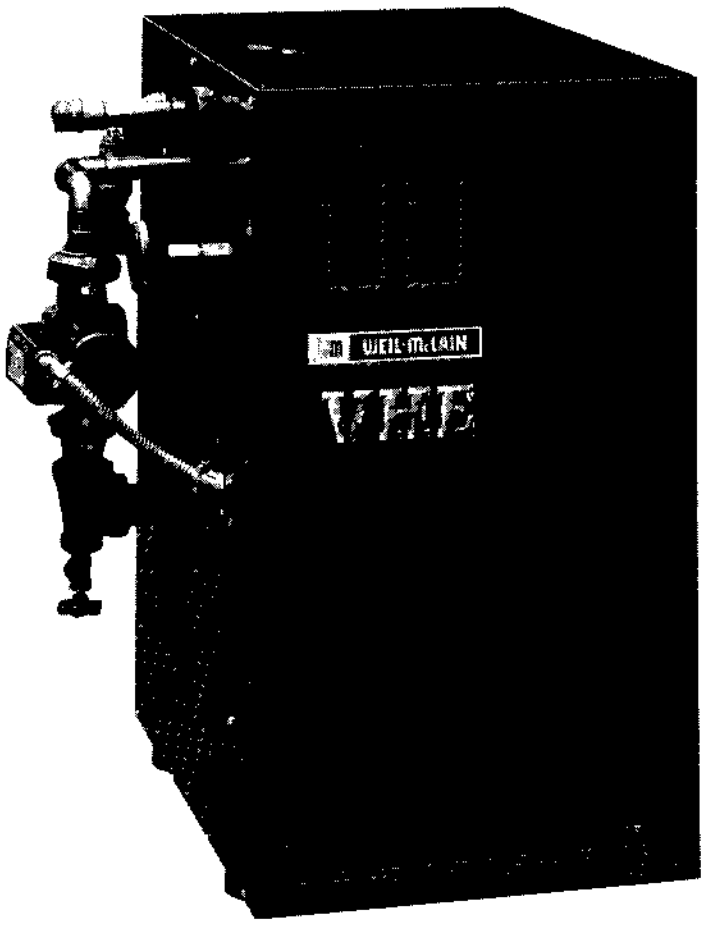
WEIL-McLAIN

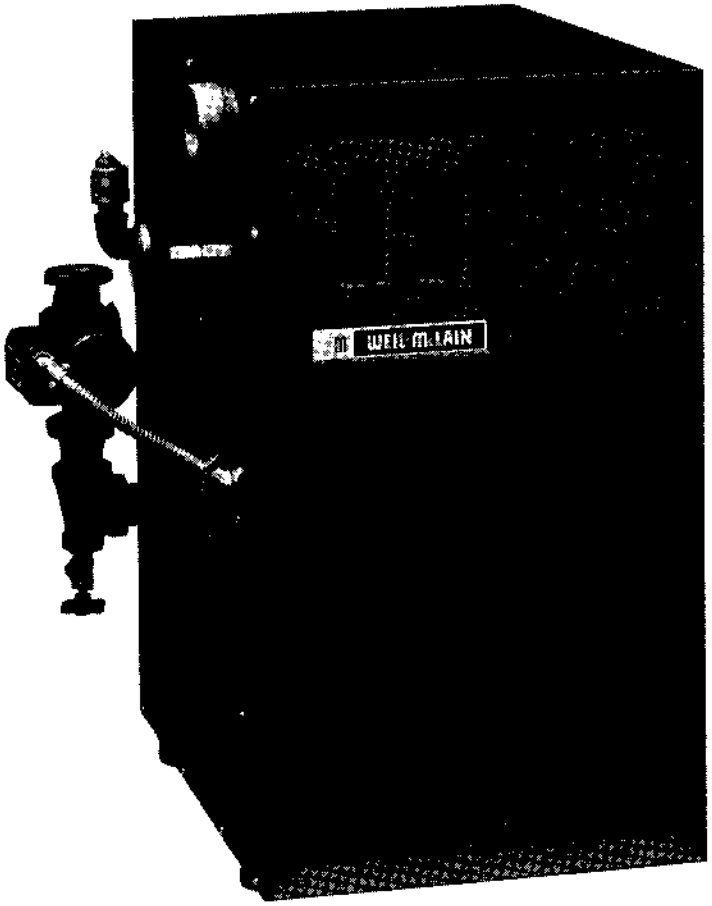
MODELS HE AND VHE®
(Series 3)
NATURAL GAS—FIRED
INDUCED DRAFT BOILERS

