

Economite DS24A Conversion Burners

The **ECONOMITE Models DS24A** direct spark ignition conversion burner is adaptable to any type gas utilization equipment, including gravity and forced circulation furnaces and boilers, and is particularly recommended for horizontal and downdraft gas utilization equipment since it needs no draft to maintain a pilot. *Power burner design makes it perfectly suited for oil burner replacement.*

In the United States, installation must conform with local codes or, in the absence of local codes, with **Installation of Domestic Gas Conversion Burners, ANSI Z21.8a**-latest edition and **National Fuel Gas Code, ANSI Z223.1**-latest edition(s) available from American National Standard Institute. Further reference should be made to the recommendation of your fuel supplier.

Note: Any additions, changes or conversions required in order for the gas utilization equipment to satisfactorily meet the application needs must be made by a MIDCO distributor (or other qualified agency) using factory specified and approved parts.

In Canada, installation must conform with local codes or, in the absence of local codes, with **Installation Codes for Gas Burning Appliances and Equipment, CGA Standard CAN/CGA 1-B149.1 or 2**. When the conversion burner is used on Forced Air Central Furnace, the two yellow and black warning labels in the literature envelope shall be attached in accordance with **Installation Code, CGA Standard CAN/CGA 1-B149, Clause 5.4.4.4**. Further reference should be made to the recommendation of your fuel supplier.

INSTALLER: Inform and demonstrate to the user the correct operation and maintenance of this gas utilization equipment. Inform the user of the hazards of storing flammable liquids and vapors in the vicinity of this gas utilization equipment and remove such hazards. Affix this manual adjacent to the conversion burner.

CODE COMPLIANCE IS THE SOLE RESPONSIBILITY OF THE INSTALLER.

USER: Retain this manual for future reference. If other than routine service or maintenance as described in this manual is required, contact a qualified service agency. **DO NOT ATTEMPT REPAIRS.** An inadvertent service error could result in a dangerous condition.

SAFETY INFORMATION TERMS: The following terms are used to identify hazards, safety precautions or special notations and have standard meanings throughout this manual. When you see the safety alert symbol and one of the safety information terms as shown below, be aware of the hazard potential.



DANGER: Identifies the most serious hazards which **will** result in severe personal injury or death.

WARNING: Signifies a hazard that **could** result in personal injury or death.

CAUTION: Identifies unsafe practices which would result in minor personal injury or product and property damage.

▲ WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result, causing property damage, personal injury or death.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.



Specifications

NATURAL or PROPANE Gas

Air Delivery	(Approximate air delivery at zero draft)	47 SCFM*
Maximum Firing Rate**		225 MBH***
Minimum Firing Rate**		50 MBH***
Tube Diameter		4 inches
Tube Length		8 inches
Minimum Combustion Chamber Size		
	225 MBH	7" W x 11" L or 10" dia.
	150 MBH	6" W x 10" L or 9" dia.
Gas Pressure Required		
	NATURAL or PROPANE	5.0" to 14.0" W.C.
Standard Voltage		120 Volts 60 Cycle
Flame Safety	Direct Spark Ignition of Main Flame, Electronic Safety	
Main Automatic Valve		3 Function Redundant

Notes:

- * SCFM=Standard Cubic Feet/Minute
 - ** Ratings based on 1,000 BTU/cu. ft. NATURAL, 2500 BTU/cu. ft. PROPANE at Sea Level.
 - *** 1 MBH=1,000 BTU/Hr.
- One gallon of fuel oil=140,000 BTU.
 Derate burner for altitudes over 2,000 feet by 4% for each 1,000 feet of additional elevation.

CAUTION: The ECONOMITE DS24A is not intended for outdoor installation and must be protected from excessive moisture. Provide adequate clearance for service and proper operation.

I Ventilation

If the former automatic oil burner gave trouble-free operation, it is probable that the gas utilization equipment area has sufficient infiltration of air for combustion and dilution of flue gases.

Nevertheless, the area must be checked:

- Open basement or utility areas of normal construction, without storm windows or tight doors, will generally allow sufficient air infiltration. However, if the gas utilization equipment is located in a tight or separate room, ventilation to an open area as described above will be required. Install two permanently open grilles, each sized on the basis of one square inch free area per 1,000 BTU (but not less than 100 square inches) of the total input rating of all gas utilization equipment in the confined space. One grille should be located within 12 inches of the ceiling, the other within 12 inches of the floor.
- If the gas utilization equipment is located in an area of unusually tight construction, or if an exhaust fan, kitchen ventilation system, clothes dryer and/or fireplace is installed in the building, provision must be made for an outside air supply near the gas utilization equipment area. Install permanently open grilles sized at not less than one square inch free area per 4,000 BTU of burner input. When ventilating through horizontal ducts, grilles should be sized at not less than one square inch free area per 2,000 BTU of all gas utilization equipment in the confined space. In any case, the minimum dimension of rectangular air ducts shall not be less than 3 inches.
- In Canada, for detailed ventilation requirements, refer to standard CAN/CGA 1-B149.1 or .2 and/or local codes.

