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**Installation, Safety, Operation & Maintenance Instructions And Parts List
 For Model BI: Arrangement 9 Blowers
 For Model BI: Arrangement 9CB Blowers.**

NOTE

READ ENTIRE MANUAL INCLUDING "SECTION IV. INITIAL UNIT STARTUP" BEFORE ATTEMPTING TO INSTALL AND OPERATE THIS EQUIPMENT.

BLOWER SPECIFICATIONS

BLOWER SERIAL NUMBER: _____ **MFG. DATE:** _____

NOTE: The serial number above is a required reference for any assistance. It is stamped on the blower nameplate.

BLOWER SPECIFICATIONS:

Model: _____ **Arrangement:** _____ **Rotation:** _____ **Discharge:** _____

Nominal Inlet Size: _____ (in Inches) **Wheel Size and Type:** _____

BLOWER PERFORMANCE DATA: (If entered on order)

CFM: _____ **SP:** _____ (Inches of Water Gauge) **Motor BHP:** _____

Density: _____ **Altitude:** _____ (Ft. above S.L.) **Airstream Temperature:** _____ °F.

Fan RPM: _____ **Maximum Safe Fan RPM:** _____ **DO NOT EXCEED THIS RPM**

MOTOR DATA: (This section is completed only if the motor was supplied by Å•)

HP: _____ **RPM:** _____ **Voltage:** _____ **Phase:** _____

Hz: _____ **Frame Size:** _____ **Enclosure:** _____ **Efficiency:** _____

IF Motor is EXP, Class(es) & Group(s) are: _____

Manufacturers Model Number: _____ **CFV Part Number:** _____

DRIVE DATA:

Fan Sheave: _____ **Motor Sheave:** _____ **Belts:** _____

No. of Grooves: _____ **Fixed Speed:** **Adjustable Speed:**

ATTENTION: RECEIVING DEPARTMENT

All Å• Å• Å• products are packaged to minimize any damage during shipment. The freight carrier is responsible for delivering all items in their original condition as received from Å•. The individual receiving this equipment is responsible for inspecting this unit for any obvious or concealed damage. If any damage is found, it should be noted on the bill of lading before the freight is accepted and the receiver must file a claim with the freight carrier.

LONG TERM STORAGE NOTICE

If this blower will NOT be installed and put into operation within 30 days, refer to the "Long Term Storage Instructions" on page 15. Failure to follow all applicable long term storage instructions, will void your warranty. This blower should be stored indoors in a clean, dry location.

⚠ DANGER






				
Hazardous voltage can cause electrical shock and death.	High speed rotating equipment can cause severe personal injury.	Lock out/Tag out to prevent personal injury <u>BEFORE</u> starting <u>ANY</u> service or inspection.	Avoid injury. <u>NEVER</u> operate without <u>ALL</u> required safety guards in place.	Avoid injury. You <u>MUST</u> read and understand all instructions in this manual <u>BEFORE</u> installing.

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I. GENERAL

A. Unpacking:

Be careful not to damage or deform any parts of the blower when removing it from the packaging container. **All the packaging material should be kept in the event the blower needs to be returned.**

Handling:

Handling of the blower should be performed by trained personnel and be consistent with all safe handling practices. Verify that all lifting equipment is in good operating condition and has the proper lifting capacity. The blower should be lifted using well-padded chains, cables or lifting straps with spreader bars. Some blower models have lifting eye locations provided in the blower base. **NEVER lift the blower by an inlet or discharge flange, blower or motor shaft, motor eye bolt, or any other part of the blower assembly that could cause distortion of the blower assembly.**

B. Safety Instructions & Accessories:

1. Safety Instructions:

All installers, operators and maintenance personnel should read AMCA Publication 410-96, “**Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans**”. This manual is included with the blower. Additional copies can be requested by writing us

2. Sound:

Some blowers can generate sound that could be hazardous to personnel. It is the responsibility of the user to measure the sound levels of the blower and/or system, determine the degree of personnel exposure, and comply with all applicable safety laws and requirements to protect personnel from excessive noise.

3. Air Pressure and Suction:

In addition to the normal dangers of rotating machinery, the blower can present additional hazards from the suction or pressure created at the blower inlet or discharge. Suction at the blower inlet can draw materials into the blower where they become high velocity projectiles at the discharge and cause severe personal injury or death. It can also be extremely dangerous to persons in close proximity to the inlet or discharge as the forces involved can overcome the strength of most individuals.

WARNING

NEVER OPERATE A BLOWER WITH A NON-DUCTED INLET AND/OR DISCHARGE. IF THE BLOWER INLET AND/OR DISCHARGE IS NON-DUCTED, IT IS THE USERS RESPONSIBILITY TO INSTALL AN INLET AND/OR DISCHARGE GUARD.

4. Temperature:

Many blowers, blower components and all motors operate at temperatures that could burn someone if they come in contact with them. If this potential hazard could exist in your installation, steps must be taken by the user to protect anyone from coming in contact with this equipment.

5. Spark Resistance: (Per AMCA Standard 99-0401-86 and ISO 13499)

DANGER

NO GUARANTEE OF ANY LEVEL OF SPARK RESISTANCE IS IMPLIED BY SPARK RESISTANT CONSTRUCTION. IT HAS BEEN DEMONSTRATED THAT ALUMINUM IMPELLERS RUBBING ON RUSTY STEEL CAN CAUSE HIGH INTENSITY SPARKS. AIR STREAM MATERIAL AND DEBRIS OR OTHER SYSTEM FACTORS CAN ALSO CAUSE SPARKS.

6. Safety Accessories:

Guards:

All moving parts must be guarded to protect personnel. Safety requirements can vary, so the number and types of guards required to meet company, local, state and OSHA regulations must be determined and specified by the actual user or operator of the equipment.

NEVER start any blower without having all required safety guards properly installed. All blowers should be checked on a regular schedule, for missing or damaged guards. If any required guards are found to be missing or defective, the power to the blower should be immediately turned off and locked out in accordance with OSHA regulations. Power to the blower should NOT be turned back on until the required guards have been repaired or replaced.

This blower can become dangerous due to a potential "windmill" effect, even though all electrical power has been turned off or disconnected. The blower wheel should be carefully secured to prevent any rotational turning **BEFORE** working on any parts of the blower/motor assembly that could move.

7. Access or Inspection Doors:

DANGER

NEVER OPEN ANY ACCESS OR INSPECTION DOORS WHILE THE BLOWER IS OPERATING. SERIOUS INJURY OR DEATH COULD RESULT FROM THE EFFECTS OF AIR PRESSURE, AIR SUCTION OR MATERIAL THAT IS BEING CONVEYED. DISCONNECT OR LOCK OUT POWER TO THE BLOWER AND LET THE BLOWER WHEEL COME TO A COMPLETE STOP BEFORE OPENING ANY TYPE OF ACCESS OR INSPECTION DOOR.

II. INSTALLATION

A. Vibration:

Before any mounting method is selected, the user should be aware of the effects vibration will have on the blower, motor and other parts. Improper blower installation can cause excessive vibration causing premature wheel and/or bearing failure, that is not covered under warranty. Vibration eliminator pads, springs or bases should be properly installed to prevent any blower vibration from transmitting to the foundation or support structure.

