. What is the ambient temperature? The gas valve or actuator could be frozen.
4. Check power on L1 & L2 in the actuator. If there is power, something is wired wrong. There should not be power on this until the FIREYE displays MTFI in the timing sequence.
5. Look in the window of the gas actuator. Normally, you will see CLOSED in yellow. If the valve is open, you may see OPEN in red. The valve could be open just a hair, and you may not know it.
6. Check to see if the actuator is firmly seated on the gas valve body. There are two set screws (90 degrees apart) that hold the actuator on the valve body.
7. There could be trash under the stem of the valve body.



## **LOCKOUT PTFI FLAME FAILURE (Pilot Trial For Ignition)**

### **What fuel are you using?**

#### **IF GAS:**

**Is there a flame?** With the heater off, remove, clean, and replace the rear sight glass. Restart heater and check for flame at PTFI.

#### **If no flame, check the following:**

1. Is the vent on the pilot gas regulator clogged? If the vent is clogged, the regulator will not allow gas to flow through. Remove the vent to check. Also, look for dust in the small hole in the regulator after removing the vent.
2. Is there gas (or propane) available? Check gas bottle (if propane). If it is a new gas bottle, there could be air in the top of the bottle. The gas bottle should have its own regulator. The gas company could have temporarily interrupted the supply of gas, and when they restored the supply, the gas line could be full of air.
3. Does the pilot solenoid open? Gas should be supplied to the pilot assembly downstream of the solenoid when it snaps to open.
4. What is the pilot pressure? Check the pilot pressure at the 1/8" plugged pipe tee at the pilot assembly. Remove the plug from the tee. There should be 3" wc pressure when the FIREYE display reads PTFI.
5. Does the transformer put out 6000 volts ac? Remove the wire at the transformer and when the FIREYE displays PTFI in the timing sequence, hold the wire about 1/16<sup>th</sup> to 3/32<sup>nds</sup> of an inch from the screw where you removed the wire. Be sure it is a grounded source. You should see an arc.
6. Is the ignition wire good? If there are any visible signs of wear on the ignition wire, replace it before going any further. If there are no visible signs of wear, proceed as follows. Remove the pilot assembly. Remove the end of the wire that connects to the igniter. When the FIREYE displays PTFI, hold the end of the wire to within 1/16<sup>th</sup> to 3/32<sup>nds</sup> of an inch from the end of the igniter. You should see an arc.
7. Is the electrode good? Remove the pilot assembly. If there are any visible cracks or broken pieces of the igniter, replace it. Remove the igniter and clean the inside of the pilot assembly with fine grit sandpaper. Replace the igniter using the Power Flame manual for a reference (1/16" to 3/32" gap, and 2 15/16" from the open end of the housing).

#### **If there is a flame, check the following:**

1. Is the scanner tube clogged? Remove scanner, and clean scanner tube.
2. Is the scanner good? Replace scanner. Make sure it is the correct scanner. Sometimes the customer installs a Honeywell scanner in place of a Fireye scanner.
3. Is the EUV1 Amplifier card good? Replace EUV1 amplifier card. (Could be infrared).

## HEATEC, INC.

P.O. BOX 7260 • CHATTANOOGA, TN 37407

5200 WILSON ROAD • CHATTANOOGA, TN 37410



### IF STRAIGHT OIL IGNITION

**Is there a flame?** With the heater off, remove, clean, and replace the rear sight glass. Restart heater and check for flame at PTFI.

#### **If no flame, check the following:**

1. What is your pump pressure? You should have pump pressure as soon as you turn on the burner (300psi). If you have no pressure, check the pump coupling or the rotation of the blower motor. Do you have fuel available? A vacuum gauge will tell you if you have fuel available.
2. What is your return pressure? Check this when the FIREYE displays PTFI in the timing sequence. You should have around 80psi at PTFI.
3. Is your ignition source good? (transformer, electrodes, and ignition wires). Remove gun assembly. Check electrode position and gap per Power Flame manual. (1/16" gap). Check wires for visible wear or cracks. Check electrodes for visible wear, cracks, or broken pieces. Check transformer by connecting wires and jumping ignition. You should see arc. (Make sure burner is not running and fuel valves are closed).
4. Are the solenoids opening? If they are, you should have return pressure.
5. Is the nozzle good? Replace nozzle.
6. Is there water in the fuel? Check the fuel filter.

#### **If there is a flame, check the following:**

1. Is the scanner tube clogged? Check by removing the scanner and clean the tube.
2. Is carbon build up keeping the scanner from seeing the flame? Remove gun assembly or back door and clean end of blast tube.
3. Is the scanner bad? Replace scanner.
4. Is amplifier card bad? Replace amplifier card. Could be EUV1 or IR.