SUPPLEMENTAL INSTRUCTIONS

WITH WHITE-RODGERS CYCLE-PILOT® SYSTEM FOR NATURAL GAS-FIRED BOILERS —for use by a certified contractor



MODEL VHE®



MODEL HE

NATURAL GAS

Part No. 550-141-450/0385WP

TABLE OF CONTENTS

HE and VHE®
Base Assembly Parts Description
With White-Rodgers Cycle-Pilot®
For Natural Gas Firing

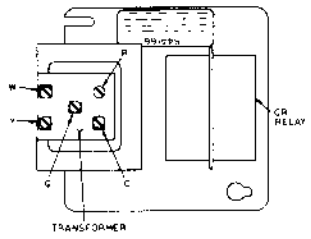
FIGURE	MODEL NO.	HE & VHE 3		HE & VHE 4		HE & VHE 5		HE & VHE 6	
NO.	PART DESCRIPTION	QTY.	PART NO.	QTY.	PART NO.	QTY.	PART NO.	QTY.	PART NO.
3	Relite Control	1	511-330-111	1	511-330-111	1	511-330-111	1	511-330-111
7	Gas Valve Assembly	1	511-044-288	1	511-044-288	1	511-044-288	1	522-044-288
8	Pilot Burner Assembly	1	511-330-235	1	511-330-235	1	511-330-235	1	511-330-235
11	Mercury Flame Sensor	1	511-724-262	1	511-724-262	1	511-724-262	1	511-724-262
■	Orifice, Main Burner Natural Gas No. 47 Drill	4	560-528-992	6	560-528-992	8	560-528-992	10	560-528-992

■ Not Shown

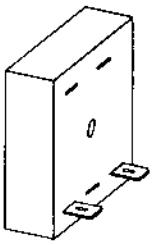
NOTE: PARTS LISTED ABOVE ARE FOR BOILERS FIRED WITH NATURAL GAS ONLY. FOR ADDITIONAL PARTS COMMON TO NATURAL AND PROPANE GASES REFER TO BOILER MANUAL.

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

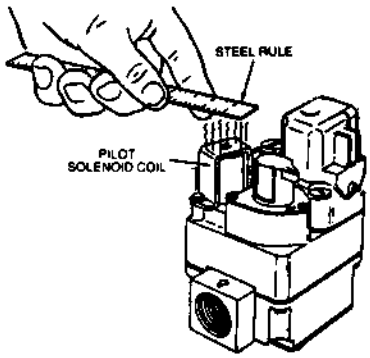
HE and VHE®
WHITE-RODGERS CYCLE—PILOT® IGNITION SYSTEM COMPONENTS FOR NATURAL GAS FIRING



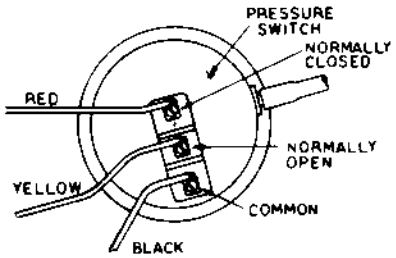
TRANSFORMER
FIGURE 1



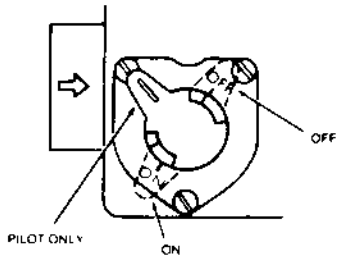
PRE-PURGE TIMER
FIGURE 5



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

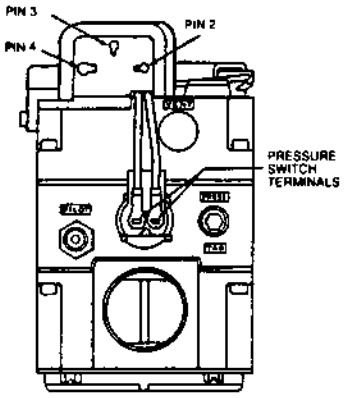


PRESSURE SWITCH
FIGURE 2

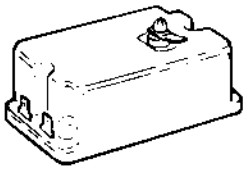


NOTE: When gas cock is positioned over black line on collar around knob, pilot will cycle on and off but main burner gas will not flow.

