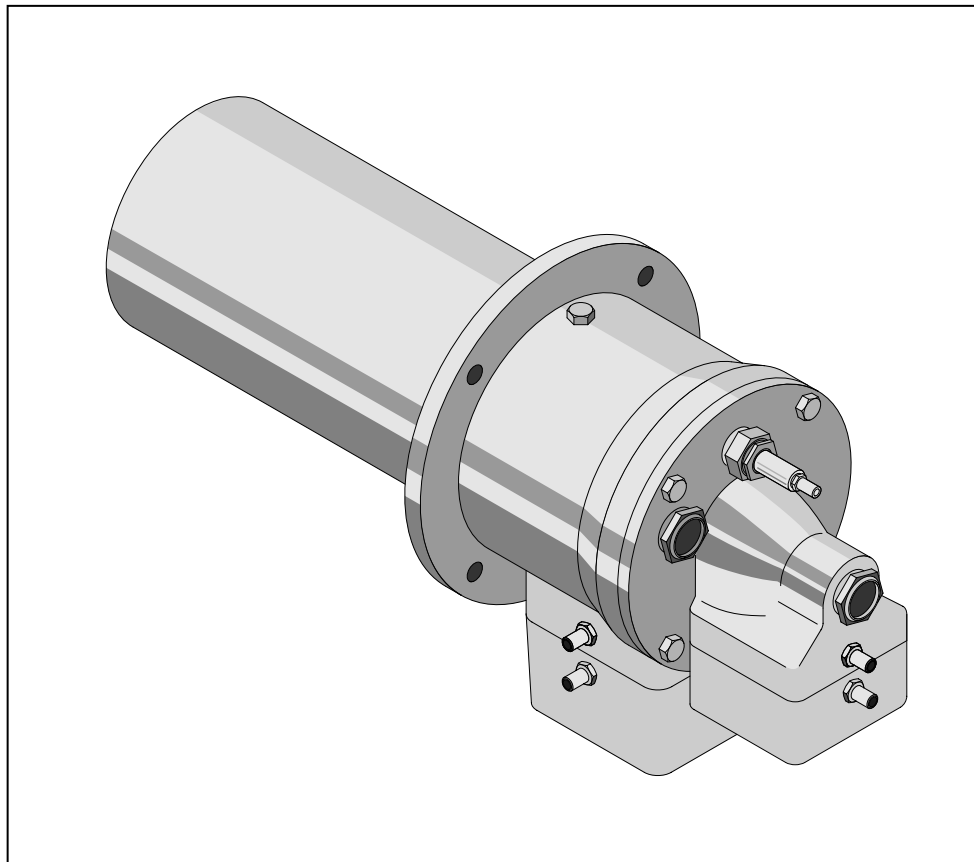


# ***Eclipse TubeFiring Burners***

*ThermThief Series  
Version 2*



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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 previous experience with this kind of equipment.

## **TFB DOCUMENTS**

### ***Installation Guide No. 310***

- This document

### ***Data Sheet No. 310-1 through 310-3***

- Required to complete installation
- Available for individual TFB models

### ***Design Guide No. 310***

- Used with Data Sheet to design burner system

### ***Price List No. 310***

- Used to order burners

## **RELATED DOCUMENTS**

- EFE 825 (Combustion Engineering Guide)
- Eclipse bulletins and Info Guides:  
610, 710, 720, 730, 742, 744, 760, 930, I-354.

### **Purpose**

The purpose of this manual is to make sure that the installation, adjustment, start-up and operation of a safe, effective and trouble-free combustion system is carried out.

## 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.



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# Introduction

# 1

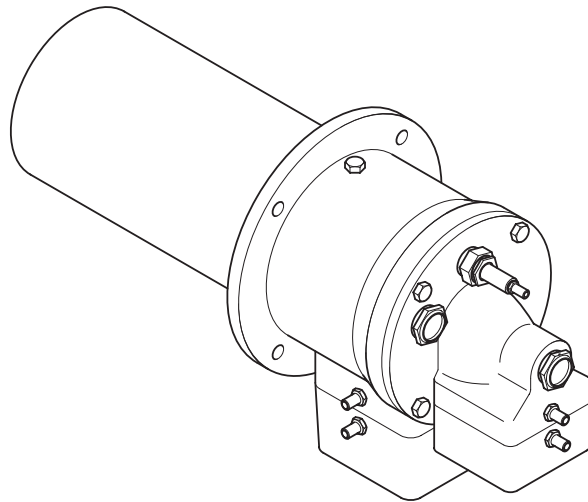
## PRODUCT DESCRIPTION

The ThermThief is a nozzle-mixing burner designed for tube firing applications with multiple fuel capability. The burner consists of a housing, rear cover, air and fuel inlet blocks, spark rod, flame rod (if selected), gas tube, nozzle and air shroud.

Burner design provides:

- Adjustable air shroud to maintain correct air velocity for different sized tube applications and fuels
- Uniform tube temperatures for extending tube life

**Figure 1.1 The ThermThief burners**



### Heat exchanger

The ThermThief can be used with or without an exhaust leg recuperator. An exhaust leg recuperator is a heat exchanger that transfers heat from the exhaust air to the combustion air. Preheating the combustion air can increase the fuel efficiency by as much as 20%. The ThermThief can handle combustion air temperatures up to 800°F.

The recommended recuperators for the ThermThief are the Eclipse Bayonet (Data 317) and the Bayonet-Ultra (Spec. 318).



# 2

## INTRODUCTION

## SAFETY

Important notices about safe burner operation will be found in this section.



### **Danger:**

---

The burners covered in this manual are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions when improperly applied, installed, adjusted, controlled or maintained.

**Do not bypass any safety feature. Fires and explosions can be caused.**

**Never try to light the burner if the burner shows signs of damage or malfunctioning.**

---



### **Warning:**

The burner is likely to have **HOT** surfaces. Always wear protective clothing when approaching the burner.



### **Note:**

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

*Read this entire manual before attempting to start the system. If any part of the information in this manual is not understood, then contact your local Eclipse Combustion representative or Eclipse Combustion before continuing.*



## **CAPABILITIES**

Adjustment, maintenance and troubleshooting of the mechanical and the electrical parts of this system should be done by qualified personnel with good mechanical aptitude and experience with combustion equipment.

## **OPERATOR TRAINING**

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.

## **REPLACEMENT PARTS**

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

# Installation

# 3

## INTRODUCTION

In this section you will find the information and instructions that you need to install the burner and the recommended accessories.



### Note:

*Most of the illustrations in this chapter are based on a 30 TFB, but are typical for all ThermThief burners.*

*Where necessary, customized illustrations are used to describe specific details.*

## HANDLING AND STORAGE

### Handling

1. Make sure that the area is clean.
2. Protect the components from the weather, damage, dirt and moisture.
3. Protect the components from excessive temperatures and humidity.

### Storage

1. Make sure that the components are clean and free of damage.
2. Store the components in a cool, clean, dry room.
3. After you have made sure that everything is present and in good condition, keep the components in the original package as long as possible.

## POSITION OF COMPONENTS

The position and the amount of components are determined by the kind of control method that you choose. All the control methods can be found on page 19 of Design Guide 310. Use the schematics to build your system.

## **APPROVAL OF COMPONENTS**

### **Limit controls and safety equipment**

All limit controls and safety equipment must comply with the current standards that follow:

- NFPA Standard 86
- NFPA Standard 86C
- UL
- FM
- CGA
- EN 746-2
- all applicable local codes and/or standards.

### **Electrical wiring**

All the electrical wiring must comply with one of these standards:

- NFPA Standard 70
- ANSI-C11981
- EN 746-2
- the electrical wiring must be acceptable to the local authority having jurisdiction.

