



GLOBAL  
FINISHING  
SOLUTIONS



# GUL and BT Low NOx Series Air Heater

## Owner's Manual

**Document Number:** 239-098 rev 2  
Publication date 12/22/2021

*Read and keep this manual for future reference. All personnel operating the equipment described in this manual should review and understand all instructions before use.*

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# Introduction

## About Global Finishing Solutions LLC

### Leading the Industry in Paint Booth and Finishing System Technology

With decades of experience, Global Finishing Solutions is the leading manufacturer of paint booths and finishing systems for many industries, including automotive refinish, aerospace and defense, industrial manufacturing, woodworking, and large equipment. By combining high-quality components, strong relationships with paint manufacturers, and our experienced distribution network, GFS provides the best equipment and support to set your business up for success.

## Contacting Global Finishing Solutions

### General information

- Toll-free: 800-848-8738
- Fax: 715-597-2193
- Email: [info@globalfinishing.com](mailto:info@globalfinishing.com)
- Online: [www.globalfinishing.com](http://www.globalfinishing.com)

### Technical support

- Toll-free: 800-848-8738
- Fax: 715-597-8818
- Email: [techservices@globalfinishing.com](mailto:techservices@globalfinishing.com)

### Parts and filters

- Toll-free: 800-848-8738
- Fax: 888-338-4584
- Email: [parts@globalfinishing.com](mailto:parts@globalfinishing.com)

## Target audience

This document is intended for use by trained, experienced installers and maintenance technicians. If you have questions about the installation procedure described in this manual, contact GFS as described above.

## Conventions used in this manual

This section describes how information is presented, organized, and referenced within this manual.

### Safety notices

This manual uses the following standards to identify conditions related to safety hazards and equipment damage.

**Table 1. Safety notices**

Symbol	Description
<b>DANGER</b>	Indicates an imminent hazard that will result in death.
<b>WARNING</b>	Indicates a hazard that can result in serious personal injury or death.
<b>CAUTION</b>	Indicates a hazard that can result in personal injury.
<b>NOTICE</b>	Indicates a situation that can result in equipment or property damage, but poses no risk of personal injury.

### Information notices

In addition to the safety notices described above, this manual uses a boldface keyword to identify certain other types of information.

**Table 2. Information notices**

Keyword	Description
<b>NOTE</b>	Denotes general information that provides additional context or guidance.
<b>Important</b>	Denotes information to which you should pay special attention.
<b>Reference</b>	Directs you to related content in a separate document.
<b>Prerequisites</b>	Specifies other tasks that must be completed or conditions that must exist before you perform the current task.
<b>Scope</b>	Describes limitations to the current task or conditions under which the task applies or does not apply to the procedure.

# General safety

Follow all safety guidelines when assembling, operating, or servicing this product.

## **WARNING**

There are inherent hazards associated with the operation and service of this equipment. For your personal safety, observe all safety information. Failure to observe these safety practices can result in personal injury or death.

## **WARNING**

Operation and maintenance of this product must be performed properly by qualified personnel who observe the warnings in all documentation and notes provided with and on the product.

## **WARNING**

Follow all general standards for installation and safety for work on installations. Follow all good practices for the proper use of lifting tackle and equipment. The use of protective equipment such as safety goggles and protective footwear must be considered.

## **WARNING**

All persons who will operate, service, inspect, or otherwise handle this product must read and understand the safe operating practices, safety precautions, and warning messages in this documentation.

## **WARNING**

The roofs of GFS equipment are not designed or intended to be walked upon or to support weight of any kind. As designed and manufactured, equipment roofs do not meet the minimum requirements of a safe walking and/or working surface under OSHA 1910.22. Under no circumstances should the roof be used by maintenance personnel or others for walking, standing, or storage of any kind. When necessary, roof access should be secured through the use of a properly supported platform that satisfies the minimum load requirements specified by ASCE 7 (Minimum Design Loads and Associated Criteria for Buildings and Other Structures) and ASCE 37 (Design Loads on Structures during Construction). Additionally, personnel should always utilize appropriate fall safety protocols when using an elevated platform. Use of the roof in a contrary manner may result in injury and/or death.

## **WARNING**

Comply with OSHA guidelines and with all applicable local electrical, safety, and fire codes and standards.

## **WARNING**

All field wiring provided must comply with local codes or, in the absence of local codes, the National Electrical Code (NFPA 70).

## **WARNING**

Electrical installation should be completed by a qualified electrician. Installation must meet all applicable national, state, and local electrical codes.

## **WARNING**

Ensure that all electrical components are grounded to a central ground.

**WARNING**

Disconnect and lock out the main electrical service before installing, adjusting, or servicing the product.

**WARNING**

Lockout the main gas shutoff valve before maintenance or inspection of the air heater.

**WARNING**

Guards and covers that prevent contact with electrically energized or moving parts are required and must not be removed or left open during operation.

**WARNING**

Local fire and building codes require fire protection. Check with local inspector authorities for requirements.

**CAUTION**

Read and save these instructions before attempting to install, operate, or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage. Retain these instructions for future reference.

**CAUTION**

This manual contains statements that relate to worker safety. Read this manual thoroughly and comply as directed. Operate this equipment in accordance with the guidelines set forth in this manual. It is impossible to list all potential hazards of this equipment. Instruct all personnel involved with this equipment in the safe conduct and operation of the system. GFS recommends that only qualified personnel operate and maintain this equipment.

**CAUTION**

Safety signs, panels, and labels that are normally affixed to the product must be replaced immediately if illegible or missing.

**CAUTION**

New or replacement parts that are installed during repair or maintenance must include all safety signs, panels, and labels as specified by the manufacturer. These must be affixed to the new or replacement parts as specified by the manufacturer.

**CAUTION**

Where applicable, use earplugs or take other safety measures for hearing protection.

**NOTICE**

product must be installed and serviced only by a trained, qualified service technician. Incorrect installation may void the warranty.

**NOTICE**

If you have questions about the warranty, please contact your distributor prior to contacting GFS.

# Air heater safety

## **WARNING**

All equipment must be operated and maintained in accordance with local, state, and federal (OSHA) requirements governing occupational safety, fire protection, and air heater operations. Operators must read and understand GFS and included independent equipment and/or component manufacturer's instructions prior to use. **Disclaimer:** GFS is not responsible for any injury, illness, or property damage that results from not abiding by local, state, or federal (OSHA) requirements that govern occupational safety, fire protection, and air heater operations. GFS is also not responsible for any injury, illness, or property damage that is the result of not adhering to GFS and/or independent equipment/component operating, service, maintenance, and/or installation requirement's or directives.

## **WARNING**

Refer to the air heater nameplate to determine the minimum and maximum gas supply pressure for the air heater. The inlet gas pressure must not exceed the pressure indicated on the nameplate.

## **WARNING**

Install the air heater in compliance with locally enforced codes and standards.

