

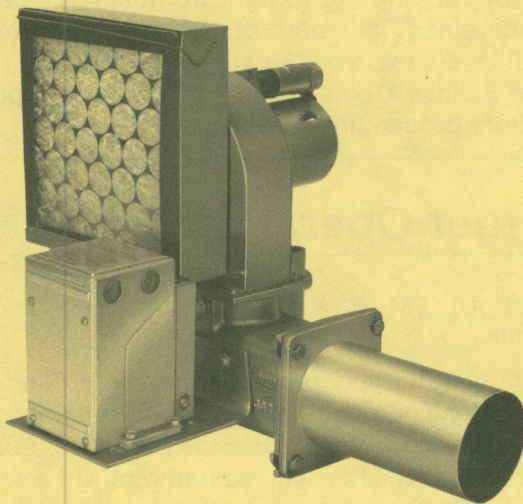
# ECLIPSE INFORMATION GUIDE

## MINIMATIC BURNERS

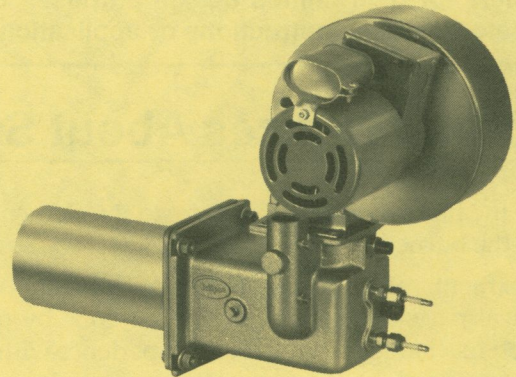
### Model 50 MMB

H-97  
Information  
Guide

4/88



Burner w/optional  
Filter & Control Motor



Minimatic  
Burner

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## WARNING

The burners covered in this Guide are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing violent explosions and fires when improperly applied, installed, adjusted, controlled, or maintained. This Guide will provide information for using these burners for their limited design purpose. Do not deviate from any instructions or application limits

in this Guide without written advice from the Engineering Department at the Eclipse Combustion Division in Rockford, Illinois. Read this entire Guide before attempting to light burners. If you do not understand any part of the information in this Guide, contact your local Eclipse representative or the Eclipse Combustion Engineering Department before proceeding further.

## Important Notices About Safe Burner Operation

1. Store the burner inside. Exposure to the elements can damage the burner.
2. Adjustment, maintenance, and troubleshooting of the mechanical parts of this unit should be done by people with good mechanical aptitude and experience with combustion equipment.
3. Order replacement parts from Eclipse Combustion only. Any customer-supplied valves or switches should carry UL, FM, CSA, and/or CGA approval where applicable.
4. The best safety precaution is an alert and competent operator. Thoroughly instruct new operators so they demonstrate an adequate understanding of the equipment and its operation. Regular retraining must be scheduled to maintain a high degree of proficiency. The operator must have easy access to this Information Guide at all times.

## 1.0 Applications

The Eclipse Minimatic burner is a compact gas burner designed for use in process air heating applications such as ovens and dryers. Minimatic burners feature an integral

air and gas butterfly mounted on the same shaft for ease of set-up and dependable operation. Minimatic burners don't require any valve or linkage adjustment.

## 2.0 Burner Operating Parameters & Requirements

### 2.1 Capacities and Supply Pressures

Maximum Input: 500,000 Btu/hr.  
Minimum Input: 10,000 Btu/hr.  
High Fire Gas Pressure: 4" w.c.  
Pilot Gas: 10-20 SCFH at 1" w.c.

### 2.2 Combustion Chamber Conditions

Maximum chamber temperature facing burner: 1200° F. Depending on the application, higher temperatures are possible. Contact Eclipse for details.

#### Chamber pressure limits:

-1.0" w.c. to +0.5" w.c.

Maximum duct air velocity across the burner:  
3000 feet/minute.

Negative chamber pressure (suction) will increase the combustion air flow through the burner, increasing its effective firing rate. At 1.0" w.c. suction, burner will be capable of approximately 600,000 Btu/hr.

Positive chamber pressure (backpressure) will reduce the combustion air flow through the burner and decrease its effective firing rate. At 0.5" w.c. backpressure, maximum firing capacity will be approximately 440,000 Btu/hr.

### 2.3 Electrical Supply

Electricity to the blower motor is 115/1/60. The blower motor is 1/8 hp, 3200 rpm with a draw of 1.8 amps continuous duty.

### 2.4 Burner Environment

Ambient temperature limits are dictated by monitoring and control equipment such as flame scanners, automatic fuel shutoff valves and electrical wiring.

Protect burners from the weather.

Combustion air should be free of contaminants which might corrode or plug the blower or burner's internal passages. Eclipse strongly recommends the use of a combustion air filter suitable for the operating conditions.

To insure a reliable supply of fresh combustion air, provide room openings to the outdoors. Allow at least one square inch of opening for each 4000 Btu/hr. of burner firing rate.

Provide access to the burners for inspection and maintenance.

## 3.0 Control System Requirements

Control of input is achieved with a 90° control actuator directly coupled to the burner valve shaft. Burner fuel/air ratio is approximately stoichiometric at high fire and goes progressively leaner (excess air) as the burner is turned down. Combustion air turndown is approximately 8:1 and fuel turndown is approximately 50:1, depending on burner settings and oven conditions.

### 3.1 Piloting

Piloting is achieved by direct spark of main flame at low fire or by using a bypass pilot.

