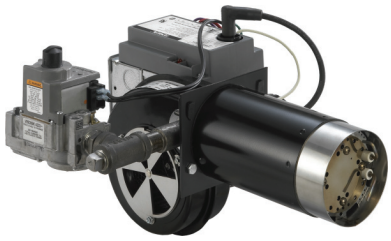
Installation, Service Instructions and Parts



Economite Series EC200 and EC300 Gas Burners (Standard)

The ECONOMITE Model EC Series gas burner is adaptable to any type gas utilization equipment, including gravity and forced air circulation furnaces and boilers, and is particularly recommended for horizontal and downdraft gas utilization equipment since it is a direct spark type burner. 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 the National Fuel Gas Code, ANSI Z223.1-latest edition available from American National Standard Institute. 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.

- 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-B-149.1 or 2. When the conversion burner is used on a 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.

- **⚠ WARNING: Additions, changes, conversions and service must be performed by an authorized Midco representative, service agency or the fuel supplier. Use only MIDCO specified and approved parts.**

- INSTALLER: Inform and demonstrate to the user the correct operation and maintenance of the 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 and associated literature to the 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 and associated literature is required, contact a qualified service agency. DO NOT ATTEMPT REPAIRS. An inadvertent service error could result in a dangerous condition.

AVOID ERROR IN PARTS SELECTION. When ordering use complete MIDCO Part Number and Description. Furnish Burner Model Number, Bill of Material Number and Serial Number (if available) from the specification plate found on the product.

IMPORTANT: Availability of parts as well as specifications are subject to change without notice. Please consult factory for item availability.

⚠ 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 phone your gas supplier from another building. 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.

BURNER MODEL: _____

BILL OF MATERIAL NUMBER: _____

SERIAL NUMBER #: _____

WIRING DIAGRAM: _____

FOR SERVICE CONTACT

Name: _____

Address: _____

_____

Phone: _____

Date of Installation: _____

Midco® INTERNATIONAL
Midco® International Inc.
4140 West Victoria Street
Chicago, Illinois 60646
toll free 866.705.0514
tel 773.604.8700
fax 773.604.4070
web www.midcointernational.com
e-mail sales@midcointernational.com

SAFETY INFORMATION TERMS: The following terms are used to identify hazards, safety precaution of special notations and have standard meanings throughout this manual. They are printed in all capital letters using a bold type face as shown below, and preceded by the exclamation mark symbol. 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.

As an ISO 9001:2008 certified company, we proudly design, manufacture and assemble our products in Chicago, Illinois, USA.

Quality Designed for Proven Performance

AHRI MEMBER

1021
8471 38
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Part 1 Installation

Specifications

NATURAL or PROPANE Gas			
Air Delivery		EC 200	EC 300
(Approximate air delivery at zero draft)		40.0 SCFM*	60.0 SCFM*
Maximum Firing Rate**		200 MBH***	300 MBH***
Minimum Firing Rate**		70 MBH***	90 MBH***
Tube Diameter		4 inches	4 inches
Tube Length		7.50 inches	7.50 inches
Combustion Chamber Size		Recommended Minimum W width, H height & L length	
100 MBH ***		8″ W x 8″ H x 8″ L	
200 MBH ***		10″ W x 10″ H x 10″ L	
300 MBH ***		14″ W x 14″ H x 14″ L	
Gas Pressure Required			
NATURAL or PROPANE		6.0″ to 14.0″ W.C.	6.0″ to 14.0″ W.C.
Electrical Supply	Standard	120/1/60, 2.0 Amps	120/1/60, 3.0 Amps
		230 volts 50/60 hz ****	230 volts 50/60 hz ****
Flame Safety		24V Electronic Flame Safety, with 100% shut-off, 30-second pre-purge.	
Main Automatic Valve		3 Function Redundant	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.
**** Available - Contact Factory
Derate burner for altitudes over 2,000 feet by 4% for each 1,000 feet above sea level.

General Information

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

Before installation, read these instructions carefully.

The EC 200 / 300 burner is a gas power burner designed for firing natural or propane gas in most applications. The burner is a self-contained unit consisting of a blower assembly, burner head, ignition control and a combination gas valve. The burner installation involves mounting the burner to the gas utilization equipment, piping the gas train and connecting the power supply. Every burner is operationally fire tested at the factory prior to shipping.

I - Ventilation

If the former automatic oil burner provided trouble-free operation, then the gas utilization equipment area should have sufficient air for combustion and the 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, additional ventilation may be required. Install two permanently open grills, 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 located in the confined space. One grille should be located within 12″ inches of the ceiling, the other within 12″ 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, provisions must be made for an outside air supply near the gas utilization equipment area. Install permanently open grills sized at not less than one square inch free area per 4,000 BTU of burner input. When ventilating through horizontal ducts, grills should be sized not less than one square inch

free area per 2,000 BTU. 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.

I - Ventilation Continued

II - Preparation of the Gas Utilization Equipment

- Clean the appliance, 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.

- Install mounting flange to the burner blast tube. The distance from the flange to the blast tube edge should be same as the gas utilization equipment wall thickness plus the flange gasket thickness. This will allow the burner blast tube to be flush with the inner chamber wall after the burner is installed. If the blast tube extends into the combustion chamber serious damage to the burner may occur, voiding the warranty, see Figure 1 & 2 for reference. For minimum combustion chamber dimensions see Table 1.

