

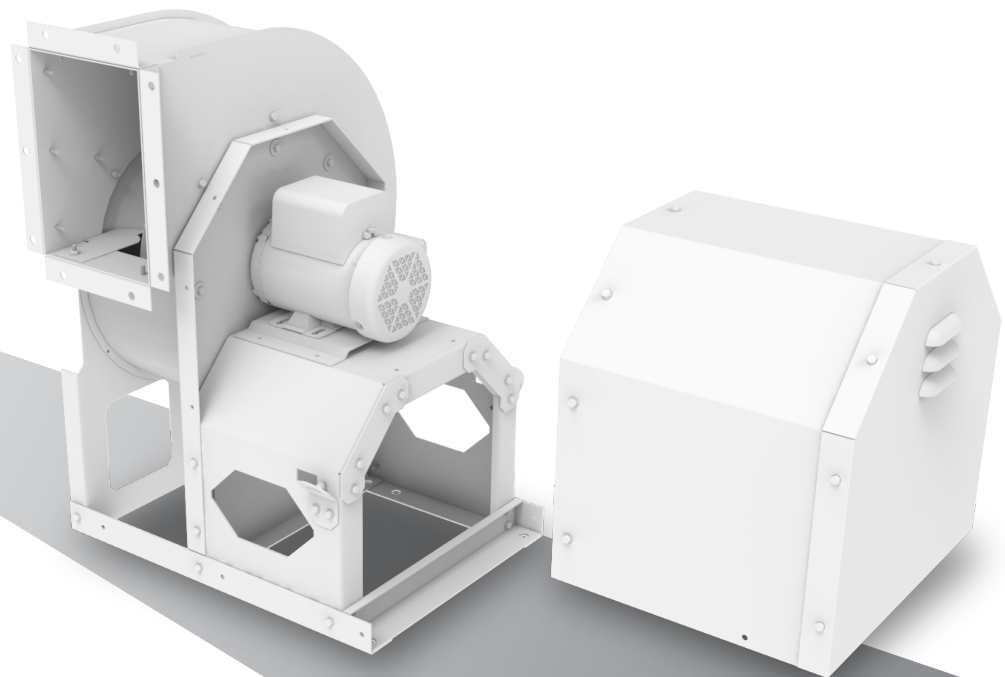
UVS

Utility Vent Set - Direct and Belt Drive

OPERATION AND MAINTENANCE MANUAL



PENNBARRY™



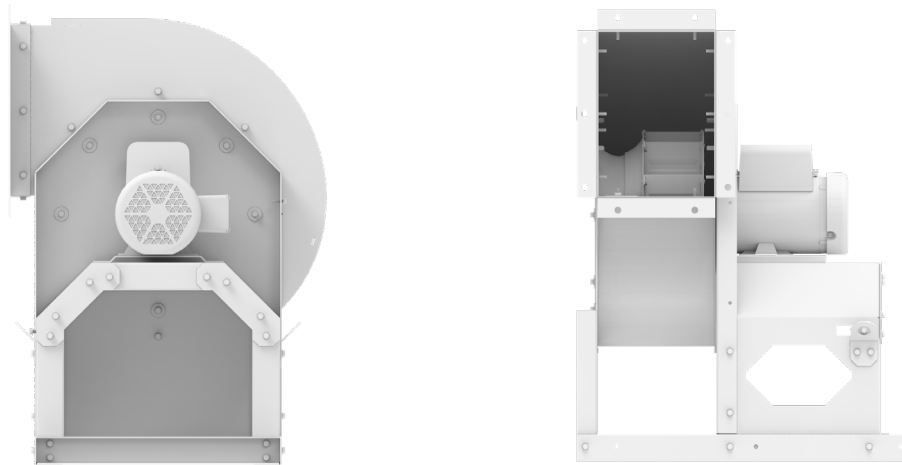
IMPORTANT! Read before proceeding!

The information contained herein is, to the best of our knowledge, accurate and applicable for proper operation and installation of the specified equipment at the time this document entered service. Before proceeding, it is recommended that you check for a more current version of this Installation Operation Manual (IOM) on our website at www.pennbarry.com. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

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INTRODUCTION



General Safety Information regarding installation.

Only Qualified personnel should install and service these fans. Comprehension of these instructions and general safety precautions is required by the installation personnel. Failure to properly install the fans could result in electrical shock, other bodily harm, and potential hazards to the installation personnel or others.

- Follow local electrical, safety, and installation codes, along with NEC (National Electric Code) and National Fire Protection Agency (NFPA), where applicable.
- Free rotation of the impeller is critical. Ensure the impeller rotates freely without rubbing other stationary components.
- Be sure to check power supply (voltage, frequency, phase, and current capacity of the electrical wires) matches the motor nameplate.
- Ground the motor adequately and securely.
- Verify the installation surface will be able to support the weight of the fan, motor, and accessories.
- Verify the installation surface is level.
- Ensure the fan inlet and outlet are guarded sufficiently so unwanted objects do not get sucked into the inlet nor unwanted objects would be discharged out the fan outlet possibly causing injury or property damage.
- Please refer to ACMA Publication 410 for further information on safe practice details involving industrial and commercial fans.
- Fan motors, and electrical components, should have electrical disconnects installed within close visual proximity of the so the disconnect can be located to turn of electrical service.
- When the fan is being serviced it should be locked out at the service disconnect and the fan wheel should be secured so it will not spin while being serviced.
- Impeller must not exceed maximum Fan RPM.
- Adjustments made to increase fan rotation will affect the motor load. If the fan rotation is increase, motor load should be verified so the current rating is not exceeded.

INTRODUCTION

- Power loss and Friction inside rotating equipment risk them becoming a burn hazard. All fan parts should be approached cautiously and, if needed, allowed to cool before servicing.
- Verify rotating parts have come to complete stop before servicing.
- Failure to follow the general safety information and installation instructions could result in death or serious injury.
- Fans are required to run with proper protective devices in place. Reference local codes to ensure protective devices compliance.
- Before opening an Access Door, on the fan, be sure the impeller is no longer rotating and is secured so it will not rotate while the Access Door is open. The fan should never be run without the Access Door properly secured.
- Due to the high forces of inlet suction, be sure the fan is completely shut off, and stopped when walking around the fan. Ensure the inlet area is clear of people and loose objects before starting the fan.

Receiving and Handling

When the unit is received, inspect the carton/crate for any signs of tampering. Inspect the unit for damage that may have occurred during transit and check for loose, missing, or damaged parts. Mishandled units can void warranty provisions. If units are damaged in transit, it is the responsibility of the receiver to make all claims against the carrier. PennBarry is not responsible for damages incurred during shipment.

Avoid severe jarring and/or dropping. Handle units with care to prevent damage to components or finishes. If the unit is scratched due to mishandling, the protective coating may be damaged. Incorrect lifting may damage the fan and void warranty.

Fans are to be moved by the lifting brackets provided or by the skid when a forklift is used. Location of the brackets varies by model and size. Take care to handle to keep from damaging the coating. IT is recommended to use spreader bars prevent damage to the fan. Not using spreader bars may result in damage which is the installer's responsibility.

1. Reference industry standard lifting and rigging practices.
2. All lifting brackets on each are to be used at the same time.
3. Never use the shaft, motor, or accessories as lifting points.
4. Keep the fan level during lifting and installation.
5. Spreader bars must span the unit to prevent damage to the unit by the lifting cables.
6. Test-lift the fan to check for proper balance and rigging before moving to desired location.
7. Do not lift the fan in windy conditions.
8. Use padding and/or sufficiently padded chains to protect the fan and coating from damage.

INTRODUCTION

Storage

Storage Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion. If it is necessary to store outdoors or within a building under construction, special care must be taken to prevent moisture, corrosion, dirt or dust accumulation. Coat the shaft with grease or rust preventative compound. Cover and seal bearings to prevent entrance of contaminants. Impeller should be rotated at least once a month to circulate the grease in bearings. If stored outdoors over seven (7) days, cover completely with a tarp or heavy waterproof paper. Electrical connections and leads must be protected from moisture. Block impeller to prevent natural rotation. Do not allow material of any kind to be piled on top or inside of fan.

Long Term Storage (Over 1 month) Long-term storage is defined as storage for period exceeding one month from the date the equipment was received. Fans and motors should be stored in a dry, low humidity area indoors. Equipment which is to be installed, but not operated for several months, should first be blocked to take the weight off of the vibration isolators (if provided), and then given the same protection, periodic inspection and maintenance as a unit in storage. To prevent puddle corrosion of fan bearings that undergo long-term storage the following preventive maintenance must be performed:

1. Fan bearings must be lubricated every month until the fans are put into service. A clear 1/16" bead of grease must appear on each side of the bearings. Fan wheels are to be rotated manually while the bearings are lubricated. Refer to the specific bearing lubrication instructions located on the fan housing for the type of lubricant to use.
2. Motor bearings should be lubricated as recommended by the motor manufacturer.

