INSTALLATION & OPERATION MANUAL

BVS Cartridge Dust Collector
(Part# 360096)

BVS813

OPERATION MANUAL
BVS
CARTRIDGE DUST COLLECTOR

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Introduction

Congratulations and THANK YOU for selecting the BVS Cartridge Dust Collector System from Empire Abrasive Equipment Company. This booklet is provided to assist you in the proper use and maintenance of this dust collector.

Please read this booklet carefully and keep it in a handy location for future reference. If you have any questions about the operation or maintenance of this equipment, please contact your Empire Distributor or Empire's Technical Service Group (800-497-4543).

Empire: The leader in air-blast technology

Empire specializes in the design and manufacture of air-blast equipment and continues as an industry leader for more than 70 years. Today, Empire produces the most extensive line of air-blast products in the world. In addition to PEB blast booths and BVS dust collectors, our product lines include ProFinish™ and ProFormer® cabinets, Econ-o-Finish® and Modified cabinets, fully Automated Blast Systems, Hoffman Blast Rooms and SuperBlast® Portable blasters.

Empire Abrasive Equipment Company's reputation as a leader in air-blast technology is the result of meeting our customer's demand for quality equipment and systems that deliver increased productivity. We support our equipment with training, service, and testing programs. When you need advice, assistance, or equipment on short notice, our national network of Empire distributors assures that help is nearby.

Equipment Warnings

WARNING
DECAL 567402

WARNING

AIR DISCHARGED FROM PROPERLY MAINTAINED EMPIRE CARTRIDGE TYPE DUST COLLECTORS MEET OSHA EMISSION LEVELS FOR "NUISANCE DUST". DUST IS GENERATED FROM BLAST MEDIA, REMOVED CONTAMINANTS, COATINGS, AND SUBSTRATES.

HAZARDOUS DUST

ADDITIONAL FILTRATION IS REQUIRED FOR DUST CONTAINING TOXINS AS DEFINED BY OSHA REGULATIONS (STANDARD - 29 CFR) 1910.1000, "AIR CONTAMINANTS, SUBPART Z, TOXIC AND HAZARDOUS SUBSTANCES" OR MAY OTHERWISE PRESENT A HAZARD TO PERSONNEL.

COMBUSTIBLE DUST

A CONCENTRATION OF COMBUSTIBLE DUST MAY BE IGNITED BY SPARK, FLAME, OR HEAT SOURCE. REFER TO NFPA 497M FOR COMBUSTIBLE DUST. USE EXTREME CARE WHEN EMPTYING THE DUST COLLECTOR WASTE. EMPTY THE COLLECTOR WASTE OFTEN AND DISPOSE OF WASTE PROPERLY.

REMOVING DUST COLLECTOR WASTE

CONSULT OSHA REGULATIONS (STANDARD - 29 CFR) 1910.120, "GENERAL DESCRIPTION AND DISCUSSION OF LEVELS OF PROTECTION AND PROTECTIVE GEAR". ALWAYS WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN EMPTYING THE DUST COLLECTOR, DISPOSING OF COLLECTOR WASTE, AND CHANGING CARTRIDGE FILTERS. EMPTY THE DUST COLLECTOR WASTE DRUM WHEN TWO THIRDS (2/3) FULL.

CLEAN FILTERS OFTEN

CLEAN DUST COLLECTOR CARTRIDGE FILTERS ONLY WHEN SYSTEM IS "ON" AND COLLECTOR "MINIHELIC" GAGE REACHES 4. CONTINUE CLEANING SEQUENTIALLY UNTIL THE GAGE REACHES 2 INCHES. PULSE AIR PRESSURE MUST BE SET AT 40 PSI. THE WASTE SLIDE GATE MUST BE OPEN WHEN THE DUST DRUM IS INSTALLED. REFER TO SEPARATE DUST COLLECTOR INSTALLATION AND OPERATING MANUAL.

AN AUTOMATIC "PHOTOHELIC" OPTION IS AVAILABLE FOR CARTRIDGE TYPE DUST COLLECTORS. CONTACT YOUR EMPIRE DISTRIBUTOR FOR INFORMATION. IF THE "PHOTOHELIC" OPTION IS INSTALLED ON THIS SYSTEM, SET THE HIGH LIMIT AT 4, LOW LIMIT AT 2 INCHES.

CAUTION

MISUSE OR MODIFICATION OF THIS EQUIPMENT MAY RESULT IN PERSONAL INJURY. DO NOT MISUSE OR MODIFY. FAILURE TO FOLLOW SAFE OPERATING AND MAINTENANCE PROCEDURES CAN RESULT IN HEALTH AND SAFETY HAZARDS.

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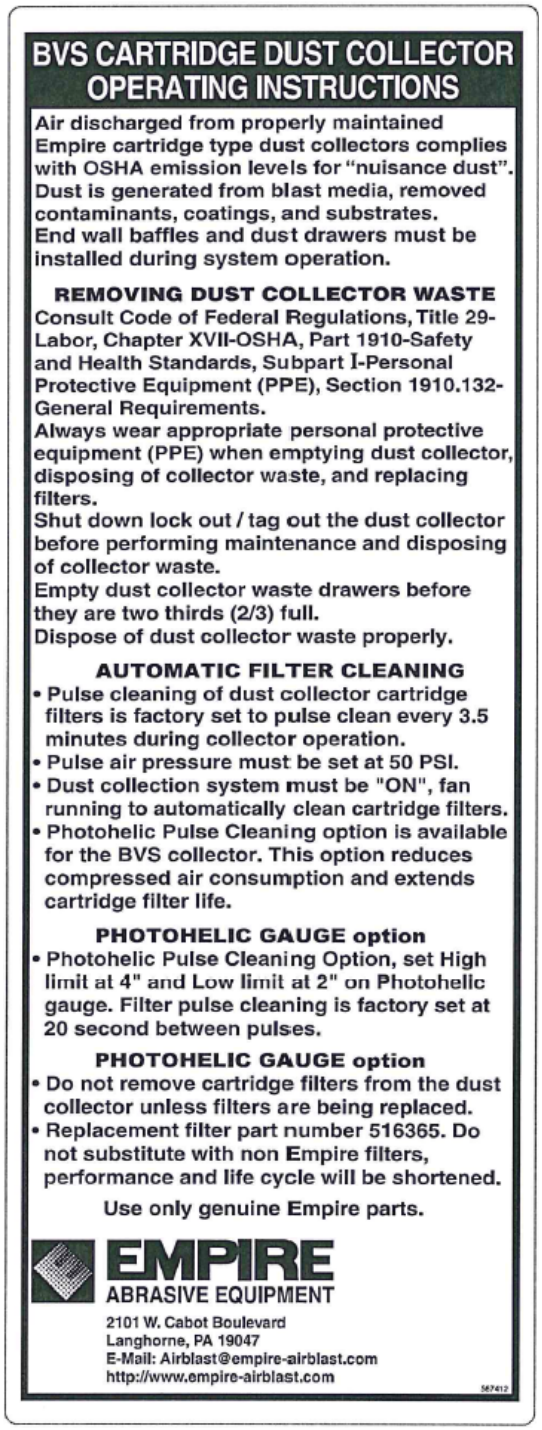
PN 567403

Equipment Operation

DECAL 567412



BVS CARTRIDGE DUST COLLECTOR OPERATING INSTRUCTIONS

Air discharged from properly maintained Empire cartridge type dust collectors complies with OSHA emission levels for "nuisance dust". Dust is generated from blast media, removed contaminants, coatings, and substrates.
End wall baffles and dust drawers must be installed during system operation.

REMOVING DUST COLLECTOR WASTE

Consult Code of Federal Regulations, Title 29-Labor, Chapter XVII-OSHA, Part 1910-Safety and Health Standards, Subpart I-Personal Protective Equipment (PPE), Section 1910.132-General Requirements.
Always wear appropriate personal protective equipment (PPE) when emptying dust collector, disposing of collector waste, and replacing filters.
Shut down lock out / tag out the dust collector before performing maintenance and disposing of collector waste.
Empty dust collector waste drawers before they are two thirds (2/3) full.
Dispose of dust collector waste properly.

AUTOMATIC FILTER CLEANING

- Pulse cleaning of dust collector cartridge filters is factory set to pulse clean every 3.5 minutes during collector operation.
- Pulse air pressure must be set at 50 PSI.
- Dust collection system must be "ON", fan running to automatically clean cartridge filters.
- Photohelic Pulse Cleaning option is available for the BVS collector. This option reduces compressed air consumption and extends cartridge filter life.

PHOTOHELIC GAUGE option

- Photohelic Pulse Cleaning Option, set High limit at 4" and Low limit at 2" on Photohelic gauge. Filter pulse cleaning is factory set at 20 second between pulses.

PHOTOHELIC GAUGE option

- Do not remove cartridge filters from the dust collector unless filters are being replaced.
- Replacement filter part number 516365. Do not substitute with non Empire filters, performance and life cycle will be shortened.

Use only genuine Empire parts.

EMPIRE
ABRASIVE EQUIPMENT

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567412

Collector Description

The Empire BVS Dust Collector is a continuous operation, self contained blast booth ventilation system with continuous duty cartridge filter cleaning during dust collector operation.

The BVS Dust Collector System components consists of a divided (dirty and clean side) Collector Housing, with (6) Empire Cartridge Filters, Air Inlet Baffle, Reverse Pulse Cartridge Cleaning System, (2) waste Dust Drawers and a 10 HP Fan Assembly.

The BVS collector provides the blast booth interior with a slight negative air pressure which prevents dust/fines from migrating from the booth during the blasting operation.

Intended Use

The Empire BVS Dust Collector is specifically designed to provide air ventilation for Abrasive Air Blast Booths. Proper ventilation greatly improves visibility inside the blast booth for personnel, provides a cleaner environment, and removes dust and fines from the blast system.

Specifications

- Fully enclosed dust collector
- 5,000 to 6,000 CFM
- 6 filter cartridges, 918 square feet of filter surface
- Filter rated at MERV 14
- Automatic electronic compressed air reverse pulse filter cleaning controls
- 50 psig max filter pulse pressure (air connection kit Part #360091)
- Controls 120V/60/50Hz
- Magnehelic gauge zero to 10 inches W.C. scale
- 10 HP Fan motor
- (2) 1½ Ft^3 plastic dust drawer
- Painted Finish - Empire machine tool beige

BVS Optional Components

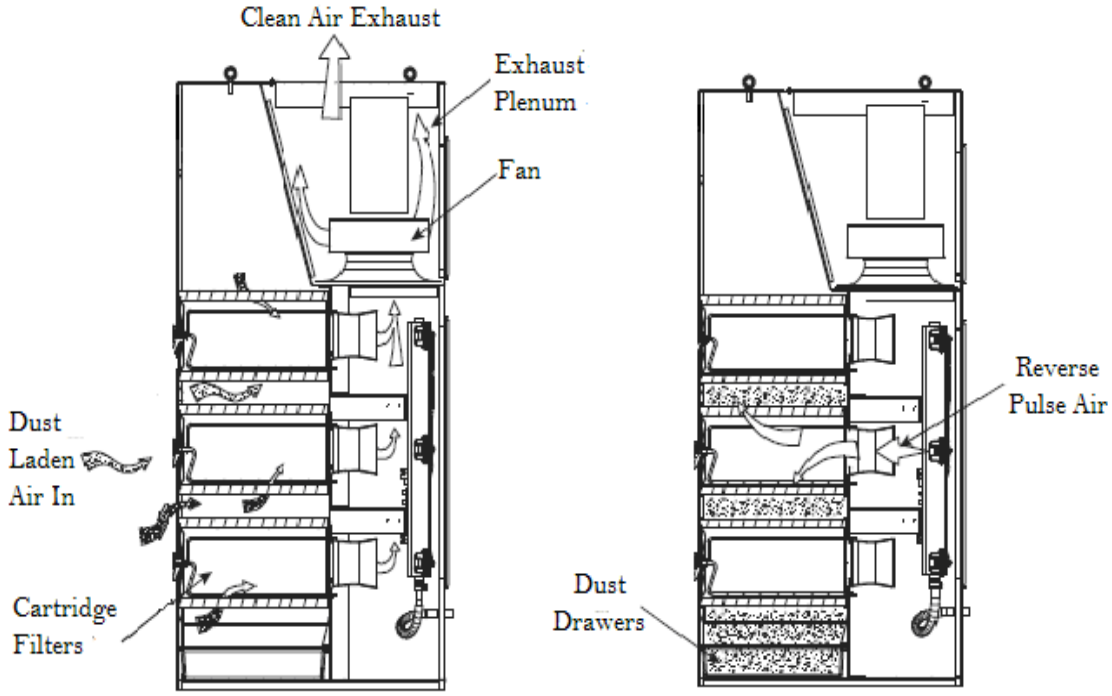
- Photohelic gauge ensures filters only cleaned when dirty
- Silencer ensures less than 85 dBA sound level from dust collector fan
- HEPA Filter rated at 99.97 % efficient on 0.3 micron particles

BVS Operation

The Empire BVS Dust Collector is a continuous operation, self contained blast booth ventilation system with on demand cartridge filter cleaning during dust collector operation.