WARNING

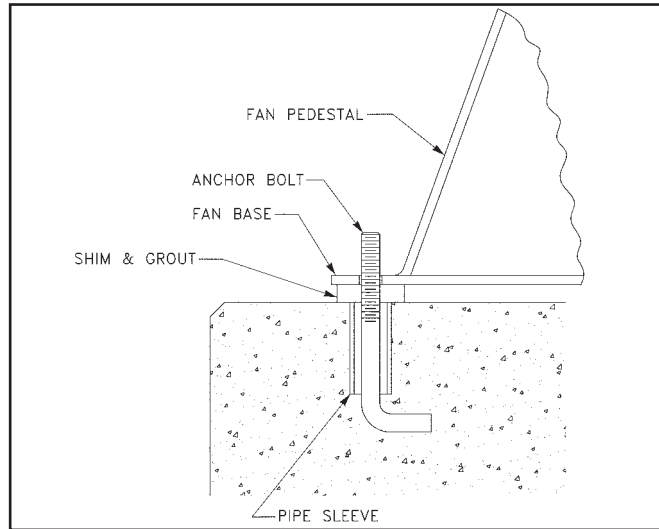
SHUT THE BLOWER DOWN IMMEDIATELY IF THERE IS ANY SUDDEN INCREASE IN VIBRATION.

B. Mounting Methods:

1. Floor Mounted Units;

Centrifugal blowers should be mounted on a flat, level, concrete foundation weighing 2-3 times the weight of the complete blower/motor assembly. It is recommended that the foundation be at least 6" larger than the base of the blower. The foundation should include anchor bolts such as shown in **Fig. 1** on page 4. Place the blower over the anchor bolts and shim under each bolt until the blower is level. After shimming, flat washers, lock washers and lock nuts should be tightened at each anchor bolt. Any gaps between the blower base and the foundation should be grouted. If the blower will be sitting on some type of vibration pads or mounts, follow the recommended mounting procedures supplied with the vibration elimination equipment.

Fig. 1



2. Elevated Units;

Improper mounting of elevated blowers can cause vibration problems. The structure that the blower/motor assembly will be mounted on must be strong enough to support at least 3 times the weight of the entire blower/motor assembly. **An insufficient support will cause excessive vibration and lead to premature wheel and/or bearing failures.** Bracing of the support structure must be sufficient enough to prevent any side sway. The entire structure should be welded at all connection joints to maintain constant alignment.

DANGER

THE IMPROPER DESIGN OF AN ELEVATED PLATFORM STRUCTURE COULD RESULT IN A RESONANT CONDITION, AND CONSEQUENTLY, CAUSE A LIFE THREATENING, CATASTROPHIC, STRUCTURAL FAILURE.

C. Duct Work Connections:

All duct connections to the blower should include flexible connectors between the ducting and the blower inlet and/or discharge. This will eliminate distortion, noise and vibration from transmitting to the duct and building. The connectors should be selected to handle the operating conditions for air volume and pressure that the blower will produce. **All ducting or accessories, added by the user, should be independently supported. DO NOT use the blower/motor assembly to support any additional weight.** Inlet and/or discharge duct elbows should be located a minimum of 2 blower wheel diameters from the blower. Any duct elbows located closer than 2 wheel diameters to the blower inlet or discharge **WILL** reduce the air performance and blower efficiency. Any duct elbows near the blower discharge should be in the **same rotational direction** as the **blower rotation**.

Non-Ducted Blower Inlet:

Any blower with no ducting on the inlet **must** have an inlet guard. The blower should be located so the blower inlet is, at least, 1 wheel diameter away from any wall or bulkhead to eliminate a reduction in air flow.

Non-Ducted Blower Discharge:

Any blower with no ducting on the discharge **must** have a discharge guard.

D. Safety Guards:

Y ^ offer guards, as optional, to keep your blower in compliance with OSHA safety regulations. These include inlet or discharge guards, shaft/bearing guards and belt guards. Arrangement 9 and 9CB blowers come with belt guards as standard. Any blowers built with high temperature construction, a heat slinger guard is standard. It is the responsibility of the user to make sure this blower meets all local, state and OSHA safety regulations. If you have a specific guard requirement not covered by OSHA, please contact ^ • A t assistance.

E. Dampers and Valves: (Airflow control devices)

If the blower is supplied with any type of air flow control device, it should be closed before initial startup of the blower to minimize overloading of the motor. Any airflow control device, with bearings, should be maintained in accordance with the manufacturers instructions. Any air flow control device, with an automatic control mechanism, should be adjusted per the manufacturers recommendations.

F. Set Screw and Taper-lock Bushing Torque Values:

All blower wheel set screws are tightened to the proper torque prior to shipment. Some wheels may have taper-lock hubs and split, taper-lock bushings to secure the wheel to the blower shaft.

NOTE: Check all set screw or taper-lock bushing torques. Forces encountered during shipment, handling, rigging and temperature can affect factory settings. For correct torque values, see **Tables 1 and 2** below.

Table 1

SET SCREW TORQUE VALUES		
Diameter & Number of Treads/Inch	Hex Wrench Size (Across Flats)	Required Torque (Inch Pounds)
1/4-20	1/8"	65
5/16-18	5/32"	165
3/8-16	3/16"	228
7/16-14	7/32"	348
1/2-13	1/4"	504
5/8-11	5/16"	1104

Table 2

TORQUE VALUES FOR TAPER-LOCK BUSHINGS	
Taper-lock Bushing Size	Required Torque (Inch Pounds)
H	95
B	192
P	192
Q	350
R	350

CAUTION

Set screws should **NEVER** be used more than once. If the set screws are loosened, they **MUST** be replaced. Use only knurled, cup-point, set screws with a nylon locking patch.

G. Blower Bearings:

If the blower bearings have set screws to lock the bearings onto the blower shaft, the set screws should be tightened to the same torque levels as shown in **Table 1** above. Blower bearings should be lubricated in accordance with the bearing manufacturer's recommendation and with the same type of grease. **See chart under B-2 on page 11.**

Bearings are pre-lubricated at the factory. The blower shaft/bearing guard (if included) should only be removed for inspection **before** startup and during inspection or maintenance. **but only after the power to the motor has been turned off and locked out. The blower shaft/bearing guard MUST be replaced before the power is turned back on.**

H. V-Belt Drives:

If we supplied the belts and sheaves (drives package), they were carefully selected for the specific operating conditions supplied to us by the customer.

DANGER

Changing **any** of the v-belt drive component selections, supplied with the blower, could result in unsafe operating conditions which could cause equipment failure, personal injury and death.

If the user is supplying the sheaves and/or belts, it is their responsibility to make the correct component selections for the specific operating conditions. Their selection must also **NOT ALLOW** the blower to exceed its **maximum safe speed or hub load**. If you do not know the maximum safe speed or hub load for this blower, **DO NOT** make any drive selection without first consulting • or our sales office for your area. **"Timing" belts should never be used on blowers.** If you are replacing belts and/or sheaves, checking belt tension or proper alignment, **see below and page 6.** Sheave set screws or taper-lock bushing bolts should be tightened to the torque values as indicated in **Tables 1 and/or 2** above.