## **WARNING**

Install the manual emergency shut-off valve in an appropriate location to allow access to the valve to shut off the fuel process heater in the case of a fire or explosion at the heater.

## **WARNING**

Gas piping must be installed to conform with local building codes, or in the absence of local codes, the latest edition of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54). In Canada, gas piping must be installed in accordance with CAN/CGA-B149.1 for natural gas units and CAN/CGA-B149.2 for propane units.

## **WARNING**

A fire suppression system is required by the International Fire Code and NFPA 33. A fire suppression system is not supplied with this equipment.

## **WARNING**

On air heaters that recirculate room air, outside ventilation air must be provided in accordance with the information shown on the air heater nameplate.

## **WARNING**

Fuel bleeds and vents must be vented outdoors.

## **WARNING**

Treat used filters and any other paint-contaminated items as flammable products and dispose of them safely.

**WARNING**

Improper disposal of used filters may cause spontaneous combustion. You must consult local authorities for proper storage and disposal requirements. Guidelines include:

- Immediately remove all contaminated filters.
- Discard filters to a safe, detached location, place them in a noncombustible container with tight-fitting lid, or place them in a water-filled metal container to prevent a possible fire hazard.
- Disposal varies depending on the type of paint that is being captured. Consult local authorities for storage and disposal requirements.

**WARNING**

If you smell gas:

1. Open windows.
2. **Do not** touch electrical switches.
3. Extinguish any open flames.
4. Immediately call your gas service provider.

**CAUTION**

Become familiar with all controls before operating or servicing this air heater.

**NOTICE**

The GUL/BT Low NOx air heater is intended to be used with GFS auto refinish paint booths and prep stations. The air heater must be interlocked with a powered exhaust system to prevent over pressurization when the heat system is operating at its rated capacity.

**NOTICE**

GFS recommends storing crates indoors pending installation. If you must store crates outside, protect crates and their contents from moisture to prevent damage to equipment.

**NOTICE**

Install the control panel per NFPA 70 and local codes and standards.

**NOTICE**

Failure to anchor the air heater structure to the floor properly may result in structural damage.



# Air heater description

Designed for indoor installation, direct-fired GUL2000 and BT1200 Low NOx air heaters draw fresh outside air over a gas-fired burner. The air heaters are designed to elevate the temperature inside the booth to provide a comfortable atmosphere for applying paint, followed by a higher temperature cure cycle. Low NOx burners are designed to produce lower nitrogen oxide emissions than a standard burner.



# Air heater installation

## Air heater location requirements

### WARNING

The top, back, and front surfaces of this heater may not be installed less than 6 inches from combustible materials.

### NOTE

The following clearances are required to perform air heater operation and maintenance procedures:

- Clear space of 3 feet is required for access to the control panel.
- Clear space of 2 feet is required on the side of the heater to access the filters.
- Clear space of 1-1/2 feet is required at the rear of the GUL air heater for access to the exhaust motor.
- Clear space around the exhaust stack large enough to access the BT air heater fan and clean out door for inspection and maintenance.

## Air heater ventilation requirements

### NOTE

BT/GUL Low NO<sub>x</sub> air heaters are intended to be used with GFS automotive refinish paint booths and CTOF booths. The air heater must be interlocked with a powered exhaust system to prevent over pressurization when the heat system is operating at its rated capacity.

- Recirculation of room air may be hazardous in the presence of:
  - Flammable solids, liquids, and gases
  - Explosive materials (e.g. grain dust, coal dust, gunpowder, etc.)
  - Substances that may be toxic when exposed to heater (e.g. refrigerants, aerosols, etc.)
- Recirculation is not recommended in uninsulated buildings where the outside temperatures fall below 32° F (0° C).
- Excessive recirculation or insufficient ventilation air, which results in inadequate dilution of the combustion products generated by the heater, may create hazardous concentrations of carbon dioxide, carbon monoxide, nitrogen dioxide, and other combustion products in the heated space.
- If gas fork trucks or other fossil fuel powered equipment are utilized in the conditioned area, additional ventilation requirements for the facility must be addressed separately.
- The heater inlet shall be located in accordance with the applicable building code provisions for ventilation air.
- Field constructed intake accessories should be properly designed to minimize the entry of snow and rain.
- All ventilation air to the heater shall be ducted directly from the outdoors.

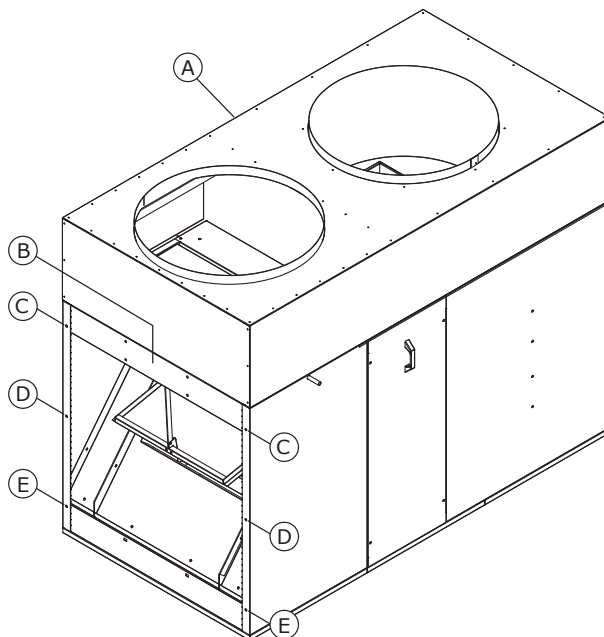
## ***If applicable: Install the GUL air heater***

**Scope:** This task applies only if the booth uses a GUL air heater. If this booth uses a BT air heater, perform “*If applicable: Install the BT air heater*” (page 12).

**Prerequisites:** The air heater footprint must already be marked on the floor.

### **Reference:**

- Refer to the Air Heater page of the Design Drawings and to the diagram below while completing this task.
- Refer to the booth installation manual for additional context and procedures.



**A:** Filter section of GUL air heater

**B:** Channel brace

**C:** Channel-brace bolts (upper bolts for connecting filter section to blower section)

**D:** Center bolts for connecting filter section to blower section

**E:** Lower bolts for connecting filter section to blower section

1. Remove the channel brace from the filter section (the larger of the two base sections) and set it aside.
2. Prepare the blower section (the smaller of the two base sections):
  - a. Remove the two access doors from the blower section and set them aside.
  - b. Remove the filters from the blower section and set them aside.

### **NOTE**

Place the filters in a location where they are protected from dirt and moisture.

3. Orient the filter section and blower section so that the open ends face each other; then slide the filter section and blower section together.
4. Slide the channel brace back into position between the filter section and the blower section; then reinstall the two bolts that secure the channel brace.

**NOTE**

The bolts connect the filter section and the blower section to each other, with the channel brace in between.