Gas Input MBH*	Width/ Height ″	Length ″
100	8″	8″
150	9″	9″
200	10″	10″
250	12″	12″
300	14″	14″

Table 1: *Minimum Combustion Chamber Dimensions*

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

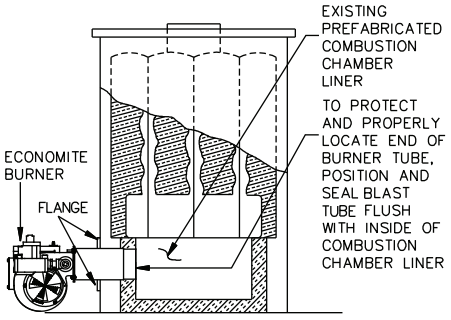

Figure 1: *Dry Base Boiler with Combustion Chamber Liner (Similar to Warm Air Furnace Construction)*

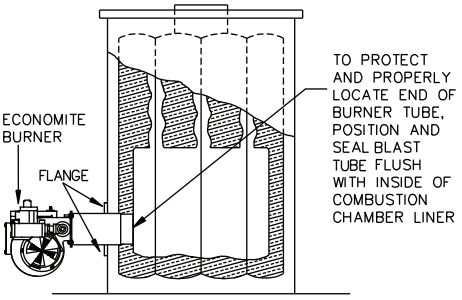

Figure 2: *Wet Base Boiler with Combustion Chamber Unlined*
Source: ANSI Z21.8b 1993, Installation of Domestic Gas Conversion Burners. For other applications, consult factory.

- Mount the burner to the appliance. Use the supplied gasket to assure a tight seal between the mounting flange and front plate gasket.
- With a wet base boiler, 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. A liner or target wall may be necessary if the combustion chamber is unusually short.
To avoid flame contact on the heat exchanger walls or flueways.
- Use 2300°F minimum insulating material when the application requires the construction or replacement of a combustion chamber liner
- The burner tube must be sealed air tight into the combustion chamber liner opening with refractory material as shown by Figures 1 and 2.

⚠ **CAUTION: In no case should the burner tube be allowed to extend into the combustion chamber; it must be set flush with the inside surface.**

⚠ **WARNING: Burner cabinet must be mounted in orientation shown in Figures 1 and 2. Any other mounting 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.**

III - Combustion Chamber Continued

- Before permanently setting the burner in place, check that the burner nozzle is free of foreign materials and that the electrodes have not been damaged or displaced, see Figure 8.

IV - Chimney, Vent Connector, and Draft Control

⚠ **WARNING: The chimney should be inspected for unsafe conditions such as deteriorated masonry and excessive soot or other blockage. Installation must conform with local codes. In the absence of local codes, the recommendation installation compliance is with ANSI Z21.8b latest edition and NFPA, ANSI Z223.1 latest edition.**

⚠ **WARNING: The Vent Connector shall not be connected to a chimney that is venting solid fuel burning from any equipment, any incinerator or any open fireplace.**

- The Vent Connector shall be made of non-combustible, corrosion resistant material capable of withstanding the vent gas temperature produced by the appliance 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.
- 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 piping shall be fastened by sheet-

