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

How To Get Help
If you need help, contact your local Eclipse representative. You can also contact Eclipse at:

1665 Elmwood Rd.
Rockford, Illinois 61103 U.S.A.
Phone: 815-877-3031
Fax: 815-877-3336
http://www.eclipsenet.com

Please have the information on the product label available when contacting the factory so we may better serve you.

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This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Is used to address practices not related to personal injury.

NOTE Indicates an important part of text. Read thoroughly.
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Introduction

Product Description

The ThermJet PCA (preheated combustion air) is a nozzle-mix burner that is designed to fire an intense stream of hot gases through a combustor using preheated combustion air temperatures up to 1000°F. (Models TJPCA0500 through TJPCA1000 are rated for use with preheated combustion air temperatures up to 700°F.)

The high velocity of the gases improves temperature uniformity, product quality and system efficiency. ThermJet PCA burners use medium velocity TJPCA combustors providing velocities from 250 ft/s to 750 ft/s depending on the temperature of the preheated combustion air.

Figure 1.1. ThermJet PCA Burner

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 previous experience with this type of equipment.

ThermJet PCA Documents

Installation Guide No. 206
- This document

Datasheet, Series No. 206-1 through 206-13
- Available for individual ThermJet PCA models
- Required to complete installation

Design Guide No. 206
- Used with Datasheet to complete installation

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 ensure that you carry out the installation of a safe, effective, and trouble free combustion system.
Important notices about safe burner operation will be found in this section. Read this entire manual before attempting to start the system. If any part of the information in this manual is not understood, contact Eclipse before continuing.

Safety

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

- Eclipse products are designed to minimize the use of materials that contain crystalline silica. Examples of these chemicals are: respirable crystalline silica from bricks, cement or other masonry products and respirable refractory ceramic fibers from insulating blankets, boards, or gaskets. Despite these efforts, dust created by sanding, sawing, grinding, cutting, and other construction activities could release crystalline silica. Crystalline silica is known to cause cancer, and health risks from the exposure to these chemicals vary depending on the frequency and length of exposure to these chemicals. To reduce this risk, limit exposure to these chemicals, work in a well-ventilated area and wear approved personal protective safety equipment for these chemicals.

**NOTICE**

- 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.

- Read entire manual before attempting to start this system. If you do not understand any part of the information contained in this manual, contact Eclipse 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 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 only. All Eclipse approved, customer supplied valves or switches should carry UL, FM, CSA, CGA, and/or CE approval, where applicable.
In this section you will find the information and instructions that you need to install the burner.

Handling

• Make sure that the area is clean.
• Protect the components from the weather, damage, dirt and moisture.
• Protect the components from excessive temperatures and humidity.
• Take care not to drop or damage components.

Storage

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

■ When the refractory combustion block is supplied with the burner, it is critical that the instructions for handling and storage are followed. The refractory should be considered fragile; improper handling and storage will cause premature failure.

Position of Components

The position and amount of components are determined by the kind of control method chosen. All the control methods can be found in Design Guide 206. Follow one of the schematics in the System Design chapter of Design Guide 206 to build your system.

Approval of Components

Limit Controls & Safety Equipment

All limit controls and safety equipment must comply with all applicable local codes and/or standards and must be listed for combustion safety by an independent testing agency. Typical application examples include:

• American: NFPA 86 with listing marks from UL, FM, CSA
• European: EN 746-2 with CE mark from TuV, Gastec, Advantica

Electrical Wiring

All the electrical wiring must comply with all applicable local codes and/or standards such as:

• NFPA Standard 70
• IEC60364
• CSA C22
• BS7671

Gas Piping

All the gas piping must comply with all applicable local codes and/or standards such as:

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

Where to Get the Standards:

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

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

The UL Standards are available from:
333 Pfingsten Road
Northbrook, IL 60062
www.ul.com

The FM Standards are available from:
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062
www.fmglobal.com/approvals
Information on the EN standards and where to get them is available from:
Comité Européen de Normalisation
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196811
Fax: +32-25196819
www.cen.eu

Comité Européen de Normalisation Electronique
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196871
Fax: +32-25196919
www.cenelec.org

Checklist Before Installation
Intake
To admit fresh combustion air from outdoors, provide an opening in the room of at least one square inch per 4,000 BTU/hr. If there are corrosive fumes or materials in the air, then supply the burner with clean air from an uncontaminated area, or provide a sufficient air filtering system.

Exhaust
Do not allow exhaust 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 burner in such a way that you can get easy access for inspection and maintenance.

