



WHITE-RODGERS

OFFICE COPY

- INSTALLTION INSTRUCTIONS - RETROFIT PACKAGE TO REPLACE STANDING PILOTS MODEL 21D18-3 FOR NATURAL GAS ONLY

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

KEEP INSTRUCTION SHEET FOR FUTURE USE.

READ CAREFULLY:

WARNING THIS PACKAGE IS NOT FOR USE WITH L.P. GAS, AND IS NOT DESIGNED FOR USE ON APPLICATIONS REQUIRING STEP OPENING, SLOW OPENING OR TWO-STAGE GAS VALVES. FOR L.P. APPLICATIONS, USE 21D18-15.

DESCRIPTION

The 21D18-5 Cycle-Pilot retrofit package is an interrupted type system designed to convert standing pilot applications to cycling pilot. The package contains the controls and hardware necessary for the conversion. When installed, the pilot flame will cycle on and off at the demand of a room thermostat. The system is for use with natural gas. The following are included as part of this package:

REPLACEMENT PARTS LIST

Part No.	Description
36C84-426	Combination Gas Valve
3098-134	Mercury Flame Sensor
5059-23	Pilot Relight/Safety Timer Control
760-56	Electrode assembly
F115-0064	Harness Assembly

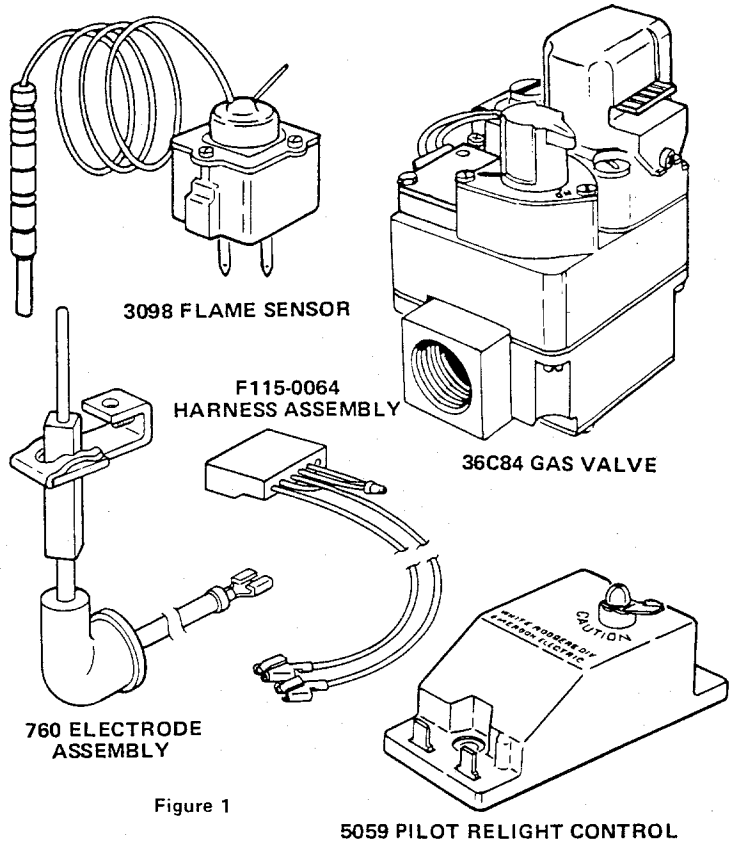


Figure 1

PRECAUTIONS

This retrofit kit must be installed by a qualified service technician.

Do not exceed the specification ratings.

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

This control is a precision instrument, and should be handled carefully. Rough handling or distorting components could cause the control to malfunction.

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

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.)

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

WARNING DO NOT USE ON CIRCUITS EXCEEDING SPECIFIED VOLTAGE. HIGHER VOLTAGE WILL DAMAGE CONTROL - COULD CAUSE SHOCK OR FIRE HAZARD.

SPECIFICATIONS

Voltage: 24 vAC

Current: .61 Amps

Valve Capacities (At Pipe Sizes)

3/4" - 335,000 BTUH

1/2" - 250,000 BTUH

Spark Gap: 3/32" Min. to 5/32" Max.

Power Requirement: 15 VA Min.

Ignition: Type 5059

Flame Failure Response: 0.8 Sec.

Recycle Time: 0.8 Sec.

Flame Established Period: 90 Sec.



WHITE-RODGERS DIVISION
EMERSON ELECTRIC CO.
9797 REAVIS ROAD
ST. LOUIS, MISSOURI 63123

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Part No. 37-4224C
Replaces 37-4224B
9103

SPECIFICATIONS (Cont'd)

Operating Temperatures:

36C84- : -40° to 175°F (-40° to 79°C)
5059- : -40° to 175°F (-40° to 79°C)
3098*- : -20° to 175°F (-29° to 79°C)
760**- : -40° to 482°F (-40° to 250°C)

F115- : -40° to 175°F (-40° to 79°C)

- * Element Tip to 1450°F. (787°C)
- ** Electrode Tip to 1450°F (787°C)

SYSTEM OPERATION

1. Thermostat calls for heat and simultaneously energizes the pilot relight control to generate sparks and the pilot-redundant valve solenoid in the combination gas valve. This allows gas flow to the pressure switch and pilot burner.
2. The sparks ignite the pilot gas. Once the flame is detected, the sparks stop. The pilot flame heats the Mercury Flame Sensor.
3. After approximately 45 seconds, sufficient heat is sensed causing the flame sensor to energize the main valve. **WHEN THE THERMOSTAT IS SATISFIED, BOTH VALVES ARE DE-ENERGIZED, STOPPING ALL GAS FLOW.**

INSTALLATION

PREINSTALLATION INSPECTION

The retrofit kit replaces the standing pilot with an intermittent pilot ignition system on atmospheric burner appliances. These systems are not for use on power burners, direct vent equipment or Powerpile control operated equipment.

Before beginning installation, the appliance *must be in optimum operating condition.*

The following PREINSTALLATION INSPECTION MUST BE PERFORMED FIRST to insure satisfactory operation of the retrofit intermittent pilot ignition kit. If a condition which could result in unsafe operation is determined, the appliance should be shut off and the owner advised of the unsafe condition. Any unsafe conditions must be corrected before proceeding with the retrofit kit installation.

1. Conduct a gas leakage test of the appliance piping and control system downstream of the shutoff valve in the supply line to the appliance.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restrictions, leakage or corrosion or other deficiencies which could cause an unsafe condition.
3. Inspect burners and crossovers for blockage and corrosion.
4. Shut off all gas to the appliance and shut off any other fuel-burning appliance within the same room. Use the shutoff valve in the supply line to each appliance. If a manual gas valve is not in the gas supply line within 6 feet of the appliance in an accessible location one shall be installed.
5. Applicable only to warm air heating appliances. Inspect heat exchangers for cracks, openings or excessive corrosion.
6. Applicable only to boilers. Inspect for evidence of water or combustion product leaks.
7. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliance is located and other spaces of the building. Turn on clothes dryers. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers. If after completing Steps 7 through 12, it is believed sufficient combustion air is not available, refer to 1.3.4 of the National Fuel Gas Code (Z223.1) for guidance.
8. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
9. a. Determine that the pilot is burning properly and that main burner ignition is satisfactory by interrupting and re-establishing the electrical supply to the appliance in any convenient manner.
b. Determine manifold pressure in order to match input after the new control is installed.
10. a. Visually determine that main burner gas is burning properly: i.e., no floating, lifting or flashback. Adjust the primary air shutter(s) as required.
11. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use a draft gage, the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
12. Return doors, windows, exhaust fans, fireplace dampers and all other fuel-burning appliances to their previous conditions of use.
13. Applicable only to warm air heating appliances. Check both limit control and fan control for proper operation. Limit control operation can be checked by temporarily disconnecting the electrical supply to the blower motor and determining that the limit control acts to shut off the main burner gas.
14. Applicable only to boilers:
 - a. Determine that the circulating water pumps are in operating condition.
 - b. Test low water cutoffs, automatic feed water controls, pressure or temperature limit controls and relief valves in accordance with the manufacturer's recommendations and instructions to determine they are in operating condition.
15. Take the 36C84 gas control from the retrofit kit and hold it near the old gas control. Visually check the control for clearance and fit in the appliance. If in doubt, measure clearances to be sure gas control will fit in the appliance housing.