**On burners with bypass piloting, Eclipse strongly recommends that the main and pilot gas lines be equipped with approved automatic shutoff valves. These valves must be interlocked in order to close in the event of flame or limit failure.**

### 3.2 Flame Monitoring

Flame monitoring can be performed by flame rods or UV scanners. A flame rod (#100602-9) is shipped with the burner. U.V. scanners mount in place of the peepsight and must be ordered separately. Refer to Eclipse H-97 bulletin for scanner selection and part number. An adaptor must also be ordered to attach the U.V. scanner to the burner (see section 5.9).

**Any flame sensing equipment supplied by the customer should be UL, FM and/or CSA approved.**

**WARNING**

**Failure to use suitable flame sensing devices and automatic fuel shut off valves can cause explosions and fires.**

### 3.3 Main Gas Valve Train

**Gas must be supplied to the burner inlet through a valve train which complies with NFPA Standards and all applicable local codes. Eclipse offers FM and IRI type main gas valve trains as options. Each valve train can be ordered with or without a gas regulator. See Bulletin M-700. IRI type trains meet or exceed NFPA Standards.**

### 3.4 Limit Controls

Limit controls and safety equipment should comply with current NFPA Standard 86 and all applicable local codes and/or standards. NFPA Standards are available from:

National Fire Protection Association  
Batterymarch Park  
Quincy, Massachusetts 02269

**IMPORTANT: The owner/user and/or his insurance underwriter must assume responsibility for the acceptance, use, and proper maintenance of the limit controls and other safety devices included with this burner, the flame supervision provided in the control panel, and the interfacing of all electrical equipment and sequencing of burner operation between the control panel and the burner.**

## 4.0 System Layout

### 4.1 Gas Piping

Natural gas must be 4" w.c. at the burner gas inlet during high fire. This inlet requires a 3/4" fitting. When determining your piping layout, consider the following high fire gas pressure losses:

High Fire Pressure Losses, "w.c.

Piping Element	Pipe Size	
	3/4"	1"
Elbow	1.5	0.1
100 ft. of straight pipe	7.0	2.0

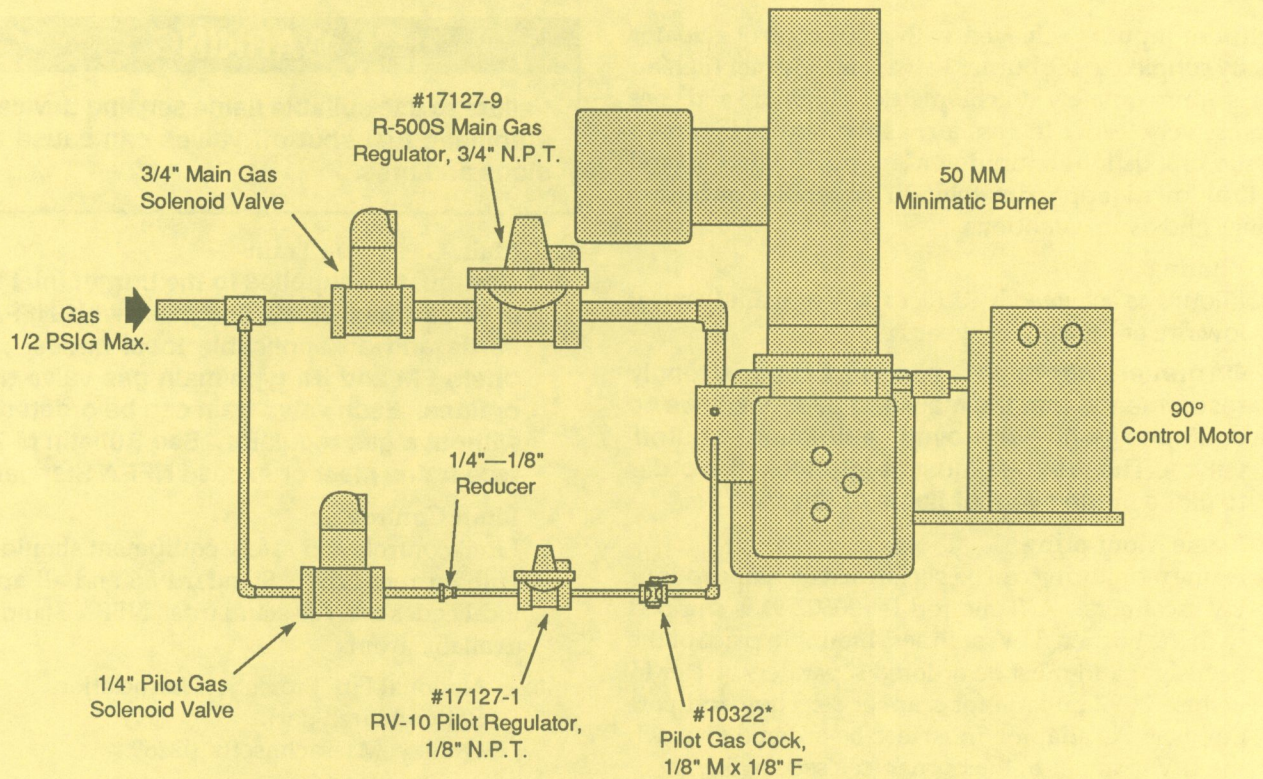
### 4.2 Calculating Pressure Losses

Pressure losses for gas valves can be calculated from the manufacturer's literature. When all pressure losses are subtracted from the supply pressure, 4" w.c. must still be available at the burner gas inlet.