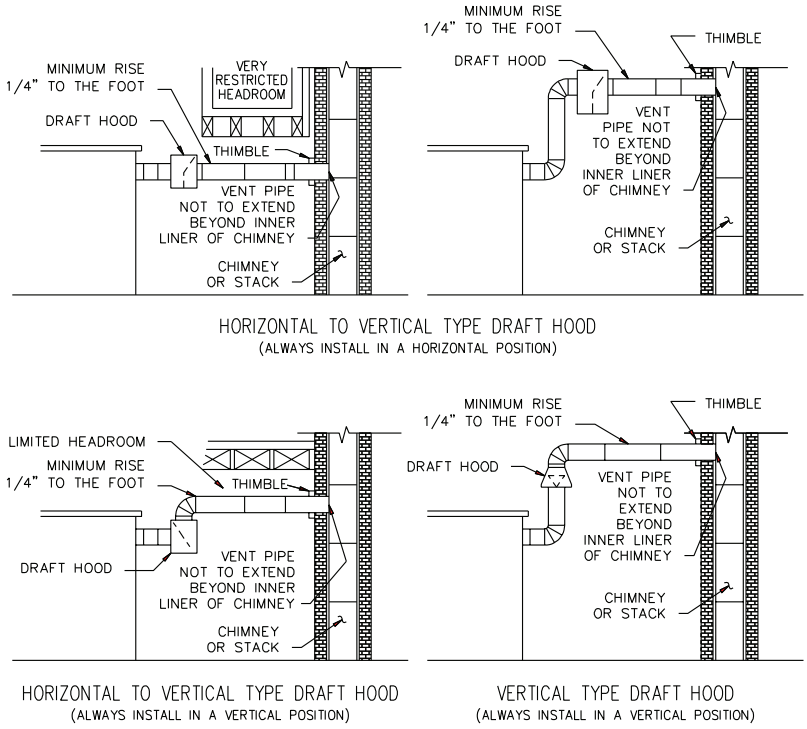

Figure 3: *Draft Hoods*

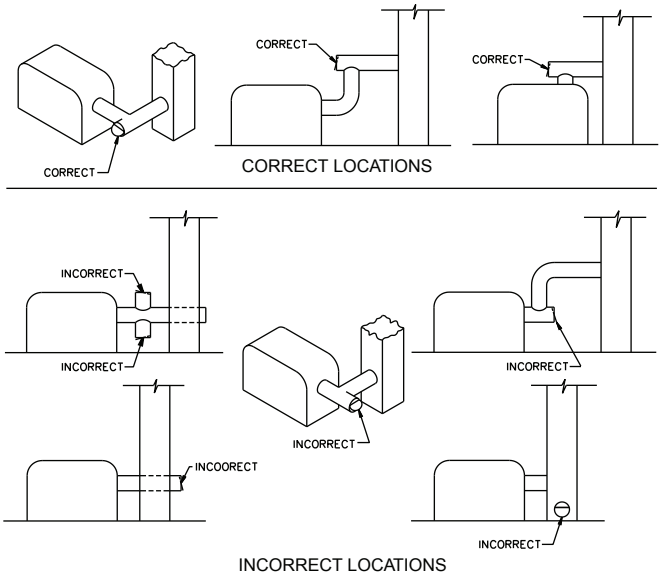

Figure 4: *Location for Barometric Draft Regulator*

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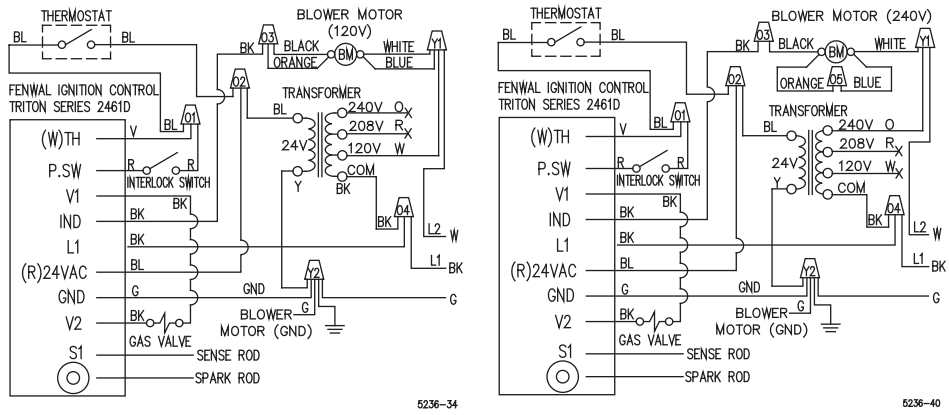
IV - Chimney, Vent Connector, and Draft Control Continued

metal screws or other approved fittings. 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 barometric draft regulator shall be installed in the same room 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.

V - Electrical

⚠ **CAUTION: Do not add any power consuming devices in the low voltage circuit to prevent overloading of the transformer.**



EC 200/300 120V Wiring Diagram

EC 200/300 240V Wiring Diagram

LEGEND

Solid: Wiring and components by factory

Dashed: Wiring and components by installer

Component

Orange Wire nut

Yellow Wire Nut

Note: If any of the original wire as supplied with the burner must be replaced, it must be replaced with a type T FF or its equivalent

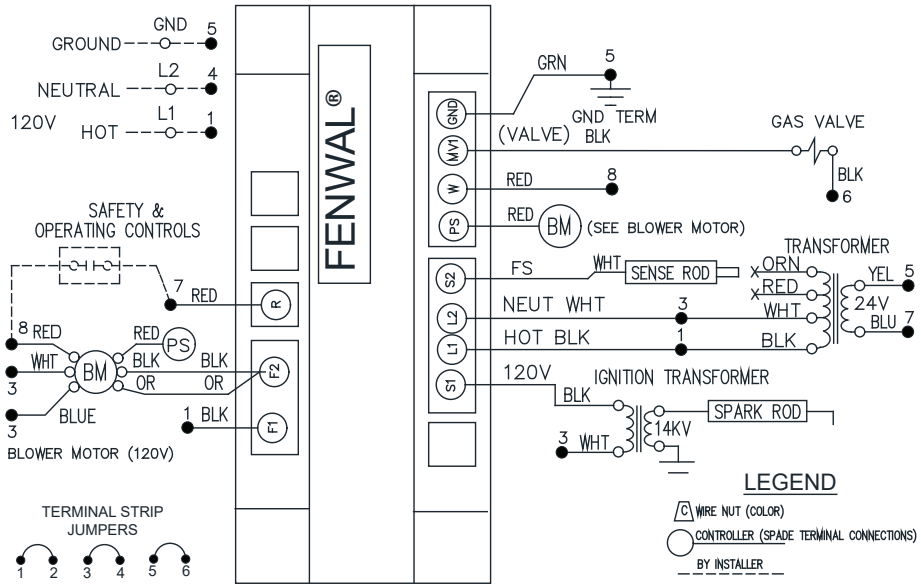


Figure 5: *Wiring Diagram - 120V and 240V and External Spark Wiring Diagrams*

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 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.**

V - Electrical - Continued

- Electrical installation must be made in accordance with the United States National Electric Code, ANSI/NFPA No.70-latest edition or Canadian Electrical Code, Part 1, CSA Standard C22.1 and applicable local code. If the burner is a part of a gas utilization equipment system, check the wiring diagram as supplied by the manufacturer.
- Refer to the wiring diagram Figure 5 or the same wiring diagram supplied on the inside of the burner wiring enclosure. There are three leads (black - L1, white - L2 and green - ground) and two thermostat wire leads (blue) inside the wiring enclosure.
- Use 14 gauge copper wire for line voltage wiring. Be sure to connect to a permanent 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 grounding.
- Confirm that the polarity is correct; L1 to black wire, neutral to white. The neutral line should not be subjected to induced low voltage (check white and green wire to earth ground) from other equipment as that can cause the electronic flame safeguard to malfunction.
- Each installation must include suitable limit controls. The existing oil burner combination limit and operating controls are NOT SUITABLE for gas burner safety and operation.
- Set the thermostat heat anticipator to the current draw of the gas burner. The current draw of the gas burner 24V operating circuit is 0.7 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