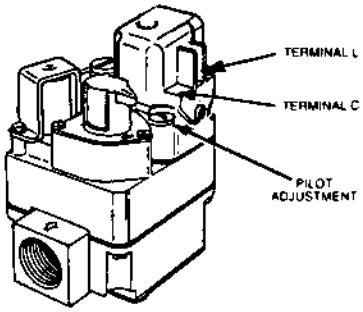
36C84 GAS COCK KNOB
FIGURE 6



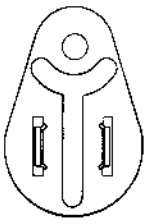
FLAME SENSOR SOCKET
FIGURE 10



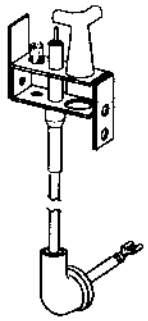
5059 RELITE CONTROL
FIGURE 3



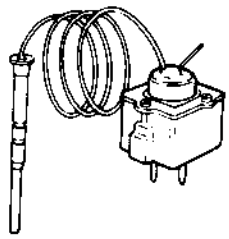
36C84 GAS VALVE
FIGURE 7



THERMAL FUSE ELEMENT (TFE)
FIGURE 4



E50 PILOT BURNER ASSY.
FIGURE 8



3098 MERCURY FLAME SENSOR
FIGURE 11

DANGER Never jumper the thermal fuse element. A fire causing personal injury and/or property damage could result.

Operation, Wiring Diagrams, Trouble Shooting

HE and VHE® With White-Rodgers Cycle-Pilot® For Natural Gas Firing

BOILER EQUIPMENT COMPONENTS

BLOWER MOTOR
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 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.

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.

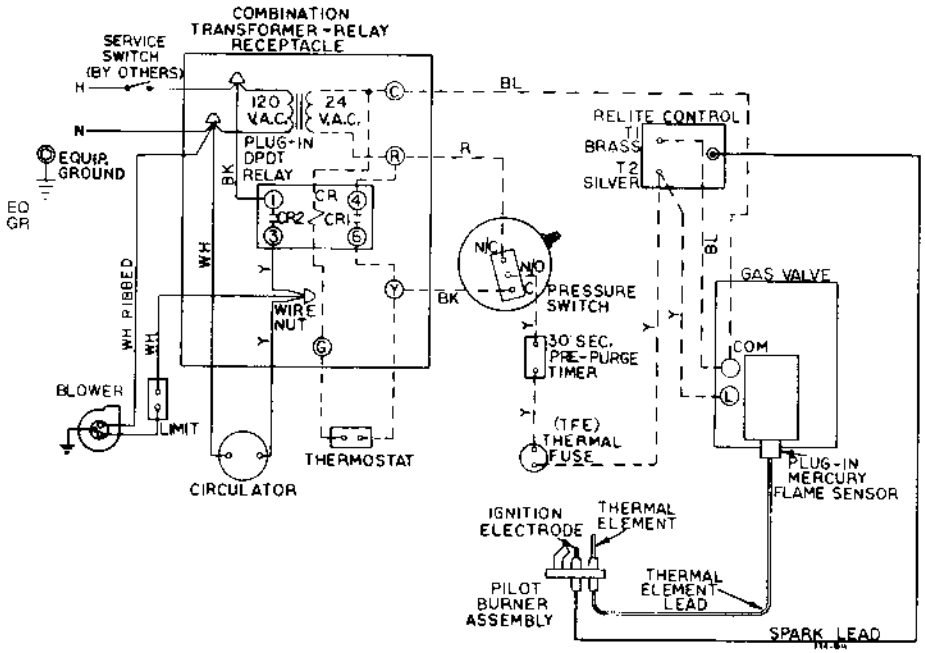
CIRCULATOR
Provides forced water circulation to hot water heating system.