### **Gas piping**

All the Gas piping must comply with one of these standards:

- NFPA Standard 54
- ANSI Z223
- EN 746-2
- the gas piping must be acceptable to the local authority having jurisdiction.

### **Where to get the standards**

The NFPA Standards are available from:  
National Fire Protection Agency  
Batterymarch Park  
Quincy, MA 02269

The ANSI Standards are available from:  
American National Standard Institute  
1430 Broadway  
New York, NY 10018

The UL Standards are available from:  
333 P ngsten Road  
Northbrook, IL 60062

The FM Standards are available from:  
1151 Boston-Providence Turnpike  
P.O.Box 9102  
Norwood, MA 02062

## CHECKLIST BEFORE INSTALLATION

The CGA Standards are available from:  
55 Scarsdale Road  
Toronto, Ontario  
Canada M3B 2R3

Information on the EN standards, and where to get the standards is available from:

Comité Européen de Normalisation  
Stassartstraat 36  
B-1050 Brussels  
Belgium  
Phone: +32-25196811  
Fax: +32-25196819

Comité Européen de Normalisation Electronique  
Stassartstraat 36  
B-1050 Brussels  
Belgium  
Phone: +32-25196871  
Fax: +32-25196919

### **Intake**

To admit fresh combustion air from outdoors, provide an opening in the room of at least 1 in<sup>2</sup> per 4000 Btu/hr.

If there are corrosive fumes or materials in the air, then supply the burner with clean air from an uncontaminated area.

### **Exhaust**

Do not allow exhaust gases to accumulate in the work area. Provide some positive means for exhausting them from the furnace and the building.

### **Access**

Make sure that you install the system in such a way that you can get easy access to the burner for inspection and maintenance.

### **Environment**

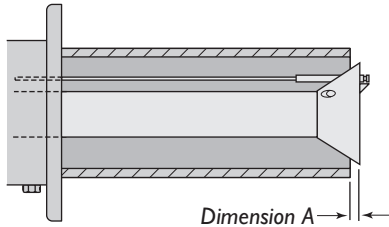
Make sure that the local environment matches the original operating specifications.

Check the following items:

- voltage, frequency and stability of the electrical power
- type and supply pressure of the fuel
- availability of enough fresh, clean combustion air
- humidity, altitude and temperature of air
- presence of damaging corrosive gases in the air.

## PREPARE THE BURNER

### Step 1: Adjust the nozzle



Burners are calibrated at the factory. However, adjustments may be necessary for your particular application. If re-calibration is required, follow the instructions below.

#### General information

The distance between the end of the ring tube and the end of the nozzle, dimension A, is very important. If dimension A is not correct, burners may not operate properly. Based on the information provided in Tables 3.1 and 3.2, verify that dimension A is correct for your operating conditions. If adjustment is necessary, follow the instructions on page 15.

#### Find dimension A

Dimension A is different for each fuel type, tube diameter and burner size.

- For the 30 TFB and 75 TFB; use Table 3.1.
- For the 200 TFB; use Table 3.2.

**Table 3.1 Dimension A inches (mm) for 30 TFB AND 75 TFB**

FUEL TYPE	MAXIMUM BURNER INPUT (1000's BTU/HR)			
	50-150	150-350	350-500	500-750
Natural gas	(6.4)	(9.5)	(12.7)	(15.9)
Propane	(3.2)	(6.4)	(9.5)	(12.7)
Butane	(3.2)	(3.2)	(6.4)	(9.5)

**Table 3.2 Dimension A inches (mm) for 200 TFB**

FUEL TYPE	MAXIMUM BURNER INPUT (1000's BTU/HR)	
	500-1000	1000-2000
Natural gas	(12.7)	(15.9)
Propane	(9.5)	(12.7)
Butane	(6.4)	(9.5)

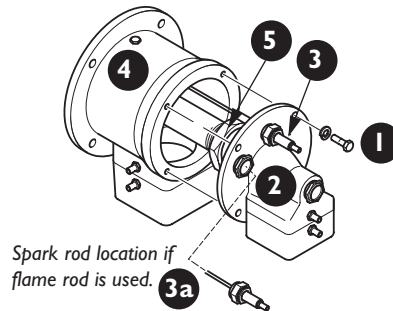
## Adjust the nozzle



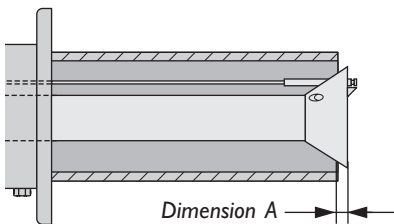
### Note:

Place burner on a suitable working surface.

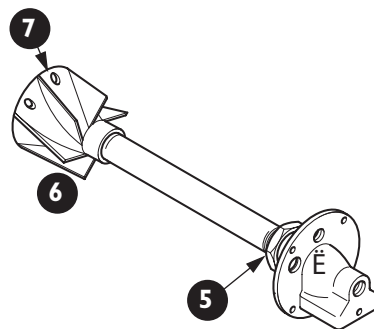
**Figure 3.1 Disassemble the burner**



1. Remove the ignition rod **3** or **3a** and flame rod **3** if applicable.
2. Remove the four bolts **1**.
3. Pull the rear cover **2** far enough away from the housing **4** to get access to the lock nut **5**.
4. Loosen the lock nut **5**.
5. Push the assembly back together.
6. Hold the rear cover **2** in position and screw the nozzle in or out to adjust dimension A.
7. Carefully pull the rear cover **2** and nozzle assembly out of the housing **4**.



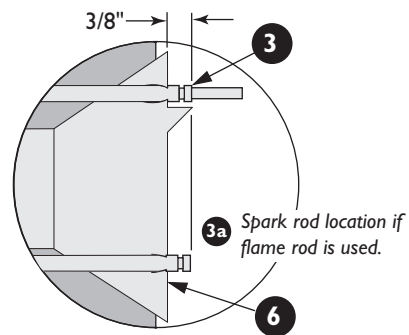
**Figure 3.2 Adjust the nozzle**



8. Turn the nozzle **6** over the shortest distance until the opening **7** in the nozzle for the ignition rod **3** aligns with the appropriate opening in the rear cover **2**.
9. Make sure that the nozzle **6** does not move and tighten the lock nut **5**.

10. Reinstall ignition rod **3** or **3a** and flame rod **3** if used.

**Figure 3.3** Position the ignition rod and flame rod if used.



11. The disk end of the ignition rod and flame rod should be approximately 3/8" past the face of the nozzle **6**.

12. The rods are adjustable at the threaded end of the rod.

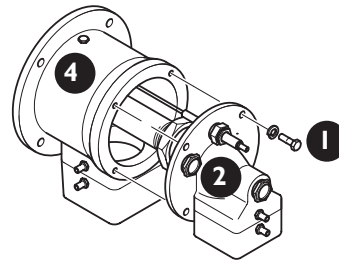
13. Tighten the compression nut on the rods after positioning.



Note:

Failure to position the ignition or flame rod may result in poor ignition or flame safety performance.

**Figure 3.4** Assemble the burner



14. Assemble the burner

- a. Install the rear cover **2** to the housing, **4** at the relative position that you need to match the pipework.
- b. Install the four bolts **1**.

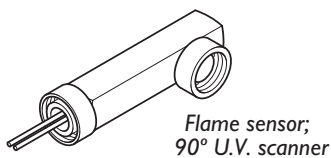
15. Reconnect the piping.



