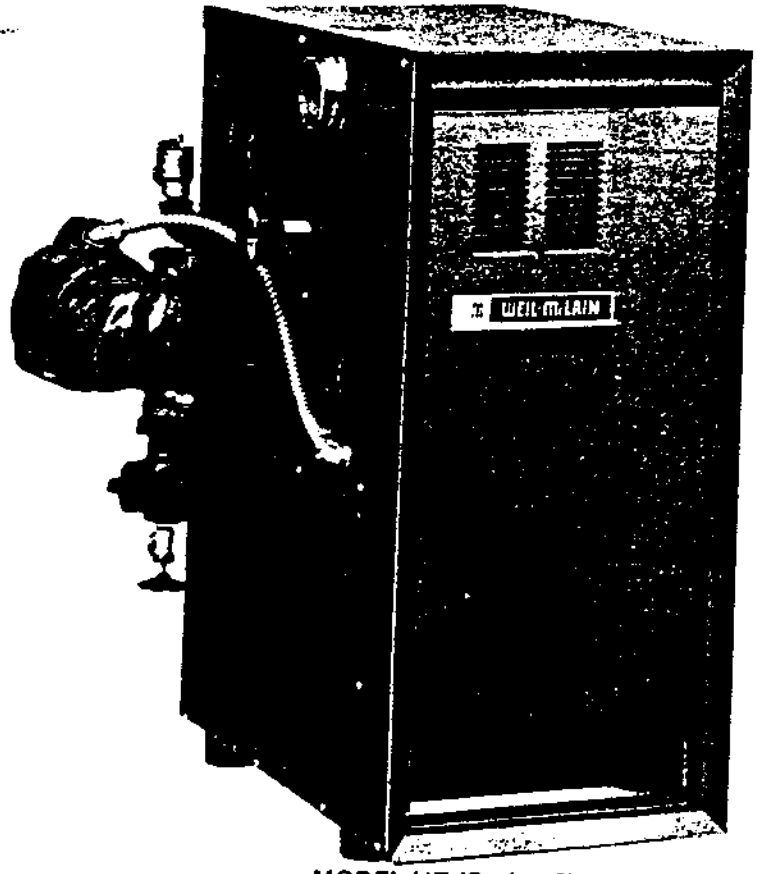
WEIL-McLAIN

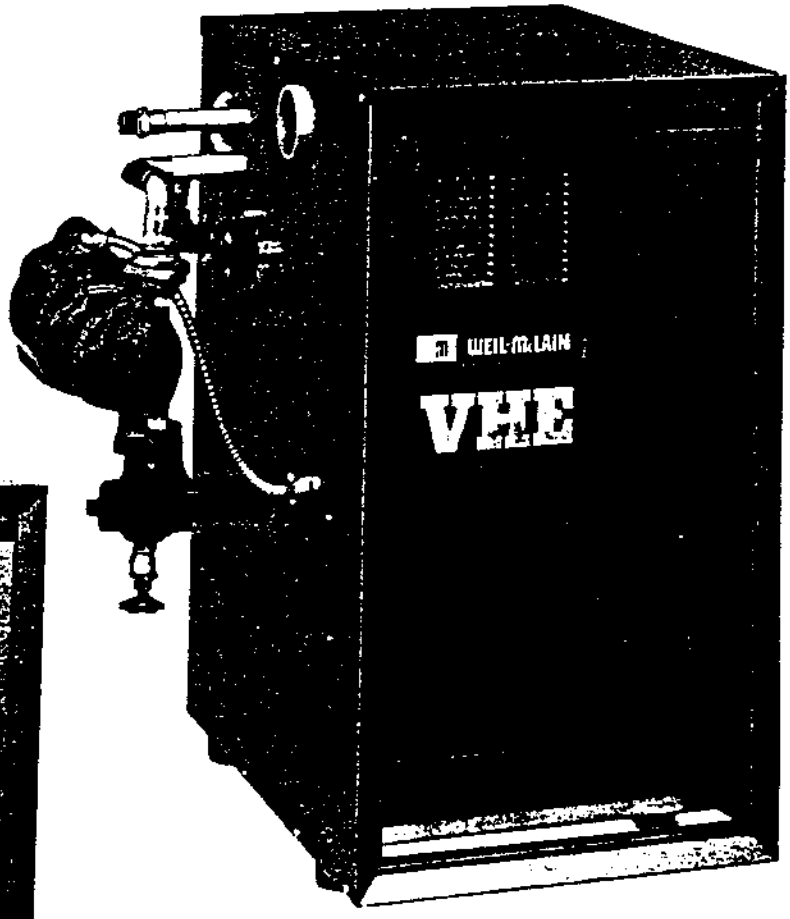
MODELS HE (Series 2) AND VHE (Series 2)

PROPANE GAS-FIRED
INDUCED DRAFT BOILERS

SUPPLEMENTAL INSTRUCTIONS
WITH WHITE-RODGERS CYCLE-PILOT® SYSTEM FOR PROPANE GAS-FIRED BOILERS



MODEL HE (Series 2)