5. Install four additional bolts (two center, two lower) to connect the filter section to the blower section.
6. Replace the filters in the blower section.

**NOTE**

These filters may be removed during the startup and commissioning process to check motor rotation and damper function.

7. Reinstall the access doors on the blower section.
8. Place the assembled base in its designated position (denoted by the air heater footprint marked on the floor).

**NOTE**

Be sure to orient the assembled base appropriately for the intended booth layout.

9. Ensure that the assembled base is level front-to-back and side-to-side.
10. Build the discharge hood as directed on the Discharge Hood Assembly page of the Design Drawings.
11. Place the assembled discharge hood on top of the air heater's burner section and bolt it into position.
12. Place the burner section (with discharge hood assembly installed) on top of the base and bolt it into position.

## ***If applicable: Install the BT air heater***

**Prerequisites:** The air heater footprint must already be marked on the floor.

**Reference:**

- Refer to the Air Heater page of the Design Drawings while completing this task.
  - Refer to the booth installation manual for additional context and procedures.
1. Place the air heater's base section in its designated position (denoted by the air heater footprint marked on the floor).

**NOTE**

Be sure to orient the base appropriately for the intended booth layout.

2. Ensure that the base section is level front-to-back and side-to-side.
3. Build the discharge hood as directed on the Discharge Hood Assembly page of the Design Drawings.
4. Place the assembled discharge hood on top of the air heater's burner section and bolt it into position.
5. Place the burner section (with discharge hood assembly installed) on top of the base and bolt it into position.

## Install gas piping

### WARNING

Gas piping must be installed to conform with local building codes, or in the absence of local codes, the latest edition of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54). In Canada, gas piping must be installed in accordance with CAN/CGA-B149.1 for natural gas units and CAN/CGA-B149.2 for propane units.

### WARNING

Refer to the air heater nameplate to determine the minimum and maximum gas supply pressure for the air heater. The inlet gas pressure must not exceed the pressure indicated on the nameplate.

### WARNING

Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

### WARNING

Fuel bleeds and vents must be vented outdoors.

1. Match the incoming pipe near the heater to the connection on the outside of the air heater. BT/GUL Low NOx air heaters are equipped with a 1-inch diameter gas train.

### NOTE

Avoid multiple taps in the gas supply so the unit has a steady supply of gas at all times.

2. Install a ground joint union with brass seat and a manual shut-off valve external to the air heater casing.

### NOTE

Install the union adjacent to the unit for emergency shut-off and easy servicing of controls.

3. Provide a sediment trap before the air heater gas train.
4. Blow out the gas line to remove debris before making connections.
5. Before starting the air heater, purge the lines to remove air.
6. Install the manual shut-off in an easily-accessible location in case of a fire or explosion at the heater.

## Install electrical wiring

### WARNING

Electrical installation should be completed by a qualified electrician. Installation must meet all applicable national, state, and local electrical codes.

### WARNING

Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

### WARNING

An electric disconnect switch with adequate ampacity must be installed in accordance with the National Electrical Code NFPA 70. Refer to the marking on the heater for voltage and ampacity.

**NOTICE**

Ensure that the power source is compatible with the requirements of your equipment. The heater nameplate identifies the proper phase and voltage of the motor.

**Reference:** Refer to instructions in the Electrical Drawings.

1. Before connecting the heater to the building power source, verify that the power line wiring is de-energized.
2. Secure the power cables to prevent contact with sharp objects.

**NOTE**

Do not kink power cables and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.

3. Check the fan wheel for free rotation.
4. Make sure that the interior of the heater is free of loose debris or shipping materials.
5. If necessary, the original wire supplied with the heater may be replaced with type TW wire or equivalent.

# Air heater operation

**WARNING**

Do not operate the air heater unless all of the filters are in place and the access doors are closed.

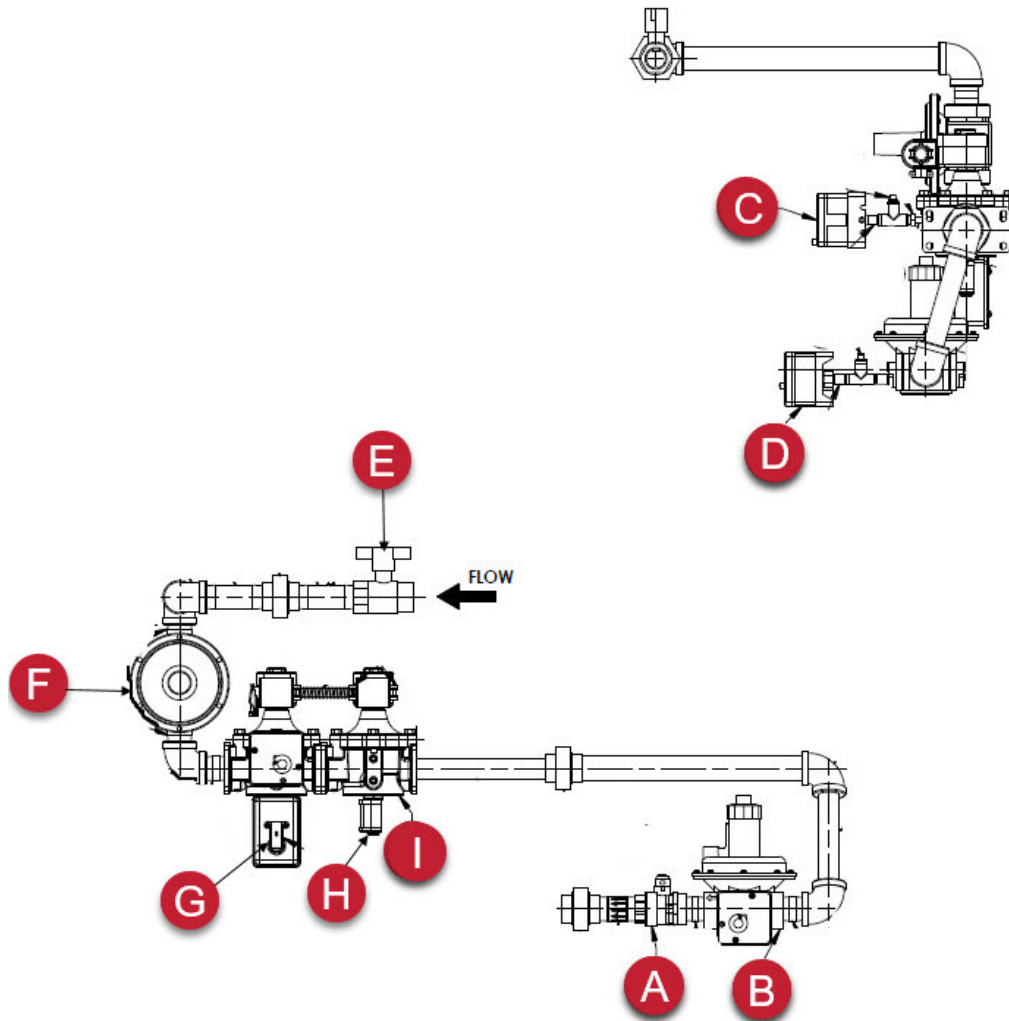
**WARNING**

Do not enter the booth during or immediately after the cure cycle. GFS air heaters are supplied with a variable length cool down cycle. The cool down cycle will purge contaminants from the space and cool the vehicle to avoid burn hazards.