## **LOCKOUT MTFI FLAME FAILURE (Main flame Trial For Ignition)**

### **What fuel are you using?**

#### **If Gas**

**Is there a flame?** With the heater off, remove, clean, and replace the rear sight glass. Restart heater and check for flame at MTFI.

#### **If no flame, check the following:**

1. Is the gas/oil switch on gas?
2. Are the manual hand valves in the gas train that we provide open?
3. Check the vent on the main gas regulator.
4. What is the position of the air dampers? Top damper should be closed, bottom damper should have about ¼" gap.
5. Is there gas available? The gas company could have temporarily interrupted the supply of gas, and when they restored the supply, the gas line could be full of air. You would then need to purge the gas line.
6. Does the gas valve actuator drive down at MTFI? Look in the window of the actuator and see. Normally, you will see CLOSED in yellow. As the valve opens, you should see the plunger going down. If not, check for power on L1 and L2 in the actuator. You should have 120volts ac at MTFI.
7. Is the butterfly valve in the gas train open enough at MTFI? If not, loosen the round linkage rod attached to the linkage arm on the butterfly valve during PTFI. At MTFI, open the butterfly valve slightly. You may need to try this several times (only opening slightly each time) if this is the problem.
8. What is the fuel pressure? Too much pressure can cause the main gas regulator to lock up, and not enough pressure can cause the burner not to light. There should no more than 11lb of pressure and no less than 8" wc. Watch the pressure after the burner lights to see if the pressure drops. If it does, the piping may be too small or their step down regulator could be too far away, or have too small of an orifice or spring.

#### **If there is a flame, check the following:**

1. What is the flame signal?
2. What is the position of the air dampers? Top damper should be closed, and the bottom damper should have about ¼" gap.
3. What is the fuel pressure? Too much pressure can cause the main gas regulator to lock up, and not enough pressure can cause the burner not to light. There should no more than 11lb of pressure and no less than 8" wc. Watch the pressure after the burner lights to see if the pressure drops. If it does, the piping may be too small or their step down regulator could be too far away, or have too small of an orifice or spring.



## **LOCKOUT MTFI FLAME FAILURE (Main flame Trial For Ignition )**

### **If diesel**

1. Is the gas/oil switch on oil?
2. What is your pump pressure? You should have pump pressure as soon as you turn on the burner (300psi). If you have no pressure, check the pump coupling or the rotation of the blower motor. If the pressure is not steady, install a vacuum gauge at the inlet of the fuel pump. Fuel should be gravity fed to the burner.
3. What direction is the motor turning? Should be clockwise looking at the end of the motor.
4. Is the customer supplied valve open? This is usually between the fuel tank and the fuel filter.
5. What is the return pressure? Check this when the FIREYE displays MTFI in the timing sequence. You should have around 80psi at MTFI.
6. Does the fuel solenoid open? You should see steady return pressure if it does. If not there could be an air leak in the suction lines.
7. Is the fuel filter clogged? Replace fuel filter.
8. Does the customer supplied fuel line have a y-strainer installed? If so, it may be clogged.
9. Is the nozzle bad? Replace nozzle.



## **LOCKOUT AUTO FLAME FAILURE**

### **If Gas**

1. What is the fuel to air ratio? Check the dampers and gas pressure. At low fire, the bottom damper should be open about ¼". The bottom damper almost never moves while the burner modulates. The top damper should be closed at low fire.
2. What is the gas pressure? The incoming gas pressure should be constant from low fire to high fire. No more than 1 lb of gas pressure to the regulator that we provide and no less than 8" wc. If the gas pressure is reduced as it is going to high fire, the orifice in the step down regulator may be too small.
3. Has the gas company or anyone else been working on the main gas line? The gas company could have temporarily interrupted the supply of gas, and when they restored the supply, the gas line could be full of air. You would then need to purge the gas line.
4. Other users could reduce the gas pressure.
5. Voltage drop from city power or generators. Generator could be changed from day to night.

### **If Diesel**

1. Are you out of fuel? Stick the tank to make sure!
2. Do you have steady pressure?
3. Is your fuel filter clogged? Does it have water in it? Replace filter. If it has water in it, drain tank and refill with good diesel.
4. Check your fuel to air ratio. At low fire, your top damper should be closed and your bottom damper should be open about ¼". Your fuel pressure should be about 80psi at low fire. At high fire, your fuel pressure should be about 150psi or higher (depending on the nozzle, check the Power Flame manual). Your top damper (at high fire) should be at least half open, maybe more.
5. You should see steady return pressure. If not, use vacuum gauge. You could have air getting into the suction line through loose fittings.
6. Is your nozzle bad? Replace nozzle
7. Voltage drop from city power or generators. Generator could be changed from day to night.