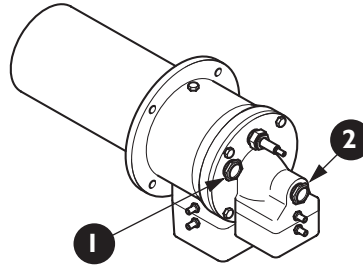
Note:

Make sure that the O-rings show no signs of damage.

**Step 2: Install the U.V. scanner (if required)**



**Figure 3.5 Position of the U.V. scanner**



1. Look through the peepsight **1** and make sure that it aligns with the U.V. port in the nozzle.
2. Remove the peepsight **1**.



**Caution:**

*If combustion air is preheated, the U.V. scanner must be protected from high temperatures. Install the U.V. scanner with a heat block seal and cooling air. (Bulletin 832)*

3. Install scanner mounting adaptor, part #10033. This will ensure the U.V. scanner does not detect the ignition spark.
4. Install the U.V. scanner, and if necessary the heat block seal, in opening **1**.
5. Make sure that the center peepsight **2** is installed.



**Danger:**

**Gas will leak if the center peepsight is not installed.**



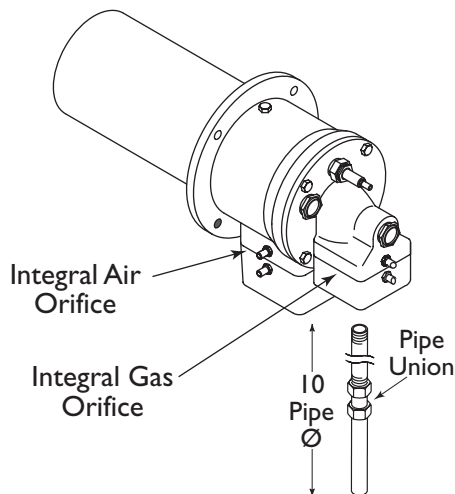
**Danger:**

**Connecting the flame sensor of a burner to the electrical circuit of the wrong burner can cause fires and explosions.**



## INSTALLATION

### Step 1: Install the Burner



### Dimensions

For full information on the burner dimensions, refer to the appropriate Data Sheet: (310-1, 30TFB; 310-2, 75TFB; 310-3, 200TFB)

The burner will bolt to the tube flange. Align the air and gas to accommodate accepted piping practices.

### Straight run of pipe before a metering orifice



**Note:**

There must be a straight run of pipe at least 10 pipe diameters before the burner metering orifice. Failure to provide this distance will result in inaccurate pressure drop readings.

### Pipe connections

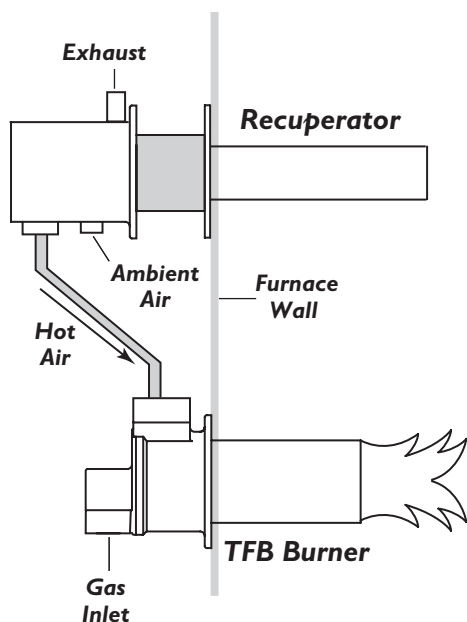
- Install a pipe union in the line to each burner. This simplifies removal of the burner.
- The use of flexible pipe nipples in the air and gas lines to the burner is optional. Flexible nipples can absorb stresses due to heat expansion.
- Flexible pipe nipples may cause higher pressure drops than equivalent standard pipes. Consider that when you size the air lines.

### Avoid large pressure drops



**Note:**

The pressure drop of the gas and the air in the piping is a critical parameter. Make sure that the size of all the piping is large enough to prevent excessive pressure losses and that the number of elbows is kept to a minimum.



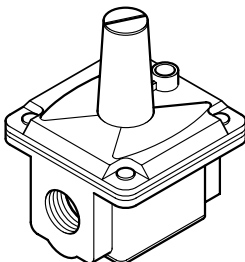
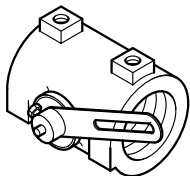
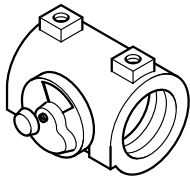
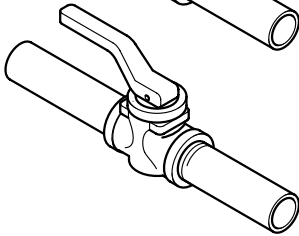
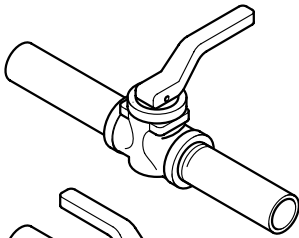
If using a recuperator, pressure drops increase with the air temperature. For the effects of the temperature on the pressure drop, refer to the Combustion Engineering Guide (EFE 825).

### Install the recuperator

In radiant tube applications, ThermThief burners can be used in conjunction with an exhaust leg recuperator.

- Insulate hot air piping and portion of recuperator shown shaded in the schematic at left with "Moist PAK-D" by Fiberfrax, Eclipse part # 57325.
- DO NOT INSULATE THE BURNER.
- For ease of assembly, use flexible nipples in hot air piping.

## Step 2: Install the Valves



### Valve orientation

Install all the valves in such a way that the arrow (if present) on the valve body points in the direction of flow.

### Gas cocks



#### Caution

**Make sure that the handle of a gas cock is at a right angle to the valve body when the valve is in the closed position. This is an important position indicator.**

### Gas balancing valves

A gas balancing valve is typically the same as a manual butterfly valve. For more information, refer to the section below.

### Manual butterfly valves

1. Install manual butterfly valves in accordance with Bulletin/Info Guide 720.
2. Install manual butterfly valves in the gas line to the burner (optional).



#### Note:

**It is recommended that there is a run of pipe with a length of at least 10 pipe diameters between any flow altering device and the metering orifice on the burner.**

### Automatic butterfly valve

An automatic butterfly is driven by an actuator (actuator and mounting bracket not illustrated).

1. Install the control valve in accordance with Bulletin/Info Guide 720.

### Ratio regulator

1. Connect an impulse line to the ratio regulator and to the air supply line.
2. Install the ratio regulator in accordance with Bulletin/Info Guide 742.

### Step 3: Install the Flame monitoring system

## CHECKLIST AFTER INSTALLATION

## PREPARE FOR ADJUSTMENT

Refer to the System Schematic on page 19 of Design Guide 310 for the control methodology you are using. There you will find the recommended components which are explained in further detail in the Appendix. Use the appropriate flame monitor if you choose this option.

To verify proper system installation, do the following:

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

After installation of the burner system components is complete, the following steps should be followed in order to prepare for adjustment:

1. Set the air pressure switch so that it drops out at 4" w.c. (10 mbar) below the pressure rating of the blower.
2. Set the low gas pressure switch at 4" w.c. (10 mbar) below the gas pressure measured at the inlet to the main gas valve train.
3. Set the high gas pressure switch so that it comes on at 4" w.c. (10 mbar) above the gas pressure measured at the inlet to the main gas valve train.
4. Close all the burner gas cocks.
5. Try to light a burner before the purge and other timers have finished their cycles. Make sure that the flame monitoring system indicates a flame failure.
6. Trip out pressure switches and other limit interlocks. Make sure that the main gas valve train closes.