SEQUENCE OF OPERATION

Refer 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, 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



WARNING

——— HIGH VOLTAGE — — — — LOW VOLTAGE

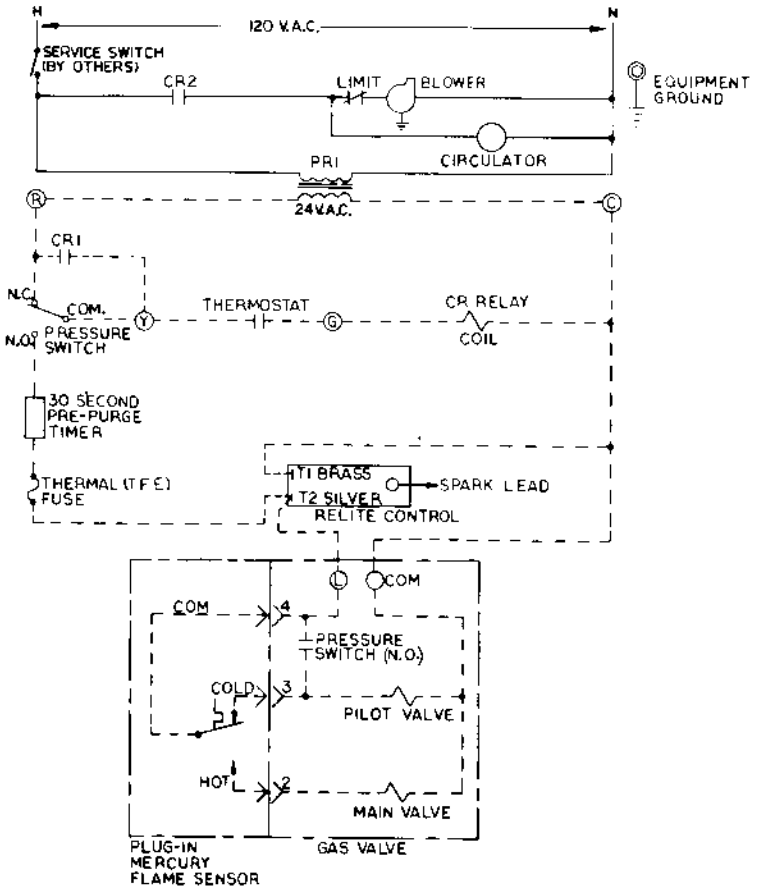
Electric shock hazard. Can cause severe injury or death. Disconnect power source before installing or servicing.

Burner access shield must be in position during boiler operation to prevent excessive delay in proving pilot (2 minutes or more) and/or a momentary flame roll-out on main flame ignition, which can melt the thermal fuse. NEVER jumper the thermal fuse or a hazardous condition will exist.

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.

LADDER WIRING DIAGRAM



——— HIGH VOLTAGE — — — — LOW VOLTAGE

THERMOSTAT HEAT ANTICIPATOR SETTING	
SYSTEM	HE and VHE
WATER	0.40 AMPS.

HE and VHE—White Rodgers Cycle-Pilot®—Boiler Schematic and Ladder Diagrams. Applicable for forced hot water boilers.

NATURAL GAS ONLY

WEIL-McLAIN®

Michigan City, Indiana 46360
A Marley Company

TROUBLE SHOOTING 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 one or both of the following:
A) Excessive delay in proving pilot (2 minutes or more)
B) A momentary flame rollout on ignition of main flame, which can melt the thermal fuse element. Never jumper the 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 is available to the boiler (minimum 102 VAC, maximum 132 VAC)?
   3. Is 24 VAC at the secondary side of the control transformer?
   4. Have an inclined manometer with a range of 0–2.0" W.C.