Surface Protection - Most fans are available with special paint finished to protect the fan against a wide variety of adverse conditions. The standard finish furnished without additional charge is well suited for indoor use. Fans installed in severe outdoor applications (i.e., coastal areas, etc.) May require additional surface protection. The outdoor finish must be compatible with Alkyd base paint. Architecturally pleasing colors are available from many paint manufacturers. This allows the owner to make the outside color choice at the time of the fan installation to match architectural features of the building.

Prior to Installation - Inspect the fan for any damage and ensure it is in operating condition. Turn the impeller to verify it spins freely. Make the impeller is centered over the venturi and that there is sufficient overlap of the impeller and the inlet venturi. Check all fasteners for tightness. If equipped, verify the fan shaft, pulleys, and belts are aligned.

Maintenance clearance of the UVS does not have any specific requirements. It is up to the customer to define the appropriate amount of clearance for access and maintenance of the unit.

INSTALLATION

Installation

Carefully inspect the fan and ensure any loose fasteners are secured, the bearings (belt driven and motor bearings). Hand rotate the impeller to make sure it spins freely and without a wobble. This fan requires a solid surface rated for the weight of the fan and must be installed level. In applications where sound levels are crucial, it is recommended isolators are used along with flex duct connections (where appropriate).

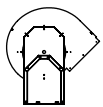
Mounting holes have been provided for mounting for direct mounting to a solid level surface, direct mounting isolators, or using isolator rails. Fans must be located and fastened firmly in a level position. The motor and drive are then mounted in their proper relative positions, if not already mounted on the fan.

Housing/Discharge Orientation

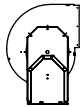
The Housing Orientation is set per customer selection. The housing can be rotated, in the field, if required. If the housing is supplied with a drain, and the housing is field rotated, the drain may need to be relocated also (this will be done, in the field, by others).

UVS Class 0 – All sizes have rotatable housings. The housing bolts, inlet cone, and wheel allows the housing to be rotated. The fan rotation is always referenced from the drive side of the fan.

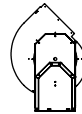
Discharge Configurations



CW-TAD



CW-TH



CW-TAU



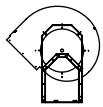
CW-UB



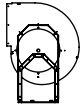
CW-BAU



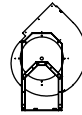
CW-BH



CCW-TAD



CCW-TH



CCW-TAU



CCW-UB



CCW-BAU



CCW-BH

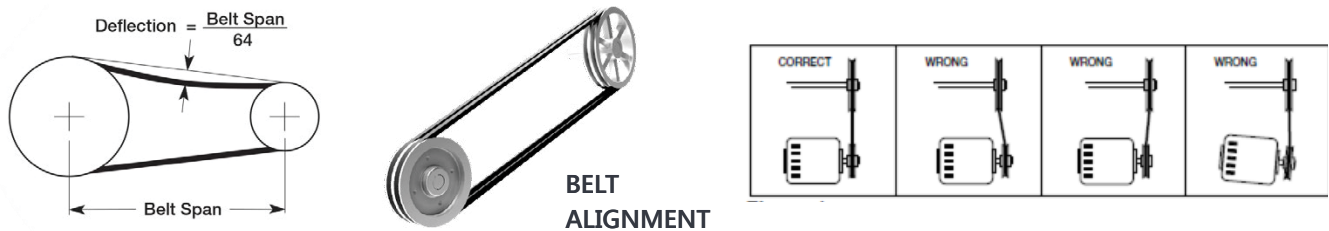
START-UP AND OPERATION

Belt Tension Check. Check condition of belts and the amount of tension prior to start-up. When it becomes necessary to adjust belt tension, do not over tighten as bearing damage will occur. Recommended belt tension should permit deflection of 1/64" per inch of span of the belt on each side of the belt measured halfway between the pulley centerline. Exercise extreme care when adjusting belts as not to misalign the pulleys. Any misalignment will cause a sharp reduction in belt life and produce squeaky, annoying noises (See figure 1). Use a straight edge to help determine alignment. (See figure 2)

Aligning pulleys

Motor and drive shafts must be parallel and the pulleys are inline. Pulley Alignment is done by loosening the set screw on the motor pulley and moving the pulley along the motor shaft. (See figure 3) The fan RPM can be adjusted by opening/closing the adjustable pulley (if provided), on the motor shaft. Multi-groove adjustable pulleys must be adjusted equally. Increasing the fan RPM will increase the load on the motor. When increasing fan speed, verify the motor load, after the speed change, to make the motor is not exceeding motor FLA.

Motor Lubrication and Maintenance replenish grease or lubricate motor bearings according to manufacturer's recommendations. **DO NOT OVER LUBRICATE.** Motor manufacturer's lubrication recommendations are printed on tags attached to motor. Should these tags be missing the following will apply:



On units equipped with two or three groove pulleys, adjust all belts with equal tension.

Verify Belts and Pulleys. Make sure the belts and pulleys match the belts and pulleys indicated on the documents provided with the fan.

Prior to applying power to the motor, check the following

1. Turn off and LOCK OUT the power source.
2. Check line voltage, phase, and frequency with motor nameplate, and electrical accessories.
3. On single phase motors, set-up the terminal blocks in accordance with the nameplate instructions (or wiring diagram). The set up must match the line voltage.
4. If the motor is three phase, group and connect the winding leads as shown on the wiring diagram. The line voltage must correspond with proper grouping of motor leads.
5. On two speed motors, follow the wiring diagram explicitly, or serious motor damage will occur.
6. For ECM direct driven motors, make sure that the integrated potentiometer is adjusted to its minimum set point.
7. For a fan is ordered with an induction motor, but not a soft start device, it is recommended the service disconnect have a time delay fuse/breaker for in-rush current.
8. Ensure all guards, motor, shaft, and belt guarding is in place before the fan runs.
9. Dampers, if supplied, should operate freely with blades closed tightly. All dampers (with actuators) should be partially closed during starting periods to reduce power requirements.

START-UP AND OPERATION

All AC induction motors will perform satisfactorily with a 10% variation in voltage, a 5% variation in frequency or a combination voltage-frequency variation of 10%. For motors rated 208-220 volts, the above limits apply only to 220 volt rating. To select control for 208-220 volt motors, use same amps for either 208 or 220 volts. Motors are received with bearings lubricated and require no lubrication for some time depending on operating conditions. (See Maintenance Section on Motor Bearings)

Fractional horsepower ball bearing motors

Under normal conditions, ball bearing motors will operate for five years without replenishing lubricant. Where applicable, under continuous operation at higher temperature (but not to exceed 140°F ambient) add lubrication after one year.

Integral horsepower ball bearing motors

Motors having pipe plugs or grease fittings should be lubricated while warm and at a standstill. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. Use low pressure grease gun and lubricate until grease appears at grease relief.

Recommended lubrication intervals - general guide only.

H.P. Range	Standard duty 8 hr./day	Severe duty 24 hr./day Dirty, Dusty	Extreme duty, Very dirty, High ambients
1 1/2 - 7 1/2	5 Years	3 Years	9 Months
10 - 40	3 Years	1 Year	4 Months
50 - 150+	1 Year	9 Months	4 Months

These ball bearing greases or their equivalents are satisfactory for ambient temperatures from 20°F to 200°F.

Chevron SRIU #2 (Standard Oil of California)

Chevron BRB #2 (Standard Oil of California)

Premium RB (Texaco, Inc.)

Alvania No. 2 (Shell Oil Company)

Make certain motor is not overloaded. Check FLA against motor nameplate.

KEEP MOTORS DRY. Where motors are idle for a long time, single phase heaters or small space heaters might be necessary to prevent water condensation in windings.

Starting. Once the fan motor is connected and ready to run, verify the fan rotation to make sure the impeller is spinning in the direction of the arrow on the fan housing.

After an hour of running check bearings to be sure they are not excessively hot. Recheck fasteners are secure.

