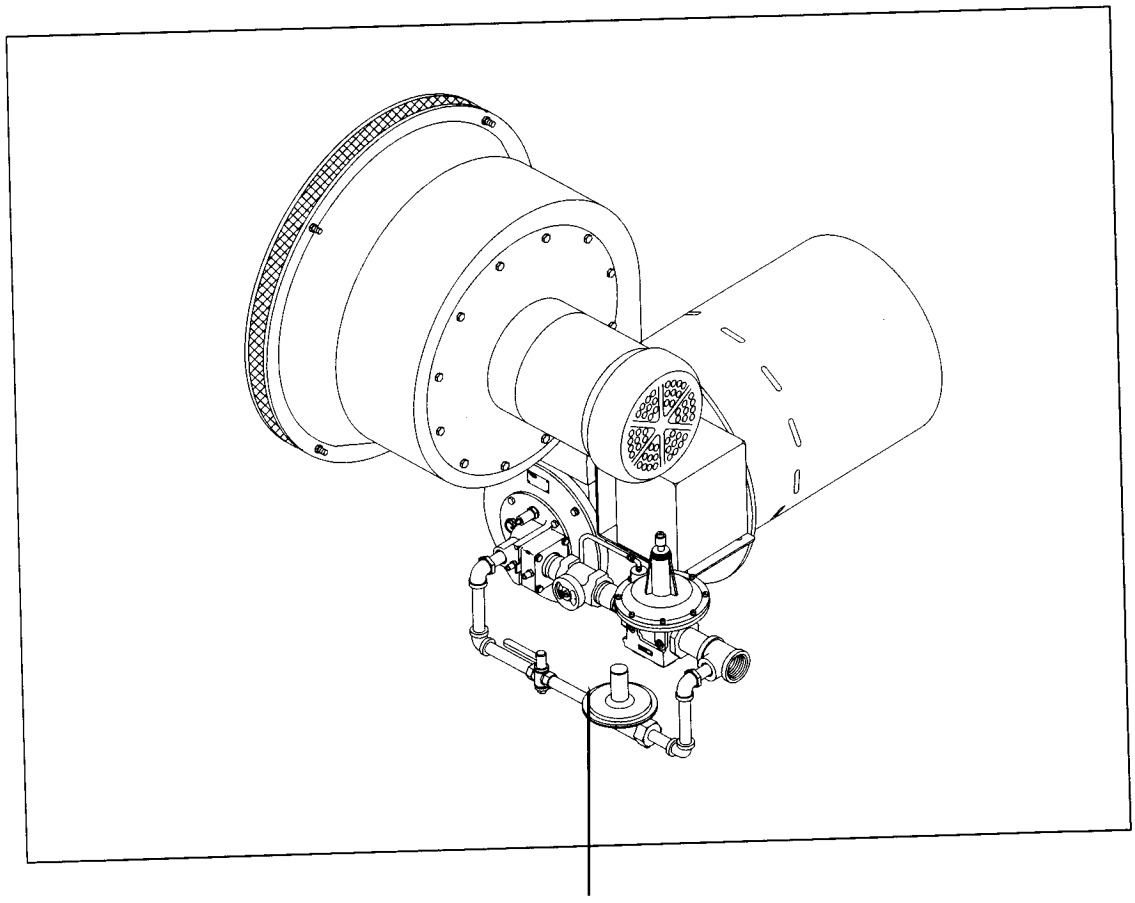
Installation Guide
No. 111, 9/98
L00024

# Eclipse Winnox Burners

## WX Series Version 1.00



Eclipse

Eclipse Combustion

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## COPYRIGHT



## DISCLAIMER NOTICE

We reserve the right to change the construction and/or configuration of our products at any time without being obliged to adjust earlier supplies accordingly.

The material in this manual is believed adequate for the intended use of the product. If the product, or its individual modules or procedures, are used for purposes other than those specified herein, confirmation of their validity and suitability must be obtained. Eclipse Combustion, Inc. warrants that the material itself does not infringe any United States patents. No further warranty is expressed or implied.

We have made every effort to make this manual as accurate and complete as possible. Should you find errors or omissions, please bring them to our attention so that we may correct them. In this way we hope to improve our product documentation for the benefit of our customers. Please send your corrections and comments to our Documentation Manager.

## LIABILITY AND WARRANTY

It must be understood that Eclipse Combustion's liability for its products, whether due to breach of warranty, negligence, strict liability, or otherwise, is limited to the furnishing of such replacement parts and Eclipse Combustion will not be liable for any other injury, loss, damage or expenses, whether direct or consequential, including but not limited to loss of use, income of or damage to material arising in connection with the sale, installation, use of, inability to use or the repair or replacement of Eclipse Combustion's products.

Any operation expressly prohibited in this Guide, any adjustment, or assembly procedures not recommended or authorized in these instructions shall void the warranty.

# About this manual

## AUDIENCE

This manual has been written for people who are already familiar with all aspects of a nozzle-mix burner and its add-on components, also referred to as "the burner system."

