

Installation, Safety, Operation & Maintenance Instructions And Parts List For Models PB, PBS, SPB and LM. Arrangement 2 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**

ATTENTION: RECEIVING DEPARTMENT

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

NOTICE

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.

⚠ 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 BEFORE starting ANY service or inspection.



Avoid injury. NEVER operate without ALL required safety guards in place.



Avoid injury. You MUST read and understand all instructions in this manual BEFORE 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, 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 at Cincinnati Fan, 7697 Snider Rd., Mason, OH 45040-9135

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 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.

WARNING

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

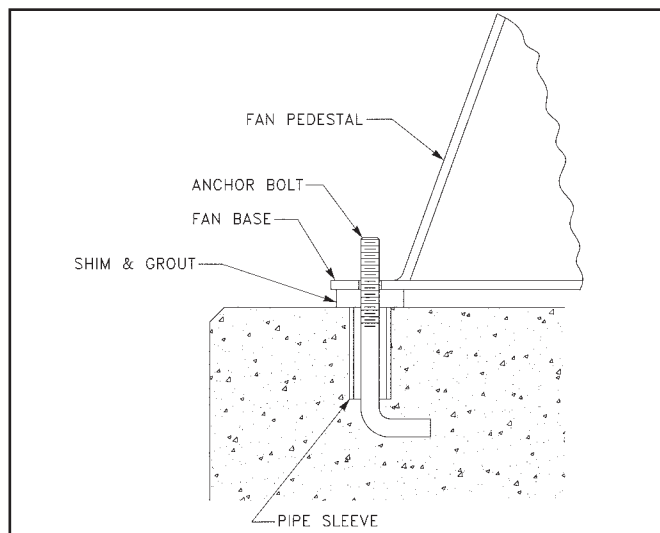
B. Mounting Methods:

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** below. 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 **Section II- Item A** on page 3 must be followed.

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. 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 **Section II- Item A** on page 3 must be followed.

⚠ 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 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, 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:

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.**

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 start-up 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

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 Wrence 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:

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 instructions in Section B, on page 9. If you need to replace the bearings, you must use Seal Master "Skwezloc, ER-T Series" bearings (or equal) only. 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 inch/pounds.

H. V-Belt Drives:

Since Cincinnati Fan did not supply the belts and sheaves (drives 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.

For complete drive installation instructions, please see the following websites:

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

OR

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

III. ELECTRICAL

A. Motors and Disconnects:

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 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.

B. Maximum Blower Speed with 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**. It may be necessary to "block out" some speeds to eliminate a resonant vibration problem. The maximum safe blower speed is shown in the **Blower Specifications** section on page 1 of this manual. If you have lost page 1, contact Cincinnati Fan 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.

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 7, 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: _____

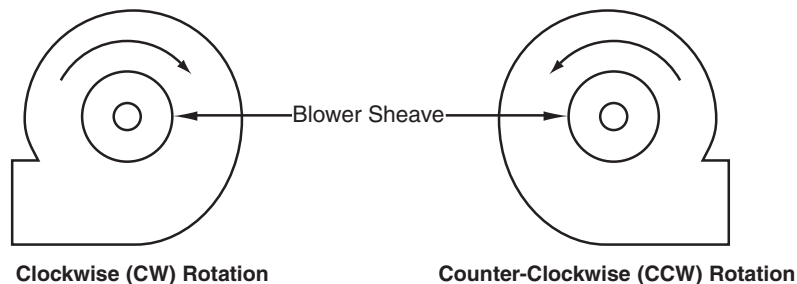
A2. 8 Hour, Post-Startup Checks Completed By: _____ DATE: _____

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

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

1. Check all blower, foundation and duct work hardware to make sure it is tight.
2. Check all blower wheel 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 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 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 spinning it 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 all 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.**
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. 2 below.

Fig. 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.

B. Vibration:

The blower was balanced at the factory to comply with ANSI/AMCA Standard 204-05, Category BV-2. 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 or sheaves 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. Since Cincinnati Fan did not supply the belts, sheaves nor any electrical components, 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 Fig. 5 on page 8.

