

# **Pre Start-up and Maintenance**

***All equipment has been factory tested, adjusted, metered and inspected to meet conditions set at the time the order was placed. Only minimal adjustments should be required. All information in this service manual is typical. All products are semi-custom and changes may occur.***

**NOTE: All servicing and adjustments of the Direct Gas-Fired unit should be performed by a qualified Service Engineer.**

- 1) The owner's representative or equipment operator should be present during start-up to receive instructions on care and adjustments of the equipment.
- 2) Remove all shipping blocks, brackets and bolts from supply fan base with optional isolation base.
- 3) Check all wiring for loose connections and tighten if necessary.

**CAUTION: Line side of disconnect may be energized.**

- 4) Inspect all fan and motor bearings and lubricate if necessary. Tighten setscrews on pulleys, bearings, and fans.

**CAUTION: Do not rupture grease seals.**

- 5) Inspect pulleys and belts for tightness, tension and alignment. Do not over tighten belts.
- 6) Check set screws on all bearings, pulleys and fans for tightness.
- 7) Check voltage supplied to disconnect switch.
  - a. The maximum voltage variation should not exceed +/- 10%.
  - b. Phase voltage unbalance must not exceed 2%.
- 8) Check thermostat(s) for normal operation.
- 9) Check that system duct work is installed and free from obstructions.
- 10) Check that fans turn free in housing.
- 11) Check burner for proper location and alignment.
- 12) Check that filters and accessories are installed correctly.
- 13) Check that all manual gas shut-off valves are closed.
- 14) When failure or malfunction of this heater creates a hazard to other fuel burning equipment, (e.g. when the heater provides make-up air to a boiler room), the heater is to be interlocked to open inlet air dampers or other such devices.

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## **Gas Pressure Switches**

Switches operate unit in Heat mode.

The low pressure switch will trip out and must be reset before resuming operation when the inlet gas valve is turned off during operation. The high pressure switch may be checked out by reducing the setting of its trip point below unit operating pressure. It should then trip out and shut off the burner. Return the adjustment to its original setting and reset to resume operation.

When checking operation of gas pressure switches on systems without pilot the heat switch will have to be turned off for approximately five seconds to reset the ignition control.

## **Air Pressure Switches**

The high air pressure switch is checked by removing the sensing tube from the entering side of the burner. Switch operation will shut off the burner. Recycle is automatic when the sensing tube is replaced. The low air pressure switch is checked by removing the sensing tube from the leaving air side of the burner. Switch operation will shut off the burner. Recycle is automatic when the sensing tube is replaced.

## **MAINTENANCE SCHEDULE AND LUBRICATION REQUIREMENTS**

Periodic maintenance is essential to the efficient operation and extended service life of this equipment. Failure to provide maintenance as recommended may void the equipment warranty.

### **A. Maintenance Schedule**

#### **1. Weekly**

- Check that fan belts are tight and sheaves are aligned. The fan belts can be checked every 30 days after the first 60 days of new belt run-in.

**CAUTION: Do not over tighten belts.**

#### **2. Monthly**

- Check all valves, piping and connections for leaks.
- Check the flame signal.
- Check the fuel pressure in the fuel supply line to each heater.
- Check the burner manifold pressure at full fire and that low fire has a continuous flame all across burner.
- Clean the flame sensor(s).
- Inspect filters. Clean or replace as necessary.
- Inspect the main fan bearings.

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- Check all dampers, damper actuators and linkages.
  - Adjust and tighten if necessary.
- Ensure that there are no obstructions blocking the air supply to the heater or the air discharge from the heater.
- Inspect the area and make sure that no combustible or hazardous material has been stored within the clearances as shown on the unit nameplate.

## **3. Quarterly**

- Complete the monthly maintenance schedule.
- Check the belt tension for the main fan(s) and adjust if necessary.
- Check the alignment of the sheaves and adjust if necessary.
- Inspect all bearings set screws for tightness and lubricate bearings if necessary.
- Check the pilot electrical system (if applicable).
  - Adjust if necessary
- Inspect the burner carefully.
  - Clean and adjust if necessary.
- Check voltages and amp draw on main fan motor.
- Check the operation of all safety controls individually.
- Check the operation of the automatic gas shut off valves and check them for leakage at the pressure test ports provided.