These aspects are:

- installation
- use
- maintenance.

The audience is expected to have had experience with this kind of equipment.

## PURPOSE

The purpose of this manual is to ensure that the design of a safe, effective, and trouble-free combustion system is carried out.

## WINNOX DOCUMENTS

**Installation Guide No. 111**

- This document

**Winnox Data Sheets, Series 111**

- Available for individual WX models
- Required to complete design, selection & installation

**Design Guide No. 111**

- Used with Data Sheet to design burner system

**Winnox Price List No. 111**

- Used to order burners

## RELATED DOCUMENTS

- EFE 825 (Combustion Engineering Guide)
- Eclipse Bulletins and Info Guides: 684, 710, 732, 742, 756, 760, 930

## Document Conventions

There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

**Danger:**

**Indicates hazards or unsafe practices which WILL result in severe personal injury or even death. Only qualified and well trained personnel are allowed to carry out these instructions or procedures.**

**Act with great care and follow the instructions.**

**Warning:**

**Indicates hazards or unsafe practices which could result in severe personal injury or damage.**

**Act with great care and follow the instructions.**

*Caution:*

*Indicates hazards or unsafe practices which could result in damage to the machine or minor personal injury, Act carefully.*

*Note:*

*Indicates an important part of the text. Read thoroughly.*

## How to Get Help

If you need help, contact your local Eclipse Combustion representative. You can also contact Eclipse Combustion at any of the addresses listed on the back of this document.

# Table of Contents

# Introduction

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## Product Description

The Winnox Version 1.00 is a nozzle-mix type, low-emissions burner designed for direct air heating, indirect air heating, and oven applications up to 1600 °F (875 °C).

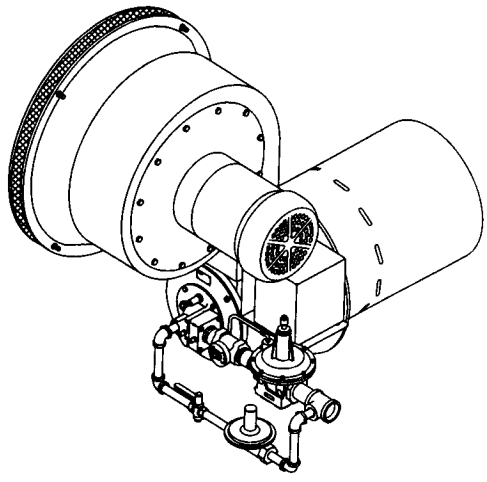
The burner package includes a combustion air blower and an air:gas ratio regulator to fire over a wide gas turndown range at a controlled ratio.

The burner is designed for:

- low $NO_x$ and CO emissions
- efficient ratio controlled combustion
- reliable burner operation
- simple burner adjustment
- direct spark ignition
- multiple fuel capability

A wide variety of options and configurations are available due to the modular design of the burner.

*Figure 1.1 The Winnox Burner*



# Safety

# 2

## INTRODUCTION

## SAFETY

This section is provided as a guide for the safe operation of the Winnox burner system. All involved personnel should read this section carefully before operating this system.

**Danger:**

**The Winnox burners, described herein, are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions if improperly applied, installed, adjusted, controlled, or maintained.**
**Do not bypass any safety feature; fire or explosion could result.**
**Never try to light a burner if it shows signs of damage or malfunction.**

**Warning:**

**The burner might have HOT surfaces. Always wear protective clothing when approaching the burner.**

*Note:*

*This manual provides information in the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits described herein without written advice from Eclipse Combustion.*

*Read the entire this manual and all related documents before attempting to start this system. If you do not understand any part of the information contained in this manual, contact your local Eclipse representative or Eclipse Combustion before continuing.*

## CAPABILITIES

Only qualified personnel, with good mechanical aptitude and experience on combustion equipment, should adjust, maintain, or troubleshoot any mechanical or electrical part of this system.

## OPERATOR TRAINING

The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule should be administered to ensure operators maintain a high degree of proficiency.

## REPLACEMENT PARTS

Order replacement parts from Eclipse Combustion only. All Eclipse Combustion approved, customer supplied valves or switches should carry UL, FM, CSA, CGA, and/or CE approval, where applicable.

# Installation

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## INTRODUCTION

In this chapter you will find information and instructions needed to install the burner and system components.

## HANDLING AND STORAGE

### Handling

Inspect the system, make sure the components are clean and free of damage.

Use the appropriate support and handling equipment when lifting the burner.

Protect all components on the system from weather, damage, dirt and moisture.

Protect the system and its components from excessive temperatures and humidity.

### Storage

When storing the system for an extended period Eclipse recommends placing it in a cool, clean, dry room.

Keep all the system components stored in their original packaging as long as possible.