MODEL VHE (Series 2)

PROPANE GAS

Part No. 550-141-421/0983WP

TABLE OF CONTENTS

HE (Series 2) and VHE (Series 2) Base Assembly Parts Description With White-Rodgers Cycle-Pilot® For Propane 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 w/Timer	1	511-330-118	1	511-330-118	1	511-330-118	1	511-330-118
7	Gas Valve Assembly	1	511-044-289	1	511-044-289	1	511-044-289	1	511-044-289
11	Switching Relay	1	510-350-224	1	510-350-224	1	510-350-224	1	510-350-224
■	Orifice, Main Burner Natural Gas No. 56 Drill	4	560-528-990	6	560-528-990	8	560-528-990	10	560-528-990
■	Orifice, Pilot Burner, Propane, w/Clip	1	560-528-948	1	560-528-948	1	560-528-948	1	560-528-948

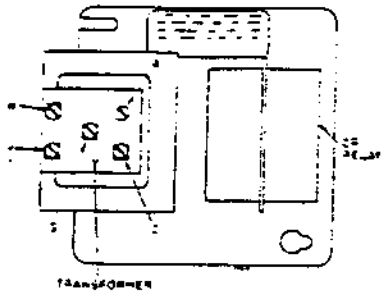
■ Not Shown.

W/A FG9-2202 STD. ORIFICE LP 3-1-85

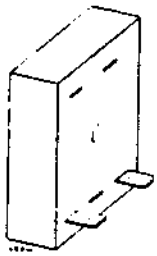
NOTE: PARTS LISTED ABOVE ARE FOR BOILERS FIRED WITH PROPANE GAS ONLY. FOR ADDITIONAL PARTS COMMON TO NATURAL AND PROPANE GASES REFER TO BOILER MANUAL.

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

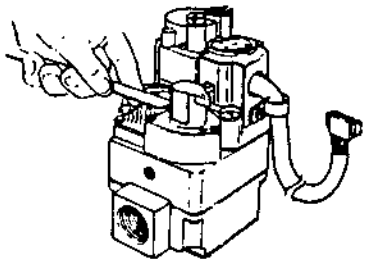
HE (Series 2) and VHE (Series 2)
WHITE-RODGERS CYCLE-PILOT® IGNITION SYSTEM COMPONENTS
FOR PROPANE GAS FIRING



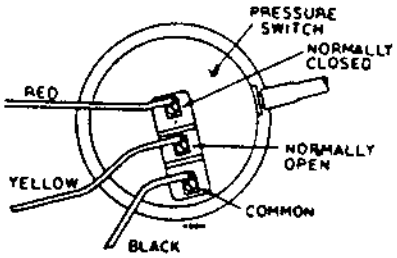
TRANSFORMER
FIGURE 1



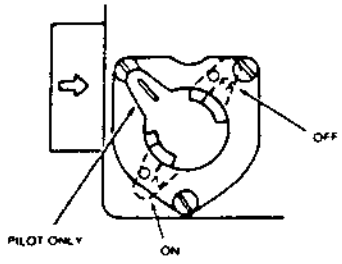
PRE-PURGE TIMER
FIGURE 5



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

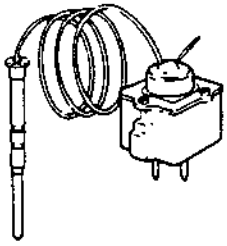


PRESSURE SWITCH
FIGURE 2

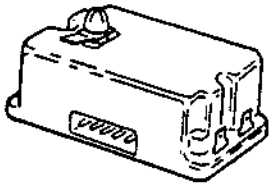


NOTE: When gas cock is positioned over black line on collar around knob, pilot will cycle on and off but main burner gas will not flow.

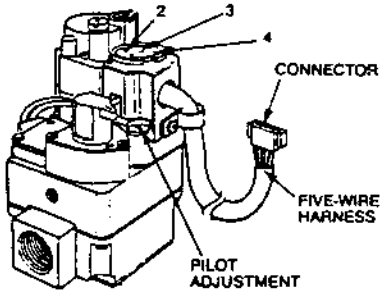
36C87-207 GAS COCK KNOB
FIGURE 6



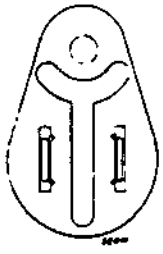
3098 MERCURY FLAME SENSOR
FIGURE 10



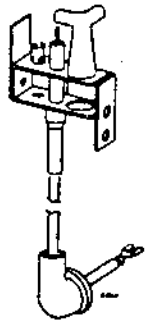
5A22-201 RELITE CONTROL
FIGURE 3



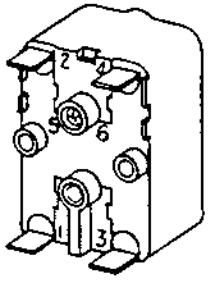
36C87-207 GAS VALVE
FIGURE 7



THERMAL FUSE ELEMENT (TFE)
FIGURE 4



E50-106 PILOT BURNER ASSY.
FIGURE 8



SWITCHING RELAY
FIGURE 11

Operation, Wiring Diagrams, Trouble Shooting

HE (Series 2) and VHE (Series 2) With White-Rodgers Cycle-Pilot® For Propane Gas Firing

BOILER EQUIPMENT COMPONENTS

BLOWER MOTOR
120/60/1, 3450 RPM permanent split capacitor motor with capacitor start and internal overload protection 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 PRESSURE AND TEMPERATURE GAUGE
Provides readings of boiler water pressure and temperature.