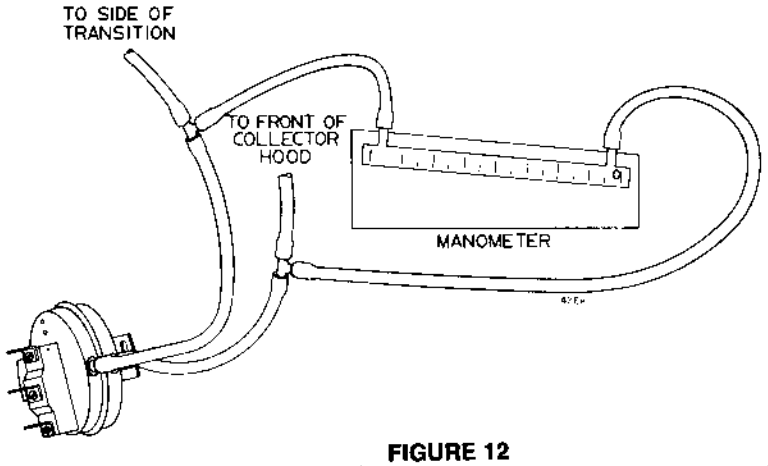


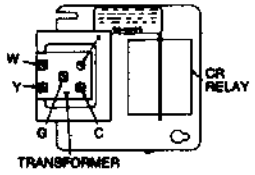
FIGURE 12

CHECKING THE PRESSURE DIFFERENTIAL SWITCH

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

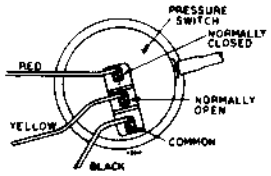
1. Remove sensing tube at front of pressure switch (closest to you as you face the boiler). Refer to Figure 12.
2. Install a "T" into sensing tube. Run another piece of tubing from the "T" to the pressure switch.
3. Attach third leg of the "T" to suction side of an inclined manometer.
4. Remove sensing 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 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 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.

TABLE I—BLOWER AND CIRCULATOR WILL NOT OPERATE



TRANSFORMER
FIGURE 1

- Is there 24V at terminals R & C? (Figure 1)
  - No
    - Is circuit breaker thrown or fuse blown at service disconnect?
      - No → Replace transformer after checking for loose connections
      - Yes → Reset circuit breaker or replace fuse
  - Yes
    - Is there 24V at terminals G& C? (Figure 1)
      - No
        - Is there 24V at common terminal of pressure switch and terminal C? (Figures 1 & 2)
          - No → Replace pressure switch
          - Yes → Replace thermostat after making sure thermostat is set for call for heat
      - Yes
        - Is CR relay pulling in? (See Figure 1)
          - No → Replace CR relay
          - Yes → Check for loose connections at CR2 contact



PRESSURE SWITCH
FIGURE 2

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

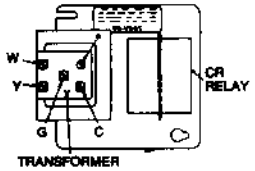
- Momentarily bypass high temperature limit switch. Does blower motor run?
  - Yes → After checking setting replace limit control.
  - No
    - Is 120 VAC available to motor/limit circuit in the junction box?
      - No → Correct wiring.
      - Yes
        - Does blower motor hum?
          - Yes → Check for bound blower wheel, shipping restraint removal or bad motor.
          - No → Replace blower motor.

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

Is there 120V at the circulator wiring connections?

- No → Check for loose connections.
- Yes → Replace circulator.

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



TRANSFORMER
FIGURE 1

Is 24VAC between Terminal C on relay/transformer (Figure 1) and normally open contact on air pressure switch? (Figure 2)

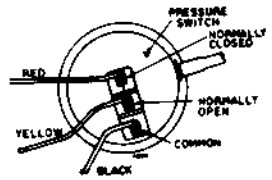
- Yes → After at least 45 seconds is 24 VAC between Terminal C on relay/transformer (Figure 1) and each terminal on 30 sec. pre-purge timer? (Figure 5)
  - Yes → Is 24 VAC present between Terminal C on relay/transformer (Figure 1) and each terminal on TFE? (Figure 4)
    - No → Check wiring then replace **TFE and** pressure switch (Figures 2 and 4).

      CAUTION

      NEVER REPLACE TFE WITHOUT REPLACING PRESSURE SWITCH

      DANGER

      NEVER JUMPER OUT (BY-PASS) TFE
    - Yes → Is 24 VAC across spade terminals on Relite control? (Figure 3)
      - Yes → Remove electrode cable from Relite control and attempt to draw a high voltage arc from Relite control to ground. Does Relite control spark to ground? (See Figure 3).
        - Yes → Check/replace pilot burner/ignition electrode assembly.
        - No → Replace Relite control.
      - No → Check wiring.
  - No → Check wiring then replace 30 second pre-purge timer. (Figure 5)
- No → Check for proper differential air pressure. (See Figure 12). Is reading more than 1.5" W.C.?
  - Yes → Replace pressure switch.
  - No → Refer to Step 10, Page 6 and correct problem.