Environment
Make sure 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
Several components must be installed on a burner before it can operate. Installation instructions follow.

It is possible to change the relative position of the gas inlet with respect to the air inlet. This can be convenient for the routing of the piping.

Rotate the Rear Cover (Optional)
To rotate the rear cover, do the following (see Figure 3.1):

1. Disconnect the piping at a union in the piping or the inlet flanges provided on the burner.

NOTE: Be careful not to lose or damage the orifice plate or the o-rings.

2. Remove the four bolts.

3. Remove the rear cover from the burner housing.

4. Rotate the rear cover to the position that you want.

5. Put the rear cover in position against the burner housing.

6. Install the four bolts.

7. Reconnect the piping. Make sure that the o-rings show no signs of damage.

Figure 3.1. Rotate the Rear Cover
Installing the Flame Sensor

1. Install the flame sensor into the 1/2" NPT opening in the rear cover.

2. Make sure that you connect the flame sensor of a burner to the electrical circuit of that burner.

**DANGER**

- If you connect the flame sensor of a burner to the electrical circuit of the wrong burner, then you can cause fires and explosions.

**NOTICE**

- Adjustments may vary from Eclipse published values if the flame controls other than those recommended in the Design Guide are used. Consult with the engineer who specified the alternate control for limitations.

UV Scanner

All ThermJet PCA burners operate with UV Scanners only. A UV Scanner can be used with all combustor types. For detailed information on how to install and connect a UV scanner, refer to scanner information guide.

**NOTE:** Ambient temperature limits for the scanners are likely to be exceeded. An insulated coupling, heat block seal or scanner cooler may be required. See Bulletins 832 & 834.

Installing the Spark Plug

Install the spark plug into the opening in the rear cover.

**NOTE:** Do not apply any grease to the threads of the spark plug. You can cause bad grounding of the spark plug if you apply grease to it. Bad grounding of the spark plug results in a weak spark.
If the combustor or burner block is shorter than the furnace wall thickness the block or combustor should be recessed into the wall. To prevent refractory overheating, a 45° chamfer should be applied.

Avoid Losses
To make sure that heat does not go back to the casing of the chamber, it is important that the radial clearance around the firing tube is filled with ceramic fiber.

Alloy Combustor (Figure 3.6)
1. Make sure the gasket \( \text{gasket 1} \) is installed between the burner and the chamber wall \( \text{gasket 2} \).
2. Make sure that gasket \( \text{gasket 1} \) does not leak.
3. Check the size of the clearance. If the gap \( \text{gap} \) around the firing tube is larger than 1/2", then pack the gap with ceramic fiber \( \text{ceramic fiber 4} \).

NOTE: Do not insulate the end of the combustion tube “tip”. Do not recess the combustion tube into the furnace wall.

Silicon Carbide (SiC) Combustor Only (Figure 3.7)
Make sure the gasket \( \text{gasket 1} \) is installed between the burner flange and chamber wall \( \text{gasket 2} \).

1. Make sure gasket \( \text{gasket 3} \) is installed between SiC tube and flange \( \text{gasket 4} \).
2. Make sure neither gasket \( \text{gasket 1} \) nor \( \text{gasket 3} \) leaks.

3. Check the size of the clearance. If the gap \( \text{gap} \) around the firing tube is larger than 1/2", pack the gap with ceramic fiber \( \text{ceramic fiber 4} \) over a maximum length of 4" (100mm). Maintain a clearance of at least 3/16" (5mm) over the remaining straight length of the firing tube. Do not wrap the cone.

Refractory Block (Figure 3.8)
1. Make sure gasket \( \text{gasket 1} \) is installed between burner \( \text{block holder 5} \) and block holder \( \text{block holder 6} \).
2. Make sure gasket \( \text{gasket 5} \) is installed between block holder \( \text{block holder 6} \) and chamber wall \( \text{chamber wall 7} \).
3. Support the weight of refractory block \( \text{block 8} \) with hard brick work anchored to the furnace shell \( \text{shell 9} \). Fill the 1/2" space around the block \( \text{block 8} \) and the three unsupported sides with soft gasket material \( \text{gasket 10} \).