## **4. Off Season or Yearly**

- Complete the monthly and quarterly maintenance schedule.
- Inspect all fan wheels and housings. Clean if necessary.
- Check that all fan wheels and sheaves are securely set on the shaft.
- Inspect all bearings and alignment. Adjust if necessary.
- Inspect all V-belts. Replace if necessary.
- Inspect all electrical components, connections and terminals. Clean and tighten where necessary.
- Test ignition spark. Adjust gap if necessary.

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- Clean ignition electrodes and check for cracks.
- Test flame safeguard relay and replace components if necessary.
- Inspect all regulators, relief valves, motorized valves, solenoid valves, vent valves, manual shut off valves and safety shut off valves. Check their operation and clean as necessary.
- Ensure all vents to the atmosphere are clean and free from obstruction.
- Inspect and clean all drip legs in the fuel line.
- Lubricate fan motor as directed by motor manufacturer.
- Inspect fan motor wiring for loose connections.
- Lightly oil all door latches.
- Check that cabinet is weather tight, replace door gaskets and re-caulk as necessary.

**NOTE: Keep screened air intakes clear of obstructions at all times.**

## Lubrication Instructions

### **Item Manufacturer Bearing Type**

All 3 phase fan **US**, Baldor or Single row ball motors (1 HP to equal bearings 20 HP)  
ODRTEFC

***Recommendation: See following note.***

All 1 phase motors Century, G.E. or Bronze sleeve (Fractional HP) equal bearings  
ODRTEFC or TEA0

***Recommendation: See following note.***

Fractional HP Century, G.E. or Bronze sleeve single phase, ODP equal bearings or  
TEFC

***Recommendation: See following note.***

Fan shaft bearings Fafnir or equal Self-aligning single row ball bearings, resilient  
mounted

***Recommendation: See following note.***

Dampers --- Arrow or equal --- Sleeve ***Recommendation: See following note.***

- I. Blower Motors - Some motors require lubrication while others do not. Those that require lubrication can be identified by the presence of grease plugs in the motor casing at each end. Motors that do not have grease plugs cannot be greased and are lubricated for the life of the motor bearing.

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- II. Lubrication of motors should be done while the motor is warm and at a standstill. Remove and clean all grease plugs and insert grease fitting in the upper hole in the motor casing at each end. (Viewed as if motor were sitting horizontally on its base.) There may be one or two plugs in each end casing of the motor. Add a small amount of clean, good grade ball bearing grease, such as Exxon Polyrex EM or equal, with a low pressure grease gun. Run the motor five minutes before removing the grease fittings and replacing the plugs.

**CAUTION: An excess of grease will overheat the bearings.**

**NOTE: On totally enclosed fan cooled (TEFC) motors, the rear end fan housing must be removed to expose the grease plugs.**

## Pillow Block Bearings

Pillow block bearings are used on supply blower(s) as required. Bearings have been pre-lubricated with number 2 lithium base grease. Re-lubrication should be done with similar grease using a low pressure grease gun. Wipe all grease fittings clean before adding grease. Grease should be added slowly, in small amounts at frequent intervals while the shaft is being manually rotated.

A slight showing of grease at seals with accompanying normal bearing temperature indicates proper lubrication. Normal temperature can range from "Cool" to "hot to the touch" depending on size, speed **and** surrounding conditions. Excessive bearing temperature indicates faulty lubrication. An insufficient amount *of* grease is suggested by a bearing showing no grease at the seals, and a higher Excessive leakage of grease at the seals, and a high operating temperature suggest too much grease.

## Frequency of Lubrication

Frequency of lubrication depends upon operating conditions. The bearing operating temperature is the best index of determining a re-lubrication schedule. The following chart gives the frequency of re-lubrication based upon continuous operation for various operating temperatures and can be used as a satisfactory guide for determining when all ball bearings should be re-lubricated.

Speed	Temperature	Cleanliness	Interval
500 RPM	Up To 150°F	Clean	2 months
1000 RPM	Up To 210°F	Clean	2 weeks
1500 RPM	Over 150°F	Clean	Weekly
Any Speed	Up To 150°F	Dirty	1 week to 1 month
Any Speed	Over 150°F	Dirty	Daily to weekly
Any Speed	Any temp.	Very dirty	Daily to weekly
Any Speed	Any temp.	Extreme Conditions	Daily to weekly

## Dampers

Dampers **should be inspected** monthly for securely fastened linkages and smooth operation. If dampers are binding or excessively noisy, lubrication may be required. Place one drop of #20 wt machine oil on each blade bearing and linkage ball joint Do not over lubricate. Wipe away any excess **from** the area. Be sure to note that dampers over 49 inches long have intermediate bearings which require lubrication.