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.

ASME SAFETY PRESSURE RELIEF VALVE
Provides safety discharge in the event boiler water pressure exceeds 30 PSIG.

FILL-TROL SYSTEM (TYPES P-HE AND P-VHE ONLY)
Includes compression tank with permanent air cushion and combination manual shut-off valve, check valve, pressure reducing valve and strainer for automatic filling and maintaining minimum system pressure.

AUTOMATIC AIR VENT (TYPES P-HE AND P-VHE ONLY)
Vents air from boiler built-in air eliminator tapping.

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 and a safety timer function. If the pilot flame is not detected by the flame sensor within two minutes, the safety contact will open, de-energizing the gas valve, stopping all gas flow.

PILOT BURNER ASSEMBLY
Spark ignition pilot with mercury flame sensing probe.

THERMAL FUSE ELEMENT
Provides safety shutdown of burners and pilot if flame is not contained in firebox.

DRAIN VALVE
Used to drain boiler if necessary.

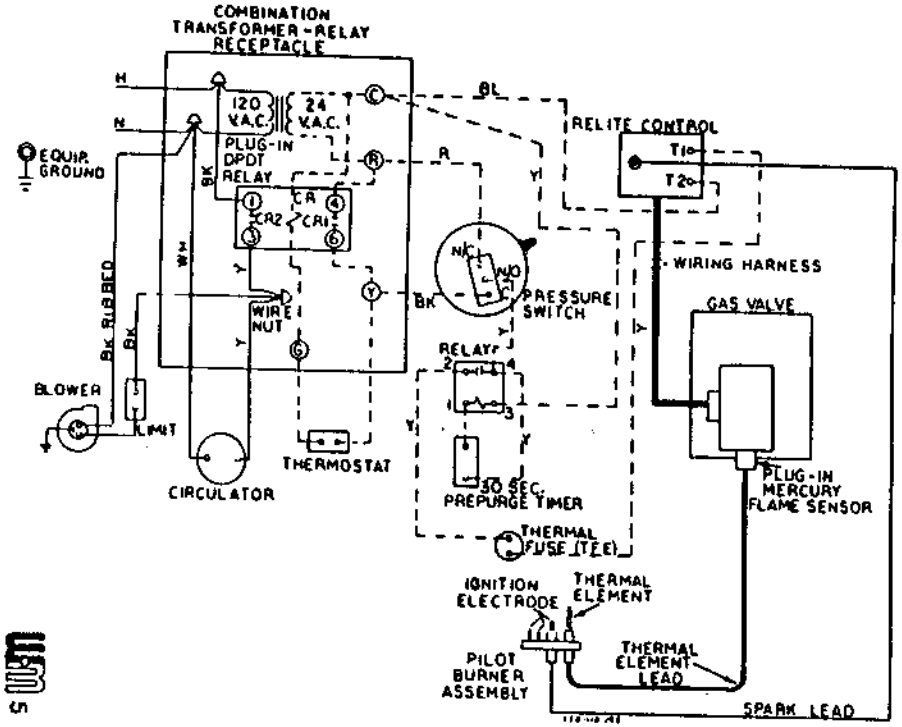
CIRCULATOR
Provides forced water circulation to hot water heating system.

SEQUENCE OF OPERATION

Referring 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, the 30 second pre-purge timer starts.
3. After a 30 second delay, 24 VAC is provided to Relite Control through relay TR1 contact:
   a) Spark voltage is provided to pilot.
   b) Pilot gas valve is energized.
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