16. Check the possible control module mounting locations inside the appliance door for excessive ambient temperatures. Maximum operating temperature for the 5059 is 175 F (79 C). Potential wire routes must also avoid hot areas.
17. Observe pilot flame pattern to determine best location for ignition electrode placement.

Visually check size and length requirements of present control system to insure retrofit components will fit in the space provided.

18. The existing pilot burner shall be used or if it must be replaced, it shall be replaced by an identical model located in the same mounting as the original.
19. Make certain that the gas valve rating is equal to or greater than the nameplate input rating of the appliance.

PROCEDURE FOR INSTALLING AUTOMATIC INTERMITTENT PILOT SYSTEM

CAUTION

1. SHUT OFF GAS DURING INSTALLATION. Turn off main gas supply and wait 5 minutes for unburned gas to vent.
2. Disconnect power supply before disconnecting wiring to prevent electrical shock or equipment damage.
3. The furnace manufacturer's original pilot burner must be used during the conversion to an Intermittent Pilot Ignition system. The existing pilot burner should never be relocated or substituted. If pilot burner needs replacement, use only the pilot burner approved for use on that make and model furnace or heating appliance.
4. Be sure to conduct Gas Leak Test (page 5 No. 16) after completion.
5. Never apply a jumper across (or short) the valve coil terminals, even temporarily.
6. Do not bend tubing at control after compression nut has been tightened, as this may result in gas leakage at the connection.
7. Install a sediment trap in the gas supply line to the gas control if not currently provided. (Fig. 4)

This procedure is intended as a guide to aid in safely installing the automatic intermittent pilot system on an existing listed appliance equipped with an atmospheric gas burner(s) and not of the direct vent type.

This procedure is based on the assumption that the history of the specific installation has been one of safe and satisfactory operation.

This procedure is predicated on central furnace and boiler installations, and it should be recognized that generalized procedures cannot anticipate all situations. Accordingly, in some cases deviation from this procedure may be necessary to determine safe operation of the equipment.

The following steps should be followed in making the modifications:

1. Perform a safety inspection of the existing appliance installation as detailed in the preinstallation examination on Pages 2 and 3.
2. Shut off all gas and electricity to the appliance. To shut off gas use the shutoff valve in the supply line to the appliance. If a manual gas valve is not in the gas supply line within 6 feet of the appliance in an accessible location one shall be installed. Do not use the shutoff valve which is provided as part of a combination control.
3. Identify and disconnect the wires going to the gas valve.

Remove existing gas valve and thermocouple. Remove any other components used in previous systems but not presently required for this application; ie., on a single function control system, remove the gas solenoid, pressure regulator, and pilot stat.

IMPORTANT

1. Installation must comply with local codes and ordinances or the National Fuel Gas Code (ANSI Z223.1 — NFPA No. 54) and National Electrical Code (ANSI/NFPA No. 70).
2. Installer must fill in and attach label to appliance being converted.
3. Retrofit kit must be used only with atmospheric burners. Do not use on direct vent appliances or power burners.
4. Retrofit kit must not be used with 250 to 750 millivolt pilot systems.

WHEN INSTALLING THIS PRODUCT...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application. Input rating of the 36C84 Gas Valve must be equal to or greater than the name plate input rating of the appliance to be retrofitted.
3. The system must be installed by a qualified service technician.
4. After installation is complete, check out product operation as provided in these instructions.

Prior to beginning this procedure, a preliminary examination of the appliance and the automatic intermittent pilot system should be made to determine that the automatic intermittent pilot system can be properly applied to the appliance.

INSTALLATION (cont.)

4. Insert bulb of Mercury Flame Sensor into pilot burner in place of thermocouple. Secure Flame sensor using the pilot burner adapters supplied with the retrofit package. See figures 3 and 10 thru 16.

CAUTION Proper pilot burner placement is essential for safe operation, and smooth main burner ignition. **UNDER NO CIRCUMSTANCES** should the existing pilot burner be relocated, or an existing factory-installed shield be altered. If pilot burner replacement is necessary, use only the pilot burner approved for installation on that particular make and model appliance.

IT MAY BE NECESSARY TO REMOVE PILOT and/or MAIN BURNER to properly locate ignition electrode. If removal is required, pilot and main burner **MUST** be installed in the exact location installed by the factory.

5. LOCATE 760 SERIES ELECTRODE on pilot burner as shown in figure 2. The mounting bracket slips over flame sensor bulb and will rest on either the pilot burner bracket or the bulb adapter used in the burner. Bend the electrode toward the sensing bulb to form a 3/32" to 5/32" spark gap. Excess electrode rod may be cut off. Be sure rod is **NOT** close to appliance chassis to prevent electrode from arcing to ground. The spark gap should be in the pilot gas stream.

If electrode cannot be mounted with the slip-on mounting bracket due to pilot burner placement, remove ceramic from slip-on bracket. Use perforated strap and "U" clamp to mount electrode assembly. See figure 2.

During installation the spark electrode may be rotated slightly. Verify that the spark gap is between 3/32" to 5/32" after pilot burner is installed in the unit.

NOTE Flame must **NOT** IMPINGE on ceramic insulator, or ceramic will be damaged.

- a. When positioning electrode, spark should jump through pilot gas stream to Flame Sensor bulb. Electrode rod must remain in pilot flame after gas has been ignited. (Electrode rod is part of 5059 Relight control flame detection circuitry.)
 - b. When adjusting/bending electrode rod, use two pair of pliers to prevent bending or twisting at the point electrode enters ceramic insulator.
6. Mount 36C84 gas valve on supply pipe. Valve may be mounted in any position, except upside down. Direction of gas flow is indicated by arrow stamped on pipe boss or bottom plate.

All piping must comply with local codes and ordinances or the National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54). If copper tubing is to be used, obtain a tube-to-pipe coupling. A sediment trap or drip leg (Fig. 4) must be installed in the supply line to the controls in all gas appliance piping.

- a. It is advisable to use new pipe, properly chamfered, reamed, free of burrs and chips. If old pipe is used, be sure it is clean and free of rust, scale, burrs, chips, and old pipe joint compound.
- b. Apply pipe joint compound (pipe dope) or teflon tape, that is approved for all gases, only to the male threads of pipe joints. **DO NOT** apply compound or teflon tape to first two threads.

If a vise or open end wrench is used to hold valve while installing pipe, do not overtighten.

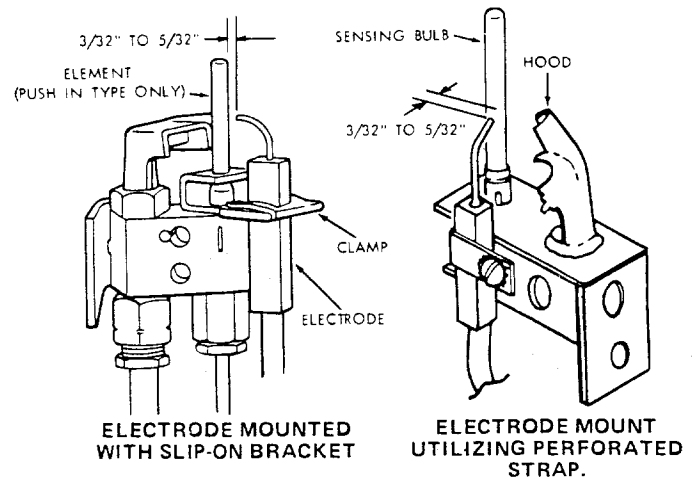
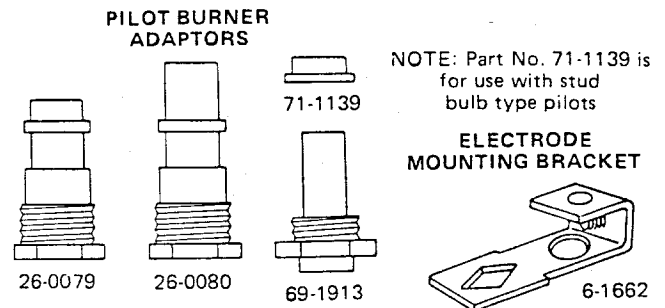