Large Refractory Blocks
On sizes TJPCA0500 thru TJPCA2000; the block must be tightly surrounded by a collar made of brick, plastic refractory, or a castable refractory of at least 4" (10 cm) minimum thickness on all sides of the block. If the collar is cast around the block, a thin plastic film (i.e. Saran Wrap® or Glad Wrap®) should be wrapped around the block to keep moisture from leaching into it. The collar should be
anchored to the furnace shell with suitable anchors and must be constructed to rest on a surface capable of supporting its weight, such as a hearth or a solid refractory or brick wall. For furnaces that are unable to support the weight of the refractory block, a stainless steel shelf can be welded to the shell to support the collar.

**NOTE:** All refractory blocks are cured at a minimum temperature of 550°F (300°C) prior to shipment.

**NOTE:** The correct insulation of burner combustion blocks in furnaces results in longer block life and adds value by reducing downtime and maintenance.

**Vertical Down Firing Blocks (Figure 3.9)**

1. Down firing blocks may be suspended by customer supplied hangers attached to the burner body mounting bolts.

2. Hangers should be attached to structural support.

---

**Straight Run of Pipe Before a Metering Orifice**

**NOTE:** There must be a run of pipe with a straight length of at least 10 pipe diameters before the burner metering orifice. If you do not do this, the pressure readings will be inaccurate.

**Pipe Connections**

Install a pipe union in the gas line to the burner. This simplifies removal of the burner.

The use of flexible pipe nipples in the gas line to the burner is optional. Flexible nipples can absorb stress due to heat expansion and slight misalignment.

**NOTE:** Flexible pipe nipples will cause inaccurate metering orifice readings and may cause higher pressure drops than equivalent standard pipe. Consider this when you size the gas lines.

**Avoid Large Pressure Drops**

**NOTE:** The pressure drop of the gas in the piping is a critical parameter. Make sure that the size of all the piping is large enough to prevent excessive pressure losses.

**Valve Installation**

**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**

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. If you do not do this, someone may think that the gas cock is in the closed position, while it is actually in the open position.

**Gas Balancing Valves**

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

**Manual Butterfly Valves**

2. Install manual butterfly valves in the air line in accordance with Bulletin 722 or manufacturer’s instructions.

**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 metering orifice on the burner.

**Automatic Butterfly Valve**

An automatic butterfly is driven by an actuator (actuator and mounting bracket not illustrated). Install the control valve in accordance with Bulletin/Info Guide 720.

**Ratio Regulator**

- Connect an impulse line to the ratio regulator and air supply line.
- Install the ratio regulator in accordance with manufacturer’s instructions.

---

**Prepare for Adjustment**

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.

- 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.

---

**Checklist After Installation**

To verify proper system installation, do the following:

1. Make sure that there are no leaks in the gas and 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, have a qualified electrician rewire the blower to reverse its rotation.

5. Make sure all valves are installed in the proper location and correctly oriented relative to the gas or air flow direction.
Adjustment, Start & Stop

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.

Modulating Gas & Air Ratio System

If you adjust an on-ratio system for the first time, you must follow these steps: (Refer to Figures in the ThermJet PCA Design Guide No. 206)

Step 1: Reset the System

1. Close the automatic gas valves and 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.

NOTICE

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

4. Adjust the eductor flow valve to set the flow measured across the orifice to the flow specified by Eclipse for your application.

Step 2: Set High Fire Air

File: Figure 4.1. Set High Fire Air

1. Set the system to high fire, but DO NOT ignite the burner(s).
2. Use the orifice flow data (provided by orifice manufacturer) to determine the pressure drop across the orifice necessary for high fire air flow.

NOTE: If using single diaphragm ratio regulator control, set air flow to 35% excess air to account for temperature changes in combustion air.

3. Set high fire air using the manual combustion air butterfly to achieve the pressure differential determined in Step 2.

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

Burner system:

a. Open all pressure tap(s) A.

b. Measure and note the static pressure at Tap A for all the burners.

c. If all the measured static pressures are within 0.3" w.c. (0.75 mbar) of each other, then proceed to the next section. If the variation is greater than 0.3" w.c. (0.75 mbar) it will be necessary to adjust the manual air butterfly valve at each burner to improve the balance.

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

4. Repeat the proceeding for other zones (if any).
Step 3: Set Low Fire Air

1. Set the system to low fire.

2. Connect the manometer to tap A (air inlet pressure tap).

3. Adjust the automatic zone air control valve until the low fire static air pressure is 0.2" w.c. This is the initial setting only. Further adjustment may be required.

4. Repeat 2 and 3 for the other zones (if any).

Step 4: Verify the Air Settings

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

Step 5: Ignite the Burners

**WARNING**

- This procedure assumes that a flame monitoring control system is installed and is serviceable. It also assumes that normal low fire start is being used. If low fire gas is too low to be used for ignition, refer to options in “Set the Bypass Pilot Gas (Optional)” on page 14.