II Preparation of the Gas Utilization Equipment

- Clean the gas utilization equipment, heat exchanger interior, combustion chamber, and flue connections. Remove all adhering tars, scale, dirt and soot. Inspect for actual leaks and/or potential leaks.
- Cement all joints, including those in the gas utilization equipment base and around door frames, to prevent leakage into or out of the combustion chamber.
- The access or firing door should open easily to relieve pressure. If positive latches exist, they should be modified to permit easy opening; a spring loaded door holder is recommended.
- On all boilers, make certain the pressure relief safety valve is in good operating condition.

III Combustion Chamber

A combustion chamber liner is normally required to protect non-heat transfer surfaces and to provide a radiant bed for rapid heat transfer to the primary surfaces of the heat exchanger. In most cases, an existing oil burner combustion chamber liner can be used, if in good condition.

III Combustion Chamber Continued

- In the case of wet base boilers, where the entire combustion chamber is comprised of heat exchange surfaces and no combustion chamber liner was provided for oil firing, a liner is usually not required for the ECONOMITE. However, a liner or target wall may be necessary if the combustion chamber is unusually short, in order to avoid flame contact on the heat exchanger walls or flueways.

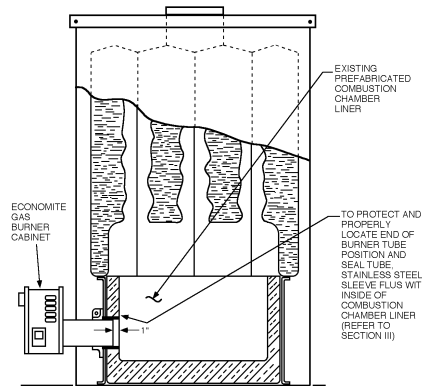


Figure 1: Dry Base Boiler with Combustion Chamber Liner (Warm Air Furnace Construction is Similar)

- Special heat resistant alloy extension tubes and instructions are available for those applications where the burner tube is too short to reach the combustion chamber (such as old-fashioned gravity warm air furnace installations).

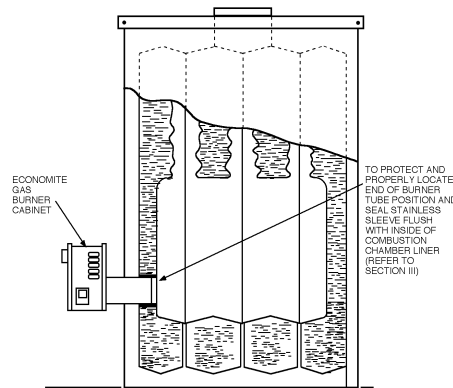


Figure 2: Wet Base Boiler with Combustion Chamber Unlined

⚠ CAUTION: In no case should the burner tube be allowed to extend into the chamber proper; it must be set at least 1" short of the inside surface.

⚠ WARNING: Burner cabinet must be mounted in orientation shown in Figures 1 and 2. Any other mountings may cause a dangerous condition, and will void burner warranty and agency approvals. Non-standard arrangements may be available for some models; consult factory for details if required.

- Before permanently setting the burner in place, check that the nozzle ribbon is free of foreign materials and also that the electrodes have not been damaged or displaced, see Figure 7.

IV Chimney, Vent Connector*, and Draft Control

*Formerly referred to as Flue Pipe

⚠ WARNING: The chimney shall be inspected for unsafe conditions such as deteriorated masonry and excessive soot or other blockage or potential blockage. Installation must conform with local codes or in the absence of local codes with ANSI Z21.8 latest edition and NFPA, ANSI Z223.1 latest edition.

⚠ WARNING: The Vent Connector shall not be connected to a chimney already venting solid fuel burning equipment, an incinerator or an open fireplace.

- The Vent Connector shall be made of non-combustible, corrosion resistant material capable of withstanding the vent gas temperature produced by the gas utilization equipment and of sufficient thickness to withstand physical damage.

Maximum Input	Vent Connector Dia.
100 MBH	5"
143 MBH	6"
195 MBH	7"
225 MBH	8"

Table 1: Recommended Vent Connector Sizes

Source: ANSI Z21.8b 1993, Installation of Domestic Gas Conversion Burners.

For other applications, consult appropriate standards.

- The Vent Connector shall be as short as possible. The entire length shall be readily accessible for inspection, cleaning and replacement.
- The length of horizontal uninsulated Vent Connector between chimney and a single gas utilization equipment shall not exceed 75% of the height of the chimney above the connector, or 100% if the Vent Connector is insulated.

□ The Vent Connector shall be installed so as to avoid turns or other construction features which create excessive resistance to flow of vent gas. It shall be installed without any dips or sags and shall slope upward at least 1/4" per foot.

