CINCINNATI FAN

user manual

Arrangement 2 centrifugal blower

Models PB - PBS - SPB - LM

INSTALLATION - OPERATION - MAINTENANCE

CF-02-IOM-24 ISSUED 5/2024

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT

LM Centrifugal Blower

Blower Serial Number _____

overview

Note

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

⚠ Warning

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

⚠ Caution

Indicates presence of a hazard which will or can cause personal injury or property damage if ignored.

Note

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

Note

This manual contains vital information for the proper installation and operation of your blower fan. Carefully read the manual before installation or operation of the blower fan and follow all instructions. Save this manual for future reference.

Specifications

Blower Serial Number _____ Mfg Date _____

Note: The serial number above is a required reference for ant assistance. It is stamped on the lower nameplate.

Blower Specifications

Model _____ Arrangement _____ Rotation_____ Discharge_____

Nominal Inlet Size _____ Wheel Size and Type _____

Blower Performance Data (if entered on order)

CFM _____ SP _____ Motor bhp _____

Density _____ Altitude ft _____ Airstream Temperature _____ °F

Fan RPM _____ Maximum Safe Fan RPM _____ **Do Not Exceed this RPM**

Note

Since Cincinnati Fan does not supply any electrical components used with Arrangement 2 blowers, it is the purchasers and/or users responsibility to make sure all electrical components used with this blower are in compliance with all company, local, state and federal regulations governing the use of this blower for the specific application it was originally purchased for. This includes all component selection, proper installation and maintenance of any component or parts that will be used in conjunction with this blower. The purchaser and/or user also assumes responsibility for warranty of the blower wheel, shaft and bearings should a failure occur due to improper alignment of the blower and motor shafts or sheaves and belts, operating the blower above the vibration limits or operating the blower above its maximum speed limit.

contents

Note

All Cincinnati Fan 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 Cincinnati Fan. 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 20. Failure to follow all applicable long term storage instructions, will void your warranty. This blower should be stored indoors in a clean, dry location.

general

Receiving

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. Lifting eye locations are 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.

Safety Instructions and Accessories

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.

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.

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.

⚠ **Warning**

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.

general

⚠ **Caution**

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.

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.

Spark Resistance: Per AMCA Standard 99-0401-86 and ISO 13499

⚠ **Warning**

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.

Safety 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.

⚠ **Caution**

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.

Access or Inspection Doors

⚠ **Caution**

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.

installation

Installation

Vibration

Before any mounting method is selected, the user should be aware of the effects vibration will have on the 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. If any vibration pads or springs will be used on Arrangement 2 blowers, the blower and **motor** must be mounted on a **common** base and the vibration pads or springs should be installed under the common blower/motor base. **Do Not** install vibration pads or springs under just the blower or motor. This will cause premature blower and/or motor bearing failure and additional vibration problems with the belt tension.

⚠ **Caution**

Shut the blower down immediately if there is any sudden increase in vibration.

Mounting Methods

Floor Mounted Unit

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 **Figure 1**. 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. **But**, the same procedure as outlined in the previous **Vibration** section must be followed.

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. 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. **But**, the same procedure as outlined in the previous **Vibration** section must be followed.

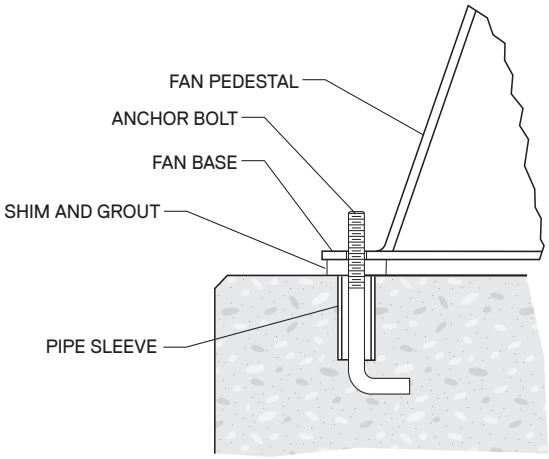


Figure 1

⚠ **Warning**

The improper design of an elevated platform structure could result in a resonant condition, and consequently, cause a life threatening, catastrophic,structural failure.