## LOCKOUT PURGE 3-P INTERLOCK OPEN

This means the limit circuit is open during the purge sequence of the FIREYE flame monitor. Check the **clear** lights on the panel door. Each light has a label above it. Read the label above the first **clear** light that is out. This indicates which device on the heater or in the control panel has tripped. These limits are wired in series. The light for the device that is tripped will be off as well as all remaining lights in the limit circuit; all the way to the green limits made light. If you have light bulbs that are burned out, use a volt meter. Check for 110 volts ac on the back of each light in the limit circuit.

- 1) **Low Media Level Switch** This is for proving level in the expansion tank. If this switch is not made, this will be the first light out and the FIREYE should display 3-P INTLK OPEN and the circulation pump should not be on (check to see). The switch could be bad or the expansion tank may be low of fluid. Always stick the exp. tank to verify the level (the sight glass **will** lie)
- 2) **High Fuel Gas Pressure Switch** This switch is mounted in the gas train and is closest to the burner. If there is a surge of gas above the preset limit, (such as a rupture in the diaphragm of the main gas regulator) the switch will trip (open the contacts). This will be the first light out and the FIREYE will display 3-P INTLK OPEN. This is a manual reset switch.
- 3) **Low Fuel Gas Pressure Switch** This switch is mounted in the gas train and is usually between the main gas valve and the main gas regulator. If the gas pressure falls below the preset limit, the switch will trip (open the contacts). This will be the first light out and the FIREYE will display 3-P INTLK OPEN. This is a manual reset switch.
- 4) **High Media Temperature** This is the Honeywell temperature controller mounted in the door of the control panel. If the temperature of the hot oil rises above the set point (push the display button on the face of the controller to see the set point), the switch in the controller will trip (open the contacts). This will be the first light out and the FIREYE will display 3-P INTLK OPEN. You should also see LIMIT flashing about every 2-3 seconds on the face of the controller. A clogged strainer is usually the problem (low flow condition). It could be as simple as the set point being too low. We should normally put the set point a minimum of 80 degrees F. above the set point on the modulating controller. This is a manual reset switch. You must press the *auto-manual-reset* button to reset the switch.
- 5) **High Flue Gas Stack Temperature** This is the Burling switch that is mounted in the base of the stack. It is preset from the factory to trip (open the contacts) at 1,000 degrees F. If the stack temp. rises above 1,000 degrees, the switch will trip (open the contacts). This will be the first light out and the FIREYE will display 3-P INTLK OPEN. A clogged strainer is usually the problem (low flow condition). If the coil gets a lot of soot build up, (causing the heat to go out the stack and not be transferred into the hot oil) the switch will trip. This is a manual reset switch. Unscrew the cap from the switch and (using the butt end of an insulated screwdriver) press the reset button.