The BVS Dust Collector System ventilates the blast booth by drawing air into the booth through the baffled air inlets and through the room picking up airborne dust and fines. The dust/fines laden air passes around the booth Air Exhaust Baffle to the collector Cartridge Filters. As the dirty air enters the filter surface, the dust/fines are captured on the outside of the filters and the cleaned air passes through the filter to the clean air chamber of the collector, to the fan and is discharged from the fan exhaust. (See below)

As dust/fines accumulate on the outside of the cartridge filters, booth ventilation air flow through the filters is restricted. The reverse pulse filter cleaning system solid state timer sequentially releases a burst of compressed air from a diaphragm valve into the center of each cartridge filter (See below). The pulse air gently passes from the inside of the cartridge to the outside removing accumulated dust which then falls and accumulates in the dust drawers below.



Reverse Pulse Solenoids & Timer

The BVS Solenoid Valve Enclosure with Timer is located inside the dust collector housing, behind the bottom access panel. The Solenoid and Timer continually pulse clean the cartridge filters during system operation. There are timer adjustments for pulsing but no other customer serviceable components.

Magnehelic Gauge

The Magnehelic gauge with a scale of zero to 10 inches W.C. scale is provided to measure the cleanliness of the cartridge filters. Acceptable gauge pressure is 0 to 4 inches. When the pressure increases to 4 inches and can not be reduced, filters require replacement.

Compressed Air Connection

The BVS Dust Collector requires a regulated oil and moisture free compressed air supply (minimum of 50 psig.) for Reverse Pulse Controls. An air pressure regulator and general purpose filter must be installed in this air supply to ensure components are not contaminated and the reverse pulse air pressure does not exceed 60 psig. If pulse pressure exceeds 60 psig, component damage will occur. 1.0 CFM at 60 psi is required.

Optional Components

Photohelic Gauge Option # 360097 with zero to 15 inch scale, reduces dust collector component wear and compressed air consumption by cleaning filters only when required. The Photohelic gauge option may be ordered and installed at a later date.

BVS Exhaust Silencer Option # 360098 is bolted to the top flange of the dust collector. The silencer will reduce fan noise to less than 85 dBA and can not be used if a HEPA filter is installed.

HEPA Filter Option # 360099 is bolted to the top flange of the dust collector. The HEPA filter is rated at MERV 13 and 99.97 % efficient on 0.3 micron particles. A Magnehelic gauge with a zero to 2 inch scale is provided to indicate the condition of the HEPA filter during system operation. The HEPA can not be used with the Silencer.

BVS Compressed Air Connection Kit # 360091 includes ¼ inch general purpose filter, pressure regulator, pressure gauge, ball valve, nipples, elbow, air hose and fitting to connect a compressed air supply required for the reverse pulse cleaning system of the BVS Dust Collector.

BVS Installation

1. The BVS Dust Collector is installed as part of the blast booth end wall assembly during blast booth construction. See "Installation Instructions Pre Engineered Blast Booth"

Electrical

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All electrical wiring is to be made by a qualified electrician following adopted codes, standards, and procedures specified by the authority having jurisdiction for that location.

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1. Wire the BVS fan motor and pulse controls per the electrical drawings supplied with this PEB blast booth system.
2. Optional Photohelic gauge installation, see Optional Component Installation, Photohelic Gauge, below.

Magnehelic Gauge

1. Locate and plan to mount the zero to 10 inch scale Magnehelic gauge on the right side wall of the BVS Dust Collector (as viewed from the BVS access doors).
2. Plug the (2) ports on the back of the gauge using 1/8" plugs supplied with the gauge.
3. Place the gauge in the mounting bracket and attach the bracket to the dust collector wall using supplied self drilling/tapping screws.
4. Install the 1/8" hose barbs supplied with the gauge in the gauge ports.
5. Connect the supplied tubing to the hose barb in the wall of the collector adjacent to the access doors.
6. Create several 12 inch diameter loops in the tubing around the gauge mounting bracket and connect the tubing to the bottom port of the gauge.
7. The top port of the gauge is to be left open to atmosphere.

Dust Drawers

Ensure the (2) Dust Drawers have been placed in the bottom of the BVS collector properly.

End Wall Baffle

Ensure the End Wall Baffle is installed to protect the cartridge filters from damage.

BVS Optional Component Installation

Photohelic Gauge

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All electrical wiring is to be made by a qualified electrician following adopted codes, standards, and procedures specified by the authority having jurisdiction for that location.

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1. Locate and plan to mount the zero to 15 inch scale Photohelic gauge on the right side wall (as viewed from the BVS access doors) of the collector.
2. Disassemble the back cover of the gauge and install (2) jumper wires, 120Vpower supply with ground, and (2) signal wires. Use Drawing B122104.
3. Use your separately supplied Electrical Assembly Drawings to determine the correct power supply for the gauge and controls.
4. When wiring is complete, mount the gauge in the mounting bracket and attach the bracket to the dust collector wall using supplied self drilling/tapping screws.
5. Install the 1/8” hose barb supplied with the gauge in the bottom gauge port.
6. Connect the supplied clear tubing to the hose barb in the wall of the collector adjacent to the access doors.
7. Create several 12 inch diameter loops in the tubing around the gauge mounting bracket and connect the tubing to the bottom port of the gauge.
8. The top port of the gauge is to be left open to atmosphere.

Silencer

1. The silencer is shipped separately and must be installed on the top of the dust collector.
2. Remove the Air Deflector from the top of the dust collector (Deflector is directly above the fan motor) and set aside.
3. Install the Air Deflector in the top of the silencer, foam side down, re-using original hardware.
4. Install supplied ½” x ¼”self stick gasket on the top flange of the dust collector.
5. Place the silencer on top of collector. Use supplied 5/16” X 1” bolts, lock and flat washers and bolt through matching holes in silencer and dust collector top flange to secure the silencer.

HEPA Filter

1. The HEPA filter assembly is shipped separate from the BVS collector and must be installed on the top of the dust collector, then the HEPA filters are installed.
2. Three (3) HEPA cartridge filters have been shipped inside the HEPA housing. Use care and do not damage the HEPA filters when removing the filter housing from the shipping pallet.
3. Remove the Air Deflector from the top of the dust collector (Deflector is directly above the fan motor) and set aside.
4. Install the supplied ½" X ¼"self stick gasket on the top flange of dust collector.
5. Place the HEPA filter housing on top of the collector. Use supplied 5/16" X 1" bolts, lock and flat washers and bolt through matching holes in HEPA housing and collector top flange to secure the HEPA housing.
6. .Use extreme care not to damage HEPA filters.
7. Carefully remove the HEPA filters from their cardboard boxes. Note that only one end of the filter has a gasket. Install (1) filter gasketed end first in each "U" shaped filter rack.
8. Use a set of (4) supplied 5/16" X 1" bolts, lock and flat washers and Filter Retainer Plates at the (4) corners of the filter rack. Tighten the hardware compressing the HEPA gasket 50%, sealing the gasketed end of the HEPA filter to the HEPA housing.
9. Locate and plan to mount the zero to 2 inch scale Magnehelic gauge on the right side wall of the BVS dust collector (as viewed from the BVS access doors) adjacent to the BVS Magnehelic or Photohelic gauge.
10. Place the gauge in the mounting bracket and attach the bracket to the dust collector wall using supplied self drilling/tapping screws.
11. Plug the (2) ports on the back of the gauge using 1/8" plugs supplied with the gauge.
12. Install a 1/8" hose barb supplied with the gauge in the side, bottom gauge port and in the 1/8" elbow in the HEPA filter housing.
13. Connect the supplied clear tubing to the hose barb in the 1/8" elbow of the HEPA filter housing.
14. Create several 12 inch diameter loops in the tubing around the gauge mounting bracket and connect the tubing to the bottom port of the gauge.
15. The top port of the gauge is to be left open to atmosphere.

BVS Start Up

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When performing equipment inspections or start up, use Lock out, Tag out procedures as required (electric, compressed air, etc) and wear the appropriate Personal Protective Equipment (PPE) for the job(s) being preformed.

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BVS Fan Start up

1. All electrical work must be performed by a qualified electrician in accordance with all applicable codes.
2. Cincinnati Fan has provided three (3) manuals for the BVS Dust Collector fan assembly: **"Recommended Safety Practices", "Initial Unit Start up Procedure For All Direct Drive Fans"** and "**Installation, Safety, Operation &Maintenance and Parts List". ** These manuals are stored in the plastic envelope on the side of the dust collector. Copies are available on our web site www.empire-airblast.com
3. Read all manuals listed above before starting and operating the BVS Dust Collector.
4. Follow the **"Initial Unit Start up Procedure For All Direct Drive Fans"** manual and record pre-startup and post start up check list data.

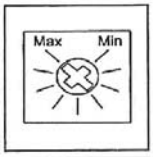
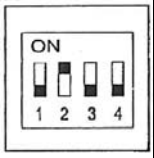
Failure to comply with above instruction manuals may void your warranty

5. Check fan wheel set screws/bushing are tightened to specified torque values.
6. Proper fan rotation is clockwise viewed from the motor end of the fan assembly.

Reverse Pulse Solenoids & Timer

The BVS Solenoid Valve Enclosure and Timer (Part # 516370) has been factory set for your installation. It is located inside of the dust collector housing, behind the bottom access panel.
There are three (3) settings that have been factory set for the proper performance of the pulse cleaning system, Time Off, Time On, and Optional Photohelic gauge. Refer to this chart for proper settings when used with the Magnehelic (Standard) or Photohelic (optional) gauge operation.

No other components of this control are customer serviceable.

Std. Magnehelic	Settings	Optional Photohelic
Set to E (210 sec.)		Set to 1 (20 sec.)
Set to "Min" (150 msec.)		Set to "Min" (150 msec.)
1 Off 2 On 3 Off 4 Off		1 Off 2 On 3 Off 4 Off

Compressed Air Connection

The BVS Dust Collector requires a regulated, oil and moisture free compressed air supply (minimum of 50 psig.) for the collector Reverse Pulse Controls. An air pressure regulator and general purpose filter must be installed in the air supply line to ensure reverse pulse components and filters are not contaminated and the reverse pulse air pressure does not exceed 60 psig. If pulse pressure exceeds 60 psig, component damage will occur. 1.0 CFM at 60 psi is required.