Duct Work Connection

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 assembly to support any additional weight. Inlet and/or discharge duct elbows should be located a minimum 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, one wheel diameter away from any wall or bulkhead to eliminate a reduction in air flow.

installation

Non-Ducted Blower Discharge: Any blower with no ducting on the discharge **must** have a discharge guard.

Safety Guards

Cincinnati Fan offers guards, as optional, to keep your blower in compliance with OSHA safety regulations. These include inlet or discharge guards and any blowers built with high temperature construction includes a heat slinger guard as standard. Since Arrangement 2 blowers are supplied without a motor, sheaves and belts, we cannot supply a blower shaft or belt guard. It is the responsibility of the user to make sure this entire blower/motor unit will meet all local, state and OSHA safety regulations after the entire assembly is completed.

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 manufacturer's instructions. Any air flow control device, with an automatic control mechanism, should be adjusted per the manufacturer's recommendations

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.

Table 1

Diameter and Number of Threads/Inch	Hex Wrench Size (across flats)	Required Torque in·lbf
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	
Taper-Lock Busing Size	Required Torque in·lbf
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.

Blower Bearings

The blower bearings on all Arrangement 2 blowers are a special type bearing. They are mounted in the cast iron bearing housing that includes a grease fitting and a grease relief fitting in the housing between the two bearings. Bearings should be lubricated per the **Routine Inspection and Maintenance** section of this manual. If the bearings need to be replaced, only use Seal Master **Skwezloc, ER-T Series** bearings (or equal). Because of the close bearing centers used in this arrangement, standard bearings cannot be used. The retaining ring cap-screw on these bearings should be tightened to 90-100 in/lb.

V-Belt Drive

Since Cincinnati Fan did not supply the belts and sheaves (drive package), they must be carefully selected for the specific operating conditions by the customer. The customer's selection must **Not Allow** the blower to exceed its maximum safe speed. If you do not know the maximum safe speed for this blower, **Do Not** make a drive selection without first consulting Cincinnati Fan or our sales office for your area. Timing belts should **never** be used on any blowers. The purchaser and/or user is responsible for installing the sheaves and belts for this blower in accordance with the drive manufacturers instructions. This includes the proper alignment of the sheaves and tensioning of the belt(s) so as not to cause excessive vibration of the blower assembly.

installation

Electrical

Motors and Disconnect Switches

Since Cincinnati Fan does not supply any electrical components used with Arrangement 2 blower, it is the purchasers and/or users responsibility to make sure all electrical components used with this blower are in compliance with any and all company, local, state and federal regulations governing the use of this blower for the specific application it was originally purchased for. This includes all component selection, proper installation and maintenance of any electrical component or parts thereof.

Maximum Blower Speed with Motor Speed Controllers

If any type of motor speed controller is used with this blower, **Do Not** exceed the maximum safe blower speed. It may be necessary to **block out** some speeds to eliminate a resonant vibration problem. The maximum safe blower speed is shown in the Specifications section of this manual. If this information is not available contact Cincinnati Fan or the sales office in your area. You must have the serial number from the blower name plate for us to determine the maximum safe blower speed.

Initial Unit Startup

Pre-Startup and Post-Startup Check (Check blocks as each step is completed. Retain for you records)

Note

Failure to complete and document all the following Pre-Startup checks, Post-Startup checks and Vibration checks, could void all warranties.

Pre-Startup Check completed by: _____ Date _____

Eight Hour Post-Startup Check completed by: _____ Date _____

Three-Day Post-Startup Check 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 the blower wheel set screws to make sure they are tight per **Table 1**.

3 ☐ ☐ ☐ If the blower wheel has a taper-lock bushing, make sure the bolts are tightened per **Table 2**.

4 ☐ ☐ ☐ Make certain there is no foreign material in the blower housing (optional) that can become a projectile.

5 ☐ ☐ ☐ Make sure any inspection doors 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 wheel by hand to ensure it rotates freely.

8 ☐ ☐ ☐ Check sheaves (not supplied by Cincinnati Fan) for proper alignment and belts for proper tension.