PRESSURE SWITCH
FIGURE 2

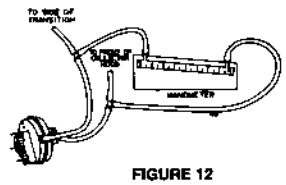
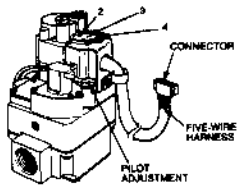


FIGURE 12

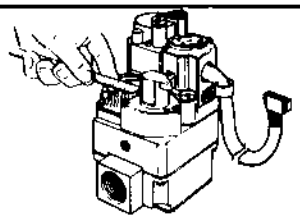
TABLE V—SPARK IS PRESENT—PILOT WILL NOT LIGHT



36C84 GAS VALVE
FIGURE 7

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



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

Move gas cock knob to the "ON" position. (Figure 6)

Is incoming pressure at least 5.0"?

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)

Is 3098 Mercury Flame Sensor plugged into gas valve? (Figure 11)

Yes | No

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 24 VAC across terminals C and L on 36C84 gas valve? (Figure 7)

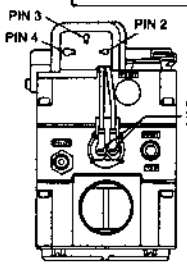
Yes | No

Check wiring to gas valve.

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 for blocked pilot orifice or tubing. (Figure 8). If orifice and tubing are clear, replace gas valve. (Figure 7)



FLAME SENSOR SOCKET
FIGURE 10

Check for ignition spark between the electrode tip and the sensing bulb. Does spark occur in the middle of the pilot gas stream.

Yes | No

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

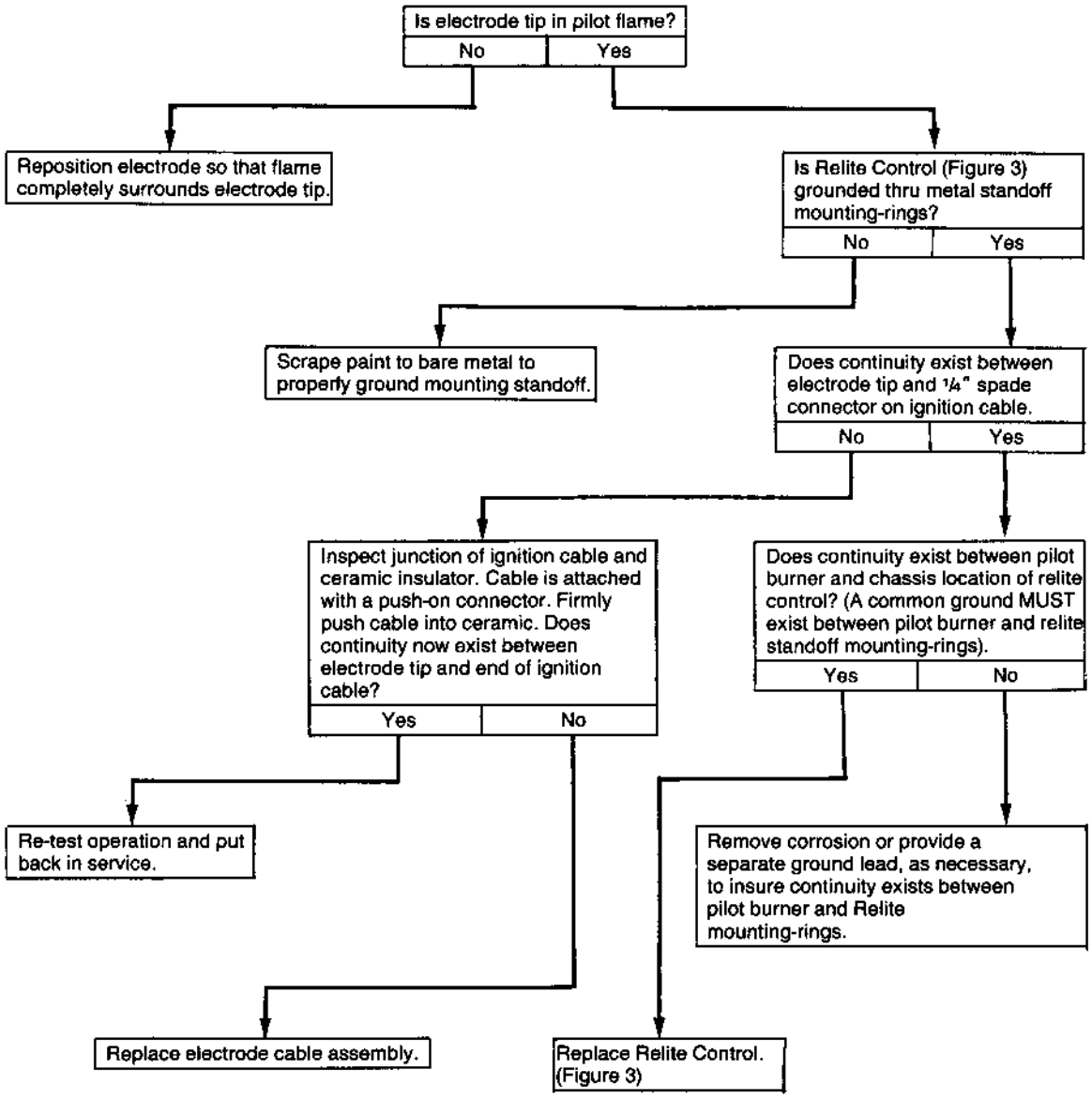
Remove the flame sensor from valve socket, and place a jumper wire between holes 3 and 4 on the gas valve. With jumper in place, check for magnetic field on top of solenoid coil. If magnetic pull is not felt, replace gas valve. If pull is felt, check flame sensor/gas valve socket connections. Clean pins on sensor plug with emery cloth. (Figure 10). Replace flame sensor if condition is not corrected.