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. Adjust the ratio regulator as required for low fire.

5. Open manual gas cock at each burner.

6. Initiate the ignition sequence through the flame monitoring control system.

7. Check that all the burners in the zone have ignited. If all the burners have ignited, drive the combustion air butterfly valve to high fire. Verify flame is present at each burner. If burners do not light, increase the gas flow by adjusting the ratio regulator, repeat step 6.

8. Recheck the high fire air settings.

**NOTE:** As application temperature increases, pressure will change. Depending on control method, readjustment of the manual combustion air butterfly valve may be necessary.
Step 6: Set High Fire Gas (Figure 4.4)

1. Use the gas curve from the appropriate ThermJet PCA datasheet for the gas being used to find the differential gas pressure needed at high fire. This is the target value for high fire.

2. Connect the manometer to taps B and D (across the gas orifice).

3. Measure the high fire differential gas pressure for the first burner.

4. Adjust the gas butterfly valve at the burner until the gas flow is at the target value.

5. Repeat 3 thru 4 for the other burners in the zone.

6. Check the gas pressure at the inlet to the zone ratio regulator. This should be at least 5" w.c. (12.5 mbar) higher than the loading line pressure. It should not exceed the maximum pressure rating of the ratio regulator.

   **WARNING**

- Insufficient gas inlet pressure may cause the proportionator to remain fully open as the burner system turns down from high fire, causing excess fuel operation and possible accumulation of unburned fuel in the chamber. In extreme cases, this may cause explosions or fires.

---

Step 7: Set Low Fire Gas

1. Drive the system to low fire.

2. Use the gas curve from the appropriate ThermJet PCA datasheet for the gas being used to determine the differential gas pressure required for low fire. This is your target value for low fire.

3. Measure the gas pressure at the first burner.

4. Adjust the ratio regulator until the gas flow is on the target value.

   **NOTE:** It is very difficult to measure the very low pressures experienced at low fire, and it may be necessary to rely on visual inspection. This is especially true when gas turndowns in excess of 10:1 are being used. The main intent is to provide a clean stable flame with a good flame signal that will not cause the furnace temperature to overshoot.

If the pressure required is too low to be measured, adjust the ratio regulator until a gas flow is obtained that will provide a clean stable flame with a strong flame signal.

---

Step 8: Verify the Gas Settings

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

---

Step 9: Readjust Settings

As application temperature increases, setting may vary. Recheck and readjust as temperatures increase.

   **NOTE:** When all the settings have been completed, mark the position of the indicator on the butterfly valves to indicate valve position.

---

Set the Bypass Pilot Gas (Optional)

1. Set the system to low fire.

2. Make sure that the blower is on.

   **WARNING**

- Before you perform this procedure, make sure the flame monitoring control system is working.

3. Use the flame monitoring control system to start the ignition and the bypass pilot gas for all the burners in the zone.
4. Adjust the manual butterfly valve in the bypass line until you obtain reliable ignition within the required trial for ignition time limit.

5. Repeat 4 for all the other burners and zones (if any).

**Start Procedure**

1. Start the blower.

2. Open all the gas cocks.

3. Start the ignition sequence.

4. Verify that flame is present at each burner.

---

**DANGER**

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

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

---

**Stop Procedure**

1. Close the following valves:
   - The manual gas cock for each burner or zone
   - The manual gas cock at the main control valve
   - All the manual shut-off valves in the gas line upstream of the burner gas cock

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.

---

**NOTICE**

- Keeping the blower on after the burner is off protects the burner and the other components from hot gases that flow back through the burner.
This chapter is divided into two sections:

- Maintenance procedures
- Troubleshooting guide

**Maintenance**

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. The following are suggestions for a monthly list and a yearly list.

**NOTE:** The monthly list and yearly lists are an average interval. If your environment is dirty, the intervals may be shorter.

**Monthly Checklist**

1. Test (leak test) safety shut-off valves for tightness of closure.
2. Test air pressure switch settings by checking switch movements against pressure settings and comparing with actual impulse pressure.
3. Visually check ignition cable and connectors.
4. Inspect impulse piping for leaks.
5. Clean and inspect all the burners.
6. Make sure that the following components are not damaged or distorted:
   - burner nozzle
   - spark plugs
   - flame sensors
   - flame tube or combustion block
7. If applicable, remove and clean all the orifice plates.