9 ☐ ☐ ☐ Check that any required guards (not supplied by Cincinnati Fan) 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**.

operation

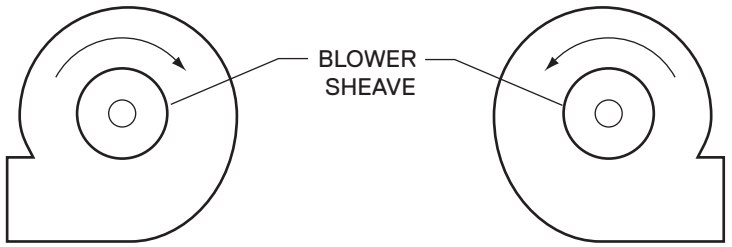
Pre-Startup Check completed by: _____ Date _____

Eight Hour Post-Startup Check completed by: _____ Date _____

Three-Day Post-Startup Check completed by: _____ Date _____

15 ☐ ☐☐ Apply power to the blower motor momentarily (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 side of the blower, NOT from the inlet side**. After reconnecting the leads, repeat this step. See **Figure 2**.

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.



Clockwise (CW) Rotation

Counter-Clockwise (CCW) Rotation

Figure 2

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 of the belts and/or sheaves 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

Since Cincinnati Fan did not supply and install the belts, sheaves or electrical components for this blower, it is the purchaser's and/or user's responsibility to select, properly install and maintain the drives in accordance with the manufacturer's directions. The purchaser and/or user is also responsible for checking and correcting the vibration of the completed assembly so it does not operate above the vibration limits indicated in the chart in Figure 4.

operation

⚠ Caution

The blower Should Not be operated if the vibration velocity of the blower exceeds 0.50 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.

⚠ Warning

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 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 Figure 4.