The regulated pulse air supply enters the BVS collector below the bottom access panel supplying air to the manifold inside the clean air side of the dust collector.

Magnehelic Gauge

One length of tubing is supplied to be connected to the bottom port of the Magnehelic gauge. The top port of the gauge is left open venting to atmosphere. Ensure the gauge is set at zero with fan off. With the fan motor running, the cartridge filters will be pulsed every 210 seconds.

Photohelic Gauge Option

One length of tubing is supplied to be connected to the bottom port of the Photohelic gauge. The top port of the gauge is left open venting to atmosphere. Ensure the gauge is set at zero with fan off.

Adjust the gauge set points (red needles) to 2, low limit and 4, high limit. The Photohelic gauge is a pressure switch that permits filter cleaning only when dirty and require cleaning. When the ΔP (pressure drop across the filters measured in inches of water column WC) reaches the high limit of 4, cleaning commences, pulsing every 20 seconds until the ΔP is reduced to the low limit of 2, pulsing will then stop.

BVS Maintenance

*****When performing maintenance on BVS components, Lock out, Tag out all utilities (electric, compressed air, etc) and wear the appropriate Personal Protective Equipment (PPE) for the job(s) being preformed.*****

Air Inlet Baffle

The two-piece BVS Air Inlet Baffle hangs on the end wall of the blast booth. The baffle protects the collector cartridge filters from the blast operation that would destroy filters and it ensures uniform air flow across the blast booth. Removing the lower baffle provides greater access to remove and empty the Dust Draws.

The lower baffle hangs on the bottom of the top baffle and is removed by lifting the lower baffle up, back and lowering to the floor. The top baffle is removed by lifting up, back and lowering the baffle to the floor. With both baffle piece removed, the BVS cartridge filters can be removed and new Empire filters installed and securely tightened.

Cartridge Filter Removal & Installation

*****When performing maintenance on BVS components, Lock out, Tag out all utilities (electric, compressed air, etc) and wear the appropriate Personal Protective Equipment (PPE) for the job(s) being preformed.*****

FILTER REMOVAL

1. Only remove cartridge filters from the BVS Dust Collector when you will install new filters. Use Empire Cartridge Filter **516365.**
2. Remove the BVS Air Inlet Baffles from the blast booth end wall and place them to the side.
3. **All personnel engaged in this activity must wear appropriate PPE equipment.**
4. Remove, empty and re-install dust drawers. **Dispose of waste properly**.
5. Remove the top two filters first and work down removing the middle and then bottom two filters.

a. Loosen and remove the large metal knob, ½" flat washer and rubber washer from the center of the filter end.
b. Rotate the filter 180° permitting accumulated dust and debris to fall from the filter.
c. Use care, dirty filters can weigh as much as 50 lbs. Pull and slide the filter off the yoke and out of the dust collector. Place filter in plastic bag and seal to contain dust.
d. When the dust drawers are 2/3 full, remove, empty debris and re-install dust drawers. **Dispose of waste properly**.
e. After all filters are removed, clean dust and debris from the dirty side of the collector including the filter seal plate, remove and empty debris from dust drawers. **Dispose of waste properly**.

FILTER INSTALLATION

USE ONLY EMPIRE REPLACEMENT CARTRIDGE FILTER # 516365

1. Stand replacement cartridge filter cardboard box on end and open end flaps. Care must be taken with any knife used to open the box that the filter is not damaged.
2. Remove the filter from the carton, note one end of the filter is open with a gasket around the end plate and the other end is fully capped with a rubber washer inserted in the center hole. Remove and save the rubber washer.
3. Inspect the new filter for shipping damage before installing in the collector. Do not install damaged filters in the dust collector.
4. Holding the new filter horizontal, place the gasketed open end of the filter over the yoke and the threaded end of the yoke must pass through the cartridge filter solid end cap center hole.
5. Install the new rubber washer (rubber washer supplied with filter) then ½" flat steel washer, followed by threading the large metal knob onto the yoke threads.
6. **Hand tighten only** until the filter gasket is compressed 50%, leaving a ¼" gap between the filter end cap and the collector seal plate.
7. Install the remaining filters, dust drawers and end wall baffles.

Dust Drawers

Accumulated dust and debris in the BVS Dust Collector can be removed by reaching under the lower air inlet baffle and pulling (2) Dust Drawers from the bottom of the dust collector. Dispose of the collector waste properly.

Removal of the Lower Air Inlet Baffle will provide greater access for cleaning the bottom of the dust collector before re-installing the Dust Drawers.

Magnehelic Gauge

1. Inspect the BVS zero to 10 Magnehelic gauge for damage (gauge lens, tubing, etc.).
2. Inspect the clear tubing for accumulation of dust in tubing coils. Disconnect the tubing from the gauge hose barb, blow dust from tubing and re-install tubing.
3. Check gauge is set to ZERO when system is off.

Reverse Pulse Solenoids & Timer

With BVS fan running, check by listening that all (6) reverse pulse air valves are sequencing at 210 second intervals.

Optional Components Maintenance

Photohelic Gauge

1. Inspect the BVS Photohelic gauge for damage (broken set point adjustment knobs, gauge lens, tubing, etc.).
2. Inspect the clear tubing for accumulation of dust in tubing coils. Disconnect the tubing from the gauge hose barb, blow dust from tubing and re-install tubing.
3. Check gauge is set to ZERO when system is off.

HEPA Filter Gauge

1. Inspect the HEPA filter zero to 2 inch scale Magnehelic gauge for damage (gauge lens, tubing, etc.).
2. Inspect the clear tubing for accumulation of dust in tubing coils. Disconnect the tubing from the gauge hose barb, blow dust from tubing and re-install tubing.
3. Check gauge is set to ZERO when system is off.
4. If the HEPA filter gauge reads 1.0 inches or higher, when system is on, the HEPA filter must be changed.
5. The BVS filters should also be inspected for damage, leakage, and replaced as required.

HEPA Filter Replacement

1. **USE ONLY GENUINE EMPIRE REPLACEMENT HEPA FILTERS # 395055**
2. With the BVS fan off and locked out, loosen the set of (4) 5/16" X 1" bolts, lock and flat washers and Filter Retainer Plates at the (4) corners of the HEPA filter rack.
3. Rotate the Filter Retaining Plates and remove the used filter. Repeat for each filter.
4. Carefully remove each new HEPA filter from the cardboard box. Use extreme care not to damage filters.
5. Note that only one end of the filter has a gasket. Install (1) filter gasketed end first in the "U" shaped filter rack.
6. Adjust and tighten (4) sets of bolts, lock and flat washers and Filter Retainer Plates at the (4) corners of the filter rack. Tighten the hardware compressing the gasket 50% sealing the gasketed end of the HEPA filter to the HEPA housing. Repeat for each filter.

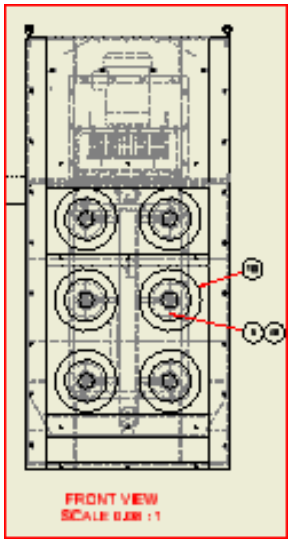
BVS Trouble Shooting

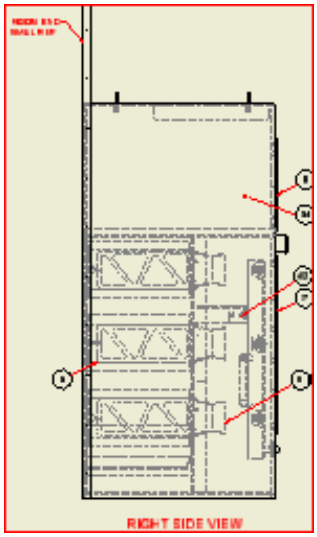
Problem	Probable Cause & Solution
Dust collector fan will not start	Main system electric disconnect switch is off, turn disconnect on
	Fan motor inverter fault, check inverter user manual for fault codes, descriptions and corrective actions
	Blown high voltage fuse(s). Check and correct wiring and components for short circuit, ground, failed component, etc. Replace fuses after repairs.
	Blown low voltage control fuse(s), check and correct wiring and components for short circuit, ground, failed component, etc. Replace fuses after repairs.
	Power outage to system, restored power.
Low air flow through blast booth	Check fan rotation, reference rotation arrow on fan housing, change as required. (Fan will move air in either direction of rotation.)
	Air inlets or exhaust obstructed, remove objects blocking air flow into and out of the room and/or dust collector.
	HEPA Filter Option, check HEPA Magnehelic gauge, if reading 1 inch or above, replace HEPA filter. Also check collector cartridge filters for dust leakage and replace cartridge filters if damaged.
	BVS Magnehelic/Photohelic gauge reads below 4 inches of pressure differential (ΔP), ensure gauge tubing and ports are not obstructed and with system off gauge reads zero. Re zero as required.
	BVS Magnehelic/Photohelic gauge reads above 4 inches of pressure differential (ΔP) will restrict air flow. See below
Dust collector Magnehelic gauge reads above 4	Check main and reverse pulse compressed air supply valves are open supplying air to the collector cleaning controls.
	The reverse pulse pressure regulator to be set at 50 psi.
	Ensure there is 120 volt power from the control panel to reverse pulse controller.
	With system ON, 120 volt power to Solenoid Valve Enclosure and Timer, set dip switch #4 to ON. The collector should pulse continuously at one second intervals. If no pulsing, check that there is 120 volt power supply to solenoid assembly. If 120 volt power is present, replace Solenoid Valve Enclosure and Timer, Part # 516370 (this part is not customer serviceable).
	Listen and ensure that each of the (6) diaphragm valves pulses during the test above. If a valve does not pulse, check the solenoid valve for compressed air leakage. See next step.
	Check solenoid valves for leaking compressed air at exhaust port. If leaking, replace Solenoid Valve Enclosure and Timer, Part # 516370 (this part is not customer serviceable).

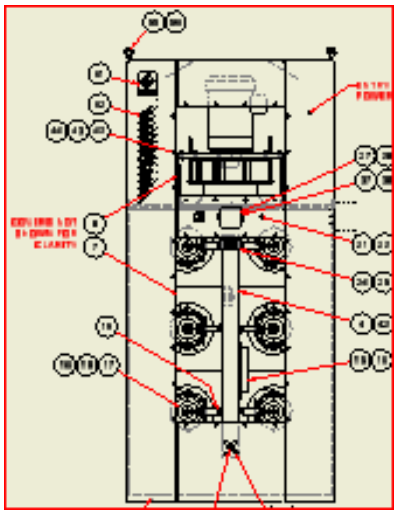
BVS Trouble Shooting continued

Dust collector Photohelic Gauge Option reads above 4”	With system ON, 120 volt power to Solenoid Valve Enclosure and Timer, set dip switch #4 to ON. The collector should pulse continuously at one second intervals. If no pulsing, check that there is 120 volt power supply to solenoid assembly. If 120 volt power is present, replace Solenoid Valve Enclosure and Timer, Part # 516370 (this part is not customer serviceable).
	If pulsing occurs with dip switch #4 ON, check for contact closure of the Photohelic gauge when gauge is above 4 inches. If there is no closure, Photohelic gauge contact or relay has failed, replace Photohelic gauge Part # 550074.