⚠ WARNING

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 an isolator base, it **SHOULD NOT** be operated if the vibration velocity of the blower exceeds 0.75 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 Fig. 5 on page 8.

Fig. 3 (Blower bearing reading points)

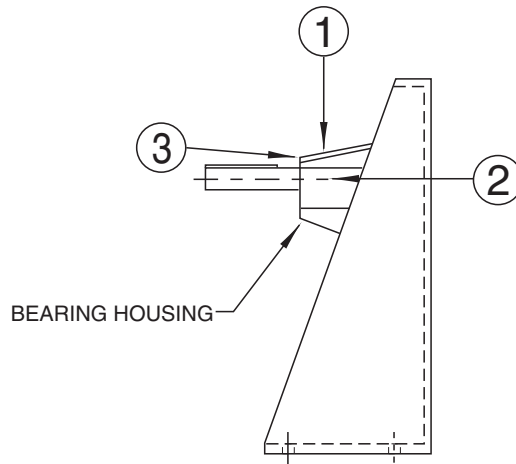


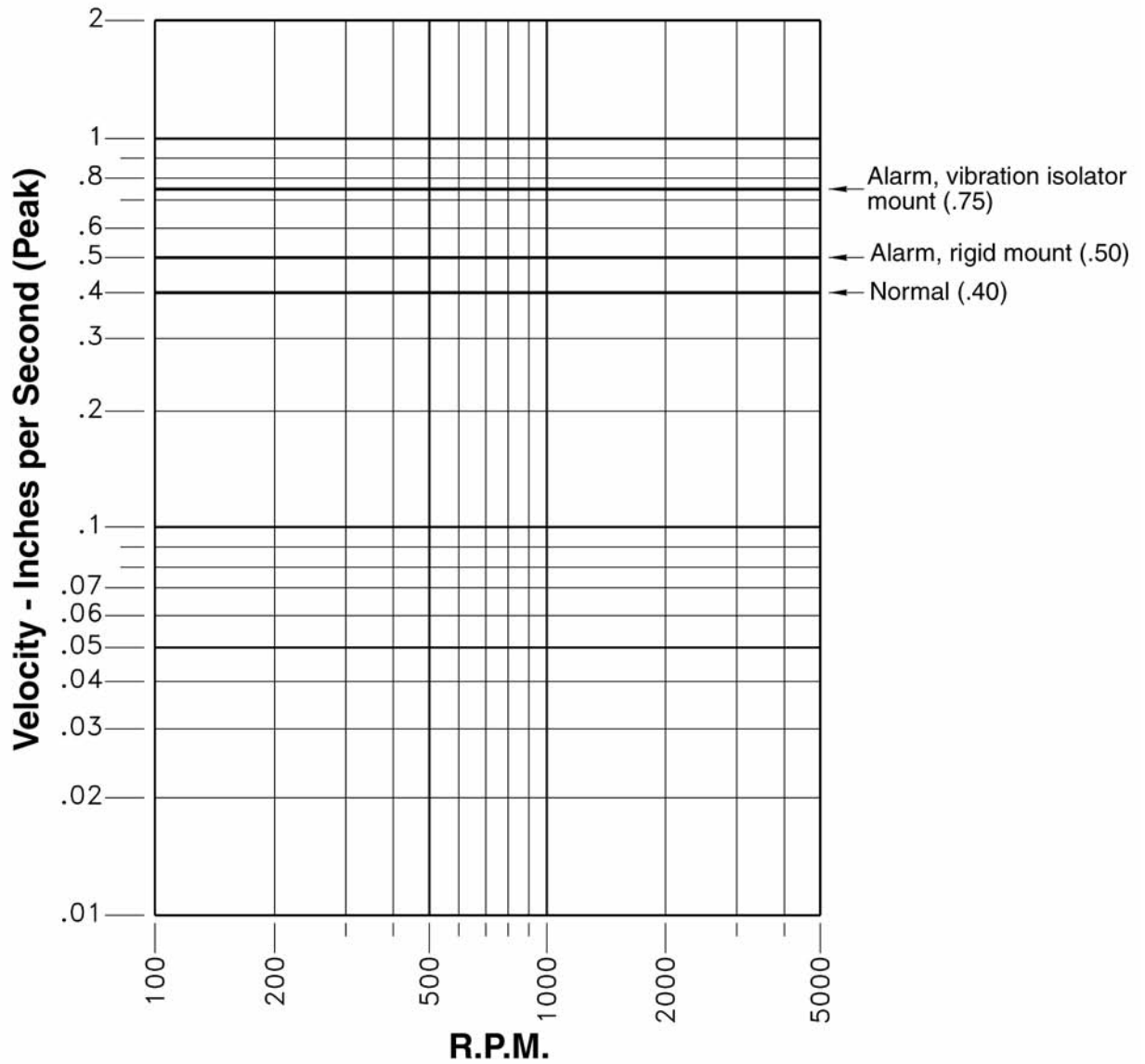
Fig. 4

**VIBRATION METER PROBE POSITIONS
For Arrangement 2 Blowers**

	1	2	3
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. 5 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 CINCINNATI FAN 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. Blower Bearing Lubrication:

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 pages 6 & 7 and Fig. 5 on page 8.**

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. Grinding off material for cast aluminum wheels:

If you are 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.

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 Curve 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.

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. 4**, on page 7, 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. Fan Shaft & 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.

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.**
2. Disconnect any 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, base and bearing assembly) from the system.
7. Remove the inlet side of the blower housing.
8. Measure the location of the blower wheel on the shaft, then remove the locking hardware in the wheel hub.
9. Take the 2 set screws out of the wheel or remove the 3 bolts in a 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 you order 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 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 you intend to use the same blower shaft, 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 1 new bearing into the bearing housing at either end.
19. Install the original shaft, or replacement shaft, through the bearing housing and the 1 bearing.
20. Fill the bearing housing cavity, with the proper grease, 1/2 way between the 1 bearing 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 you took in **Step 12** above.

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 inch/pounds.
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 4 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 took in **Step 8** on page 10. **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.
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. Install the inlet side of the blower housing and then repeat **Step 31** above.
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 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 **Fig. 5** on page 8. They should also be very close to the original readings you recorded in **Fig. 4** on page 7.