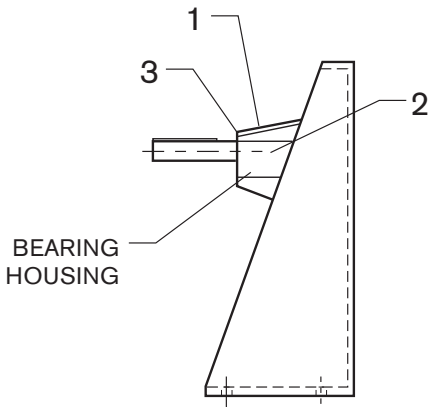


Figure 3

Table 3 – Vibration Meter Probe Positions

	1	2	3
A			
B			
C			

A–Pre-Startup Check completed by: _____ Date _____

B–Eight Hour Post-Startup Check completed by: _____ Date _____

C–Three-Day Post-Startup Check completed by: _____ Date _____

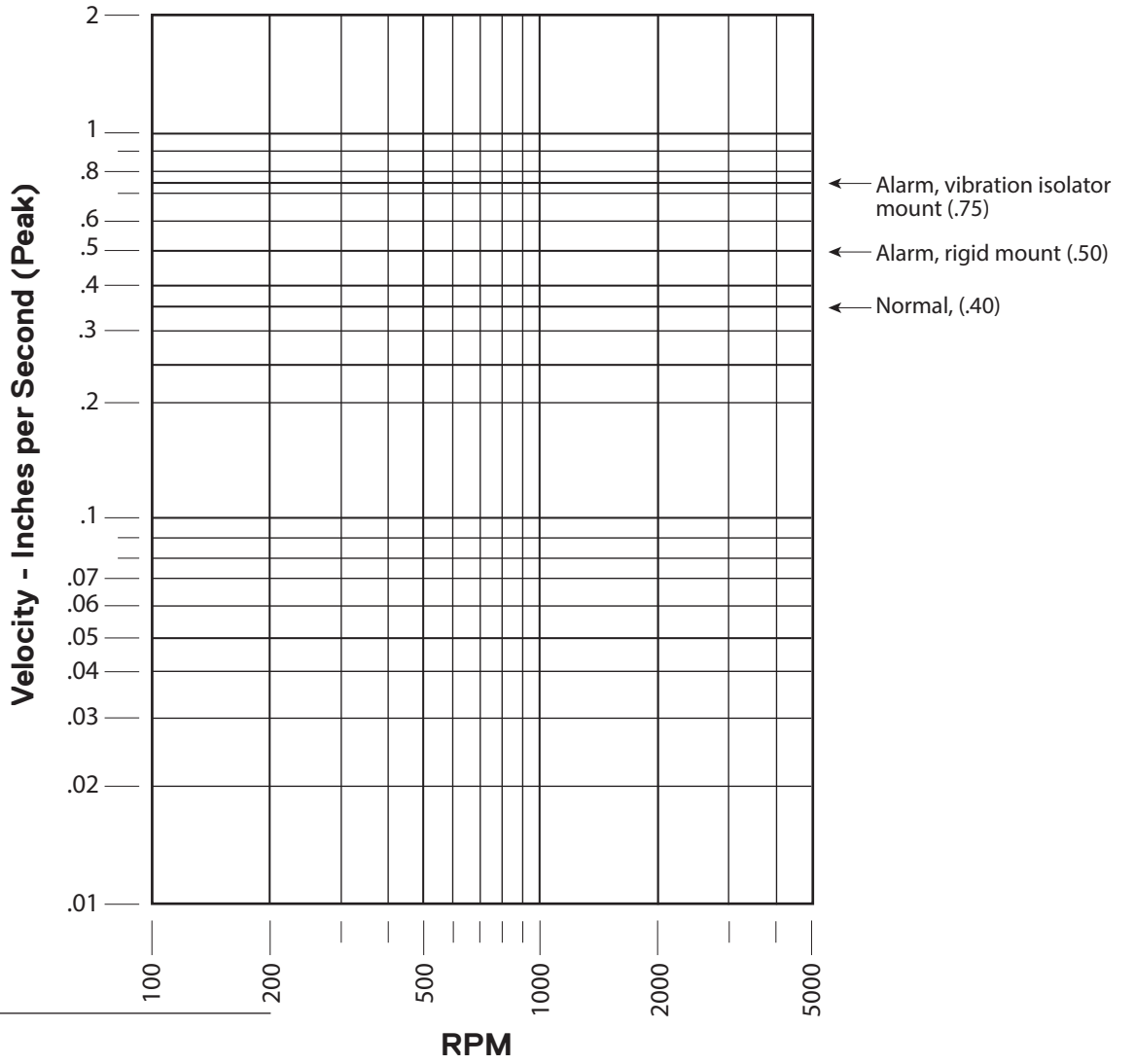


Figure 4

Vibration Severity Graph

maintenance

Routine Inspection and 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.

⚠ Caution

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 Cincinnati Fan or our sales office in your territory to determine if the unit will operate safely at the new conditions.

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**.

Note

If any set screws have become loose, they must be replaced. Never use set screws more than once. Replace with knurled, cup-point set screws with a nylon locking patch.

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.

maintenance

Fan Bearings are Pre-Lubricated and Ready for Use Recommended Lubrication Frequency in Months						
Fan Operating Speed RPM	Fan Shaft Diameter (OD)					
	1/2" to 1"	1 1/8" to 1 1/2"	1 5/8" to 1 15/16"	2" to 2 1/2"	2 11/16" to 3 3/16"	3 7/16" to 3 15/16"
Up to 500	6	6	6	6	5	5
500 - 1000	6	6	6	5	4	4
1000 - 1500	6	5	5	4	3	2
1500 - 2000	5	5	4	3	2	1
2000 - 2500	5	5	3	2	2	
2500 - 3000	5	4	2	2	1	
3000 - 3500	4	3	2	1		
3500 - 4000	3	33	1			
4000 - 4500	2	2	1			
4500 - 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. **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.

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 the **Vibration Section** and **Figure 4**.

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. 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. **Grinding of material for cast aluminum wheels.** If grinding on the wheel to remove material, be very careful not to grind too much in one area which could affect the structural integrity of the wheel.
2. **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.
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 Cincinnati Fan or our local sales office for your area for assistance if necessary.

Vibration

As mentioned previously in this manual, excessive vibration can cause premature motor failure that could lead to catastrophic failure of the blower. After performing any routine maintenance, the vibration readings should be taken. New readings should be taken (maximum every 12 months) and compared to the readings you recorded in **Table 3** 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:

- Wheel unbalance
- Bearing Failure
- Foundation stiffness
- Mechanical looseness
- Misaligned sheaves and/or belts
- Poor blower inlet and/or discharge conditions

Fan Shaft and Bearing Replacement

The blower shaft and bearings for Cincinnati Fan 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 complete blower shaft, bearings and bearing housing be replaced as an assembly.