Figure 2



SEE FIGURES 10 THRU 16 FOR TYPICAL PILOT BURNER APPLICATIONS

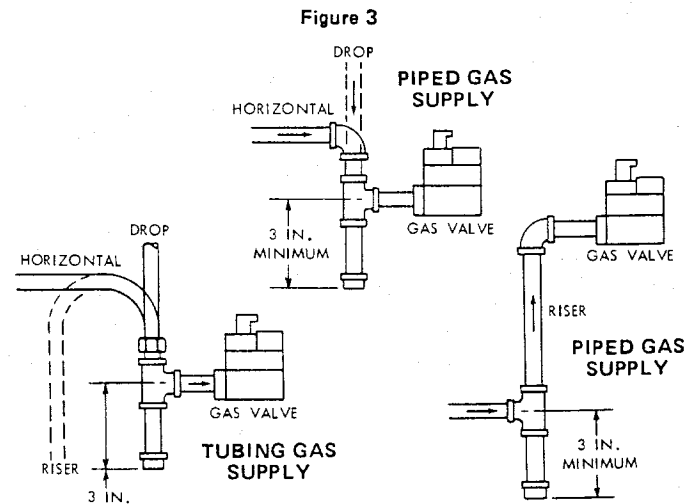


Figure 4

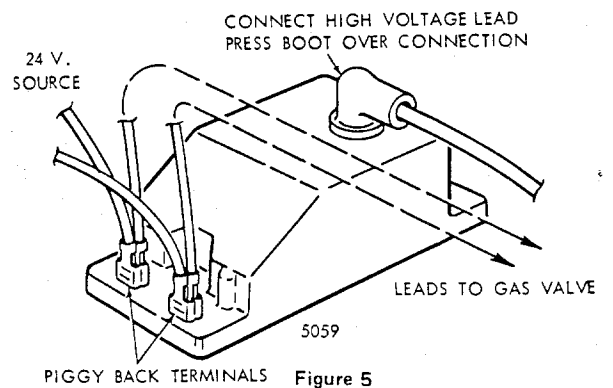
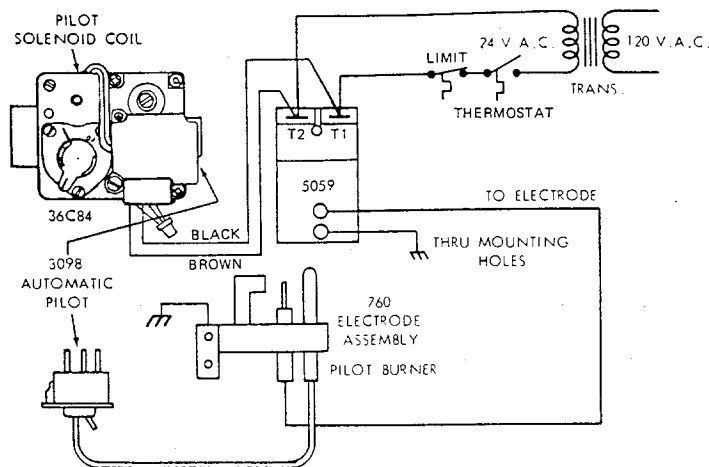


Figure 5

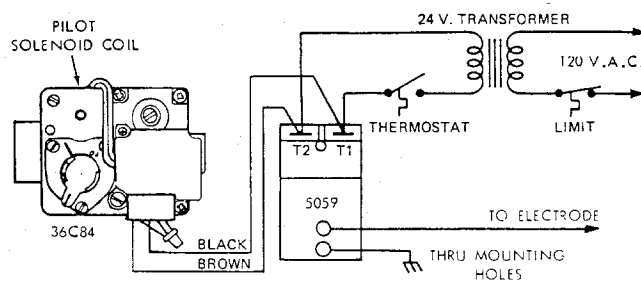
7. Attach pilot tubing to gas valve. Install fitting into pilot gas tapping, turning until finger-tight. Insert clean deburred tubing all the way through the fitting. Holding the tubing securely, slowly tighten fitting until a slight "give" is felt. Then tighten 1½ additional turns.
8. Mount the 5059 Pilot Relight control in an area on the appliance where it will not be affected by roll out flame, flame heat, or radiant heat. Maximum ambient-temperature is 175°F.

- a. Be sure metal to metal contact is made between mounting hole standoffs on Relight control and mounting surface.
- b. Connect high voltage lead to terminal on top of Relight control, after feeding lead through angled insulation boot. Press boot over connection. Avoid excessive strain on ignition cable, to prevent cable from being pulled out of ceramic. (The ignition cable is held in the ceramic by a push-on connector.)



TYPICAL LOW VOLTAGE WIRING
Figure 6

9. Attach plug in harness assembly onto terminal board of the 36C84 gas valve. Route leads to the 5059 Relight Control. Using the 1/4" piggy-back spade terminals already assembled on leads, attach the black lead to terminal T1 and the brown lead to terminal T2. See figure 5 and 6.



TYPICAL WIRING FOR LOW VOLTAGE THERMOSTAT AND LINE VOLTAGE LIMIT
Figure 7

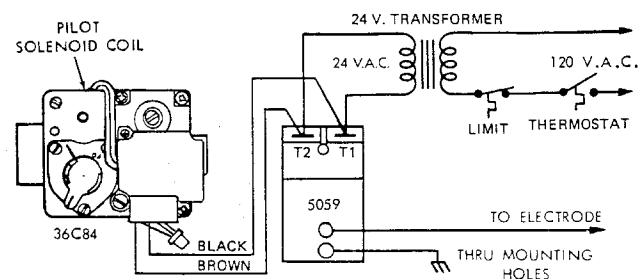
10. If replacing a 24 volt gas valve, attach wires previously connected to OLD gas valve to the piggy-back terminals on the 5059 Relight control. If replacing other control configurations refer to figures 6 thru 9 for typical wiring.

11. When wiring this system, be sure the limit control IS NOT accidentally wired OUT of the CIRCUIT.

12. Inspect all old wiring for damage, loose connections, etc. Secure all wiring to chassis or piping with electrical/friction tape or plastic wire-wraps so they will not be able to contact high temperature locations.

13. Carefully extend capillary coil from pilot burner to prevent kinks or other damage. Capillary should be stretched only far enough to reach gas valve. Excess capillary should remain coiled to prevent damage.

14. Adjust heat anticipator on room thermostat for 0.6 amps current draw. Adjust room thermostat to call for heat.



TYPICAL WIRING FOR LINE VOLTAGE THERMOSTAT AND LIMIT
Figure 8

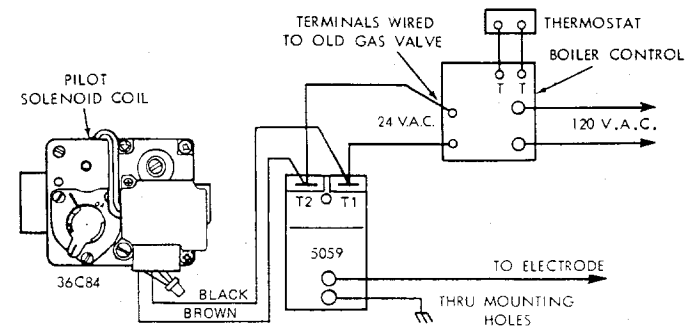
CAUTION Do not jumper or accidentally short terminals on 5059 Relight control: room thermostat heat anticipator could BURN OUT!

15. Turn on all gas and electricity to the appliances.

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

16. Use soap solution to conduct a gas leakage test of the appliance piping and control system downstream of the shutoff valve in the supply line to the appliance.

17. 5059 Relight control should begin sparking. Make sure sparking occurs between ignition electrode and Mercury Flame sensor or pilot hood, in the middle of the gas stream. The spark gap must be 3/32" to 5/32". If electrode placement is not correct, disconnect power, and re-position electrode.