- A manually operated damper shall **not** be placed in the Vent Connector or chimney of any gas utilization equipment.

IV Vent Connector Continued

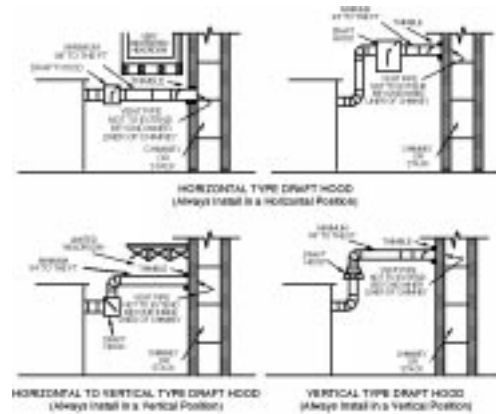


Figure 3: Draft Hoods

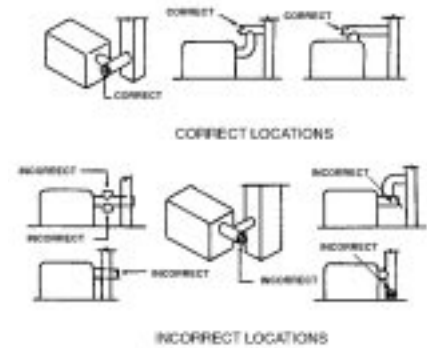


Figure 4: Location for Barometric Draft Regulator

Figures 3 and 4: Copyright by the American Gas Association. Used by permission of the copyright holder.

- The Vent Connector shall be firmly attached to draft hood outlets and flue collars. Joints between sections of connector piping shall be fastened by sheet-metal screws or other approved means. The Vent Connector shall be supported for the design and weight of the material employed to maintain clearance and prevent physical damage and separation of joints.

V Electrical

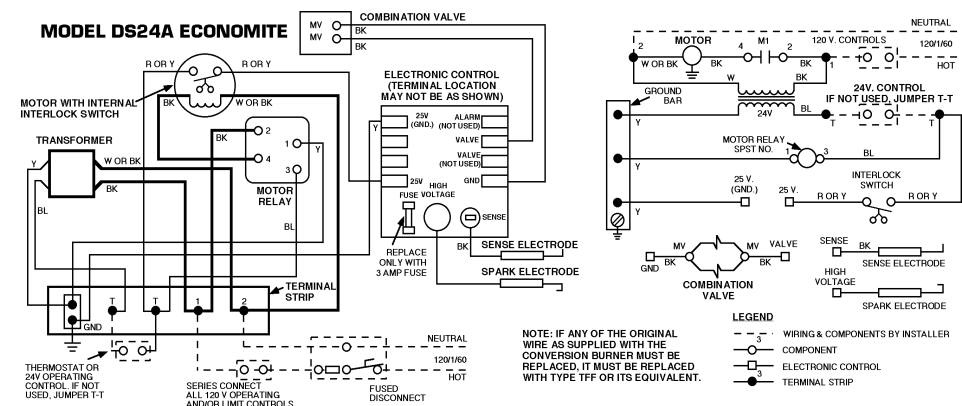


Figure 5: Wiring Diagram

CAUTION: Do not add any power consuming devices in the low voltage circuit as overloading of the transformer can result. Do not use Motor Relay to operate any external devices as overloading of motor relay contacts can result.

Note: If any of the original wiring as supplied with the conversion burner must be replaced, it must be replaced with type TFF wire or its equivalent.

Installation wiring and grounding of the burner must conform to local codes, or in their absence in the **United States to National Electric Code, ANSI/NFPA No. 70-latest edition**; in **Canada, to Canadian Electrical Code Part 1, CSA Standard C22.1**.

- Use 14 gauge copper wire for line voltage wiring. Be sure to hook up to a permanently live circuit. Provide a fused on-off disconnect switch carrying a minimum 3 amp fuse.
- The frame of the burner must be well grounded. A terminal is provided in the control box for positive grounding where insulated pipe couplings are used or where any doubt exists regarding grounding sufficiency.
- Confirm that the polarity is correct—hot wire strip terminal 1, neutral 2—and that the neutral line is not subject to induced low voltage (check 2 to earth ground) from other equipment as that can cause the electronic flame safeguard to malfunction.
- Each installation must include suitable limit controls. Existing oil burner combination limit and operating controls are normally **NOT SUITABLE** for gas burner use.
- Set the thermostat heat anticipator for the total current draw handled by the thermostat. The current draw of the ECONOMITE 24V operating circuit is 0.9 amps.

