

6/18/91



WHITE-RODGERS

36E86 Series Gas Control for Cycle Pilot Systems FOR NATURAL GAS ONLY INSTALLATION AND START-UP INSTRUCTIONS

Operator: Save these instructions for future use!

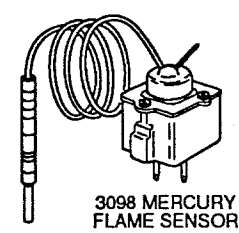
**FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE
INSTALLING OR OPERATING THIS CONTROL COULD CAUSE PERSONAL INJURY
AND/OR PROPERTY DAMAGE.**

DESCRIPTION

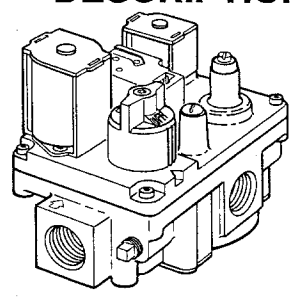
⚠ WARNING
This system is NOT for use with L. P. Gas and is NOT designed for use on applications requiring step opening, two-stage, or slow opening gas controls. The incorrect application could cause fire and/or explosion.

The 36E86 combination gas control is a compact multi-function control designed to meet the requirements for use with cycle pilot. Along with its compact size, all valve adjustments and features, as well as the system interface wiring panel, have been designed on the top surface of the control for simplified application and easy accessibility.

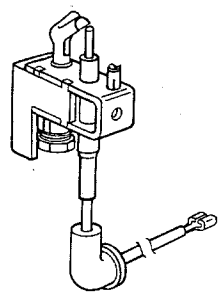
This control system automatically cycles the pilot flame on demand from a room thermostat or operating control. The system eliminates the gas wasted by a standing pilot, and pilot outage problems due to drafts. The troubleshooting guides and sequence of operation apply only to systems with the components listed in the following table, titled **REPLACEMENT PARTS**.



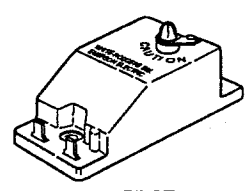
3098 MERCURY FLAME SENSOR



36E86 GAS CONTROL



E51-15 ELECTRODE ASSEMBLY



5059 PILOT RELIGHT CONTROL

CYCLE PILOT HARNESSES Available for Natural Gas Only

Harness Length	12"	18"	24"	30"	36"
Type No.	F115-0084	F115-0072	F115-0085	F115-0086	F115-0087

REPLACEMENT PARTS

Part No.	Description
36E86	Gas Control
5059	Pilot Relight Control
F115	Harness Assembly
3098	Flame Sensor
E51 or E52	Pilot Burner/ Electrode Assembly

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PRECAUTIONS

NOTE

Do not exceed the specification ratings.

All wiring must conform to local and national electrical codes and ordinances.

This package contains precision instruments that should be handled carefully. Rough handling or distorting components could cause the controls to malfunction.

⚠ WARNING

Do not use on circuits exceeding specified voltage. Higher voltage will damage the control and may cause shock or fire hazard.

⚠ CAUTION

To prevent electrical shock and/or equipment damage, disconnect electrical power to the system, at the main fuse or circuit box, until installation is complete.

Do not short out terminals on gas valve or primary control to test. Short or incorrect wiring can cause equipment damage, property damage, and/or personal injury.

This control is not intended for use in locations where it may come in direct contact with water. Suitable protection must be provided to shield the control from exposure to water (dripping, spraying, rain, etc.).

SPECIFICATIONS

Voltage: 24 volts AC (30 VAC max.), 60 Hz

Current: 0.54 amps

Power Requirements: 15 VA min.

Timing Specifications:

5059 Pilot Relight Control

Flame Failure Response Time: 0.8 sec.

Flame Failure Recognition: 0.8 sec.

36E86 Gas Valve Specifications:

Capacities (at pipe size):

1/2" x 3/8" 100,000 BTUH

1/2" x 1/2" 140,000 BTUH

1/2" x 3/4" 140,000 BTUH

Pressures:

Inlet — 5 to 14" W. C.

14" W. C. (1/2 PSI) Max

Outlet — stamped on side of valve

Ambient Operating Temperatures:

-40° to 175°F

SYSTEM OPERATION

Refer to **COMPONENT DESCRIPTIONS** for detailed operation of each component.