## APPROVALS OF COMPONENTS

### Limit controls and safety equipment

All limit controls and safety equipment must comply with all applicable local codes and/or standards, which may include:

- NFPA Standard 86
- NFPA Standard 86C
- UL
- FM
- CGA
- EN 746-2

### Electrical wiring

All electrical wiring must comply with all applicable local codes and/or standards, which may include:

- NFPA Standard 70
- ANSI-C11981
- EN 746-2

## Gas piping

All gas piping must comply with all applicable local codes and/or standards, which may include:

- NFPA Standard 54
- ANSI Z223
- EN 746-2

### Where to get the standards:

NFPA:

National Fire Protection Agency
Batterymarch Park
Quincy, MA 02269
www.nfpa.org

ANSI:

American National Standard Institute
1430 Broadway
New York, NY 10018
www.ansi.org

UL:

Underwriters Labs
333 Pfingsten Road
Northbrook, IL 60062
www.ul.com

FM:

Factory Mutual System
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062
www.factorymutual.com

CGA:

Canadian Gas Association
55 Scarsdale Road
Toronto, Ontario
Canada M3B 2R3
www.cga.ca

EN:

Comité Européen de Normalisation
Strassartstraat 36
B-1050 Brussels

## PRE-INSTALLATION CHECKLIST

### Air Supply

Provide an opening in the burner room of at least one square inch per 3000 BTU/hr (5 $cm^2$ per 1 kW) to supply the burner intake with fresh, outdoor, combustion air.

If there are corrosive fumes or materials in the surrounding air, find an uncontaminated source to supply air to the burner.

### Exhaust

Do not allow exhaust gases to accumulate in the work area. Provide a means for exhausting these gases from the building.

### Access

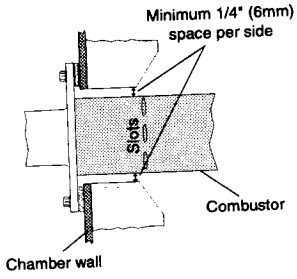
Install the burners so they may be easily accessed for inspection and maintenance.

### Environment

Be sure the burner operating environment matches the original operating specifications. Check the following items:

- voltage, frequency, and stability of electrical power
- fuel type and fuel supply pressure
- adequate fresh, clean, combustion air
- humidity, altitude, and temperature of the supply air
- presence of damaging corrosive gases in the air
- prevent direct exposure to water.

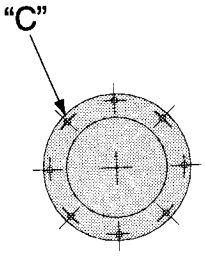
## BURNER




### Chamber Opening

Provide an opening in the chamber wall at least ½" (12mm) larger in diameter than the outside diameter of the combustor (1/4" - 6mm per side).

Provide an accessible pressure tap on the chamber wall to measure the pressure inside the firing chamber. The pressure tap should be located near the burner.




### Mounting Pattern

Attach eight mounting bolts to the chamber wall. Position these bolts to match the clearance holes (C) on the burner mounting flange. Refer to the appropriate Winnox data sheet.

## INSTALLATION (CONTINUED)

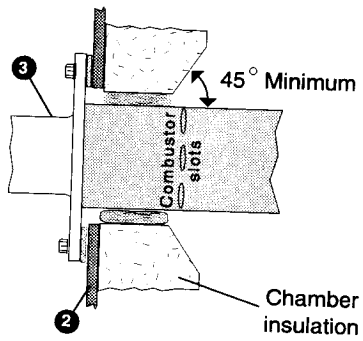



*Figure 3.1 Chamber wall*

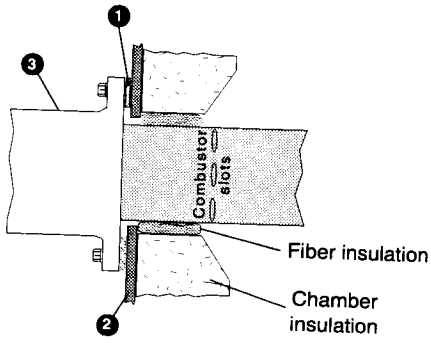
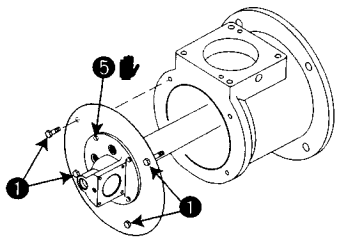
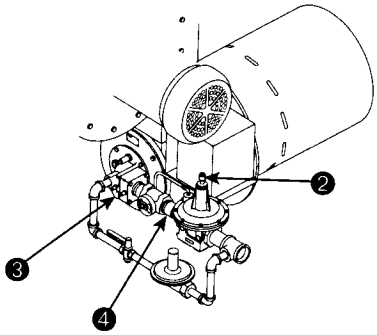



*Figure 3.2 Alloy combustion tube*

## GAS PIPING





### Chamber Wall

Make sure the chamber wall ❷ is strong enough to support the weight of the burner ❸. If necessary, reinforce the mounting area.