1. **Lock out the power source to the motor and let wheel come to a complete stop.**
2. Disconnect the inlet and/or discharge duct work from the blower.
3. Remove the belt guard (if applicable). Not supplied by Cincinnati Fan.
4. Loosen the tension on the belt(s) by loosening the motor and the motor adjustment mechanism.
5. Remove the belt(s), loosen the blower sheave set screws or taper-lock hub bolts and remove the blower sheave.
6. Remove the blower assembly (housing, wheel, bearing base, shaft and bearings) from the system.
7. Remove the inlet side of the blower housing.
8. Measure and record the location of the blower wheel on the shaft, then remove the locking hardware in the wheel hub
9. Take the two set screws out of the wheel or remove the three bolts in the taper-lock bushing.
10. Carefully remove the blower wheel.
11. Remove the 4 bolts, inside the drive side of the housing, that connect the housing to the blower base and the bearing housing.

Note

If ordering an Arrangement 2 shaft and bearing assembly, the bearing housing, shaft and bearings are supplied as a completed assembly. After receiving the complete assembly, proceed to step 26. If you are not replacing the complete assembly, proceed with step 12.

12. Measure and record the shaft length from the front face of the bearing housing to the end of the shaft.
13. Loosen the cap screw in the bearing retaining ring on each bearing.
14. Remove the shaft from the bearings.

15. Remove both bearings from the bearing housing.
16. Clean the inside of the bearing housing and inspect it for any deformities in the machined raceways where the new bearings will be installed. If there are any deformities, the bearing housing should be replaced.
17. If the same blower shaft is being used, file down all the set screw marks on the shaft.

Note

All Arrangement 2 blowers use Seal Master, "Skwezloc, ER-T bearings (or equal) only.

18. Install one new bearing into the bearing housing at either end.
19. Install the original shaft, or replacement shaft, through the bearing housing and the one bearing.
20. Fill the bearing housing cavity, with the proper grease, half way between the first bearing installed and the opposite end where the second bearing will be installed.
21. Install the second bearing.
22. Locate the end of the shaft by the same dimension recorded in Step 12.
23. Turn the shaft by hand to "seat" the bearing races.
24. Tighten the cap screw in the retaining ring of each bearing to 90-100 in/lb.
25. Repeat step 23. The shaft **must** turn freely without any binding in spots.
26. Install the complete shaft/bearing assembly onto the base and the drive side of the blower housing.
27. Install the four bolts through the drive side of the blower housing, base and bearing housing. Add the lock washers and nuts and tighten.
28. Install new set screws into the wheel, or taper-lock hub bolts into the hub. **Do Not** use old set screws or bolts. Replace any set screws with knurled, cup point, set screws with a nylon locking patch.
29. Install the blower wheel onto the shaft, and in the same location on the shaft, per the dimension you recorded in Step 8. **Do Not** pound the wheel on the shaft with a hammer. Pounding the wheel on with a hammer will damage the bearings.
30. Align the wheel and shaft keyways and install a new key.
31. Spin the wheel by hand to make sure it is not rubbing the blower housing. Adjust if necessary.

Note

32. Tighten the wheel set screw, over the key first, to the torque values in Table 1. Next, tighten the set screw onto the blower shaft or, tighten the taper-lock hub bolts per Table 2.
33. Install the inlet side of the blower housing and then repeat Step 31.
34. Reinstall the blower, back into the system.
35. Reinstall the sheaves and belt(s).
36. Check the alignment of the sheaves and adjust the belt tension per the drive manufacturer's instructions.
37. Reinstall all guards and any duct work connections.
38. Unlock power to the motor and turn power on for about 10 minutes.
39. Turn off and lock out power to the motor. Wait for blower wheel to come to a complete stop.
40. Remove belt guard (if applicable).
41. Check the sheave alignment and belt tension. Adjust if necessary.
42. Reinstall belt guard (if applicable).
43. Unlock power to the motor and turn on.
44. Take vibration readings. They should not exceed the limits indicated on the vibration chart in **Figure 4**. They should also be very close to the original readings you recorded in **Figure 3**.
45. Repeat steps 39 through 44 (in that order) after 8 hours and again after 1 week.

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.

Safety Equipment and Accessories

It is the user's responsibility to make sure that any 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, motors, controls, special coatings, silencers, expansion joints, valves, flexible connectors, and filters.