1. When the room thermostat or operating control calls for heat, it simultaneously energized the 5059 pilot relight control and the pilot/redundant solenoid in the gas valve. Sparks from the pilot relight control ignite the pilot gas, establishing a pilot flame.
2. Sparking stops once the flame is detected by the pilot relight control. The pilot flame begins to heat the 3098 mercury flame sensor bulb.
3. After approximately 45 seconds, sufficient heat is sensed, causing the flame sensor to energize the main gas valve. Main burner gas is ignited by the pilot flame. The system will operate in this mode until the thermostat is satisfied (or electrical power or gas pressure are interrupted).

COMPONENT DESCRIPTIONS

36E86 GAS CONTROL

The 36E86 series gas control incorporates the following features.

- Pilot/redundant solenoid line valve
- Integral pressure switch to sense incoming gas pressure
- Main valve relay and operator
- Integral pressure regulator
- Socket to accept plug-in mercury flame sensor

The 36E86 series control is composed of two independently operated gas valves. The pilot/redundant solenoid

valve is the first in the two-valve series. It controls gas flow to the pilot and main burner outlets. The pilot solenoid is controlled by the room thermostat or operating control, and opens on each call for heat. When the pilot solenoid opens, gas pressure enters the valve body and passes through to the pilot outlet. Gas pressure within the valve body causes the contacts on the pressure switch to close, creating a holding circuit for the pilot valve. The pilot valve will remain energized as long as the thermostat and pressure switch contacts are closed.

The main valve is the second in the two-valve series, and is controlled by the mercury flame sensor. It will open only after a pilot flame has been proven by the flame sensor.

The integral pressure regulator maintains a constant outlet pressure with varying inlet pressures from 5 to 14" W. C.

5059 PILOT RELIGHT CONTROL

This control is energized by the thermostat or operating control on each call for heat. It generates ignition sparks that are routed to the pilot burner via the electrode cable assembly. Once a pilot flame is detected between the ignition electrode and pilot burner (ground), ignition sparks stop. If the pilot flame is extinguished during the heat cycle, the pilot relight control will begin to generate sparks the instant the flame is not detected. The control delivers very low current sparks at approximately 10,000 volts.

3098 MERCURY FLAME SENSOR

This control is a mechanical device that proves the existence of an adequate pilot flame. It converts pilot flame heat to motion (through hydraulic action) to operate a set of electrical contacts that control power to the main valve. The flame sensor consists of a sensing bulb,

COMPONENT DESCRIPTIONS (cont)

capillary, diaphragm, and snap switch assembly, and a mercury fill. When the sensing bulb is heated by the pilot flame, the mercury within the bulb is vaporized, transmitting a pressure increase to the diaphragm through the capillary. The increase in pressure causes the snap switch to break to connection between the **common** and **cold** contacts (pins 4 and 3), and make the **common** and **hot** contacts (pins 4 and 2). The **cold** contact controls the pilot solenoid, while the **hot** contact controls the main valve.

E51 PILOT BURNER/ELECTRODE ASSEMBLY

This component consists of a non-aerated, lintless pilot with an integral electrode and cable assembly. A slip-on orifice is held in the burner flame with a spring clip, and can easily be removed for inspection, cleaning, or replacement. The electrode is factory-installed and positioned for proper operation. It is equipped with a high voltage cable, female quick-connect (1/4") terminal, and an insulating boot.

INSTALLATION

WARNING

NEVER USE FLAME OR ANY KIND OF SPARKS TO CHECK FOR GAS LEAKS – COULD CAUSE FIRE AND/OR EXPLOSION.

All piping must comply with local codes, ordinances, and/or national fuel gas codes.

NOTE

DO NOT REMOVE plastic dust covers from the gas valve until ready for installation.

MAIN PIPING CONNECTIONS

WARNING

Failure to turn off electric or main gas supply to heating system could cause personal injury and/or property damage by shock, gas suffocation, fire, and/or explosion.

1. Turn off electrical power to the system at the fuse box or circuit breaker. Also turn off the main gas supply.
2. If replacing an existing control, disconnect all plumbing and electrical connections from the old control.