*Note:*

*The slots in the combustor must not be covered with insulation. If necessary, taper the chamber insulation at a minimum of 45° to provide clearance for the combustor slots.*

### Burner Mounting

Mount burner to chamber wall using eight (8) customer supplied nuts and lock washers.

### Alloy Combustion Tube

1. Be sure gasket ❶ is installed between burner ❸ and chamber wall ❷.
2. Pack fiber insulation around the tube to a depth not beyond the combustor slot position, as illustrated.

*Caution:*

*Placing insulation over combustor slots will impede burner performance and decrease combustor life*

3. No gasket is supplied or required between burner and combustor.

### Burner Piping

The burner is factory assembled and shipped as ordered.

*Note:*

*If it is necessary to redirect piping, remove* ***OUTER FOUR BOLTS ONLY*** ❶. *Rotate rear cover and replace bolts. When reassembling, be sure that:*

- *ratio regulator spring column ❷ is pointing up.*
- *arrow on the ratio regulator points in the direction of gas flow.*
- *integral fuel orifice and o-rings ❸ are reinstalled.*
- *same straight run of pipe ❹ remains between the ratio regulator and the burner .*

*Caution:*

*Do not attempt to redirect piping by removing the inner circle bolts ❺. Internal burner parts will be damaged.*

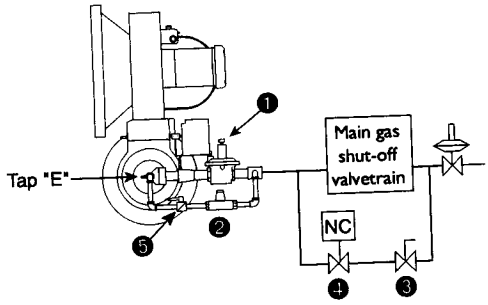



*Figure 3.4 Optional start piping*

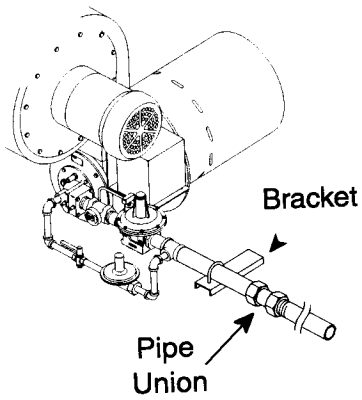



*Figure 3.5 Pipe Connections*

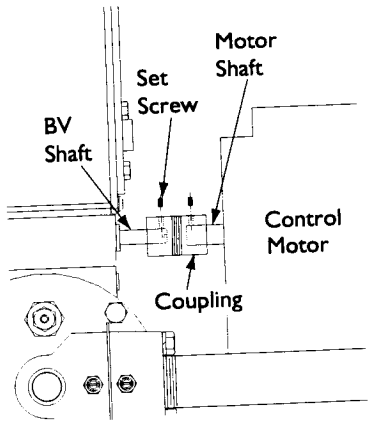



*Figure 3.6 Control Motor*

## Supply Piping

Inlet pressure to the ratio regulator must stay within specified limits. Refer to the appropriate Winnox data sheet.

- Locate the valve train close to the burner. The gas must reach the burner during the fixed trial for ignition.
- Sufficiently size shut off valves in the valve train.
- Make sure piping is large enough.
- Minimize piping elbows.

## Pilot Start Gas Piping (optional)

Install the piping as shown in the schematics in Chapter 3 of the Winnox Design Guide No. 111 using the following guidelines:

- Locate the start gas solenoid ❹ close to the burner. The gas must reach the burner during the trial for ignition period.
- Minimize piping elbows.
- Start gas can be adjusted with the adjustable orifice valve ❺. Refer to Bulletin 732 for further information.

## Pipe Connections

- Installation of a pipe union in the gas line is recommended to simplify burner removal.
- Use of flexible pipe is optional.

<u>Note:</u>

*Flexible pipe causes higher pressure drops than standard pipe. Consider this when sizing your gas lines.*

## Piping Support

Use brackets or hangers to support the gas piping. If you have questions, consult your local gas company.

## CHECK LIST AFTER INSTALLATION

### Control Motor

Install a control motor to modulate the air butterfly valve if not previously installed on the burner.

*Note:*

*Be sure the control motor shaft and air butterfly valve shaft are aligned properly. A flexible coupling should be sufficient to handle any minor misalignment.*

**To verify the system was properly installed, perform the following checks:**

1. Be sure there are no leaks in the gas lines.
2. Be sure all the components contained in the flame monitoring and control system are properly installed. This includes verifying that:
   - all the switches are installed in the correct locations.
   - all wiring, pressure, and impulse lines are properly connected.
3. Be sure all components of the spark ignition system are installed and functioning properly.
4. Be sure the blower rotates in the proper direction. If the rotation is incorrect, have a qualified electrician rewire the blower to rotate in the proper direction.
5. Be sure all valves are installed in the proper location and correctly oriented relative to the flow direction.