⚠ **CAUTION: The available gas pressure should be within the limits shown in the SPECIFICATIONS section. Excessive pressure will damage the Combination Gas 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.**

Pipe Size	Type of Gas	Approximate Capacity -MBH Pipe Length				
		10	20	40	75	100
3/4	Natural	200	150			
3/4	Propane	590	400	275	190	160
1	Natural	400	275	200	150	
1	Propane	1075	730	500	360	300
1 1/4	Natural	900	600	450	325	275
1 1/4	Propane			1040	750	630
1 1/2	Natural		900	650	475	400
1 1/2	Propane					975

Capacities shown are for a total pressure drop of 0.3"W.C. For 0.5"W.C. pressure drop, multiply capacity shown by 1.3. Propane capacities shown are for a total pressure drop of 0.5" W.C. For higher permissible pressure drops, consult your gas supplier.

Table 2: *Schedule 40 NPT Pipe-Capacity Chart*

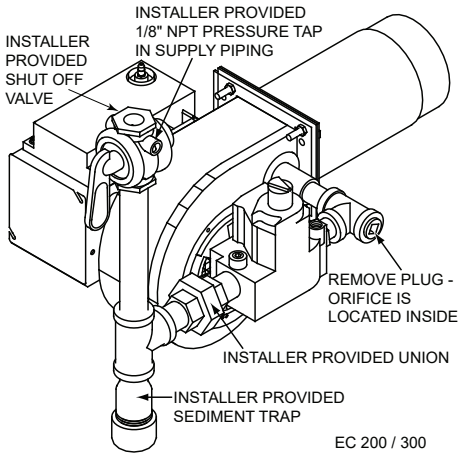


Figure 6: *Piping Connections*

- 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 burrs.
- Provide a sediment trap, union and 1/8″ pressure tap in piping close to burner as shown in Figure 6.
- Use pipe joint compound approved for use with natural and liquid petroleum gases.
- Piping must comply with local codes.
- To obtain the maximum firing rate of the burner, the fuel gas supply piping must be sized to provide a minimum of 6″ W.C. pressure to the inlet of the combination valve when the burner and all other gas appliances are on.
- When pressure testing the supply piping, the burner valve train must be protected.

⚠ **CAUTION: If the test pressure is 0.5 PSIG or less, closing the Main Manual Shut-Off Valve will suffice.**

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

VI - Piping Continued

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

VII Main Gas Spud

The EC200 and EC300 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 EC Series Economite is shipped ready for NATURAL gas and is field convertible to PROPANE gas, see Table 3.
- As shipped, the EC200 has no spud installed, manifold pressure set at 4.1″ W.C., air restrictors off and the air shutter full open. As shipped the EC 300 has no spud installed, manifold pressure set at 4.0″ W.C., air restrictors off and the air shutter full open. OEM applications will be set based on the equipment requirements.
- If the required firing rate does not fall within the range of the installed orifice, or if converting to PROPANE gas, use Table 3 to select the spud with the correct orifice size (stamped in inch diameter) for the desired capacity from the spare orifice bag assembly.
- To change the orifice, turn off the Main Manual Shut-Off Valve and the main electric to the burner Refer to piping diagram, Figure 6, to locate the orifice location if required.

⚠ **WARNING: Reposition the combustion air shutter for the maximum firing rate of the selected orifice capacity range**

⚠ **CAUTION: The approximate air and gas settings described below are for initial start-up only. Final start-up settings must be made in accordance with Section VIII, Burner Set-Up/Adjustment Instructions for the manifold gas pressure are detailed in Section XIII, Combination Gas Valve.**

EC 200		Natural Gas			Propane Gas			
Heat Input BTU/Hr	Manifold Gas Pressure ″ W.C.	Air Shutter Position	Orifice Size	Air Restrictor	Manifold Gas Pressure ″ W.C.	Air Shutter Position	Orifice Size	Air Restrictor
70000	2.6	1.0	0.173″	On	1.2	1.0	0.173″	On
100000	1.0	2.0	None	On	2.3	2.0	0.173″	On
150,000	2.6	7.0	None	On	1.2	7.5	None	On
200,000*	4.1	9.0	None	None	1.8	9.0	None	None

EC 300		Natural Gas			Propane Gas			
Heat Input BTU/Hr	Manifold Gas Pressure ″ W.C.	Air Shutter Position	Orifice Size	Air Restrictor	Manifold Gas Pressure ″ W.C.	Air Shutter Position	Orifice Size	Air Restrictor
90,000	2.5	1.0	0.173″	On	1.1	1.0	0.173″	On
150,000	1.3	3.0	None	On	2.8	3.0	0.173″	On
200,000	2.2	6.5	None	On	1.2	6.0	None	On
250,000	2.9	6.0	None	None	1.6	6.0	None	None
300,000*	4.0	9.0	None	None	2.1	9.0	None	None

** As Shipped from Factory*

Table 3: *Recommended Air Shutter Setting at Zero Draft Conditions and Orifice Size*

VIII - Burner Set-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 10 below.