### 4.3 Gas Control Layout

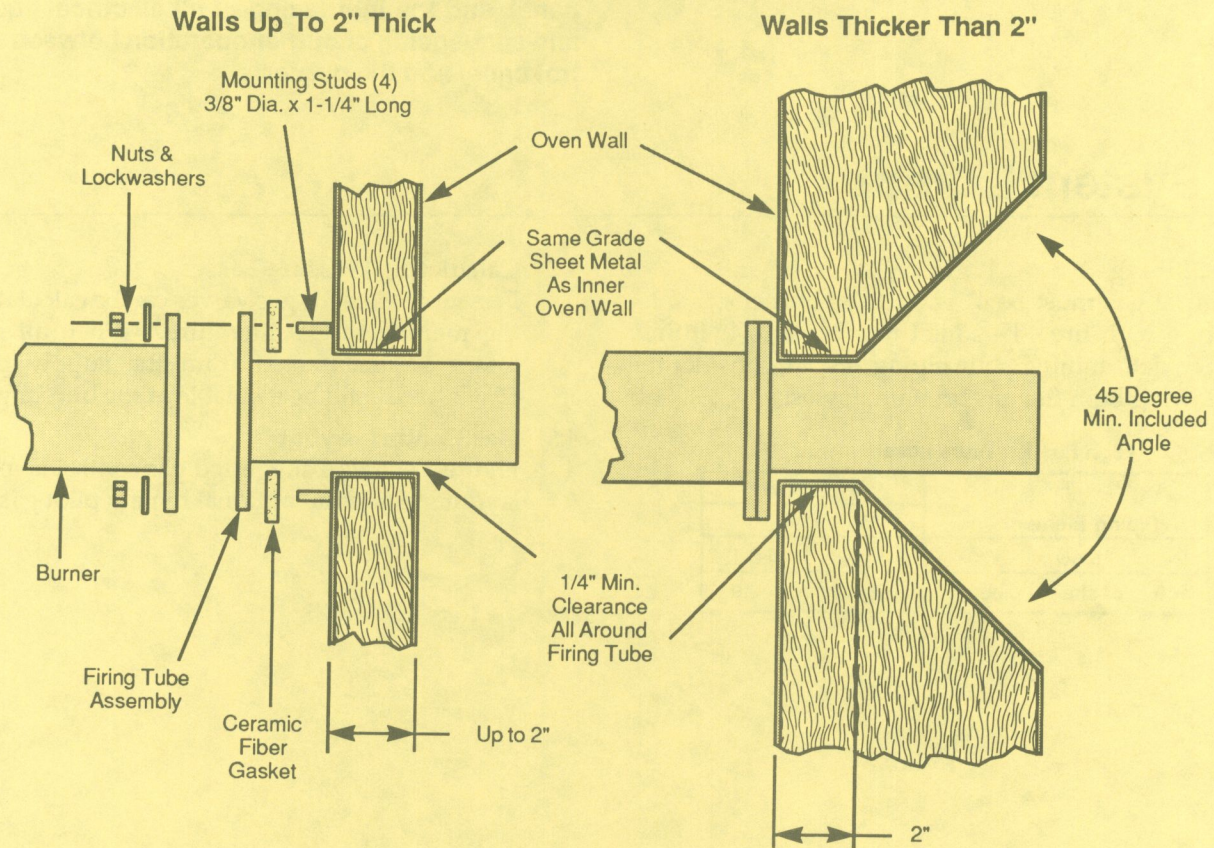
Figure 1 shows a suggested gas control layout. This layout includes an optional bypass pilot gas system.

**Figure 1—Typical Gas Control Set-up**



\* May be screwed directly into the burner pilot tap

**Figure 2—Burner Mounting**



## 5.0 Installation

### WARNING

If improperly adjusted or operated, burners are capable of producing toxic concentrations of gases, including carbon monoxide. Venting these products into confined, poorly ventilated areas is dangerous. To avoid this situation:

- Vent the appliance to the outdoors wherever feasible. Refer to the appliance manufacturer's instruction manual for flue and stack design guidelines.

- Where equipment location or other considerations prevent outside venting, be sure that the building has adequate volume and fresh air makeup to dilute any potentially harmful combustion products down to safe levels as defined by OSHA or other authorities having jurisdiction.

#### 5.1 Burner Inspection

Make a thorough inspection of the burner when uncrating and before installing it. If any parts appear broken, bent, or damaged, contact your Eclipse representative or the Eclipse factory before installing the burner.

#### 5.2 Burner Mounting

Burners are designed to be bolted to the oven wall as shown in Figure 2. The flange will support only the weight of the burner assembly. Burner supply piping must be independently supported, and the oven wall must be suitably reinforced to support the burner's weight.

#### 5.3 Burner Orientation

Install the burner so the control motor is oriented according to its manufacturer's recommendations.

#### 5.4 Gas Piping

Use flexible nipples on all gas connections. Solid piping may restrain the burner from normal thermal expansion and damage the burner or its piping components. Do not use the burner assembly to support the piping.

All valves must be installed so that the arrow on the side of the valve body points in the direction of flow. If the handle of a manual plug type gas cock is re-

movable, be sure that the handle is properly installed. When the valve is in the "off" position, the handle must be 90° or at a right angle to the line of flow through the valve.

**Gas piping must comply with American National Standard "National Fuel Gas Code" (NFPA No. 54 or ANSI Z223.1), or must be acceptable to the authority having jurisdiction.**

#### 5.5 Blower Motor

Be sure the blower motor is wired to rotate in the proper direction.

#### 5.6 Air Filter Mounting

Filters ordered with the burner are mounted at the factory. Filters ordered separately must be mounted in place of the inlet grill as shown in Figure 3.

#### 5.7 Control Motor Mounting

Figure 4 details the parts and steps necessary to mount a control motor to the burner.

#### 5.8 Ignition Plug

A self-grounding ignition plug (#150000-28) is supplied with the burner. Figure 4 shows the location of the ignition plug port. Power supplied to the ignition plug must be 6000 VAC minimum at 60 VA. Do not use pipe dope on ignition plug threads.