I. V-Belt Drive Installation:

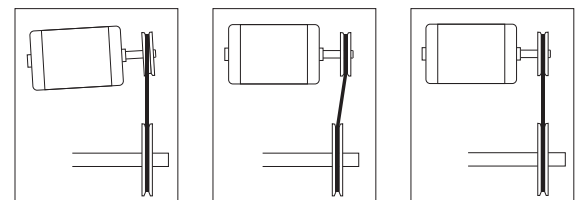
Power to the motor must be turned off and locked out, BEFORE inspecting, installing or servicing any components of the drives. READ THE BELOW AND FOLLOW ALL THE STEPS ON PAGE 6.

If you are installing any new belts, inspect and replace any worn or damaged sheaves, bearings or shafts while the power is **turned off and locked out**. This will eliminate additional down time later to replace any other parts that were worn or defective.

If you are installing a complete set of new drives, the most critical steps of the installation are alignment of the sheaves and belt tension. **Misaligned sheaves and/or improper belt tension will cause excessive fan vibration and result in premature belt and/or bearing failure.**

The blower and motor shafts must be parallel and the sheaves must be in line with each other. See **Fig. 2** on the right.

Fig. 2



Shafts not parallel

Sheaves not aligned

Proper alignment

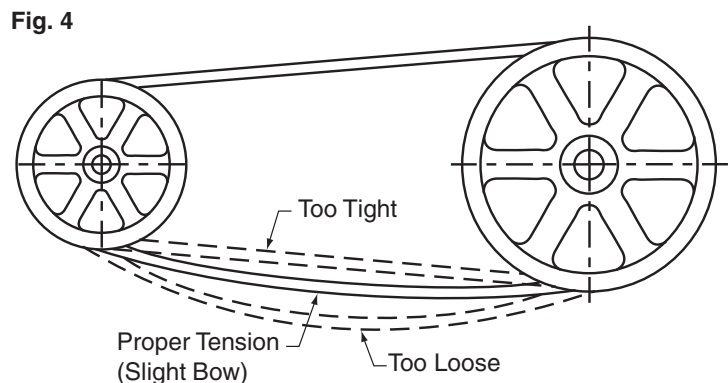
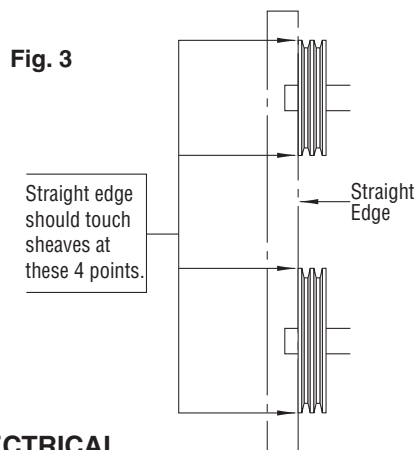
For complete drive installation instructions, please see these websites:

www.emerson-ept.com/catalogs/instshts/browning/form5453.pdf
OR

www.maskapulleys.com/images/produit/Product%20Training_jan09.1.pdf

ASSEMBLY STEPS: (Below are general instructions. Obtain specific instructions from your drives dealer)

1. Remove belt guard and shaft guard, if supplied, and remove any protective coating from the end of the blower and/or motor shafts.
2. The adjustable motor slide base should be used for belt tension adjustment. Adjust the motor on the slide base by turning the adjustment bolt(s) in the end of the slide base, so the motor is as close to the blower as possible.
NOTE: The 4 nuts that secure the motor feet onto the motor slide base should be loosened **just enough** so the motor will **slide** along the slide base **before** you loosen or tighten the belt tension adjustment bolt(s).
3. If you are replacing the belt(s) and/or sheaves, remove belt(s) from sheaves and then loosen the sheaves set screws or taper-lock bushings to remove the sheaves.
4. Check the blower and motor shafts for any nicks or burrs. Remove any burrs with a file or emery paper.
5. Slide the new sheaves onto the blower and motor shafts. **DO NOT** drive or pound the sheaves on as this may damage the blower and/or motor bearings.
6. Check the blower and motor shafts to make sure they are **parallel**. See **Fig. 2** on page 5.
7. Place the belt(s) over the sheaves. **DO NOT** force, pry or “roll” the belts, as this could damage the cords in the belt(s). If there is more than 1 belt, all the belts should be a “**matched set**”.
8. Align the blower and motor sheaves with a straight-edge or string as shown in **Fig. 3** below. If the sheaves are not the same width, align by sight. For more precise methods, consult your local drives dealer.
NOTE: Any sheave with a taper-lock bushing will slide a little on the shaft as the bolts are tightened. You will need to compensate for the sliding before performing step 9.
9. Tighten the set screws in the sheaves or the bolts in the taper-lock bushings to the correct torque values as indicated in **Tables 1 and/or 2** on page 5.
10. Adjust the motor slide base until the belts appear to be snug, then repeat **Step 6** above.
11. Tighten the 4 nuts holding the motor feet onto the motor slide base, then repeat **Step 6** above.
CAUTION: BEFORE ATTEMPTING STEPS 12 AND 15, MAKE SURE THE AREA AROUND THE BLOWER IS SAFE AND SECURED SO NO ONE CAN GET NEAR THE BLOWER AND POSSIBLY GET INJURED WHEN IT IS STARTED.
12. Unlock power to the motor and run the blower for 15-20 minutes to allow belts to “seat” properly. **Then turn off and lock out power to the motor.**
13. Loosen the 4 bolts holding the motor feet onto the motor slide base and re-adjust the belt tension. **Final belt tension should be checked with a “tensioning gauge”.**
14. Tighten the 4 nuts holding the motor feet onto the motor slide base.
15. Unlock power to the motor and run the blower for 8 hours. The belts should be running as shown in **Fig. 4** below. If not, repeat steps 13 and 14 after **you have turned off and locked out power to the motor.**
16. **Turn off and lock out power to the motor**, reinstall belt guard and shaft guard, unlock power to motor and run the blower.
17. After running the blower for 24 hours, **lock out power to the motor**, remove belt guard and repeat steps 13 through 16.
18. After running the blower for 100 hours, lock out power to the motor, remove belt guard and repeat steps 13 through 16. Repeat this periodically, but never more than a one year period.



III. ELECTRICAL

A. Disconnect Switches:

All blower motors should have an independent disconnect switch located in close visual proximity to turn off the electrical service to the blower motor. **Disconnects must be locked out in accordance with OSHA “lock out-tag out” procedures any time inspection or maintenance is being performed on the blower and/or motor assembly. The “lock out-tag out” procedure should be performed by a licensed electrician or authorized personnel.** All disconnects should be sized in accordance with the latest NEC codes (National Electric Codes) and any local codes and should be installed only by a licensed electrician. “Slow blow” or “time delay” fuses or breakers should be used since the initial start-up time for the blower motor, although rare, can be up to 10 seconds.

B. Motors:

DANGER

ALL WIRING CONNECTIONS, INSPECTION AND MAINTENANCE OF ANY MOTOR MUST BE PERFORMED BY A LICENSED ELECTRICIAN IN ACCORDANCE WITH THE MOTOR MANUFACTURERS RECOMMENDATIONS, ALL ELECTRICAL CODES AND OSHA REGULATIONS. FAILURE TO PROPERLY INSTALL, MAKE WIRING CONNECTIONS, INSPECT OR PERFORM ANY MAINTENANCE TO A MOTOR CAN RESULT IN MOTOR FAILURE, PROPERTY DAMAGE, EXPLOSION, ELECTRICAL SHOCK AND DEATH.