——— HIGH VOLTAGE — — — — LOW VOLTAGE

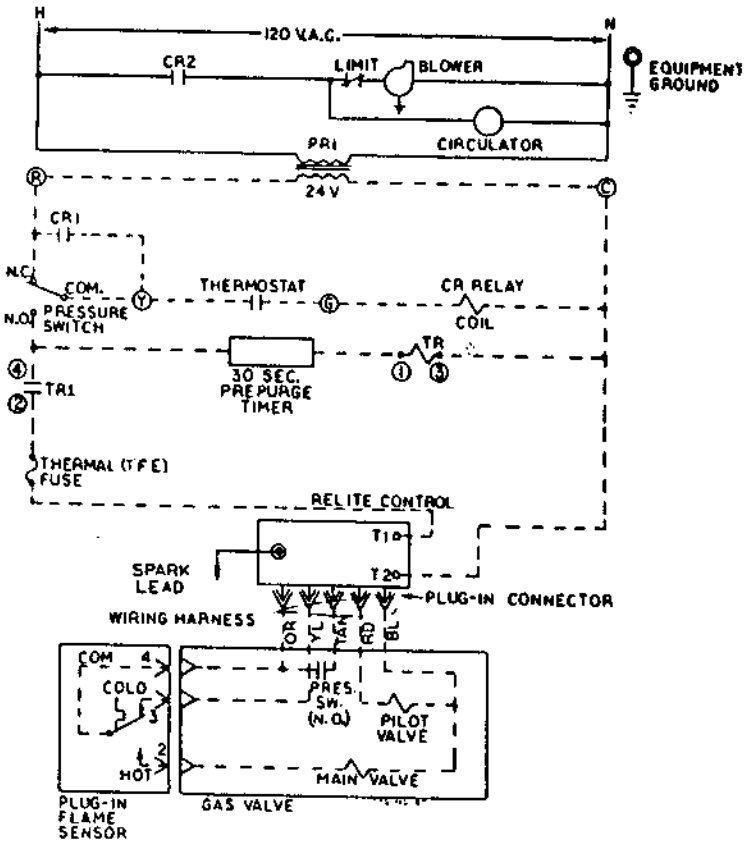
CAUTION DISCONNECT POWER SOURCE BEFORE INSTALLING AND/OR SERVICING UNIT.

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 boiler for application information.
4. Use only 90°C. Thermoplastic Wire, or equivalent, if any of the original wire must be replaced.

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

LADDER WIRING DIAGRAM



——— HIGH VOLTAGE — — — — LOW VOLTAGE

HE and VHE, Series 2 Boiler Schematic and Ladder Diagrams. PI Electronic Ignition Pilot System with White-Rodgers Cycle-Pilot Controls. Applicable to forced hot water boilers for propane gas firing.

WEIL-McLAIN
Michigan City, Indiana 46360
A Marley Company

TROUBLE SHOOTING PROCEDURE

DANGER **NEVER** jumper out (by-pass) the 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.

Control System is provided with flame failure "LOCK-OUT" feature. To reset "LOCK-OUT" circuit interrupt power to Relite Control for five minutes by either lowering thermostat setting or disconnecting power to boiler. **For initial start-up, a number of trials may be required to bleed air from gas piping.**

Before starting the trouble shooting procedure, be sure of the following:

1. You have a voltmeter capable of checking 120 VAC, 24 VAC and a continuity tester.
2. That 120 VAC power supply is available to the boiler (minimum 102 VAC, maximum 132 VAC).
3. That there is 24 VAC at the secondary side of the control transformer.
4. You have an inclined manometer with a range of 0–2.0" W.C.

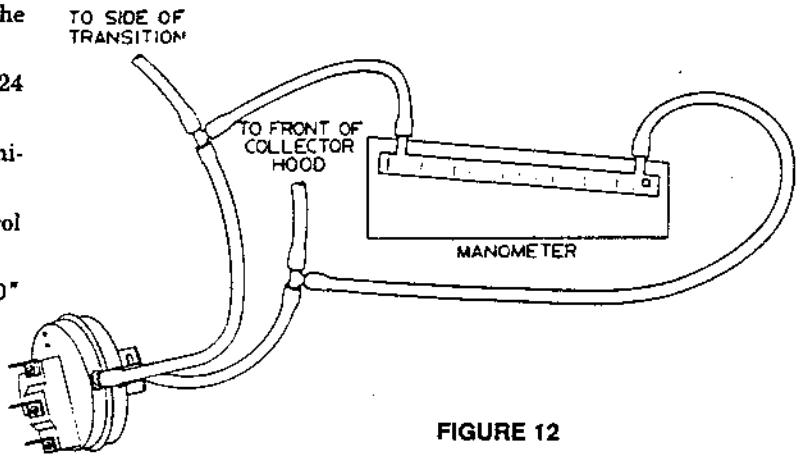


FIGURE 12

CHECKING THE PRESSURE DIFFERENTIAL SWITCH

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

1. Remove the sensing tube at the front of the pressure switch (closest to you as you face the boiler). Refer to Figure 12.
2. Install a "T" into the sensing tube and another piece of tubing from the "T" to the pressure switch.
3. Attach the third leg of the "T" to the suction side of an inclined manometer.
4. Remove the sensing tube at the rear of the pressure switch.
5. Install a "T" into the sensing tube and another piece of tubing from the "T" to the pressure switch.
6. Attach the third leg of the "T" to the pressure side of the manometer.
7. Close the 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 (Figures 1 and 2).
9. If the reading on the manometer is at least 1.8 inches water column pressure, but there is not 24 V across N.O. terminal on pressure switch and terminal C, replace the pressure switch.
10. If the reading is lower than 1.8" W.C. look for the following causes:
    a. Blockage in sensing tube.
    b. Obstruction in the 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 the block assembly.
    g. Blockage in the 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