#### 5.9 Flame Rod and U.V. Scanners

Figure 5 shows the location of the flame rod port. For the best burner performance, make sure the flame rod is located in the opening 180° away from the combustion air blower.

U.V. scanners are ordered separately and mount in place of the peepsight. Recommended scanner adapter part numbers are:

#103003 for scanners with 1/2" thread;

#103001 for scanners with 3/4" thread.

See Eclipse P-30 Information Guide for more information on installing flame monitoring equipment.

#### 5.10 Wiring

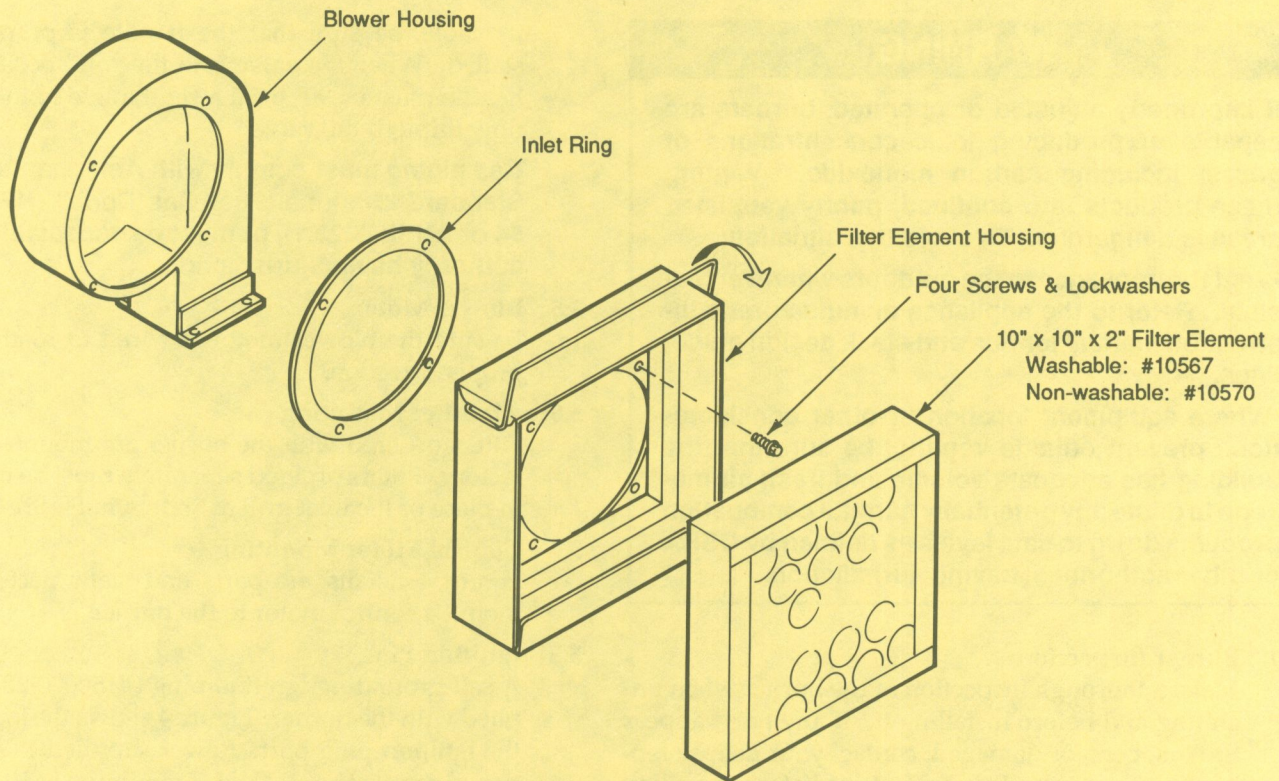
**Electrical wiring must comply with the National Electric Code\*, (NFPA Std. 70 or ANSI-CI 1981), or must be acceptable to the authority having jurisdiction.**

\*Available from:

National Fire Protection Association  
Batterymarch, Park  
Quincy, MA 02269

American National Standard Institute  
1430 Broadway  
New York, NY 10018

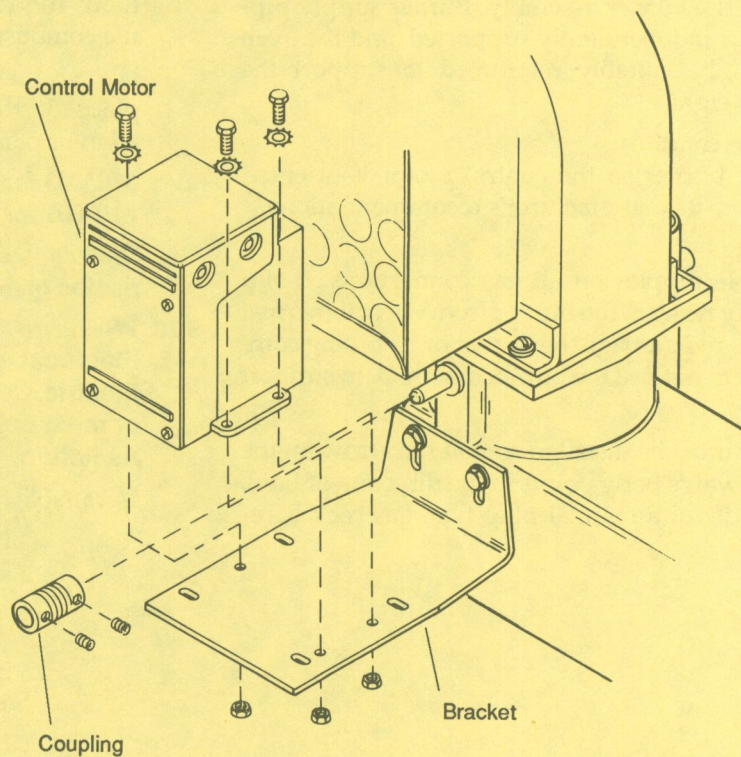
### Figure 3—Air Filter Mounting



### Figure 4—Control Motor Mounting

#### Mounting Steps:

1. Mount bracket to burner.
2. Place motor on bracket and install the coupling.
3. Fasten motor to bracket.
4. If motor and valve shaft are not lined up, loosen the bracket and/or motor bolts and reposition the bracket and motor for correct alignment.
5. Once the control motor is properly mounted to the burner, follow the instructions detailing control motor set up in Section 6.1.