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

VI Piping

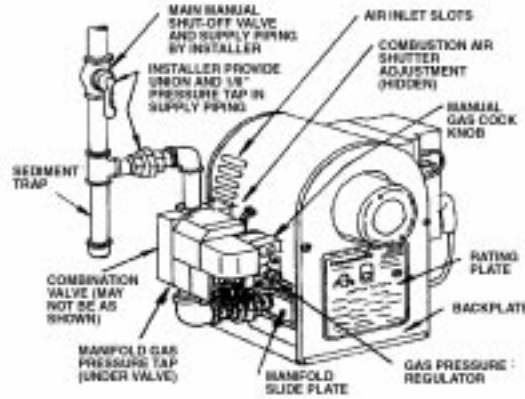


Figure 6: Piping Connections

- Provide a sediment trap, union and $\frac{1}{8}$ " pressure tap in piping close to burner as shown in Figure 6.
- Use pipe joint compound approved for use with Liquid Petroleum Gases.

Pipe Size	Type of Gas	Approx. Capacity-MBH Length of Pipe				
		10	20	40	60	100
$\frac{1}{2}$	NATURAL	130	90	60	50	60
	PROPANE	200	145	100	80	
$\frac{3}{4}$	NATURAL	225	190	130	105	80
	PROPANE		225	205	165	125
1	NATURAL			225	195	150
	PROPANE					225
$1\frac{1}{4}$	NATURAL					225

Table 2: Supply Pipe Capacities in MBH

leak test, it is recommended that the Combination Valve be disconnected. Exposing the Combination Valve to a pressure over $\frac{1}{2}$ PSIG (14.0" W.C.) will damage the valve and void all warranties.

⚠ DANGER: Explosion hazard.
Do not use oxygen for pressure testing.
An explosion could occur during initial start-up.

- If the burner piping must be rearranged because of space limitations, be sure to carry out the general arrangement shown in Figure 6. Install the Combination Valve in any position except upside down.
- When the burner is installed in jacketed equipment, it is recommended that the Combination Valve be left adjacent to the burner within the vestibule and the Main Manual Shut-Off Valve be installed outside.

VII Main Gas Spud

Standard burners are approved for use with NATURAL or PROPANE gas only, and should be used only with the gas specified on rating plate.

- A Standard Model DS24A Economite is shipped ready for NATURAL gas. As shipped, it is field convertible to PROPANE gas, see Table 3.
- As shipped, the installed NATURAL gas spud has a .218 diameter orifice size for an input capacity range of approximately 105 to 150 MBH. Spare spuds are included in a spare spud bag (stamped with inch diameter) for other capacity ranges and/or conversion to PROPANE, see Table 3.
- The Combination Valve Gas Pressure Regulator is set to provide 2.0" W.C. manifold gas pressure for minimum spud input and the combustion air shutter is set for maximum spud input, 32 turns from full closed to provide a lean gas/air mixture for initial start-up.
- If a standard NATURAL gas ECONOMITE DS24A is to be used with PROPANE gas, affix the PROPANE label from the spare spud bag over the NAT designation on the rating plate and install the appropriate size main spud as detailed below.
- If the required firing rate does not fall within the range of the installed spud, or if converting to PROPANE gas, select the correct capacity range from Table 3 and if so indicated, the spud with the correct orifice size (stamped with inch diameter) from the spare spud bag. If the required firing rate is at the minimum of a capacity range, select the next lower range spud.
- To change the main spud, turn off the Main Manual Shut-Off Valve and burner power, remove the backplate, disconnect the factory installed union located between Combination Valve and manifold slide plate and pull out curved manifold pipe. Unscrew the installed main spud from the end of the curved manifold pipe and install the selected main spud, making sure to reuse the fiber spud gasket. Reassemble burner in reverse order.

⚠ CAUTION: The available gas pressure should be within the limits shown in the SPECIFICATIONS section. Excessive pressure will damage Combination Valve and Regulator. If the supply pressure exceeds the 14.0" W.C. maximum, a suitable intermediate main regulator must be installed ahead of the Main Manual Shut-Off Valve shown in Figure 6.

The burner gas supply piping should branch off from the main line as close to the gas meter as possible. Do not connect to the bottom of a horizontal section. Use new black pipe and malleable fittings free of cutting and threading burrs or defects.

Piping must comply with local codes.

To obtain the maximum firing rate of 225 MBH, the NATURAL and PROPANE gas supply piping must be sized to provide minimum of 5.0" W.C. pressure to the inlet of the Combination Valve when the burner and all other gas utilization equipment are on.

⚠ CAUTION: Because it is difficult to accurately control pressure during supply pipe

VII Main Gas Spud Continued

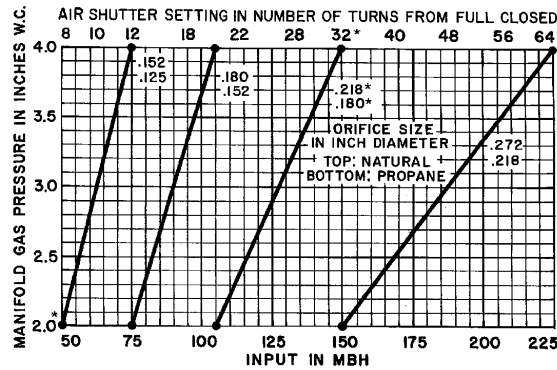


Table 3: Main Gas Spud Capacity and Preliminary Gas and Air Settings

The air and gas settings described above are for initial start-up only. Final settings must be made in accordance with Section VIII, *Initial StartUp/Adjustment* Instructions for adjustment of the manifold gas pressure are detailed in Section XI, *Combination Gas Valve*.