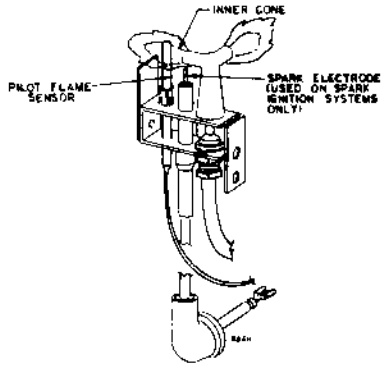
Check for weak ignition spark, spark occurring at locations other than ignition electrode, high drafts across pilot burner, and damaged pilot burner assembly. (Figure 8)

Decrease pilot gas pressure. Remove pilot adjust cover screw and rotate adjust screw clockwise to decrease gas pressure (Figure 7)

Attempt to increase pilot gas pressure by removing pilot adjust cover-screw and rotating pilot adjust screw counterclockwise. If pilot flame size does not increase, check for high drafts across pilot burner. (Figure 10)

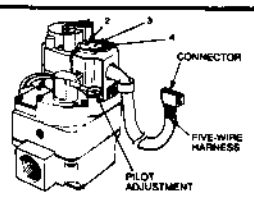
TABLE VI—SPARK WILL NOT SHUT-OFF AFTER PILOT FLAME IS ESTABLISHED





TYPICAL PILOT BURNER FLAME

TABLE VII—PILOT LIGHTS—NO MAIN BURNER IGNITION



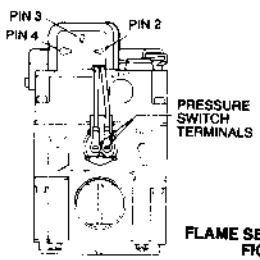
36C84 GAS VALVE
FIGURE 7

CAUTION

Access panel must be in position during boiler operation to prevent one or both of the following conditions:
A) Excessive delay in proving pilot (2 minutes or more).
B) A momentary flame rollout on ignition of main flame, which can melt the thermal fuse.

Is gas cock on 36C84 valve in "ON" position? (Figure 6)

- No → Move valve on "ON" position and cycle system. (Figure 6)
- Yes → Unplug flame sensor from gas valve. Does pilot remain lit? (Figures 10–11)
  - Yes → 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 → Is upper 3/4" of flame sensor bulb engulfed by pilot flame? (Figures 8–11)
      - Yes → Does continuity exist between sockets 2 and 4 on flame sensor receptacle? (Figure 10)
        - Yes → Check for poor connections between flame sensor plug and gas valve socket.
        - No → Replace flame sensor. (Figure 11)
      - No → Make sure sensing bulb is completely inserted to stop ring. Recycle system. (Figures 8–11)
    - No → Is incoming gas pressure at least 5" W.C.?
      - No → Replace gas valve.
      - Yes → 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)
  - No → Does the pilot valve close?
    - No → Replace gas valve. (Figure 7)
    - Yes → Is incoming gas pressure at least 5.0" W.C.? (Figure 7)
      - No → 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 26).
      - Yes → Replace 36C84 gas valve. (Figure 7)



FLAME SENSOR SOCKET
FIGURE 10