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## Air Filters

All filter banks should be equipped with a manometer or differential pressure switch to indicate when the filters are dirty. Dirty filter elements should be replaced when the differential pressure across them reaches the manufacturer's recommended final value. Dirty filter elements should be replaced with a clean element of the same type size. In addition, **the manufacturer strongly recommends**, that air filters be **checked every 30 days** and replaced with new filters (throw-away type) or cleaned (washable type) as required. Cleanable filters should be given new application of filter coating after washing to maintain optimum filter performance.

The frequency of cleaning and replacing air filters applies twelve months of the year where blowers are used for ventilation and heating.

## Belt Tension and Adjustment

Belt tension is adjusted during the initial run-in and test periods at the factory. However, the belts are run as slack as possible to prevent excessive damage to the bearings, yet tight enough to prevent slippage. It is necessary, therefore, to check belt tension during the first few months of operation, and to **check for proper tension weekly during the first 60 days**, after which 30-day check intervals are sufficient.

**CAUTION: Turn off all power to the equipment before checking belt tensions.**

**CAUTION: Do not over tighten belts.**

**CAUTION: Do not attempt to tighten any belt or belts by changing the pitch of an adjustable pulley. This will change the air flow and fan speed. Consult the factory if the fan speed must be changed.**

## Suggested Belt Tension Method

Check tension frequently during the first 24-48 hours of run-in operation. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over tensioning shortens belt and bearing life.

**To properly tension a conventional V-belt drive, use the following procedure:**

1. Measure the span length.
2. At the center of the span, apply a force perpendicular to the span to deflect the belt 1/16 inch for every inch of span length. For example, for a 40 inch span, apply a force that will deflect the belt 40/164 or 5/16 of an inch.
3. Compare the force you have applied with the values given in the table below. If the force is between the values for normal tension and 1 1/2 times normal tension, the belt tension should be satisfactory. If the belt tension is not within this range, it can be adjusted by loosening the motor mounting bolts and adjusting the position of the motor along its base.

**NOTE: A new drive can be tightened to two times the minimum value shown to allow for normal drop in tension during the run-in period.**

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## Section Belt

Small pulley diameter range in inches	Manufacturer & Type Belt	Pounds Force for Normal Tension	Pounds Force for 1 1/2 times Normal Tension
3.4-4.2	Gates Hi-Power	4.4	6.6
4.4-4.6	Gates Hi-Power	4.9	7.4
5.8-8.6	Gates Hi-Power	5.8	8.7

Note: For recommendation of other types of belts, consult respective manufacturers.

## Gaskets

Gaskets are used on doors, inspection covers, some filter racks, and some outdoor air dampers. Inspect gaskets periodically and repair or replace as required.

## Heater

I. At least a yearly inspection is recommended for heating installations and more frequently for process applications in year-round operation. Your own experience is the best guide in determining frequency of inspection, but as a minimum, the following procedure should be followed:

- A. Shut the system down totally, disconnecting or locking out power supply so there can be no accidental start-up during inspection.
- B. Inspect the burner carefully, including upstream and downstream sides of mixing plates as well as burner body face. Note that complete burner assembly may have to be removed for proper inspection and cleaning. Any accumulation of scale or foreign material on either side of the mixing plates should be removed with a wire brush. Check visually that no holes in the mixing plates are blocked. If any burner ports are plugged, even partially, clear them with a piece of wire. Consult the factory for alternate procedures.

**WARNING: Do not enlarge burner ports or performance may be drastically affected.**

If any mixing plates are loose or missing fasteners, tighten or replace as necessary. Always use zinc plated or stainless fasteners.

The mixing plates on the burner may display "hairline" cracks. These cracks are normal and caused by thermal stresses occurring during combustion. The presence of these "hairline" cracks in no significant way affects the combustion efficiency or performance of the heater. Should a large opening develop, it may cause difficulties in cross ignition of

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flame across the face of the burner. If this does occur, the specific mixing plate or plates involved **must** be replaced.

- **Further details can be found in the Owners manual provided with each system. We encourage you to read and understand you manual; to further understand the units function and service needs. This will maintain the longevity of you complete system and afford you a better understanding of the functionality of its design.**