3. The control must be installed in an upright position, or at an angle $\pm 90^\circ$ from upright. The arrow on the valve indicates the direction of gas flow through the control.
4. You should use new pipe that is properly chamfered, reamed, and free of burrs and chips. If you are using old pipe, be sure it is clean and free of rust, scale, burrs, chips, and old pipe joint compound.
5. Apply pipe joint compound (pipe dope) or teflon tape that is approved for all gases, only to the male threads of the pipe joints. DO NOT apply compound or teflon tape to the first two threads (see fig. 1 for typical piping connections).
6. When installing gas control to supply piping, grip the control by the inlet boss only. DO NOT overtighten (see table below for maximum torque).

Maximum torque to apply to inlet boss

Inlet Boss	Inch Lbs.	N. M.
1/2" NPT	375	42.38

7. See **SYSTEM WIRING** when making electrical connections. After all gas and electrical connections are completed, turn gas on and check for gas leaks with leak detection solution or soap suds. Bubbles forming indicate a leak. **SHUT OFF GAS AND FIX ALL LEAKS IMMEDIATELY.**

INSTALLATION (cont)

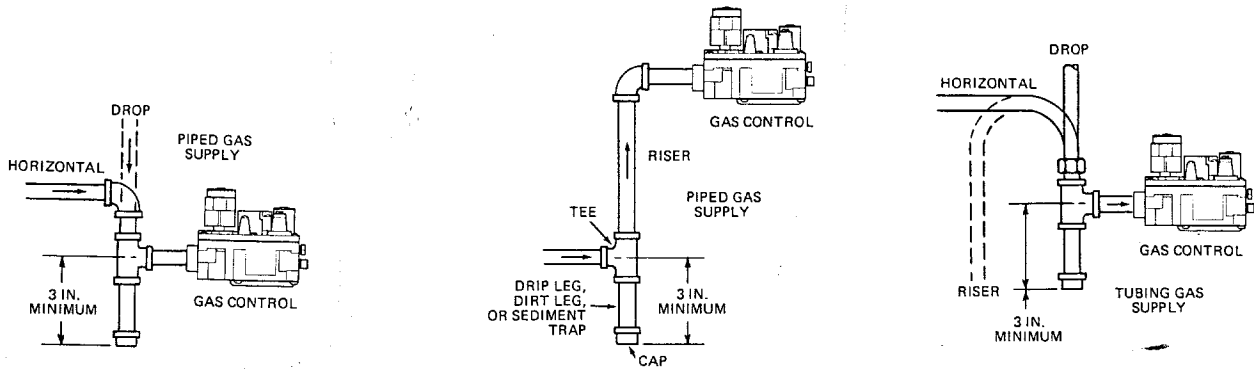


Figure 1. Piping Connections

PILOT GAS CONNECTION

Install fitting into pilot gas outlet (see fig. 3), turning until finger-tight. Insert clean, deburred tubing all the way through the fitting. While holding the tubing securely, slowly tighten fitting until you feel a slight "give". Tighten the fitting an additional 1 1/2 turns.

SYSTEM WIRING

⚠ CAUTION

To prevent electrical shock and/or equipment damage, disconnect electrical power to system at main fuse or circuit breaker box until installation is complete.

NOTE

The wiring and schematic diagrams on the following page show only terminal identification and typical wiring hookup. Always refer to the equipment manufacturer's wiring instructions for system hookup operations.

All wiring should be installed in accordance with local and national electrical codes and ordinances.

Always check that the electrical power supply used agrees with the voltage and frequency shown on the gas control.