The operator interface terminal houses the touchscreen and/or pushbutton controls the operator uses to control the booth. Starting the booth, painting, curing, stopping, and shutting down the booth are described in the control panel operator manual for your booth model.

## Air heater gas trains

Refer to the illustrations below for gas train components for BT/GUL Low NOx air heaters.



- A:** 1-inch quick mount actuated ball valve
- B:** Ratio regulator
- C:** Low-gas pressure switch manual reset
- D:** High-gas pressure switch manual reset
- E:** 1-inch NPT T-handle ball valve
- F:** 1-inch NPT regulator
- G:** Proof of closure
- H:** Visual indicator
- I:** 1-inch double gas shutoff valve assembly

**Figure 1.** Low NOx burner 1000 series gas train (used on GUL and BT air heaters)



## Natural gas to propane conversion

All BT/GUL Low NOx air heaters come with a natural gas orifice installed that can be replaced with a liquid propane orifice to convert the burner to use propane fuel.

Air heaters burning propane will use the LP orifice. This component will be shipped loose with the air heater (along with a conversion label and service bulletin) and must be installed in the gas train prior to operation. See Table 3 for orifice and heater specifications.

### NOTE

The conversion to propane affects the minimum and maximum inlet pressures.

**Table 3. BT1200 Forced Dry/BT1200 Recirc/GUL2000 specifications with Low NOx burner 1000 series**

Maximum Air-flow Rate	Gas Train Diameter	Fuel	Maximum Firing Rate	Minimum Inlet Pressure	Maximum Inlet Pressure	Temperature Rise at Maximum Air-flow Rate
12,541 CFM	1 inch	Natural Gas	1,000,000 BTU/hr	5 inch w.c.	14 inch w.c.	77 °F
		Propane	1,000,000 BTU/hr	Contact GFS	Contact GFS	77 °F
15,205 CFM	1 inch	Natural Gas	1,000,000 BTU/hr	5 inch w.c.	14 inch w.c.	62 °F
		Propane	1,000,000 BTU/hr	Contact GFS	Contact GFS	62 °F

### ***If applicable:* Replace the Low NOx burner orifice**

**Scope:** Complete this procedure to convert the air heater to burn propane fuel instead of natural gas, if required by the site.

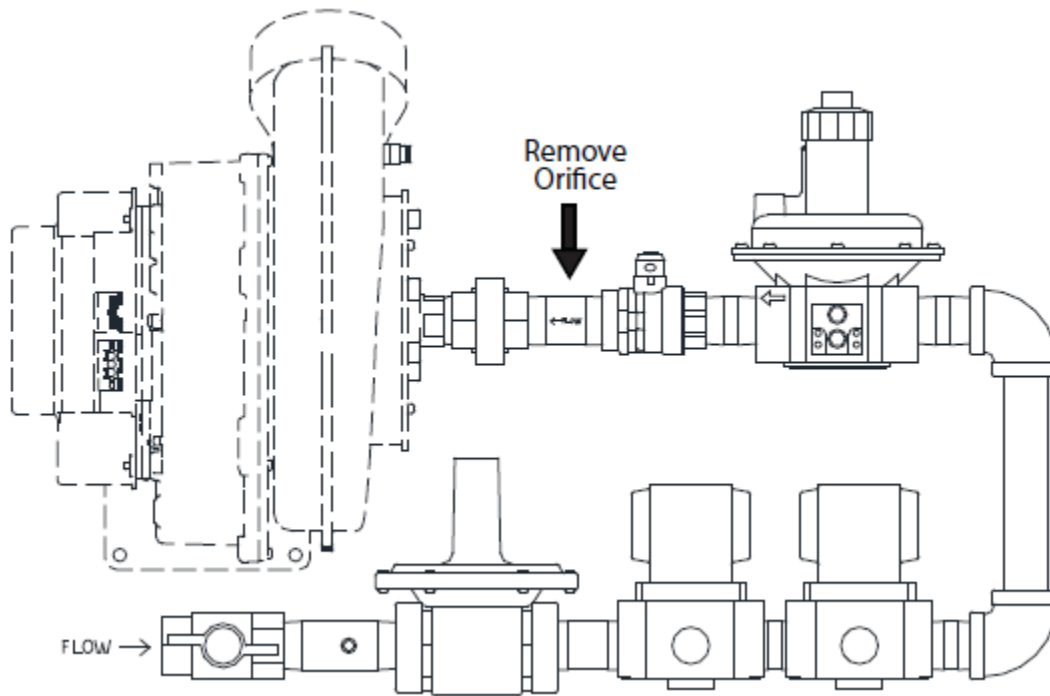
**Reference:** Refer to the Midco natural gas to propane fuel conversion service bulletin for more detailed information.

### **DANGER**

Before attempting service, turn off gas to burner and turn off power to the burner and at the burner disconnect switch. Failure to do so could result in personal injury or death.

### **WARNING**

This conversion kit must be installed by a qualified service agency in accordance with the following instructions and all applicable codes and requirements of the authority having jurisdiction. If these instructions are not followed exactly, a fire, an explosion or production of carbon monoxide may result causing property damage, personal injury, or loss of life. The qualified service agency is responsible for the proper installation of the conversion kit. The installation of the conversion kit is not proper and complete until the operation of the converted appliance is checked as specified in the appliance manufacturers instructions and the burner installation instructions.



**Figure 2. Low NOx 1000 series gas burner orifice**

1. Remove the orifice closest to the burner and replace it with the orifice supplied in the conversion kit.

**NOTE**

Make sure the brass piece on the orifice is positioned on the side closest to the burner.