VIII Initial StartUp/Adjustment

WARNING: Ignition is automatic. Make spark observations into combustion chamber only with Main Manual Shut-Off Valve closed. Confirm that gas utilization equipment does not contain any accumulated gases. Purge as described in Step 3 below.

1. Check the burner piping and valves for gas leaks by applying a weak liquid soap solution to unions and joints with the gas supply on. Leakage will be indicated by the appearance of soap bubbles. Locate and correct all gas leaks before proceeding.

WARNING: DO NOT USE OPEN FLAME.

2. Purging the air from the gas supply line at this step will expedite the first light-off.

CAUTION: Purge outside the building. Do not purge into the gas utilization equipment.

3. To purge the gas utilization equipment and chimney of any accumulated gases, turn Manual Gas Cock Knob on the Combination Valve to **OFF**, turn burner power on and set the operating control to **ON** or thermostat to call for heat. Let the blower run long enough to accomplish four air changes, but not less than five minutes.

4. **CAUTION: Make sure that the capacity range of the installed spud and the preliminary combustion air shutter setting are suitable for capacity rating of the gas utilization equipment. Refer to Section VII, *Main Gas Spud* and Table 3.**

5. **RESET** the Electronic Control by setting the operating control to **OFF** or the thermostat below room temperature for at least 30 seconds, see Section XII, *Electronic Control*.

6. Confirm that Main Manual Shut-Off Valve is open. Turn Manual Gas Cock Knob on Combination Valve to **ON**.

7. Turn operating control to **ON** or set thermostat above room temperature. Main flame should come on when the motor reaches operating speed (after a 30 second prepurge in Canada). Whenever the burner fails to light during the 6-second ignition trial, or if the flame is lost during the burner run and not re-established within 6 seconds, the Electronic Control will shut off the Combination Valve and **LOCK OUT**. To **RESET** the Control for restart, de-energize the Electronic Control by setting the operating control to **OFF** or thermostat below room temperature for at least 30 seconds. If burner still fails to light, turn it off and repeat from Step 5 above. Then if necessary, refer to the *Trouble Chart* to isolate the problem.

WARNING: Repeated unsuccessful attempts to light will result in accumulated gases in gas utilization equipment and chimney. To prevent these gases from reaching an explosive level, periodically purge the gas utilization equipment and chimney as described in Step 3.

8. To make a preliminary setting of the burner input, determine the manifold gas pressure required from Table 3 and adjust the Combination Valve pressure regulator accordingly, see Section XI, *Combination Gas Valve*.

9. To determine the firing rate for NATURAL gas, accurately time **test dial** for the number of seconds for one revolution and use the following formula. All other gas utilization equipment must be off.

$$\frac{3600 \times \text{test dial size} \times \text{BTU value}}{\text{No. of seconds for one rev. test dial}} = \text{BTU/Hr.}$$

Then divide by 1,000 for MBH value:

$$\text{Example: } \frac{3600 \times 1 \times 1000}{20} = 180,000 \text{ BTU/Hr.} = 180 \text{ MBH}$$

WARNING: When reinstalling the curved manifold pipe, make sure the manifold slide plate is positioned in its holder and that the main spud is inserted into the end of the nozzle, see Figures 6 and 7. Reconnect union and replace back-plate.

WARNING: Reposition the combustion air shutter for the maximum firing rate of the selected spud capacity range. Do not change the Combination Valve Gas Pressure Regulator setting at this time.

CAUTION: The approximate

VIII Initial Start-up/ Adjustment Continued

For PROPANE gas, consult your supplier for method of determining firing rate.

10. Readjust the combustion air shutter to provide a quiet, soft blue flame with well defined orange and yellow tips for NATURAL gas or with well defined yellow tips for PROPANE.
11. Check the operation of the burner; start and stop it several times with the thermostat or operating control.
12. With the burner running, check the operation of all limit and associated controls.
13. PERFORM THE FOLLOWING FINAL ADJUSTMENTS for combustion and flue gas temperature. Take the flue gas samples and temperature immediately ahead of the draft control.
 - A. The flue gas temperature should be above 325°F but not exceeding 550°F. Excessive flue gas temperatures will result in low efficiencies. Low flue gas temperature may cause excessive condensation. Reset gas input if necessary to adjust stack temperature.
 - B. Make the final setting of the combustion air shutter by checking the flue gases with an **ORSAT** or similar combustion testing instrument. The carbon monoxide content should conform to local codes, or in their absence to the level specified in the United States or Canadian Standard referenced on the front cover of this manual; and the carbon dioxide content should be approximately 9.5% for NATURAL and 12.1% for PROPANE, or within the limits prescribed by local codes.
14. Check the draft control to make sure there is no spillage of flue products into the room.
15. **FILL OUT THE INSTALLATION ADJUSTMENT DATA TAG** and affix to the burner or gas utilization equipment.