BVS Parts







Ref.	Part Number	Description	Ship Weight
2	516360	BVS BLOWER, 10HP, 6,000CFM, 6"SP	95
5	761679	YOKE, BVS, SINGLE FILTER	8
9	549344	VENTURI, EDC	2
10	516365	FILTER CARTRIDGE	24
12	516420	KNOB, MULTIPLE LOBE, 1/2-13 THREAD	3
13	516302	PLASTIC DUST DRAWER, BVS	8
15	516370	SOLENOID VALVE ENCLOSURE WITH TIMER, 6 VALVE	6
16	510541	TUBING, POLYETHYLENE, .17" ID X .25" OD"	1
17	520432	ELBOW, BRASS, 1/8" MPT X 1/4" TUBE X 90"	1
18	516352	VALVE, DIAPHRAGM, 1" NPT, PULSE JET, DWYER"	2
33	524471	GASKET, 1/16" X 1" X 50', OPENCELL, PSA"	1
53	552902	WASHER, FLAT, 1/2", STEEL	1
**	550383	GAUGE ONLY, MAGNEHELIC, 0-10 WC--**STANDARD**	4
**	550074	GAUGE ONLY, PHOTOHELIC, 0-15 WG---OPTIONAL	8

Appendix

"Recommended Safety Practices"

"Initial Unit Start up Procedure For All Direct Drive Fans"

"**Installation, Safety, Operation &Maintenance and Parts List"**

AMCA Publication 410

RECOMMENDED SAFETY PRACTICES

for Users and Installers of Industrial and Commercial Fans

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

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FOREWORD

i. This publication has been prepared by the Air Movement Division of the Air Movement and Control Association International, Inc. (AMCA International). The information contained in this publication has been derived from many sources. The suggestions made necessarily should be general in their meaning and cannot be applied literally to all specific situations or conditions.

ii. The safe installation and operation of fans is the responsibility of the system designer, installer, maintainer, and user.

From the initial system design through the life of the equipment, safety should be a foremost consideration. Some areas which require some special attention include system design, layout and construction, fan performance specification, foundation and installation details, storage procedures, start-up and commissioning procedures, operation, maintenance, and repair. Specific safety requirements are mandated by federal, state, and local codes. *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans* is published by AMCA International for assistance. System designers, installers, maintainers, and users should consult and properly comply with all applicable codes and guidelines.

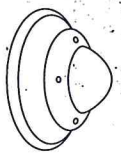
iii. The safety recommendations contained herein are intended to assist designers, installers, maintainers, or other users of air moving devices in the safe operation and use of the devices mentioned. These recommendations do not represent the only methods, procedures, or devices appropriate for the situations discussed. Caution should be used at all times when working in or around moving parts.

iv. AMCA International disclaims any and all warranties, expressed or implied, regarding the products sold by the manufacturer with which this booklet has been provided. Further, AMCA International recommends that competent personnel be consulted in deciding what is the preferred or recommended safety procedure in a particular instance where the guidelines contained in this booklet are unclear or in any way incomplete.

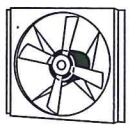
v. AMCA International has offered the information within this booklet to assist in the safe operation, maintenance, and use of the products sold by members of AMCA International. In so doing, AMCA International does not assume any legal duties of the designer or manufacturer to instruct or warn about their product. AMCA International expressly disclaims liability for any injury or damage arising out of the operation or use of the product or the guidelines contained herein.

vi. These recommended safety practices were adopted by the AMCA International membership on April 28, 1996.

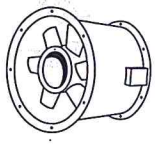
Power Roof Ventilator



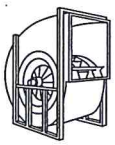
Wall Exhauster



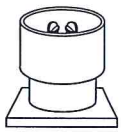
Propeller Fan



Axial Fan



Centrifugal Fan



Upblast Roof Exhauster

1. Introduction

1.1 Fans and other air moving devices are made in a wide variety of types, sizes, and arrangements. This guide addresses the proper use and installation of industrial and commercial fans. It is not intended to address residential and consumer fans.

1.2 Various "size" factors are important when assessing potential for injury; some factors include: diameter of impeller (wheel, rotor, propeller), rotational inertia, voltage, and current.

1.3 This guide is intended to assist in the safe installation of air moving equipment and to warn operating and maintenance personnel of the commonly recognized hazards associated with this equipment.

1.4 Handling and installation should always be performed only by experienced and trained personnel who are aware of the hazards associated with rotating equipment. Failure to comply with these practices may result in death or serious bodily injury. In addition to following the manufacturer's installation instructions, care should be taken to ensure compliance with specific safety requirements mandated by federal, state, and local codes. Industry safety standards and practices published by AMCA International and by other recognized agencies and associations should be consulted and followed where applicable.

2. Personnel Safety Accessories

2.1 General

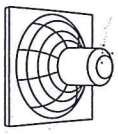
Protective devices are incorporated as standard construction on some types of fans but on many fans, these devices are offered as optional accessories. This is done because the need for the devices and the design required will frequently depend upon the type of system, fan location, and operating procedures being employed. Proper protective safety devices; company safety standards; specific safety requirements mandated by federal, state, and local codes; and industry safety standards and practices published by AMCA International and by other recognized agencies and associations should be determined by the user, who should specify and obtain the appropriate devices from the fan manufacturer or others, and should not allow operation of the equipment without them. Examples of available devices include the following:

2.2 Fan Guards

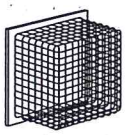
2.2.1 All fans have moving parts which require guarding in the same way as other moving machinery. Fans located less than seven (7) feet above the floor require special consideration. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA International and

by other recognized agencies and associations should be followed.

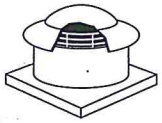
2.2.2 Roof-mounted fans and other fans which are not generally accessible may not require safety guards which might otherwise be appropriate. Where accessibility to these fans is occasional or infrequent, the expense of permanent guarding may be reduced through the use of lockout switches and suitable warnings. In such cases, maintenance personnel should engage the lockout switch before undertaking any maintenance or repairs. As is the case with other machinery involving moving parts, common sense and caution will preserve personal safety.



Industrial Type Guard



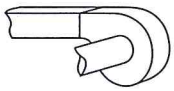
Maximum Safety Guard for Propeller Fan



Screen on Roof Ventilator

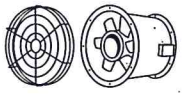
2.3 Inlet and Outlet Guards

Axial and centrifugal fans are often connected directly to ductwork which will prevent contact with the internal moving parts; when an exposed inlet or outlet represents a hazard, a suitable guard should be installed.



Centrifugal Fan Protected by Ductwork

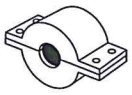
Inlet or Outlet Guard on Centrifugal Fan



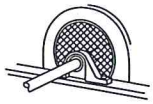
Guard for Axial Fan with Non-Ducted Inlet or

2.4 Drive Guards

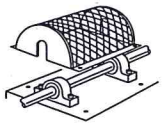
2.4.1 Fans may be driven directly from the motor shaft or through a belt drive. Where the bearing assembly, rotating shaft, sheaves, or belts are exposed, a suitable guard may need to be provided. Some example guards are shown below.



Drive Coupling Guard



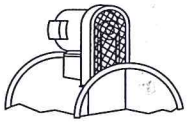
Heat Slinger Guard (shaft and bearing guard omitted for clarity)



Shaft and Bearing Guard

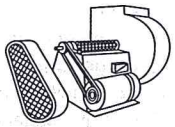
2.4.2 Drive guards may be required for tubular centrifugal or axial fans to cover the exposed drive sheave and belts outside the fan housing.

2.4.3 A typical centrifugal fan drive guard may vary with the arrangement. Safety guards should be used when drive systems are accessible to personnel. In restricted areas, omission of the back cover may be acceptable.



Drive Guard - Axial Fan

2.4.4 Dampers and their linkage may operate suddenly without warning at high speeds. Dampers and their linkage contain pinch points which should be identified and guarded.



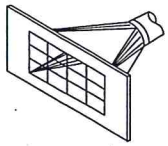
Drive Guard - Centrifugal Fan

3. Hidden Dangers

3.1 General

In addition to the obvious hazards associated with the moving parts of rotating machinery, fans present additional potential hazards that are not so obvious and should be considered by the system designer and user for safe operation.

3.2 Suction and Pressure



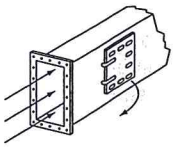
Special Purpose Intake Screen

3.2.1 Fans operate by creating suction and air pressure which can be hazardous. Solid objects can be drawn into a fan's inlet and then become dangerous projectiles when they are exhausted through the fan's outlet. **Solid objects can also cause fan failure or impeller failure due to imbalance or damage to the impeller blades.** Personnel in close proximity to a fan inlet can be overcome by the suction, and drawn into the fan.

3.2.2 Whenever there is a possibility that solid objects can be drawn into a remote intake, the intake should be guarded at all times. Before a guard is removed, the fan should be disconnected and the power supply locked out.

3.2.3 Where fans are installed over an occupied area, safety guards should be provided to prevent dropped objects from entering this area during installation and maintenance.

3.2.4 Access doors to a fan or duct system should never be opened while the fan is operating or coasting to a stop. On the downstream (or pressure) side of the system, releasing the door with the system in operation may result in an explosive opening. On the upstream (or suction) side, the inflow may be sufficient to draw in tools, clothing, and other materials. The power supply should always be locked out prior to accessing a fan or ductwork.



Bolted Access Door in Duct

3.2.5 Fan design sometimes requires access doors to be supplied with internal components such as a plug to fill a hole in the fan casing. These doors can often be heavy and difficult to handle. Care should be exercised when opening, removing, and installing these components.

3.3 Windmilling

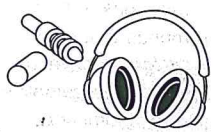
Even when the power supply is locked out, fans may cause injury or damage if the impeller is subject to "windmilling" which is the turning of the impeller and drive components due to a draft in the system. To guard against this hazard, the impeller should be secured to physically restrict rotational movement.

3.4 Temperature

Many fans, fan motors, and fan components run at temperatures that could burn someone who comes in contact with the hot areas, including discharged or leaking gases. If this potential hazard is present, steps should be taken so that personnel working near the fan are aware of the danger and can exercise caution.

3.5 Fan Noise and Environment

Some fans can generate sound that could be hazardous to exposed personnel. Sound pressure can be measured in the field, but obtaining accurate data is difficult. The environment in which the fan operates can impact the ability to obtain accurate fan sound readings. Consult the manufacturer for fan sound data. It is the responsibility of the system designer, installer, user, and maintainer to comply with specific safety requirements mandated by federal, state, and local codes; and to follow industry safety standards and practices published by AMCA International and by other recognized agencies and associations, regarding personnel safety from exposure to fan noise associated with use and exposure to equipment.



Hearing Protection

3.6 Stroboscopic Effect

The stroboscopic effect of certain lights in combination with certain fan speeds may cause a rotating assembly to appear stopped. In these cases, irregular markings can be placed on the moving parts to prevent this type of effect. Personnel should be warned that the fan may be in motion even if it appears not to be.

3.7 Special Purpose Fans and Systems

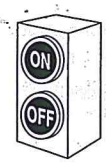
The hidden dangers associated with Special Purpose Fans used in special systems are covered in Section 6.

4. Power Isolation

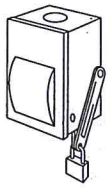
4.1 Every fan should be installed with a suitable device allowing it to be completely disconnected or isolated from the power supply.

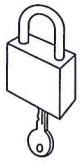
4.2 Many fans are started by remote switches or push-buttons, by interlocks with other equipment, or by automatic controls. Before performing any maintenance, inspection, or other activity which will require removal of guards, ductwork, access doors, etc., or exposure of moving parts, the fan power supply should be locked out and the fan tagged out of service.