TYPICAL BOILER CONTROL WIRING
Figure 9

INSTALLATION (cont.)

18. Check incoming supply voltage and 24 volt transformer output. Be sure transformer capacity is adequate. This control system requires 15 VA for proper operation.

Determine that the appliance transformer has adequate capacity by following the steps outlined below:

- Compute the approximate current draw by adding the current draw of the automatic intermittent pilot system (0.61 amps) to the current draw of any relays or other devices operated by the transformer.
 - Multiply the total current draw as computed above by 24V to determine the total VA (volt-ampere) required.
 - The total VA (volt-ampere) required should be equal to or less than the VA rating of the transformer.
 - If the total VA (volt-ampere) required is greater than the VA rating of the transformer, the transformer must be replaced with a Class 2 transformer of adequate rating.
19. Turn gas cock on valve to ON position. Turn on power to appliance to energize system. Two to five minutes will be required to bleed air through the valve and pilot line. Once gas is present at the pilot, leak check the pilot line with soap solution.
20. Adjust the thermostat to its highest temperature setting, and test manifold pressure and adjust the pressure regulator to match original input as required. See Fig. 18 for location. (The pressure determined in step 9B of the Preinstallation inspection.) Follow instructions under pressure regulator setting.
21. As soon as a pilot flame is established, sparks from the Relight control should stop. If sparking does not stop, make sure ignition electrode is in pilot flame and metal standoffs on 5059 Relight control are grounded.
22. After 45 seconds pilot flame will heat Mercury Flame sensor. Flame sensor will then switch main valve ON. Main burner will ignite.
23. Use soap solution to leak check the piping to the main burner.

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

24. Visually determine that main burner is burning properly: i.e., no floating, lifting or flashback. Adjust the primary air shutter(s) as required.
25. If primary air shutter(s) is readjusted, verify performance of burners when appliance burner is "Hot" and "Cold."
26. Determine that the pilot is igniting and burning properly and that main burner ignition is satisfactory by interrupting and re-establishing the electrical supply to the appliance in any convenient manner. Make this determination with the appliance burner both cold and hot. Perform this step as many times as necessary to satisfy yourself that the automatic intermittent pilot system is operating properly.

If the pilot flame is low and does not engulf the bulb

of the mercury flame sensor, the system will not energize the main valve.

If pilot gas pressure is too high, gas will sputter past the ignition electrode, and may not ignite. High pilot gas pressure may also cause the flame to lift off the burner causing "low" heat in the flame sensor bulb.

To adjust the pilot gas pressure, remove the cover screw illustrated in figure 18. Turn the pilot adjust screw clockwise to REDUCE pilot pressure, counterclockwise to increase pressure. Be sure to replace, and tighten, cover screw.

27. Cycle the system a number of times to insure smooth ignition and proper operation.

Sequence the appliance through at least three operating cycles.

28. Applicable only to furnaces. Check both the limit control and the fan control for proper operation. Limit control operations can be checked by blocking the circulating air inlet or temporarily disconnecting the electrical supply to the blower motor and determining that the limit control acts to shut off the main burner gas.

29. Applicable only to boilers.

- Determine that the circulating water pumps are in operating condition.
- Test low water cutoffs, automatic feed water controls, pressure and temperature limit controls and relief valves in accordance with the manufacturer's recommendation to determine they are in operating condition.

30. Fill in the small installation label and place both the label and "LIGHTING INSTRUCTIONS," in a prominent location over existing instruction. Clean area to accept adhesive backed label. Remove protective backing and attach label.

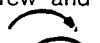

31. Give the Homeowner's Guide and all other instruction sheets to the homeowner.

PRESSURE REGULATOR SETTING

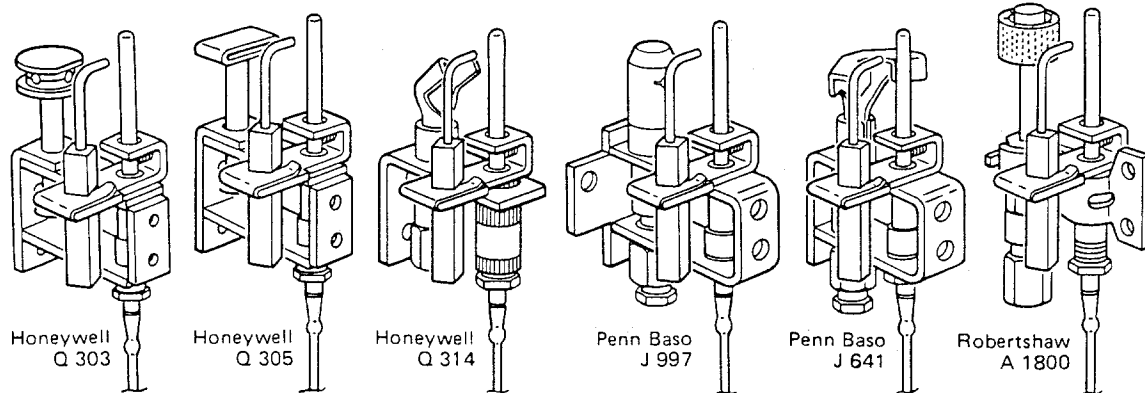
NATURAL GAS

The valve is shipped from the factory with the regulator set for 3.5" W.C. (natural gas). Adjust pressure regulator to match original input. If another outlet pressure is required, proceed as follows.:

Turn Off System Power

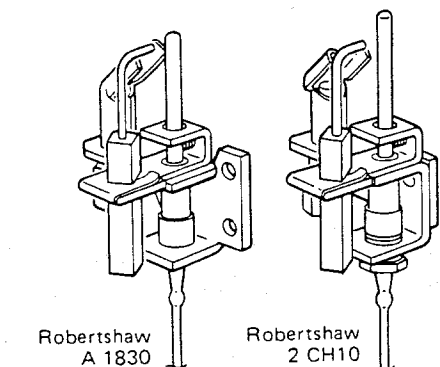
- Attach a manometer to the outlet pressure tap of 36C84 valve.
- Turn on system power and energize valve.
- Remove regulator cover screw and turn regulator adjust screw clockwise () to increase pressure, counterclockwise () to decrease pressure. Adjust regulator for pressure specified in equipment rating plate. See Fig. 18.
- Replace and tighten regulator cover screw.

Typical Pilot Burner Applications



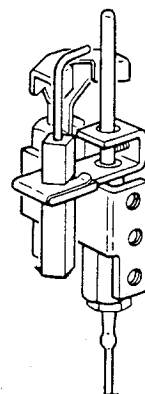
Insert adaptor (26-0079, Fig. 14) into pilot bracket. Place "C" ring in groove "A" (Fig. 16). Slide mercury element into place. Position electrode mounting bracket over element.

Figure 10



Insert adaptor (26-0079, Fig. 14) into pilot bracket. Place "C" ring in groove "B" (Fig. 16). Slide mercury element into place. Position electrode mounting bracket over element.

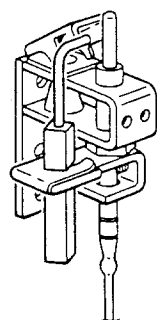
Figure 11



Penn Baso
J 999

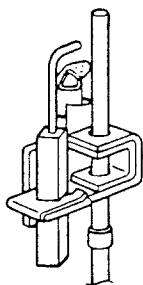
Insert Adaptor (26-0080) into pilot bracket. Place 'C' ring in groove 'A' (Fig. 16). Slide mercury element into place. Position electrode mounting bracket over element.

Figure 12



Honeywell
Q 308

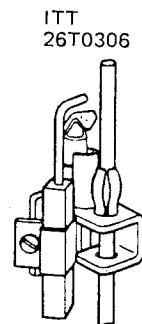
Insert adaptor (69-1913, Fig. 14) into pilot bracket. Place "C" ring in groove "C" (Fig. 16). Invert mounting bracket on electrode assembly (remove spring retainer, invert, reinstall spring clip), drop mounting bracket over mercury element. Insert mercury element into place.