1. Before burner start up, be sure to study and familiarize yourself with the exact sequence of operation and all other details of this burner and the gas utilization equipment.
2. 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.
3. Purge the air from the gas supply line to expedite the first light off.
4. Ensure the gas utilization equipment is in the proper operating condition.
5. Attach two gas manometers to the burner. Connect one to the inlet pressure tap of the gas valve and the other to the outlet pressure tap of the gas valve.
6. Connect a microampmeter to the ignition controller to monitor the flame signal during the start up process. Refer to the ignition control specification sheet that is supplied with the burner for proper lame signal requirements and sequence of control operation.

NOTE: Midco International reserves the right to change ignition controller or other components without notice.

7. Set the burner air shutter to the proper setting according to the recommended data in Table 3 for zero draft condition.
8. To **RE-SET** the Electronic Burner Control a manual re-set is required. Turn the operating control to Off or set the thermostat below room temperature for at least 30 seconds, or remove the 24v for a period of 5 seconds, see Section XIV, Electronic Burner Control.
9. Confirm that Main Manual Shut-Off Valve is open. Turn Manual Gas Cock Knob on Combination Gas Valve to **ON**.

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

10. Turn the combination valve knob on. Turn the burner power on. Turn operating control to **ON** or set thermostat above room temperature. After four seconds the blower motor will be start to purge the combustion chamber. Main flame should come on after a 30 second pre-purge. Whenever the burner fails to light during the 7-second ignition trial period, or if the flame is lost during the burner run cycle and not re-established within 37 seconds, the Electronic Burner Control will shut off the Combination Gas Valve and **LOCK OUT**. To **RE-SET** see step 8 for restart. At the end of the purge cycle, typically 30 seconds, the combination valve will be energized and a spark will be initiated at the same time. The trial for ignition will be approximately seven seconds.
11. 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 XIII, *Combination Gas Valve.*

⚠ 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 and chimney.

12. If ignition failure occurs, the main power must be turned off to reset. If the burner fails again refer to the trouble chart.
13. 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.
14. Check the operation of the burner; start and stop it several times with the thermostat or operating control.
15. With the burner running, check the operation of all limit and associated safety controls.
16. 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

VIII - Burner Set-Up/ Adjustment Continued

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.

17. Check the draft control to make sure there is no spillage of flue products into the room.

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

IX - Determining the Firing Rate

To determine the firing rate for NATURAL gas accurately, use time **test dial** to determine the number of seconds for one revolution and use the following formula.

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

Then divide by 1,000 for MBH value:

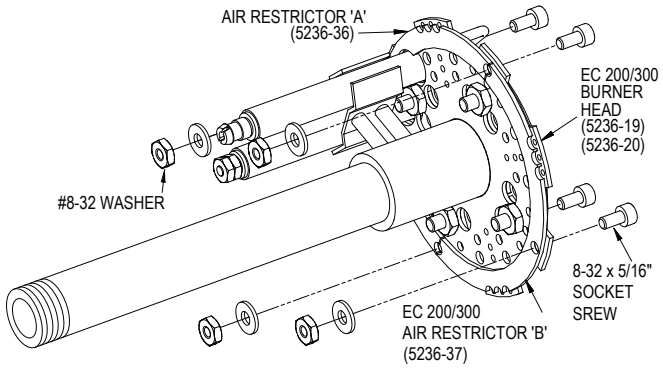
Example:

$$\frac{\textbf{3600 x 1 x 1000}}{\textbf{20}} = \textbf{180,000 BTU/Hr = 180 MBH}$$

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

X - Air Restrictor

When the EC 200 burner is to be used at 150 MBH/hr and below, or EC 300 burner is to be used at 200 MBH/hr and below, the air restrictors should be installed on the burner head to get the best combustion performance.



For easy installation follow the steps below.

1. Check the associated package containing two air restrictors (A & B), four 8-32 x 5/16 socket screws and four #8-32 nuts.

NOTE: There is a slight difference between the two air restrictors.

2. Disassemble the blast tube from the blower housing by removing the nuts on the flange.
3. Put the air restrictor A in the place, see Figure 7 for reference. The air restrictor A should be installed on the back side of the burner head; on the same side of the electrodes. Install one screw in the middle hole of air restrictor and put one nut on the screw.
4. Put the air restrictor B in the place, see Figure 7 for reference. Install one screw in the middle hole of air restrictor and put one nut on the screw.
5. Line up two air restrictors and put the other two screws in place. Then tighten four of them.
6. Assemble the blast tube back to the blower housing.

XI - 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.

- Service will normally consist of inspection and cleaning. Check the electrodes for deterioration and the insulators for cracks. The electrodes are adjustable. If defective replace. Be sure to replace the rubber boot over the spark electrode and treat electrode leads with care. Due to high voltage any damage to the insulation is a potential leak path. When a new electrode is installed, be sure to set the spark gap and flame sensor dimensions, as shown in Figure 8.