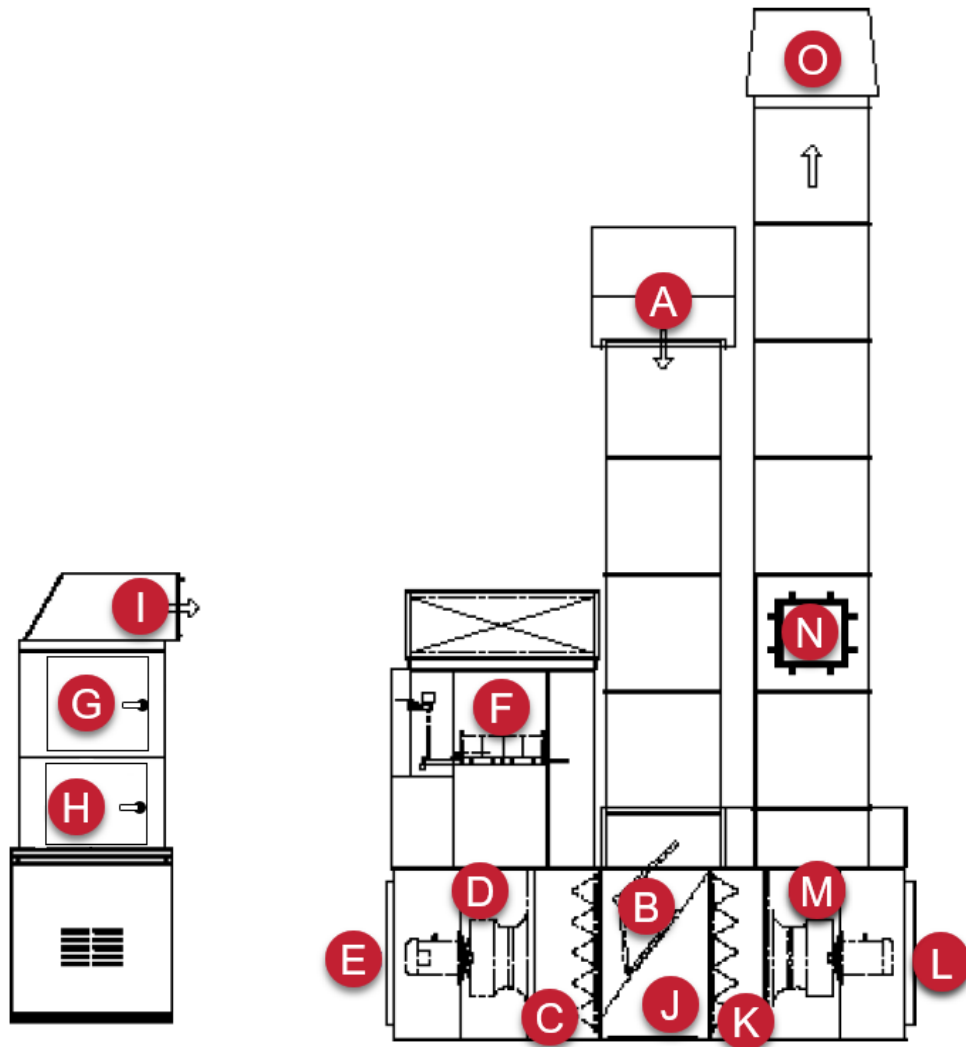
2. Make sure there are no gas leaks and restore electrical and gas supply to the burner.
3. Perform the initial startup and adjustment procedures.
4. Fill out the tags and labels provided in the conversion kit and apply them to the burner and control box.

# Maintenance schedule

The frequency of the following maintenance checks depend upon the material being sprayed (amount and kind). The booth operators and maintenance technicians should perform these checks at regular intervals to reduce fire hazards, maintain booth efficiency, prevent freshly painted objects from becoming blemished, and hinder booth corrosion and wear. Adjust the frequency of the checks according to local guidelines and actual usage.

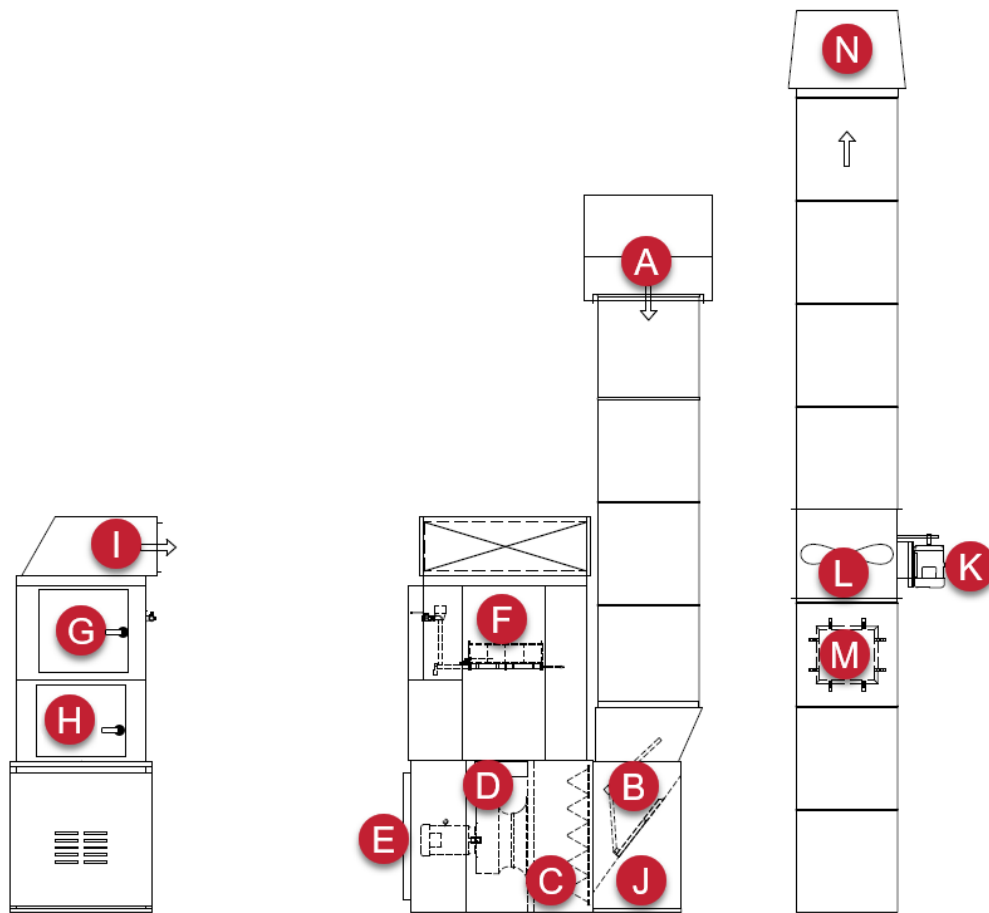
Complete the applicable air heater maintenance procedures at the intervals shown below. For full service procedures, refer to the air heater maintenance procedures later in this manual.