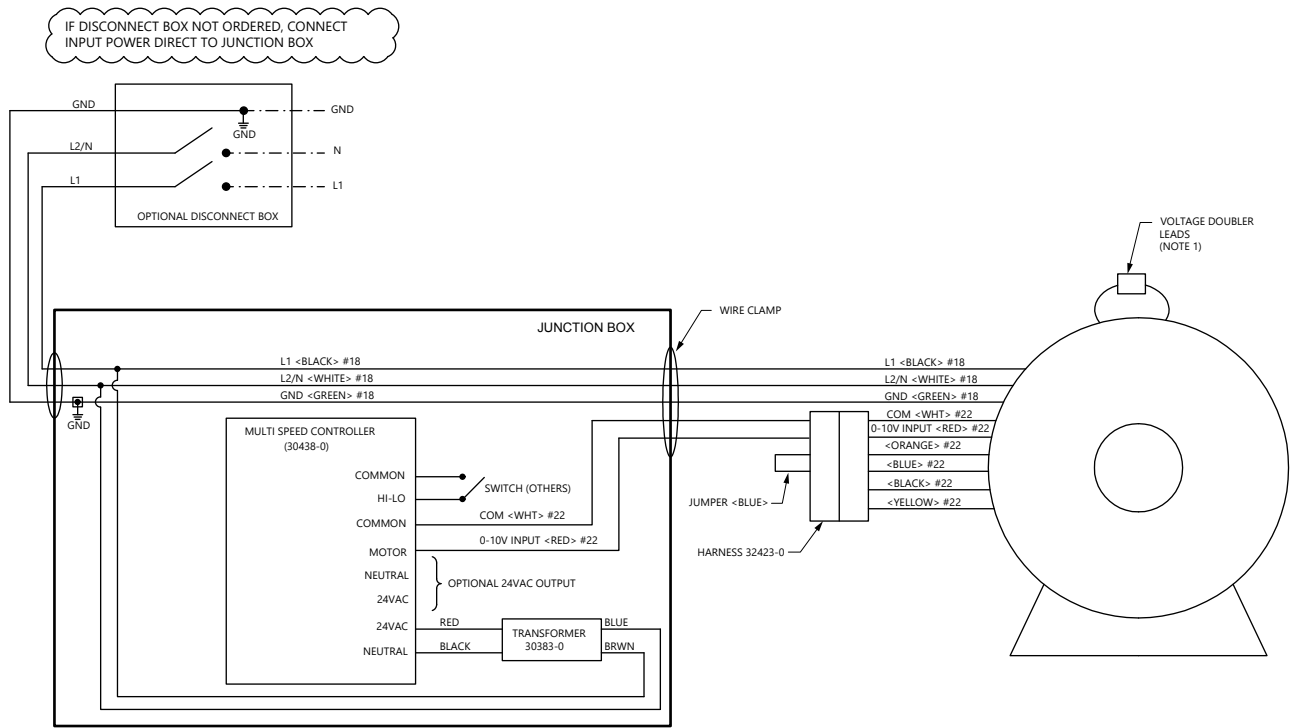
Motor Wiring Diagrams

Ducted/Non-ducted installations. Follow the guidelines below for installation to get the most efficient use of the fan. Failure to do so will see diminished fan performance, increased maintenance cost, and reduced fan life.

General information on Duct Connections - The connections from fan to ductwork must not be distorted. Ducts should never be supported by the fan. Expansion joints between duct connections should be used where expansion is likely to occur or where the fan is mounted on vibration isolators. All joints should be sealed to prevent air leaks and all debris removed from ductwork and fan.

START-UP AND OPERATION

ECM w MTD. SPD. CTRL. Controller Option 9 32426-0 R0

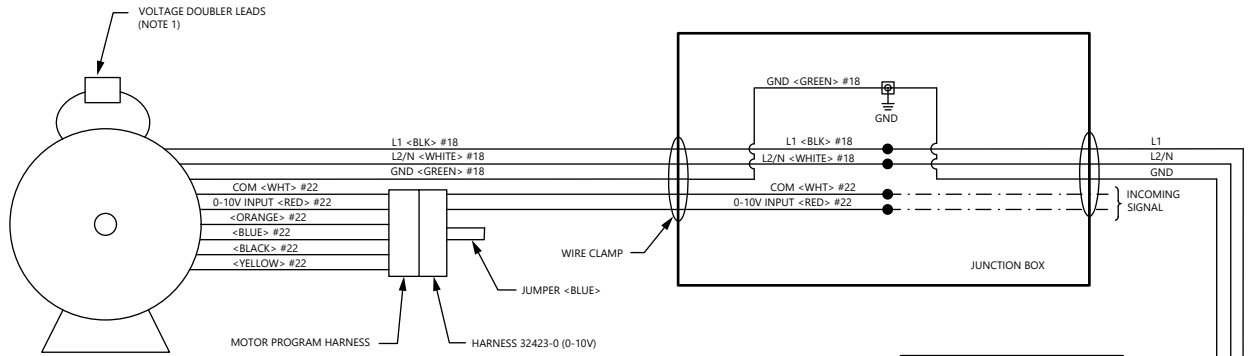


NOTES:

1. VOLTAGE DOUBLER LEADS TO BE CONNECTED ONLY FOR 120V. MUST BE DISCONNECTED WHEN 208-277V IS USED.

START-UP AND OPERATION

ECM w Programming Harness 32425-0 R0



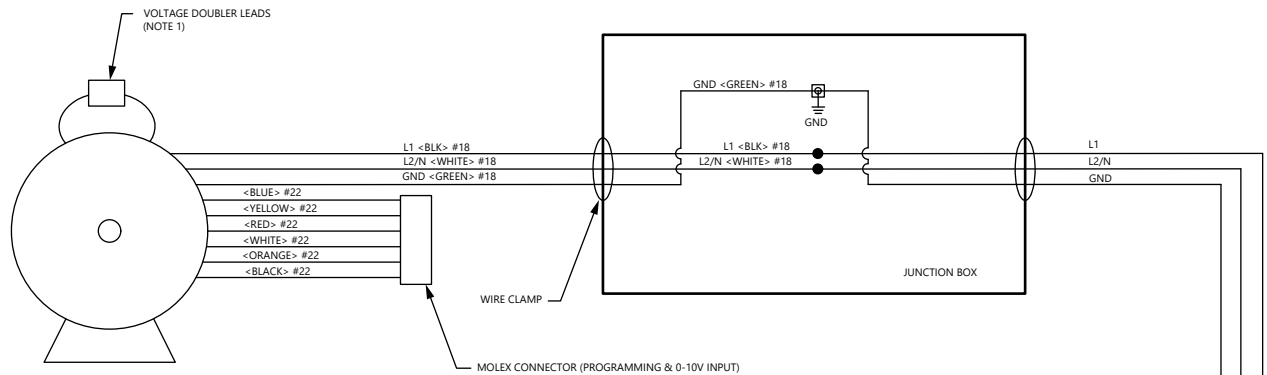
NOTES:

- VOLTAGE DOUBLER LEADS TO BE CONNECTED ONLY FOR 120V. MUST BE DISCONNECTED WHEN 208-277V IS USED.

- FIELD WIRE BY OTHERS
- FACTORY WIRE
- ISOLATED WIRE NUT
- ◼ ISOLATED CRIMP CAP

IF DISCONNECT BOX NOT ORDERED, CONNECT INPUT POWER DIRECT TO JUNCTION BOX

ECM wo Programming Harness Controller Option A 32424-0 R0



NOTES:

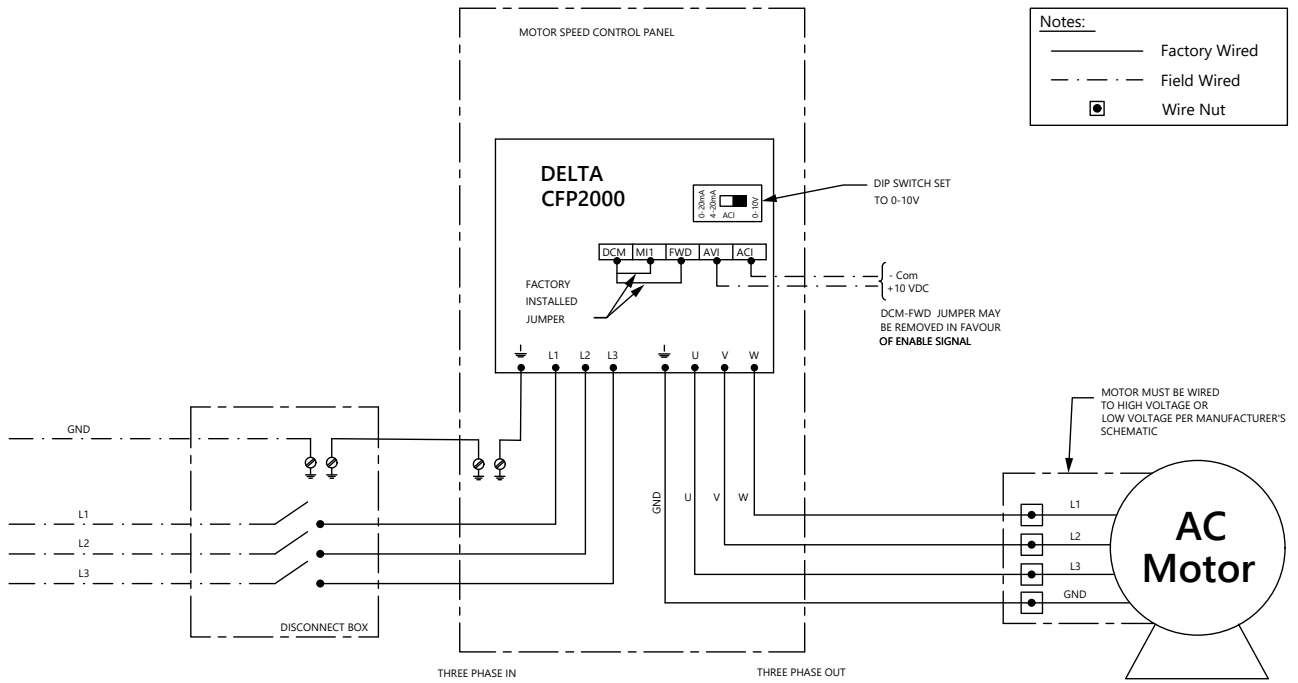
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- FACTORY WIRE
- ISOLATED WIRE NUT
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IF DISCONNECT BOX NOT ORDERED, CONNECT INPUT POWER DIRECT TO JUNCTION BOX

