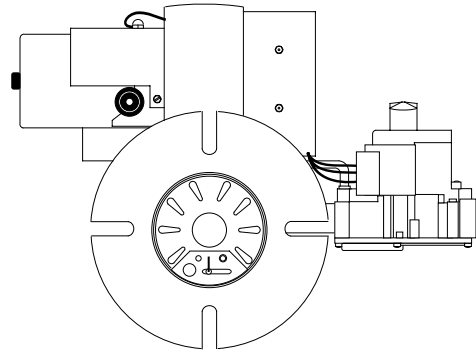


INSTALLATION AND SERVICE INSTRUCTIONS



ANSI Z21.17
CONVERSION
BURNERS

ECONOMITE MODEL RE32 Gas Conversion Burner



The **ECONOMITE Model RE32** intermittent spark ignition conversion burner is adaptable to most 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 Z21b**-latest edition, and **National Fuel Gas Code, ANSI Z223.1**-latest edition, 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 supplier's 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.

MIDCO International Inc.

4140 WEST VICTORIA STREET, CHICAGO, ILLINOIS 60646 / (773) 604-8700 FAX: (773) 604-4070 / <http://www.midco-intl.com>

SPECIFICATIONS

NATURAL or PROPANE Gas

AIR DELIVERY (Approx. Air Delivery at Zero Draft).....	62SCFM*
MAXIMUM FIRING RATE**.....	300MBH***
MINIMUM FIRING RATE**.....	50MBH***
TUBE DIAMETER.....	.4 inches
TUBE LENGTH.....	.21/2 - 61/4 inches
MINIMUM COMBUSTION CHAMBER SIZE	
300 MBH.....	7" W x 11" L or 10" dia.
50 MBH.....	6" W x 10" L or 9" dia.

GAS PRESSURE REQUIRED

NATURAL.....	4.0" to 14.0"W.C.
PROPANE.....	4.0" to 14.0"W.C.
STANDARD VOLTAGE.....	120 Volts.....60 Cycle
PILOT SAFETY.....	Electronic, 100% shut-off
MAIN AUTOMATIC VALVE.....	4 Function Redundant

*SCFM = Standard Cubic Feet/Minute

**All Ratings Based on 1000 BTU/Cu. Ft. NATURAL, 2500 BTU/Cu. Ft. PROPANE at Sea Level Derate burner for altitudes over 2,000 feet by 4% for each 1,000 feet above sea level

***1 MBH = 1,000 BTU/Hr.

One gallon fuel oil = 140,000 BTU/Hr.

PART 1 INSTALLATION

⚠ CAUTION: The ECONOMITE RE32 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 gas.

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 ratings of all gas utilization equipment in the combined 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 burner input. 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 equipment for actual leaks and/or potential leaks.

□ Cement all joints, including those in the 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.

□ 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 excess flame contact on the heat exchanger walls or flueways.

□ If a built up combustion liner is required, use 2300°F minimum insulating material.

□ The opening in the combustion chamber must fit the burner tube. If an existing chamber with an oversized opening is to be used, fill the remaining space around the tube with refractory material and seal air tight.

NOTE: In no case should the burner tube be allowed to extend into the chamber proper; it must be set flush to 1/4" short of the inside surface, because high combustion chamber temperatures will cause premature pilot deterioration.

□ Burners are shipped with the burner tube at its fully extended length of 6 1/4 inches. To reduce the tube length, complete the following steps (see Figure 1):

1. Uncover the Burner Tube Clamp access port located on the lower right side of the burner box (under motor), adjacent to the mounting flange.
2. Turn the exposed screw counter-clockwise to loosen the Burner Tube Clamp.
3. Turn the Pilot Tube Clamp Nut (see Figure 1) counterclockwise, to loosen the Pilot Tube.
4. Push Burner Tube in to desired length and tighten Burner Tube Clamp and recover access port.
5. Locate the retention plate at least 7/8 inch but not more than 1 3/8 inch from the end of the burner tube and tighten the Pilot Tube Clamp Nut.
6. Cut the Pilot Tube to the appropriate length and reattach tube fitting using compression sleeve supplied in