**Figure 5—Minimatic Burner 50 MM  
Assembly #100607**

**Capacity**

Maximum: 500,000 Btu/hr.  
Minimum: 10,000 Btu/hr.


**Turndown**


Air: 8:1  
Gas: 50:1

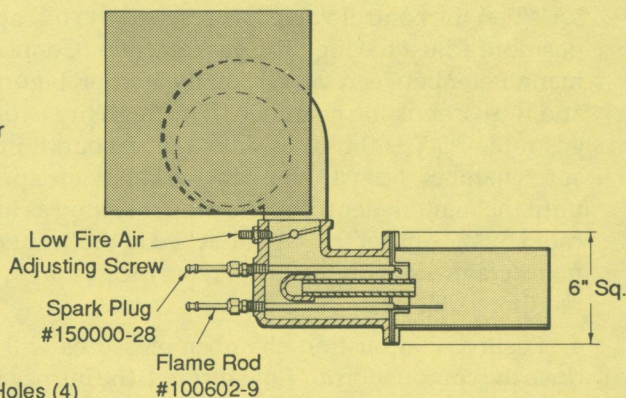
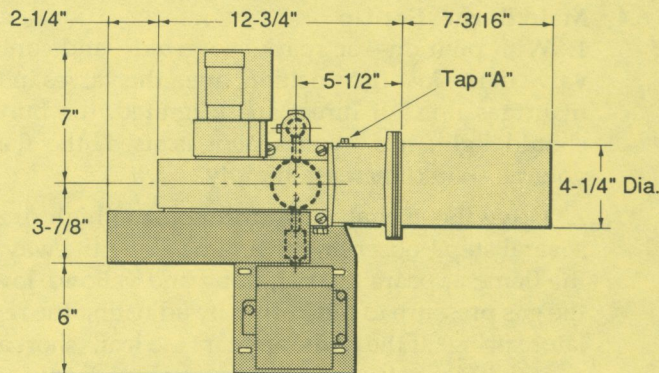
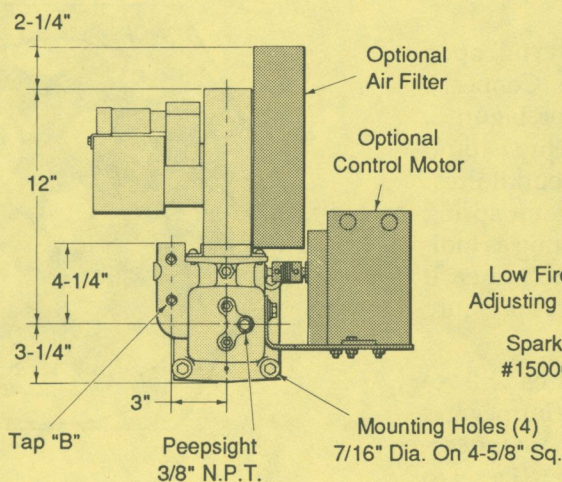
**Gas Pressure:** 4" w.c.

**Motor:** 1/8 hp, 115 volt, 3200 rpm, 1.8 amp continuous duty

**Max. Chamber Temperature:** 1200° F. Depending on the application, higher temperatures are possible. Contact Eclipse for details.

 = Basic burner assembly

 = Options



## 6.0 Start-Up & Adjustment

### 6.1 Control Motor Set Up

1. Be sure the control motor was properly installed as described in Figure 4. Make certain the setscrew fastening the shaft coupling to the valves is tight, and the setscrew fastening the shaft coupling to the motor is loose.
2. Manually close the valve (clockwise) and drive the control motor to its low fire position.
3. Grasp the valve end of the coupling and twist it slightly in the clockwise direction; this insures that the valve discs are seated in the closed position. While holding the coupling in this position, tighten the setscrew onto the motor shaft.
4. Cycle the motor between high and low a few times. When the motor comes to low, the spiral section of the coupling should "wind up" a few degrees, permitting a little motor overtravel.

### 6.2 Start the Combustion Air Blower

Visually confirm that the fan or impeller is rotating in the correct direction. If rotation is wrong, have a qualified electrician correct the wiring to the blower motor.

### 6.3 Set The Bypass Pilot

**Note:** If the burner system is not equipped with a bypass pilot, go to Section 6.4.

1. With the control valve in the low fire position, energize the spark igniter and open the valves in the pilot gas line.
2. Adjust the size of the pilot flame by turning the main regulator spring in to increase gas flow and out to decrease gas flow. See Figure 6.
3. If there is a strong negative pressure in the combustion chamber, the pilot may not be stable. Compensate for this instability by reducing the low fire air flow. To achieve this reduction, loosen the locknut on the low fire adjusting screw and turn the screw clockwise, as illustrated in Figure 7. Turning the screw clockwise too far will cause binding of the air valve disc. Tighten the locknut after achieving the proper setting.
4. After the pilot is set, shut it off and repeat the lightoff sequence several times to make sure it is set properly.