## LOCKOUT PURGE 3-P INTLK OPEN (CONT.)

- 6) **Circulating Pump Auxiliary Contacts** This contact is located on the motor starter for the circulating pump. If the breaker trips, the starter will disengage, causing the contacts to open. This will be the first light out and the FIREYE will display 3-P INTLK OPEN. After resetting the breaker, check the amp draw from each leg (wire) going to the motor. Then look at the tag on the motor. If the amp draw is more than the Full Load Amp rating on the motor, slowly close the valve on the outlet of the pump until the amp draw is about one amp lower than the Full Load Amp rating on the motor. The valve should not be more than half closed. The plunger on the switch can break or the switch can come off the starter.
- 7) **Low Media Differential Pressure (or Low Media Pressure on older model heaters)** This is a Barksdale switch and is usually mounted on the right side of the heater, looking from the burner end. It is both a low and high differential switch. If the differential pressure falls below the setting on the dial (circuit # 2 on the left side of the switch), the contacts will open. This will be the first light out and the FIREYE will display 3-P INTLK OPEN. The setting on the switch (the dial) should be half way between the differential pressure (the difference between the two gauges) and zero. Check the coupling between the circulating pump and motor. A clogged strainer can cause this to continuously trip. Clean the strainer. Moisture in the hot oil can cause this to continuously trip. Wait until the hot oil temperature falls below 250 degrees F. and put the heater (not the burner) in purge (open valve #2). During purge, keep the output of the burner at or below 30%.
- 8) **High Media Differential Pressure** This is a Barksdale switch and is usually mounted on the right side of the heater, looking from the burner end. It is both a high and low differential switch. If the differential pressure rises above the setting on the dial, (circuit # 1 on the right side of the switch) the contacts will open. This will be the first light out and the FIREYE will display 3-P INTLK OPEN. The setting on the switch is half way between the differential pressure (the difference between the two gauges) and the maximum pump pressure. This indicates a blocked coil, which is very rare. Check motor amperage.
- 9) **Combustion Air Auxiliary Contacts** This contact is located on the motor starter for the blower motor. If the breaker trips, the starter will disengage, causing the contacts to open. This will be the first light out and the FIREYE will display 3-P INTLK OPEN. This indicates the breaker has tripped. **Note**, this light will always be off when the burner is in alarm. If the breaker is not tripped, this **did not** cause the alarm. **Always** ask if the breaker tripped or if the breaker needed to be reset.
- 10) **Low Combustion Air Switch** This switch is located on the right side of the burner housing. It gets air pressure from the blower wheel in the housing. If the blades of the blower wheel become clogged with dust, the switch may trip. If the switch is out of adjustment, it may trip. We tell you how to adjust the low combustion air switch on page 5 of the TEC-NOTE *Checking Limit Circuit Devices*. The TEC-NOTE is found in our new heater manual on our website: [heatec.com](http://heatec.com).

Remember, a bad gas/oil switch can cause the limit circuit to trip and give the message 3-P INTLK OPEN. If you are having difficulty finding which limit is causing the problem, ask the customer to wiggle the gas oil switch. Or, have them turn the switch to the alternate fuel. This may at least let the burner go through purge. If the burner does go through purge, the gas/oil switch is probably bad. There is also a *TEC NOTE* replacing the gas/oil switch.

**HEATEC, INC.**

P.O. BOX 7260 • CHATTANOOGA, TN 37407

5200 WILSON ROAD • CHATTANOOGA, TN 37410



## **LOCKOUT STANDBY 3-P INTLK CLOSED**

Dipswitch #6 (3-P Proven Open to Start) on the EP 160 programmer card is in the UP position (enabled). At the start of the cycle, the 3-P circuit was closed. It will hold this position for 60 seconds and then lockout if the 3-P circuit does not open.

1. The combustion air switch is closed when you turn on the burner. It should be open for a split second while air pressure is being built up in the burner housing. The switch may need adjusting. See the TEC NOTE in the new heater manual at *heatec.com*
2. The 3-P circuit could be jumped out.



## **LOCKOUT PURGE D-8 LIMIT OPEN**

The high fire proof switch (D-8 limit) was open for ten minutes during purge and locked out. Remember, D-8 LIMIT OPEN is normal for the first 30 seconds of purge. Make sure this is the **LOCKOUT** message!

### **First, ask if the Honeywell mod motor moves**

#### **If the motor does move, make these checks first:**

1. Does the motor move 90 degrees? With the burner switch off, make a vertical line on the end of the shaft that drives the linkage up and down. When the burner goes to high fire, the line should be almost straight across (horizontal).
2. Are the wires plugged into the switch? Remove the cover (lid) and check. This will be the top limit switch.
3. Adjust the innermost blue cam. With the motor in the high fire position (make sure by following the procedure in #1 above), insert a flat bladed screwdriver in a slot in the middle of the cam. Raise the butt end of the screwdriver rotating the cam slowly (one click at a time) until the switch makes. Move the cam one or two clicks *more* after the switch makes. *Make sure* the *protruding lobe* of the cam is what makes the switch close.

#### **If the motor does not move, make these checks first:**

1. Does the motor move when going to high fire purge? If not, tap on the motor with a screwdriver or other object and see if motor moves. The resistor board, most likely, is the problem.
2. Check the dip switches on the resistor board. #5, #6, and #8 should be down (enabled). Disable them and then enable them again.
3. Check and tighten all of the wires (R, B, and W) from the modulating motor, to the burner junction box, to the electrical panel, and to the Honeywell modulating controller. Wire numbers should be 9, 10, 11, 12, and 13.
4. Is the transformer bad? Remove the cover (lid) and, with a volt meter, check for 24 volts ac across T1 and T2 on the resistor board (the two brown wires). If you have 24 volts, the transformer is good. If you do not have 24 volts, check for 120 volts ac across the white and black wires going to the transformer. If you have voltage here, the transformer is bad. If you do not have 120 volts ac, check for control voltage (120 volts ac) in the main heater panel. There could be a breaker tripped or the secondary transformer (converting 480 volts ac to 120 volts ac) could be bad.
5. Check the resistor board and the motor. Make sure the motor is in the low fire position. Jumper across R and B on the resistor board. If the motor still does not move, remove the resistor board. Put the two brown wires on the T1 and T2 prongs respectively. Put a jumper across prongs R and B in the motor. If the motor moves, the resistor board is bad. If not, the motor is bad.