Replacement Parts

Under normal conditions, you should not need any spare or replacement parts for at least 24 months after shipment from Cincinnati Fan. 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.

- If this fan is vital to any process that could cost you lost revenue, we strongly recommend that you keep a blower wheel and motor at your location.
- 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 parts or complete units, contact us for the name of our sales office in your area or locate them on our website at **cincinnatifan.com.**

Note

The blower serial number from the blower name plate is required to identify parts correctly.

maintenance

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.

⚠ Warning

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.

Trouble	Cause
Excessive Vibration	Loose mounting bolts, set screws or taper-lock hub bolts, bearings and sheaves
	Misalignment of sheaves, blower bearings or motor
	Worn or corroded blower wheel
	Accumulation of foreign material on blower wheel
	Bent motor or blower shaft
	Worn motor and/or blower bearings
	Worn sheaves and/or belts
	Motor out of balance
	Inadequate structural support
	Support structure not sufficiently cross braced
	Weak or resonant foundation
	Foundation not flat and level
Airflow (CFM) Too Low	Blower wheel turning in wrong direction (rotation)
	Actual system static pressure (SP) is higher than expected
	Motor speed (RPM) to low, incorrect or defective belts and/or sheaves
	Dampers or valves not adjusted properly
	Leaks or obstructions in duct work.
	Filters dirty
	Inlet and/or discharge guards are clogged
	Duct elbow too close to blower inlet and/or discharge
	Improperly designed duct work
	Wheel not properly located relative to the inlet bell (LM models only)
Airflow (CFM) Too High	Actual system static pressure (SP) is lower than expected
	Motor speed (RPM) to low
	Filter not in place
	Dampers or valves not adjusted properly
Motor Overheating	Actual system static pressure (SP) is lower than expected
	Voltage supplied to motor is too high or too low
	Motor speed (RPM) too high or defective motor
	Air density higher than expected
	Motor wired incorrectly and/or loose wiring connections
	Note – a normal motor will operate at 174°F

Excessive Noise	Wheel rubbing inside of housing
	Worn or corroded blower wheel
	Accumulation of foreign material on blower wheel
	Loose mounting bolts, set screws or taper-lock hub bolts, bearings or sheaves
	Misalignment of blower bearings, sheaves or motor
	Bent motor shaft or blower shaft
	Worn motor and/or blower bearings
	Motor out of balance
	Motor and/or blower bearings need lubrication
	Vibration originating elsewhere in system
	System resonance or pulsation
	Inadequate or faulty design of blower support structure
	Blower operating near stall condition due to incorrect system design or installation
Fan Doesn't Operate	Motor wired incorrectly or loose wiring connections
	Incorrect voltage supply
	Defective fuses or circuit breakers
	Power turned of elsewhere
	Defective motor

Long Term Storage

Storage exceeding 30 days after receipt of equipment.

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

Note

- Storage site selection:
  - Level, well-drained, firm surface, in clean, dry and warm location. Minimum temperature of 50°F (10°C).
  - Isolated from possibility of physical damage from construction vehicles, erection equipment, etc.
  - Accessible for periodical inspection and maintenance.
- The blower should be supported under each corner of its base to allow it to "breathe". Supports (2 x 4s, timbers, or railroad ties) should be placed diagonally under each corner.
- 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.**

maintenance

- Initial inspections must be made of the blower components, and immediate corrective action taken if discrepancies are found, to insure adequate protection of the equipment during storage.
    - Blower bearings only should be completely filled with lubricant to minimize the chance of oxidation or rust.
- Storage Maintenance:

Note

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.

Storage/Maintenance Schedule Log Example	
Action	Date Checked
Reinspect units to insure any protective devices used are functioning properly. Check for scratches in the finish which will allow corrosion or rust to form	
Rotate blower wheel a minimum of 10 full revolutions to keep the moor bearing grease from separating and drying. **This is a critical step.**	

- General Motor Procedure:

Since Cincinnati Fan does not supply the motor for Arrangement 2 blowers, consult you motor supplier for the correct long term storage instructions.