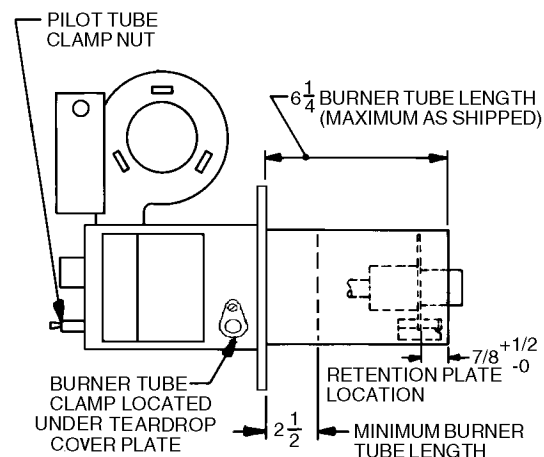


FIGURE 1 Burner Tube Adjustment

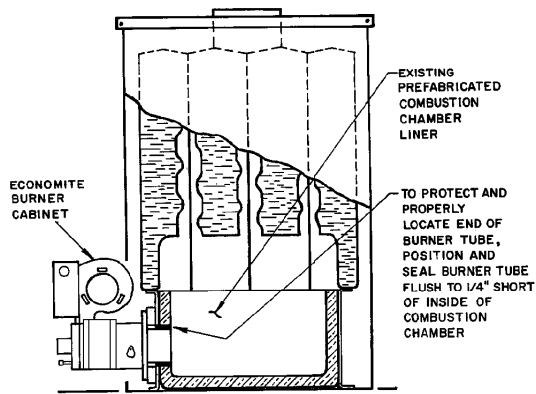


FIGURE 2 Dry Base Boiler With Combustion Chamber Liner (Furnace Construction is Similar)

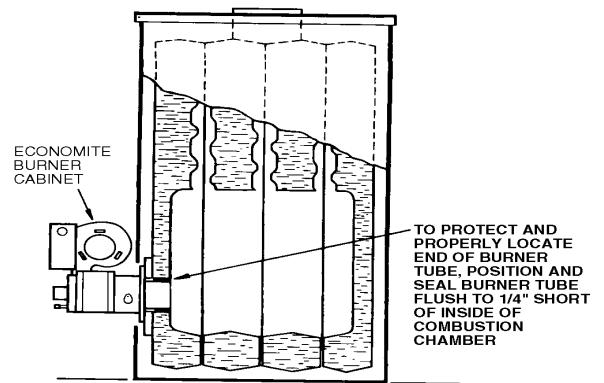


FIGURE 3 Wet Base Boiler with Unlined Combustion Chamber

⚠ WARNING: BURNER CABINET MUST BE MOUNTED IN ORIENTATION SHOWN IN FIGURES 2 AND 3. ANY OTHER MOUNTINGS MAY CAUSE 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 retention plate and pilot assembly to make sure they are free of foreign materials.

IV CHIMNEY, VENT CONNECTOR, AND DRAFT CONTROL

⚠ 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.

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.

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.

A draft hood or a barometric draft regulator shall be installed in the same room or enclosure as the equipment in such a manner as to prevent any difference in the pressure between the hood or regulator and the combustion air supply. In no case shall the relief opening of the draft hood or barometric draft regulator be located at a point lower than the top of the highest flue passage in the equipment.

Gas utilization equipment requiring controlled draft may be equipped with a listed double acting barometric draft regulator installed and adjusted in accordance with the manufacturer's instructions **if approved by local codes.**

A device which will automatically shut off gas to the burner in the event of sustained backdraft is required. It shall be of the listed manual reset type and installed and adjusted by a qualified service technician in accordance with the manufacturer's instructions.