## 6.0 Start-Up & Adjustment (continued)

### 6.4 Main Burner Set-Up

1. With pilot on—or spark energized—and control valve in the low fire position, open the valves in the main gas line. If direct spark ignited, the burner should light; if a bypass pilot is used, the flame volume should increase slightly.

2. Drive the air valve control motor to high fire in several steps, observing the flame along the way. If the flame appears too rich (long and yellow), lower the gas pressure to the burner by adjusting the regulator spring. If the flame appears too lean (short and a weak blue), raise the gas pressure by adjusting the same regulator spring.

3. When the control valve has reached the full open position, adjust the high fire gas/air ratio. Connect a manometer between tap "B" on the burner, Figure 5, and the combustion chamber. For a high fire natural gas rate of 500,000 Btu/hr. into a near neutral pressure chamber, adjust the main gas regulator spring until the manometer reads the proper setting as indicated by the burner test tags attached to the burner. If no test tags are with the burner, set the gas pressure reading to 3.2" w.c.

4. Positive combustion chamber pressures will reduce the combustion air flow through the burner and decrease its effective firing rate. To maintain the correct gas/air ratio, the regulator will have to be set to provide less than 3.2" w.c. drop between tap "B" and the combustion chamber.

5. Negative combustion chamber pressures will increase the combustion air flow through the burner, increasing its effective firing rate. Consequently, the gas pressure drop between tap "B" and the combustion chamber will have to be increased above 3.2" w.c.

6. Once high fire is properly set, drive the control motor to low fire. If the low fire flame is long and yellow, more combustion air is required. Loosen the locknut on the low fire air adjusting screw and turn it counterclockwise until a satisfactory looking flame is obtained. Tighten the locknut.

If the low fire flame is too lean (unstable or a weak flame signal), loosen the locknut on the low fire air adjusting screw and turn it clockwise until a satisfactory flame is obtained. Then tighten the locknut.

7. If it was necessary to make any drastic low fire adjustments, drive the control motor back to high fire and readjust the main gas regulator, if necessary.

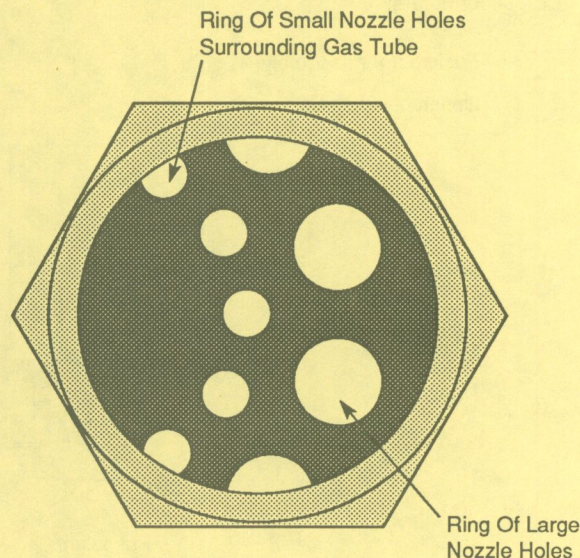
8. Cycle the burner between high and low fire several times to insure repeatability of settings.

The combustion chamber pressure is likely to change as the oven comes up to operating temperature. Recheck burner settings hot and readjust them if necessary.

### 6.5 Shutdown

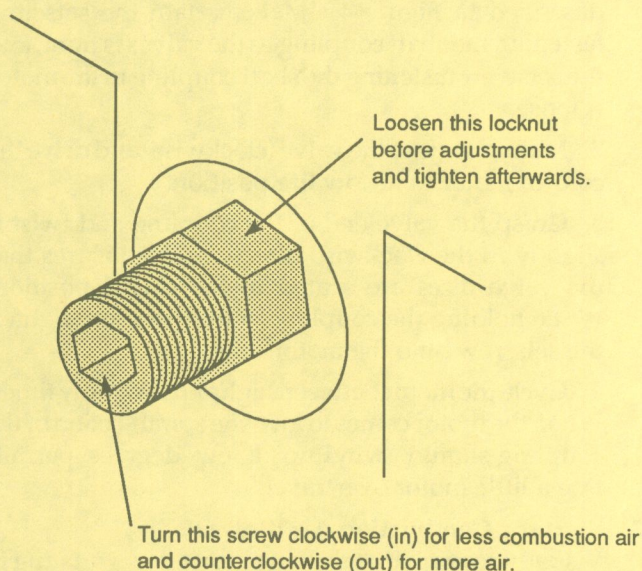
The blower must not be turned off until the chamber temperature is below 250° F. This will prevent hot gases from flowing back through the burner and blower and damaging them.

### Figure 6—View Of Pilot Flame Through Peepsight



A properly set pilot flame should be blue in color and visible in the small nozzle holes, but not the large nozzle holes. See Figure 5 for peepsight location.

### Figure 7—Low Fire Screw Adjustment



See Figure 5 for adjusting screw location.



## 7.0 Trouble-Shooting

### CAUTION

Trouble shooting of panels and electrical circuits should be done by qualified plant electricians, technicians, or engineers experienced in all facets of this type of combustion equipment.