ITT
26T1320

Insert adaptor (26-0080, Fig. 14) into pilot bracket. Place "C" ring in groove "A" (Fig. 16). Slide mercury element into place. Position electrode mounting bracket over element.

Figure 13



ITT
26T0306

Use standard thermocouple clamp and sleeve to mount mercury element. Slide thermocouple clamp to groove 'A', Fig. 16. Perforated strapping is used to position electrode assembly. Bend electrode so spark will jump to mercury element and electrode tip will be in pilot flame. Gap must be 3/32" to 5/32". Excess electrode may be cut off. Both mercury element and electrode must be in pilot flame.

INSTALLATION (cont.)

ADAPTORS

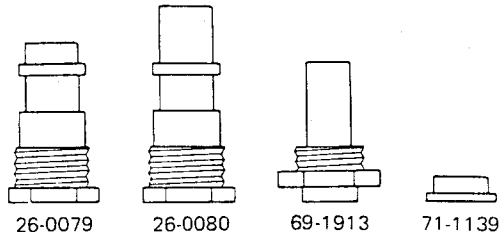


Figure 14

ELECTRODE
MOUNTING BRACKET

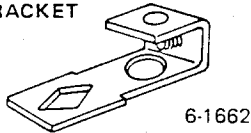


Figure 15

MERCURY
ELEMENT

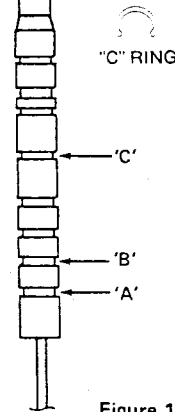


Figure 16

INVERT: PUT TRANSFORMER
ON TOP

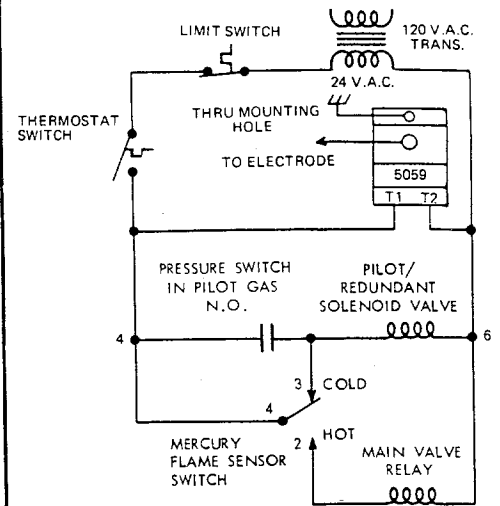


Figure 17

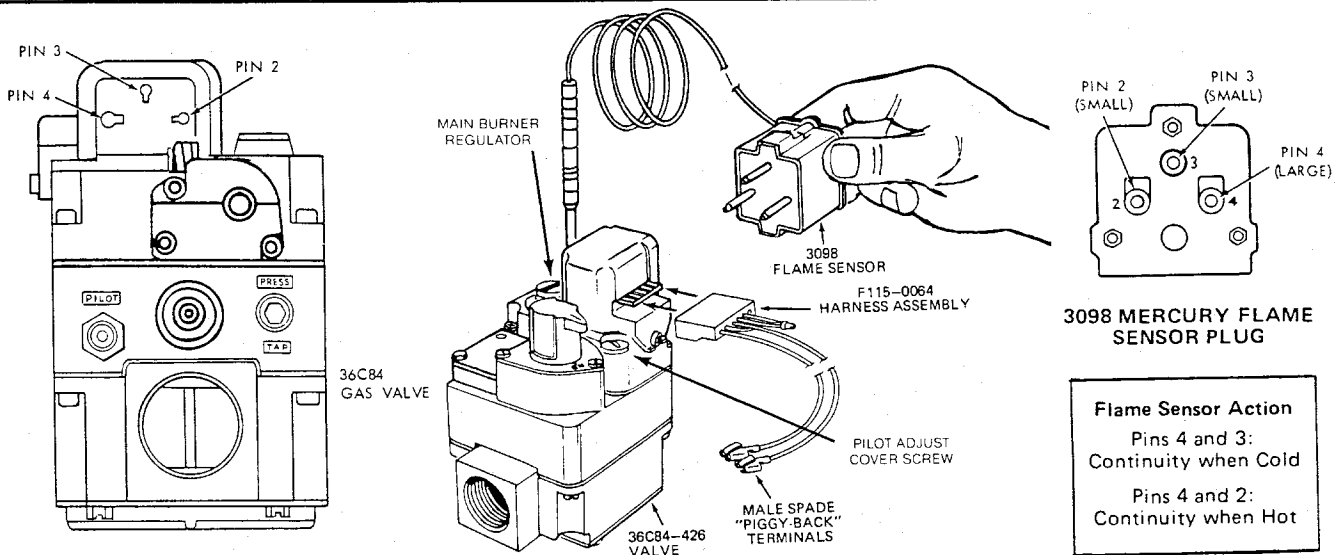


Figure 18

COMPONENT DESCRIPTIONS

36C84- GAS VALVE: This valve incorporates the following features; Pilot/Redundant solenoid valve, integral pressure switch to sense incoming gas pressure, main valve, integral pressure regulator, and socket to accept plug-in Mercury Flame sensor. The pilot/redundant valve is the first in a two-valve series. It controls gas flow to the pilot burner and to the main valve. Pilot gas is taken from between the two valves. The pilot solenoid is controlled by the thermostat, opening on a call for heat. Once gas pressure enters the valve body, the contacts on the pressure switch close, creating a holding circuit for the pilot valve. The pilot valve will remain energized as long as the thermostat and pressure switch contacts remained closed. The main valve is controlled by the Mercury Flame sensor, opening only after the sensor has "proved" that a pilot flame exists. The integral pressure regulator maintains a constant outlet pressure to the main burner manifold even though the inlet pressure may vary from 5 to 14 inches W.C.

3098- MERCURY FLAME SENSOR: This is the MECHANICAL device that proves existence of an acceptable pilot flame. It converts the heat of a pilot flame to motion which is used to open and close a set of electrical

contacts, and consists of a bulb, capillary, diaphragm, snap-switch mechanism and a mercury-fill. When the bulb is heated by a pilot flame the mercury is vaporized, causing pressure in the capillary and diaphragm. Movement of the diaphragm causes the snap-switch to open one set of contacts, and close a second set. These contacts control the pilot valve and the main valve. Approximately 45 seconds are required to heat the flames sensor under normal conditions. It will cool in 20 seconds.

5059- PILOT RELIGHT CONTROL: This control is energized by the thermostat on a heat call and generates ignition sparks. Once a flame is established, the control senses the flame and stops sparking. If the pilot flame is extinguished during a heat call, the Relight control will begin sparking the instant flame is not detected. The control delivers very low current sparks at approximately 6,000 volts.

760- IGNITION ELECTRODE CABLE ASSY: Consists of an electrode mounted in a ceramic insulator with a special high-temperature cable, and mounting hardware.

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

- Volt-Ohm Meter; for measuring voltage and resistance.
- Manometer (or gas pressure gauge) to measure inlet and outlet gas pressure.
- 6" jumper wire for testing circuits (stripped at both ends).
- 18" jumper wire with alligator clip.
- Assorted hand tools.

Figures 20 thru 23 are troubleshooting guides that provide a systematic method for isolating equipment problems. To effectively use the guides, each step must be completed in-sequence, performing whatever tests are suggested. After the completion of each test, the guides will direct the serviceman to the next logical step in troubleshooting based on the outcome of the previous check. Components should be replaced only after each step has been completed, and the final block in the guide suggests replacement.