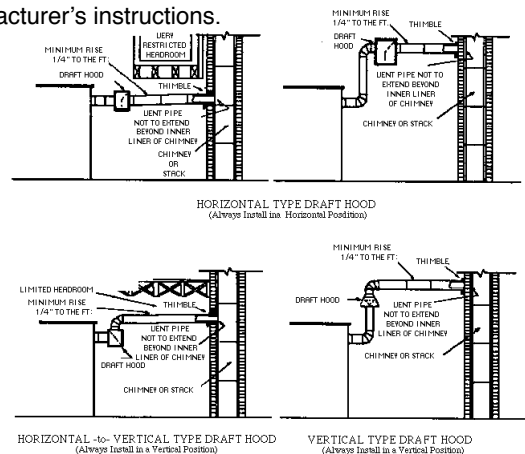


FIGURE 4 Draft Hood

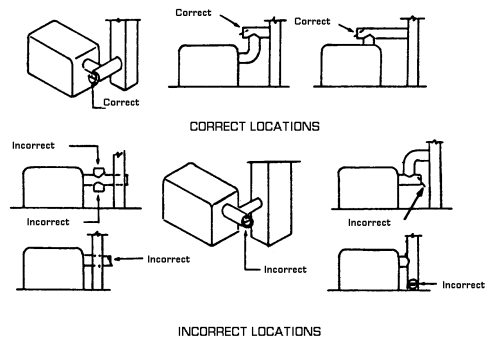


FIGURE 5 Barometric Dampers
Figure 4 and 5 : Copyright by the American Gas Association. Used by permission of the copyright holder.

Maximum Input	Flue Pipe Diameter
64 MBH	4"
100 MBH	5"
143 MBH	6"
195 MBH	7"
225 MBH	8"
300 MBH	9"

TABLE 1: Recommended Flue Pipe Sizes

Source: ANSI Z21.8A-1990, Installation of Domestic Gas Conversion Burners. For Other Applications, Consult Appropriate Standards.

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.

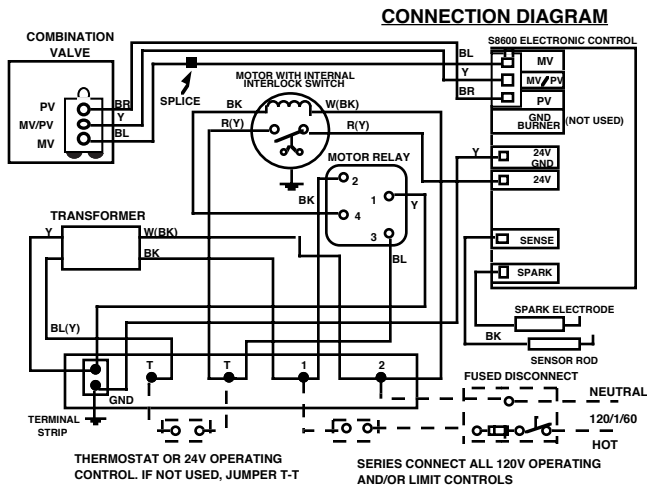
The Vent Connector shall be firmly attached to draft hood outlets and flue collars. Joints between sections of connector-

V ELECTRICAL

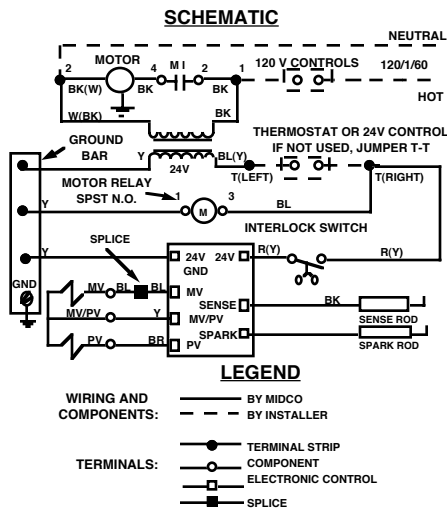
Installation wiring and grounding of the burner must conform to local codes, or, in their absence in the United States to **National Electric Code, ANSI/NFPA No. 70-1** latest edition; in Canada, to **Canadian Electrical Code Part 1, CSA Standard C22.1**.

- Use 14 gage copper wire for line voltage wiring. Be sure to hook up to permanently live circuit. Provide a fused on-off disconnect switch carrying a minimum 3 amp fuse.
- The frame of the burner should be well grounded. A terminal is provided on the strip for positive grounding.
- Confirm that the polarity is correct -- hot wire to 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 flame safeguard to malfunction.
- Each installation must include suitable limit control(s). Existing oil burner combination operating and limit 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.



