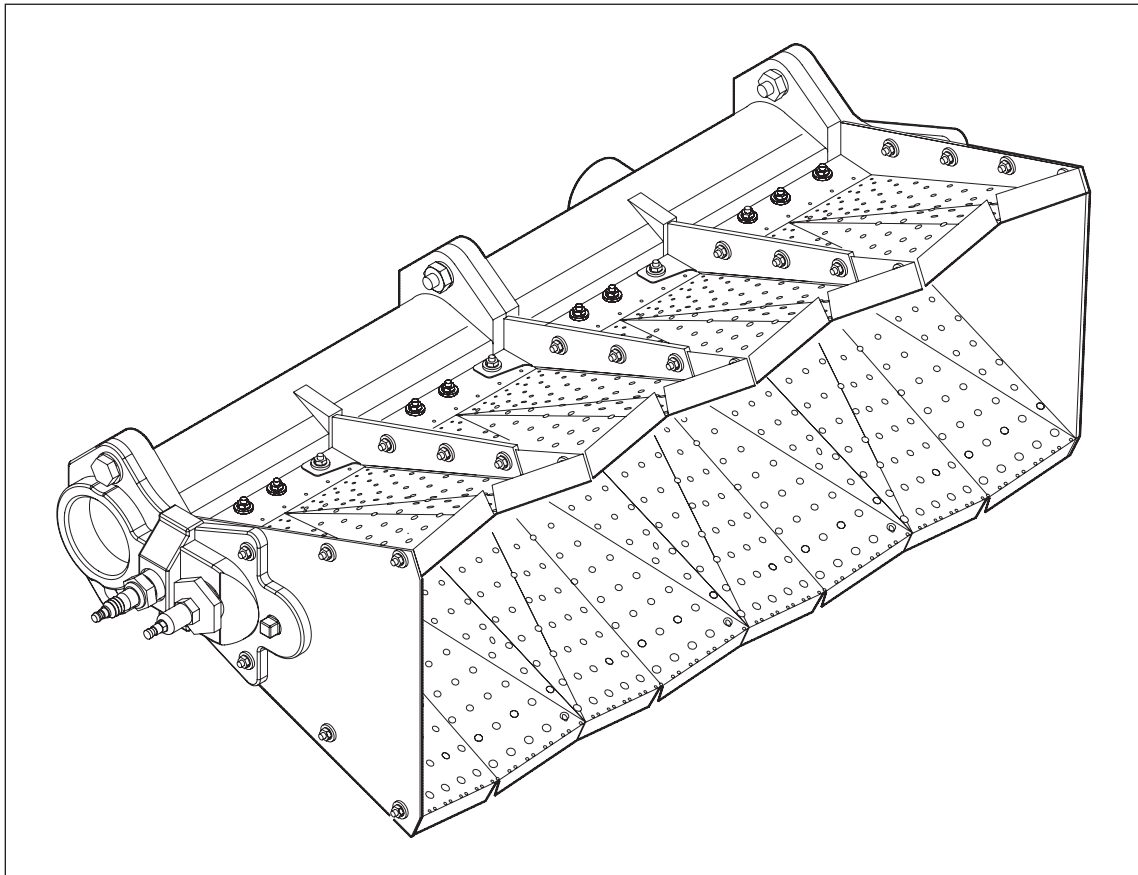


Eclipse AirHeat

Burners

AH-MA Series

Version 2



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It must be understood that Eclipse's liability for its product, whether due to breach of warranty, negligence, strict liability, or otherwise is limited to the furnishing of replacement parts and Eclipse 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, or damage to material arising in connection with the sale, installation, use of, inability to use, or the repair or replacement of Eclipse'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 those persons who are already familiar with all the aspects of an air heat burner and its add-on components, also referred to as “the burner system”. These aspects are:

- Design/selection
- Installation
- Use
- Maintenance

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

AH-MA PUBLICATIONS

Installation Guide No. I60

- This publication.

Data Sheet No. I60

- Required to complete design calculations.

Design Guide No. I60

- Used with Data Sheet to complete design calculations.

Price Sheet No. I60

- Used to order burners.

RELATED PUBLICATIONS

- EFE-825 (Combustion Engineering Guide)
- Eclipse Bulletins & Instruction Manuals: 818, 820, 826, 832, 852, 854, 856

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 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>



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Adjustment, Start & Stop

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Maintenance & Troubleshooting

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Introduction

1

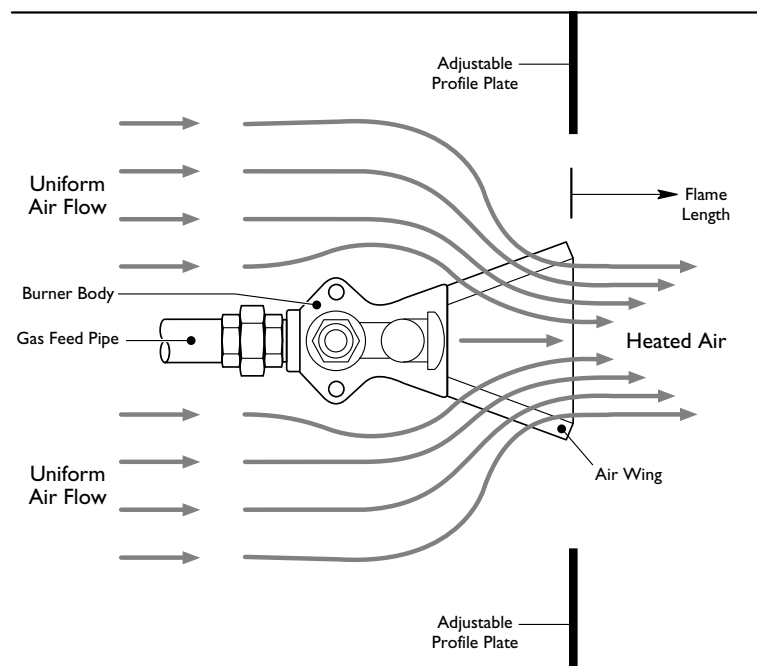
PRODUCT DESCRIPTION

Eclipse AH-MA v2.10 Air Heat burners produce a uniform, odorless, and smokeless flame ideal for heating fresh air in make-up and process air heating applications. The AH-MA design provides stable operation over a wide range of velocities, inputs, and fuels.