Note: For subsequent normal starting and shut-off procedure, refer to CONSUMER INSTRUCTIONS or to the instruction plate mounted on the burner.

Part 2 Service

IX Nozzle and Electrodes

- ⚠ DANGER:** Be sure that the Main Manual Shut-Off Valve, Combination Valve and Burner Power Switch are turned off before removing any parts for service.
- ⚠ WARNING:** Do not attempt to FIRE the burner with the burner backplate removed as air from the blower will not reach the combustion chamber and a dangerous level of unburned gas could accumulate.

The nozzle and electrode assembly can be removed as a unit by removing the backplate, disconnecting the factory installed union located between Combination Valve and Manifold Side Plate and pulling out curved manifold pipe. Withdraw nozzle assembly, enough to permit disconnecting electrode leads before removing nozzle completely.

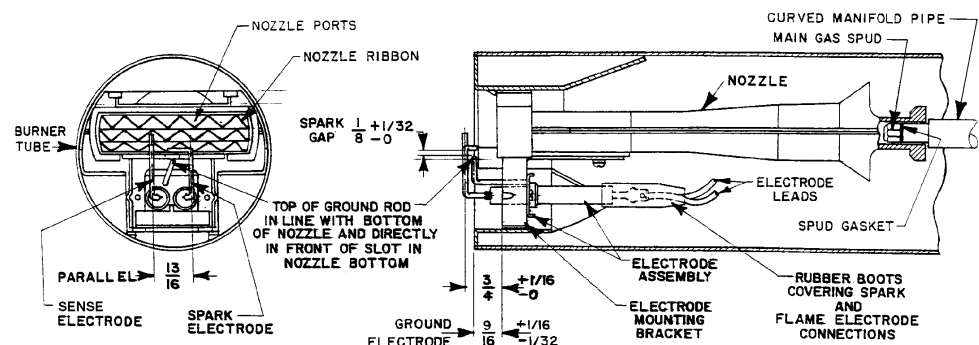


Figure 7: Nozzle Assembly and Electrode Assembly

□ Service will normally consist of inspection and cleaning, particularly the removal of any dirt or scale in the nozzle ribbon. Check the electrodes for serious burning and the insulators for cracks. The electrode assembly is not adjustable, if defective; replace with a new one. When reconnecting the electrode leads refer to Figure 7 for the correct hookup. Be sure to replace the rubber boots over the electrodes and treat the electrode leads with care. Because of high voltage any damage to the insulation is a potential leak path.

- ⚠ WARNING:** When reassembling burner, make sure that the manifold slide plate is positioned in its holder and that the main gas spud is inserted into the end of nozzle, see Figures 6 and 7.

X Blower Shelf Assembly

The shelf assembly including the blower and motor, motor relay, low voltage transformer and terminal board can be withdrawn as a unit after the backplate is removed and external wiring is disconnected.

X Blower Shelf Assembly Continued

- Cleaning of the blower wheel is usually the only service required. Need for cleaning is indicated if the air inlet slots in the burner housing show an accumulation of dust and lint, or if the character of the flame—long, hazy and yellow (sooty)—indicates a deficiency of air. Motor air cooling vents if present, should also be cleaned at this time.
- If the motor must be replaced, remove the blower wheel first and remove the retainer clips at the rubber motor grommets, pull the motor out of keyhole brackets. Remount in reverse order, noting that brass flanges of rubber motor mounts are located against motor. Do not omit the three clips. Position blower wheel on motor shaft to provide $\frac{1}{8}$ inch clearance between blower inlet opening and blower wheel ring.
- Shelf gaskets are installed on the inside of the back cover and the inside the front of the burner cabinet. Be sure they are in place when re-installing the shelf assembly. Otherwise, blower air will be lost and combustion could be affected.

XI Combination Gas Valve

The 24 volt Combination Valve serves three functions:

1. Main Manual Gas Shut-off
 2. Manifold gas pressure regulation
 3. Automatic electric redundant (double seated) gas valve
- For manual control the Manual Gas Cock Knob is turned full **ON** or full **OFF**.
 - The Combination Valve Gas Regulator has an outlet pressure setting range of 2.0" to 4.0" W.C. and is factory set for 2.0" W.C. Manifold Gas Pressure Tap is located on the outlet end of the Combination Valve body.
 - If pressure adjustment is required for setting capacity, remove regulator cap for access to slotted adjustment screw. Turning of adjustment screw counterclockwise reduces pressure; clockwise increases pressure. Do not adjust past point where no change in pressure is noted.
- Note:** Pressure setting can only be made with burner running and gas on.
- ⚠ CAUTION: If gas supply pressure is below its specified range during adjustment, an overfire condition could result when pressure returns to normal, particularly if the regulator adjustment screw is bottomed out. ALWAYS confirm that at least the minimum rated gas pressure is being supplied to the burner during regulator adjustments, and NEVER bottom out regulator screw.**
- If the pressure regulator fails to maintain a constant manifold gas pressure within ± 0.1 " W.C., and it is confirmed that the inlet gas pressure to the Combination Valve is a steady 14.0" W.C. maximum during standby, and a steady 5.0" W.C. minimum with the flame on, the regulator portion of the valve is defective and the entire valve must be replaced.
- ⚠ CAUTION: If the Combination Valve has been moved or replaced, soap bubble test for leaks with the burner running.**
- ⚠ CAUTION: If leakage through the valve occurs on standby, as evidenced by the presence of any flame, the entire valve should be replaced.**

XII Electronic Control

The electronic control is a 24 volt AC, solid state electronic device that automatically ignites and monitors the main flame (in Canada, a 30 second prepurge is required). It has an integral high voltage transformer and upon a **call for heat**, applies high voltage to the spark electrode and 24 volts to the Combination Valve. When the flame is proven, the spark is terminated and the burner run continues.

- If the flame is not proven within 6 seconds (36 seconds for burners with prepurge) or if the proof of flame is lost during the burner run and is not re-established within 6 seconds (36 seconds for burners with prepurge), the control will shut off the Combination Valve and **LOCK OUT**. To **RESET** the system, set operating control to **OFF** or thermostat below room temperature for at least 30 seconds.
 - If the electronic control is changed, the replacement must be identical to the make and model number, or it must be an authorized substitute.
- ⚠ WARNING: Explosion hazard. Can cause serious injury or death. This device can malfunction if it gets wet. Never try to use a device that has been wet-**replace** it.**

Maintenance

Keep the area around the burner clear and free of combustible materials, gasoline and other flammable liquids or vapors. Do not obstruct burner air inlet slots or ventilation grilles for combustion air.

The motor features permanently lubricated ball bearings and requires no routine oiling maintenance.

IMPORTANT: Check the burner flame periodically. A proper NATURAL gas flame will appear blue at the burner face with orange and yellow tips. A proper PROPANE gas flame will appear blue at the burner face with yellow tips. If the flame is too rich, it will appear billowy and yellow with hazy tips. If too lean, it will appear short and all blue. If the flame does not appear proper, **CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING, READJUSTMENT AND/OR REPAIR.**

⚠ WARNING: If any flame is observed when the burner is on standby, or if the ignition spark or valve operator is heard to come on before the motor reaches operating speed, immediately turn off the Main Manual Shut-off Valve and burner power. A dangerous condition has developed and must be corrected. **CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING READJUSTMENT AND/OR REPAIR.**

⚠ WARNING: If PROPANE gas is used and the burner is located in a basement, crawl space or confining space, contact your gas supplier about installing a GAS LEAK warning device. PROPANE gas is heavier than air and can settle in low areas or confined spaces. This would create a danger of explosion or fire. If you suspect a gas leak, follow instructions on front cover of this manual.

Lighting Instructions

1. SET OPERATING CONTROL TO **OFF** OR THERMOSTAT BELOW ROOM TEMPERATURE FOR AT LEAST 30 SECONDS.
2. TURN MANUAL GAS COCK KNOB ON COMBINATION VALVE TO **ON**.
3. TURN BURNER POWER ON.
4. SET OPERATING CONTROL TO **ON** OR THERMOSTAT TO CALL FOR HEAT (IN CANADA THERE IS A 30 SECOND PREPURGE).
5. WAIT 6 SECONDS. IF BURNER HAS FAILED TO LIGHT, OR IF BURNER LIGHTS THEN GOES OUT AND SYSTEM GOES INTO SAFETY LOCKOUT, DE-ENERGIZE THE SYSTEM BY SETTING OPERATING CONTROL TO **OFF** OR THERMOSTAT BELOW ROOM TEMPERATURE FOR AT LEAST 30 SECONDS TO RESET THE SYSTEM AND THEN SET OPERATING CONTROL TO **ON** OR THERMOSTAT TO CALL FOR HEAT.

TO SHUT OFF

1. TURN MANUAL GAS COCK KNOB ON COMBINATION VALVE TO **OFF**.
2. TURN BURNER POWER OFF.

SHOULD OVERHEATING OF THE GAS UTILIZATION EQUIPMENT OCCUR:

1. Shut off the main manual shut-off gas valve to the equipment.
2. **Do not** shut off the power switch to the **ECONOMITE** burner, or the equipment pump or blower.

Make sure the thermostat and operating controls are calling for heat. Defective wiring or loose connections can simulate the component defects outlined below. Check associated wiring before replacing a component.

ELECTRICAL AND FLAME CHECKS MUST BE MADE IN ORDER LISTED.