START-UP AND OPERATION

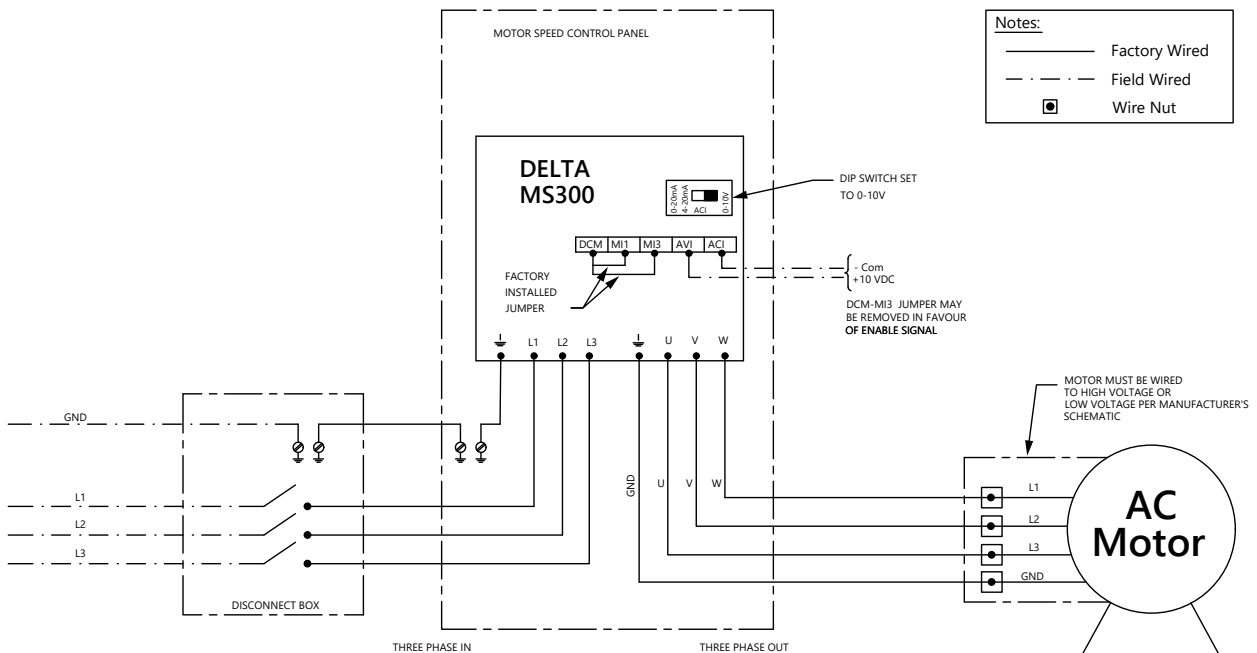
INDC or PM Delta CFP2000 40846-22 R0



40846-22 (3-PH IN / 3-PH OUT) DELTA CFP2000

FOR ADDITIONAL INFORMATION ON SPEED CONTROLLER SEE WWW.PENNBARRY.COM

INDC or PM Delta MS300 40846-14 R0

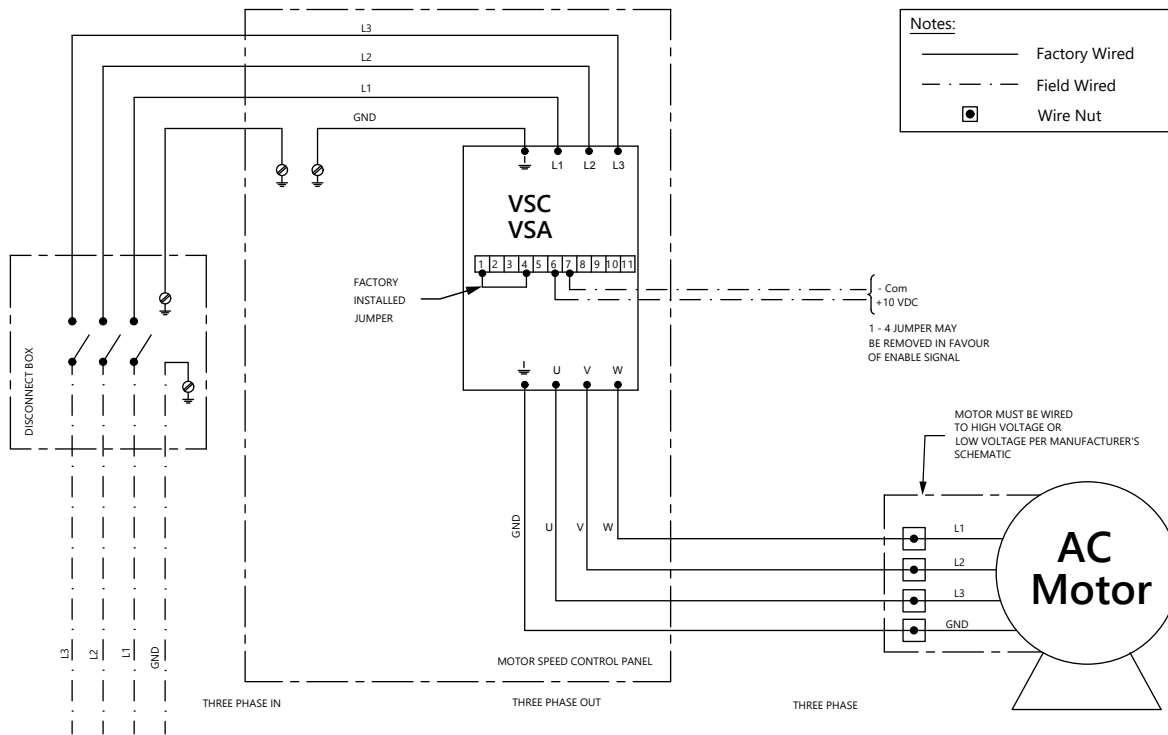


40846-14 (3-PH IN / 3-PH OUT) DELTA MS300

FOR ADDITIONAL INFORMATION ON SPEED CONTROLLER SEE WWW.PENNBARRY.COM

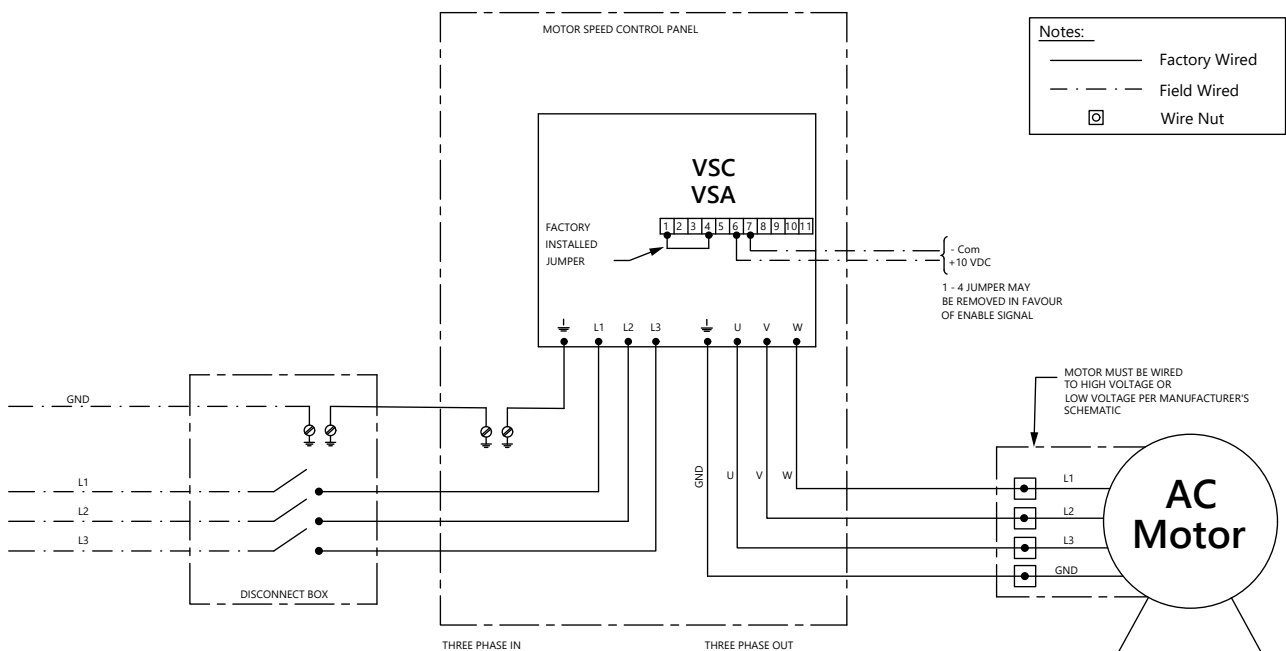
START-UP AND OPERATION

INDC or PM VSC-VSA IP20 40846-6 R0



FOR ADDITIONAL INFORMATION ON SPEED CONTROLLER SEE WWW.PENNBARRY.COM

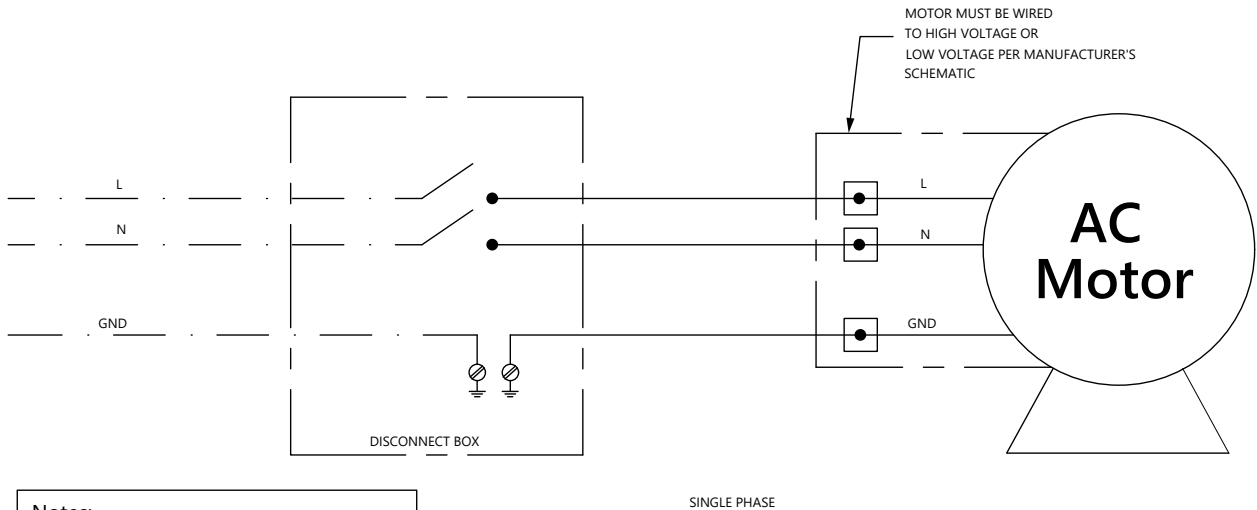
INDC or PM VSC-VSA IP66 40846-10 R0



FOR ADDITIONAL INFORMATION ON SPEED CONTROLLER SEE WWW.PENNBARRY.COM

START-UP AND OPERATION

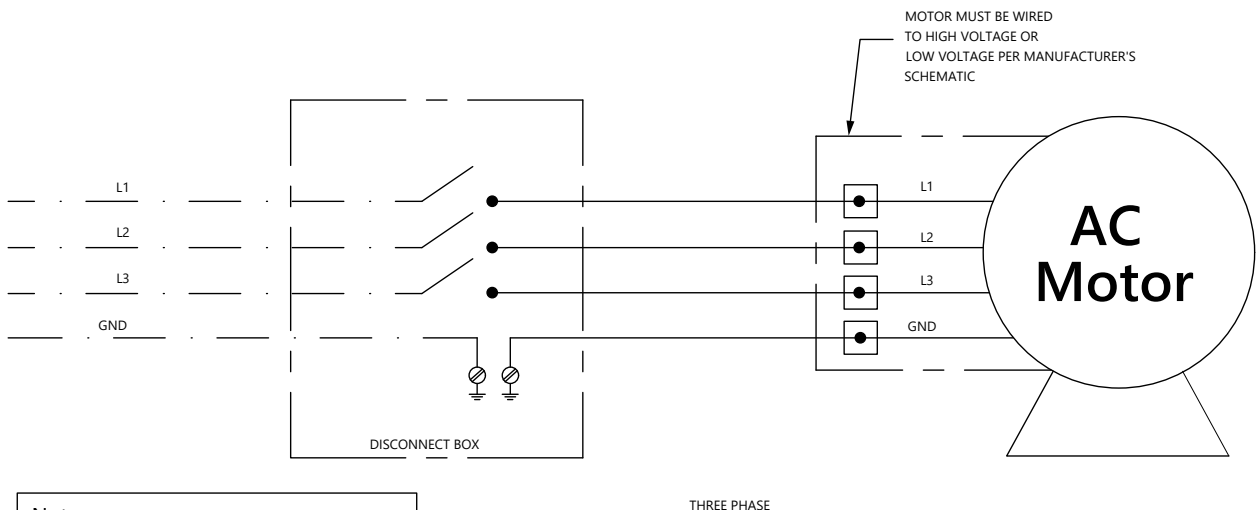
INDC Wired to DSC 1-PH 40848-3 R0



Notes:

- Factory Wired
- - - Field Wired
- Wire Nut

INDC Wired to DSC 3-PH 40848-2 R0



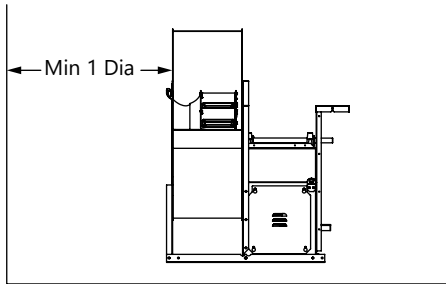
Notes:

- Factory Wired
- - - Field Wired
- Wire Nut

START-UP AND OPERATION

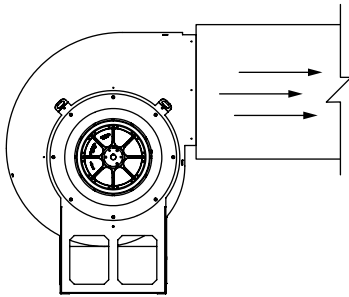