# Adjustment, Start & Stop

# 4

## INTRODUCTION

In this chapter, you will find instructions on how to adjust, start, and stop the burner system. Become familiar with burner control methods before attempting to make adjustments..

**Danger:**

**The Winnox burners, described herein, are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions if improperly applied, installed, adjusted, controlled, or maintained.**

**Do not bypass any safety feature; fire or explosion could result.**

**Never try to light a burner if it shows signs of damage or malfunction.**

## ADJUSTMENT

**Adjustment steps:**

1. Reset the system
2. Set low fire air
3. Ignite the burner
4. Set low fire gas
5. Set high fire gas
6. Verify settings

### Step 1: Reset the system

**Reset procedure:**

1. Set the low gas pressure switch to 20% below the "Main gas inlet pressure" range as specified in the appropriate data sheet.
2. Set the high gas pressure switch to 20% above the "Main gas inlet pressure" range as specified in the appropriate data sheet.
3. Close all the burner gas valves, manual and automatic.
4. Try to ignite the burner; be sure the flame monitoring system indicates a flame failure.

**Step 1: Reset system (continued)**

5. Activate the pressure switches and other limit interlocks. Be sure the switches fail as intended in the event of a power failure.

**Danger**

**If simulated limits or simulated flame failures do not shut down the fuel system within the required failure response time, immediately correct the problem before proceeding.**

6. If the burner is firing into a duct or chamber with a circulating fan, start the fan to produce a full process air flow past the burner.
7. Adjust main gas inlet pressure to the ratio regulator within the range specified in the appropriate data sheet.

**Warning:**

**Gas inlet pressures must stay within the specified range. Pressure above the specified range can damage the ratio regulator.**

**Warning:**

**Pressure below the specified range can impair the ability of the ratio regulator to control the gas flow.**

**Operating the system outside the specified range can cause excess fuel consumption and the possible accumulation of unburned fuel in the chamber.**

**In extreme cases, this accumulation of unburned fuel may cause fires or explosions.**

8. Verify that the actuator opens the air BV towards the back of the burner as shown. If it doesn't, refer to the actuator's literature for instructions on how to reverse the direction.

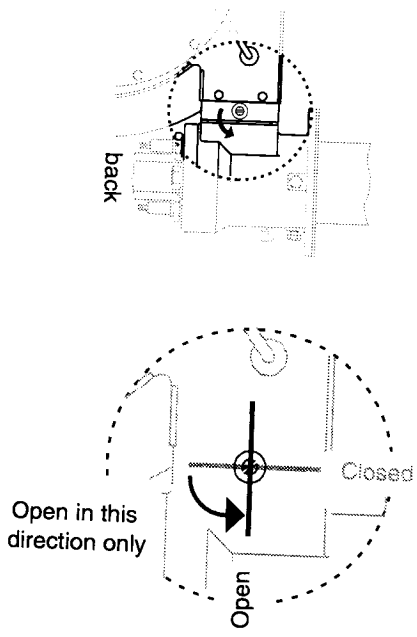



*Figure 4.1 Air BV open direction*

## Step 2: Set low fire air

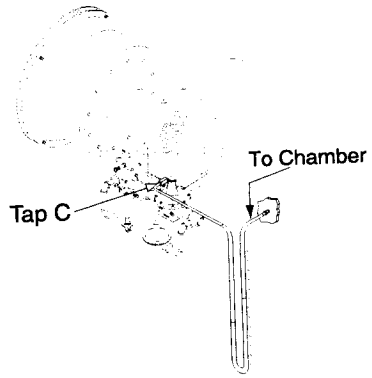



*Figure 4.2 Air Differential Pressure*

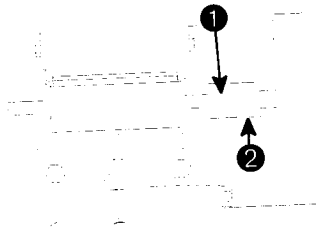



*Figure 4.3 Air BV Adjustment*

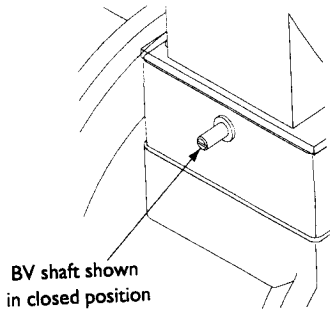



*Figure 4.4 Air BV Shaft*

### Low fire air adjustment procedure:

1. Start combustion air blower.
2. Drive control motor to low fire position.
3. Measure air differential pressure between tap (C ) and combustion chamber.

*Note:*
*The pressure tap is in the open position when the screw inside the tap is unscrewed approximately 1/2 turn. Do not remove screw. Be sure to tighten pressure tap screw clockwise to the closed position after pressure measurements have been taken.*

4. Set low fire air.
   a. Loosen the set screw ❶ on burner side of coupling ❷.

*Note:*
*There is a slot in the end of the BV shaft that is parallel to the air damper. This slot is used for visual indication of the BV position. The BV is closed when the shaft slot is perpendicular to the direction of air flow through the BV.*

   b. Rotate air BV shaft to fully closed position. (Holes in BV damper will supply low fire air.)