### **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.**

---

# Adjustment, Start & Stop

# 4

## INTRODUCTION

In this chapter you will find instructions on how to adjust a system, and how to start and stop a system.



### **Danger:**

**Do not bypass any safety feature. You can cause fires and explosions.**

**Obey the safety precautions in Chapter 2 "Safety".**

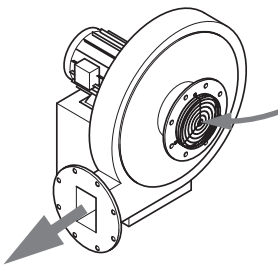
Read all of this chapter before starting your system.

## ADJUSTMENT PROCEDURE

If you are adjusting the system for the first time, you must follow these steps:

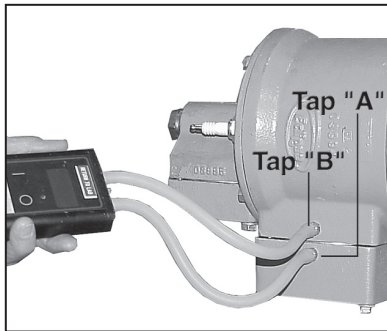
1. Reset the system
2. Set high fire air
3. Set low fire air
4. Verify the air settings
5. Ignite the burners
6. Set high fire gas
7. Verify the gas settings
8. Adjust low fire.

### **Step 1: Reset the system**



1. Close the automatic gas valves and the gas cocks.
2. Fully open the manual air butterfly valve at each burner.
  - a. Drive the automatic zone air control valve to high fire.
  - b. Adjust the automatic zone air control valve so that it is fully open.
3. Start the blower.

## Step 2: Set high fire air



### Caution:

Make sure that the blower rotates in the correct direction. If incorrect, have a qualified electrician rewire the blower to reverse its rotation.

1. Make sure that the system is at high fire.
2. Set high fire air.

### **The following steps apply to an ambient air system with orifice plates installed:**

Use the air curve on page 3 of the Data Sheet for your particular burner to find the air pressure differential that you need at high fire. This is now your target value for high fire.



### Note:

A pressure tap is open when the screw inside the tap is unscrewed approximately half a turn.

- a. Make sure that pressure tap A and pressure tap B of the burner are open (Open the internal screw  $\frac{1}{2}$  turn).
- b. Connect the manometer to tap A and tap B of the burner (across the air orifice). Make sure that the hose completely covers the side vents on pressure tap.
- c. Adjust the manual zone air butterfly valve until the high-fire air pressure-differential is at the target value. Make sure that the manual butterfly valves at every burner are fully open.
- d. Measure and note the air pressure differential for all other burners in the zone.
- e. If all the measured differential pressures are within 0.3" w.c. of each other, then proceed to the next section. If the variation is greater than 0.3" w.c., then it will be necessary to adjust the manual air butterfly valve at each burner to improve the balance.



### Caution:

Make sure that all the pressure taps are closed.



### Caution:

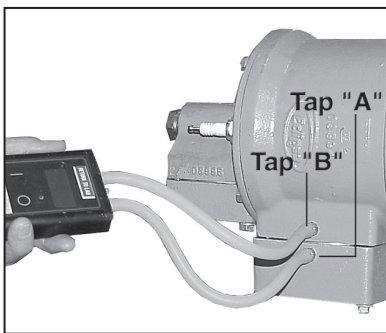
Verify the required input levels. Firing at higher levels will reduce tube life or even destroy tubes.

### **The following steps apply to a preheated air system with recuperator, and with no orifice plates installed:**

Use ambient "Static air pressures" on page 27 to find the static air pressure that you need at high fire. This is now your target value for high fire.

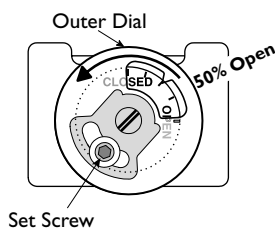
- a. Make sure that pressure tap A of the first burner is open.
- b. Adjust the zone air manual butterfly valve until the high-fire air pressure is at the target value.

**Step 3: Set low fire air**



**Step 4: Verify the air settings**

**Step 5: Ignite the burners**



- c. Measure and note the static air pressure for all other burners in the zone.
- d. If all the measured differential pressures are within 0.3" w.c. of each other, then proceed to the next section. If the variation is greater than 0.3" w.c., then it will be necessary to adjust the manual air butterfly valve at each burner to improve the balance.



**Caution:**

*Make sure that all the pressure taps are closed.*

**The following steps apply to an ambient air system with orifice plates installed:**

1. Set the system to low fire.
2. Choose one burner in the zone. Connect the manometer to tap A and tap B of the burner (across the air orifice).
3. Adjust the automatic zone air control valve until the low-fire air-pressure differential is 0.2" w.c. This is your initial setting only. Further adjustment may be required.
4. Repeat steps 2. and 3. for the other zones (if any).

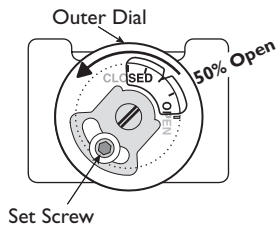
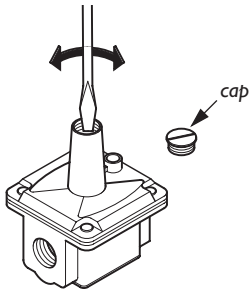
**The following steps apply to a preheated air system with recuperator, and with no orifice plates installed:**

1. Set the system to low fire.
2. Choose one burner in the zone. Connect the manometer to tap A.
3. Adjust the automatic zone air control valve until the low-fire static air-pressure is:
  - 0.05" w.c for the 30 TFB
  - 0.2" w.c for the 75 TFB and 200 TFB.
4. This is your initial setting only. Further adjustment may be required.
5. Repeat steps 2. and 3. for the other zones (if any).

Make sure that all the settings are still the same after cycling the system several times between high fire and low fire.

**Manual Ignition Steps:**

1. Drive the zone air automatic control valve to low fire.
2. Make sure the combustion air blower is running.
3. Set the manual gas butterfly valve at each burner to 50% open.



4. Set the adjusting screw on the ratio regulator 6 full rotations of 360° down from the top (initial setting).
5. Open the zone manual gas cock.
6. Start ignition transformer.



**Danger:**

**Do not touch the ignition plug or the ignition wire when the ignition is on. You will get a shock.**

7. While viewing down the peepsight, open the manual gas cock at burner. Burner should ignite.
8. If burner does not light within 20 seconds, close gas cock, purge with air and add an additional 1/2 turn down on ratio regulator.
9. Repeat step 7.
10. Terminate ignition transformer.
11. Repeat from step 6 on for all other burners in the zone.

**Automatic Ignition Steps:**

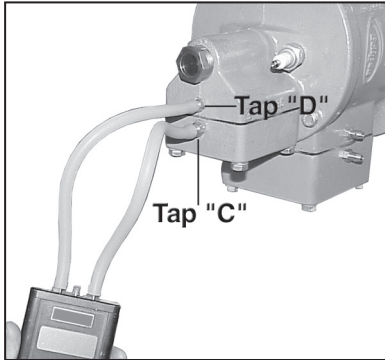
1. Drive the zone air automatic control valve to low fire.
2. Make sure the combustion air blower is running.
3. Set the manual gas butterfly valve at each burner to 50% open.
4. Set the adjusting screw on the ratio regulator 6 full rotations of 360° down from the top (initial setting).
5. Open the zone manual gas cock.
6. Open the manual gas cock at each burner.
7. Initiate the ignition sequence through the flame monitoring system.
8. Check that all the burners in the zone have ignited.
  - If a gas solenoid valve is fitted at each burner, then repeat 7. for all burners in the zone.
  - If burners do not light, purge with air and add a 180° rotation down on the ratio regulator. Repeat step 7.