Non-Ducted Installations

Non-ducted Inlet. If the fan does not have a ducted inlet, then there should be one impeller clearance in front of the inlet. See diagram below.



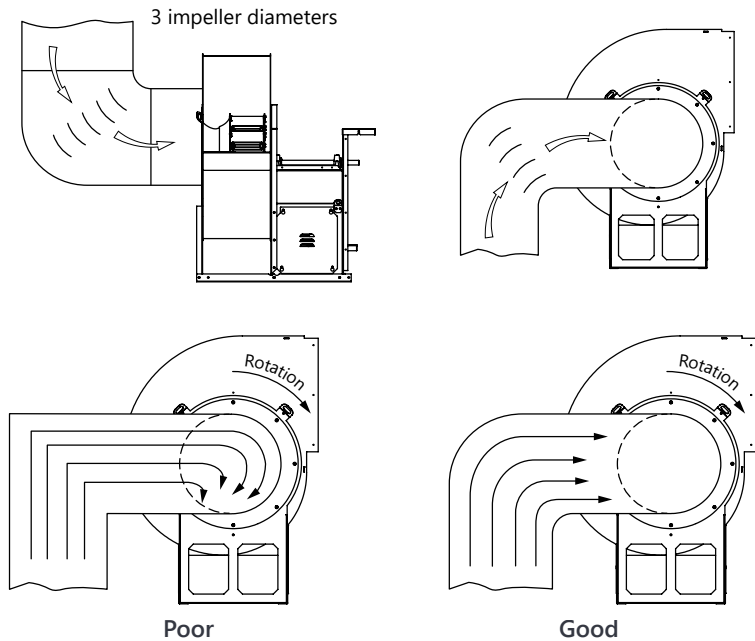
Non-Ducted Inlet Clearance

Non-ducted outlet. If the fan is discharged into free discharge or an abrupt plenum will result in lowered fan performance as the fan isn't directing the discharge nor achieving required pressure to move the discharge appropriately.



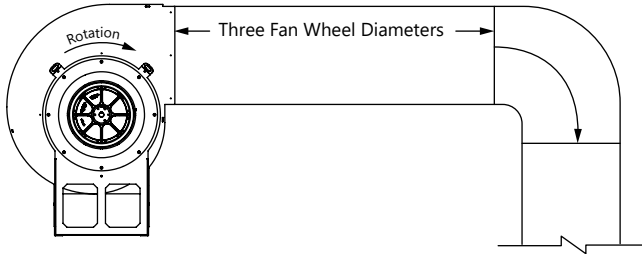
When the fans are installed with duct they should follow general guidelines below.

Ducted Inlets -It is highly recommended inlet have 3 impeller diameters of straight duct into the inlet. It is also recommended duct turns have turning vanes to reduce inlet turbulence (Inlet Spin/Swirl).



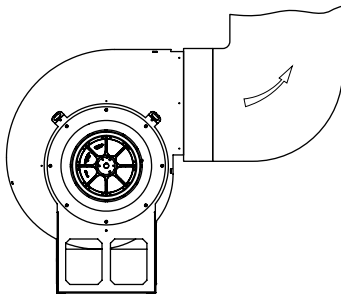
START-UP AND OPERATION

Ducted Outlets - Discharge ducts should have 3 impeller diameters before any duct turns. When the duct does turn it should use turning vanes and should turn in the direction of the discharge. See below diagrams for reference.