*Note*
*When firing into a positive chamber pressure, rotate the air BV from closed position in the direction of actuator travel to obtain a minimum 0.3" w.c. (0,8 mbar) air differential pressure.*

   c. Hold BV shaft firmly in place and tighten set screw ❶ .

*Note:*
*High fire air adjustment is not required if burner is firing into a neutral pressure chamber and a 90° travel control motor is used.*

*It may be necessary to limit control motor stroke to less than 90° if firing into a large positive or negative chamber.*

*Contact your Eclipse Combustion representative for further information.*

5. Verify high fire air
   a. Drive control motor to high fire, full open.
   b. Compare the high fire air differential pressure between tap (C) and the combustion chamber to the appropriate data sheet chart "Air ΔP vs. Input." If high fire air is insufficient, refer to Section 5, Troubleshooting and Maintenance, in this document.
6. Return the control motor to the low fire position.
7. Close the pressure taps.

## Step 3: Ignite the Burner
## Low fire start

**Warning:**

**These procedures are written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

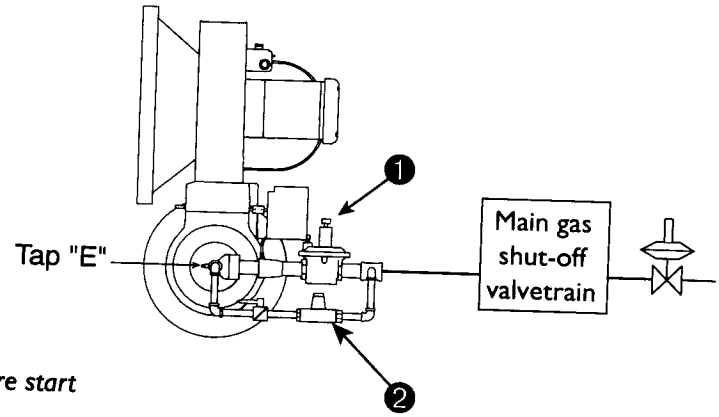



*Figure 4.5 Low fire start*

**Low fire start :**

1. Drive control motor to low fire.
2. Be sure combustion air blower is running.
3. Turn bias adjusting screw ❶ on ratio regulator spring column three complete (360°) turns counter-clockwise (up) from bottom.
3. Open main gas manual shut off valves.
4. With pressure taps open, connect manometer between tap "E" and the chamber.
5. Set system control to stay at low fire during and after ignition sequence.
6. Attempt to ignite burner.
7. During trial for ignition, adjust bypass pressure regulator ❷ to achieve the appropriate ΔP between tap "E" and the chamber as listed in the appropriate data sheet.

*Note:*

*If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.*

8. If burner does not ignite:
   a. Attempt to ignite burner again to purge air from the gas piping.
   b. Repeat until burner ignites. If necessary, refer to Chapter 5, Maintenance and Troubleshooting in this manual, for help.
9. After ignition, verify low fire flame:
   a. Shut off gas. When chamber temperature is below 250°F (121°C), shut off combustion air blower.
   b. Restart combustion air blower and ignite burner.
   c. Verify repeatability of ignition and low fire flame signal.
10. Close all pressure taps.

**Step 3: Optional: Ignite the Burner**
**Low fire start with pilot start option:**

**Warning:**
**These procedures are written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

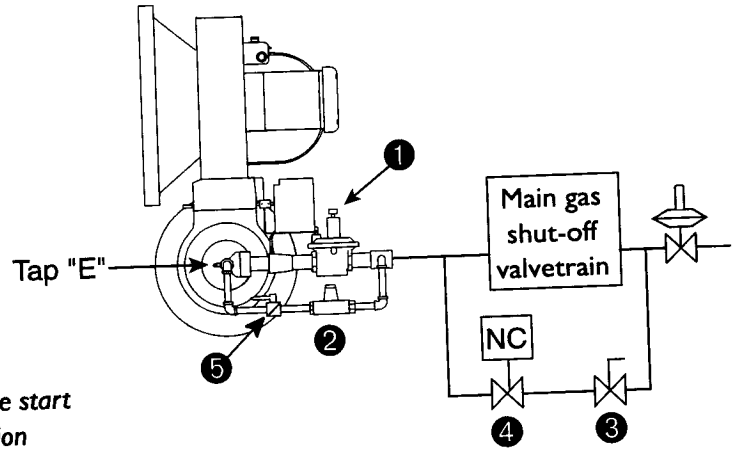



*Figure 4.6 Low fire start with pilot start option*

**Low fire start with piloting option:**

1. Drive control motor to low fire.
2. Be sure combustion air blower is running.
3. Turn bias adjusting screw ❶ on ratio regulator spring column three complete (360°) turns counter-clockwise (up) from bottom.
4. Open manual shut off valve ❸ in the piloting system.