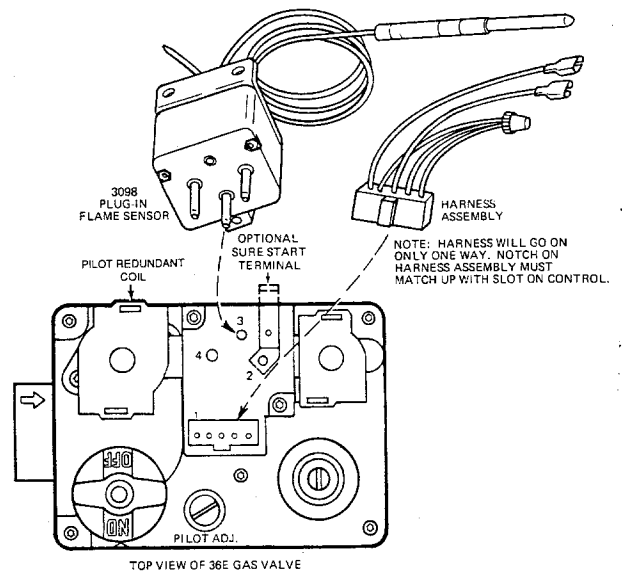


Figure 2. Flame Sensor and Harness Cable Connections to 36E Gas Control

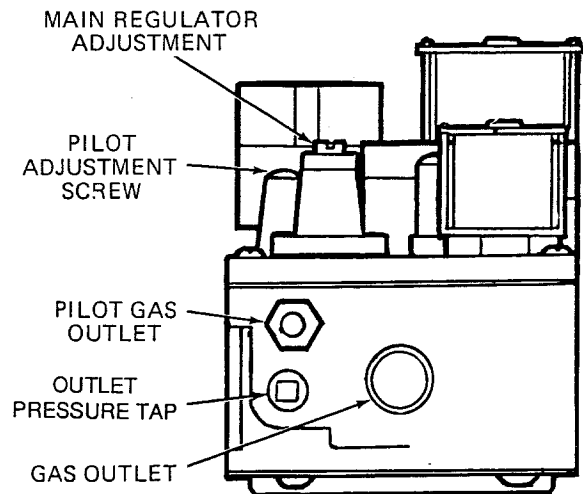


Figure 3. 36E Gas Control Side View

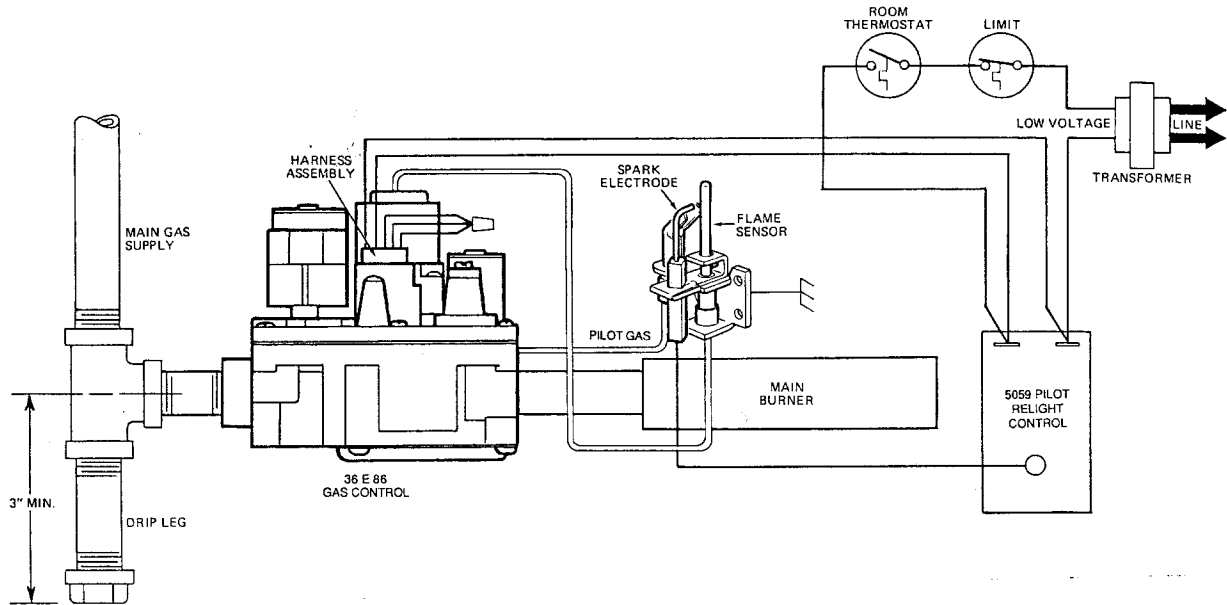


Figure 4. Schematic Diagram (24v AC Control Circuit)