Good

Not recommended discharge.



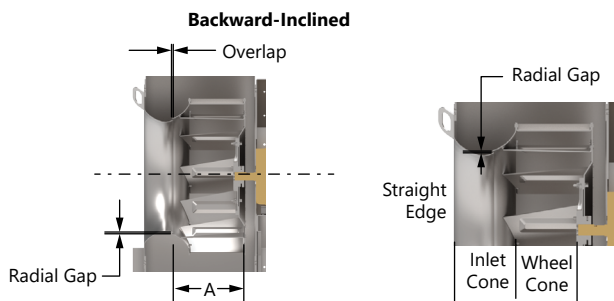
Drain

The fan has an optional drain to take away water or condensate. The drain will be located at the lowest point of the fan housing. Trapping of the drain will be by others and proper drain water disposal should follow local codes.

Impeller alignment (Overlap, and Radial Gap)

The impeller is required to rotate freely and not rub on the inlet venturi. The impeller wheel cone of the UVS will need to overlap the inlet venturi.

Refer to the table and diagrams for overlap and radial gap.



START-UP AND OPERATION

Size	Overlap	Radial Gap
060	0.22	0.03
070	0.22	0.03
080	0.22	0.03
100	0.22	0.03
122	0.27	0.06
135	0.30	0.08
150	0.33	0.10
165	0.36	0.11
182	0.40	0.14
200	0.44	0.16
222	0.49	0.19
245	0.54	0.23
270	0.59	0.26
300	0.66	0.30
330	0.72	0.34
365	0.80	0.39
402	0.88	0.44
445	0.98	0.50
490	1.07	0.55
542	1.19	0.62

To help the fan run efficiently, the overlap and radial gap must be maintained. After the newly installed fan has run for 24 hours, the gap and overlap should be verified to the charts provided.

Radial Gap - To adjust the radial gap by loosening the bolts holding the inlet cone in-place and then moving the inlet cone up, or down, until the proper gap is achieved.

Overlap – To adjust overlap, the wheel hub is to be loosened on the shaft. The wheel should be moved back or forward to get the correct overlap.

After adjustments, secure fasteners and verify pulley alignment. Pulley alignment may be required.

MAINTENANCE

Fan maintenance

Always disconnect or shut off fan before attempting any maintenance. A definite time schedule for inspecting all rotating parts should be established. The frequency of inspection depends on the severity of operation and the location of the equipment. Fan bearing alignment should be checked at regular intervals. Misalignment can cause overheating, wear to bearing dust seals, bearing failure and/or unbalance. Fan bearings should be lubricated at regular intervals. Periodic inspection will be necessary. If grease is found to be breaking down, replenish grease by pumping new grease into bearing until all the old grease has been evacuated. See section on BEARING LUBRICATION.

Bearings on high speed fans tend to run hot: 75°F to 100°F above ambient. Do not replace a bearing because it feels too hot to touch. Place a contact thermometer against the bearing pillow block and check the temperature. Before you investigate high temperature, realize that ball or roller bearing pillow blocks can have a total temperature of 225°F (107°C). High temperature bearings are rated at 425°F (218°C).

Foundation bolts and all set screws should be inspected for tightness.

Fans should be inspected for wear and dirt periodically. Any dirt accumulated in housing should be removed. The impeller may have to be cleaned. A wash down with steam or water jet is usually sufficient, covering bearings so water will not enter the pillow blocks. Impellers having worn blades should be replaced. Impellers require careful rebalancing before being returned to service. Replacement impellers should have the balance checked upon start-up and corrected as required to operate properly in its specific application.

Repairing of exterior and interior parts of fans and ducts will extend the service life of the installation. Select a paint which will withstand the operating temperatures. For normal temperatures a good machinery paint may be used. Corrosive fumes require all internal parts to be wire brushed, scraped clean and repainted with an acid resisting paint. Competent advice should be sought when corrosive fumes are present.

Blow out open type motor windings with low pressure air to remove dust or dirt. Air pressure above 50 psi should not be used, as high pressure may damage insulation and blow dirt under loosened tape. Dust can cause excessive insulation temperatures. Do not exceed OSHA air pressure requirements.

Excessive vibration will shorten the life of any mechanical device. Correct any imbalance situation before returning fan to service.

Lubrication lines

Lubrication lines installed at the factory are not filled with grease at the factory. Caution must be used when first greasing the bearings to purge air from the lines without blowing bearing seals or over greasing a bearing.

Adjustable motor base

Belt drives can be aligned and adjusted by loosening clamping bolts and sliding motor axially and retightening. Belt tension can be fine tune adjusted by loosening or tightening the adjustment bolts. Loosen clamping bolts first, then adjust adjusting bolts and retighten clamping bolts. Belt tension is adjusted with the adjusting bolts and maintained with the clamping bolts.

Fan mechanical balancing

Fan impellers are balanced statically and dynamically by the factory, but may require further trim balancing. The final installed vibration level of the fan is also dependent upon its installation and foundation. Fans shipped completely assembled have been trim balanced at the factory. Before any attempt is made at balancing, check for any other causes of vibration or unbalance as listed in the TROUBLESHOOTING CHECKLIST. A fan handling clean air should not need rebalancing after original balance. Dust build-up on fan blades or wear can cause fan unbalance. Periodic inspection of the fan should be made to determine the amount of dirt build-up or wear. Portable instruments are available that will indicate vibration in mils (1 mil = 0.001 inches). Each fan has a Quality Assurance label affixed to the fan. All pertinent information on factory balance is recorded on the label for the owner's information and use.

Important note:

The fan must be checked and corrected for any out of balance condition any time a component of the rotating assembly is replaced or altered.

MAINTENANCE

Lubrication Of Anti-Friction Bearings

Bearings on assembled fans receive their initial lubrication from the bearing manufacturer. Bearings shipped separate from the fan or as a replacement may not be lubricated before shipment. When there is the slightest doubt, the safe practice is to assume that the bearing has not been lubricated. Always turn fan off before lubricating.

For grease lubricated ball or roller bearing pillow block, a good grade of grease, free from chemically or mechanically active material should be used. These greases are a mixture of lubricating oil and a soap base to keep the oil in suspension. They have an upper temperature limit where oil and soap base oxidize and thermally decompose into a gummy sludge.

Mixing of different lubricants is not recommended. If it is necessary to change to a different grade, make or type of lubricant, flush bearing thoroughly before changing. Regreasing will vary from 3 months to a year depending on the hours of operation, temperature and surrounding conditions. Special greases may be required for a dirty or wet atmosphere (consult your lubricant supplier).

When grease is added, use caution to prevent any dirt from entering the bearing. The pipe plug or grease relief fitting should be open when greasing to allow excess grease to flow out. The pillow block should be about 1/3 full, as excess grease may cause overheating. Use a low pressure gun.

These ball bearing greases or their equivalents are satisfactory for ambient temperatures from 20°F to 200°F.

Chevron SRIU #2 (Standard Oil of California)

Chevron BRB #2 (Standard Oil of California)

Premium RB (Texaco, Inc.)

Alvania No. 2 (Shell Oil Company)

Frequency of lubrication

The bearings are lubricated at predetermined intervals and the condition of the grease established as it is purged out of the seals or by examination of the grease in the housing. An average installation where the environmental conditions are clean and room temperatures prevail may only require bearing lubrication every 3 to 6 months, while operation in a dirty atmosphere at high temperatures will require much more frequent intervals.

Figure 1: Frequency Of Lubrication

Shaft Size	Operating Speed (RPM)									
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
	Lubrication Frequency (Months)									
.50" - 1.00"	6	6	6	6	6	6	4	4	2	2
1.06" - 1.44"	6	6	6	6	6	6	4	4	2	1
1.50" - 1.75"	6	6	6	4	4	2	2	2	1	1
1.88" - 2.19"	6	6	4	4	2	2	1	1	1	
2.25" - 2.44"	6	4	4	2	2	1	1	1		
2.50" - 3.00"	6	4	4	2	1	1	1			
3.06" - 3.50"	6	4	2	1	1	1				
3.56" - 4.00"	6	4	2	1	1					

Base your particular interval on condition of grease after a specific service period. The chart above is intended as a guideline for your consideration. (Figure 1)

MAINTENANCE

Belt drives

Fans shipped completely assembled have had the belt drive aligned at the factory. Alignment must be checked before operation.

- Be sure pulleys are locked in position.
- Key should be seated firmly in keyway.
- The motor and fan shafts must be properly aligned, with the center line of the belts at a right angle to the shafts.
- Start the fan. Check for proper rotation of impeller. Run fan at full speed. A slight belt bow should appear on the slack side. Adjust belt tension by adjusting motor on its adjustable base.
- If belts squeal excessively at startup, they are too loose and should be tightened.
- When belts have had time to seat in the sheave grooves, readjust belt tension. Check belt tension after 8, 24 and 100 hours of operation.