THERMOSTAT OR 24V OPERATING CONTROL. IF NOT USED, JUMPER T-T
SERIES CONNECT ALL 120V OPERATING AND/OR LIMIT CONTROLS



LEGEND
WIRING AND COMPONENTS: — BY MIDCO, - - - BY INSTALLER
TERMINALS: ● TERMINAL STRIP, □ COMPONENT, □ ELECTRONIC CONTROL, ■ SPLICE

FIGURE 6 Wiring Diagram

⚠ CAUTION: Do not add any power consuming devices in the low voltage circuit as it could overload the transformer. Do not use Motor Relay to operate any external devices as the extra load could damage the relay contacts.

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.

VI PIPING

⚠ 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 rated for main and pilot loads must be installed ahead of the Main Manual Shut-Off Valve shown in Figure 7.

- 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.
- Provide a sediment trap, union and 1/8" pressure tap in piping close to burner as shown in Figure 7.
- Use pipe joint compound approved for use with Liquid Petroleum Gases.
- Piping must comply with local codes.
- To obtain the maximum firing rate of 300 MBH, the gas supply piping must be sized to provide a minimum of 4.0" W.C. pressure to the inlet of the combination valve when the burner and all other gas utilization equipment are on. For a firing rate of 225 MBH or less, 3.5" W.C. inlet pressure is sufficient.
- When selecting the burner supply pipe size per Table 2, the permissible pressure drop must be based on the pressure available at the inlet to the supply pipe branch line when **all other** gas utilization equipment is on.

NOTE: If there is more than 1.0" W.C. differential in the inlet pressure to the burner compared to when all other gas utilization equipment is off, refer to Section IX, last paragraph.

⚠ CAUTION: Because it is difficult to accurately control pressure during supply pipe leak test, it is recommended that the Combination Valve be disconnected. Exposing the Combination Valve to a pressure over 1/2 (14" W.C.) PSIG 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 7. Install the combination valve in any position except up-side down.

When the burner is installed in the vestibule of jacketed equipment, it is recommended that the combination valve be left adjacent to the burner within the vestibule. Install the Main Manual Shut-Off Valve in the piping outside the jacket of the equipment.

PIPE SIZE	TYPE OF GAS	APPROX. CAPACITY-MBH				
		LENGTH OF PIPE				
		10	20	40	60	100
1/2	NATURAL	130	90	60	50	60
	PROPANE	200	145	100	80	60
3/4	NATURAL	275	190	130	105	80
	PROPANE	300	300	200	165	125
1	NATURAL	300	300	245	195	150
	PROPANE			300	300	235
1 1/4	NATURAL			300	300	300
	PROPANE					300

TABLE 2: Supply Pipe Capacities in MBH

Capacities shown are for a total pressure drop of 0.3" W.C. For higher permissible pressure drops, consult your fuel supplier.

Source: Gas Engineers Handbook-1974

VII MAIN GAS SPUD

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

□ As shipped, the installed NATURAL gas spud has a #8 (.199) drill orifice size (PROPANE a #25 [.149]), for an input capacity range of approximately 85 to 125 MBH (PROPANE 75 to 110 MBH). The combination valve main gas pressure regulator is set to provide 2.0" W.C. manifold gas pressure for a minimum spud input and the blower air shutter is set for maximum spud input, 11 turns from full closed (PROPANE 9 turns), to provide a lean gas/air mixture for initial start up.

□ If a standard NATURAL gas Model RE32 is to be used with PROPANE gas, a conversion kit which contains a .025 Pilot Spud, a 1/8" main spud and a PROPANE label is available. Change the pilot spud, affix the PROPANE label 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 capacity range, select the next lower range.

□ Remove the installed spud and spring assembly, select new spud and assemble to spring, install assembly (spud first), spring only or neither, as shown for the capacity range selected per Table 3.

⚠ WARNING: Reposition the primary air shutter for the maximum firing rate of the selected capacity range. Do not change the combination valve main gas pressure regulator setting at this time.

⚠ CAUTION: The approximate air and gas settings described above are for initial start up only. Final settings must be made in accordance with Section VIII. Instructions for adjustment of the manifold gas pressure are detailed in Section XI.