4.3 In some installations other equipment, such as gas burners, may be interlocked with the fan so that disconnecting the fan will automatically shut off the burner or other device. Maintenance on systems of this type should be performed only under the supervision of competent engineering personnel and in accordance with applicable codes and standards.



Remote Switch


Disconnect Switch


Lock Carried by Maintenance Personnel

4.4 In cases where the fan is power driven by a source other than an electric motor, appropriate provisions should be made for the isolation or disengagement of the power supply.

5. Start-Up Checklist

5.1 General

5.1.1 Before putting any fan into initial operation, the manufacturer's instructions should be followed. Transportation, handling, and installation can cause fasteners to loosen, and cause misalignment of fan components. Carefully follow this check list when commissioning equipment.

5.1.2 Lock out the primary and all secondary power sources.

5.1.3 A complete inspection should be made of all of the ductwork and the interior of the fan. Make certain there is no foreign material which can be drawn into or blown through the fan or ductwork. Appropriate protective measures and safety practices should be observed when entering or working within these areas. These measures might include the use of goggles, respirators, or other personal protective devices.

5.1.4 Make sure the foundation or mounting arrangement and the duct connections are adequately designed and installed per drawings and in accordance with recognized acceptable engineering practices and with the fan manufacturer's recommendations.

5.1.5 Check and tighten all bolts, fasteners, and set screws as necessary.

5.1.6 Check the fan assembly and bearings for proper grounding to prevent static electricity discharge.

5.1.7 Ensure power and drive components such as motor starter, variable frequency drive, or hydraulic power unit are properly sized, matched, and connected to the fan.

5.1.8 Check bearings for recommended lubricant and lubrication amount.

5.1.9 Spin the rotating assembly to determine whether it rotates freely, without hitting anything, and is not grossly out of balance.

5.1.10 Inspect impeller for proper rotation for the fan design.

5.1.11 Check alignment of drives and all other components.

5.1.12 Check the belt drive for proper sheave selection and installation and make sure the sheaves are not reversed (excessive speeds could develop).

5.1.13 Check for recommended belt tension.

5.1.14 Properly secure all safety guards.

5.1.15 Assure that all appropriate warnings have been put in place.

5.1.16 Secure all access doors to the fan and ductwork.

5.1.17 Momentarily energize the fan to check the direction of rotation. Listen as the fan coasts to a stop for any unusual noise, identify the source, and take corrective action as necessary.

5.1.18 Switch on the electrical supply and allow the fan to reach full speed. Check carefully for:

(1) Excessive vibration

(2) Unusual noise

(3) Proper belt alignment

(4) Proper lubrication

(5) Proper amperage, voltage, or power values.

(6) If any problem is indicated, SWITCH OFF IMMEDIATELY.

(7) Lock out the power supply. Secure the fan impeller if there is a potential for windmilling. Check carefully for the cause of the trouble, correct as necessary, and repeat check list procedure.

5.2 Even if the fan appears to be operating satisfactorily, shut down after a brief period, lock out the power supply, and recheck items 5.1.5 through 5.1.17 as the initial start-up may have loosened the bolts, fasteners, and set screws.

5.3 The fan may now be put into operation, but during the first eight hours of running, it should be closely observed and checked for excessive vibration and noise. At this time checks should also be made of motor input current and motor and bearing temperatures to ensure that they do not exceed manufacturer's recommendations.

5.4 After eight (8) hours of operation, the fan should be shut down and the power locked out. Check list items 5.1.5 through 5.1.17 should be inspected and adjusted, if necessary.

5.5 After twenty-four (24) hours of satisfactory operation, the fan should be shut down (locked out) and the drive belt tension should be readjusted to recommended tension.

5.6 After commissioning and start-up, the fan should be operated and maintained in accordance with the manufacturer's and component manufacturer's recommendations. Some basic guidelines for Warning Signs and Routine Maintenance are included in Sections 7 and 8. These sections are meant as a supplement to the manufacturer's instructions and are not intended to replace the manufacturer's instructions.

6. Special Purpose Fans

6.1 Most fans are designed to handle clean air at standard temperatures between 32 °F and 120 °F. These fans should not be placed in systems or used for other than their design intended use. Special Purpose Fans are designed for use in systems that may include extreme temperatures, explosive, toxic, or special gases, material handling, corrosive environments, or other special hazards which should be carefully considered. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA International and by other recognized agencies and associations should be followed.

6.2 Where the system will handle explosive or flammable material (dust, fumes, gases), fans of spark-resistant construction should be used.

6.3 Fans connected by ductwork or other piping may contain gases other than air which are hazardous. In these cases, procedures should be established to prevent exposure of personnel working on or near the fan, and by maintenance personnel who may need to enter the fan. Appropriate personal protective equipment as determined by the material safety data sheet, and system operators should be utilized. Appropriate environmental protective measures should also be taken.

6.4 Fan inlet boxes, housings, ductwork, and other system components which are large enough to permit entry should be considered confined spaces. System areas may also serve as low points where heavy gases, liquids, or other substances may accumulate and present explosive, fire, health, or suffocation hazards. Appropriate protective measures and safety practices should be observed when entering or working within these areas.

6.5 Material-handling fans are specially designed to allow the fan to handle a specific type of material without excessive accumulation of material on the fan impeller. Fans handling corrosive gases or erosive material should be checked periodically. If loss of material is evident, the fan should be shut down, power supply locked out, and tagged out of service. The manufacturer or other qualified personnel should be consulted to determine if the fan is within safety limits for operation. To ensure satisfactory operation it is essential to observe the manufacturer's limitations concerning the type of material to be handled by the fan.

6.6 Fan ratings and maximum speed limits are typically based on the use of air at 70 °F. At temperatures above the normal range (specified by the manufacturer), a reduction should be made in the maximum speed limit. Information on this reduction and on other precautions to be taken for high temperature applications should be obtained from the fan manufacturer. Personnel working near high temperature fans should be aware that coming in contact with the fan's housing, ductwork, or handled gases could result in serious burns. Where the danger of burns is not apparent, appropriate warnings should be posted. Appropriate protective apparel should be worn whenever working in close contact with heated housings or ductwork.

6.7 Corrosive contaminants can be formed when moisture combines with an active airborne chemical. Fans subjected to corrosive contaminants will corrode; however, suitable protective coatings or material, if used in the fan construction, can delay corrosion. Protected fans should be regularly inspected to ensure that the protection remains effective. Personnel working in environments with airborne chemicals may require personal protective apparel equipment.

6.8 Where liquid can accumulate within the fan, provide for the installation of adequately sized drains.

6.9 In those applications where there is a potential for chemical build-up (such as grease, creosote, etc.), periodic cleaning and proper drainage are necessary to avoid a fire hazard.

7. Warning Signs

7.1 General

7.1.1 A change in the operating characteristics of a fan may indicate the need for maintenance. Sudden changes may indicate severe problems or dangerous conditions developing. Investigate any changes in the operational characteristics or unusual symptoms of the fan. Refer to AMCA Publication 202, Troubleshooting, for a more detailed explanation of investigating procedures. Consult your manufacturer or other qualified consultant with questions concerning changes observed.

7.2 Excessive Vibration

7.2.1 Operational vibration levels are one of the best indicators of the condition of the blower. Careful observation and monitoring of vibration levels can detect a minor problem in the early stages of development when correction is less costly and easier. Recommended maximum vibration levels should be obtained from the equipment manufacturer.

7.2.2 If excessive vibration is observed, stop the fan and lock it out until the cause is corrected. Check for material build-up on the impeller. Generally this will show up as material flaking off the fan impeller and causing an imbalance which may lead to catastrophic failure of the fan or its components. Excessive vibration can also be caused by looseness in the drive train, loose fasteners, misalignment or impeller damage. Contact the fan manufacturer or other qualified consultant to determine the maximum vibration level if it is not included in maintenance instructions.

7.3 Noise

Changes to the sound level may indicate maintenance is needed. Some unusual noises often heard include: bearing noise indicating the bearings need lubricant or replacement; scraping or ticking noise indicating the rotating parts are hitting the stationary parts; squealing indicating the belt drive needs tensioning; repeated changing pitch of the blower indicating operation of the blower at too low a flow. If any of these noises or any other unusual noises are detected, their cause should be determined and corrective action taken as necessary.

7.4 High Motor Temperatures

Check that cooling air to the motor has not been diverted or blocked by dirty guards or similar obstacles. Check the input amperage. An increase in amperage may indicate that some major change has occurred in the system.

7.5 High Bearing Temperatures

This condition is usually caused by improper lubrication; this can be either "over," "under," or "unsuitable" lubrication. In every case, if the cause of the trouble is not easily seen, experienced personnel should examine the equipment before it is put back in operation.

7.6 Poor Performance

Too much flow or pressure or too little flow or pressure is often a symptom of a change in the operating system. A fan will typically operate at the same performance in a static system some typical causes include: operating of the fan backwards after maintenance procedures; filters dirty or not in place; change or blockage in the ductwork; change in speed of the fan (switching the sheaves); loss or failure of the impeller. All of these causes and many others will affect the flow and pressure produced by the fan.

8. Routine Maintenance

8.1 A preventive maintenance program is an important aspect of an effective safety program. Consult your manufacturer or other qualified consultant with questions concerning changes observed during periodic inspections and routine maintenance.

8.2 The fan manufacturer's operating and maintenance recommendations, as well as the components manufacturer's instructions (such as motor, bearing, drives, etc.) should be strictly followed.

8.3 Maintenance should always be performed by experienced and trained personnel who are aware of the hazards associated with rotating equipment. Do not attempt any maintenance on a fan unless the fan power supply has been locked out and tagged out and the impeller has been secured.

8.4 When performing maintenance functions which include disassembly of the fan, careful consideration should be given to the size, weight, center of gravity, and lifting means of the fan components. It should also be noted that the outboard bearing on some fans such as arrangements 1, 8, 9, and 10 is often cap-loaded. Removal of the securing means may result in a sudden change in impeller position.

8.5 Historical data is often the best indicator for determining the operational condition of the fan. Maintenance logs which include relubrication, vibration levels, temperature levels, power requirements, inspection, and other pertinent records should be maintained and consulted as necessary when assessing the condition of the fan.

8.6 Under normal circumstances, handling clean air, the system should require cleaning only once a year. However, the fan and system should be checked at regular intervals to detect any unusual accumulation.

8.7 The fan impeller should be specially checked for build-up of material or dirt which may cause an imbalance with resulting undue wear on bearings and belt drives. A regular maintenance program should be established as needed to prevent material build-up.

8.8 Periodic inspection of the rotating assembly should be made to detect any indication of weakening of the rotor because of corrosion, erosion, or metal fatigue. Where signs of deterioration are found, lock out and tag out the impeller until the unit has been inspected and approved by a qualified consultant.

cincinnati fan

IMPORTANT

INITIAL UNIT STARTUP PROCEDURE FOR ALL DIRECT DRIVEN FANS

Be sure to read **ALL** of this manual and **ALL** of the **I.S.O.M. (Installation, Safety, Operation & Maintenance)** manual **BEFORE** attempting to install and operate this equipment.