Belt drive assembly can be mounted as follows

- Clean motor and drive shafts. Be sure they are free from corrosive material. Clean bore of sheaves and coat with heavy oil for ease of shaft entry. Remove oil, grease, rust or burrs from sheaves. Place fan sheave on fan shaft and motor sheave on its shaft. DO NOT POUND ON sheave as it may result in damage. Tighten sheaves in place.
- Move motor on base so belts can be placed in grooves of both sheaves without forcing. Do not roll belts or use tool to force belts over grooves.
- Align fan and motor shafts so they are parallel. The belts should be at right angles to the shafts. A straight edge or taut cord placed across the faces of the sheaves will aid in alignment with single groove sheaves. If multiple groove sheaves are installed, use the center line of the drive as your alignment point.
- Tighten belts by sliding motor in its base. Correct tension gives the best efficiency. Excessive tension causes undue bearing pressure.
- Be sure all safety guards are in place.
- Start the fan and run at full speed. Adjust belt tension until only a slight bow appears on the slack side of the belts. If slippage occurs, a squeal will be heard at start-up. Eliminate the squeal by tightening the belts.
- Belts require time to become fully seated in the sheave grooves. Check belt tension after 8, 24 and 100 hours of operation. Allowing belts to operate with improper tension will shorten belt life substantially.
- If the shafts become scratched or marked, carefully remove the sharp edges and high spots such as burrs with fine emery cloth or a honing stone. Avoid getting emery dust in the bearings.
- Do not apply any belt dressing unless it is recommended by the drive manufacturer. Belts are designed for frictional contact between the grooves and sides of the belts. Dressing will reduce this friction.
- Minimum belt center distances are available from factory upon request.
- Belt tension on an adjustable pitch drive is obtained by moving the motor, not by changing the pitch diameter of the adjustable sheaves.

Disassembly of Fan

Before removing any equipment, the fan's power source should be locked "off" for personal safety. The position of mating parts such as bearing, drive, etc., should be marked in their relative position for simplifying assembly bolts and maintained with the clamping bolts.

1. Remove all safety guards.
2. Disconnect ducting or supports to remove fans.
3. Remove drive cover plate to provide access to inner housing (Arr. 9 fan only)
4. Remove drive from fan.
5. Clean off the shaft, removing dirt and burrs and lubricate with oil for bearing and wheel removal.

MAINTENANCE

6. Loosen setscrews on pillow block bearing and remove the bearings (Arr. 9 fan only). Bearing bars should be checked with straightedge to determine if the bar has a crown, and bearings shimmed accordingly when assembled.

Bearing Replacement

Bearing Removal

Lock and Tag Out the power source before starting Bearing Replacement. Bearings will most likely require the removal of shaft guard, weather/motor cover, and/or the belt guards.

For fan Arrangements 1, 9, and 10:

1. Mark the position on the shaft of both bearing races, setscrews, and the wheel and pulley. Mark the location and orientation of the fan inlet. Note the clearance between the wheel and inlet cone.
2. Remove lube lines, if supplied.
3. Follow the bearing manufacturer's instructions for removing and installing the bearings.
4. Remove the fan pulley and fan inlet.
5. Remove the wheel from the shaft. (Note, this may require a puller for taking the wheel off).
6. Before bearing bolts are removed, support the fan shaft.
7. Remove bearing hold-down bolts. Remove shaft and bearings as one unit.
8. Clean the shaft with a suitable degreaser and remove any burrs with an emery cloth, or suitable file.
9. Remove the bearing from the shaft may require a bearing puller. If a bearing puller is not available, tap on the bearing with a wood block and hammer to remove it.

Bearing Installation

1. Reference installation instructions, from the manufacturer, before installing.
2. Oil the shaft for protection.
3. Slide new bearings on the fan shaft.
4. Align bearings on shaft where the bearing positions were marked, prior to removal. At that point, the bearings can be secured to the shaft.
5. Put bolts into new bearing and the bearing mount. Do not tighten the bolts.
6. Remove any supports used to hold the shaft.
7. Set bearings into place on bearing mount. Ensure bearings are level, alignment, and square.
8. Manually rotate the shaft so bearings can set in.
9. Listen and inspect for and rubbing or sounds from the bearings.
10. If supplied, reattach lube lines to the new bearings.
11. Reinstall drives and belts, taking care for alignment and tightness.
12. Reattach any guards that have been removed and follow procedures for safe start up.

MAINTENANCE

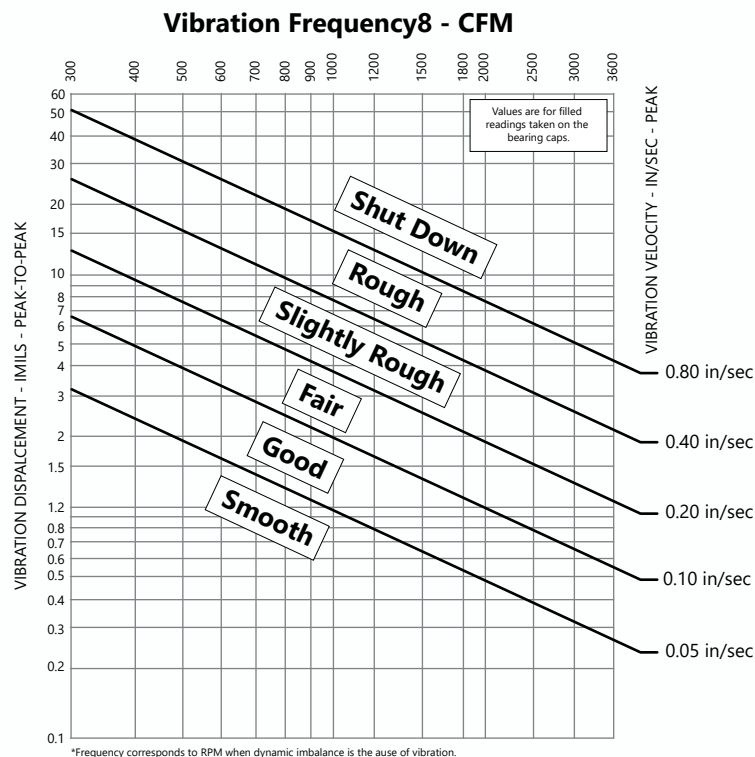
Assembly of Fans

To reassemble fan, reverse the process as listed above. Care should be taken once the fan is reassembled to assure components are firmly fastened and aligned. Shimming of bearings may be required to attain proper bearing and shaft alignment. Also, the straightedge should be laid across the full-length of the bearing mounting plate to determine if a crown exists. Shim each bearing accordingly. Wheel clearances and split housed bearing assembly tolerances must be adhered to. PennBarry requires that for any rotating assembly replacements, the fan should be rebalanced.

Vibration Tolerances

All fans are dynamically balanced at the factory before shipment. The dynamic balance is made utilizing a PMC, IRD or Schenck analyzer at the operating speed if known, or the maximum RPM of the unit. Measurements are taken off both bearings in mil readings of displacement. The readings will meet or exceed the guidelines as established in AMCA Std. 204-96, "Balance Quality and Vibration Levels for Fans." Final measurements are recorded on PennBarry's inspection copies. When motors and drives are not provided by PennBarry it will be necessary for the customer to provide a trim balance in the field.

Vibration Severity Chart



Guidelines for Interpreting the Classification on the Severity-Chart

Smooth: Alignment, balance and the integrity of the support structure must be near perfect and the vibration from sources other than the fan equipment must be low.

Good: Requires reasonable care on installation, proper foundation, good balance on the rotating components and good alignment of the running gear.

Fair: Fan equipment can operate in this region, but imperfections are indicated.

Slightly Rough: Requires service. Continued use in this condition will reduce equipment life. Monitor equipment for deterioration.

Rough: Requires service. Dangerous operating conditions for fan equipment. Shut equipment down.

Shut Down: Do not operate fan equipment. Potential for catastrophic failure.

MAINTENANCE

Ordering Replacement Parts

When ordering replacement parts it is necessary to provide PennBarry with the serial number of the unit and/or the original shop order number on which the fan was ordered. Typical replacement parts are as follows:

1. Wheel
2. Bearings
3. Housing
4. Motor
5. Shaft
6. Drives

When ordering replacement parts, specify any required accessories, such as special material, flanges and coatings. This will assure that the replacement parts are correct.