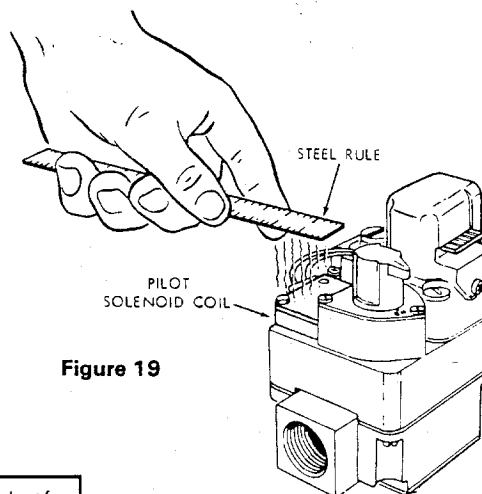
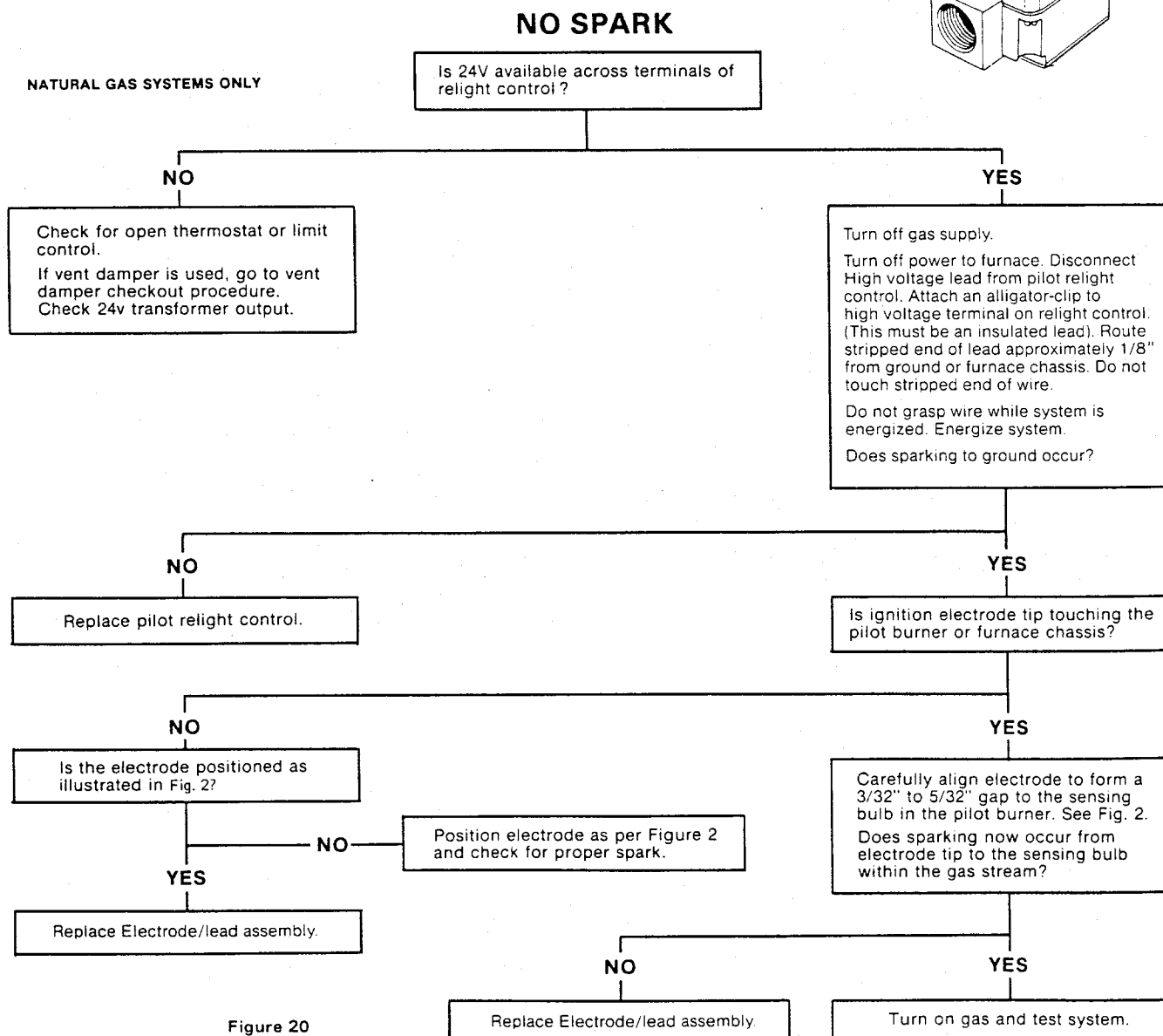


Figure 19



SPARK IS PRESENT — PILOT WILL NOT LIGHT

Make sure flame sensor is plugged into gas valve and all gas cocks are ON. Lay flat steel rule or screwdriver blade across the top of the pilot solenoid coil. A magnetic pull will be felt if pilot coil is energized. Is pilot solenoid coil energized? (Fig. 19)