PROBLEM	CAUSE(S)
Pilot fails to light.	<ol style="list-style-type: none"> <li>1. On initial start-up, gas line may be filled with air. Repeat ignition trial several times to purge.</li> <li>2. No power to ignition transformer or pilot solenoid.</li> <li>3. Open circuit between ignition transformer and spark plug.</li> <li>4. Spark plug needs cleaning.</li> <li>5. Spark plug center electrode grounded against burner.</li> <li>6. Spark plug improperly grounded. Do not use pipe dope on ignition plug threads.</li> <li>7. Pilot gas cock screw closed.</li> <li>8. Insufficient gas pressure into or out of pilot regulator.</li> </ol>
Main flame fails to light or goes out as burner cycles to high fire.	<ol style="list-style-type: none"> <li>1. Pilot set too lean, becoming unstable as air increases.</li> <li>2. Insufficient pressure into or out of main gas regulator.</li> </ol>
Main flame too long and yellow on high fire.	<ol style="list-style-type: none"> <li>1. Gas flow is too high. Main regulator spring is screwed in too far.</li> </ol>
Main flame too short on high fire.	<ol style="list-style-type: none"> <li>1. Gas flow is too low. Main regulator spring is screwed out too far.</li> </ol>
Low fire (pilot) flame is long, soft or yellow.	<ol style="list-style-type: none"> <li>1. Insufficient air flow due to improper adjustment of low fire air screw.</li> <li>2. Insufficient air flow due to dirty blower filter or impeller.</li> </ol>
Low fire flame is weak or unstable.	<ol style="list-style-type: none"> <li>1. Insufficient gas flow due to improper adjustment of low fire air screw.</li> </ol>
Burner behaves erratically, does not respond to adjustment.	<ol style="list-style-type: none"> <li>1. Burner internals loose, dirty or burned out. If this symptom appears to be a problem, contact your Eclipse representative or the Eclipse factory for service.</li> <li>2. Regulator has a broken diaphragm or a dirty valve.</li> </ol>

## 8.0 Maintenance

8.1 A sound preventative maintenance program, carried out by qualified individuals, will greatly increase equipment reliability and productivity. Frequency of maintenance checks should reflect the duty cycle of the heating equipment, and conditions such as dirt and temperature. Any maintenance program should include at least the following steps:

1. Check the burner's high and low fire air and gas settings.
2. Examine and, if necessary, clean or replace air and gas filter elements.
3. Check all piping connections for leaks.
4. Check the ability of the flame supervision system to function properly by simulating system failures:
  - a. Simulate burner flameout by manually shutting off the gas.
  - b. Trip out pressure switches and other limit interlocks.
  - c. Try to light the burner before the purge and other timers have finished their cycles. If simulated limit or flame failures do not shut down the fuel system within an acceptable short period of time, immediately take the equipment out of service and correct the problem.

5. Leak test automatic and manual reset fuel valves per insurance company procedures.
6. Check all bolts and screws for tightness.
7. Check the area around the burner mounting flange for signs of overheating. Gasket or insulation replacement may be necessary.

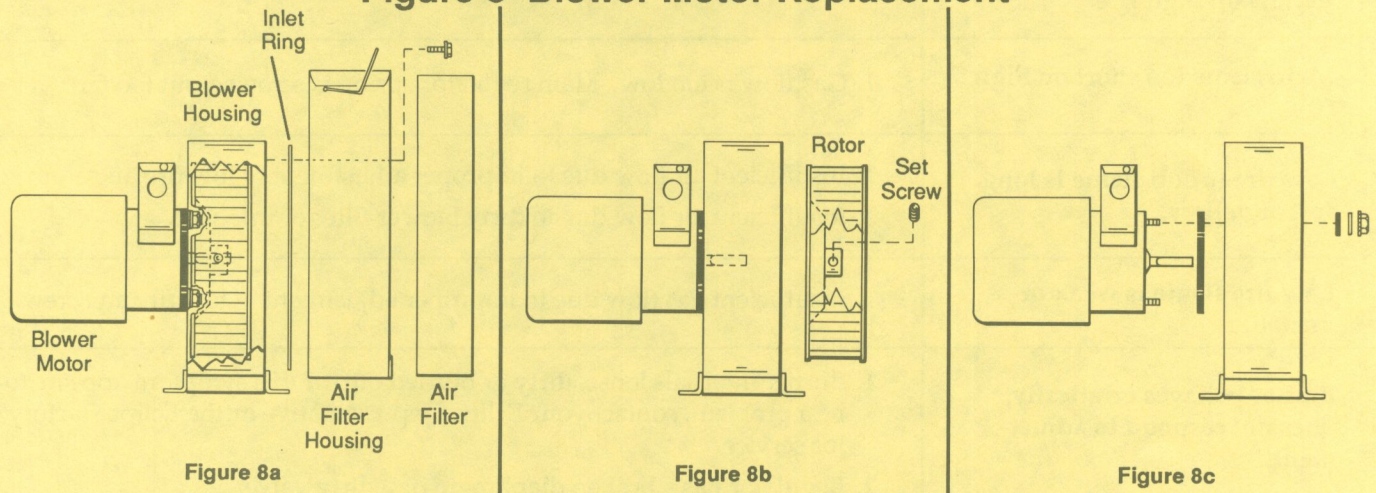
### 8.2 Blower Motor Replacement

Figure 8 details the procedures for blower motor replacement. Replacement motors must have the same nameplate ratings as the original motor.

### 8.3 Ignition Plug & Flame Rod Replacement

Ignition plugs and flame rods wear out over long periods of normal burner operation. For Minimatic burners, the ignition plug part number is 150000-28 and the flame rod part number is 100602-9. Eclipse recommends that the user keep at least one of each in stock at all times to prevent nuisance shutdowns. See Figures 9 and 10 for plug and rod replacement.