Parts List Diagram

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	167033	HOUSING WELDMENT 100% UVS	1
2	167091	HOUSING HARDWARE KIT	1
3	167038	INLET COVER PLATE UVS	1
4	167079	PEDESTAL DRIVE COVER PLATE ARR-10 UVS	1
5	167049	PEDESTAL ARR-10 UVS	1
6	167081	DRIVE SPACER PLATE UVS	1
7	167054	PEDESTAL MOUNTING ANGLE ARR-10 UVS	2
8	167055	PEDESTAL END STIFFNER	1
9	167063	LIFTING LUG UVS	2
10	167095	PEDESTAL HARDWARE KIT ARR-10 UVS	1
11	167052	BEARING TRAY ARR-10 UVS	1
12	167060	BEARING ASSEMBLY UVS	1
13	167053	SHAFT ARR-10 UVS	1
14	SEE TABLE	BUSHING	1
15	3907114	WHEEL ASSEMBLY, PRU/PRD	1
16	SEE NOTE B	VENTURI	1
17	167057	MOTOR PLATE ARR-10 UVS	1
18	16709401	MOTOR PLATE HARDWARE KIT ARR-10 UVS	1
19	MOTOR	AS PER ORDER	1
20	167082	BELT GUARD BASE	1
21	167083	BELT GUARD COVER	1
22	167085	BELT GUARD TOP	1
23	167094	BELT GUARD HARDWARE KIT	1
24	167059	MOTOR COVER ARR-10 UVS	2
25	167041	CUT OFF PLATE	1
26	167084	ORIFICE PLATE (see note A)	1

FAN SIZE	BUSHING PART NO.
60 TO 135	55002-0
150 TO 200	55004-0
222	55006-0
245	Q2-1.19
270 & 300	55987-0
330 & 365	Q2-1.69
402	Q2-1.94

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	<small>THIS IS ANGLE PRODUCTION</small>	<small>FINISH</small> <small>BLANK SIZE</small> <small>X</small>	<small>DO NOT SCALE DRAWING</small> <small>UNCONTROLLED WHEN PRINTED</small>	<small>CHK</small> <small>APP</small>	<small>DATE</small> <small>07/16/2021</small>	<small>WITH BELT GUARD</small> <small>UVS</small>
	<small>NEXT ASSY</small> <small>APPLICATION</small>					<small>DATE</small> <small>167032</small>
						<small>SHEET</small> <small>5 OF 5</small>

TROUBLESHOOTING

Troubleshooting Checklist

In the event trouble is experienced in the field. Listed below are the most common fan difficulties.

Symptom	Possible Cause(s)	Corrective Action
Capacity of Pressure Below Rating	Total resistance of system higher than anticipated	System problems
	Speed too low	Adjust drive
	Dampers or variable inlet vanes improperly adjusted	Adjust
	Poor fan inlet or outlet conditions	Elbows at or too close to fan
	Air leaks in system	Seal joints / correct damper settings
	Damaged impeller or incorrect direction of rotation	Correct
Vibration and Noise	Misalignment of impeller, bearings, couplings	Loosen align, tighten
	Unstable foundation	Inferior design, start over
	Foreign material in fan causing unbalance	Remove
	Worn bearings	Replace bearings and shaft
	Damaged impeller or motor	Check and repair
	Broken or loose bolts or set screws	Replace
	Bent shaft	Replace
	Worn coupling	Replace
	Impeller or driver unbalanced	Balance
	60/120 Hz magnetic hum due to electrical input	Check for high or unbalanced voltage
	Fan delivering more than rated capacity	Reduce speed
	Loose dampers	Adjust and tighten
	Speed too high or fan rotating in wrong direction	Correct
Vibration transmitted to fan from some other source	Isolate	
Overheated Bearings	Too much grease in ball bearings	Allow run time to purge (24 hours)
	Poor alignment	Correct
	Damaged impeller or drive	Inspect, correct or replace
	Bent shaft	Replace
	Abnormal end thrust	Loosen set screws and adjust
	Dirt in bearings	Replace bearing; use filtered grease
	Excessive belt tension	Adjust
Overloaded Motor (Pulls too many AMPs)	Speed too high	Reduce speed or change HP
	Discharge over capacity due to existing system resistance being lower than original rating	Adjust system resistance
	Specific gravity or density of gas above design value	Recalculate and correct
	Wrong direction poor rotation	Correct
	Poor alignment	Correct
	Impeller wedging or binding on inlet bell	Loosen and adjust
	Bearings improperly lubricated	See page 4
	Motor improperly wired	Verify and correct

TROUBLESHOOTING

Symptom	Possible Cause(s)	Corrective Action
Motor Problems	Check for low or high voltage from power source	Correct voltage
	High temperature; drawing too much current or dirt in windings	Repair motor
	Vibration and noise	Correct armature imbalance
	Armature rubs against stator	Replace worn bearings
	Too much or not enough lubrication in bearings	Correct lubrication
	Commutator brushes on d-c motor worn or not seated under proper tension	Repair motor
	Vibration and noise; loose hold down bolts	Tighten hold down bolts
	Low insulation resistance due to moisture	Check resistance with a megohm meter ("Megger") or similar instrument employing a 500 volt d-c potential. Resistance should read at least 1 megohm
Motor Overheating	Belt Slippage (belt drive units only)	Adjust tension or replace belts
	Over voltage or under voltage	Contact power supply company
	Operation in wrong direction	Reverse direction of motor
	Fan speed too high	Slow down fan by opening variable pitch pulley on motor shaft
	Incorrect motor (service factor 1.0, low ambient temp.)	Replace motor with correct open, NEMA service factors (1.15 or higher) with 400 ambient
	Insufficient airflow to kitchen hood fan operating on low speed with kitchen in full operation	Check airflow under hood and adjust kitchen equipments output
	Undersized motor	Replace fuses or open circuit breaker
Fan Inoperative	Blown fuse or open circuit breaker	Shut off power and check wiring for proper connections
	Loose or disconnect wiring	Adjust drive
	Defective motor	Repair or replace motor
	Broken belts	Replace belts
	No 0-10v signal going into the motor (direct driven model only)	Make sure the included plot is not in the off position
Insufficient Airflow	Open access doors or loose sections of ducts	Check for leakage
	Clogged filters	Clean filters
	Operation in wrong direction	Correct rotation of wheel
	Insufficient make-up air direction	Add make-up fan or louver opening
	Damper (if installed) in the wrong position	Adjust damper opening

Note: Care should be taken to follow all local electrical, safety and building codes. Provisions of the National Electric Code (NEC), as well as the Occupational Safety and Health Act (OSHA) should be followed.

All motors are checked prior to shipment. If motor defects should develop, prompt service can be obtained from the nearest authorized service station of the motor manufacturer while under warranty. Exchange, repair or replacement will be provided on a no charge basis. If the motor is defective within the warranty period. The PennBarry representative in your area will provide a name and address of an authorized service station, if requested.



Warning: Motor guarantee is void unless overload protection is provided in motor wiring circuit.

LIMITED WARRANTY

What Products Are Covered

PennBarry Commercial and Industrial Fans (each, a “PennBarry Product”)

One Year Limited Warranty For PennBarry Products

PennBarry warrants to the original commercial purchaser that the PennBarry Products will be free from defects in material and workmanship for a period of one (1) year from the date of shipment.

Exclusive Remedy

PennBarry will, at its option, repair or replace (without removal or installation) the affected components of any defective PennBarry Product; repair or replace (without removal or installation) the entire defective PennBarry Product; or refund the invoice price of the PennBarry Product. In all cases, a reasonable time period must be allowed for warranty repairs to be completed.

What You Must Do

In order to make a claim under these warranties:

1. You must be the original commercial purchaser of the PennBarry Product.
2. You must promptly notify us, within the warranty period, of any defect and provide us with any substantiation that we may reasonably request.
3. The PennBarry Product must have been installed and maintained in accordance with good industry practice and any specific PennBarry recommendations.

Exclusions

These warranties do not cover defects caused by:

1. Improper design or operation of the system into which the PennBarry Product is incorporated.
2. Improper installation.
3. Accident, abuse or misuse.
4. Unreasonable use (including any use for non-commercial purposes, failure to provide reasonable and necessary maintenance as specified by PennBarry, misapplication and operation in excess of stated performance characteristics).
5. Components not manufactured by PennBarry.

Limitations

1. In all cases, PennBarry reserves the right to fully satisfy its obligations under the Limited Warranties by refunding the invoice price of the defective PennBarry Product (or, if the PennBarry Product has been discontinued, of the most nearly comparable current product).
2. PennBarry reserves the right to furnish a substitute or replacement component or product in the event a PennBarry Product or any component of the product is discontinued or otherwise unavailable.
3. PennBarry’s only obligation with respect to components not manufactured by PennBarry shall be to pass through the warranty made by the manufacturer of the defective component.

General

The foregoing warranties are exclusive and in lieu of all other warranties except that of title, whether written, oral or implied, in fact or in law (including any warranty of merchantability or fitness for a particular purpose).

PennBarry hereby disclaims any liability for special, punitive, indirect, incidental or consequential damages, including without limitation lost profits or revenues, loss of use of equipment, cost of capital, cost of substitute products, facilities or services, downtime, shutdown or slowdown costs.

The remedies of the original commercial purchaser set forth herein are exclusive and the liability of PennBarry with respect to the PennBarry Products, whether in contract, tort, warranty, strict liability or other legal theory shall not exceed the invoice price charged by PennBarry to its customer for the affected PennBarry Product at the time the claim is made.



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