1. **DO NOT connect or operate a motor without reading the motor manufacturers instructions supplied with the motor.** The basic principle of motor maintenance is: **KEEP THE MOTOR CLEAN AND DRY.** This requires periodic inspections of the motor. The frequency of the inspections depends on the type of motor, the service and environment it will be subjected to and the motor manufacturers instructions.
2. **Cleaning:** Cleaning should be limited to exterior surfaces only. **Follow motor manufacturers cleaning instructions.**
3. **Lubrication:** Most small motors have sealed bearings that are permanently lubricated for the life of the motor. Some larger motors have grease plugs that should be replaced with grease fittings to perform re-lubrication. These motors, or any motor with grease fittings, should be lubricated in accordance with the motor manufacturers recommendations. Lubrication frequency depends on the motor horsepower, speed and service. **BE SURE** you use compatible grease and **DO NOT** over grease.
4. **Location:** If the motor will be outside and subjected to the weather, it is recommended that a weather cover be installed to keep rain and snow off of the motor. No motors are guaranteed to be “watertight”. Be careful to allow enough openings between the motor and the motor cover to let the motor “breathe”. If the back end of the motor is covered, the cover should be no closer than 3” to the back of the motor for proper ventilation.
5. **Wiring Connections:** All wiring connections should be made for the proper voltage and phase as shown on the motor nameplate. Connections should follow the motor manufacturers recommendations as shown on the wiring schematic. This wiring diagram will be located on the outside of the motor, inside of the motor conduit box or on the motor nameplate. **Reversing some wires might be necessary to get the correct blower rotation.**
6. **Motors with Thermal Overload Protection:** If a motor is equipped with thermal overloads, the thermal overload must be wired per the wiring schematic to be operable. **There are 3 types of thermal overloads:**
 - a. **Automatic:** These will automatically shut the motor down if the internal temperature exceeds the design limits.

DANGER

MAKE SURE YOU LOCK OUT THE POWER TO THE MOTOR **BEFORE** INSPECTING ANY MOTOR WITH AUTOMATIC THERMALS, WHEN THE THERMALS COOL DOWN, THEY WILL ALLOW THE MOTOR TO AUTOMATICALLY START UP AGAIN, UNLESS YOU HAVE LOCKED OUT THE POWER TO THE MOTOR.

- b. **Manual:** These motors will have a button on them. If the motor overheats, it will shut down. After you have inspected the motor and eliminated the over heating problem, you will need to “reset” it by pushing the button. **Lock out the power BEFORE inspecting the motor.**
 - c. **Thermostats:** This type of thermal is a temperature sensing device **ONLY**. If the motor overheats, the thermostats will open or close (depending on the type) and send a “signal” to the electrical box. **THEY WILL NOT TURN THE MOTOR OFF. These are pilot circuit devices that must be connected to the magnetic starter circuit.**
7. **EXPLOSION PROOF Motors:** No motor is explosion proof. Explosion proof motors are designed so if there is an explosion **WITHIN** the motor, the explosion will be **CONTAINED INSIDE** the motor and not allowed to get out to the atmosphere. All explosion proof motors must be selected based on the atmosphere and/or the environment the motor will be operating in. Explosion proof motors are designed, rated, and labeled for their operating conditions based on Classes, Groups and “T” Codes. **The Class, Group and “T” code of an EXP motor MUST be selected based on the atmosphere and/or environmental conditions the motor will be operating in. Consult the NEC (National Electric Code) and the NFPA (National Fire Protection Association) for the proper EXP motor Class, Group and “T” Code required for your specific application and location.**

DANGER

IF AN EXPLOSION PROOF MOTOR IS USED IN AN AREA CONTAINING VOLITILE LIQUIDS, GASES, FUMES OR DUST FOR WHICH THE MOTOR WAS NOT DESIGNED TO OPERATE IN, AN EXPLOSION AND/OR FIRE CAN OCCUR

NOTICE:

- a. All EXP motors have some type of thermal overload as required by UL (Underwriters Laboratories). Refer to all of Section 6 above.
- b. All EXP motors are required to have the UL (Underwriters Laboratories) and CSA (Canadian Standards Association) listing numbers on the motor name plate or on a separate plate attached to the motor. The Class, Group and “T” Code the motor is designed for must also be listed.

8. Normal Motor Operating Temperatures:

Using your hand to test the normal running temperature of a motor can be a very painful experience;

The normal operating temperature of a fully loaded, open type, electric motor operating in a 70°F. (21°C.) ambient temperature is 174°F. (79° C.)

C. Maximum Blower Speed and Motor Speed Controllers:

If you will be using any type of motor speed controller with this blower, **DO NOT** exceed the maximum safe blower speed. Installing and using a speed control device requires special training and certification as required by the speed control manufacturer. See the manufacturers instructions for proper use, installation and wiring connections for the maximum speed settings. It may be necessary to “block out” some speeds to eliminate a resonant vibration problem. The maximum safe blower speed is shown on the data sheet shipped with the blower. If you have lost the data sheet, contact ^ • or our sales office for your area. You must have the serial number from the **blower** name plate for us to determine the maximum safe blower speed.

Y ^ will only extend the motor manufacturers warranty, when used with a speed controlling device, if the motor has the words “**Inverter Duty**” marked on the motor name plate. If the motor does not have “**Inverter Duty**” marked on the motor name plate, and you have a motor failure, you will be required to contact the motor manufacturer for any service or warranty claims.

IV. INITIAL UNIT STARTUP

NOTICE: Failure to complete and document all the following pre-startup and both post-startup checks, listed in sections A (below) and B on page 9, could void all warranties.

A. Pre-Startup & Post-Startup Checks: (Check blocks as each step is completed. Retain this for your records.)

A1. Pre-Startup Checks Completed By: _____ DATE: _____

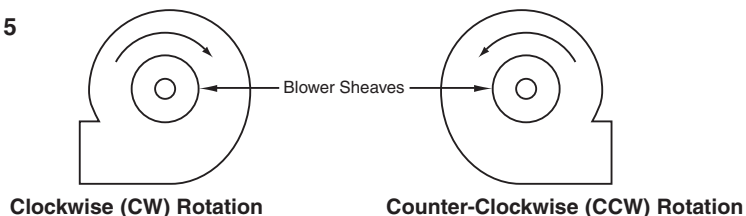
A2. 8 Hour, Post-Startup Checks Completed By: _____ DATE: _____

A3. 3 Day, Post-Startup Checks Completed By: _____ DATE: _____

MAKE SURE POWER TO THE MOTOR IS LOCKED OUT BEFORE STARTING PRE-START OR POST-START CHECKS.