**Note:**

*Initially it may be necessary to repeat step 7. two or three times to purge all the air out of the gas pipework.*

9. If all the burners have ignited, then drive the zone air butterfly valve to high fire. Make sure that the burners stay ignited.

**Step 6: Set high fire gas**

1. Use the gas curves on page 3 of the appropriate Data Sheet to find the gas pressure differential that you need at high fire. This is now your target value for high fire.

**Note:**

*A pressure tap is open when the screw inside the tap is unscrewed approximately half a turn.*

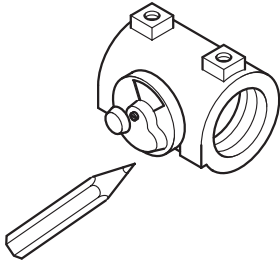
2. Make sure that pressure tap C and pressure tap D of the burner are open (Open the internal screw  $\frac{1}{2}$  turn).
3. Connect the manometer to tap C and tap D of the burner (across the gas orifice).
4. Measure the high fire gas-pressure drop for the first burner.
5. Adjust the manual gas butterfly valve at the burner until the gas flow is at the target value.
6. Repeat 4. and 5. for the other burners in the zone (if any).
7. Check the gas pressure at the inlet to the zone ratio regulator. This should be at least 5" w.c. higher than the loading line pressure. It should not exceed the maximum pressure rating of the ratio regulator.
8. Measure the oxygen level in the exhaust, using an oxygen analyzer.
9. If the  $O_2$  level is between 2.5% and 4%, the level is correct. If not, adjust the manual gas butterfly valve until you have the appropriate level.
10. Repeat steps 2. thru 9. for the other burners.
11. For each burner, connect the manometer across pressure taps C and D and measure the pressure drop.
  - If all pressure drops are at or below the target value, then the settings are correct.
  - If necessary, adjust the manual zone air butterfly valve to obtain the target value.
12. Verify settings when the furnace is at operating temperature.

**Caution:**

*Make sure that all the pressure taps are closed.*



### Step 7: Verify the gas settings



### Step 8: Adjust low fire

1. Make sure that all the settings are still the same after you cycle the system several times between high fire and low fire.
2. When all settings have been completed, mark the position of the position indicator on each butterfly valve to indicate valve position. This will save time later.



---

#### **Danger:**

**Make sure that you close all the pressure taps after you remove the manometer. Gas that leaks from the pressure taps can cause fires and explosions.**

---

1. Drive the system to low fire.
2. If a burner goes out, close gas cocks. Go to Step 5: "Ignite the burners" on page 22, and follow steps.
3. Adjust the ratio regulator until the O<sub>2</sub> level is between 10% and 14%.

#### **If the oxygen levels are between 10% and 14%, but the temperature continues to rise above the desired level:**

4. Reduce low fire air flow by adjusting the zone air control valve linkage. Recheck oxygen levels at low and high fire.
5. If necessary, repeat step 3.

## START PROCEDURE



### Danger:

**If a burner does not light and the system does not shut down automatically, you must close the main gas cock. An uncontrolled flow of gas can cause fires and explosions.**

**To avoid severe electric shock, do not touch the ignition plug or ignition wire during ignition sequences.**

### Manual Ignition

1. Make sure the gas cock at each burner is closed.
2. Start air blower.
3. Drive the automatic zone air control valve to low fire.
4. Start ignition transformers.
5. Open the gas cock at each burner checking to ensure that the burner lights.

### Automatic Ignition

1. Start the blower.
2. Open all the gas cocks.
3. Start the ignition sequence.
4. Verify that flame is present at each burner.

### If a burner does not light and:

- the system does not shut down automatically** :  
Close the main gas cock manually. Do NOT operate the system. Go to "Checklist After Installation" on page 19. After that, repeat the start procedure.
- the system shuts down automatically** :  
See "Trouble-shooting" on page 30.

## STOP PROCEDURE

1. Close these valves:
  - the manual gas cock at the main control valve
  - the manual gas cock for each burner or zone
2. Let the burners cool down. Keep the blower on until the chamber temperature is less than 1000° F (500°C) and then stop the blower.

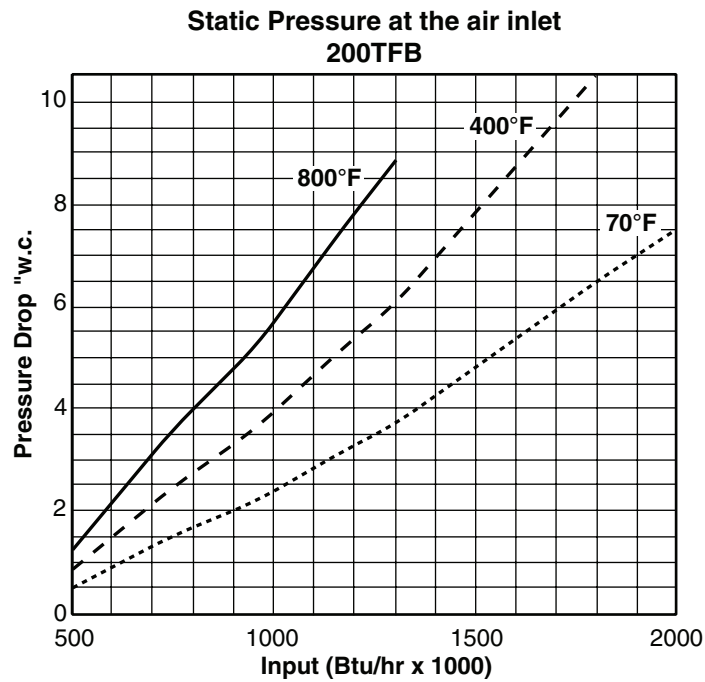
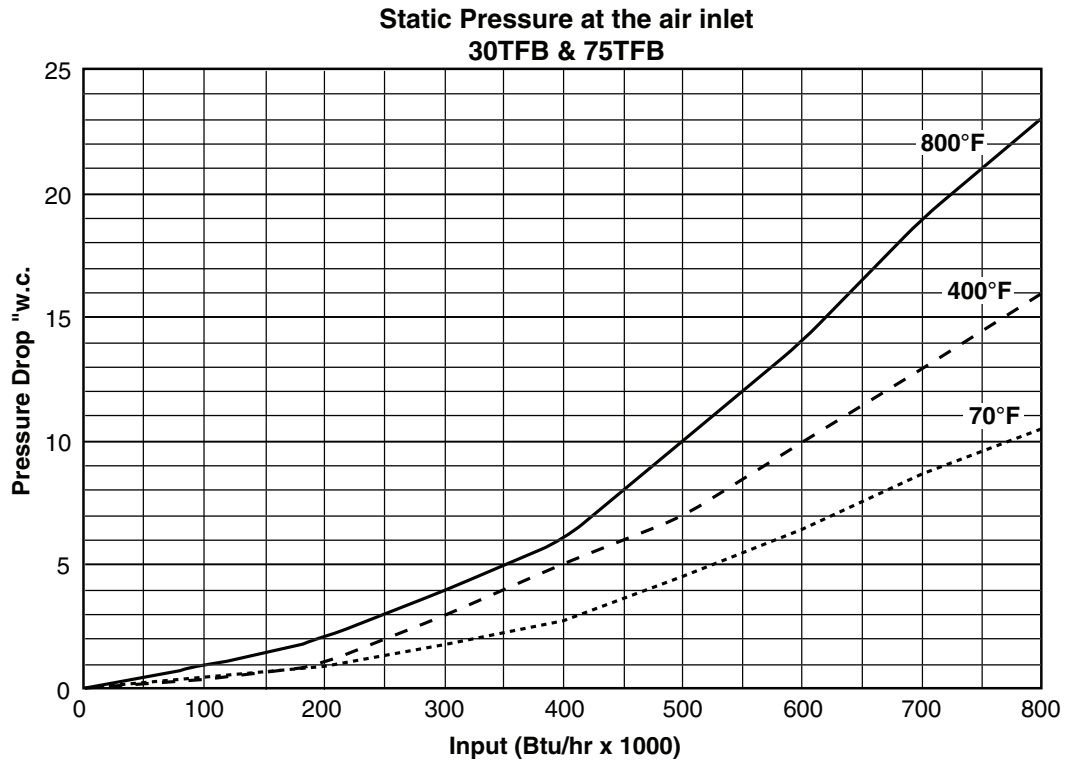


