

SERVICE

Troubleshooting

⚠ WARNING: When testing electrical equipment, always follow standard electrical safety procedures.

Before beginning these troubleshooting procedures, always review these basic points.

- 1) Check for 120 VAC power to the furnace. If there is no voltage, check the disconnecting switch for circuit breaker trip or blown fuses.
- 2) Make sure the room thermostat is set on the heating mode and is “calling for heat”.
- 3) Check for sufficient oil supply and that all oil shutoff valves are open.
- 4) To successfully service this oil furnace, the following recently (within the last year) calibrated instruments must be available.
 - Smoke spot test kit with Bacharach-type oil burner smoke scale
 - Carbon dioxide (CO₂) and carbon monoxide (CO) test kit or analyzer
 - Flue gas temperature measuring instrument
 - Draft gauge, capable of measuring 0.01 to 0.25 in. W.G. draft (Draft is the pressure differential between the static pressure measured in the vent pipe, or just above the combustion chamber, and the indoor atmospheric pressure. Under normal operating conditions, it will have a **negative** value, i.e. the pressure in the combustion chamber and the vent system are less than room air pressure.)
 - Multimeter (analog or digital type)
 - Oil pressure gauge, capable of measuring at least 0 to 200 PSIG
 - Burner electrode and nozzle setting gauge
- 5) Be familiar with the correct operation of these instruments as well as how to adjust the oil burner settings (refer to burner manufacturer’s literature).

A. **Symptom: Furnace does not operate.**

Items to check:

⚠ WARNING: Repeated operation of the oil primary safety control reset button can cause a build-up of unburned oil in the combustion chamber. An accumulation of oil in the combustion chamber is a hazardous situation and may cause a fire or explosion.

- 1) Make sure the disconnecting switch is “ON” and the circuit breaker has not tripped, or fuses have not blown.
- 2) Confirm there is 120 VAC at the fan center junction box.

- 3) Confirm the room thermostat is wired correctly, set on the “HEAT” mode, and “calling for heat”.
- 4) For all primary controls, lockout can be confirmed by measuring voltage from the oil primary safety control to the burner motor. If none, depress the oil primary reset button. [On the Honeywell oil primary control, lockout has occurred if the indicator light (an LED) is rapidly flashing; depress the oil primary reset button.]

If the burner does not operate properly after depressing the reset button three (3) times, turn off the electrical power to the furnace and close the manual oil shutoff valve. Immediately contact a qualified heating contractor for service.

B. Symptom: Burner short cycles or “locks out” on oil primary safety control.

Items to check:

- 1) Fuel oil tank nearly empty or oil flow restriction. Refill oil tank, replace oil filter, open all shutoff valve(s), and purge oil line(s) of air.
- 2) If the oil primary control has not “locked out” (e.g., on the Honeywell primary control, the indicator light is not flashing), measure the electrical current to the room thermostat. Set the heat anticipator on the room thermostat to the current value measured. Also, check the wiring between the thermostat and primary control to be sure it is correct and no loose connections exist.
- 3) Inspect the burner flame sensor, “cad cell”, to be sure the lens is clean and the cell is correctly aimed at the flame.
- 4) Inspect the burner oil nozzle for blockages and signs of deterioration. Replace the nozzle, if required. Also, measure and reset the electrode gap and alignment. If badly worn or deformed, replace the electrodes. (Refer to the burner manufacturer’s instructions.)
- 5) Confirm there is a strong spark across electrodes. Generally, viewing a spark jump across the electrodes is sufficient indication the ignition transformer is operating correctly. **Testing an electronic ignition transformer with a transformer tester is generally not recommended.**
- 6) Inspect the heat exchanger through the cleanout ports for signs of excessive soot, scale buildup, or blockage. If a heavy deposits are present, clean the heat exchanger.

C. Symptom: Burner short cycles on high limit thermostat, but does not “lock out” on oil primary safety control.

Items to check:

- 1) Open dampers or registers in the air distribution system. Clear any duct system restrictions.
- 2) Inspect and clean all air filters in the air distribution system.
- 3) Inspect blower for interference with rotation or locked rotor condition. Also, confirm the blower wheel is secured to the fan motor shaft.
- 4) The fan motor or run capacitor may be damaged. Test and replace the motor or capacitor, as required.
- 5) Increase fan speed.