1. Check all blower, foundation and duct work hardware to make sure it is tight.
2. Check all blower wheel, sheave and bearing set screws to make sure they are tight per **Table 1** on page 5.
3. If the blower wheel or sheaves have a taper-lock bushing, make sure the bolts are tightened per **Table 2** on page 5.
4. Make certain there is no foreign material in the blower or duct work that can become a projectile.
5. Make sure any inspection doors in the blower housing or duct work are securely bolted or locked.
6. Ensure all electrical power components are properly sized and matched for your electrical system.
7. Check the blower wheel, by turning the blower shaft by hand, to ensure it rotates freely.
8. Check sheaves for proper alignment and belts for proper tension. **See instructions on pages 5 and 6.**
9. Check that all required guards are properly secured.
10. Any dampers should be fully opened, then fully closed to make sure there is no binding or interference.
11. If your blower is mounted on an elevated support structure, make sure the structure is welded at all the joint connections, welds have not cracked and the structure is properly braced to prevent “side sway”.
12. Close any dampers to minimize the load on the motor, especially on blowers with high temperature construction. **Never** subject a “cold” blower to a “hot” gas stream. If the blower will be handling “hot gases” greater than 150°F (65°C) it is imperative that the blower be subjected to a gradual rate of temperature increase, not to exceed 15°F/minute (8°C/minute). The same temperature limits are also important when the blower is experiencing a drop in temperature until the temperature drops down to 150°F (65°C). Only, when the entire blower has reached an equilibrium temperature of 150°F (65°C), or less, should the power be turned off.
13. Make sure the power source connections to the blower motor are per the motor manufacturer’s instructions.
14. Make sure the blower wheel is stationary prior to startup. **Starting a blower with a wheel that is rotating backwards can cause wheel damage.**
15. Apply power to the blower motor momentarily (i.e. “bump start”) to check for proper blower wheel rotation. If the blower is rotating in the wrong direction, reconnect the motor leads per the motor manufacturer’s wiring schematic. **Blower rotation is determined by viewing the blower from the motor or drive side of the blower, NOT from the inlet side.** After reconnecting the leads, repeat this step. **See Fig. 5 below.**
16. Apply power to the motor and let it come up to full speed. Turn off the power. Look and listen for any unusual noise or mechanical abnormality while the blower wheel is still spinning. If any are noticed, lock out the power, wait for the blower wheel to come to a complete stop, locate the cause and correct it.

Fig. 5



17. Unlock power to the motor and run the blower for 15-20 minutes to allow belts to “seat” properly. **Turn off and lock out power to the motor.**
18. Remove the belt guard.
19. Check the belt tension with a “**belt tensioning gauge**”. If the belts are too loose, loosen the 4 nuts holding the motor feet on the motor slide base and re-adjust the belt tension.
20. Tighten the 4 nuts in the motor feet.
21. Unlock power to the motor and run the blower for 8 hours. The belts should be running as shown in **Fig. 4** on page 6. If not, repeat steps 19 and 20 **after you have turned off and locked out power to the motor.**
22. When belts are running properly, **turn off and lock out power to the motor.** Re-install belt guard
23. Unlock power to the motor and run the blower.
24. Measure, record and keep the following motor data for future reference and comparison:
(Single phase motors will only have L1 and L2 leads)
Amperage draw on each motor lead: L1 _____ L2 _____ L3 _____
 (Running amps should NOT exceed the motor name plate amps for the voltage being operated on).
Voltage coming to motor leads: L1 _____ L2 _____ L3 _____
 (Should be about the same input voltage on all leads).
25. After running the blower for 24 hours, **turn off and lock out power to the motor**, remove belt guard and repeat steps 19 through 23 above.
26. Repeat step 25 after 100 hours and periodically after that.

B. Vibration:

The blower was balanced at the factory to comply with ANSI/AMCA Standard 204-05, Category BV-3. However, rough handling in shipment and/or erection, weak and/or non-rigid foundations, and misalignment may cause a vibration problem after installation. After installation, the vibration levels should be checked by personnel experienced with vibration analysis and vibration analysis equipment.

NOTE:

The blower **SHOULD NOT** be operated if the vibration velocity of the blower exceeds 0.40 inches per second, filter out, if the blower is rigidly mounted. If the blower is mounted on isolators or on an isolator base, it **SHOULD NOT** be operated if the vibration velocity of the blower exceeds 0.65 inches per second, filter out.

Vibration readings for belt driven blowers should be taken at the top, sides and end as per **Fig. 6** below. They should also be taken on the top, sides and ends of the blower bearings as per **Fig. 7** below. After you have taken your vibration readings, write them down in the spaces in **Fig. 8** on page 10 and keep for future comparison.

⚠ DANGER

If the blower is going to be conveying material, it is the user’s responsibility to periodically turn the blower off and lock out the power. The blower wheel should then be checked for material build-up and/or erosion. If material has built up on any parts of the wheel, it **MUST** be removed and cleaned before it is put back into service. If any parts of the wheel have been eroded, the wheel **MUST** be replaced. Failure to perform this inspection can cause excessive vibration that will damage the blower and/or motor bearings. When vibration becomes excessive, it will lead to complete blower failure that could cause property damage, severe personal injury and death. The user must determine the frequency of this inspection based on the actual circumstances of their operation, **BUT** checking the vibration readings should **NEVER** exceed a 12 month period. For the AMCA/ANSI standard for vibration limits, see Fig. 9 on page 10.

Fig. 6 (Motor reading points)

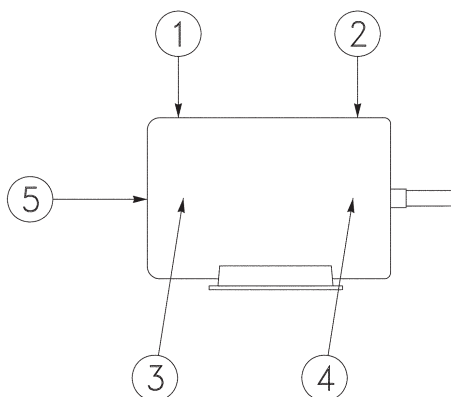


Fig. 7 (Blower bearing reading points)