### Note

*Keeping the blower on after the burner is off, protects the burner and other components from hot gases that flow back through the burner.*

# STATIC AIR PRESSURES

When a burner uses preheated combustion air, there are no air orifices installed. In that case, the static air pressure is used to set the initial air flow of a burner. From there on the burner is further adjusted.



# Maintenance & Trouble-shooting

# 5

## INTRODUCTION

### Introduction

This section is divided into two parts:

- The first part describes the maintenance procedures.
- The second part helps to identify problems that may occur, and gives advice on how to solve these problems.

## MAINTENANCE

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

In the paragraphs that follow are suggestions for a monthly list and a yearly list.



### Caution:

*The monthly list and the yearly list are an average interval. If your environment is dirty, then the intervals should be shorter.*

## Monthly Checklist

1. Inspect flame sensing devices for good condition, and cleanliness.
2. Check for proper inlet air/gas ratios.
3. Test all the alarm systems for proper signals.
4. Check ignition rod for damage or distortion.
5. Check valve motors and control valves for free, smooth action and adjustment.
6. Measure and record the high fire oxygen levels in the exhaust every month. If there is any change, find the cause and correct it.
7. View down the peepsights on the burners and down the exhaust legs of the tubes to check for unusual flame or carbon build-up. If necessary, remove the burner to investigate.

## Yearly Checklist

1. Test interlock sequence of all safety equipment. Manually make each interlock fail, noting that related equipment closes or stops as specified by the manufacturer.  
Test flame safeguard by manually shutting off gas to burner.
2. Test (leak test) safety shut-off valves for tightness of closure.
3. Test main fuel hand-valves for operation.
4. Test pressure switch settings by checking switch movements against pressure settings and comparing with actual impulse pressure.
5. Visually check ignition cable and connectors.
6. Inspect impulse piping for leaks.
7. Remove and inspect all the burners. Clean off any carbon build up.
8. Make sure that the following components are not damaged or distorted:
  - the burner nozzle
  - the ignition rods
  - the flame tube.

If applicable, remove and clean all the orifice plates.

# TROUBLE-SHOOTING

**Table 5.1** Trouble-shooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
Start-up sequence runs but burner does not light. (See also next page).	No ignition: • There is no power to the ignition transformer.	Restore the power to the ignition transformer.
	No ignition: • Open circuit between the ignition transformer and the ignition rod.	Repair or replace the wiring to the ignition rod.
	No ignition: • The ignition rod needs cleaning.	Clean the ignition rod.
	No ignition: • The ignition rod is not correctly grounded to the burner.	Clean the threads of the ignition rod and the burner. Do not use pipe sealant on ignition plug threads.
	No ignition: • The ignition rod is grounded to the nozzle or the air shroud.	Check the ignition rod position.
	No ignition: • The ignition and flame rod wiring is reversed.	Correct wiring.
	Not enough gas: • Air in the gas line.	Repeat the start attempt several times.
	Not enough gas: • The gas pressure into the ratio regulator is too low.	Measure the gas pressure into the ratio regulator and adjust gas pressure if necessary.  (See Chapter 4 "Adjustment, Start & Stop" on page 20)
	Not enough gas: • The impulse line to the ratio regulator is leaking.	Repair any leaks.
	Not enough gas: • Start gas solenoid valve does not open (if fitted).	Check wiring to the valve. Check output from the flame safeguard.  Check solenoid valve coil for proper operation. Replace if necessary.
	Not enough gas: • Manual gas valve closed.	Open the gas valve.
	Poor ignition: • Incorrect type of flame safety. Must have ignition during all the trial for ignition.	Change flame monitoring equipment.
Poor ignition: • Wrong type of ignition transformer	Use correct type.	

**Table 5.1 Troubleshooting (Continued)**

PROBLEM	POSSIBLE CAUSE	SOLUTION
Start-up sequence runs but burner does not light. (Continued)	<ul style="list-style-type: none"> <li>Improper air/gas settings.</li> </ul>	Check pressures and settings and adjust as necessary.
	Too much gas: <ul style="list-style-type: none"> <li>Gas pressure out of ratio regulator is too high.</li> </ul>	Check adjustments. If necessary, remove regulator and investigate.
	Not enough gas: <ul style="list-style-type: none"> <li>Manual gas cock not open.</li> </ul>	Open the manual gas cock.
	Improper air/gas ratio: <ul style="list-style-type: none"> <li>Air in the gas line.</li> </ul>	Repeat start-up several times.
	Improper air/gas ratio: <ul style="list-style-type: none"> <li>Ratio regulator incorrectly set.</li> </ul>	Adjust to proper setting.
	Insufficient flame signal: <ul style="list-style-type: none"> <li>Flame rod or U.V. scanner needs cleaning.</li> </ul>	Clean the flame rod or U.V. scanner lens.
	Insufficient flame signal: <ul style="list-style-type: none"> <li>Flame rod is grounded to nozzle.</li> </ul>	Adjust position so ceramic insulation contacts nozzle.
	Insufficient flame signal: <ul style="list-style-type: none"> <li>Flame rod and spark rod reversed.</li> </ul>	Reposition spark plug/flame rod.
The low fire flame is weak or unstable	<ul style="list-style-type: none"> <li>Not enough gas.</li> </ul>	Readjust gas flow at ratio regulator.
	<ul style="list-style-type: none"> <li>Not enough air.</li> </ul>	Open automatic valve slightly.
The burner does not light or goes off when it cycles to high fire.	<ul style="list-style-type: none"> <li>Burner set too lean, becoming unstable as air increases.</li> </ul>	Adjust the settings to provide more gas.
	<ul style="list-style-type: none"> <li>Insufficient pressure into ratio regulator.</li> </ul>	Adjust the pressure settings on the main gas regulator or change spring.
	<ul style="list-style-type: none"> <li>Main gas adjustable valve not open enough.</li> </ul>	Adjust the main gas adjustable valve.
	<ul style="list-style-type: none"> <li>Marginal air pressure switch setting.</li> </ul>	Adjust the air pressure switch setting.
	<ul style="list-style-type: none"> <li>Gas press. switch set incorrectly</li> </ul>	Adjust switch setting.
The burner is erratic and does not respond to adjustment	Internal damage to the burner: <ul style="list-style-type: none"> <li>Some parts inside the burner are loose, dirty or burned out.</li> </ul>	Contact Eclipse Combustion
The burner is unstable or produces soot, smoke or excessive carbon monoxide.	<ul style="list-style-type: none"> <li>The air/gas ratio is out of adjustment.</li> </ul>	Reset the burner controls. (See Chapter 4 "Adjustment, Start & Stop" on page 20)
	<ul style="list-style-type: none"> <li>Bleed fitting (if used) is dirty.</li> </ul>	Clean fitting. Check and clean filters (if necessary).
	<ul style="list-style-type: none"> <li>After this step it is important that you clean the ignition rod and the U.V. scanner, and make sure that there is no excessive soot on the nozzle. Clean where necessary.</li> </ul>	