Form: IUSP-DD-0611
Effective: June 1, 2011

INITIAL UNIT STARTUP

NOTICE: Failure to complete and document all the following pre-startup and both post-start-up checks, listed in sections A (below) and B on page 3, 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:** _____

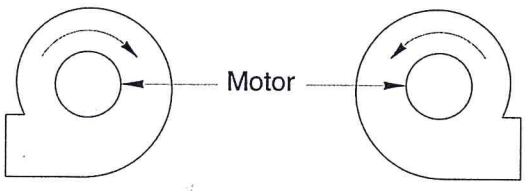
A2. 8 Hour, Post-Startup Checks Completed By: _____ **DATE:** _____

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. ☐☐☐ If possible, *CAREFULLY* spin the blower wheel by hand to ensure it rotates freely and no rubbing or clicking noise is heard.
2. ☐☐☐ Check all blower, foundation and duct work hardware to make sure it is tight.
3. ☐☐☐ Check all blower wheel set screws to make sure they are tight per **Table 1** on page 5 of the I.S.O.M. manual.
4. ☐☐☐ If the wheel has a taper-lock bushing, make sure the bolts are tightened per **Table 2** on page 5 of the I.S.O.M. manual.
5. ☐☐☐ Make certain there is no foreign material in the blower or duct work that can become a projectile.
6. ☐☐☐ Make sure any inspection doors in the duct work are securely bolted or locked.
7. ☐☐☐ Ensure all electrical power components are properly sized and matched for your electrical system.
8. ☐☐☐ Check that all required guards are properly secured.
9. ☐☐☐ Any dampers should be fully opened and closed to make sure there is no binding or interference.
10. ☐☐☐ If your blower is mounted on an elevated support structure, make sure the structure is welded at all the joint connections and the structure is properly braced to prevent "side sway".
11. ☐☐☐ Close any dampers to minimize load on 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.
12. ☐☐☐ Make sure the power source connections to the blower motor are per the motor manufacturers instructions.
13. ☐☐☐ Make sure the blower wheel is stationary prior to startup. **Starting a blower with a wheel that is rotating backwards can cause wheel damage.**
14. ☐☐☐ 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 manufacturers 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 Fig. 1 below.**

Fig. 1



Clockwise (CW) Rotation **Counter-Clockwise (CCW) Rotation**

15. ☐☐☐ Apply power to the blower 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.
16. ☐☐☐ Unlock power and start the blower.
17. ☐☐☐ Measure, record and keep the following motor data for future reference and comparison:
(Single phase motors will only have L1 and L2 leads)

Amperage draw on each motor lead: L1 _____ **L2** _____ **L3** _____
(Running amps **SHOULD NOT** exceed the motor nameplate amps for the voltage being operated on)

Voltage coming to motor leads: L1_____ **L2**_____ **L3**_____
(Should be about the same input voltage on all leads)

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 may cause a vibration problem after installation. After installation, the vibration levels should be checked by personnel experienced with vibration analysis and vibration analysis equipment.

NOTE:

The blower SHOULD NOT be operated if the vibration velocity of the fan 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 0.75 inches per second, filter out.

Vibration readings for direct driven blowers should be taken on the motor at the top, sides and end as per **Fig. 2** below. After you have taken your vibration readings, write them down in the spaces below and keep for future comparison.

⚠ DANGER

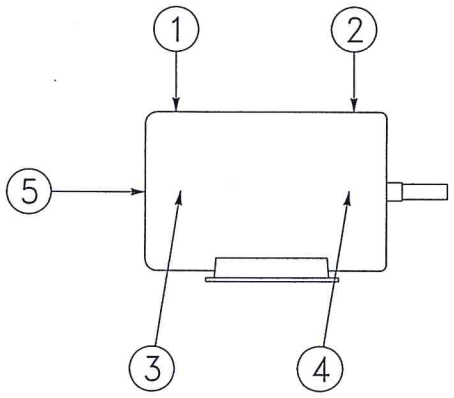
If the blower is going to be conveying material, it is the users responsibility to periodically turn the blower off and lock out the power. The blower wheel should then be checked for material build-up and/or erosion. If material has built up on any parts of the wheel, it MUST be removed and cleaned before it is put back into service. If any parts of the wheel have been eroded, the wheel MUST be replaced. Failure to perform this inspection can cause excessive vibration that will damage the blower and/or motor bearings. When vibration becomes excessive, it will lead to complete blower failure that could cause property damage, severe personal injury and death. The user must determine the frequency of this inspection based on the actual circumstances of their operation, BUT checking the vibration readings should NEVER exceed a 12 month period. For the AMCA/ANSI standard for vibration limits, see Fig. 3 on page 4.

Fig. 2

VIBRATION METER PROBE POSITIONS

For Arrangement 4 Blowers

	1	2	3	4	5
A					
B					
C					

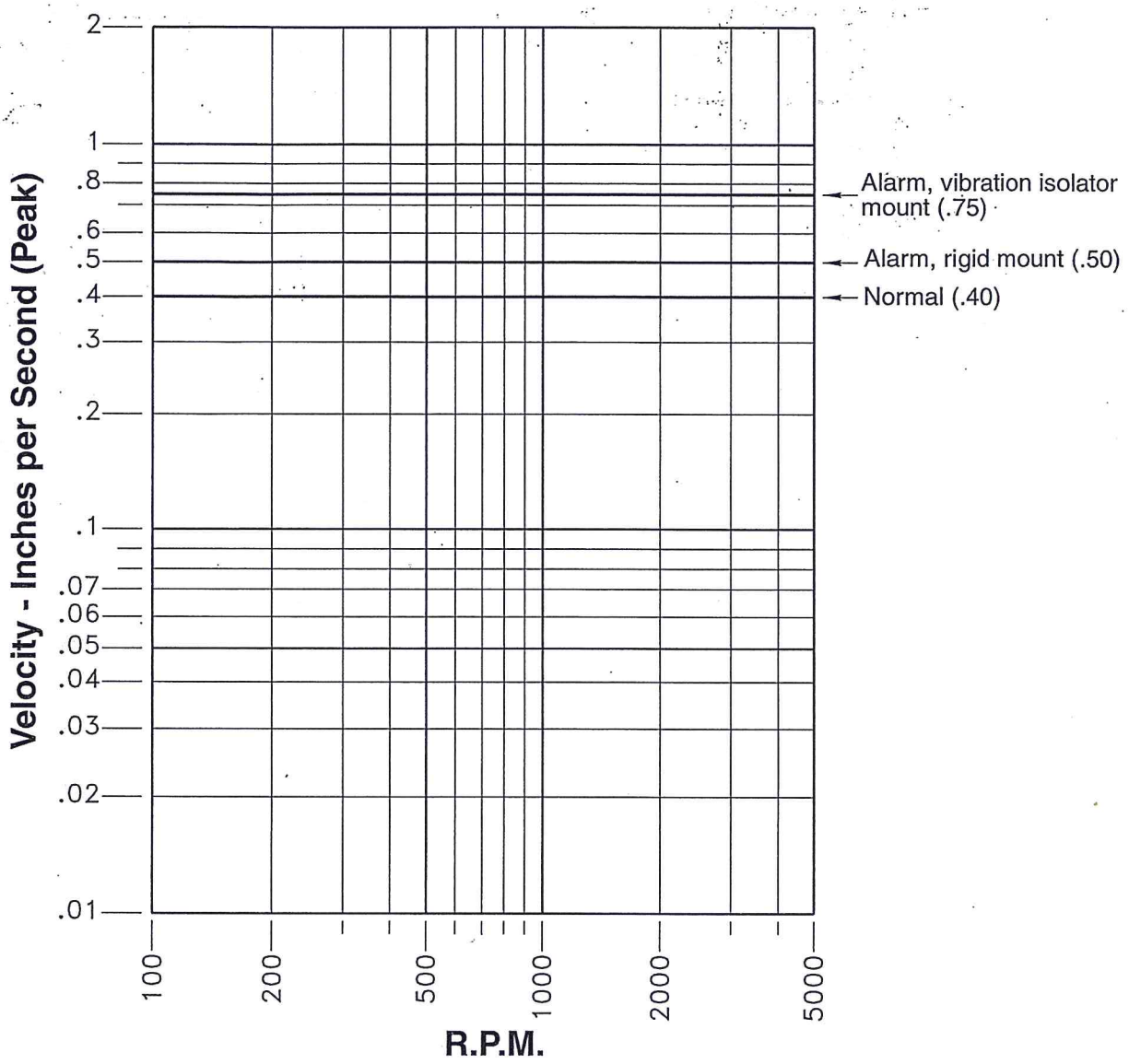


A Pre-Startup ..... Readings taken by: _____ **Date:** _____

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

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

Fig. 3 Vibration Severity Chart



cincinnati fan

Form: OMM-26-1011
Effective: 10/1/2011
Part No.: 01238

Installation, Safety, Operation & Maintenance Instructions And Parts List
For Model PL Plenum Fans
Arrangement 4 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: PL-180 **Arrangement:** 4 **Rotation:** CW

Wheel Size and Type: HDAF 70%

BLOWER PERFORMANCE DATA: (If entered on order)

CFM: 6000 **SP:** 6.000 (Inches of Water Gauge) **Motor BHP:** _____

Density: 0.075 **Altitude:** _____ (Ft. above S.L.) **Airstream Temperature:** 70 °F.

Fan RPM: 3500 **Maximum Safe Fan RPM:** Call for > 3500 **DO NOT EXCEED THIS RPM**

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

HP: 10 **RPM:** 3500 **Voltage:** 208-230/460V **Phase:** 3

Hz: 60 **Frame Size:** 215TC **Enclosure:** TEFC **Efficiency:** EPAct Eff

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

Manufacturers Model Number: VM3711T **CFV Part Number:** 37586B

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 pages 12 and 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.

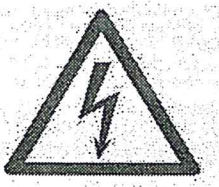
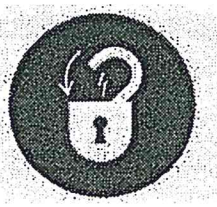
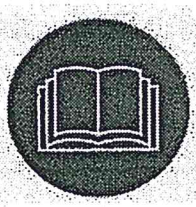
⚠ DANGER				
				
Hazardous voltage can cause electrical shock and death.	High speed rotating equipment can cause severe personal injury.	Lock out/Tag out to prevent personal injury BEFORE starting ANY service or inspection.	Avoid injury. NEVER operate without ALL required safety guards in place.	Avoid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

TABLE OF CONTENTS

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, motor shaft, motor eye bolt, or any other part of the blower assembly that could cause distortion of the blower assembly.**

B. Safety Instructions & Accessories:

1. **Safety Instructions:**
   All installers, operators and maintenance personnel should read AMCA Publication 410-96, **"Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans".** This manual is included with the blower. Additional copies can be requested by writing us 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 immediately turned off and locked out in accordance with OSHA regulations. Power to the blower should NOT be tuned 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 AFFECTS OF AIR PRESSURE, AIR SUCTION OR MATERIAL THAT IS BEING CONVEYED. DISCONNECT OR LOCK OUT POWER TO THE BLOWER AND LET THE BLOWER WHEEL COME TO A COMPLETE STOP *BEFORE* OPENING ANY TYPE OF ACCESS OR INSPECTION DOOR.

II. INSTALLATION

A. Vibration:

Before any mounting method is selected, the user should be aware of the effects vibration will have on the blower, motor and other parts. Improper blower installation can cause excessive vibration causing premature wheel and/or motor 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, support structure or ducting.

⚠ WARNING

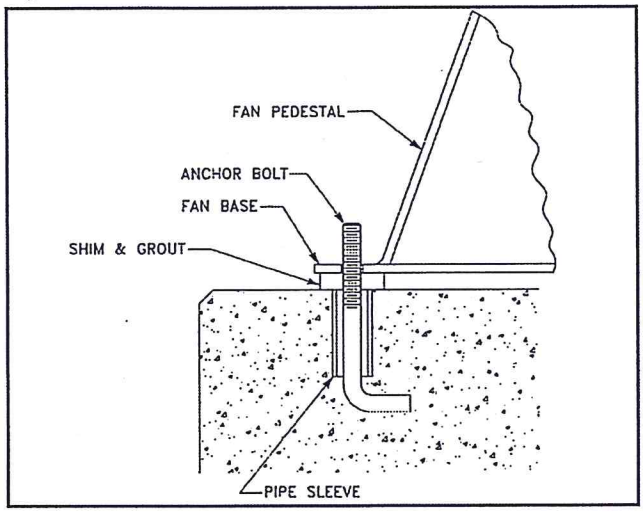
SHUT THE BLOWER DOWN IMMEDIATELY IF THERE IS ANY SUDDEN INCREASE IN VIBRATION.