Items to Be Inspected and/or Cleaned	Daily	Monthly	Yearly
Check air heater and combustion air filters and replace if needed.	X		
Inspect and clean the air heater, including the fan inlet and intake areas, fan, wheels, and other moving parts.		X	
<i>If applicable:</i> Adjust belt tension		X	
Inspect and clean the air heater.			X
Ensure that the cycle damper(s) can rotate freely.			X



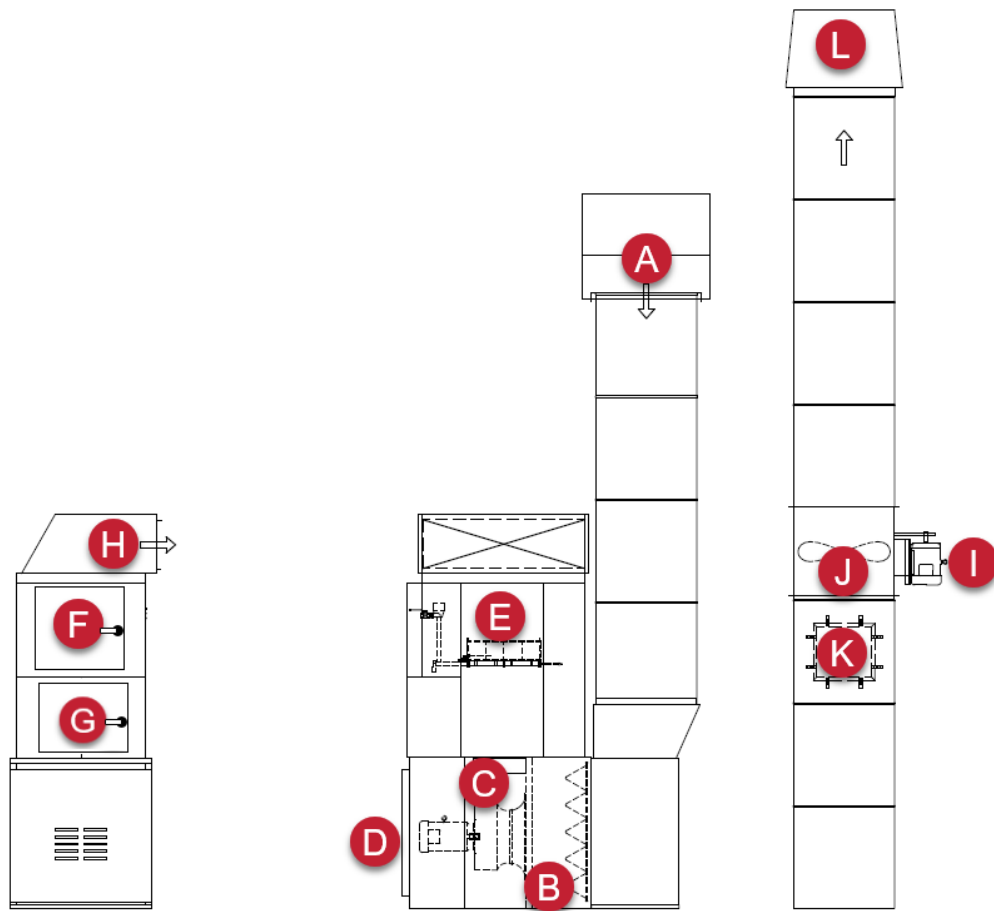
- A: Fresh air inlet*
- B: Cycle damper*
- C: Intake filter access door*
- D: Intake blower assembly*
- E: Intake motor access door*
- F: LNB series Low NOx burner*
- G: Gas train and combustion air filter access door*
- H: Control panel access door*
- I: Air heater discharge*
- J: Recirculating opening*
- K: Exhaust filter access door*
- L: Exhaust motor access door*
- M: Exhaust blower assembly*
- N: Exhaust inspection door*
- O: Exhaust air discharge*

**Figure 3. Recirculating GUL Low NOx Air Heater**



- A:** Fresh air inlet
- B:** Cycle damper
- C:** Intake filter access door
- D:** Intake blower assembly
- E:** Intake motor access door
- F:** LNB Series Low NOx burner
- G:** Gas train and combustion air filter access door
- H:** Control panel access door
- I:** Air heater discharge
- J:** Recirculating opening
- K:** Exhaust motor
- L:** Exhaust fan assembly
- M:** Exhaust inspection door
- N:** Exhaust air discharge

**Figure 4. Recirculating BT Low NOx Air Heater**



- A: Fresh air inlet*
- B: Intake filter access door*
- C: Intake blower assembly*
- D: Intake motor access door*
- E: LNB Series Low NOx burner*
- F: Gas train and combustion air filter access door*
- G: Control panel access door*
- H: Air heater discharge*
- I: Exhaust motor*
- J: Exhaust fan assembly*
- K: Exhaust inspection door*
- L: Exhaust air discharge*

**Figure 5. Forced Dry BT Low NOx Air Heater**

## Daily maintenance

This section contains tasks that should be performed every day.

### NOTE

Refer to the “Air heater filter replacement log” (page 33) to track the exhaust filter replacement dates.

### Replace combustion blower filters

**Scope:** This procedure applies only to air heaters with Low NOx burners.

### WARNING

Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

1. Locate the gas train and the box that houses the combustion blower.
2. Loosen the 8 mm bolts securing the filter frame to the side of the combustion blower box and lift the filter frame grate out of place.
3. Remove the used filter pad.
4. Making sure the replacement filter is oriented the same way, insert the new combustion blower filter (GFS part number 1010333).
5. Close the filter frame grate and tighten the bolts.

### Replace air heater filters

### WARNING

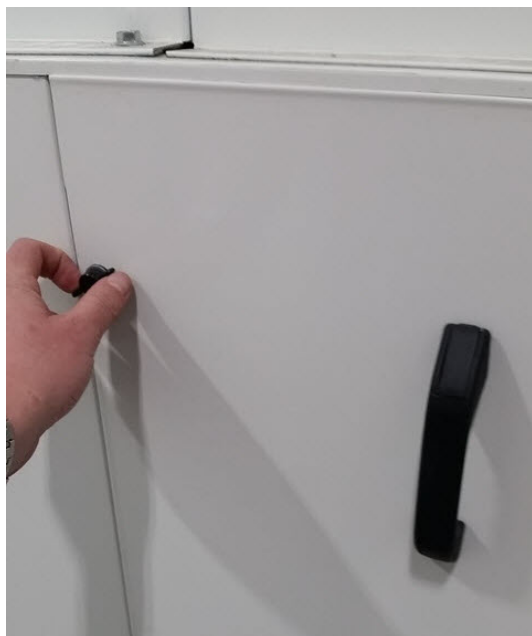
Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

Perform these steps to replace the air heater filters:

1. On the air heater, locate the panel that houses the filter.



2. Remove the four wing-head thumb screws.



3. Lift the panel using the handle to remove and gain access to the filters.
4. Using both hands, pull the used filter by its frame along the track and out of the unit.  
Remove the remaining filters in the same manner as the first filter.



**WARNING**

Treat used filters and any other paint-contaminated items as flammable products and dispose of them safely.

**NOTE**

Pay attention to the orientation of the filter inside the unit.

5. Making sure the filter is oriented the same way, slide the new GFS pocket filters along the track into the air heater.
6. Reattach the panel and secure it with the four wing-head thumb screws.