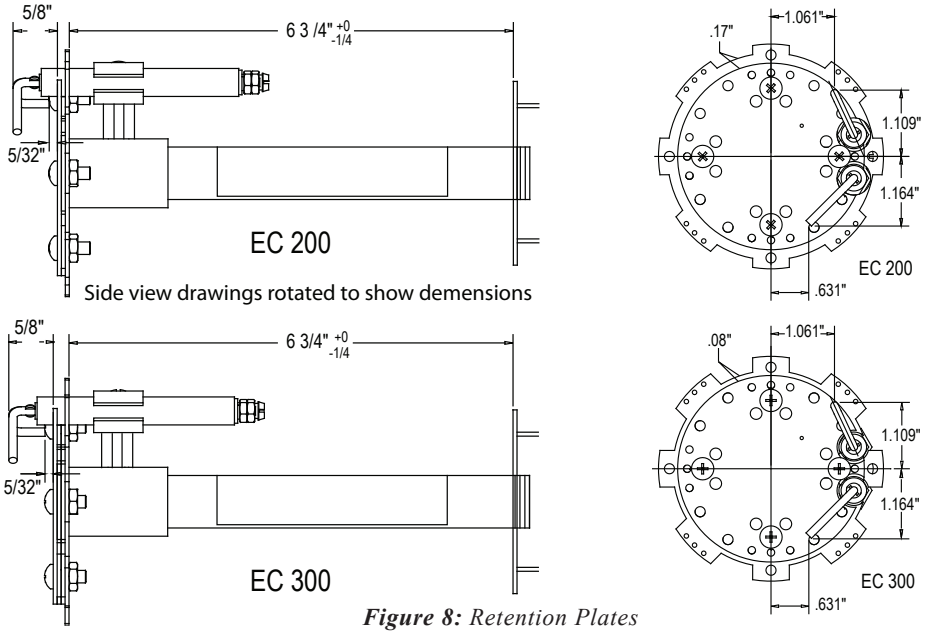


Figure 8: *Retention Plates*

XII - Blower Assembly

- Cleaning of the blower wheel is usually the only service required. Need for cleaning is indicated if the air inlet of the burner housing shows 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.

XIII - Combination Gas Valve

The 24 volt Combination Gas Valve serves three functions:

1. Manual Gas Shut-off
2. Manifold gas pressure regulation
3. Automatic electric redundant (double seated) gas valve

- For manual control, turn switch between ON and OFF positions
- The Combination Valve Gas Regulator is factory set for 4.1″ W.C. for the EC 200 and 4.0″ for the EC 300. Manifold Gas Pressure Tap is located on the outlet end of the Combination Valve body.
- If pressure adjustment is required to change settings, remove regulator cap for access to slotted adjustment screw. Turning of adjustment screw counterclockwise reduces pressure; clockwise increases pressure. Do not adjust past the point where no change in pressure is noted.

Note: Pressure setting can only be made with burner running and gas on.

⚠ CAUTION: If the gas supply pressure is below its specified range during adjustment, an overfire condition could result when normal pressure returns, 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.

XII - Blower Assembly Continued

- 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 Gas Valve is a steady 14.0″ W.C. maximum during standby, and a steady 6.0″ W.C. minimum with the flame on, the regulator portion of the gas valve is defective and the entire gas valve must be replaced.

⚠ **CAUTION: If the Combination Gas Valve has been moved or replaced, perform test for leaks with the burner running.**

⚠ **CAUTION: If leakage through the gas valve occurs on standby, as evidenced by the presence of any flame, the entire gas valve needs to be replaced.**

XIV - Electronic Control

- Operation - Power Up/Standby: Upon applying power (24 volts) to 24VAC, the control will reset, perform a self check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds, and enter the thermostat scan state.
- Heat Mode: when a call for heat is received from the thermostat, the control will check the internal blower motor interlock switch for normally open contracts. The combustion blower is then energized and once the internal blower motor interlock switch contacts close, a pre-purge delay begins. Following the pre-purge period the gas valve is energized and spark will commence for the trial for ignition period.
- When flame is detected during the trial for ignition, spark should shutoff immediately while the gas valve and combustion blower remain energized. The thermostat, internal blower motor interlock switch, and main burner flame are constantly monitored. When the thermostat is satisfied and the call for heat ends, the main valve is de-energized immediately, the control senses the loss of flame signal and initiates an (optional) post-purge period before de-energizing the combustion blower.
- Failure to Light - Lockout: Should the main burner fail to light, or flame is not detected during the trial for ignition period, the control will go into lockout. The valve will be turned off immediately, and the combustion blower will be turned off following an optional post purge period.

⚠ **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 or submerged.**

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 or ventilation air.
- The motor features permanently lubricated ball bearings and requires no routine oiling or 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 gas valve operator is heard to come on before the motor reaches operating speed, immediately turn off the Main Manual Shut-off Valve and power to the burner. A dangerous condition has developed and must be corrected. CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING, RE-ADJUSTMENT 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 dangerous condition and cause an explosion or fire. If you suspect a gas leak, follow instructions on front cover of this manual.**

