

Installation, Operation and Maintenance Manual

Please read and save these instructions. 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.

Vektor-CD Direct or Belt Drive

The Vektor-CD fan is a side inlet centrifugal blower with a high plume dilution nozzle designed for laboratory exhaust systems. Available in either direct or belt drive configurations, the Vektor-CD is capable of up to 14 inches wg of static pressure and 100,000 cfm and can be constructed to AMCA spark B or C specifications. All fans are AMCA 210 and 260 certified for flows as well as AMCA 300 for sound. The Vektor-CD is available in 15 sizes ranging from 12 to 66 inch wheels. Each fan has a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.



General Safety Information

Only qualified personnel should install this fan system. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity are present. If more information is needed, contact a licensed professional engineer before moving forward.

DANGER

Always disconnect power before working on or near a fan. Lock and tag the disconnect switch or breaker to prevent accidental power up.

CAUTION

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

CAUTION

Precaution should be taken in explosive atmospheres.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than maximum cataloged fan rpm. Adjustments to fan speed significantly effects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open access doors to a duct while the fan is running.

Receiving

Upon receiving the product, check to make sure all items are accounted for by referencing the bill of lading to ensure all items were received. Inspect each crate for shipping damage before accepting delivery. Notify the carrier if any damage is noticed. The carrier will make notification on the delivery receipt acknowledging any damage to the product. All damage should be noted on all the copies of the bill of lading which is countersigned by the delivering carrier. A Carrier Inspection Report should be filled out by the carrier upon arrival and the Traffic Department. If damaged upon arrival, file claim with carrier. Any physical damage to the unit after acceptance is not the responsibility of Greenheck Fan Corporation.

Unpacking

Verify that all required parts and the correct quantity of each item have been received, including accessory kit containing flex connector, gasketing, etc. If any items are missing report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Handling

Fans are to be rigged and moved by the lifting brackets provided or by the skid when a forklift is used. Location of brackets varies by model and size. Handle each piece in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce ability of fan to resist corrosion. See coating repair section of this manual for details involving touch-up of damaged surfaces.

Fans should never be lifted by the shaft, fan housing, motor, belt guard, weatherhood, windband or other accessories.

Storage

Fans are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

INDOOR

The ideal environment for the storage of fans and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Temperatures should be evenly maintained between 30°F (-1°C) and 110°F (43°C) (wide temperature swings may cause condensation and “sweating” of metal parts). All accessories must be stored indoors in a clean, dry atmosphere.

Remove any accumulations of dirt, water, ice or snow and wipe dry before moving to indoor storage. To avoid “sweating” of metal parts allow cold parts to reach room temperature. To dry parts and packages use a portable electric heater to get rid of any moisture build up. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ in. (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

OUTDOOR

Fans designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the fan. The fan should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight, and space for periodic inspection. To minimize water accumulation, place all fan parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Fan wheels should be blocked to prevent spinning caused by strong winds.

Inspection and Maintenance during Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed; see page 15.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant on motor and bearings. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Wipe clean thoroughly with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive or WD-40® or the equivalent.

REMOVING FROM STORAGE

As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion, until the fan equipment goes into operation.

Prior to assembly and installation of the Vektor fan and system components, inspect the fan assembly to make sure it is in working order.

1. Check all fasteners, set screws on the fan, wheel, bearings, drive, motor base and accessories for tightness.
2. Rotate the fan wheel(s) by hand and assure no parts are rubbing. Access to the wheel is obtained through a bolted panel located on the side of the fan housing.
3. Ensure proper wheel settings for radial gap and alignment. Refer to page 13.

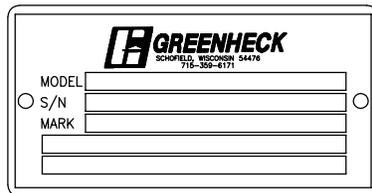
Installation

Installations with inlet or discharge configurations that deviate from this standard may result in reduced fan performance. Restricted or unstable flow at the fan inlet can cause pre-rotation of incoming air or uneven loading of the fan wheel yielding large system losses and increased sound levels.