AH-MA v2.10 burners are line type burners constructed of cast iron or aluminum burner bodies and diverging stainless steel air wings. The burner bodies supply fuel to the center of the air wings to control the air and fuel mixture inside the burner and to optimize emissions and efficiency. Completely corrosion resistant design options are available using aluminum burner bodies or electroless nickel plated cast iron burner bodies.

The AH-MA v2.10 Air Heat burner is assembled from straight sections, tees, and crosses to produce nearly any configuration required. Large burners can be built as a combination of staged, individually controlled sections to increase turndown.

Figure 1.1 AH-MA v2.10 Air Heat Burner



Safety

2

INTRODUCTION

SAFETY

In this section, you will find important notices about safe operation of a burner system. Read this entire manual before you attempt to start the system. If you do not understand any part of the information in this manual, then contact your Eclipse representative or the Eclipse factory before you continue.



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. You can cause fires and explosions.

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



Warning:

The burner and duct sections are 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 limited design purpose. Do not deviate from any instructions limits in this manual without written advice from Eclipse.

SAFETY (CONTINUED)



Warning:

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.

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 within ductwork.



Note:

Information in Data Sheet No. 160 is necessary to complete some of the procedures.

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 three factors: 1) burner design, 2) system design and 3) the control method that you choose. All three factors are considered in the “System Design” chapter of the AH-MA Air Heat Burner Design Guide No. 160. Use the information in that chapter to build your system.

APPROVAL OF COMPONENTS

Limit controls and safety equipment

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

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

APPROVAL OF COMPONENTS (CONTINUED)

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 also 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 also be acceptable to the local authority with 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 Pfingsten Road
Northbrook, IL 60062

The FM Standards are available from:

1151 Boston-Providence Turnpike
P.O.Box 9102
Norwood, MA 02062

The CGA Standards are available from:

55 Scarsdale Road
Toronto, Ontario
Canada M3B 2R3

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

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

CHECKLIST BEFORE INSTALLATION

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

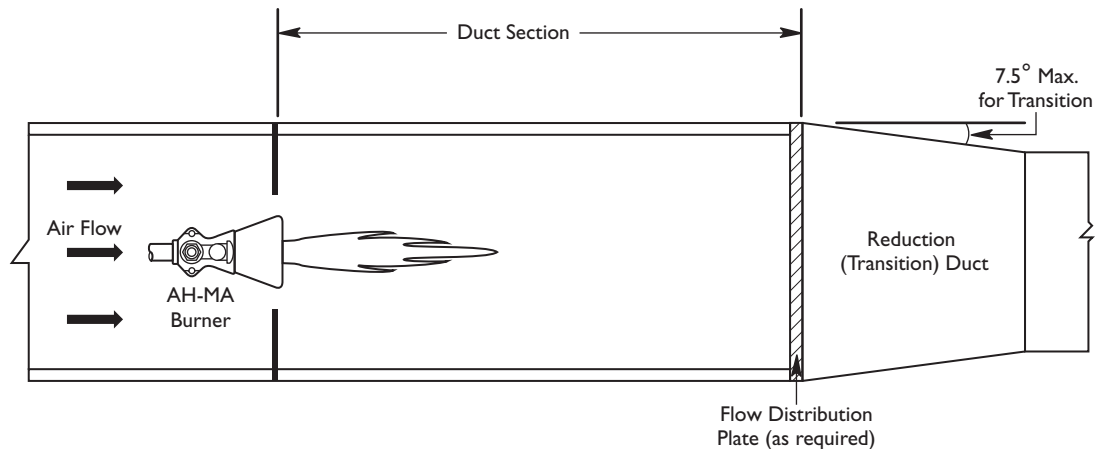
Make sure that the local environment matches the original operating specifications. Check the following items:

- 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.

DUCT CONFIGURATION

When laying out the duct, allow enough length downstream of the burner to avoid flame impingement; see page 3 of the Data Sheet No. 160 for flame lengths. To improve temperature uniformity, this distance should be increased or a flow distribution plate used, as shown in Figure 3.1.

Figure 3.1 Duct Configuration



Note:

Use the following distances between the burner and transition duct when temperature uniformity is essential: For rectangular ducts: either the width or height of one duct section (whichever is greater), or For circular ducts: the diameter of one duct section.

SUSPENDING THE BURNER

Eclipse AH-MA v2.10 Air Heat burners must be securely supported to avoid misalignment of the burner in the duct; see Figure 3.2 on the next page for support examples.



Caution:

Supports should allow for thermal expansion of the burner and duct as the temperature of the components increase. Piping expansion joints should be used outside of the duct to accommodate movement of the duct section when heated.



Caution:

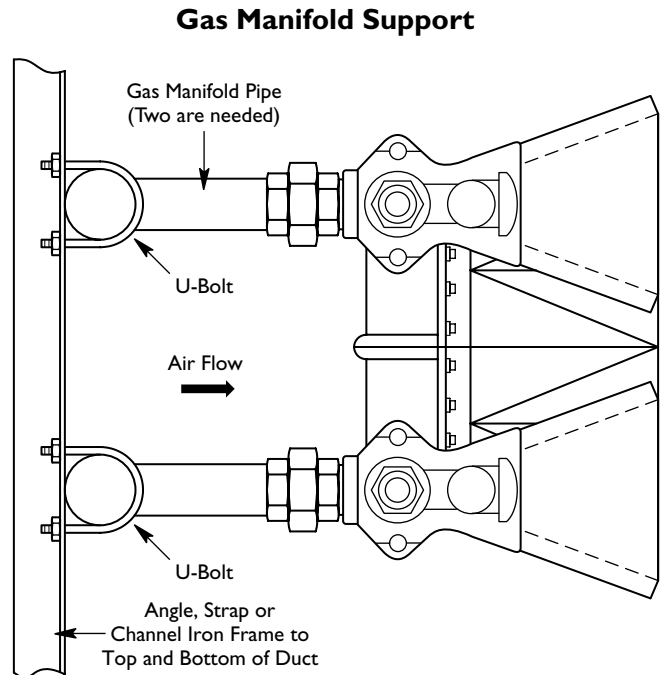
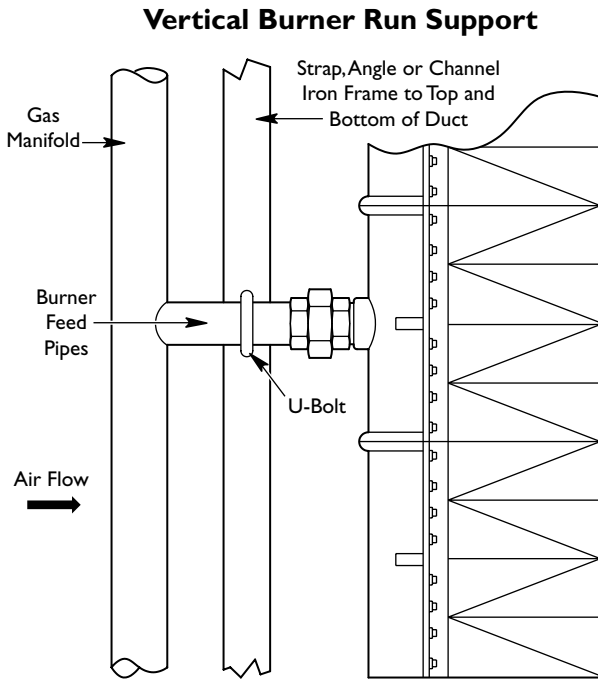
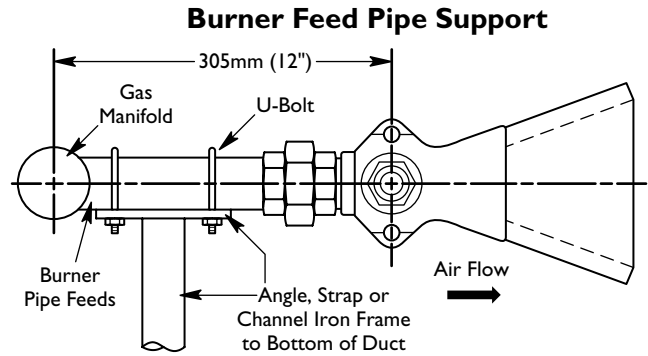
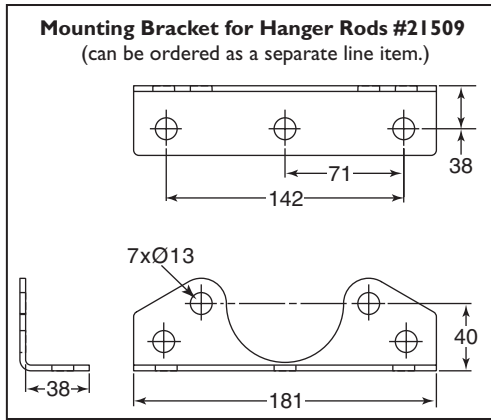
Avoid large obstructions in the air flow from supports, causing uneven air flow into the burner. Use low profile supports such as flat iron to minimize flow disturbances.

SUSPENDING THE BURNER (CONTINUED)

Figure 3.2 Burner and Pipe Support Examples



Note:
On pipe or manifold support examples, locate the main support as close as possible to the burner assembly's center of gravity to minimize the load.



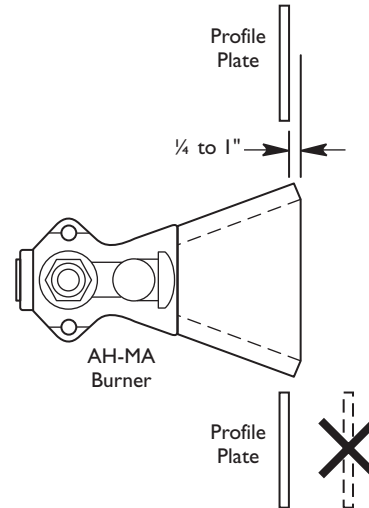
PREPARE THE BURNER

There are several components that must be installed to a burner system before it can operate. Instructions to do that follow below.

Adjust the Profile Plates

Profile plates should be adjusted to their initial position; see Figure 3.3.

Figure 3.3 Profile Plate Positioning



Caution:

Profiles plate should be positioned upstream of the firing end of the burner. If necessary, the plates can be located up to 1" back from the firing end, but under no circumstances should they be in front of the burner.

Install the Flame Sensor

1. Depending on the chosen flame sensor, locate and install it into the corresponding opening located in the end plate as shown in Figure 3.4.
2. Make sure that you connect the flame sensor of a burner to the electrical circuit of the burner.

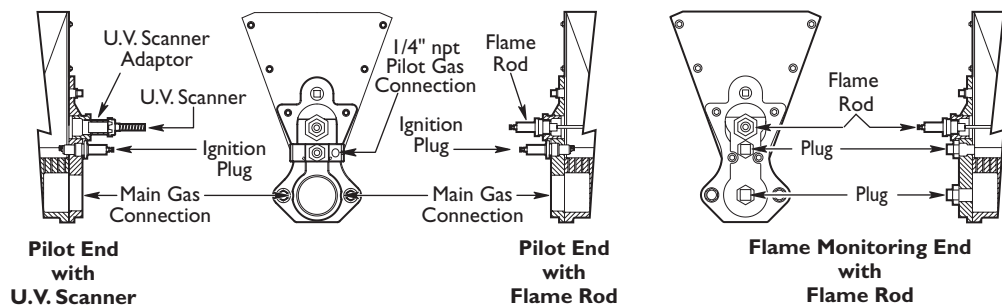


Danger:

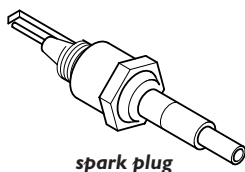
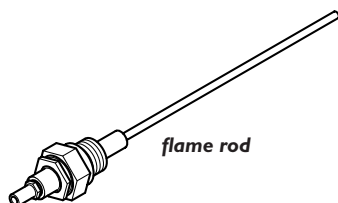
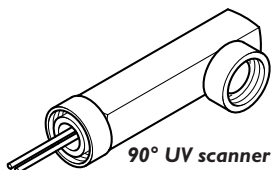
If you connect the flame sensor of a burner to the electrical circuit of the wrong burner, then you can cause fires and explosions.