**Table 5.1    Trouble-shooting (Continued)**

PROBLEM	POSSIBLE CAUSE	SOLUTION
Burner pulsates or produces noise.	<ul style="list-style-type: none"> <li>Acoustic feedback from tube. (The exact cause of this problem is unknown.)</li> </ul>	Slide a piece of steel plate over the end of the tube until the rumbling disappears. Weld the plate in place. Readjust the burner controls if necessary.
	<ul style="list-style-type: none"> <li>Input inconsistent with nozzle settings.</li> </ul>	Check if input is consistent with nozzle settings and adjust if necessary.
	<ul style="list-style-type: none"> <li>Could be lean.</li> </ul>	Check oxygen levels and adjust to 2 to 4% O <sub>2</sub> (at high fire).
	<ul style="list-style-type: none"> <li>Burner could be improperly set to fire at an input rate which exceeds its maximum rated capacity.</li> </ul>	<p>Check the pressure drops to verify that the inputs are at the correct levels.</p> <p>Reduce the input on the air and gas as required to achieve the specified inputs.</p>
	<ul style="list-style-type: none"> <li>Negative pressure in the building.</li> </ul>	In some cases, building exhaust systems create a negative pressure that “pulls” on the exhaust outlet of the tube. By placing a washer or restriction plate over the tube outlet, this suction can be equalized by burner pressure.
Cannot achieve full capacity	<ul style="list-style-type: none"> <li>Air filter is blocked.</li> </ul>	Clean the filter.
	<ul style="list-style-type: none"> <li>Gas pressure too low into the ratio regulator.</li> </ul>	Adjust gas pressure.
	<ul style="list-style-type: none"> <li>Loading line pressure too low.</li> </ul>	Open the zone air control valves to increase the air volume and pressure. Recheck all burner settings
	<ul style="list-style-type: none"> <li>Adjusting valve has closed.</li> </ul>	Open the valve to previous setting and check the input and flue gas settings to verify proper operations.
	<ul style="list-style-type: none"> <li>Blower is wired backwards.</li> </ul>	A blower wired to turn backwards will produce approximately 60% of its rated capacity. Check the rotation of the blower impeller. If spinning backwards, have a qualified electrician reverse the electrical wiring.



**Table 5.1 Troubleshooting (Continued)**

PROBLEM	POSSIBLE CAUSE	SOLUTION
Cannot initiate start sequence	<ul style="list-style-type: none"> <li>Air pressure switch has not made contact.</li> </ul>	Check air pressure switch adjustment.  Check air filter. Check blower rotation. Check outlet pressure from blower.
	<ul style="list-style-type: none"> <li>High gas pressure switch has tripped.</li> </ul>	Check incoming gas pressure. Adjust gas pressure if necessary.  Check pressure switch setting and operation.
	<ul style="list-style-type: none"> <li>Low gas pressure switch has tripped.</li> </ul>	Check incoming gas pressure. Adjust gas pressure if necessary.  Check pressure switch setting and operation.
	<ul style="list-style-type: none"> <li>Malfunction of flame monitoring system such as shorted out flame sensor or electrical noise in the sensor line.</li> </ul>	Have qualified electrician investigate and rectify.
	<ul style="list-style-type: none"> <li>Purge cycle not completed.</li> </ul>	Check flame safeguard system, or purge timer.
	<ul style="list-style-type: none"> <li>Main power is off.</li> </ul>	Make sure power is on to control system.
	<ul style="list-style-type: none"> <li>No power to control unit.</li> </ul>	Call qualified electrician to investigate.