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 inches larger than the base of the blower. The foundation should include anchor bolts such as shown in **Fig. 1** on page 4. Place the blower over the anchor bolts and shim under each bolt until the blower is level. After shimming, flat washers, lock washers and lock nuts should be tightened at each anchor bolt. Any gaps between the blower base and the foundation should be grouted. If the blower will be sitting on some type of vibration pads or mounts, follow the recommended mounting procedures supplied with the vibration elimination equipment.

Fig. 1



2. **Elevated Units;**

Improper mounting of elevated blowers can cause vibration problems. The structure that the blower/motor assembly will be mounted on must be strong enough to support at least 3 times the weight of the entire blower/motor assembly. **An insufficient support will cause excessive vibration and lead to premature wheel and/or motor bearing failure.** 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 of the platform.

⚠ DANGER

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

C. Duct Work Connections:

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

Non-Ducted Blower Inlet:

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

Non-Ducted Blower Discharge:

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

D. Safety Guards:

Cincinnati Fan offers guards, as optional, to keep your blower in compliance with OSHA safety regulations. These include inlet or discharge guards. Any blowers built with high temperature construction, a "heat slinger guard" is standard. It is the responsibility of the user to make sure this blower meets all local, state and OSHA safety regulations. If you have a specific guard requirement not covered by OSHA, please contact the local Cincinnati Fan sales office for assistance.

E. Dampers and Valves: (Airflow control devices)

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

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

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

III. ELECTRICAL

A. Disconnect Switches:

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

B. Motors:

⚠ DANGER

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

1. **DO NOT connect or operate a motor without reading the motor manufacturers instructions supplied with the blower.** The basic principle of motor maintenance is: **KEEP THE MOTOR CLEAN AND DRY.** This requires periodic inspections of the motor. The frequency of the inspections depends on the type of motor, the service and environment it will be subjected to and the motor manufacturers instructions.
2. **Cleaning:** Cleaning should be limited to exterior surfaces only. **Follow motor manufacturers cleaning instructions.**
3. **Lubrication:** Most small motors have sealed bearings that are permanently lubricated for the life of the motor. Some larger motors have grease plugs that should be replaced with grease fittings to perform re-lubrication. These motors, or any motor with grease fittings, should be lubricated in accordance with the motor manufacturers recommendations. Lubrication frequency depends on the motor horsepower, speed and service. **BE SURE** you use compatible grease and **DO NOT** over grease.
4. **Location:** If the motor will be outside and subjected to the weather, it is recommended that a weather cover be installed to keep rain and snow off of the motor. No motors are guaranteed to be "watertight". Be careful to allow enough openings between the motor and the motor cover to let the motor "breath". If the back end of the motor is covered, the cover should be no closer than 3" to the back of the motor for proper ventilation.

5. **Wiring Connections:** All wiring connections should be made for the proper voltage and phase as shown on the motor nameplate. Connections should follow the motor manufacturers recommendations as shown on the wiring schematic. This wiring diagram will be located on the outside of the motor, inside of the motor conduit box or on the motor nameplate. **Reversing some wires might be necessary to get the correct blower rotation.**
6. **Motors with Thermal Overload Protection:** If a motor is equipped with thermal overloads, the thermal overload must be wired per the wiring schematic to be operable. ***There are 3 types of thermal overloads:***
   a. **Automatic:** These will automatically shut the motor down if the internal temperature exceeds the design limits.

⚠ DANGER

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

   b. **Manual:** These motors will have a button on them. If the motor overheats, it will shut down. After you have inspected the motor and eliminated the over heating problem, you will need to "reset" it by pushing the button. **You should still lock out the power BEFORE inspecting the motor.**
   c. **Thermostats:** This type of thermal is a temperature sensing device **ONLY**. If the motor overheats, the thermostats will open or close (depending on the type) and send a **"signal"** to the electrical box. ***THEY WILL NOT TURN THE MOTOR OFF.*** **These are pilot circuit devices that must be connected to the magnetic starter circuit.**

7. **EXPLOSION PROOF Motors:** No motor is explosion proof. Explosion proof (EXP) motors are designed so if there is an explosion **WITHIN** the motor, the explosion will be **CONTAINED INSIDE** the motor and not allowed to get out to the atmosphere. All explosion proof motors must be selected based on the atmosphere and/or the environment the motor will be operating in. Explosion proof motors are designed, rated, and labeled for their operating conditions based on Classes, Groups and "T" Codes. **The Class, Group and "T" Code of an EXP motor MUST be selected based on the atmosphere and/or environmental conditions the motor will be operating in. Consult the NEC (National Electric Code) and the NFPA (National Fire Protection Association) for the proper EXP motor Class, Group and "T" Code required for your specific application and location.**

⚠ DANGER

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

NOTICE:

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

8. **Normal Motor Operating Temperatures:**
   Using your hand to test the normal running temperature of a motor can be a very painful experience;
   The normal operating temperature of a fully loaded, open type, electric motor operating in a 70°F. (21° C.) ambient temperature is 174°F. (79° C.)

C. Maximum Blower Speed and Motor Speed Controllers:

If you will be using any type of motor speed controller with this blower, **DO NOT** exceed the **maximum safe blower speed.** Installing and using a speed control device requires special training and certification as required by the speed control manufacturer. See the manufacturers instructions for proper use, installation and wiring connections for the maximum speed settings. It may also be necessary to "block out" some speeds to eliminate a resonant vibration problem. The maximum safe blower speed is shown on the data sheet shipped with the blower. If you have lost the data sheet, contact 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. Cincinnati Fan will only extend the motor manufacturers warranty, when used with a speed controlling device, if the motor has the words **"Inverter Duty"** marked on the motor name plate. If the motor does not have **"Inverter Duty"** marked on the motor name plate, and you have a motor failure, you will be required to contact the motor manufacturer for any service or warranty claims.

IV. INITIAL UNIT STARTUP

NOTICE: Failure to complete and document all the following pre-startup and both post-startup checks, listed in sections A (below) and B on page 8, 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: _____

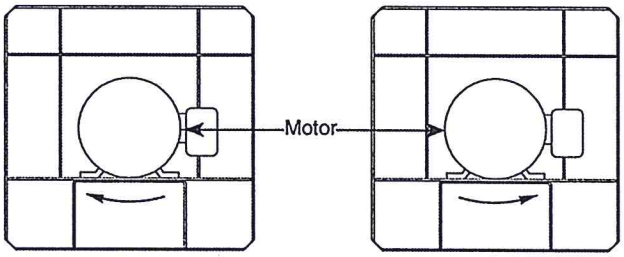
A2. 8 Hour, Post-Startup Checks Completed By: _____ DATE: _____

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. ☐☐☐ If possible, *CAREFULLY* spin the blower wheel by hand to ensure it rotates freely and no rubbing or clicking noise is heard.
2. ☐☐☐ Check all blower, foundation and duct work hardware to make sure it is tight.
3. ☐☐☐ Check all blower wheel set screws to make sure they are tight per **Table 1** on page 5.
4. ☐☐☐ If the wheel has a taper-lock bushing, make sure the bolts are tightened per **Table 2** on page 5.
5. ☐☐☐ Make certain there is no foreign material in the blower or duct work that can become a projectile.
6. ☐☐☐ Make sure any inspection doors in the duct work are securely bolted or locked.
7. ☐☐☐ Ensure all electrical power components are properly sized and matched for your electrical system.

Fig. 2



Clockwise (CW) Rotation **Counter-Clockwise (CCW) Rotation**

8. ☐☐☐ Check that all required guards are properly secured.
9. ☐☐☐ Any dampers should be fully opened and closed to make sure there is no binding or interference.
10. ☐☐☐ If your blower is mounted on an elevated support structure, make sure the structure is welded at all the joint connections and the structure is properly braced to prevent "side sway".
11. ☐☐☐ Close any dampers to minimize load on 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.
12. ☐☐☐ Make sure the power source connections to the blower motor are per the motor manufacturers instructions.
13. ☐☐☐ Make sure the blower wheel is stationary prior to startup. **Starting a blower with a wheel that is rotating backwards can cause wheel damage.**
14. ☐☐☐ 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 manufacturers 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 Fig. 2 below.**
15. ☐☐☐ Apply power to the blower 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.
16. ☐☐☐ Unlock power and start the blower.
17. ☐☐☐ Measure, record and keep the following motor data for future reference and comparison:
(Single phase motors will only have L1 and L2 leads)

Amperage draw on each motor lead: L1 _____ L2 _____ L3 _____
(Running amps **SHOULD NOT** exceed the motor nameplate amps for the voltage being operated on)

Voltage coming to motor leads: L1_____ L2_____ L3_____
(Should be about the same input voltage on all leads)

B. Vibration:

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

NOTE:

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

Vibration readings for direct driven blowers should be taken on the motor at the top, sides and end as per **Fig. 3** below. After you have taken your vibration readings, write them down in the spaces below and keep for future comparison.

⚠ DANGER

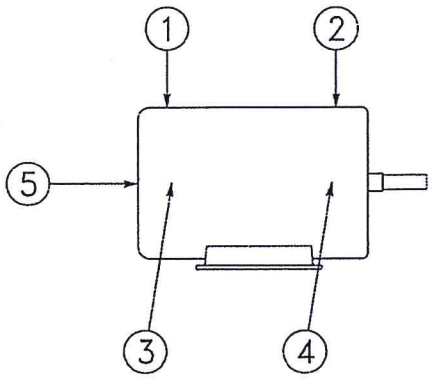
If the blower is going to be conveying material, it is the users responsibility to periodically turn the blower off and lock out the power. The blower wheel should then be checked for material build-up and/or erosion. If material has built up on any parts of the wheel, it MUST be removed and cleaned before it is put back into service. If any parts of the wheel have been eroded, the wheel MUST be replaced. Failure to perform this inspection can cause excessive vibration that will damage the blower and/or motor bearings. When vibration becomes excessive, it will lead to complete blower failure that could cause property damage, severe personal injury and death. The user must determine the frequency of this inspection based on the actual circumstances of their operation, BUT checking the vibration readings should NEVER exceed a 12 month period. For the AMCA/ANSI standard for vibration limits, see Fig. 4 on page 9.