Figure 3.4 End Plate Examples

(shown with optional UV, flame rod & spark plug installed)



PREPARE THE BURNER (CONTINUED)



PIPING

There are two different types of flame sensors:

1. UV scanner:

For detailed information on how to install and connect a UV scanner, refer to:

- Bulletin/Instruction Manual 854 for straight UV scanners
- Bulletin/Instruction Manual 852 for 90° UV scanners
- Bulletin/Instruction Manual 856 for self-check UV scanners

2. Flame rod:

For detailed information on how to install and connect a flame rod, refer to Bulletin/Info Guide 832.

Install the Spark Plug

Install the spark (ignition) plug into the appropriate opening of the end plate as shown in Figure 3.4.



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.

Piping Layout

Install all piping as shown in Figure 3.5.

Support the piping

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

Pipe connections

1. Install a pipe union in the line to each burner. This simplifies removal of the burner.
2. The use of flexible pipe nipples in gas lines to the burner is optional. Flexible nipples can absorb stresses due to heat expansion.
3. Flexible pipe nipples may cause higher pressure drops than equivalent standard pipes. Consider that when you size the air lines.
4. Install pressure taps in the main and pilot gas lines as shown at left.

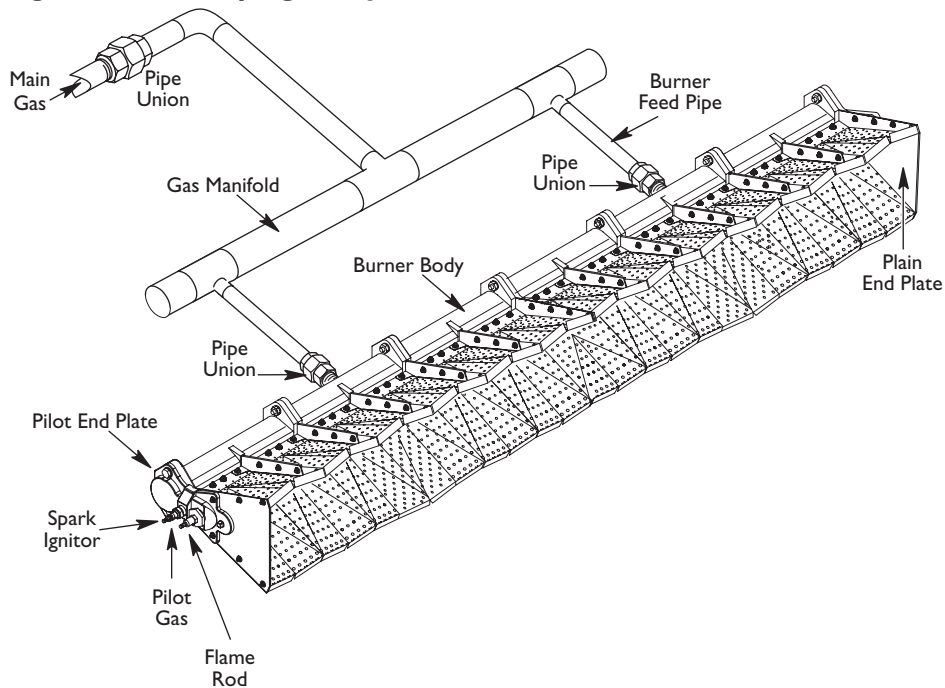
Avoid large pressure drops



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.

Figure 3.5 Gas Piping & Layout



CHECKLIST AFTER INSTALLATION

To make sure that the system is installed correctly, do the steps that follow:

1. Make sure that there are no leaks in the gas lines.
2. Make sure that the blower rotates in the correct direction. If incorrect, then have a qualified electrician rewire the blower to reverse its rotation.
3. Set the air proving switch.
4. Set the low gas pressure switch at 4" w.c. below the gas pressure that you measure at the inlet to the main gas valve train.
5. Set the high gas pressure switch at 4" w.c. above the gas pressure that you measure at the inlet to the main gas valve train.
6. Close all the burner gas cocks.
7. Trip out pressure switches and other limit interlocks. Make sure that the main gas valves close.



Danger:

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

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 features. You can cause fires and explosions.

Obey the safety precautions in the Safety chapter.

ADJUSTMENT PROCEDURE



Note:

Adjustment requires two manuals: this Installation Guide and Data Sheet No. 160. This chapter refers to component information which is found in Data Sheet No. 160.

Step 1: Reset the system

Read all of this chapter before starting your system.

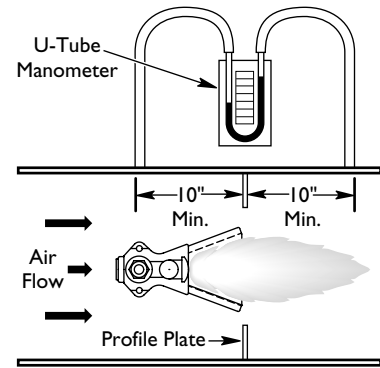
If you are adjusting the burner system for the first time, then you must follow these steps:

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

Close the automatic gas valves and the gas cocks.

Step 2: Set air pressure drop

1. Start the main fan on the make-up or process air unit.
2. Set the fan inlet damper or profile plates to produce the desired pressure drop across the burner. Air pressure drop can be read as a differential pressure across the burner using a U-Tube manometer as shown at right.



Step 3: Verify the air settings

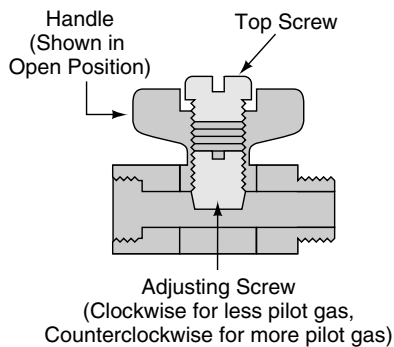
Make sure that all the settings are still the same after you cycle the system several times between high fire and low fire. Check air proving switch and adjust if necessary.



Note:

Test spark ignitor with a visual or audible check before attempting ignition.

Step 4: Ignite pilot



Pilot Adjusting Valve

1. Set system to operate on pilot only. See the literature included with the flame monitoring relay.
2. Set pilot regulator to 6" w.c. outlet pressure.
3. Open the pilot adjusting valve 3-4 turns. (P/N 12659 ordered separately.)
4. Initiate start sequence and ignite the pilot.



Note:

Initially it may be necessary to repeat step 4 two or three times to purge air out of the gas pipework.