**Yearly 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 spark plugs and check proper gap.
5. Check valve motors and control valves for free, smooth action and adjustment.
6. Check for proper operation of the ventilating equipment.
7. Test the interlock sequence of all safety equipment; manually make each interlock fail, noting that related equipment closes or stops as specified by the manufacturer.
8. Test flame monitoring control system by manually shutting off gas to burner.
9. Test main fuel hand-valves for operation.
10. Clean or replace the combustion air blower filter.

**Troubleshooting Procedures**

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<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
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<td>Air pressure switch has not made contact</td>
<td>Check air pressure switch adjustment. Check air filter. Check blower rotation. Check outlet pressure from blower.</td>
</tr>
<tr>
<td></td>
<td>High gas pressure switch has tripped</td>
<td>Check incoming gas pressure. Adjust gas pressure if necessary. Check pressure switch setting and operation.</td>
</tr>
<tr>
<td></td>
<td>Low gas pressure switch has tripped</td>
<td>Check incoming gas pressure. Adjust gas pressure if necessary. Check pressure switch setting and operation.</td>
</tr>
<tr>
<td></td>
<td>Malfunction of flame monitoring control system such as shorted out flame sense or electrical noise in the sensor line</td>
<td>Have a qualified electrician investigate and rectify.</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>----------</td>
</tr>
<tr>
<td>Cannot initiate start sequence</td>
<td>Purge cycle not completed</td>
<td>Check flame monitoring control system or purge timer.</td>
</tr>
<tr>
<td></td>
<td>Main power is off</td>
<td>Make sure power is on to control system.</td>
</tr>
<tr>
<td></td>
<td>No power to control unit</td>
<td>Call qualified electrician to investigate.</td>
</tr>
<tr>
<td>Start-up sequence runs but burner does not light</td>
<td>No ignition: There is no power to the ignition transformer</td>
<td>Restore power to the ignition transformer.</td>
</tr>
<tr>
<td></td>
<td>No ignition: Open circuit between the ignition transformer and the spark plug</td>
<td>Repair or replace the wiring to the spark plug.</td>
</tr>
<tr>
<td></td>
<td>No ignition: The spark plug needs cleaning</td>
<td>Clean the spark plug.</td>
</tr>
<tr>
<td></td>
<td>No ignition: The spark plug is not correctly grounded to the burner</td>
<td>Clean the threads of the spark plug and the burner. Do not apply grease to the thread of the spark plug.</td>
</tr>
<tr>
<td></td>
<td>Too much gas: Improper gas valve train sequence</td>
<td>Verify solenoid valve is down-stream of proportionator.</td>
</tr>
<tr>
<td></td>
<td>Too much gas: Manual gas butterfly valves have been opened too far</td>
<td>Check pressures and settings against start-up report and adjust as necessary.</td>
</tr>
<tr>
<td></td>
<td>Too much gas: Gas pressure out of the main gas pressure regulator is too high</td>
<td>Check start-up setting. If necessary, remove regulator and investigate.</td>
</tr>
<tr>
<td></td>
<td>Not enough gas: The gas pressure out of the main gas pressure regulator is too low</td>
<td>Check start-up setting. Check regulator and adjust if necessary.</td>
</tr>
<tr>
<td></td>
<td>Not enough gas: Start gas solenoid valve does not open</td>
<td>Check solenoid valve coil for proper orientation. Replace if necessary.</td>
</tr>
<tr>
<td></td>
<td>Not enough gas: Gas valve not open</td>
<td>Check wiring to the automatic gas shut-off valve.</td>
</tr>
<tr>
<td></td>
<td>Not enough gas: Air in the gas line</td>
<td>Check output from the flame safeguard. Open gas cock. Purge gas line.</td>
</tr>
<tr>
<td>The low fire flame is weak or unstable</td>
<td>Low fire adjusted too slow</td>
<td>Increase low fire gas setting.</td>
</tr>
<tr>
<td></td>
<td>Not enough gas</td>
<td>Check start-up settings and adjust to increase low gas flow.</td>
</tr>
<tr>
<td></td>
<td>Not enough air</td>
<td>Check start-up settings. Investigate any change, i.e. blocked filter, loose connections.</td>
</tr>
<tr>
<td>The burner goes off when it cycles to high fire</td>
<td>Insufficient air (flame too rich)</td>
<td>Check start-up settings. Check air filter, clean or replace if required.</td>
</tr>
<tr>
<td>The burner is erratic and does not respond to adjustment</td>
<td>Flame signal weak</td>
<td>Check condition of flame monitoring device.</td>
</tr>
<tr>
<td></td>
<td>Internal damage to the burner. Some parts inside the burner may be loose or dirty</td>
<td>Contact Eclipse.</td>
</tr>
<tr>
<td>The burner is unstable or produces soot or smoke</td>
<td>The air/gas ratio is out of adjustment</td>
<td>Measure all gas pressures and air pressures. Compare to initial start-up settings, and adjust them where necessary.</td>
</tr>
<tr>
<td>Cannot achieve full capacity</td>
<td>Air filter is blocked</td>
<td>Clean or replace the air filter.</td>
</tr>
<tr>
<td></td>
<td>Gas pressure is too low into the main gas pressure regulator</td>
<td>Adjust gas pressure.</td>
</tr>
<tr>
<td></td>
<td>Increase furnace/chamber pressures</td>
<td>Re-check setup pressures.</td>
</tr>
<tr>
<td></td>
<td>Poor piping practices</td>
<td>Contact Eclipse.</td>
</tr>
</tbody>
</table>
## Appendix