Fig. 3

VIBRATION METER PROBE POSITIONS

For Arrangement 4 Blowers

	1	2	3	4	5
A					
B					
C					

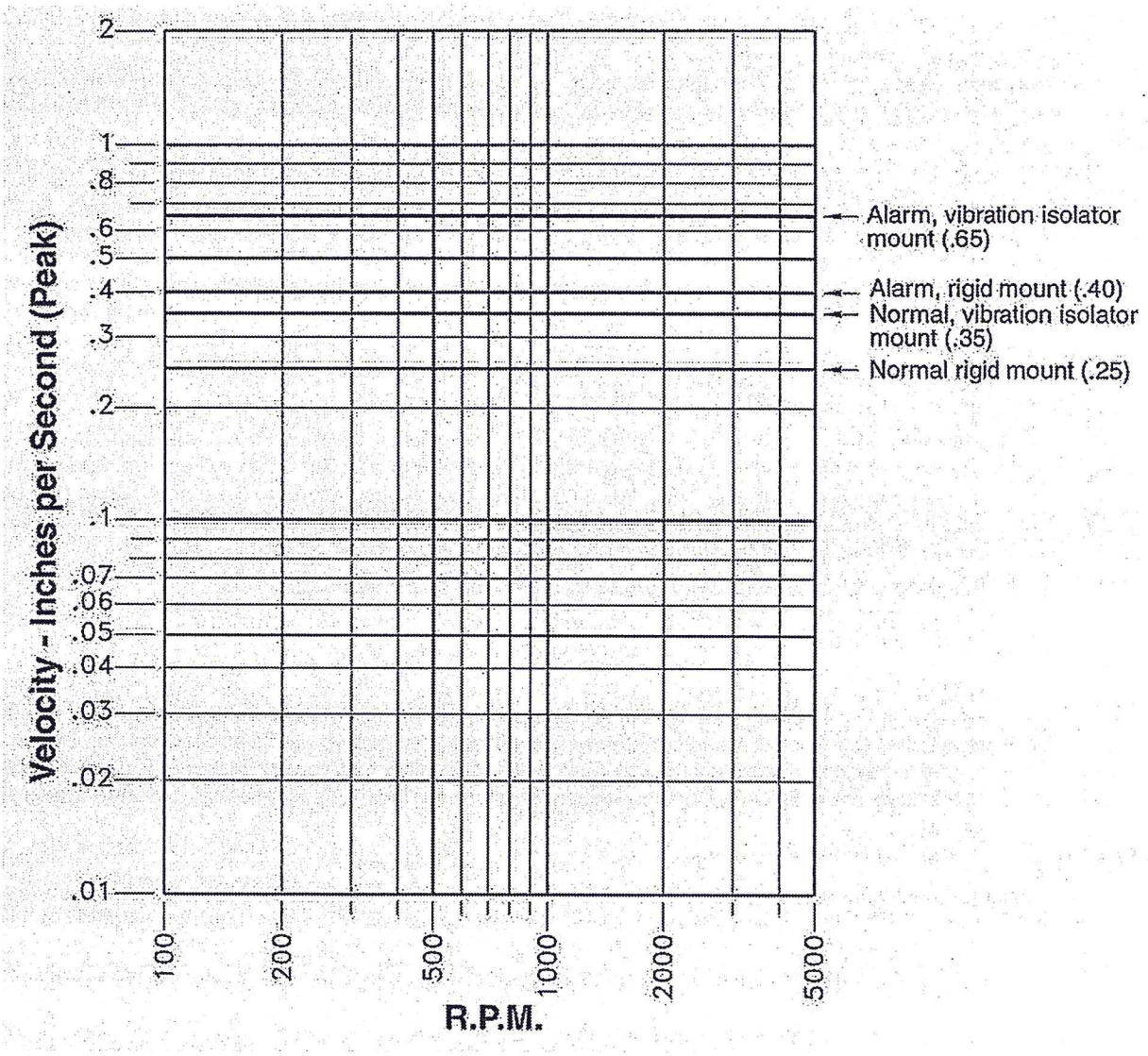


A Pre-Startup ..... Readings taken by: _____ Date: _____

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

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

Fig. 4 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. Wheel set screws or taper-lock bushings should be tightened to the torque values shown in **Tables 1 and 2** on page 5.

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

B. Motor Bearing Lubrication:

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

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

C. Wheel Balance:

All blower wheels are balanced at the factory. It is not uncommon that additional "trim balancing" is required after the blower is assembled. Trim balancing of the blower assembly, in the field, is typically always necessary for all replacement wheels. **After any wheel is installed, the final balance of the entire blower assembly should be checked.** Refer to **Section B** on page 8 and **Fig. 4** on page 9. Air stream 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 air stream 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 motor shaft.**

There are two ways to balance a blower wheel:

1. **Add balancing weights for fabricated aluminum, steel or stainless steel wheels:**
   Balance weights should be rigidly attached to the wheel at a location that will not interfere with the blower housing nor disrupt air flow. They should (if at all possible) be welded to the wheel. When trim balancing the wheel, **on the blower,** be sure to ground the welder **directly** to the blower wheel. Otherwise, the welding current will likely pass through the motor and damage the motor bearings.
2. **Grinding off material for cast aluminum wheels: (on some models only)**
   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.

   NOTE:
   Removing any Backward Inclined or Airfoil wheel from the blower to clean it, 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 blowers airflow (CFM), 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 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 **Figure 3**, on page 8, 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.
2. Mechanical looseness.
3. Poor blower inlet and/or discharge conditions.
4. Foundation stiffness.

E. Dampers and Valves: (Airflow control devices)

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 users responsibility to make sure that all safety guards required by the 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 manufacturers maintenance manuals should be referred to for correct maintenance procedures. These accessories include, but are not limited to, the following:
Shaft seals, inspection doors, vibration isolators or vibration bases, air flow or pressure measuring equipment, hoods, controls, special coatings, silencers, expansion joints, valves, flexible connectors and filters.

VI. ORDERING REPLACEMENT PARTS:

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

NOTICE:

1. **If this blower is vital to any process that could cost you lost revenue, we strongly recommend that you keep a replacement blower wheel and motor at your location.**

2. **If this blower 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.cincinnatifan.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	1. Loose mounting bolts, wheel set screws, taper-lock hubs. 2. Worn or corroded blower wheel. 3. Accumulation of foreign material on blower wheel. 4. Bent motor shaft. 5. Worn motor bearings. 6. Motor out of balance. 7. Inadequate structural support. 8. Support structure not sufficiently cross braced. 9. Weak or resonant foundation. 10. Foundation not flat and level.
Airflow (CFM) Too Low	1. Blower wheel turning in wrong direction (**rotation**). 2. Actual system static pressure (**SP**) is higher than expected. 3. Motor speed (**RPM**) too low. 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. Blower wheel not properly located relative to the inlet bell (if provided).
Airflow (CFM) Too High	1. Actual system static pressure (**SP**) is lower than expected. 2. Motor speed (**RPM**) too high. 3. Filter not in place. 4. Dampers or valves not adjusted properly.

PROBLEM	CAUSE
Motor Overheating	**NOTE: A normal motor will operate at 174°F. See B-8 on page 6.** 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 or loose wiring connections. 6. Cooling fan cover on back of motor is clogged. (Fan cooled motors only.)
Excessive Noise	1. Wheel rubbing inside of housing. 2. Worn or corroded blower wheel. 3. Accumulation of foreign material on blower wheel. 4. Loose mounting bolts, wheel set screws, or taper-lock hubs. 5. Bent motor shaft. 6. Worn motor bearings. 7. Motor out of balance. 8. Motor bearings need lubrication. 9. Vibration originating elsewhere in system. 10. System resonance or pulsation. 11. Inadequate or faulty design of blower support structure. 12. Blower operating near "stall" condition due to incorrect system design or installation.
Fan Doesn't Operate	1. Motor wired incorrectly. 2. Incorrect voltage supply. 3. Defective fuses or circuit breakers. 4. Power turned off elsewhere. 5. Motor wired incorrectly or loose wiring connections. 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 "breath". 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. 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 a minimum of 10 full revolutions to keep the motor bearing grease from separating and drying out. ***This is a critical step.***	

Long Term Storage instructions continued on page 13.

5. General Motor Procedure:

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

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

   ***NOTE*:**
   For specific storage instructions, for the <u>actual</u> motor and 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 Sellers 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 or Users 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, 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.cincinnatifan.com**

cincinnati fan

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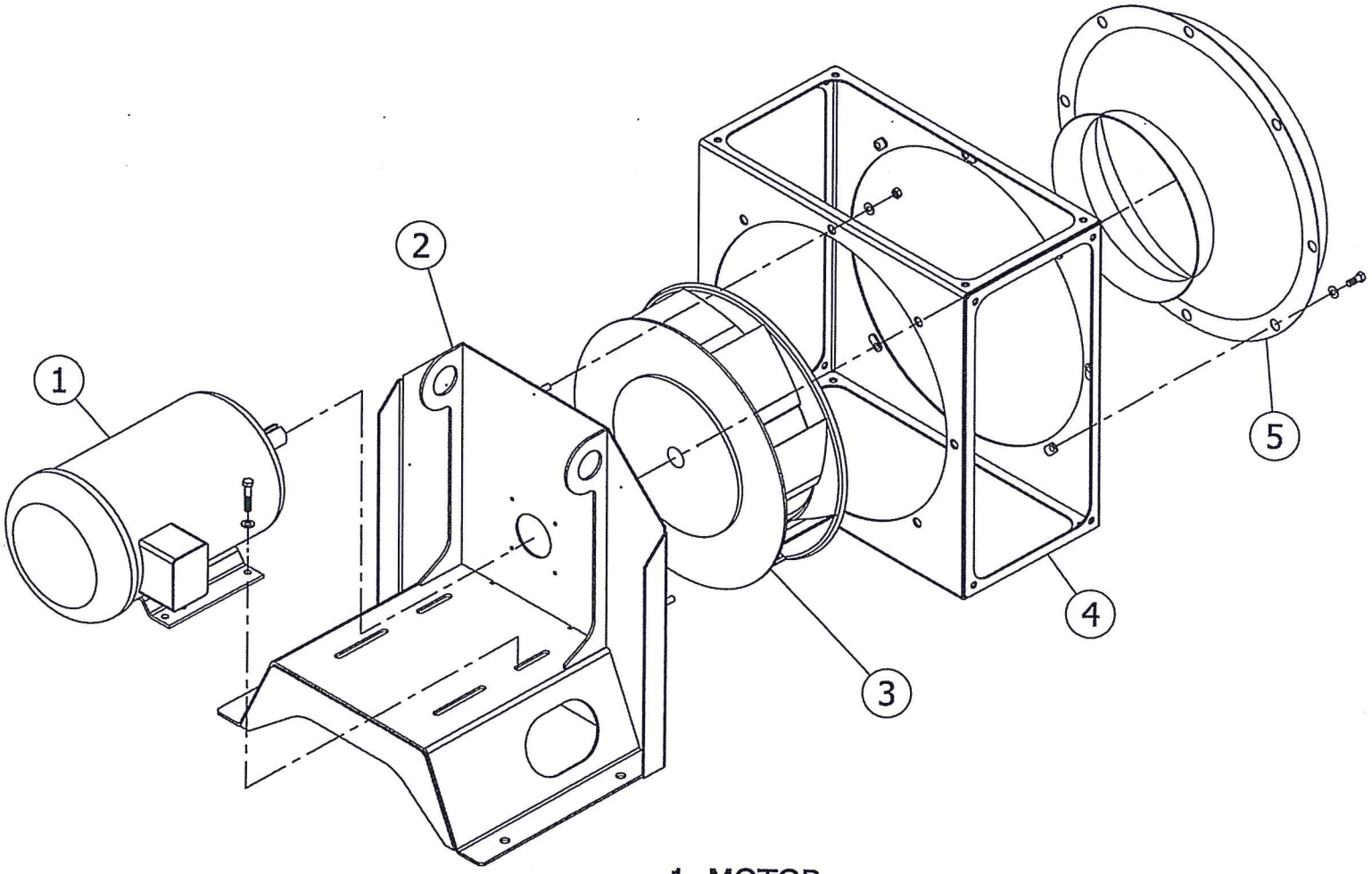

1. MOTOR
2. BASE
3. BLOWER WHEEL
4. INLET BELL SUPPORT
5. INLET BELL (COLLAR OPTIONAL)

PLENUM FAN ARRANGEMENT 4

The drawing shown above is a representation of the basic model blower or fan purchased on the serial number shown on page 1. It does not include any optional or accessory parts or any special construction features that might have been supplied with the original order.