5. Trim pilot with adjustable gas cock to obtain flame just inside air wings.



Note:

The pilot flame should be a bushy, blue flame inside the first one-fourth of the air wings. This flame should provide a stable pilot with good flame signal readings sufficient to energize the main gas valve.

Step 5: Ignite the burner



Note:

This procedure assumes that automatic flame safety is installed and is serviceable.

1. Make sure the supply air fan is running.
2. Adjust the main gas regulator to supply the minimum pressure required; see Data Sheet No. I 60 for gas pressure drop and measurement information.
3. Verify that the main gas control valve is at its minimum open position (5°).
4. Light the pilot.
5. Open all manual fuel shut-off valves.
6. Initiate the ignition sequence through the flame safety.
7. Check that the pilot and then burner flames have ignited.



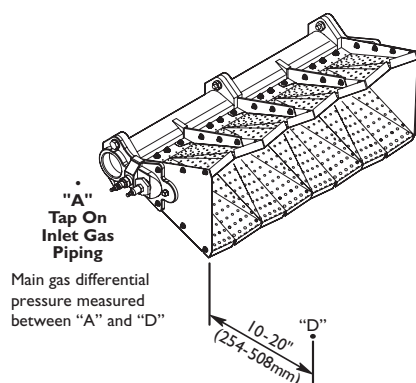
Note:

The input required to ignite the main burner will be more than the minimum input capability of the burner given in Data Sheet No. I 60. Nominally, an input of 50,000 Btu/hr/ft. is required for ignition of the main burner.

Step 6: Adjust low fire gas

If necessary, adjust the main gas control valve's minimum open position until the low fire flame is tight against the base of the burner body and is uniform along the length of the burner.

Step 7: Adjust high fire gas



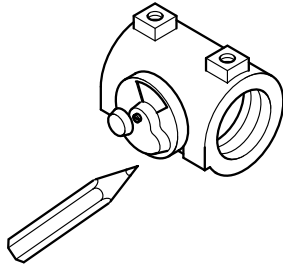
1. Drive the main gas control valve to high fire.
2. Measure the gas pressure drop at high fire and compare to the appropriate chart in Data Sheet No. I 60. If the maximum input is not achieved or is too high while the main gas control valve is fully open, two adjustments can be made:
 - a. The manual butterfly valve in the gas line can be adjusted open or closed, or
 - b. The main gas pressure regulator can be adjusted higher or lower.



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.

Step 8: Verify gas settings



START PROCEDURE

1. Once the high and low fire conditions have been set, cycle the burner from high to low fire several times to check repeatability of settings.
2. Shut down the burner and relight to ensure automated pilot and main flame ignition operates correctly.
3. Check all safety interlocks and limits to ensure proper operation.
4. make sure that all the settings are still the same after you cycle the system several times between high fire and low fire.
5. 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.

1. Start the air supply fan.
2. Open all the gas cocks.
3. Start the automatic ignition sequence.



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.

4. Make sure that you can see the flame in the burner system.

If the burner system does not light and does not shut down automatically, close the main gas cock manually. DO NOT operate the system. Go to “Checklist after Installation” on page 16 and verify the steps. After that, repeat the start procedure.

If the burner system does not light and shut downs automatically, see the troubleshooting section in the next chapter.

STOP PROCEDURE

To stop the close the following valves:

- The manual gas cock for the burner
- The manual gas cock at the main control valve
- All of the manual shut-off valves in the gas line upstream of the burner gas cock.

Maintenance & Troubleshooting

5

INTRODUCTION

This section is divided into two parts:

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

MAINTENANCE

Preventative maintenance is the key to a reliable, safe and efficient system. The following are suggested guidelines for periodic maintenance. Burners in severe environments or operational conditions should be checked more frequently.



Note:

The monthly and yearly lists are an average interval. If your environment is dirty, then the intervals may be shorter. Check with local authorities having jurisdiction on their recommended maintenance schedules.



Caution:

Turn off power to burner and controls before proceeding with burner inspection.

MONTHLY CHECKLIST

1. Inspect flame-sensing devices for good condition and cleanliness.
2. Test all alarms for proper signals.
3. Check ignition spark electrode operation and check proper gap.
4. Check all valve motors and control valves for free, smooth action and adjustment.
5. Test interlock sequence of all safety equipment and 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.
6. Test all manual fuel valves for operation.
7. Check filters on main air fan for cleanliness.
8. Check gas filter or strainers.

YEARLY CHECKLIST

1. Test (leak test) safety shut-off valves for tightness of closure.
2. Test pressure switch settings by checking switch movements against pressure settings.
3. Visually check ignition cable and connectors.
4. Inspect gas injection holes and burner mounting structure.
5. Check profile plate position against final position from initial setup.
6. Check all screws and bolts holding air wings to each other and to the burner bodies.
7. Inspect both sides to ensure no air holes are blocked and that there is no build up of foreign material on the wings.
8. Inspect air wings for distortion and bending. Excessive distress may indicate a non-uniform pressure drop/velocity or operation outside of the recommended limits on input and velocity. Replace air wings as necessary.

TROUBLESHOOTING GUIDE

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|------------------------------------|--|--|
| Cannot initiate start-up sequence. | Air pressure switch has not made contact: <ul style="list-style-type: none"> • Air flow too low. • Air pressure switch incorrectly set. • Air pressure drop measured incorrectly. | Check air flow and investigate any changes. Check air pressure switch adjustment. Move pressure taps on duct to a better location |
| | High gas pressure switch has tripped: <ul style="list-style-type: none"> • Gas pressure too high. • Gas pressure switch set too low. | Check incoming gas pressure against initial settings; adjust as required. Adjust setting to be approximately 4" w.c. above gas pressure. |
| | Low gas pressure switch has tripped: <ul style="list-style-type: none"> • Gas pressure too low. • Gas pressure switch set too high. | Check incoming gas pressure against initial settings; adjust as required. Adjust setting to be approximately 4" w.c. below gas pressure. |
| | Purge cycle not completed. | Check flame safeguard system or purge timer |
| | Main power is off. | Make sure power is on to control system |
| | No power to control unit | Call qualified electrician to investigate. |
| | Malfunction of flame safeguard system: <ul style="list-style-type: none"> • Flame sensor shorted out. • Electrical noise in sensor line. • Unit is broken. | Ensure flame rod element is not touching burner; check UV sensor and wiring. Shield or separate sensor lines from high voltage. Call qualified electrician to investigate. |