Note:
*Be sure main gas manual shut off valves are closed.*

5. With pressure taps open, connect manometer between tap "E" and the chamber.
6. Set system control to stay at low fire during and after ignition sequence.
7. Attempt to ignite burner by energizing spark and bypass gas solenoid valve ❹.
8. During trial for ignition, adjust bypass pressure regulator ❷ to achieve the appropriate ΔP between tap "E" and the chamber as listed in the appropriate data sheet.

Note:
*If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.*

9. If burner does not ignite:
   a. Attempt to ignite burner again to purge air from the gas piping.
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    a. Shut off gas. When chamber temperature is below 250°F (121°C), shut off combustion air blower.
    b. Restart combustion air blower and ignite burner.
    c. Verify repeatability of ignition and low fire flame signal.
11. Close all pressure taps.

## Step 4: Set low fire gas

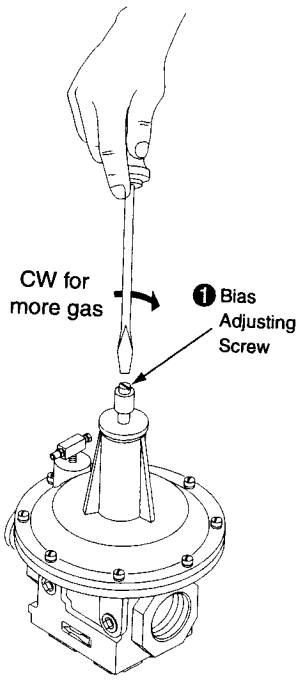
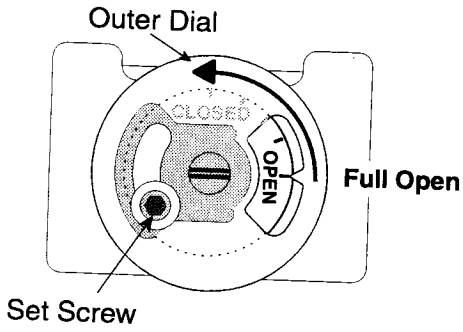



*Figure 4.7 Ratio regulator adjustment*



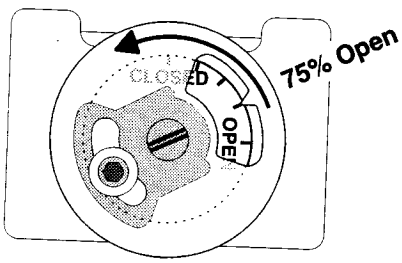




*Figure 4.8 Manual BV adjustment*

### Set low fire gas procedure:

**Warning:**
**This procedure is written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

1. Verify bias adjusting screw ❶ on ratio regulator spring column is three full clockwise turns (360° x 6) up from the bottom.
2. Set manual gas BV to 75% open.

*Note:*

*To adjust manual BV:*

*a. Loosen set screw.*
*b. Turn dial.*
*c. Tighten set screw.*

3. Open all manual gas shut off valves.
4. Set system control to stay at low fire during and after ignition sequence.
5. With taps open, connect manometer between tap "B" and combustion chamber.
6. Ignite the burner.
7. Turn bias adjusting screw ❶ slightly to achieve 0.1" w.c. (0.3 mbar) ΔP between tap "B" and combustion chamber. Repeat ignition sequence until burner lights.

*Note:*

*If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.*

8. Verify low fire flame .
   a. Drive control motor from low fire and back. Verify low fire and stable flame signal are repeated.
   b. Turn the burner off and repeat the ignition sequence. Verify low fire and stable flame signal are repeated.
9. Close all pressure taps.

### Step 5: Set high fire gas

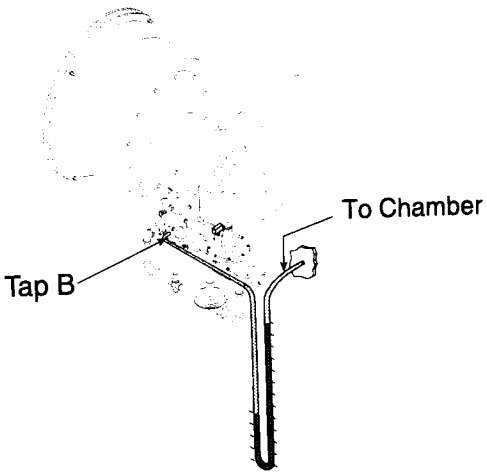



*Figure 4.9 High fire differential gas pressure*

### Set high fire gas procedure

1. Use the "Fuel ΔP vs. Input" chart from the appropriate data sheet to find the differential gas pressure needed at high fire.
2. Connect manometer between tap "B" and the chamber.
3. Set manual gas BV to 75% open.

*Note:*

*To adjust manual BV:*

- ***a.*** *Loosen set screw.*
- ***b.*** *Turn outer dial.*
- ***c.*** *Tighten set screw.*

4. With burner lit, drive control motor to high fire position.
5. Adjust BV until required differential gas pressure is achieved.
6. If required differential gas pressure cannot be achieved, refer to Chapter 5, Maintenance and Troubleshooting for guidance.