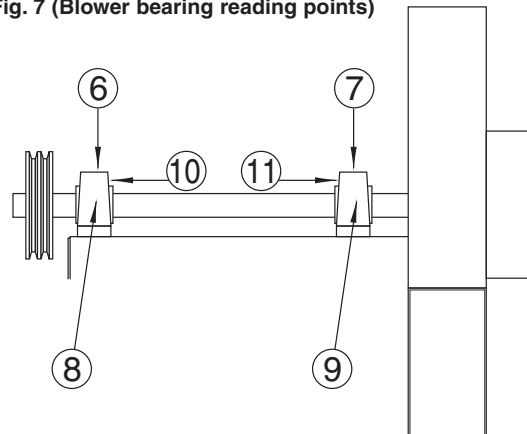


Fig. 8

VIBRATION METER PROBE POSITIONS
For Arrangement 9 and 9CB Blowers

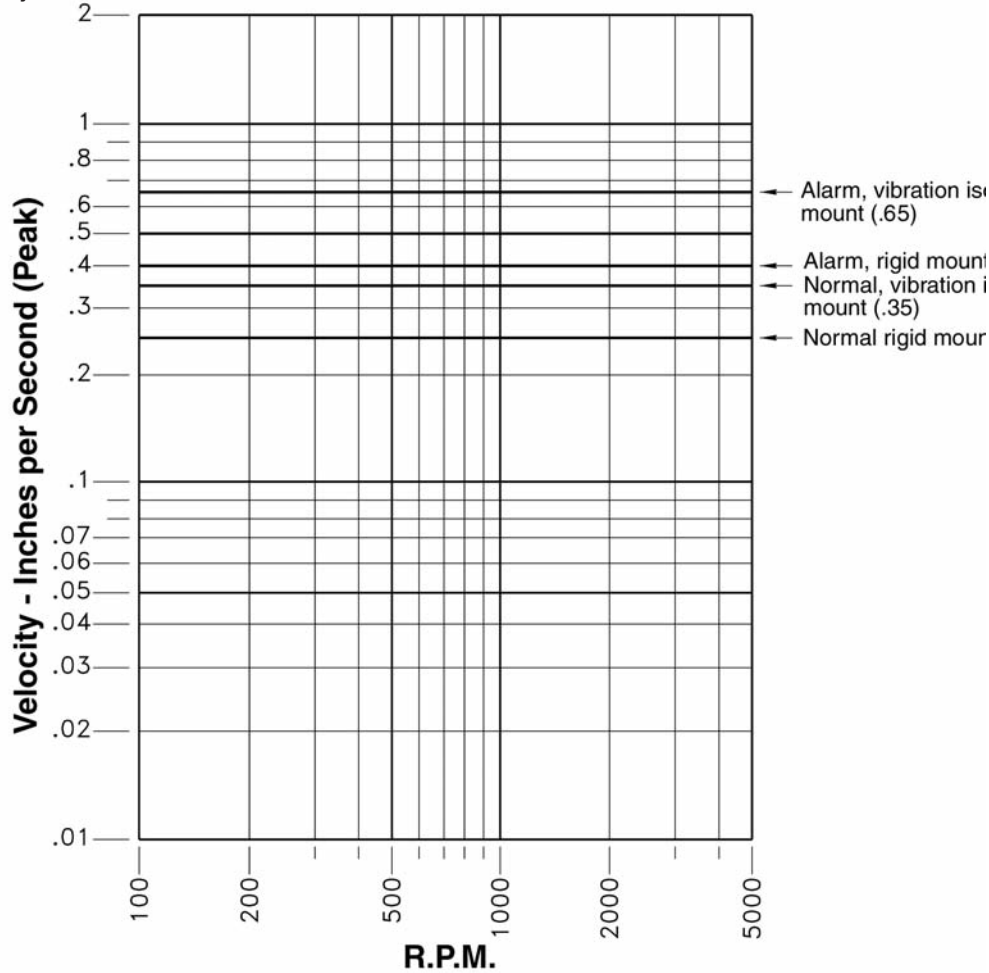
	1	2	3	4	5	6	7	8	9	10	11
A	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
C	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

A Pre-Startup Readings taken by: _____ Date: _____

B 8 Hour Post-Startup Readings taken by: _____ Date: _____

C 3 Day Post-Startup Readings taken by: _____ Date: _____

Fig. 9 Vibration Severity Chart



V. ROUTINE INSPECTION & MAINTENANCE

Periodic inspection of all the blower parts is the key to good maintenance and trouble-free operation. The frequency of inspections must be determined by the user and is dependent upon the severity of the application, **BUT**, it should **NEVER** exceed a 12 month period. The user should prepare an inspection and maintenance schedule and make sure it is adhered to.

⚠ WARNING

BEFORE STARTING ANY INSPECTION OR MAINTENANCE, BE SURE BLOWER IS TURNED OFF, POWER IS LOCKED OUT AND THE BLOWER WHEEL HAS BEEN CAREFULLY SECURED TO PREVENT WIND MILLING. IF THE OPERATING CONDITIONS OF THE BLOWER ARE TO BE CHANGED (SPEED, PRESSURE, TEMPERATURE, ETC.) CONSULT I G OR OUR SALES OFFICE FOR YOUR TERRITORY TO DETERMINE IF THE UNIT WILL OPERATE SAFELY AT THE NEW CONDITIONS.

A. Hardware:

All blower and foundation hardware should be checked to make sure it is tight. All set screws or taper-lock bushing bolts should be tightened to the torque values shown in **Tables 1 and 2** on page 5.

NOTE: If any set screws have become loose, they must be thrown away and replaced. **NEVER** use set screws more than once. **Replace with knurled, cup-point set screws with a nylon locking patch.**

B. Motor and Blower Bearing Lubrication:

1. Motor Bearings:

Most smaller motors have sealed bearings that never require re-lubrication for the life of the motor. For any motors with grease fittings, consult the motor manufacturers recommendations with reference to the lubrication frequency and the type of grease that should be used.

DO NOT over grease the motor bearings. Generally, 1-2 shots should be enough. Use a hand operated grease gun at no more than 40 PSI. **IF POSSIBLE, CAREFULLY lubricate the motor bearings while the motor is running.**

2. Blower Bearings:

Blower bearings should be re-lubricated per the chart below for all **clean and dry** applications where the ambient temperature or blower air temperature is -20°F (-29°C) up to 120°F (49°C). If your application is dirty, moisture laden air, or is outside the temperature limits stated previously, consult the bearing manufacturer for the proper grease type and lubrication frequency. The chart below is affixed to every belt driven blower base.

NOTE: For high temperature applications that require high temperature grease in the blower bearings, a chart similar to below will also specify that **ONLY Dow Corning DC44 (silicone based) high temperature grease should be used.**

DO NOT over grease the blower bearings. Generally, 1-2 shots should be enough. Use a hand-operated grease gun at no more than 40 PSI. **IF POSSIBLE, CAREFULLY lubricate the blower bearings while the blower is running.**

THIS FAN IS EQUIPPED WITH BEARINGS PRE-LUBRICATED AND READY FOR USE						
Generally Recommended Lubrication Frequency in MONTHS						
FAN OPERATING SPEED (RPM)	FAN SHAFT O.D. IN INCHES					
	1/2" TO 1"	1 1/8" TO 1 1/2"	1 5/8" TO 1 15/16"	2" TO 2 1/2"	2 1/16" TO 3 3/16"	3 7/16" TO 3 15/16"
UP TO 500	6	6	6	6	5	5
501-1000	6	6	6	5	4	4
1001-1500	6	5	5	4	3	2
1501-2000	5	5	4	3	2	1
2001-2500	5	5	3	2	2	—
2501-3000	5	4	2	2	1	—
3001-3500	4	3	2	1	—	—
3501-4000	3	3	1	—	—	—
4001-4500	2	2	1	—	—	—
4501-5000	2	1	—	—	—	—

The above lubrication frequencies are based on the fan bearings operating in a clean and dry environment from -20°F (-29°C) up to 120°F (49°C). For hostile, moisture laden environments and/or temperatures below -20°F (-29°C) or above 120°F (49°C), consult the bearing manufacturer for the proper grease type and recommended lubrication frequencies.

If possible, carefully lubricate the bearings while the fan is running.

Add grease until a slight bead appears at the bearing seals. **DO NOT** over grease. Generally, 1-2 shots with a hand grease gun that has a maximum pressure rating of 40 PSI.

Warning: Over greasing bearings will cause them to run hot.

The **TYPE** of grease you use **MUST BE** compatible with the grease already in the bearings.