## Monthly maintenance

This section contains tasks that should be performed on a monthly basis. Increase or decrease frequency as needed for specific operating conditions and use of air heater.

### Inspect and clean the air heater

#### CAUTION

Use care when touching the exterior of an operating motor or a motor that has just been shut down. Motors usually run hot and may be hot enough to be painful or cause injury.

#### WARNING

Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

1. Check that the fan inlet and intake areas (approaches to the ventilator) are free from obstructions and clean.
2. Check the fan, wheel, other moving parts, and the inlet, especially if the blower is installed in a corrosive or dirty environment.  
  
Oil, dust, or overspray may occasionally accumulate on the fan, causing an imbalance. For smooth and safe operation, inspect and clean the wheel and other moving parts as needed.
3. *If applicable*, check air heater V-belt alignment.

#### NOTE

For instructions, see "*If applicable*: Check V-belt drive alignment" (page 31)

4. After performing the above maintenance checks, ensure that all fasteners are tight.
5. When the booth has been returned to a safe operating state, remove the locks and restore power.

## ***If applicable: Adjust belt tension***

**Scope:** This procedure only applies to the tube axial fan belt drives in BT air heaters.

Belt tension is very important to the proper operation of a fan and to the service life of a V-belt drive. The belts on a new fan are properly adjusted; however, all V-belts stretch in the first few hours of operation. It is necessary to readjust the belt tension after eight hours of running. After approximately 100 hours of running, the belts should be adjusted again. Thereafter, tracking the number of hours the air heater is in use and periodic inspection are recommended so belts may be adjusted or replaced when necessary.

### **WARNING**

Operating drives without guards in place can result in severe injury or death. If you remove any guards, make sure you replace them before removing locks and restoring power.

### **WARNING**

Before servicing, lockout/tagout the main electrical service to the device.

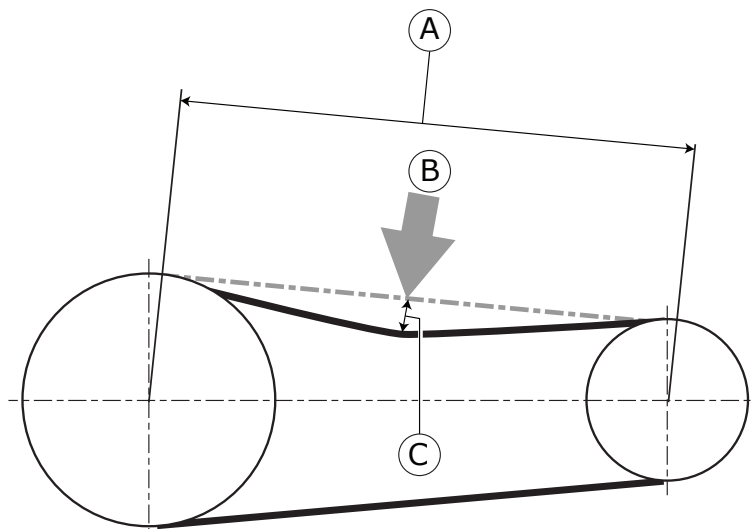
### **CAUTION**

Do not tighten belts by changing the setting of the motor pulley as this changes the fan speed and may damage the motor.

### **NOTICE**

Over-tightening results in too much tension, causing excessive belt wear and noise. Under-tightening results in too little tension, causing slippage at start-up and uneven wear.

1. Measure the belt span as illustrated below.



**A:** Span length  
**B:** Force  
**C:** Deflection

2. Calculate the required deflection by multiplying the belt span by 1/64.

For example, if the belt span is 32 inches, the belt deflection equals 1/2 inch (32 inches x 1/64 = 1/2 inch).

3. Apply the force from the following table evenly across the width of the belt at the center of the belt span and measure the deflection.

**NOTE**

A strip of keystone or similar material may be used to distribute the force evenly across the belt width.

**Table 4. Belt deflection force**

Belt type	New belt force (measured in pounds)	Used belt force (measured in pounds)
B	6.7-9.4	4.5-6.3

4. With the force still applied, measure the actual belt deflection. Adjust the belt tension if the measured belt deflection is greater than the calculated deflection.
5. When the air heater has been returned to a safe for operation state, remove locks and restore power.

## Yearly maintenance

This section contains tasks that should be performed on a yearly basis. Increase or decrease frequency as needed for specific operating conditions and use of air heater.

### NOTE

Once each year, perform these tasks in addition to the monthly maintenance tasks.

### Inspect and clean the air heater

Once each year, complete these tasks in addition to the monthly air heater maintenance tasks.

### WARNING

Before servicing, lockout/tagout the air heater, including the main electrical service and the main gas supply.

### CAUTION

Use care when touching the exterior of an operating motor or a motor that has just been shut down. Motors usually run hot and may be hot enough to be painful or cause injury.

1. *If applicable:* Inspect the air heater fan belt for wear; replace any torn or worn belts.

### NOTE

For instructions, see "Replace fan belts" (page 32).

2. Inspect the bolts and screws for tightness. Tighten them as necessary.
3. Inspect the motor for cleanliness. Remove dirt and grease from the wheel and housing to prevent imbalance and damage.
  - a. Clean exterior surfaces only.
  - b. Use a rag to remove dust and grease from the motor housing to ensure proper motor cooling.
  - c. Remove dirt and grease from the wheel and housing to prevent imbalance and damage.
4. Remove the flame sensor wire, spark cable, and wiring harness attached to the blower.
5. Loosen the union between the ratio regulator zero governor valve and blower to inspect the burner inlet.
6. Loosen the four 1/2-inch bolts attaching the burner to the heater to remove the burner; then, inspect heat chamber and burner head for cracks.
7. Remove the flame sensor and spark rod by loosening two nuts holding the ignition and flame sensing assembly. Then, inspect the spark rod.
  - The tip should be clean and free of dirt and carbon. If not clean, replace the spark rod.
  - The porcelain must be intact. If the porcelain is cracked, replace the spark rod (GFS part number 908513\_5246-43).
8. Inspect the flame sensor.
  - The metal rod should be clean and free of dirt and carbon. If needed, either replace the flame sensor, or clean the sensor with steel wool and wipe with a clean paper towel. Avoid touching the flame sensor while cleaning.

- The porcelain must be intact. If the porcelain is cracked, replace the flame sensor.

### ***If applicable: Inspect the cycle damper***

1. Remove the filter access door.
2. Remove the air heater intake filters.
3. Inspect the cycle dampers, pivots, and linkage for damage. Replace components if necessary.
4. Ensure the cycle damper is free to rotate to the fully closed position.
5. Replace the air heater intake filters.
6. Replace the filter access door.

### **Reset the air heater flame safety control**

If the flame safety control alarm light is on (locked out), manually reset the unit.