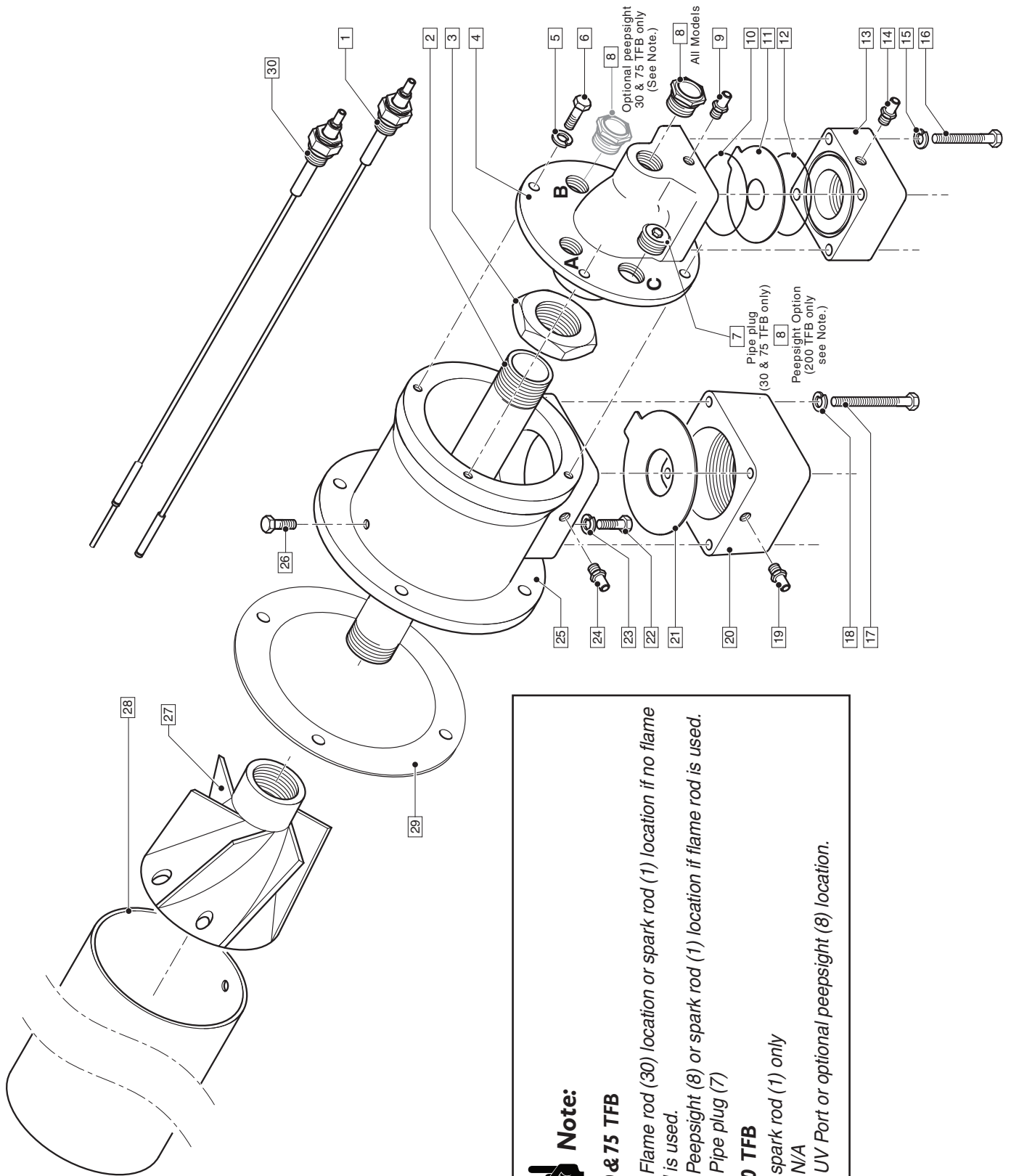
# ILLUSTRATED PARTS LIST

Pos. NO.	QTY.	Part Description	ECLIPSE PART NUMBER*	
			30 & 75 TFB	200 TFB
1	1	Spark electrode assembly	100640-x	100640-x
2	1	Tube, gas	14565-x	15998-x
3	1	P.F. Locknut, 1- 11	18847	17014
4	1	Cover, rear	7103-2	7013
5	4	Washer, lock	15306	15222
6	4	Screw, hex head	15886	15886
7	1	Pipe plug	19477	-----
8	1 or 2	Peepsight	11737	10509
9	1	P.F. Plug, Test,	13445	13445
10	1	Seal, O'ring. Viton, V747	14777	14778
11	1	Plate, gas orifice	14191-x	14188-x
12	1	Seal, O'ring. Viton, V747	14777	14778
13	1	Inlet, gas	3974-x	3973-x
14	1	P.F. Plug, TEST	13445	13445
15	4	Washer, lock	15222	15222
16	4	Screw, hex head	15887	15888
17	4	Screw, hex head	15893	15888
18	4	Washer, lock	15222	15222
19	1	P.F. Plug, TEST	13445	13445
20	1	Air inlet block	3973-x	3996-x
21	1	Plate, air orifice	14188-x	14802-x
22	1	Screw, hex cap	15215	15215
23	1	Washer, lock	15222	15222
24	1	P.F. Plug, TEST	13445	13445
25	1	Housing	7118-1	3994
26	1	Screw, hex cap	15215	15215
27	1	Nozzle	7122-x**	7012
28	1	Air tube	22304-x	15999-x
29	1	Gasket	17054	14932
30	1	Flame Rod	10014915-x	N/A

\* For all part numbers ending in -X, see pages 36 & 37 for details.

\*\* 7122-1 for non-flame rod burner and 7122-3 for flame rod burners.

## 30,75 & 200 TFB



## REPLACEMENT PARTS

## REPLACEMENT PARTS – GAS ORIFICE PLATES

BURNER MODEL	GAS ORIFICE DIAMETER	PART NUMBER
30 TFB/75 TFB	3.8mm (0.15")	14191-7
30TFB/75 TFB	5.2mm (0.22")	14191-3
30 TFB/75 TFB	6.4mm (0.25")	14191-5
30 TFB/75 TFB	7.6mm (0.30")	14191-1
30 TFB/75 TFB	9.1mm (0.36")	14191-8
30 TFB/75 TFB	10.8mm (0.43")	14191-6
30 TFB/75 TFB	12.7mm (0.50")	14191-2
30 TFB/75 TFB	14mm (0.55")	14191-9
200TFB	13mm (0.50")	14188-7
200 TFB	16mm (0.63")	14188-8
200 TFB	18mm (0.71")	14188-4
200TFB	19mm (0.75")	14188-6
200 TFB	20mm (0.79")	14188-9
200TFB	21mm (0.83")	14188-16
200TFB	24mm (0.95")	14188-1

## REPLACEMENT PARTS – AIR ORIFICE PLATES

BURNER MODEL	AIR ORIFICE DIAMETER	PART NUMBER
30 TFB/75 TFB	18mm (0.70")	14188-4
30TFB/75 TFB	24mm (0.95")	14188-1
30 TFB/75 TFB	29mm (1.13")	14188-3
30 TFB/75 TFB	34mm (1.33")	14188-2
30 TFB/75 TFB	37mm (1.45")	14188-5
30 TFB/75 TFB	42mm (1.65")	14188-12
30 TFB/75 TFB	44mm (1.75")	14188-17
200 TFB	54mm (2.13")	14802-2
200TFB	60mm (2.36")	14802-4
200 TFB	65mm (2.56")	14802-7
200 TFB	70mm (2.76")	14802-8

## REPLACEMENT PARTS - INLET BLOCKS

	Burner Model		
	30TFB	75TFB	200TFB
Gas Inlet	3974-4 (1/2" NPT)	3974-2 (3/4" NPT)	3973-3 (1-1/2" NPT)
	3974-3 (1/2" Rc)	3974-1 (3/4" Rc)	3973-1 (1-1/2" Rc)
Air Inlet	3973-3 (1-1/2" NPT)	3973-2 (2" NPT)	3996-1 (3" NPT)
	3973-1 (1-1/2" Rc)	3973-10 (2" Rc)	3996-2 (3" Rc)

# REPLACEMENT PARTS

## REPLACEMENT PARTS FOR 30TFB & 75TFB

"B" DIMENSION AIR TUBE LENGTH	SELECTION	AIR TUBE PART NUMBER (NATURAL GAS)	AIR TUBE PART NUMBER (PROPANE/ BUTANE)	SPARK ROD PART NUMBER	Flame ROD PART NUMBER	GAS TUBE PART NUMBER
76mm (3")	A	22304-1	22304-23	100640-30	10014915-30	14565-30
102mm (4")	B	22304-2	22304-24	100640-31	10014915-31	14565-31
127mm (5")	C	22304-3	22304-25	100640-32	10014915-32	14565-32
152mm (6")	D	22304-4	22304-26	100640-33	10014915-33	14565-33
178mm (7")	E	22304-5	22304-27	100640-34	10014915-34	14565-34
203mm (8")	F	22304-6	22304-28	100640-35	10014915-35	14565-35
229mm (9")	G	22304-7	22304-29	100640-36	10014915-36	14565-36
254mm (10")	H	22304-8	22304-30	100640-1	10014915-1	14565-1
279mm (11")	I	22304-9	22304-31	100640-2	10014915-2	14565-2
305mm (12")	J	22304-10	22304-32	100640-3	10014915-3	14565-3
330mm (13")	K	22304-11	22304-33	100640-4	10014915-4	14565-4
356mm (14")	L	22304-12	22304-34	100640-5	10014915-5	14565-5
378mm (15")	M	22304-13	22304-35	100640-6	10014915-6	14565-6
403mm (16")	N	22304-14	22304-36	100640-7	10014915-7	14565-7
429mm (17")	O	22304-15	22304-37	100640-8	10014915-8	14565-8
454mm (18")	P	22304-16	22304-38	100640-9	10014915-9	14565-9
479mm (19")	Q	22304-17	22304-39	100640-10	10014915-10	14565-10
505mm (20")	R	22304-18	22304-40	100640-11	10014915-11	14565-11
530mm (21")	S	22304-19	22304-41	100640-12	10014915-12	14565-12
556mm (22")	T	22304-20	22304-42	100640-13	10014915-13	14565-13
581mm (23")	U	22304-21	22304-43	100640-14	10014915-14	14565-14
606mm (24")	V	22304-22	22304-44	100640-15	10014915-15	14565-15

## REPLACEMENT PARTS FOR 200 TFB

"B" DIMENSION AIR TUBE LENGTH	SELECTION	AIR TUBE PART NUMBER	SPARK ROD PART NUMBER	GAS TUBE PART NUMBER
152mm (6")	D	15999-1	100640-33	15998-1
178mm (7")	E	15999-2	100640-34	15998-2
203mm (8")	F	15999-3	100640-35	15998-3
254mm (10")	H	15999-4	100640-1	15998-4
279mm (11")	I	15999-5	100640-2	15998-5
305mm (12")	J	15999-6	100640-3	15998-6
330mm (13")	K	15999-7	100640-4	15998-7
356mm (14")	L	15999-8	100640-5	15998-8
378mm (15")	M	15999-9	100640-6	15998-9
505mm (20")	R	15999-10	100640-11	15998-10



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