NATURAL GAS SYSTEM ONLY

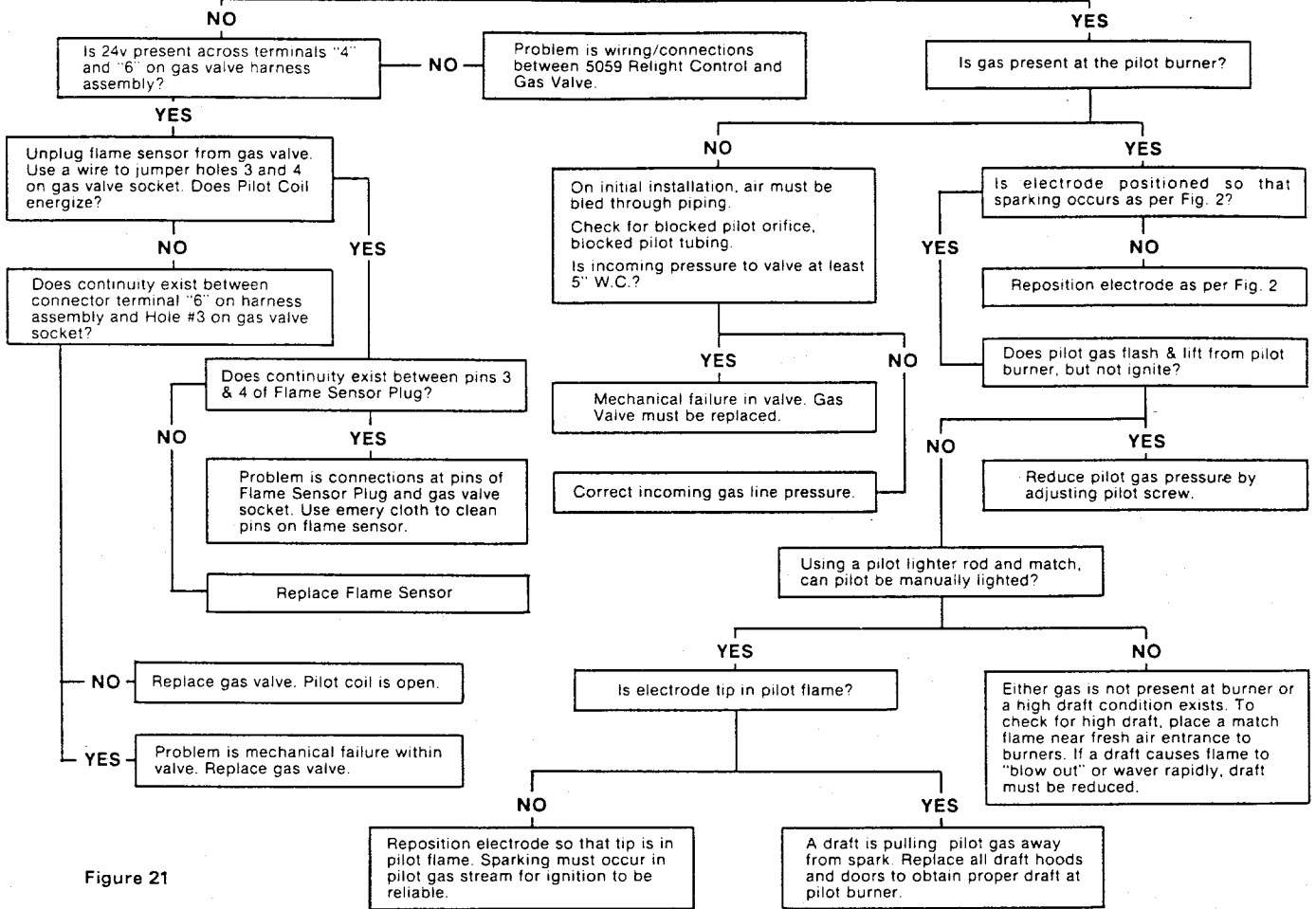


Figure 21

SPARK WILL NOT SHUT-OFF AFTER PILOT FLAME IS ESTABLISHED

NATURAL GAS SYSTEMS ONLY

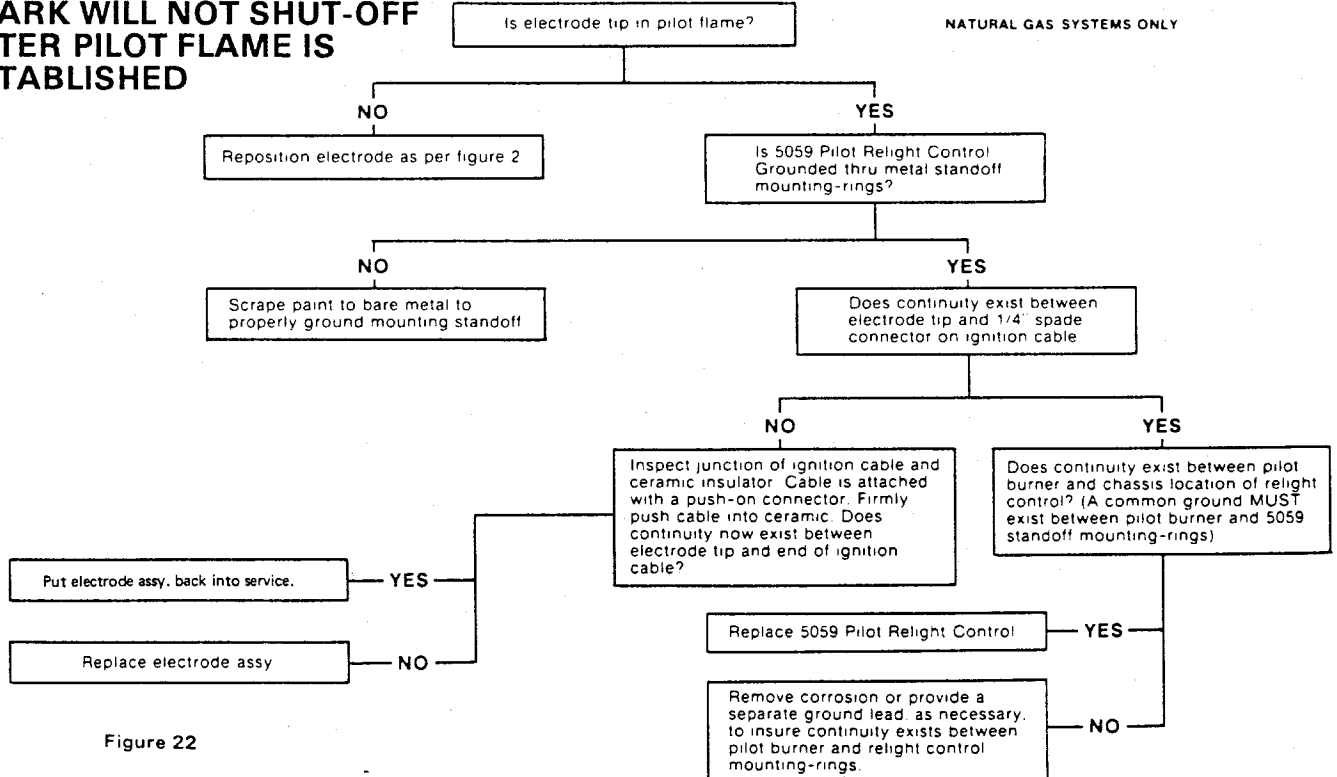


Figure 22

PILOT LIGHTS - NO MAIN BURNER IGNITION

De-energize system for 2 minutes to allow flame sensor to cool. Make sure all gas cocks are in the ON position. Energize system and observe pilot flame and sensing bulb.

NATURAL GAS SYSTEMS ONLY

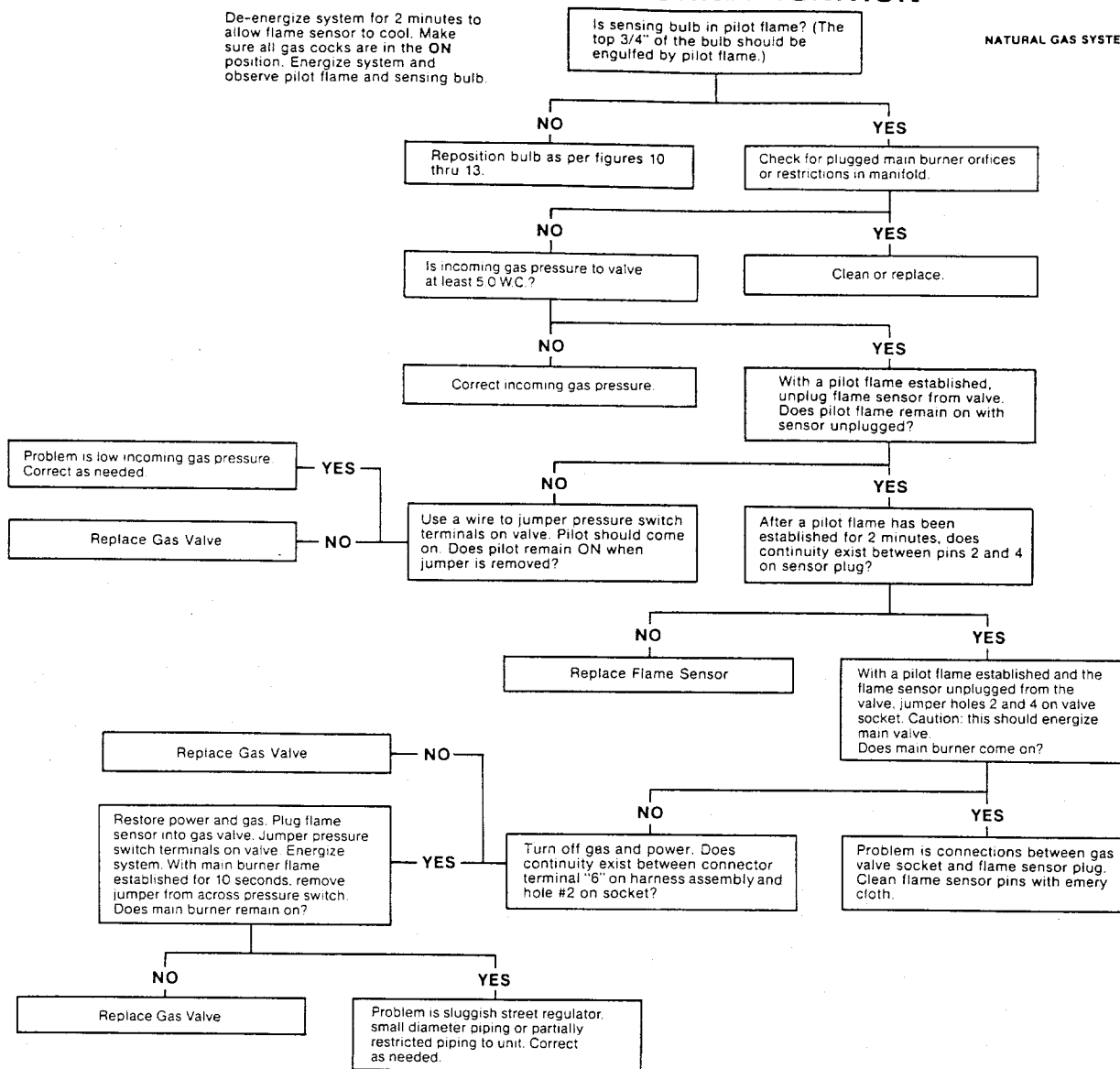
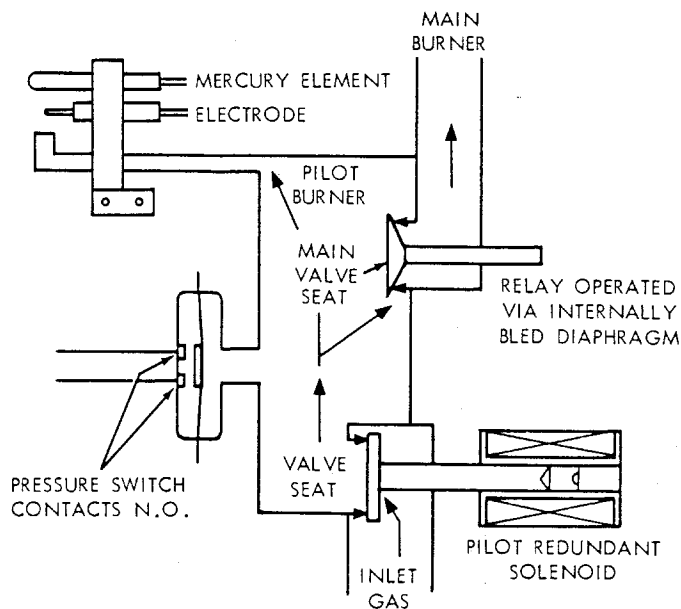