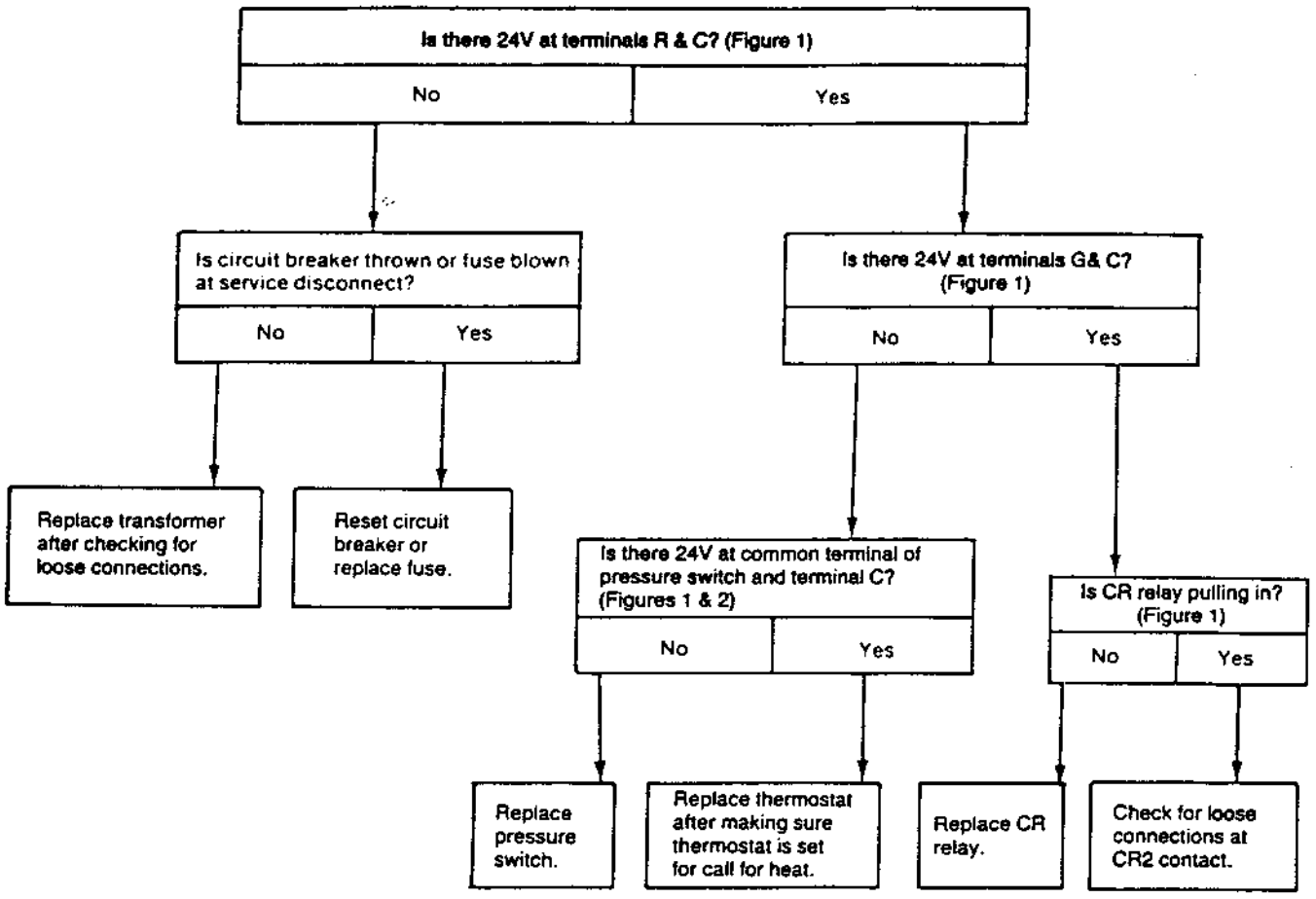


TABLE II—BLOWER WILL NOT OPERATE, BUT CIRCULATOR DOES OPERATE

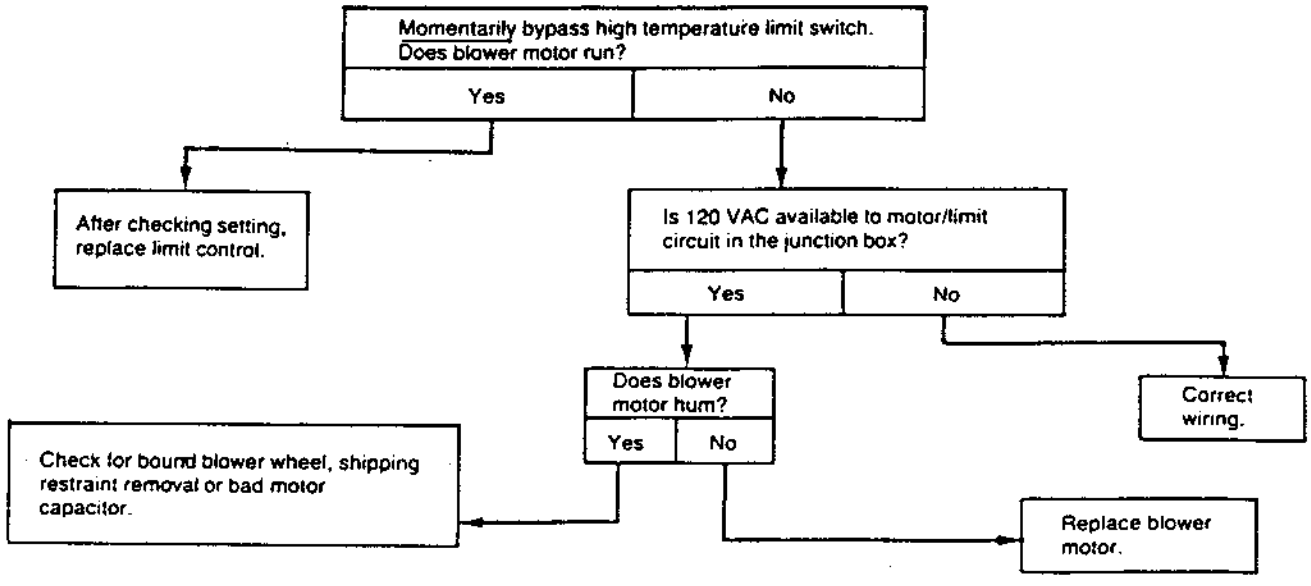


TABLE III—CIRCULATOR WILL NOT OPERATE, BUT BLOWER DOES OPERATE

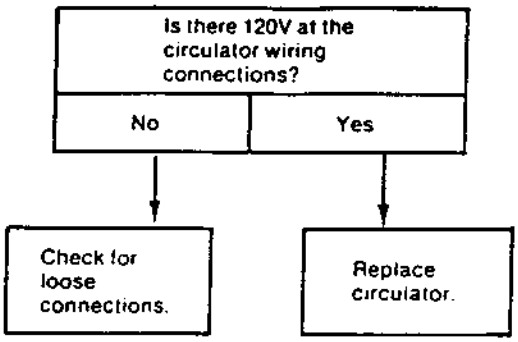


TABLE IV—NO SPARK AT PILOT—BLOWER & CIRCULATOR BOTH OPERATE

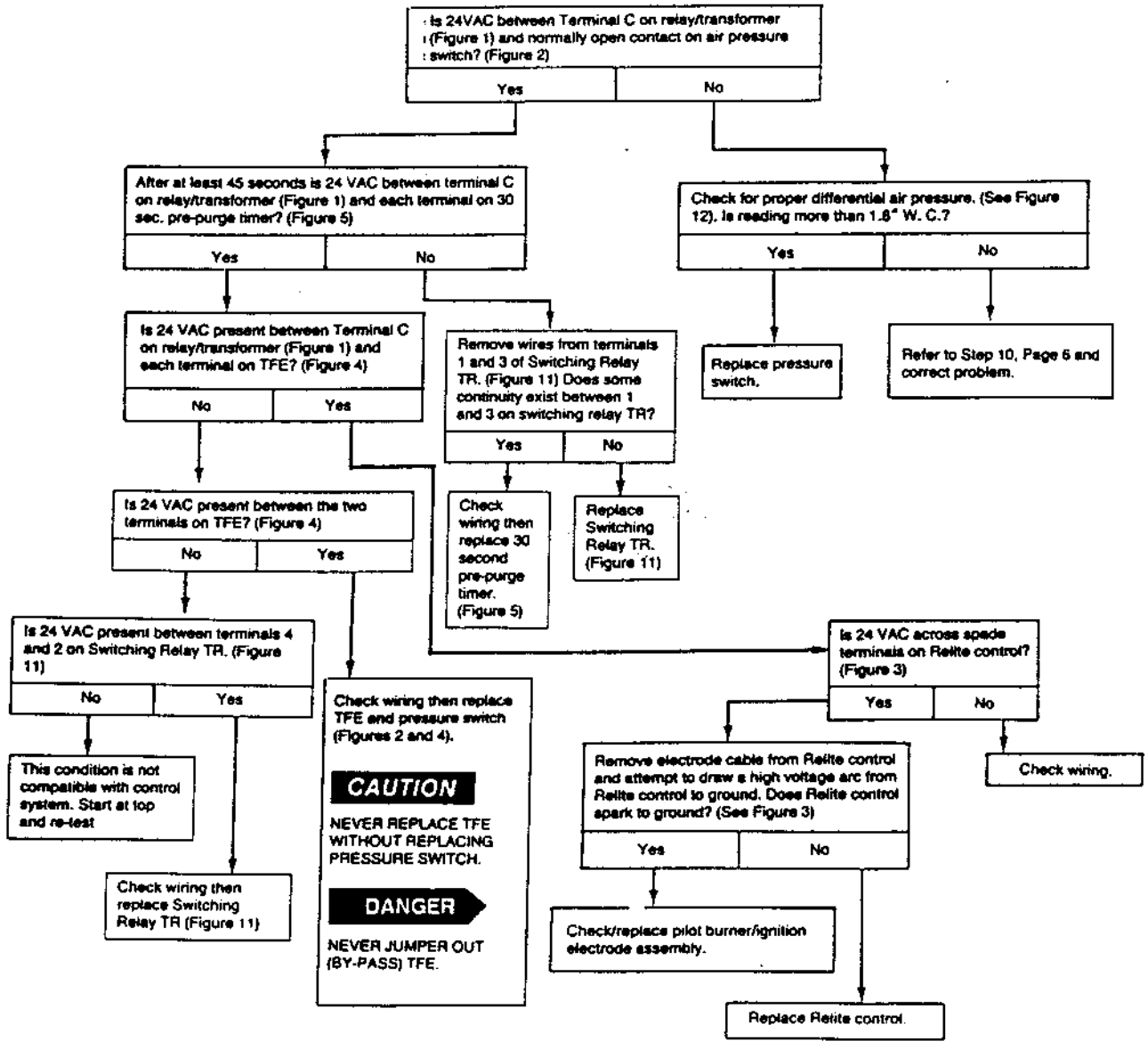


TABLE V—SPARK IS PRESENT—PILOT WILL NOT LIGHT

Is incoming gas pressure at least 11.0" W.C.?

- No → If all gas cocks are open, contact the gas supplier. The boiler requires a minimum of 11.0" W.C. inlet gas pressure.
- Yes → Is Mercury Flame Sensor plugged into gas valve? (Figure 10)
  - No → Firmly seat Flame Sensor into gas valve socket. (Figures 7–10)
  - Yes → Move gas cock knob to the "OFF" position. (Figure 6). Interrupt power to the Relite Control (Figure 3) for FIVE MINUTES by either lowering thermostat setting or disconnecting power to the boiler. This will reset "LOCK-OUT" circuit.