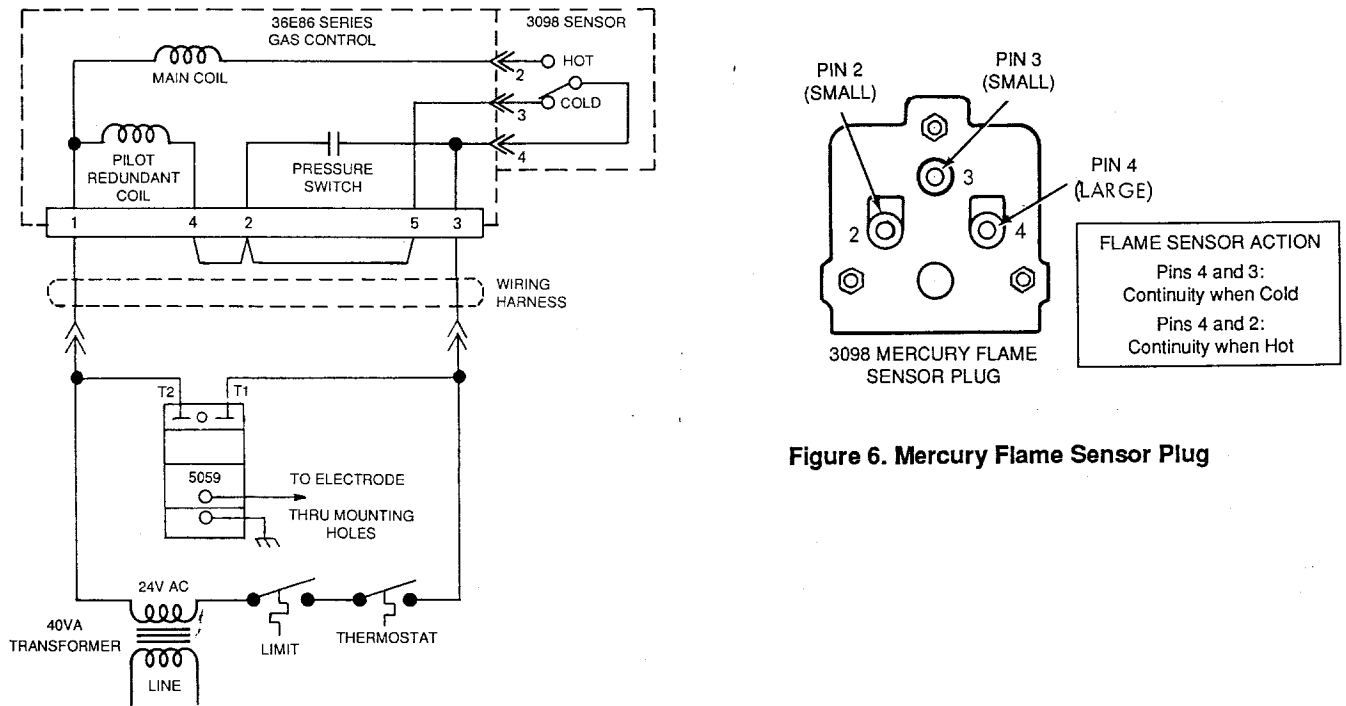


Figure 5. Internal Wiring of 36E86 Gas Control and 3098 Flame Sensor

TROUBLESHOOTING

The following test equipment is required to troubleshoot this system with a minimum of time and effort:

- Volt-ohmmeter for measuring voltage and resistance.
- Manometer to measure inlet and outlet gas pressures.
- 6" jumper wire for testing circuits (stripped at both ends).
- 18" jumper wire and alligator clips.
- Assorted hand tools.

Figures 8 through 11 are troubleshooting guides that provide a systematic method for isolating equipment problems. To effectively use the guides, each step **must** be completed in the proper sequence, performing whatever tests are suggested. After completion of each test, the guides will direct the service technician to the next troubleshooting step, based on the results of the previous check. Components should be replaced only when suggested by the troubleshooting guide, and only after completing each check in the proper sequence.

NOTE

These troubleshooting charts are for natural gas systems ONLY!