I. Motor Will Not Run or Motor Runs in Repeated Cycles.

- A. Confirm 120V between strip terminals **1** and **2** and verify the circuit polarity and electrical ground, between strip terminal **1** and burner chassis metal.
- B. Check 24V* operating control circuit:
 1. Between left strip terminal **T** and **GND**:
 - a. No voltage, transformer defective.
 - b. Very low voltage,* circuit overloaded or transformer defective.
 2. Between right strip terminal **T** and **GND**. No voltage, circuit between **T** and **T** is open.
- C. Confirm 120V between strip terminal **2** and motor relay terminal **4**:
 1. No voltage, motor relay is defective.
 2. Voltage present, motor is defective.

II. Motor Runs Continuously, But No Flame.

- A. Confirm that both Main Manual Shut-Off Valve and Manual Gas Cock Knob on Combination Gas Valve are in the **ON** position.
- B. Whenever the burner fails to light during the 6-second trial for ignition, or if the flame is lost during the burner run and not re-established within 6 seconds (36 seconds in Canada) the Electronic Control will shut off the Combination Valve and **LOCK OUT**. To **RESET** the Control for restart, set the operating control to **OFF** or thermostat below room temperature for at least 30 seconds.
 1. Check for 24V* between strip terminal **GND** and Electronic Control **25V** terminal. No voltage, blower interlock circuit is defective.
 2. If Electronic Control has a fuse, test for 24V from each end of fuse to strip terminal **GND**.
- C. For each of the following tests, reset the Electronic Control per step II.B. **TESTS ARE VALID ONLY DURING THE 6 SECOND TRIAL FOR IGNITION.**
 1. **Turn Manual Gas Cock Knob to OFF**. Check for 24V between the Electronic Control **25V** terminal and strip terminal **GND**. No voltage, defective Electronic Control.
 2. Check for 24V* between valve **MV** terminal and valve body:
 - a. With voltage, **RESET** Electronic Control and listen for audible **CLICK** as valve operators open. No **CLICK**, replace valve.
 3. Check for ignition spark (spark length approximately 1/8"). Since this is a capacitor discharge system, observe closely when visually checking the spark as it is faint and thread-like and may be overlooked in bright light.
 - a. Between Electronic Control high voltage terminal and strip terminal **GND**. No spark, defective Electronic Control.
 - b. Between Electronic Control high voltage terminal and Spark Electrode Wire (insert head of #8 x 3/4" or longer round head screw into snap terminal inside right angle rubber boot). No spark, broken wire, cracked insulator, or "spark gap" too wide, see Figure 6.
 - c. Between spark electrode tip and top of ground rod, see Figure 6. If spark is not visible and/or can not be heard, remove nozzle assembly (see Section IX **Nozzle and Electrodes**) and ground it solidly to burner metal. No spark, cracked insulator and spark traveling to ground along crack.
 4. **Turn Manual Gas Cock Knob to ON**. Connect manometer to the manifold gas pressure tap and during trial for ignition, check the gas pressure:
 - a. Pressure should be between 2.0" and 4.0" W.C. for NATURAL and PROPANE and steady. Verify per Section VII **Main Gas Spud** that the spud orifice size and manifold pressure are correct.
 - b. Zero, erratic low or high pressure: confirm that the inlet pressure to the Combination Valve is between 5" and 14" W.C. for NATURAL and PROPANE during standby and during trial for ignition.
 - c. If manifold pressure is zero, below 2.0" or above 4.0" W.C. for NATURAL and PROPANE or erratic, the regulator section of the Combination Valve is defective and the entire valve must be replaced.

III. Flame on Only During 6-Second Trial for Ignition.

- A. With motor running check burner line voltage terminals for 120V as follows:
 1. Between strip terminals **1** and **2**-120V: voltage OK.
 2. Between strip terminals **1** and **GND**-120V: ground OK.
 3. Between strip terminals **2** and **GND**-"0" V: no backfeed, OK
- B. Follow **RESET** procedure as specified in step II.B.
 1. Check sense electrode position per Figure 6.
 2. Check sense wire for continuity.
 3. Connect DC microammeter in series with Electronic Control **SENSE** terminal and sensor wire. With flame on, flame signal should be at least 2 microamps.

IV. Short Flame.**

- A. Low manifold gas pressure.
- B. Main gas spud orifice too small.
- C. Primary air adjustment open too far.


V. Long Hazy Flame.**

- A. High manifold gas pressure.
- B. Main gas spud orifice too large.
- C. Primary air adjustment closed too far.
- D. Dirty blower wheel.

VI. Gas Fails to Shut Off.

- A. Automatic electric (redundant) valve section of Combination Valve is defective and entire valve must be replaced.

* Normal low voltage:
 Motor running-24V minimum.
 Combination Valve energized-21V minimum.

**  **CAUTION: If changes are made in the Main Gas Spud Orifice size, Manifold Gas Pressure or Primary Air Adjustment, change the installation data tag accordingly.**