    - After FIVE MINUTE wait, reconnect power to Relite Control and turn gas cock knob to the "ON" position. NOTE: If pilot flame does not ignite in about two minutes after spark begins, the pilot valve will "LOCK-OUT". It may be necessary to reset "LOCK-OUT" circuit in order complete testing.
      - When spark starts, place a steel rule or small screwdriver blade across the top of the pilot solenoid coil. Is a magnetic pull felt? (Figure 9)
        - Yes → Is gas present at the pilot burner? (Use a match taped to a long screwdriver or a pilot lighter to manual light pilot.) (Figure 8)
          - No → Check for blocked pilot orifice, or tubing. (Figure 8). If orifice and tubing are clear, replace gas valve. (Figure 7)
          - Yes → Check for ignition sparks between the electrode tip and the pilot head. Does spark occur in the middle of the pilot gas stream?
            - Yes → 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)
            - 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 → Decrease pilot gas pressure. Remove pilot adjust cover screw and rotate adjust screw clockwise to decrease gas pressure (Figure 7)
              - No → 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 8)
        - No → Remove flame sensor (Figure 10) from valve socket, and place a jumper wire between holes 3 and 4 on the gas valve. When spark starts, is magnetic pull felt on top of solenoid coil?
          - Yes → Clean pins on sensor plug with emery cloth and re-test with sensor re-installed. Replace flame sensor if condition is not corrected.
          - No → Remove jumper and re-install flame sensor. Unplug five wire harness from Relite Control and check for continuity between Red and Blue wires in five wire harness. Does some continuity exist between Red and Blue wires?
            - Yes → After re-setting "LOCK-OUT" circuit and re-testing, replace Relite Control (Figure 3).
            - No → Replace Gas Valve (Figure 7)