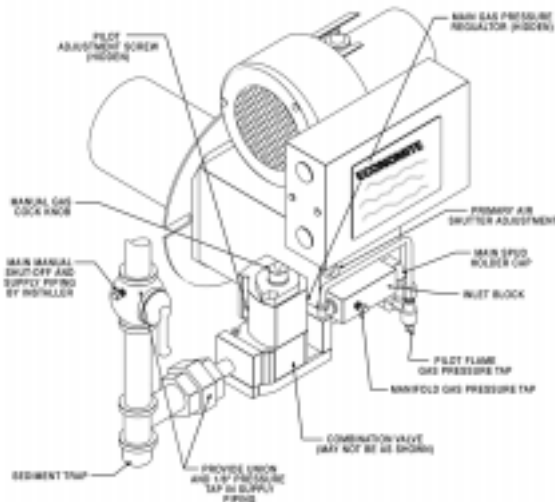
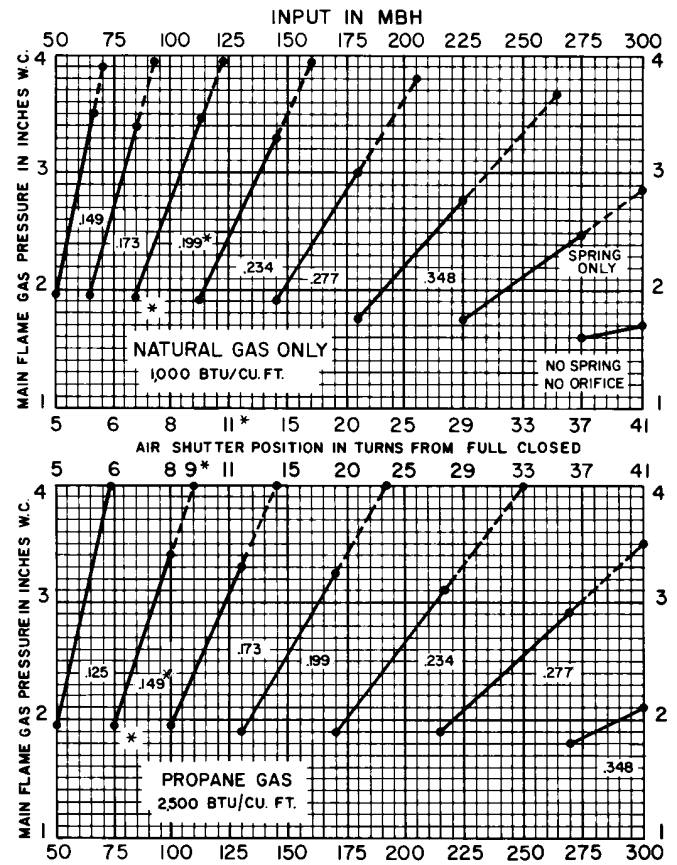


FIGURE 7 Piping Connections

VIII INITIAL START UP/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.

NOTE: Standard burners are shipped with the combination valve pilot adjustment set to provide a permissible pilot flame gas pressure when the gas pressure at the inlet to the combination valve is within 4.0" - 6.0" W.C. NATURAL and PROPANE. If the inlet gas pressure is not suitable, refer to TROUBLE CHART, Section II.C.



*Spud orifice size and approximate shutter and manifold gas pressure settings; as shipped.

— Orifice range with 4.0" W.C. inlet pressure
 - - - - Orifice range with 5.0" W.C. inlet pressure
 Data shown is approximate and based on "0" overfire pressure at sea level.

TABLE 3: Spud Capacity and Preliminary Gas and Air Settings

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 line at this point will expedite the first start as described below.
⚠ 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 gas pressure is suitable for the input rating of the gas utilization equipment. See Section VII and Table 3.**
5. Reset the Electronic Control by setting the operating control to **OFF** or the thermostat below room temperature for at least 60 seconds. See Section XII.
6. Turn Manual Gas Cock Knob on Combination Valve to **ON**.
7. Turn operating control to **ON** or set thermostat above room temperature. A few seconds after the motor reaches operating speed the pilot should light, followed by the main flame. If the burner fails to light within 90 seconds, the Electronic Control will shut off the pilot and main valves and will **lock out**. To reset the Electronic Control for restart, de-energize the control by setting the operating

control to **OFF** or thermostat below room temperature for at least 60 seconds. If burner still fails to light, turn it off and repeat from step 4. Then, if necessary, refer to the **trouble chart** to isolate the problem.

▲ WARNING: Repeated unsuccessful attempts to light will result in accumulated gases in combustion chamber. To prevent these gases from reaching an explosive level, periodically purge the combustion chamber as described in step 4 above.