TROUBLESHOOTING GUIDE (CONTINUED)

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|---|---|---|
| Start-up sequence runs but pilot does not light. | No spark: <ul style="list-style-type: none"> No power to ignition transformer. Open circuit between the ignition transformer and the spark plug. Spark plug has carbon build-up. Spark plug not correctly grounded. Spark plug gap is incorrect. | Have electrician investigate. Repair or replace wiring to spark plug. Clean or replace spark plug. Clean spark plug threads. Do not apply grease or pipe compound to pipe threads. Set gap to specifications. |
| | Not enough pilot gas: <ul style="list-style-type: none"> Pilot gas regulator set too low. Gas pressure into pilot regulator too low. Pilot gas cock closed. Pilot solenoid valve does not open. Gas adjusting valve set too low. Air in the gas line. Gas is leaking from pilot end plate. | Check incoming gas pressure against initial settings; increase as necessary. Check outgoing gas pressure of main regulator; increase as necessary. Open pilot gas cock. Have qualified electrician check power supply to solenoid Adjust gas flows Repeat start-up several times to purge air out of gas lines. Check bolts and tighten as necessary. |
| | Too much gas. | Trim pilot gas adjusting valve. |
| Start-up sequence runs, pilot lights but main burner does not light. | No flame rod or UV signal. | Check wiring and control logic. |
| | Not enough main gas <ul style="list-style-type: none"> Main gas regulator set too low. Gas pressure into main regulator too low. Main gas cock closed. Main safety shut-off valve does not open. Gas adjusting valve set too low. Air in the gas line. | Check outgoing gas pressure of main regulator; increase as necessary. Check incoming gas pressure against initial settings; increase as necessary. Open all gas cocks. Have qualified electrician check power supply and safety circuitry. Adjust gas flows. Repeat start-up several times to purge air out of gas lines. |
| | Too much gas. | Trim pilot gas adjusting valve. |
| Pilot ignites but flame safeguard shuts down burner Burner kicks out shortly after start-up. | No flame rod or UV signal. | Check wiring and control logic. |
| | Low gas pressure switch is set too high. | Check and reset low pressure switch setting. |

TROUBLESHOOTING GUIDE (CONTINUED)

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|--|---|--|
| The low fire flame is weak and unstable. | <ul style="list-style-type: none"> • Not enough gas. • Too much air. • Poor distribution of main gas. • Poor air distribution | <p>Check startup settings and adjust to increase gas flow.</p> <p>Check air pressure drops/velocities across the burner and adjust.</p> <p>Ensure proper number of gas feeds are used. Ensure manifold is sized properly. Refer to Design Guide No. I60 for recommendations.</p> <p>Check profiling and duct configuration</p> |
| Burner does not go to high fire. | <ul style="list-style-type: none"> • Not enough gas pressure into main gas regulator. • Gas pressure drops as input is increased. • Main gas control valve is not functioning. | <p>Adjust pressure regulator so pressure is provided at burner as specified in this manual</p> <p>Check for clogging of valves and regulators in gas line.</p> <p>Check actuator and linkage.</p> |
| Main flame is uneven along the length of the burner. | <ul style="list-style-type: none"> • Air pressure drop/velocity is too low. • Poor air distribution. • Air wings are dirty, holes are clogged. • Poor distribution of main gas. | <p>Increase air pressure drop.</p> <p>Check profiling and duct obstructions</p> <p>Inspect and clean the air wings if necessary.</p> <p>Ensure proper number of gas feeds are used. Ensure manifold is sized properly; refer to Design Guide No. I60 for recommendations.</p> |
| Main flame is too large at high fire. | <ul style="list-style-type: none"> • Gas pressure too high at burner inlet. • Air pressure drop/velocity too low. | <p>Check gas pressure against design. Adjust main gas pressure regulator, or adjust manual adjusting valve.</p> <p>Open air damper on main air blower or adjust profile plates</p> |
| Main flame does not achieve capacity. | <ul style="list-style-type: none"> • Air pressure drop/velocity is too high. • Burner is firing below rated input • Burner gas holes are plugged. | <p>Check pressure drop or velocity. Check air damper on main air blower.</p> <p>Check gas pressure differential. Adjust main gas pressure regulator as necessary.</p> <p>Inspect gas holes for dirt or lint; clean as needed.</p> |
| Main flame is yellow and long. | <ul style="list-style-type: none"> • Air pressure drop/velocity is lower than design. • Air wings are dirty, holes are clogged. | <p>Check pressure drop or velocity. Open air damper on main air blower.</p> <p>Inspect and clean the air wings if necessary.</p> |



Appendix

CONVERSION FACTORS

Metric to English.

| FROM | To | MULTIPLY BY |
|--------------------------------------|-------------------------------|-------------------------|
| cubic meter (m ³) | cubic foot (ft ³) | 35.31 |
| cubic meter/hour (m ³ /h) | cubic foot/hour (cfh) | 35.31 |
| degrees Celsius (°C) | degrees Fahrenheit (°F) | (°C × 1.8) + 32 |
| kilogram (kg) | pound (lb) | 2.205 |
| kilowatt (kW) | Btu/hr | 3414 |
| meter (m) | foot (ft) | 3.28 |
| millibar (mbar) | inches water column ("wc) | 0.401 |
| millibar (mbar) | pounds/sq in (psi) | 14.5 × 10 ⁻³ |
| millimeter (mm) | inch (in) | 3.94 × 10 ⁻² |

Metric to Metric.

| FROM | To | MULTIPLY BY |
|-------------------|-------------------|-------------|
| kiloPascals (kPa) | millibar (mbar) | 10 |
| meter (m) | millimeter (mm) | 1000 |
| millibar (mbar) | kiloPascals (kPa) | 0.1 |
| millimeter (mm) | meter (m) | 0.001 |

English to Metric.

| FROM | To | MULTIPLY BY |
|-------------------------------|--------------------------------------|--------------------------|
| Btu/hr | kilowatt (kW) | 0.293 × 10 ⁻³ |
| cubic foot (ft ³) | cubic meter (m ³) | 2.832 × 10 ⁻² |
| cubic foot/hour (cfh) | cubic meter/hour (m ³ /h) | 2.832 × 10 ⁻² |
| degrees Fahrenheit (°F) | degrees Celsius (°C) | (°F - 32) ÷ 1.8 |
| foot (ft) | meter (m) | 0.3048 |
| inches (in) | millimeter (mm) | 25.4 |
| inches water column ("wc) | millibar (mbar) | 2.49 |
| pound (lb) | kilogram (kg) | 0.454 |
| pounds/sq in (psi) | millibar (mbar) | 68.95 |