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

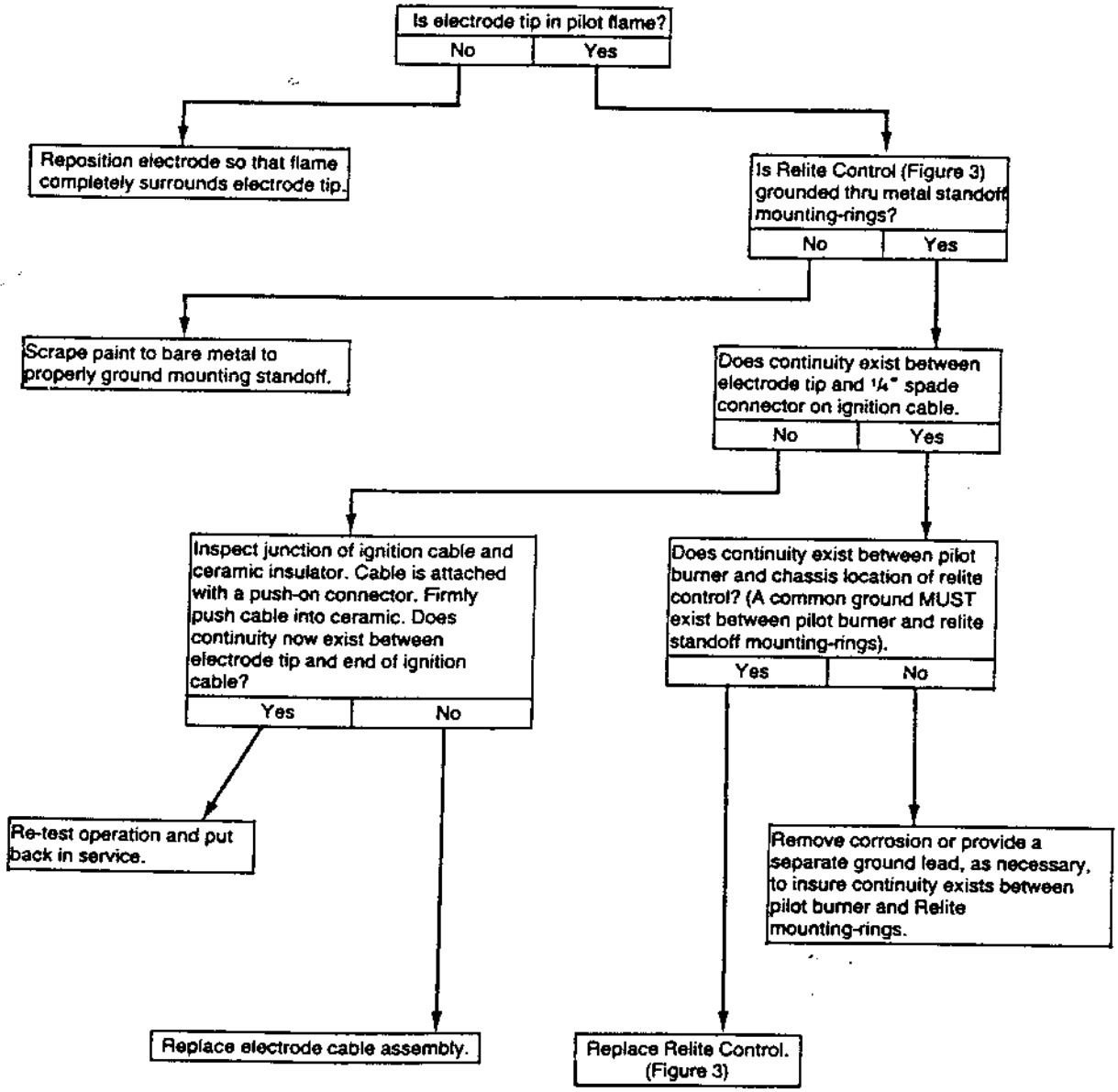


TABLE VII—PILOT LIGHTS—NO MAIN BURNER IGNITION

Is gas cock in "ON" position? (Figure 6)
- Yes
- No → Move valve on "ON" position and cycle system. (Figure 6)

Unplug flame sensor from gas valve. Does pilot remain lit? (Figures 7–11)
- Yes
- No

Insert a short jumper wire between holes 2 and 4 on the gas valve socket. CAUTION: This should energize the main valve. Does the main valve come on? (Figure 7)
- Yes
- No

Is incoming gas pressure at least 11.0" W.C.?
- Yes → Re-install flame sensor and reset LOCK-OUT circuit. After pilot ignites is there 24 VAC between tan and blue wires in Five-wire harness? Note: Use paper clip or stiff wire to insert into back side of five-wire connector on wire harness (see Figure 7) to take voltage reading. Plug Five-wire harness back into Relite Control before taking voltage readings.
  - Yes → After re-setting LOCK-OUT circuit and re-testing, replace Relite Control (Figure 3)
  - No → Replace Gas Valve (Figure 7)
- No → Check for partially open gas cocks. Contact the gas supplier. The boiler valve requires an inlet pressure 11.0" W.C. for proper operation. (Figure 6).

Is upper ¾" of flame sensor bulb engulfed by pilot flame? (Figures 8–10)
- Yes
- No → Make sure sensing bulb is completely inserted to stop ring. Recycle system. (Figures 8–11)

Does continuity exist between sockets 2 and 4 on flame sensor receptacle? (Figure 7)
- Yes → Check for poor connections between flame sensor plug and gas valve socket.
- No → Replace flame sensor. (Figure 10)

Does the pilot valve close?
- Yes → Is incoming gas pressure at least 11.0" W.C.? (Figure 7)
  - Yes → Replace gas valve. (Figure 7)
  - No → Check for partially open gas cocks. Contact the gas supplier. The Boiler requires an inlet pressure 11.0" W.C. for proper operation. (Figure 6).
- No → Replace gas valve. (Figure 7)