45. Repeat steps 39, 40, 41, 42, 43 and 44 (**in that order**) after 8 hours and again after 1 week.

E. 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.

F. 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, motors, 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 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.

- 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, sheaves, 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. Or you can find them on our website at: **www.cincinnati-fan.com**

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

VII. TROUBLESHOOTING

⚠ 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.

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.

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 and motor shaft. 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 or blower 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 LM Model only).
Airflow (CFM) Too High	<ol style="list-style-type: none"> 1. Actual system static pressure (SP) is lower than expected. 2. Motor or blower speed (RPM) too high. 3. Filter not in place. 4. Dampers or valves not adjusted properly.
Motor Overheating (Consult your motor supplier)	<p>NOTE: A normal motor will operate at 174°F.</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 sheaves, blower and motor shaft. 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 (Consult your motor supplier)	<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 bearing housing should be completely filled with lubricant to minimize the chance of oxidation or rust.
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 blower bearing grease from separating and drying out. <i>This is a critical step.</i>	

6. General Motor Procedure:

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

NOTE:

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

IX. LIMITED WARRANTY:

Cincinnati Fan & Ventilator Company (Seller) warrants products of its own manufacture, against defects of material and workmanship 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 Seller's nameplate or any generic fan nameplate containing the fan serial number voids all warranties, either written 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.

RESPONSIBILITY:

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.

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, belts and sheaves, 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: www.cincinnati-fan.com



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X. PARTS DRAWING:

PLEASE NOTE

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 1. 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. **www.cincinnati-fan.com**