8. To make a preliminary setting of the burner input, determine the manifold gas pressure required from Table 3 and adjust the combination valve main gas pressure regulator accordingly. See Section XI.
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.

$$\text{Example: } \frac{3600 \times 1 \times 100}{20} = 180,000 \text{ BTU/Hr} = 180 \text{ MBH}$$

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

10. Readjust the primary 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 gas.

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° 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 primary 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 reference on the front cover of this manual; the carbon dioxide content should be approximately 9.5% for NATURAL and 12.1% for PROPANE, or within the limits prescribed by the 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

▲ DANGER: Be sure the manual Main Shut-Off Valve combination valve and Burner Power Switch are turned OFF before removing any parts for service.

IX DRAWER ASSEMBLY

When the pilot flame gas pressure is in the proper range (see Table 4), lint, dust, or corrosion is the most common cause of pilot problems.

- The retention plate and pilot are part of the drawer assembly which can be removed as a unit. Remove the four back plate screws; then, disconnect the pipe union, pilot tube and control wires and pull out the drawer assembly.
- When servicing, clean the retention plate ports and pilot assembly including the pilot spud and electrode porcelain on sensor rod and/or spark electrode. Examine the sensor rod. If there is any serious corrosion or loss of metal at the tip replace the sensor rod.
- Make sure that the pilot mica peepsight is not damaged or missing as air leakage through the peepsight hole could mimic some of the conditions described below. See Figure 7.
- Check that the pilot orifice diameter is correct.
- Make sure that the burner tube is properly positioned in the combustion chamber entry. It must be set flush to 1/4" short of the inside of the combustion chamber as shown in Figure 2 or 3. It must not protrude into the combustion chamber.
- If cleaning does not eliminate the lighting problem, further checks are required:

▲ CAUTION: Do not indiscriminately increase pilot orifice diameter. Pilot troubles are rarely cured in this manner and new troubles may be introduced by causing the pilot flame to float and lose contact with the sensor rod.

- If the standby gas pressure is over 14.0" W.C., or less than 4.0" W.C., refer to Section VI.
- If the standby gas pressure is between 4.0" W.C. and 14.0" W.C. and does not vary more than 1.0" W.C., use the pilot adjustment screw in the combination valve (Section XI) to set the pilot flame gas pressure at 4.0" W.C.
- If the inlet pressure varies more than 1.0" W.C., a 1/8 inch Maxitrol RV12 series(or equal) pressure regulator set for an

outlet pressure of 3.5" W.C. must be installed in the pilot gas line and the pilot adjustment screw set full open.

	Nominal BTU /Cu. ft. Value	
	NAT-1000	PROPANE-2500
Orifice Diameter	.032	.025
Pilot Flame Gas Pressure	3.0"-4.0" W.C.	
Approx. Capacity	2400 BTU/Hr.	

TABLE 4 Pilot Specifications

X BLOWER ASSEMBLY

Cleaning of the blower wheel is usually the only service required. Need for cleaning is indicated if the inlet screen or blower wheel shows an accumulation of dust and lint, or if the character of the flame indicates a deficiency of air. Motor cooling air vents if present, should also be cleaned at this time.

- If the motor must be replaced: Disconnect motor leads, remove inlet ring and screen, blower wheel and the three motor mount retainer clips. Pull motor out of keyhole brackets. Remount in reverse order noting that brass flanges of rubber motor mounts are located against motor. The wheel should be located 1/4 inch inside the edge of the inlet side of the blower housing.

XI COMBINATION GAS VALVE

The 24 volt combination valve serves four functions: 1) Main Manual Gas Shut-Off, 2) Manifold gas pressure regulation, 3) Automatic electric pilot gas valve, and 4) Automatic electric redundant main gas valve. A pilot adjustment screw and filter are also included.