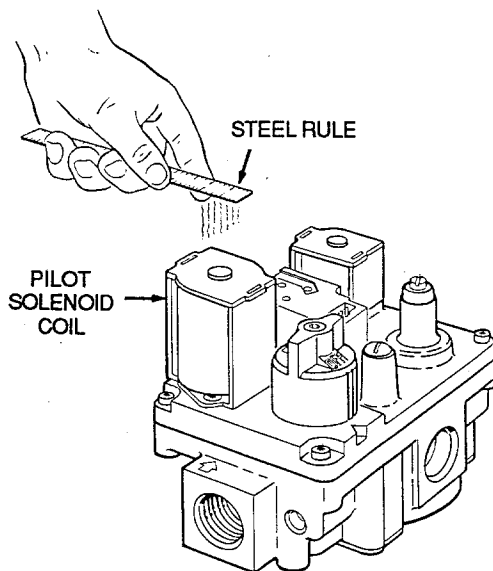


Figure 7. Testing Pilot Solenoid Coil

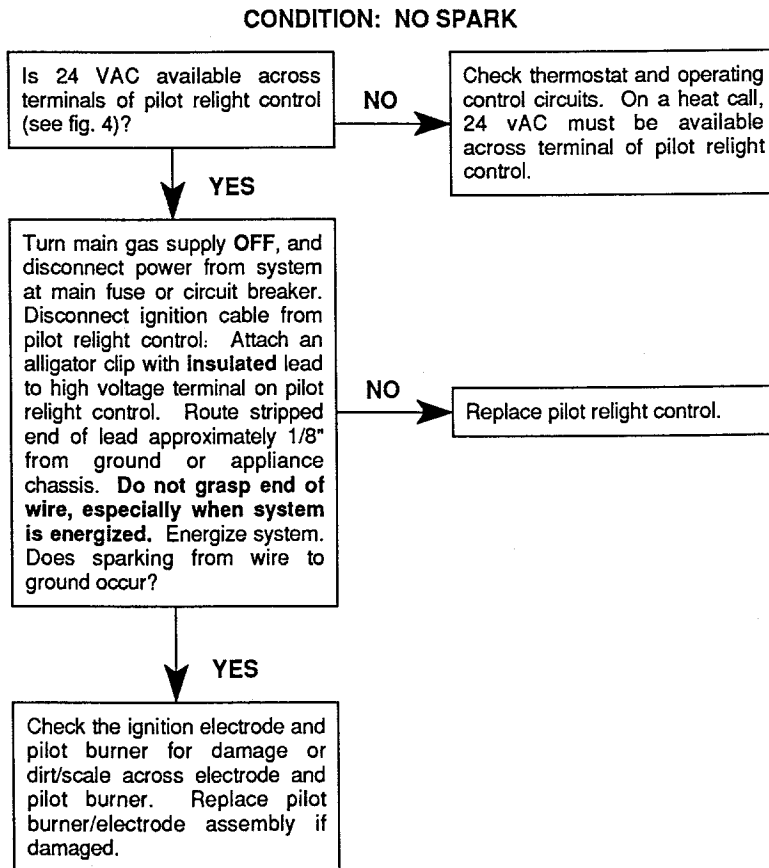


Figure 8

CONDITION: SPARK IS PRESENT — PILOT WILL NOT LIGHT

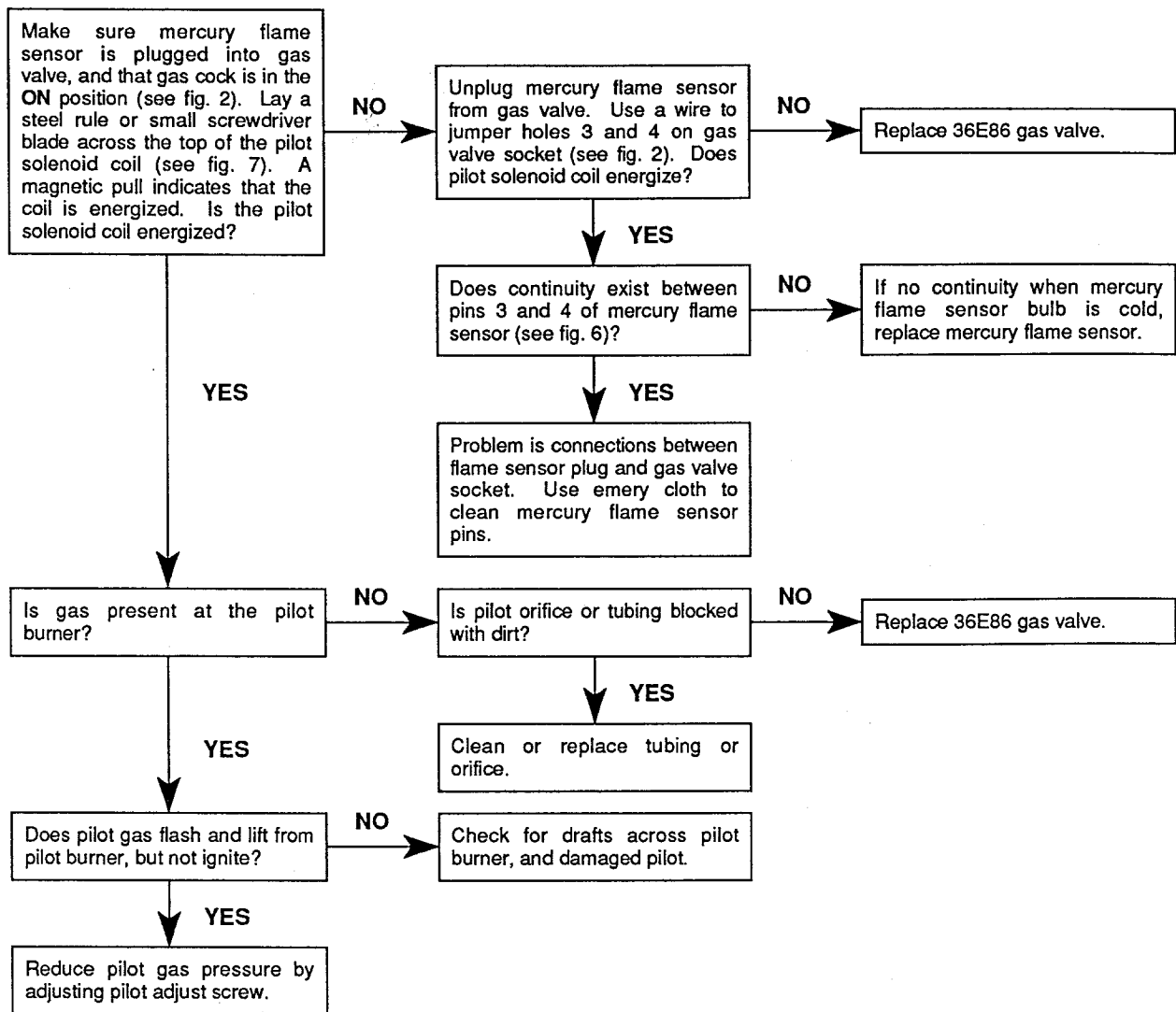


Figure 9