D. Symptom: Unable to achieve clean combustion by making burner air adjustments.

Items to check:

- 1) Measure the burner air tube insertion depth and alignment. The end of the tube should **not** protrude inside the combustion chamber. The end of the tube should be approximately $\frac{1}{4}$ inch away from the inner wall surface of the combustion chamber.
- 2) Inspect the oil nozzle for excessive wear, blockage, or deterioration. Measure and, if necessary, reset the nozzle depth or turbulator location with respect to end of the burner head. Replace the nozzle, if necessary (refer to the oil burner manufacturer's instructions).
- 3) Measure the oil pump pressure. If required, adjust the pressure to burner nameplate value. (This is the typical minimum pressure required to obtain the full input rate from the furnace).
- 4) Verify the burner is configured as specified in Table 1 and adjusted according to the **Initial Burner Operation** section of this manual and the burner manufacturer's instructions.
- 5) Measure the overfire draft. If required, adjust the barometric damper to increase the stack draft to obtain an overfire draft of 0.02 in. W.G. with the burner operating. (This is the typical minimum draft required to obtain the specified flue gas combustion analysis values given in Table 1.) If the specified overfire draft cannot be obtained with a stack draft of 0.02 in. W.G., the heat exchanger may be partially blocked and could require cleaning.

- 6) Measure the draft at the point where the vent connector attaches to the heat exchanger flue pipe. With the burner operating, the stack draft should not exceed 0.05 in. W.G. If the stack draft has been adjusted above this value to give the proper overfire draft, the heat exchanger will require cleaning.

If there is little or no stack draft, the chimney flue way may require cleaning, the chimney is too restrictive, or a downdraft condition exists.

E. Symptom: Furnace blower will not start.

Items to check:

- 1) Confirm there is 120 VAC at the blower motor terminal block.
- 2) If there **is not** 120 VAC at the blower terminal block, measure the voltage at the fan center relay. If the fan can be activated by itself from the room thermostat subbase, confirm it will operate. If so, the fan center relay contacts may be burnt, or damaged, or the fan limit control may be defective. Test these components and replace the defective component, as required.
- 3) If there **is** 120 VAC at the blower terminal block, either the run capacitor or blower motor may be damaged. Test and replace the capacitor or motor, as required.

F. Symptom: Blower cycles on and off after the burner has shutdown.

Item to check:

- 1) Increase the fan limit control differential. Typically, the fan “off” setting should be 30 degrees F. below the fan “on” setting. Adjust the setting as required.

NOTICE: If the fan and high limit control is faulty, it should be replaced. However, it must only be replaced by the same make and model as the original. All the original temperature settings should be duplicated on the replacement model as well. REMOVE THE LOW VOLTAGE JUMPER IN THE CONTROL, IF EQUIPPED. Refer to the electrical diagram for proper electrical connections.

Flame Sensor (“Cad Cell”) Checkout Procedure

On the Honeywell oil primary control, to check the electrical resistance of the flame sensor (referred to as a cadmium sulfide photocell, or “cad cell”), depress the reset button on the oil primary safety control while the burner is firing. The oil primary control will report the measured resistance range of the cad cell by flashing the LED (light emitting diode) one (1) to four (4) times. Refer to the oil burner manufacturer’s instructions for further details.

For all primary controls, an alternate procedure to check the flame sensor operation is as follows:

- 1) Remove the flame sensor lead wires from the terminals (labeled “CAD CELL” on the underside of the Honeywell control) of the oil primary safety control module. Start the burner. Shortly after combustion is established, place a temporary jumper wire across the cad cell terminals, or leads, of the control. Connect an ohmmeter across the flame sensor lead wires. The measured resistance should be less than,
 - 1600 Ohms for the Honeywell cad cell,
 - 1500 Ohms for the Carlin cad cell, and
 - 1200 Ohms for the Riello cad cell.

NOTICE: On the Riello 40-F3 burner only, it may be difficult or impossible to measure the actual operating resistance of the cad cell with the burner operating. With the electrical power off, carefully remove the printed circuit board from the Riello oil primary control and subject the cad cell to direct sunlight. The measured resistance of the cad cell should reduce to 50 Ohms, or less. Cover the cad cell and measure the dark cell resistance, refer to step 3 below.

- 2) Stop the burner and remove the jumper wire.
- 3) With the burner off, measure the resistance of the flame sensor with the ohmmeter. The resistance of the sensor without “seeing” a light source (so-called “dark” cell resistance) should be greater than,
 - 20,000 Ohms for the Honeywell cad cell,
 - 50,000 Ohms for the Carlin cad cell, and
 - 40,000 Ohms for the Riello cad cell.
- 4) If the sensor resistances are outside the acceptable ranges given above, confirm the lens of the cell is clean and the cell is located correctly in the burner housing. If the cell is clean and correctly located, replace the flame sensor.

NOTICE: All resistances are approximate values only and will vary depending upon the intensity of the light source (flame or sunlight) and the condition or age of the cad cell.

On the Riello 40-F3 burner only, the cad cell is an integral part of the oil primary control. If replacement of the cad cell is required, the entire primary control must be replaced.

Replacement Parts

Appendix D of this manual contains a list of replacement parts available for these furnaces.