**\*NOTE: Honeywell is in the process of changing their mod motors. This change will take place in late 2006 and in 2007. We do not yet know what the changes will be.**



## LOCKOUT PURGE D-8 LIMIT CLOSED

The D-8 circuit (high fire proof switch) has been closed for 30 seconds at the start of the burner cycle.

1. Check the position of the motor. With the burner switch off, the motor should be in the low fire position. The linkage arms could be in a bind and not letting the motor move. This would have to happen in the high fire position; not likely, but possible.
2. The motor could be stuck in the high fire position. Tap on the motor with a screwdriver or other object. The resistor board may not be making contact with the prongs it plugs into in the motor.
3. Check and tighten all of the wires (R, B, and W) from the modulating motor, to the burner junction box, to the electrical panel, and to the Honeywell modulating controller. Wire numbers should be 9, 10, 11, 12, and 13.
4. Adjust the innermost cam as a last resort. With the motor in the low fire position, you should see the protruding lobe on the cam at about middle ways of the cam. If the cam has the switch made in the low fire position, insert a flat bladed screwdriver in a slot in the cam. Lower the butt end of the screwdriver, rotating the cam slowly (one click at a time) until you see the *protruding lobe* about middle ways of the cam. Start the burner. You should see the *protruding lobe* make the switch just before the motor stops moving. Adjust the cam accordingly, if needed.

## LOCKOUT PURGE M-D LIMIT OPEN

The M-D limit (low fire proof switch) has not closed at the end of the timing sequence. It will hold in this position for 10 minutes and then lockout if the M-D limit does not close.

1. Check the position of the motor. The motor should be in the low fire position.
2. Tap on the motor with a screwdriver or other object. The resistor board may not be making good contact with the prongs it plugs into in the motor.
3. The wires may have come unplugged from the bottom switch. Remove the cover (lid) and check.
4. Check and tighten all of the wires (R, B, and W) from the modulating motor, to the burner junction box, to the electrical panel, and to the Honeywell modulating controller. Wire numbers should be 9, 10, 11, 12, and 13.
5. The outermost cam could be out of adjustment. In motors with two blue cams, the *protruding lobe* should have the bottom switch (low fire proof switch) depressed (when the motor is in the low fire position). In motors with a blue cam and a red cam, the more gradual protruding lobe on the red cam must drop off of the bottom switch (when the motor is in the low fire position). Adjust the cam accordingly, if needed. Only do this as a last resort.



## **LOCKOUT PURGE M-D LIMIT CLOSED**

At the end of high fire purge and the beginning of low fire start, the M-D limit (low fire proof switch) is closed. It will hold in this position for 30 seconds and then lockout if the M-D circuit does not open.

1. The cam is most likely out of adjustment. Remove the cover (lid) from the motor. With the motor in the high fire position, you should see the protruding lobe of the outer cam about middle ways of the cam. If not adjust accordingly.

## **HOLD STANDBY FALSE FLAME**

**The scanner either sees a flame (or something glowing) or thinks it sees a flame (is bad).**

1. Is there a fire or something glowing (carbon buildup) in the combustion chamber? The blower motor will not start in this mode, even if you reset the FIREYE.
2. The scanner could be bad. Replace the scanner. Then reset the FIREYE.
3. The amplifier card could be bad. Replace the amplifier card. Then reset the FIREYE.
4. The programmer card could be bad. Replace the programmer card. Then reset the FIREYE.
5. The chassis could be bad. Replace the chassis. Then reset the FIREYE.

## **STANDBY L1-13 OPEN**

**This is a normal mode. The burner is waiting to be turned on or for heat demand.**

**The following devices are in the L1-13 circuit:**

1. The burner off/on switch (heater control). Check to see if the switch is bad.
2. Temperature controller. Check to see if the Honeywell UDC temperature controller (modulating controller) has alarm 1 showing on the faceplate.
3. Time clock. If the heater has a time clock, make sure the switch is on. If no time clock, terminal 17 should be jumpered to terminal 1.
4. Check to see if the burner relay is powered.
5. Check the programming in the Honeywell temperature controller (modulating controller). Pay special attention to CONTROL and ALARM 1.