SYSTEM SUMMARY

Write down the settings for the burner system in the table that follows:

| GENERAL SYSTEM PARAMETERS | BURNER SETTINGS | |
|--------------------------------|--------------------------------------|----------|
| | HIGH FIRE | LOW FIRE |
| Customer: | Main gas pressure: | |
| Customer P.O.: | Air pressure from the blower: | |
| Customer signature: | Air pressure drop across the burner: | |
| Date: | Gas pressure drop across the burner: | |
| Furnace type: | Flame signal strength: | |
| Furnace temperature: | Flame length: | |
| Number of burners: | | |
| High fire input per burner: | | |
| Orifice sizes: | | |
| Operating voltage & frequency: | | |
| Altitude: | | |

ILLUSTRATED PARTS LIST-STRAIGHT SECTION

| Pos. No. | QTY. | PART NAME | PART No. |
|----------|------|------------------------------|----------|
| 1 | 4 | Straight Air Wing | 76501 |
| 2 | 2 | Air Wing Joint Bracket | 76507 |
| 3 | 2 | Air Wing Reinforcement Plate | 76505 |
| 4 | 1 | Plain End Plate | 76504 |
| 5 | 1 | Pilot End Plate | 76503 |
| 6 | 2 | End Plate Gasket | 76510 |
| 7 | 8 | Screw, M4 x 12, Hex Head | 20394 |
| 8 | 8 | Screw, M4 x 20, Hex Head | 20395 |
| 9 | 8 | Screw, M4 x 25, Hex Head | 20335 |
| 10 | 4 | Screw, M10 x 40, Hex Head | 20336 |
| 11 | 48 | Washer, M4, Flat | 90787 |
| 12 | 24 | Washer, M4, Lock | 20244 |
| 13 | 8 | Washer, M10, Flat | 90768 |
| 14 | 4 | Washer, M10, Lock | 15890 |
| 15 | 24 | Nut, M4 | 90786 |
| 16 | 4 | Nut, M10 | 15889 |
| 17 | 1 | Spark Plug | 13047-1 |
| 18 | 1 | Flame Rod | 13093 |
| 19 | 1 | UV Adapter, 1/2" | 202010 |
| 19 | 1 | UV Adapter, 3/4" | 202011 |
| 20* | 1 | Gas Cock, Adjustable 1/4" | 12695 |

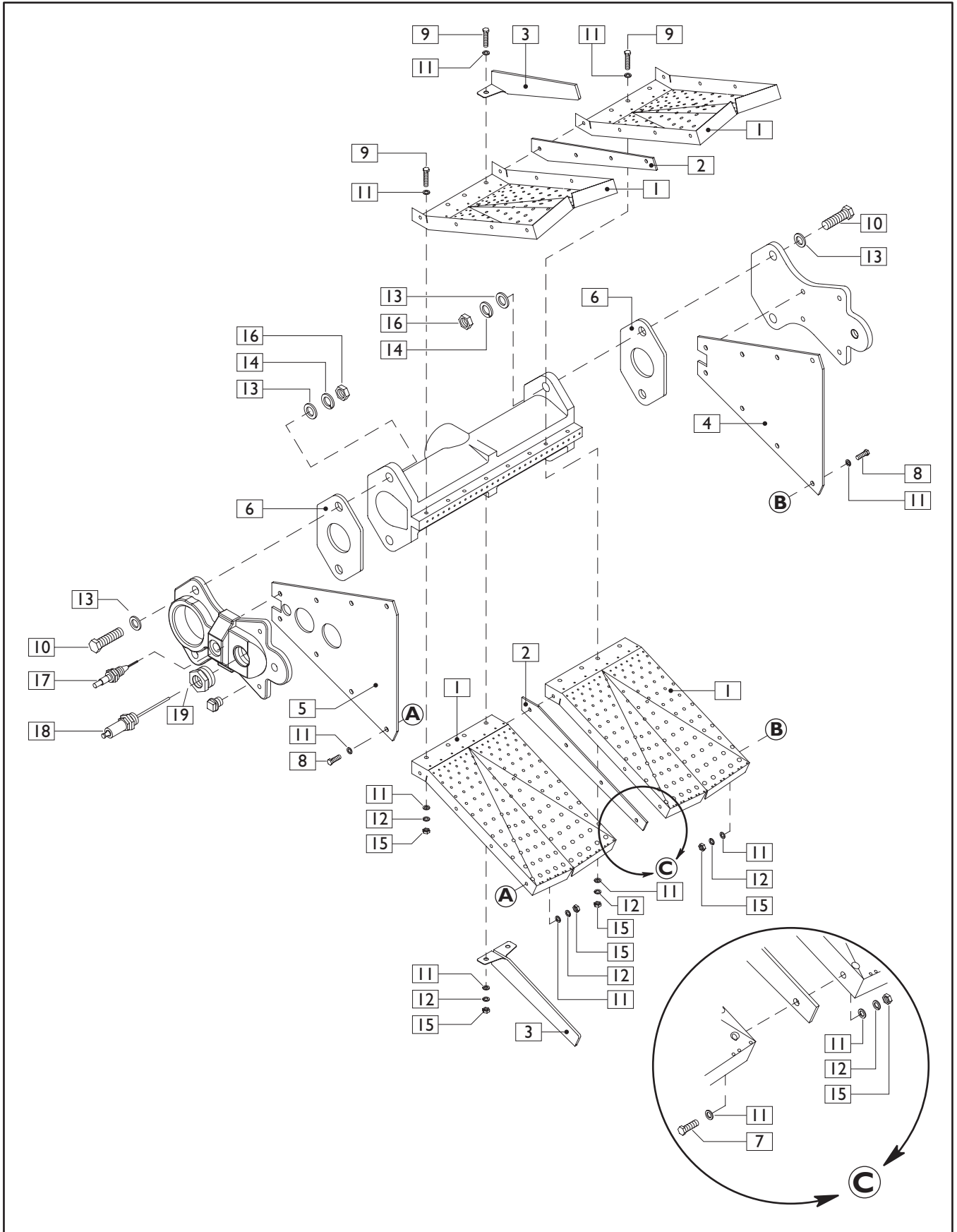
*Not Shown

RECOMMENDED SPARE PARTS— STRAIGHT SECTION

To make sure that the downtime of the system is as short as possible in case of a failure, you should keep a stock of spare parts.