1. Reset the flame safety guard.
2. Reset warning on screen.

### **Reset the gas pressure switch**

Units are equipped with a manual reset high gas pressure switch. The burner will not operate if a switch is tripped. To reset a switch, follow the reset instructions provided on the top of the switch.

### **Reset the high temperature limit switch**

Typically, two high temperature limit switches protect the system in the event a failure causing high temperature in the air heater blower cabinet or high blower discharge temperature. One device automatically resets when temperature falls under the device's setpoint. The second device requires manual reset after a high temperature fault. The booth uses one of the following types of manual reset, high temperature limit switches:

- **Honeywell:** Press the red button toward the bottom (on the face) of the limit device
- **Future Design:** Press the reset button.

#### **NOTE**

Either type can be reset with or without power applied to the booth.

#### **NOTE**

You may not feel any change in the device as you reset it.

## General service procedures

This section contains procedures that can be performed as needed to correct problems or as directed by the preventive maintenance schedules in “Daily maintenance” (page 23), “Monthly maintenance” (page 26), and “Yearly maintenance” (page 29).

### ***If applicable: Check V-belt drive alignment***

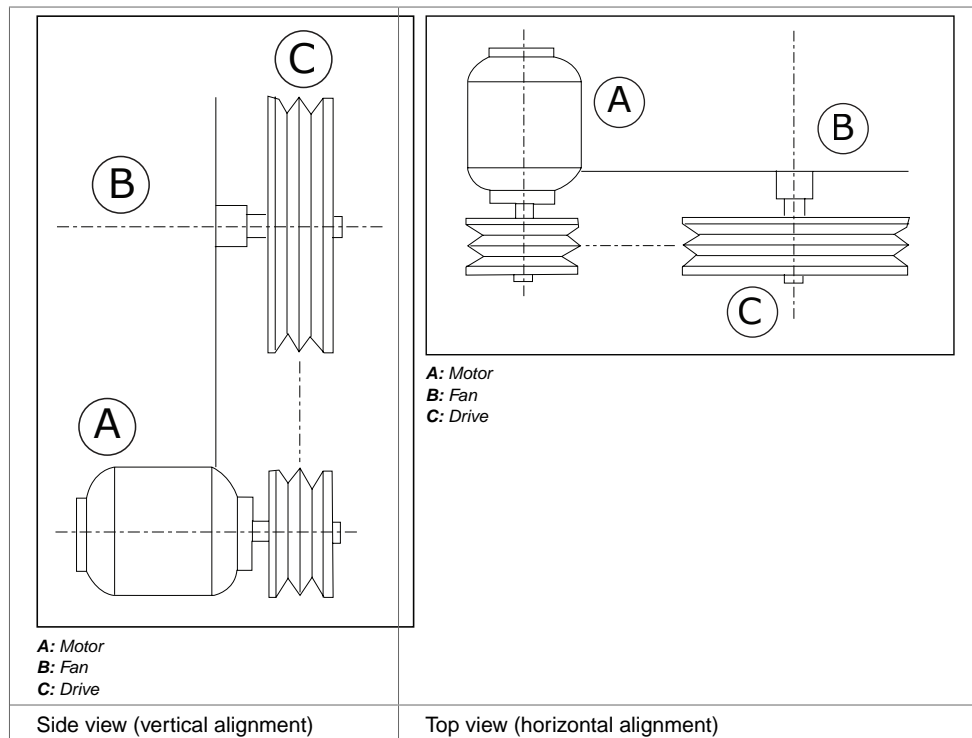
**Scope:** This procedure only applies to the tube axial fan belt drives in BT air heaters.

Proper alignment and balance of the V-belt is important; check the following items to ensure smooth fan operation.

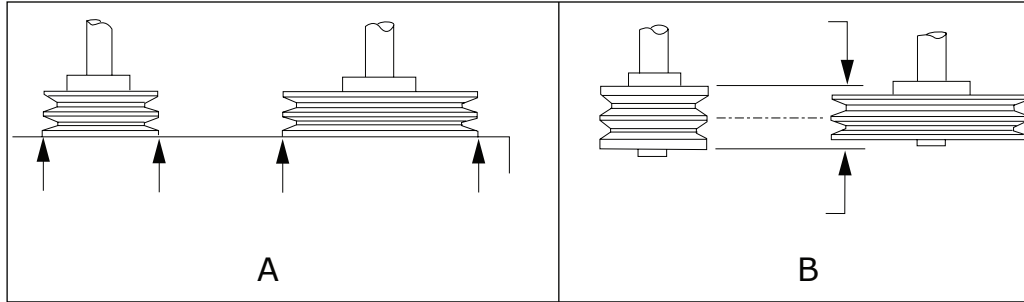
1. Check that the fan and motor sheaves are in axial alignment; adjust sheaves as required.

**NOTE**

Shafts are parallel in both the vertical and horizontal planes.



2. Check that the fan motor sheaves are in radial alignment; adjust sheaves as required:
  - When sheaves are of equal width, align the sheaves with a straight-edge (inset A).
  - When sheaves are of unequal width, align the center of the sheaves (inset B).



**A:** Equal-width sheaves: Align to straight-edge touching sheaves at arrows  
**B:** Unequal-width sheaves: Align to center of sheaves

3. Verify that sheaves have no noticeable eccentricity.
4. If adjustments were made, check belts for proper tension.

**NOTE**

Belts that are either too loose or too tight cause vibration and excessive wear. (see “If applicable: Adjust belt tension” (page 27), as applicable).

5. After all adjustments have been completed, check the complete assembly for smoothness of operation.

**Replace fan belts**

**WARNING**

Before servicing, lockout/tagout the fan, including the main electrical service.

1. Loosen the motor hold-down bolts and move the motor toward the fan. (This is done by turning a jackscrew which is a part of the motor base on models having larger motors.) The belt may be slipped off the motor sheave and then easily removed from the sheave on the blade shaft.
2. Check the numbers on the belt and make the replacement with a belt having the same length and section.



3. Adjust the motor outward to tighten the belt (see “If applicable: Adjust belt tension” (page 27)) and tighten the motor hold-down bolts. Be sure that the motor is not cocked at an angle and that the end face of the motor sheave is parallel to the end face of the driven sheave.
4. Adjust the belt tension (see “If applicable: Adjust belt tension” (page 27)).
5. After performing the above maintenance, check that all fasteners are tight.
6. When the air heater has been returned to a safe for operation state, remove locks and restore power.



# Air heater filter replacement log

Air heater and combustion blower filters should be replaced every 160 to 180 hours of operation.

## NOTE

Visually inspect the filters daily and change them immediately if they become saturated sooner than the recommended replacement interval.

Hours of Operation	Date	Comments
Spec/Actual		
160/		
320/		
480/		
640/		
800/		
960/		
1,120/		
1,280/		
1,440/		
1,600/		
1,760/		
1,920/		
2,080/		
2,240/		
2,400/		
2,560/		
2,720/		
2,880/		
3,040/		