### Figure 8—Blower Motor Replacement

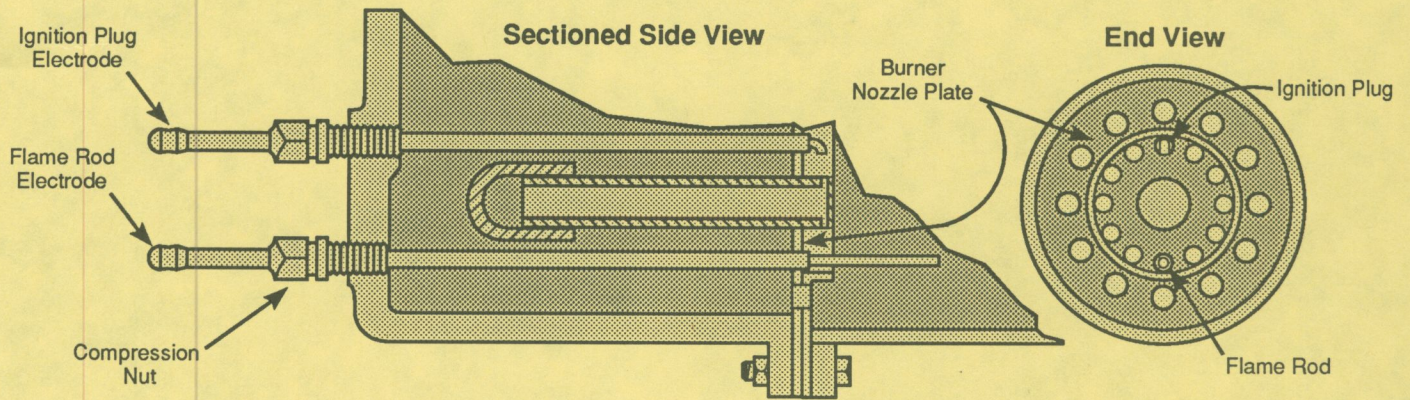


#### Motor Removal Steps:

1. Remove the air filter from its housing. Loosen the four screws that secure the housing to the blower, as in Figure 8a.
2. Loosen the setscrew which holds the rotor to the blower motor shaft. Remove the rotor, as in Figure 8b.
3. Loosen the screws on the inside of the blower housing which secure the blower motor. Remove the motor, as in Figure 8c.
4. To install the replacement motor, reverse the removal procedures.

When reassembling, inspect all gaskets and replace if necessary. Be certain the rotor does not strike or rub any of the inner surfaces of the blower housing.

### Figure 9—Ignition Plug & Flame Rod Replacement



Note: the flame rod and ignition plug must be secured in the ring of small nozzle holes inside the burner as well as the fittings at the back of the burner. This ring of small nozzle holes may be viewed through the peesight at the back of the burner, as shown in Figure 6.

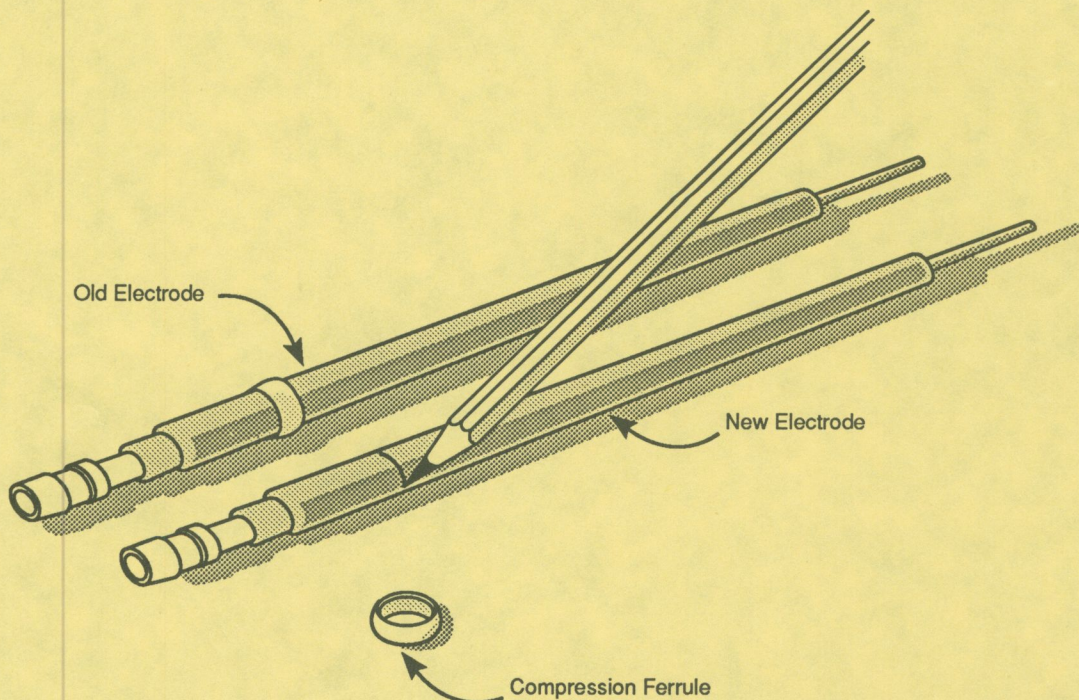
To replace either the ignition plug or flame rod, loosen the compression nut on the back of the burner. Draw the electrode out of the burner. If the compression ferrule has not already been tightened onto the new electrode, lay the new electrode alongside the old one and mark the location of the ferrule on the sheath, as illustrated in Figure 10. Carefully slide the electrode into the burner until the mark is in the proper location. Slip the ferrule over the electrode and screw on the compression nut. Tighten the

compression nut only enough to crimp the ferrule in place. Do not overtighten—you may crack the electrode insulator.

**Handle the electrodes with care at all times. They are fragile and can be broken easily.**

**For the best burner performance, make sure the flame rod is located in the opening 180° away from the combustion air blower, as shown in Figure 5.**

### Figure 10—Marking Electrode Ferrule Location





**Offered By:**

Power Equipment Company  
2011 Williamsburg Road  
Richmond, Virginia 23231  
Phone (804) 236-3800  
Fax (804) 236-3882

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[www.peconet.com](http://www.peconet.com)