### Conversion Factors

#### Metric to English

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply By</th>
</tr>
</thead>
<tbody>
<tr>
<td>cubic meter (m³)</td>
<td>cubic foot (ft³)</td>
<td>35.31</td>
</tr>
<tr>
<td>cubic meter/hr (m³/h)</td>
<td>cubic foot/hr (cfh)</td>
<td>35.31</td>
</tr>
<tr>
<td>degrees Celsius (°C)</td>
<td>degrees Fahrenheit (°F)</td>
<td>(°C x 1.8) + 32</td>
</tr>
<tr>
<td>kilogram (kg)</td>
<td>pound (lb)</td>
<td>2.205</td>
</tr>
<tr>
<td>kilowatt (kW)</td>
<td>BTU/hr</td>
<td>3414</td>
</tr>
<tr>
<td>meter (m)</td>
<td>foot (ft)</td>
<td>3.28</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>inches water column (&quot;w.c.&quot;)</td>
<td>0.401</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>pounds/sq in (psi)</td>
<td>14.5 x 10⁻³</td>
</tr>
<tr>
<td>millimeter (mm)</td>
<td>inch (in)</td>
<td>3.94 x 10⁻²</td>
</tr>
<tr>
<td>MJ/m³ (normal)</td>
<td>BTU/ft³ (standard)</td>
<td>2.491 x 10⁻²</td>
</tr>
</tbody>
</table>

#### Metric to Metric

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply By</th>
</tr>
</thead>
<tbody>
<tr>
<td>kiloPascals (kPa)</td>
<td>millibar (mbar)</td>
<td>10</td>
</tr>
<tr>
<td>meter (m)</td>
<td>millimeter (mm)</td>
<td>1000</td>
</tr>
<tr>
<td>millibar (mbar)</td>
<td>kiloPascals (kPa)</td>
<td>0.1</td>
</tr>
<tr>
<td>millimeter (mm)</td>
<td>meter (m)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

#### English to Metric

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Multiply By</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTU/hr</td>
<td>kilowatt (kW)</td>
<td>0.293 x 10⁻³</td>
</tr>
<tr>
<td>cubic foot (ft³)</td>
<td>cubic meter (m³)</td>
<td>2.832 x 10⁻²</td>
</tr>
<tr>
<td>cubic foot/hour (cfh)</td>
<td>cubic meter/hour (m³/h)</td>
<td>2.832 x 10⁻²</td>
</tr>
<tr>
<td>degrees Fahrenheit (°F)</td>
<td>degrees Celsius (°C)</td>
<td>(°F - 32) ÷ 18</td>
</tr>
<tr>
<td>foot (ft)</td>
<td>meter (m)</td>
<td>0.3048</td>
</tr>
<tr>
<td>inch (in)</td>
<td>millimeter (mm)</td>
<td>25.4</td>
</tr>
<tr>
<td>inches water column (&quot;w.c.&quot;)</td>
<td>millibar (mbar)</td>
<td>2.49</td>
</tr>
<tr>
<td>pound (lb)</td>
<td>kilogram (kg)</td>
<td>0.454</td>
</tr>
<tr>
<td>pounds/sq in (psi)</td>
<td>millibar (mbar)</td>
<td>68.95</td>
</tr>
<tr>
<td>BTU/ft³ (standard)</td>
<td>MJ/m³ (normal)</td>
<td>40.14</td>
</tr>
</tbody>
</table>