C. Wheel Balance:

All blower wheels are balanced at the factory. It is not uncommon that additional “trim balancing” is required after the blower is assembled. Trim balancing of the blower assembly, in the field, is typically always necessary for all replacement wheels. **After any wheel is installed, the final balance of the entire blower assembly should be checked. Refer to Section B on page 9 and Fig. 9 on page 10.**

Airstream material or chemicals can cause abrasion or corrosion of the blower parts. This wear is generally uneven and, over time, will lead to the wheel becoming unbalanced causing excessive vibration. When that happens, the wheel must be rebalanced or replaced. The other airstream components should also be inspected for wear or structural damage and cleaned or replaced if necessary. **After cleaning any blower wheel, it should be balanced and then “trim balanced” on the blower shaft.**

There are three ways to balance a blower wheel:

1. Add balancing weights for fabricated aluminum, steel or stainless steel wheels:

Balance weights should be rigidly attached to the wheel at a location that will not interfere with the blower housing nor disrupt air flow. They should (if at all possible) be welded to the wheel. When trim balancing the wheel, on the blower shaft, be sure to ground the welder **directly** to the wheel. Otherwise, the welding current will likely pass through the blower shaft and damage the blower and/or motor bearings.

2. Grinding off material for cast aluminum wheels:

Grinding on the wheel to remove material, be very careful not to grind too much in one area. That could affect the structural integrity of the wheel.

3. Forward curved wheels, Model LM only (also known as squirrel cage or multivane wheels).

These wheels have balancing clips attached to individual blades around the wheel. That is the only proper way to balance this type of wheel.

NOTE:

Removing any Forward Curved, Backward Inclined or Airfoil wheel from the blower requires special attention when reinstalling the wheel back into the blower housing. Make sure you reinstall the wheel so the proper wheel-to-inlet clearance is maintained. Failure to do this will affect the blower's airflow (CFM), and/or static pressure (SP) capabilities and efficiency. Consult [✓] or our local sales office for your area for assistance if necessary.

D. Vibration:

As mentioned previously in this manual, excessive vibration can cause premature motor and/or blower bearing failure that could lead to catastrophic failure of the blower. After performing any routine maintenance, the vibration readings should be taken again. New readings should be taken (maximum every 12 months) and compared to the readings you recorded in **Fig. 8**, on page 10, during the initial startup. **If any major differences are present, the cause should be determined and corrected before the blower is put back into operation.**

The most common causes of vibration problems are:

- | | |
|-------------------------|--|
| 1. Wheel unbalance | 4. Poor blower inlet and/or discharge conditions |
| 2. Bearing failure | 5. Foundation stiffness |
| 3. Mechanical looseness | 6. Misaligned sheaves and/or belts |

E. Blower Shaft & Bearing Replacement:

The blower shaft and bearings for [] blowers are carefully selected to match the maximum load and operating conditions for each specific blower model. If the instructions in this manual and those provided by the bearing manufacturer are followed, you should not need to replace the bearings for many years.

When you do need to replace the bearings, it is strongly recommended that the blower shaft also be replaced at the same time.

Use the following applicable steps when replacing the blower bearings and/or blower shaft:

- 1. LOCK OUT THE POWER SOURCE TO THE MOTOR AND LET WHEEL COME TO A COMPLETE STOP.**
- If necessary, disconnect the inlet and/or discharge duct work from the blower.
- Remove the inlet side of the blower housing.
- Measure the location of the blower wheel on the shaft, then remove the locking hardware in the wheel hub.
- Carefully** remove the blower wheel.
- Remove the blower shaft/bearing guard and belt guard (if applicable).
- Loosen the 4 bolts holding the motor onto the motor adjustment base.
- Loosen the tension adjustment bolt(s) on the end of the motor adjustment base.
- Remove the belt(s), loosen the blower sheave set screws or taper-lock hub bolts and remove the blower sheave.
- Disconnect any lube lines to the bearings (if applicable).
- On most models, there is a rust preventative coating that was applied to the blower shaft before shipment. Remove this coating at all areas with a solvent or degreaser.
WARNING: DO NOT use gasoline to remove the coating. CAUTION: Use gloves to protect your skin.
- Measure location between bearings and distance from the bearings to each end of the shaft.
- Remove the hardware holding the bearings on the blower shaft. Then, remove blower shaft from bearings.
- Remove the hardware holding the bearings on the blower base. **Be careful not to change the location of any bearing pads that are under the bearings.**
- When replacing the bearings, we strongly recommend that the blower shaft also be replaced. However, if you intend to use the same blower shaft, file down all the setscrew marks on the shaft.
- Install new bearings onto the new blower shaft or onto the original shaft. Be sure the bearing locking collars are facing each other and the set screws are in line with each other.
- Place the blower shaft/bearing assembly onto the blower base with any bearing pads located under each bearing as were under the original bearings.
- Install the hardware to bolt the bearings to the blower base, **but DO NOT tighten at this time.**

19. Slide the blower shaft into the bearings so the dimensions match those taken in **Step 12** on page 12.
20. Tighten the bearing mounting bolts that hold the bearings on the blower base.
21. Using a soft-faced mallet, **GENTLY** tap on the blower shaft in between the two bearings while turning the blower shaft by hand. This will “seat” the bearing races. **The shaft MUST TURN freely.**
22. Tighten the set screws in both bearings. **NOTE:** If there are 2 set screws per bearing, make sure you tighten the set screws in line with each other on each bearing and then the other set screws.
23. Turn the blower shaft again to make sure it turns freely and does not bind.
24. Slide blower sheave onto the blower shaft.
25. Align the blower and motor sheaves and adjust belt tension per the instructions in **Section 1** on pages 5 & 6.
NOTE: Install new shaft key and any sheave set screws.
26. Reconnect any bearing lube lines (if applicable.)
27. While rotating the blower shaft, lubricate blower bearings with fresh grease per instruction **B-2** on page 11.
28. Install new set screws into the wheel, or taper-lock hub bolts into the hub. **Do not use old screws or bolts.**
29. Install the blower wheel onto the blower shaft making sure it is in the same location on the blower shaft as it was originally per the dimension you took in **Step 4** on page 12.
30. Install new shaft key into the wheel.
31. Turn the wheel by hand to determine if there is any binding of the shaft in the bearings, or if there is any interference between the back plate of the wheel and the blower housing.
32. Tighten the wheel set screw, over the key first, to the torque values in **Table 1** on page 5. Now, tighten the set screw onto the blower shaft. Or, tighten the taper-lock hub bolts per **Table 2** on page 5.
33. Reinstall the blower inlet side housing.
34. Turn the wheel by hand to determine if there is any interference between the wheel and the inlet side of the blower housing.
35. Unlock power to motor and turn on.
36. Let blower run for 10 minutes.
37. **Turn off and lock out power to the motor.**
38. Check all hardware and set screws to make sure they are tight.
39. Reinstall all safety guards supplied with the blower or by the user, and any duct work connections.
40. Unlock power to motor and turn on.
41. **Repeat steps 1, 6, 38, 39 and 40 (in that order) after 8 hours and again after 1 week.**

F. Dampers and Valves: (Airflow control device)

Turn off and lock out power to the blower motor. Any dampers or valves should be periodically inspected to make sure all parts are still operable within their full range and there is no interference with any other damper or blower components. Any bearings or seals should be checked for their proper function. The manufacturers maintenance instructions should be followed.