EC Series Exploded - Isometric View

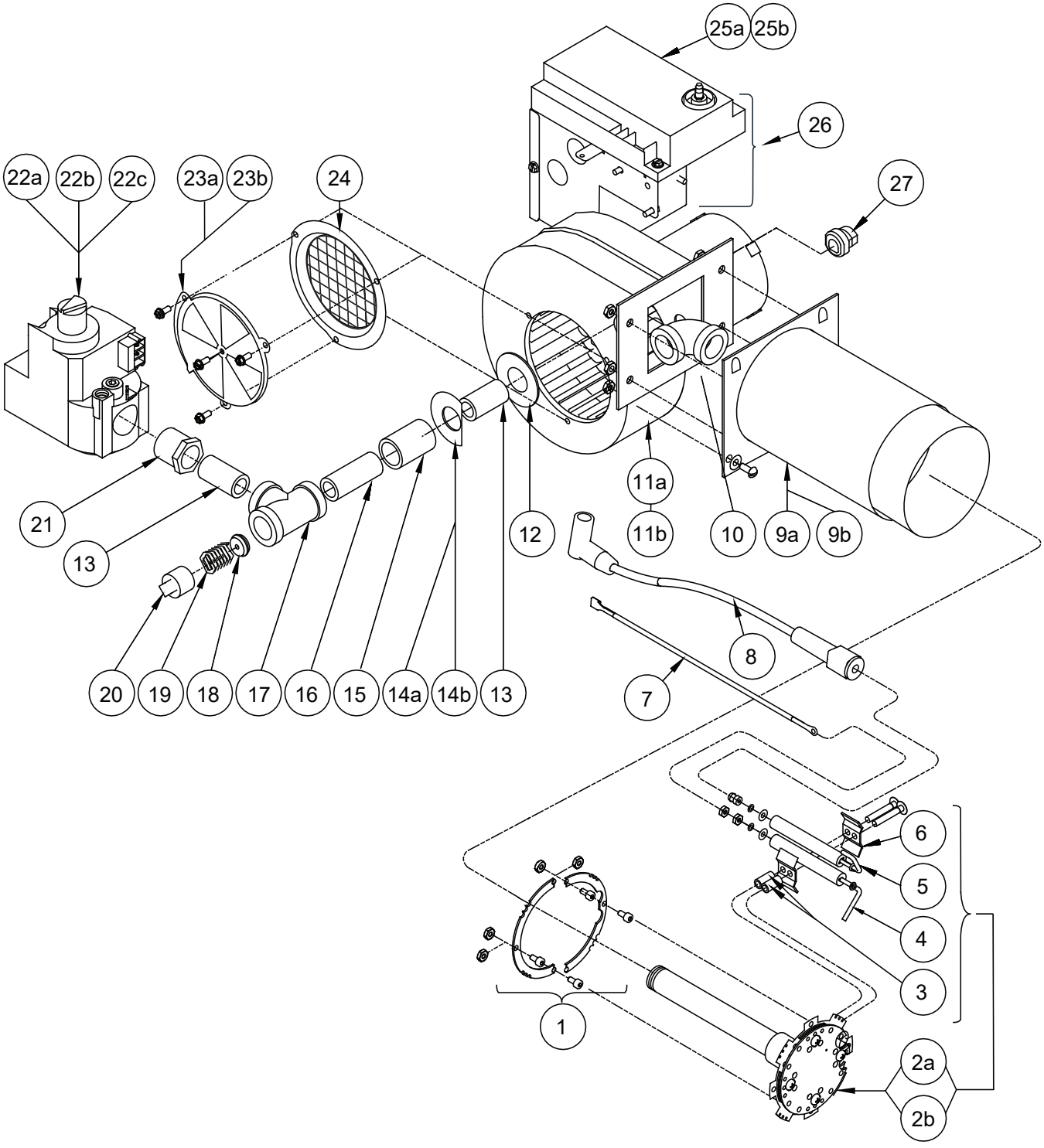


Figure 9: *Isometric View of EC200 and EC300*

EC Parts List and Lighting Instructions

Item	Part #	Description	Qty
1	5236-43	Air Restrictor Pack Includes Orifice(.173), Orifice Spring and Hardware	1
2a	5236-20R	EC200 Burner Head Assembly	1
2b	5236-19R	EC300 Burner Head Assembly	1
3	8452-44	Bracket Spacer	2
4	5236-18	EC200/EC300 Flame Rod Assembly	1
5	5236-16	EC200/EC300 Spark Rod Assembly	1
6	5232-25	Flame and Spark Rod Bracket	2
7	8505-94	Flame Rod Wire Assembly	1
8	8505-93	SAEJ2031 Ignition Cable Assembly	1
9a	5236-13	EC200 Blast Tube	1
9b	5236-14	EC300 Blast Tube	1
10	8495-04	1/2″ Elbow	1
11a	8437-57	EC200 Motor Blower Assembly (Includes Wheel, Housing and Motor)	1
	5236-64	EC200 Blower Wheel	1
	5236-66	EC200 Blower Motor	1
11b	8437-56	EC300 Motor Blower Assembly (Includes Wheel, Housing and Motor)	1
	5236-65	EC300 Blower Wheel	1
	5236-67	EC300 Blower Motor	1
12	5236-26	EC200/EC300 Washer	
		EC200	4
		EC300	5
13	8487-50	1/2″ Close Nipple	2
14a	5236-17	EC200 Special Washer	1
14b	5236-15	EC300 Special Washer	1
15	8493-67	1/2″ Full Coupling	1
16	8487-53	1/2″ X 2-1/2″ Long Nipple	1
17	8494-02	1/2″ Tee	1
18	5726-72	R Main Spud- .173 Dr (#17) Orifice	1
19	6622-30	Orifice Spring	1
20	8496-17	1/2″ Square Plug	1
21	8492-51	3/4″ X 1/2″ Hex Bushing	1
22a	8419-70	EC200 -Redundant Combination Slow Opening Valve VR8305K4233	1
22b	8419-75	EC300 Direct Spark Gas Valve Slow Opening Valve VR8305K4852	1
22c	8420-07	EC200 Direct Spark Ignition Gas Valve Slow opening valve 36J54-214	1
23a	5236-48	Air Shutter Assembly EC200	1
23b	5236-47	Air Shutter Assembly EC300	1
24	5236-35	Inlet Ring And Air Screen Weldment EC200 Only	1
25a	8429-51	Fenwal 2461DSI Controller	1
25b	8429-99	Fenwal 35-665 Controller	1
26	5235-03	Control Assembly - (Includes Ignition Control; Transformer and Box)	1
27	8457-47	Strain Relief	2
	Not Shown		
	8447-39R	External Spark Transformer Repair Kit for EC200 & EC300	
	8452-16	Mounting Flange Kit w/ Gasket	
	8452 48	Flange Gasket	
	5734-51	Transformer Repair Kit - EC200/ EC300	
	7400-20	Wire Kit	

Important: Availability of parts as well as specifications are subject to change without notice. Please consult factory for item availability. Avoid errors in parts selection, when ordering, use complete Midco Part number and description. Furnish burner model number, bill of material number and date code from the Specification Plate located on the burner.