- The pilot adjustment screw is located on the combination valve. Remove plug for access and turn clockwise to reduce flow.
- The main gas pressure regulator, which has an outlet pressure setting range of 2.0 " to 4.0 " W.C. is factory set for a

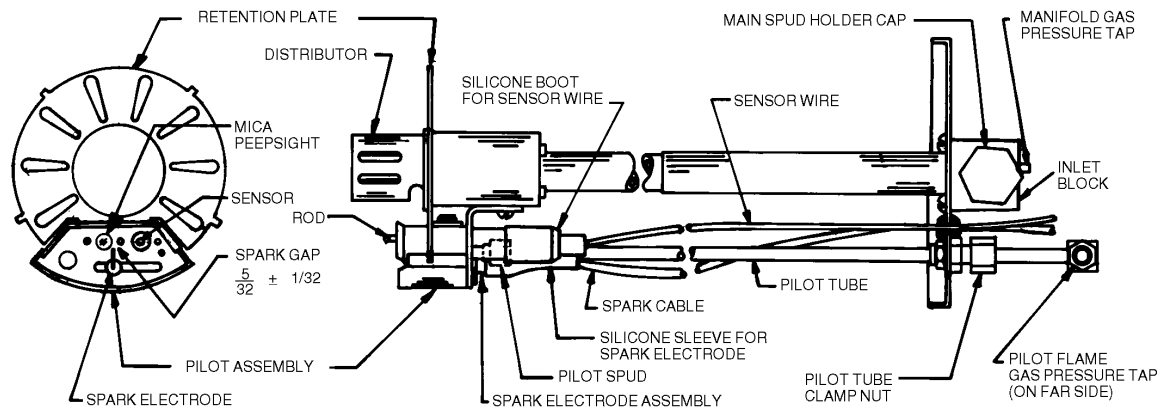


FIGURE 8 Drawer Assembly

manifold gas pressure of 2.0" W.C. 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 must be made with burner running and main gas ON.

▲ CAUTION: If gas supply pressure is below its specified range during regulator 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.

□ The tap for manifold gas pressure measurement is located in the Burner Inlet Block (see Figure 7 or 8). Remove plug for access.

□ If the gas 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 14.0" W.C. maximum during standby, and 4.0" W.C. minimum with the main flame on, the regulator portion of the valve is defective and entire valve must be replaced.

□ If, on a call for heat, the main flame ignition does not occur even though the pilot is burning, failure of the electric main valve operator may be indicated. Refer to the **trouble chart** for further information.

▲ CAUTION: If the combination valve has been moved or replaced, soap bubble test for leaks with the burner running.

□ If leakage through the valve occurs, as evidenced by presence of pilot and/or main flame on standby, the entire valve must be replaced.

XII ELECTRONIC CONTROL SYSTEM

The Electronic Control is a solid state device that automatically ignites and monitors the pilot flame. 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 pilot valve. When the pilot flame is established and proven, the control powers the main automatic valve.

□ If the pilot flame is not proven within 90 seconds, or if the proof of flame is lost during the burner run and the pilot is not re-established within 90 seconds, the control will shut off the combination valve and **lock out**. To reset the control for restart, de-energize the control by setting the operating control to **OFF** or thermostat below room temperature for at least 60 seconds.

□ If the Electronic Control is changed, the replacement must be identical to the make and model number, or 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.

CONSUMER INSTRUCTIONS

MAINTENANCE

□ Keep the area around the burner clear and free of combustible materials, gasoline or other flammable liquids or vapors. Do not obstruct burner air openings 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 AND/OR READJUSTMENT.

▲ 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 manual gas control and burner power. A dangerous condition has developed and must be corrected. CONTACT A QUALIFIED SERVICE

▲ 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. TECHNICIAN FOR READJUSTMENT OR REPAIR.

2. SET OPERATING CONTROL TO **OFF** OR THERMOSTAT BELOW
3. ROOM TEMPERATURE.
4. TURN MANUAL GAS COCK KNOB ON COMBINATION VALVE TO **ON**.
5. TURN BURNER POWER **ON**.

SET OPERATING CONTROL TO ON OR THERMOSTAT TO CALL FOR HEAT. IF THE PILOT FLAME IS NOT PROVEN WITHIN 90 SECONDS, OR IF THE PROOF OF FLAME IS LOST DURING BURNER RUN AND THE PILOT IS NOT RE-ESTABLISHED WITHIN 90 SECONDS, THE CONTROL WILL SHUT OFF COMBINATION VALVE AND LOCK OUT. TO RESET FOR RESTART, DE-ENERGIZE THE CONTROL BY

6. SETTING THE OPERATING CONTROL TO **OFF** OR THERMOSTAT BELOW ROOM TEMPERATURE FOR AT LEAST 60 SECONDS.
 1. REPEAT STEP 4 FOR RESTART.
 2. **TO SHUT OFF**
TURN MANUAL GAS COCK KNOB ON COMBINATION VALVE TO **OFF**.
TURN BURNER POWER **OFF**.