Figure 23

GAS FLOW SCHEMATIC

Figure 24



ANSI STANDARDS

EXHIBIT A

RECOMMENDED PROCEDURE FOR SAFETY INSPECTION OF AN EXISTING APPLIANCE INSTALLATION AS A PRELIMINARY STEP TO APPLYING AN AUTOMATIC INTERMITTENT PILOT SYSTEM

The following procedure is intended as a guide to aid in determining that an appliance is properly installed and is in a safe condition for continuing use.

This procedure is predicated on central furnace and boiler installations equipped with an atmospheric gas burner(s) and not of the direct vent type. It should be recognized that generalized test procedures cannot anticipate all situations. Accordingly, in some cases, deviation from this procedure may be necessary to determine safe operation of the equipment.

- a. This procedure should be performed prior to any attempt at modification of the appliance or the installation.
- b. If it is determined there is a condition which could result in unsafe operation, the appliance should be shut off and the owner advised of the unsafe condition.

The following steps should be followed in making the safety inspection:

1. Conduct a gas leakage test of the appliance piping and control system downstream of the shutoff valve in the supply line to the appliance.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restrictions, leakage or corrosion or other deficiencies which could cause an unsafe condition.
3. Shut off all gas to the appliance and shut off any other fuel-burning appliance within the same room. Use the shutoff valve in the supply line to each appliance. If a manual gas valve is not in the gas supply line within 6 feet of the appliance in an accessible location one shall be installed.
4. Inspect burners and crossovers for blockage and corrosion.
5. Applicable only to warm air heating appliances. Inspect heat exchangers for cracks, openings or excessive corrosion.
6. Applicable only to boilers. Inspect for evidence of water or combination product leaks.
7. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliance is located and other spaces of the building. Turn on clothes dryers. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers. If after completing Steps 7 through 12, it is believed sufficient combustion air is not available, refer to 1.3.4 of the National Fuel Gas Code (Z223.1) for guidance.
8. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
9. a. Determine that the pilot is burning properly and that main burner ignition is satisfactory by interrupting and re-establishing the electrical supply to the appliance in any convenient manner.
b. Determine manifold pressure in order to match input after the new control is installed.
10. a. Visually determine that main burner gas is burning properly: i.e., no floating, lifting or flashback. Adjust the primary air shutter(s) as required.
b. If appliance is equipped with high and low flame control or flame modulation, check for proper main burner operation at low flame.
11. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use a draft gage, the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
12. Return doors, windows, exhaust fans, fireplace dampers and all other fuel-burning appliances to their previous conditions of use.
13. Applicable only to warm air heating appliances. Check both limit control and fan control for proper operation. Limit control operation can be checked by temporarily disconnecting the electrical supply to the blower motor and determining that the limit control acts to shut off the main burner gas.
14. Applicable only to boilers:
 - a. Determine that the circulating water pumps are in operating condition.
 - b. Test low water cutoffs, automatic feed water controls, pressure and temperature limit controls and relief valves in accordance with the manufacturer's recommendations and instructions to determine they are in operating condition.

ANSI STANDARDS

EXHIBIT B

PROCEDURE FOR INSTALLING AUTOMATIC INTERMITTENT PILOT SYSTEMS

Prior to beginning this procedure, a preliminary examination of the appliance and the automatic intermittent pilot system should be made to determine that the automatic intermittent pilot system can be properly applied to the appliance.

This procedure is intended as a guide to aid in safely installing a listed automatic intermittent pilot system on an existing listed appliance equipped with an atmospheric gas burner(s) and not of the direct vent type.

This procedure is based on the assumption that the history of the specific installation has been one of safe and satisfactory operation.

This procedure is predicated on central furnace and boiler installations, and it should be recognized that generalized procedures cannot anticipate all situations. Accordingly, in some cases deviation from this procedure may be necessary to determine safe operation of the equipment.

The following steps should be followed in making the modifications:

1. Perform a safety inspection of the existing appliance installation. See Exhibit A for a recommended procedure for such a safety inspection.
2. Shut off all gas and electricity to the appliance. To shut off gas use the shutoff valve in the supply line to the appliance. If a manual gas valve is not in the gas supply line within 6 feet of the appliance in an accessible location one shall be installed. Do not use the shutoff valve which is provided as part of a combination control.
3. Install the automatic intermittent pilot system in strict accordance with the manufacturer's installation instruction.
4. Turn on all gas and electricity to the appliance.
5. Determine that the appliance transformer has adequate capacity by following the steps outlined below:
 - a. Compute the approximate current draw by adding the current draw of the automatic intermittent pilot system to (1) the current draw of the association valving, and (2) the current draw of any relays or other devices operated by the transformer.
 - b. Multiply the total current draw as computed above by 24V to determine the total VA (volt-ampere) required.
 - c. The total VA (volt-ampere) required should be equal to or less than the VA rating of the transformer.
 - d. If the total VA (volt-ampere) required is greater than the VA rating of the transformer, the transformer must be replaced with a Class 2 transformer of adequate rating.
6. Check the heat anticipator in the comfort thermostat to determine if it is properly adjusted to the current draw of the control system. Follow the thermostat manufacturer's instructions.
7. Make certain wiring connections are tight and wires are positioned and secured so they will not be able to contact high temperature locations.
8. Conduct a gas leakage test of the appliance piping and control system downstream of the shutoff valve in the supply line to the appliance.
9. a. Adjust the thermostat to its highest temperature setting, and test manifold pressure and adjust the pressure regulator to match original input as required. (Refer to Exhibit A, Step 9b).
b. Visually determine that main burner is burning properly: i.e., no floating, lifting or flashback. Adjust the primary air shutter(s) as required.
10. If the appliance is equipped with high and low flame controlling or flame modulation, check for proper main burner operation at both high and low flame.
11. Determine that the pilot is igniting and burning properly and that main burner ignition is satisfactory by interrupting and re-establishing the electrical supply to the appliance in any convenient manner. Make this determination with the appliance burner both cold and hot. Perform this step as many times as is necessary to satisfy yourself that the automatic intermittent pilot system is operating properly.
12. Test the pilot safety device (1) to determine if it is operating properly, and (2) for turndown characteristics according to the manufacturer's installation instructions. No adjustments should be made other than those recommended by the system manufacturer.
13. Sequence the appliance through at least three operating cycles.
14. Applicable only to furnaces. Check both the limit control and the fan control for proper operation. Limit control operation can be checked by blocking the circulating air inlet or temporarily disconnecting the electrical supply to the blower motor and determining that the limit control acts to shut off the main burner gas.
15. Applicable only to boilers.
 - a. Determine that the circulating water pumps are in operating condition.
 - b. Test low water cutoffs, automatic feed water controls, pressure and temperature limit controls, and relief valves in accordance with the manufacturer's recommendation to determine they are in operating condition.
16. Add the labels (#30 pg. 6) on the appliance.