CONDITION: SPARK WILL NOT SHUT OFF AFTER PILOT FLAME IS ESTABLISHED

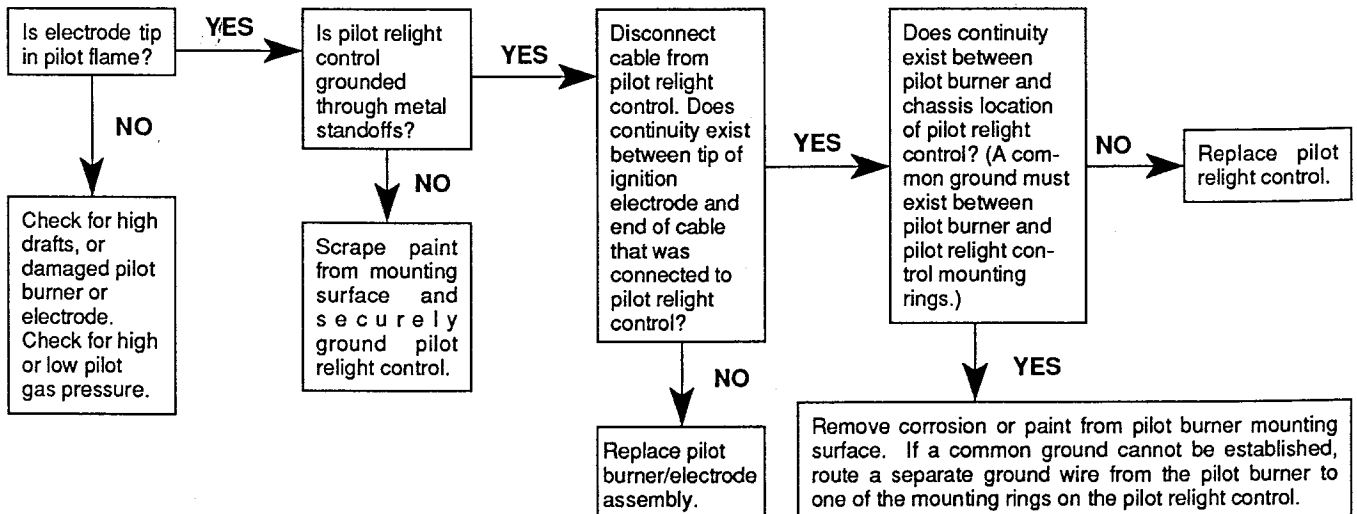


Figure 10

NOTE

These troubleshooting charts are for natural gas systems ONLY!

**CONDITION: PILOT IS LIT OR CYCLES ON AND OFF —
NO MAIN BURNER IGNITION**