Recommended spare parts

- Spark plug
- Flame rod
- UV scanner (if used)
- End plate gasket



ILLUSTRATED PARTS LIST-TEE SECTION

| Pos. No. | QTY. | PART NAME | PART No. |
|----------|------|------------------------------|----------|
| 1 | 2 | Straight Air Wing | 76501 |
| 2 | 2 | Tee Air Wing | 76502 |
| 3 | 1 | Air Wing Joint Bracket | 76507 |
| 4 | 1 | Air Wing Reinforcement Plate | 76505 |
| 5 | 1 | Plain End Plate | 76504 |
| 6 | 1 | Pilot End Plate | 76503 |
| 7 | 2 | End Plate Gasket | 76510 |
| 8 | 8 | Screw, M4 x 12, Hex Head | 20394 |
| 9 | 8 | Screw, M4 x 20, Hex Head | 20395 |
| 10 | 12 | Screw, M4 x 25, Hex Head | 20335 |
| 11 | 4 | Screw, M10 x 40, Hex Head | 20336 |
| 12 | 56 | Washer, M4, Flat | 90787 |
| 13 | 28 | Washer, M4, Lock | 20244 |
| 14 | 8 | Washer, M10, Flat | 90768 |
| 15 | 4 | Washer, M10, Lock | 15890 |
| 16 | 28 | Nut, M4 | 90786 |
| 17 | 4 | Nut, M10 | 15889 |
| 18 | 1 | Spark Plug | 13047-1 |
| 19 | 1 | Flame Rod | 13093 |
| 20 | 1 | UV Adapter, 1/2" | 202010 |
| 20 | 1 | UV Adapter, 3/4" | 202011 |
| 21* | 1 | Gas Cock, adjustable, 1/4"* | 12659 |

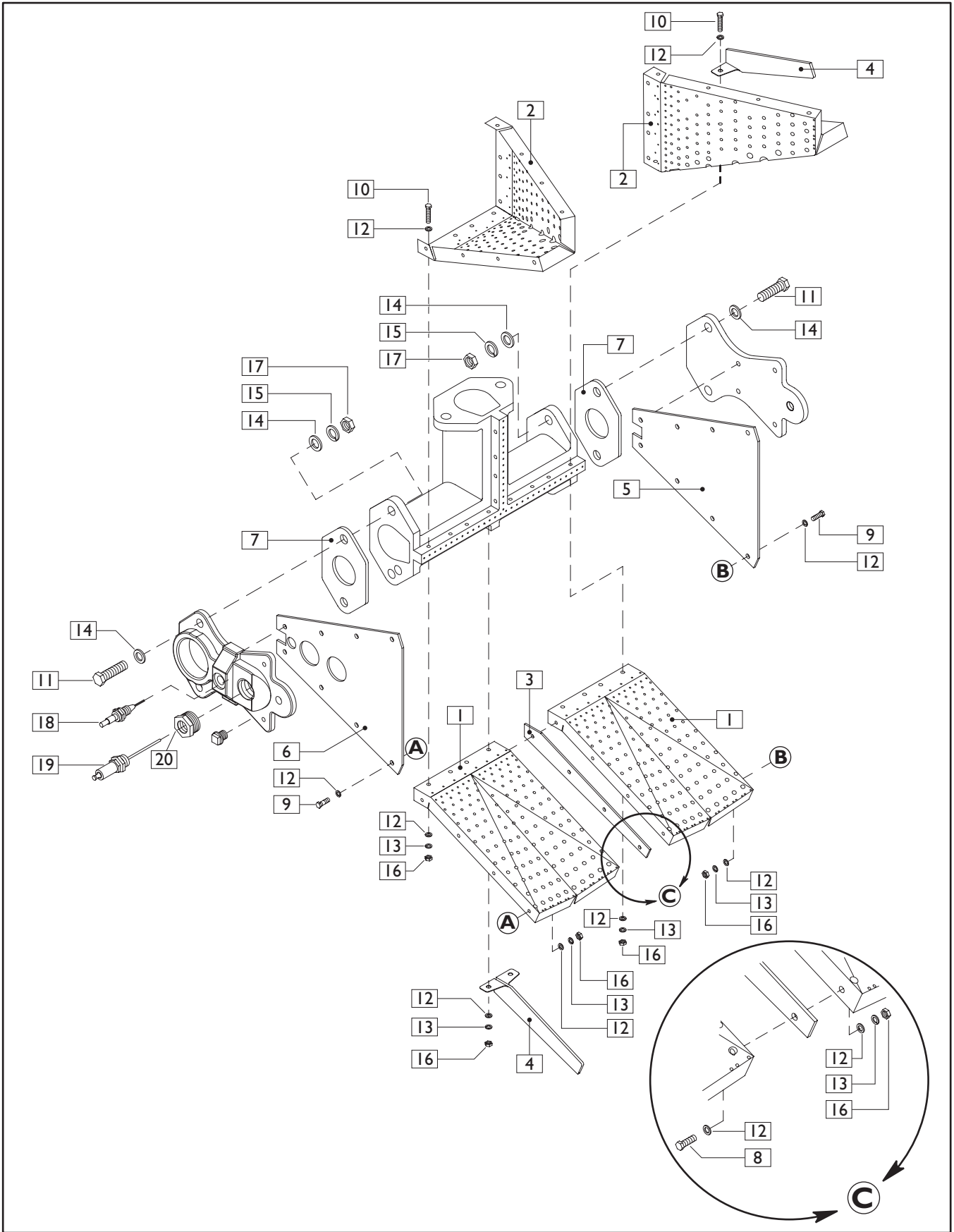
*Not Shown

RECOMMENDED SPARE PARTS— TEE SECTION

To make sure that the downtime of the system is as short as possible in case of a failure, you should keep a stock of spare parts.

Recommended spare parts

- Spark plug
- Flame rod
- UV scanner (if used)
- End plate gasket





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