Note

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

Limited Warranty

Cincinnati Fan and Ventilator Company (Seller) warrants products of its own manufacture, against defects of material and workman-ship under normal use and service for a period of eighteen (18) months from date of shipment or twelve (12) months from date of installation, whichever occurs first. This warranty does not apply to any of Seller's products or any part thereof which has been subject to extraordinary wear and tear, improper installation, accident, abuse, misuse, overloading, negligence or alteration. This warranty does not cover systems or materials not of Seller's manufacture. On products furnished by Seller, but manufactured by others, such as motors, Seller extends the same warranty as Seller received from the manufacturer thereof. Expenses incurred by Purchaser's in repairing or replacing any defective product will not be allowed except where authorized in writing and signed by an officer of the Seller.

The obligation of the Seller under this warranty shall be limited to repairing or replacing F.O.B. the Seller's plant, or allowing credit at Seller's option. **This warranty is expressly in lieu of all other warranties either expressed or implied including the warranties of merchantability and fitness for a particular purpose and of all other obligations and liabilities of the seller. The purchaser acknowledges that no other representations were made to purchaser or relied upon by purchaser with respect to the quality or function of the products herein sold.**

Removal of the Sellers nameplate or any generic fan nameplate containing the fan serial number voids all warranties, either writ-ten or implied. Failure to complete and document all the pre-startup and post startup checks and perform the suggested routine maintenance checks voids all warranties, either written or implied.

Limitation of Liability

Notice of any claim, including a claim for defect in material or workmanship, must be given to Seller in writing within 30 days after receipt of the equipment or other products. Seller reserves the right to inspect any alleged defect at Purchaser's facility before any claim can be allowed and before adjustment, credit, allowance replacement or return will be authorized. See RETURNS below. Seller's liability with respect to such defects will be limited to the replacement, free of charge, of parts returned at Purchaser's expense F.O.B. Seller's plant and found to be defective by the Seller.

In no event will seller be liable for special, indirect, incidental or consequential damages, whether in contact, tort, negligence, strict liability or otherwise, including without limitation damages for injury to persons or property, lost profits or revenue, lost sales or loss of use of any product sold hereunder. Purchaser's sole and exclusive remedy against seller will be the replacement of defective parts as provided herein or refund of the purchase price for defective products, at seller's sole option. Seller's liability on any claim, whether in contract, tort, negligence, strict liability or otherwise, for any loss or damage arising out of or in connection with purchaser's order or the products or equipment purchased hereunder, shall in no case exceed the purchase price of the equipment giving rise to the claim.

Responsibly

It is the understanding of the Seller that Purchaser and/or User will use this equipment in conjunction with additional equipment or accessories to comply with all Federal, State and local regulations. The Seller assumes no responsibility for the Purchaser's and/or User's compliance with any Federal, State and local regulations.

Returns

Cincinnati Fan & Ventilator Company assumes no responsibility for any material returned to our plant without our permission. An RMA (Return Material Authorization) number must be obtained and clearly shown on the outside of the carton or crate and on a packing slip. Any items returned must be shipped freight prepaid. Failure to comply will result in refusal of the shipment at our receiving department.

information

Disclaimer

This manual, and all its content herein, is based on all applicable known material at the time this manual was created. **Any parts of this manual are subject to change at any time and without notice.**

If any statements, diagrams and/or instructions contained herein, for components not manufactured by the Seller, conflict with instructions in the manufacturer's manual (i.e.: motors, bearings, dampers, etc.), the instructions in the manufacturer's manual, for that component take precedent.

Should you want the latest version of this manual, please contact us or our sales office for your area. Or, you can print a current version by going to our website at **cincinnatifan**.com.

Parts Drawing

Cincinnati Fan manufactures many models and arrangements with special variations. For that reason, the maintenance manuals contained on our website do not include a parts drawing nor the completed blower or fan specifications on page 2. For the parts drawing of all the standard components and specifications for the specific blower or fan that you have, please contact our local Cincinnati Fan sales office for your area.

You will need to give them the serial number shown on the blower or fan nameplate so they can supply you the correct information.

Click on "Contact a Sales Rep" on our website for the name and contact information for our local sales office for your area at **cincinnatifan**.com.

centrifugal blower

USER MANUAL

SPX ENGINEERED AIR MOVEMENT
7697 SNIDER ROAD
MASON, OH 45040 USA
513 573 1000 | **spxairmovement**.com

CF-05-IOM-24 | ISSUED 3/2024

SPX TECHNOLOGIES