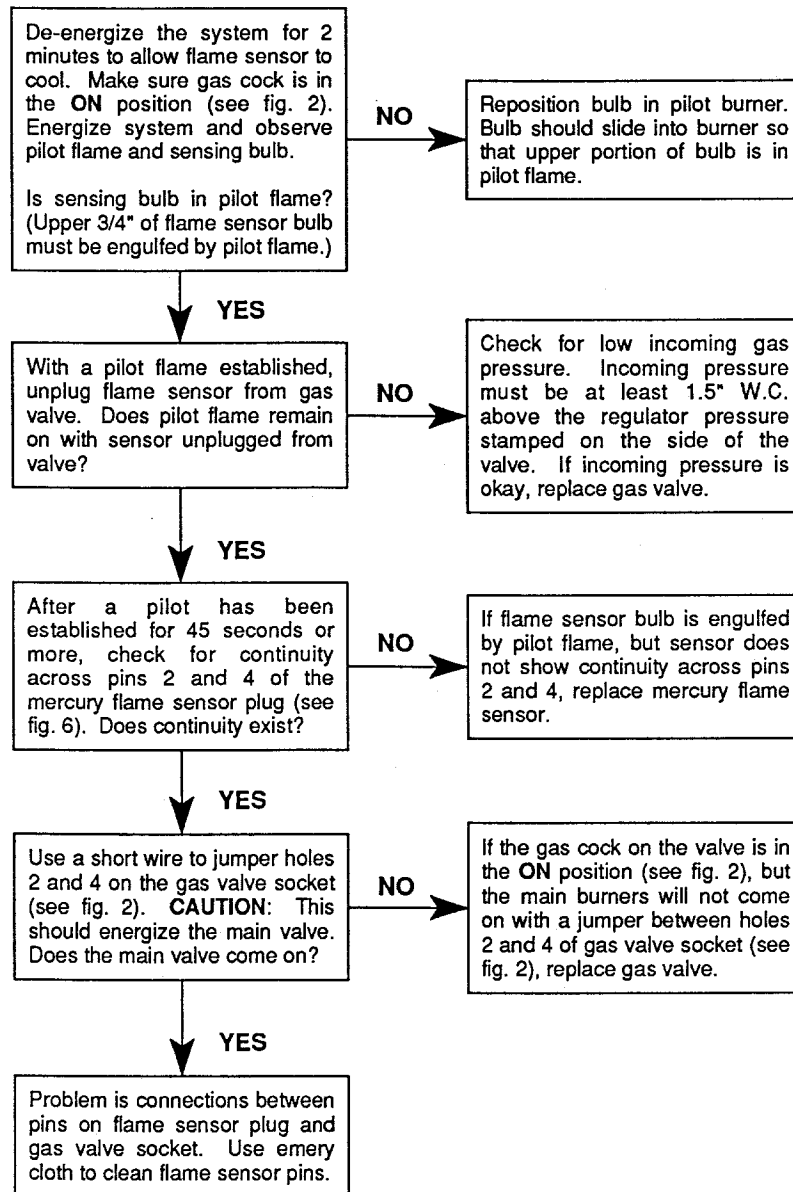


Figure 11

If you need further information about this product, please write to

White-Rodgers Division, Emerson Electric Co.
9797 Reavis Road
St. Louis, MO 63123
Attention: Technical Service Department