Lighting Instructions

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 (there is a 30 second pre-purge).
5. Wait 37 seconds. If burner fails 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. Then set operating control to ON or thermostat to call for heat.

TO SHUT OFF

1. Turn switch on gas valve to OFF position.
2. Turn burner electrical 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 burner, the equipment pump or blower.

Trouble Chart

Trouble Chart

NOTE: ELECTRICAL AND FLAME CHECKS MUST BE MADE IN ORDER LISTED.

1. Check status of electronic burner control diagnostic indictor LED.
   - A. LED On = electronic burner control fault.
   - B. 1 flash = air flow fault.
   - C. 2 flashes = flame with no call for heat.
   - D. 3 flashes = ignition lockout.
2. Confirm that both main manual shut off valve and manual gas cock knob on combination gas valve are in the ON position. Make sure that the thermostat, operating controls and safety controls are calling for heat. Defective wiring or loose connections can simulate malfunctioning components: or any of the conditions below. Check associated wiring and connectors before replacing a component. Whenever the burner fails to light during the seven second trial for ignition, or if the flame is lost during the burner run cycle and not re-established within 37 seconds (30 second pre-purge), the electronic burner control will shut OFF the combination gas valve and lockout the burner. To reset, set the operating control to OFF or thermostat below set point for at least 30 seconds.
3. Confirm that:
   - A. Burner is properly grounded (Green wire to ground).
   - B. Line voltage is present between L1 (Black wire) and L2 (White wire). If not present, check line power source.
   - C. Line voltage is present between L1 (Black wire) and Ground (Green wire).
   - D. There is no voltage present between L2 (White wire) and Ground (Green wire)
4. Confirm that 24V is present at:
   - A. Transformer, 24V secondary side (Yellow wires). If not present, replace transformer
   - B. R terminal on electronic burner control and Ground.
   - C. First Blue wire in electrical box labeled “T” (thermostat) and Ground, second Blue wire in electrical box labeled “T” (thermostat) and Ground. If power is only present at one Blue wire, check thermostat and thermostat wiring.
   - D. TH terminal on electronic burner control and Ground. If no power is present at TH terminal, check thermostat and thermostat wiring.
5. Blower motor should now be ON. If ON, proceed to step 7. If not ON:
   - A. Confirm that line power is present at IND wires at the electronic burner control

NOTE: IND wires exit the back side of the electronic burner control and one IND wire goes to the line power hot side of the blower motor (White and Blue wires for 115V, White and Black wires for 230V).

   - B. Confirm that line power neutral (L2, White wire) is connected to motor neutral wires (Orange and Black wires for 115V, Orange and Blue wires for 230V). Line power is being delivered to the blower motor and it is not running, replace the blower motor.

6. With blower motor running, confirm that 24V power is present at PSW terminal on the electronic burner control and Ground. If power is not present, check wires and wire connections of the internal motor interlock switch (2 red wires exiting the motor). If the blower motor is running and the internal blower motor interlock switch is open, replace the blower motor.
7. After 30 second blower motor pre-purge, confirm 24V power at V1 terminal on electronic burner control and Ground. If power is not present, replace electronic burner control.

NOTE: After the pre-purge period, the controller will simultaneously energize the gas valve and send power to the spark rod, causing an ignition spark at the end of the rod.

⚠ **CAUTION: Spark generating circuit is HIGH VOLTAGE !**

If an ignition spark is not present at the tip of the spark rod, turn the power supply OFF. Inspect ignition wire/connectors, spark rod, spark rod positioning, spark rod gap and spark rod ceramic insulator. Adjust, repair or replace as necessary. If an ignition spark is still not present, perform a spark test on the electronic burner control per the electronic burner control manufacturers recommendations. If spark test fails, replace electronic burner control.

8. Once ignition spark is present, main flame should be present. If not present:
   - A. Confirm that there is no air in gas line. If so, purge air from gas line.
   - B. Confirm that 24V power is being delivered to the gas valve (V1 and V2 on electronic burner control).
   - C. Check for adequate flame current signal strength with an electrical meter (Refer to the electronic burner control manufacturers specification sheet that is supplied with the burner as noted in Section VIII, sub-section 6).
9. Once main flame is established and flame current signal strength is good, proceed to “Re[illegible] Service, Section VIII Burner set-up/ adjustment” to finalize the burner set-up.

As an ISO 9001:2008 certified company, we proudly design, manufacture and assemble our products in Chicago, Illinois, USA.
Midco® International Inc. - 4140 West Victoria Street - Chicago, Illinois 60646 - toll free: 866 705 0514
tel: 773.604.8700 - fax: 773.604.4070 - web: www.midcointernational.com - e-mail: sales@midcointernational.com

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