1. SHOULD OVERHEATING OF THE GAS UTILIZATION EQUIPMENT
2. OCCUR:

TROUBLE CHART

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 THE ORDER LISTED.

Shut off the manual gas control to the gas utilization equipment.
Do not shut off the control switch to the pump or blower.

is faint and thread-like and may be overlooked in bright light.

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 is overloaded or transformer defective.
 2. Between right strip terminal **T** and **GND**.
 - a. 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 and combination gas shut-off valves are in the **ON** position.
- B. If the pilot flame is not proven within 90 seconds, or if the proof of flame is lost during the burner run and the pilot is not re-established within 90 seconds, the Electronic Control will **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 60 seconds.
 1. No pilot flame.
 - a. Check for 24V* between Electronic Control terminal **24V** and strip terminal **GND**. No voltage, Blower Motor Interlock Switch is defective.
- C. For each of the following tests, reset the Electronic Control per step II.B. **TESTS ARE VALID ONLY DURING THE 90 SECOND TRIAL FOR IGNITION.**
 1. **TURN MANUAL GAS COCK KNOB OFF.** Check for 24V* between Electronic Control terminal **PV** and strip terminal **GND**. No voltage, Electronic Control is defective.
 2. Check for 24V* between pilot valve terminal **PV** on the combination valve and terminal strip **GND**. No voltage, defective valve wire harness. Voltage present, pilot valve operator is defective; replace valve.
 3. Connect manometer to pilot flame gas pressure tap. **TURN MANUAL GAS COCK KNOB ON.** Separate main valve wire at harness splice. During trial for pilot ignition period, check gas pressure.
 - a. No pressure, confirm that both Main Manual Shut-Off and combination gas shut-off valves and pilot adjustment screw are full open. Repeat step 3, and if still no pressure, pilot valve operator is defective.
 - b. Pilot flame pressure is 3.0" to 4.0" W.C., continue with step 4.
 - c. Refer to **Standby Gas Pressure** requirements in Section IX and adjust or regulate the pilot gas pressure as indicated.
 4. Check for ignition spark (spark gap is approx. 5/32 ±1/32) Since this is a capacitor discharge system, observe closely when visually checking the spark as it

- a. Between Electronic Control high voltage terminal and strip terminal **GND**. No spark, defective Electronic Control.
- b. Check for ignition spark at electrode tip. No spark, defective electrode or cable.
- c. Check for gas flow at pilot tip. No flow, clogged pilot spud or pilot tube.

III. FLAME ON ONLY DURING TRIAL FOR IGNITION PERIOD.

- A. With motor running and flame off, check line voltage terminals for voltage 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 sensor wire for continuity.
 2. Separate main valve wire at harness splice. Connect DC microamp meter in series with sensor wire and Electronic Control. With pilot only burning, flame signal should not be less than 2 microamps. Adjust pilot flame gas pressure per Section IX to obtain acceptable signal and note gas pressure and resultant signal for future reference.
 3. Reconnect separated main valve wire at harness. After main flame comes on, flame signal should increase. If signal does not increase, a rich flame is indicated. Refer to Table 3 for approximate air shutter and/or manifold gas pressure settings (see step VI).
- C. **IMPORTANT:** If changes are made in the main spud orifice size, manifold gas pressure or primary air adjustment, change the installation data tag accordingly.

IV. PILOT FLAME ON BUT NO MAIN FLAME.

- A. Check for 24V* between Electronic Control terminal **MV** and strip terminal **GND**. No voltage, Electronic Control is defective.
- B. Check for 24V* between main valve terminal **MV** on combination valve and strip terminal **GND**. No voltage, defective valve wire harness. Voltage present, main gas valve operator is defective.

V. SHORT FLAME.

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

VI. LONG HAZY FLAME.

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

VII. GAS FAILS TO SHUT OFF.

- A. Defective combination valve.

* Normal low voltage: Burner in standby - 24V min.
Burner running (main gas valve energized) - 21V min.