## Step 6: Verify Settings

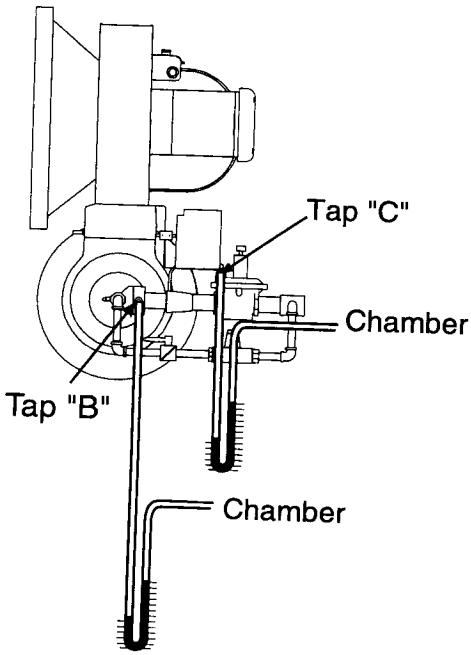



*Figure 4.10 Verify pressure settings*

### Setting verification:

1. With burner lit, drive control motor to high fire.
2. Wait for the chamber to reach normal operating conditions (e.g. chamber temperature, process flows, etc.).
3. Measure high fire fuel differential pressure between tap (B) the chamber. Compare this to the "Fuel ΔP vs. Input" chart on the data sheet.
4. Measure high fire air differential pressure between tap (C) and the chamber. Compare this pressure to the "Air ΔP vs. Input" chart on the data sheet.
5. Drive the control motor to low fire and verify low fire flame signal and flame appearance (if viewing).
6. Cycle burner from high to low several times to check repeatability of settings.
7. Readjust burner if the settings do not repeat as excepted. If necessary, refer to Chapter 5, Maintenance & Troubleshooting.
8. Use the system setup summary sheet on page 30 to record all setup data as an aid for future troubleshooting and setup operations.

*Caution:*
*Do not turn the combustion air blower off until the chamber temperature is below 250°F (121°C). This will prevent hot gases from back flowing into the burner and blower causing damage to the burner.*

9. Stop the burner.

# Maintenance & Troubleshooting 5

## INTRODUCTION

This chapter is divided into two sections:

- Maintenance procedures
- Troubleshooting guide

Preventive maintenance is the key to a reliable, safe and efficient system. The core of any preventive maintenance system is a list of periodic tasks.

## MAINTENANCE

*Note:*
*These are guidelines only. The customer should make the final determination on maintenance intervals and tasks to be performed while considering the working environment.*

### Monthly Checklist

1. Inspect the flame sensing devices for good condition and cleanliness.
2. Check for proper air/gas pressures (Refer to the Winnox Data Sheets, Series 111).
3. Test all the system alarms for proper response signals.
4. Check and clean igniter electrodes.
5. Check the air control valve for smooth, trouble free operation and adjustment.
6. Check for the proper operation of ventilating equipment.
7. Test the interlock sequence on all safety equipment. Manually force each interlock to intentionally fail while at the same time noting if related equipment closes or stops as specified by the manufacturer. Test the flame safeguard by manually shutting off the gas to the burner.
8. Test the manual gas shut off cocks for proper operation.
9. Clean and/or replace the combustion air blower filter.
10. Inspect and clean the combustion air blower rotor.

## System Setup Summary

| Parameter | Setting | |
|---|---|---|
| | Low Fire | High Fire |
| Main gas pressure | | |
| Gas pressure into the ratio regulator | | |
| Bypass fuel differential pressure: *Tap "E" - Chamber* | | |
| Fuel differential pressure: *Tap "B" - Chamber* | | |
| Loading line pressure: *Tap "C" - Chamber* | | |
| Flame signal strength | | |

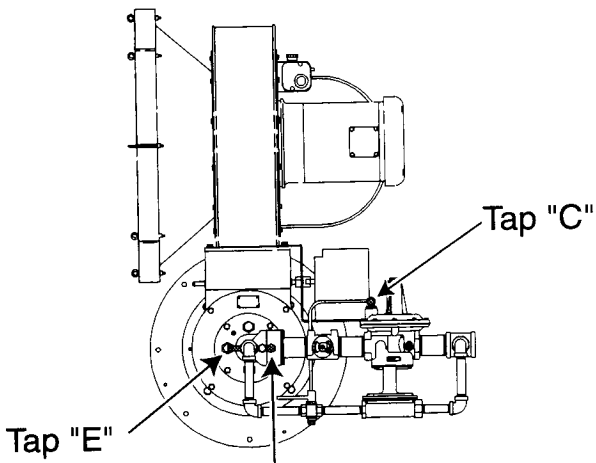



*Figure A-1*


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

www.peconet.com