G. Safety Equipment & Accessories:

It is the user’s responsibility to make sure that all safety guards required by company, local, state and OSHA regulations are properly attached and fully functional at all times. If any guards become defective or non-functional at any time, **the power to the blower MUST be turned off and locked out** until complete repairs and/or replacements have been made, installed and inspected by authorized personnel. Any accessories used in conjunction with the blower should also be inspected to make sure they are functioning within their intended limits and design specifications. The manufacturer’s maintenance manuals should be referred to for correct maintenance procedures. These accessories include, but are not limited to, the following:

Shaft seals, inspection doors, vibration isolators or vibration bases, air flow or pressure measuring equipment, hoods, controls, special coatings, silencers, expansion joints, valves, flexible connectors, and filters.

VI. ORDERING REPLACEMENT PARTS:

Under normal conditions, you should not need any spare or replacement parts for at least 24 months after shipment from ~•. That does not include any wear due to abrasion, corrosion, excessive temperatures, abuse, misuse, accident or any severe conditions the fan was not designed for.

- A. If this fan is vital to any process that could cost you lost revenue, we strongly recommend that you keep a blower wheel, blower shaft and bearings, motor, sheaves and belt(s) at your location.**
- B. If this fan is vital for the safety of any people and/or animals, we strongly recommend that you keep a complete blower/motor assembly, as originally ordered, at your location.**

To order any parts or complete units, contact us for the name of our sales office for your area.

Á

WE MUST HAVE THE BLOWER SERIAL NUMBER FROM THE BLOWER NAME PLATE TO IDENTIFY PARTS CORRECTLY.

VII. TROUBLESHOOTING

Potential problems and causes listed below are in no order of importance or priority. The causes are only a list of the most common items to check to correct a problem. If you find the cause of a problem, **DO NOT** assume it is the **ONLY** cause of that problem. Different problems can have the same causes.

DANGER

Troubleshooting should only be performed by trained personnel. Any potential electrical problems should only be checked by a licensed electrician. All safety rules, regulations and procedures MUST be followed. Failure to follow proper procedures can cause property damage, severe bodily injury and death.

PROBLEM	CAUSE
Excessive Vibration	<ol style="list-style-type: none"> 1. Loose mounting bolts, set screws, taper-lock hub bolts, bearings and sheaves. 2. Misalignment of sheaves, blower bearings or motor. 3. Worn or corroded blower wheel. 4. Accumulation of foreign material on blower wheel. 5. Bent motor or blower shaft. 6. Worn motor and/or blower bearings. 7. Worn sheaves and/or belts. 8. Motor out of balance. 9. Inadequate structural support. 10. Support structure not sufficiently cross braced. 11. Weak or resonant foundation. 12. Foundation not flat and level.
Airflow (CFM) Too Low	<ol style="list-style-type: none"> 1. Blower wheel turning in wrong direction (rotation). 2. Actual system static pressure (SP) is higher than expected. 3. Motor speed (RPM) too low, incorrect or defective belts and/or sheaves. 4. Dampers or valves not adjusted properly. 5. Leaks or obstructions in duct work. 6. Filters dirty. 7. Inlet and/or discharge guards are clogged. 8. Duct elbow too close to blower inlet and/or discharge. 9. Improperly designed duct work 10. Wheel not properly located relative to the inlet bell (on Models LM, HDBI and HDAF only).
Airflow (CFM) Too High	<ol style="list-style-type: none"> 1. Actual system static pressure (SP) is lower than expected. 2. Motor speed (RPM) too high. 3. Filter not in place. 4. Dampers or valves not adjusted properly.
Motor Overheating	<p>NOTE: A normal motor will operate at 174°F. See B-8 on page 8.</p> <ol style="list-style-type: none"> 1. Actual system static pressure (SP) is lower than expected. 2. Voltage supplied to motor is too high or too low. 3. Motor speed (RPM) too high or defective motor. 4. Air density higher than expected. 5. Motor wired incorrectly and/or loose wiring connections.
Excessive Noise	<ol style="list-style-type: none"> 1. Wheel rubbing inside of housing. 2. Worn or corroded blower wheel. 3. Accumulation of foreign material on blower wheel. 4. Loose mounting bolts, set screws, taper-lock hub bolts, bearings or sheaves. 5. Misalignment of blower bearings, sheaves or motor. 6. Bent motor or blower shaft. 7. Worn motor and/or blower bearings. 8. Motor out of balance. 9. Motor and/or blower bearings need lubrication. 10. Vibration originating elsewhere in system. 11. System resonance or pulsation. 12. Inadequate or faulty design of blower support structure. 13. Blower operating near “stall” condition due to incorrect system design or installation.
Fan Doesn't Operate	<ol style="list-style-type: none"> 1. Motor wired incorrectly and/or loose wiring connections. 2. Incorrect voltage supply. 3. Defective fuses or circuit breakers. 4. Power turned off elsewhere. 6. Defective motor.

VIII. LONG TERM STORAGE INSTRUCTIONS: (Storage exceeding 30 days after receipt of equipment)

NOTE: Failure to adhere to these instructions voids all warranties in their entirety.

1. Storage site selection:

- (a) Level, well-drained, firm surface, in clean, dry and warm location. Minimum temperature of 50°F (10°C).
- (b) Isolated from possibility of physical damage from construction vehicles, erection equipment, etc.
- (c) Accessible for periodical inspection and maintenance.

2. The blower should be supported under each corner of its base to allow it to “breathe”. Supports (2 x 4’s, timbers, or railroad ties) should be placed diagonally under each corner.

3. If the equipment is to be stored for more than three (3) months, the entire blower assembly must be loosely covered with plastic, **but not tightly wrapped**.

4. Initial inspections must be made of the following components, and immediate corrective action taken if discrepancies are found, to insure adequate protection of the equipment during storage.

- (a) **Blower bearings only** should be completely filled with lubricant to minimize the chance of oxidation or rust.
- (b) Sheave center distance should be reduced to reduce tension on the belts.

5. Storage Maintenance:

A periodic inspection and maintenance log, by date and action taken, must be developed and maintained for each blower. See example below. Each item must be checked monthly.

EXAMPLE: **Storage / Maintenance Schedule Log**

ITEM	ACTION	DATES CHECKED
1	Re-inspect units to insure any protective devices used are functioning properly. Check for scratches in the finish which will allow corrosion or rust to form.	
2	Rotate wheel or blower shaft a minimum of 10 full revolutions to keep the motor and blower bearing grease from separating and drying out. <i>This is a critical step.</i>	

6. General Motor Procedure:

If the motor is not put into service immediately, the motor must be stored in a clean, dry, warm location. Minimum temperature of 50°F. (10°C,). Several precautionary steps must be performed to avoid motor damage during storage.

- a. Use a “Megger” each month to ensure that integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
- b. **DO NOT** lubricate the motor bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage the insulation quality in the motor.
- c. If the storage location is damp or humid, the motor windings **must** be protected from moisture. This can be done by applying power to the motor’s space heaters, (IF AVAILABLE) while the motor is in storage. If the motor does not have space heaters, storing it in a damp or humid location will, very quickly, cause internal corrosion and motor failure which is not warranted.
- d. Rotate motor shaft a minimum of 10 full turns each month to keep bearing grease from separating and drying out.

NOTE:

For specific storage instructions, for the actual motor and any accessory parts that were supplied, refer to the manufacturer’s instructions.

Daniels Fans, 7697 Snider Rd., Mason, OH 45040

1-800-628-1200

nasales@danielsfans.com