System Identification Tags

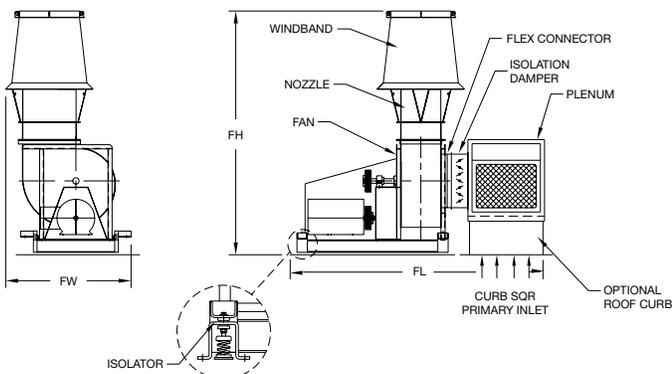
Vektor fan systems may arrive in component pieces due to shipping restrictions. Individual components of a system have matching identification tags which should be used to identify and assemble the complete system.

Assembling systems with different identification tags can cause reductions in the fan(s) performance.

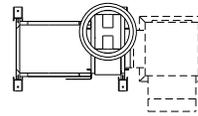


Standard Fan Configurations

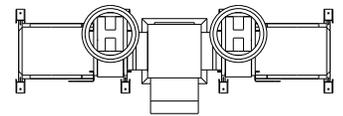
The following illustration identifies a typical configuration of the Vektor-CD system. Greenheck also supplies custom configurations. Your system may not be depicted in the drawing shown. Refer to submittal drawing.



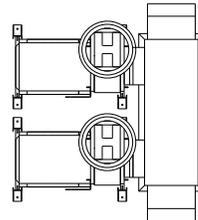
Vektor-CD Arrangements



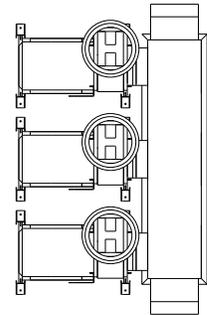
Vektor-CD
Single Fan System



Vektor-CD
Opposed Fan System



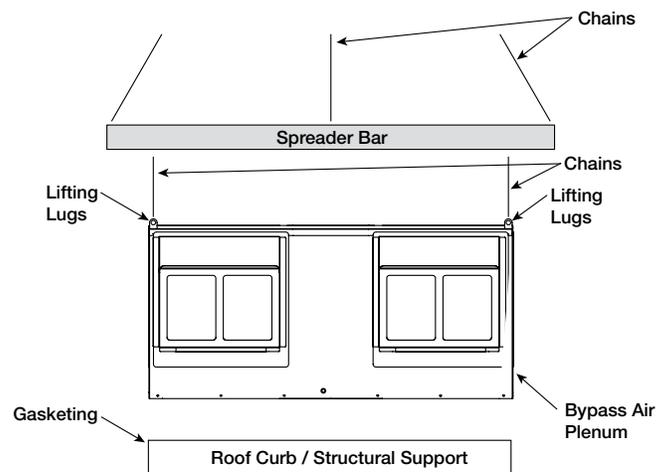
Vektor-CD
Dual Fan System



Vektor-CD
Triple Fan System

Rigging / Assembly Instructions

1. Use standard lifting and rigging practices.
2. All lifting lugs on each component must be utilized at the same time.
3. Plenum, blower, and windband are to be kept level during installation.

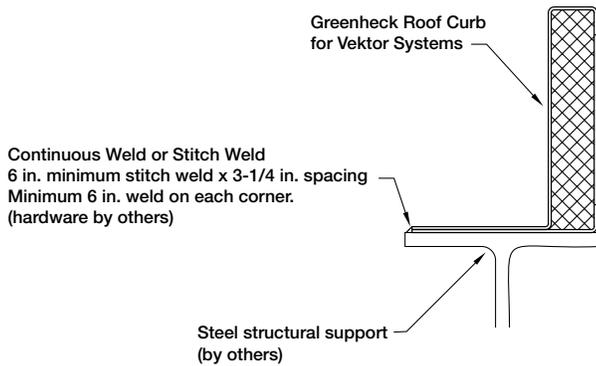


Curb Installations

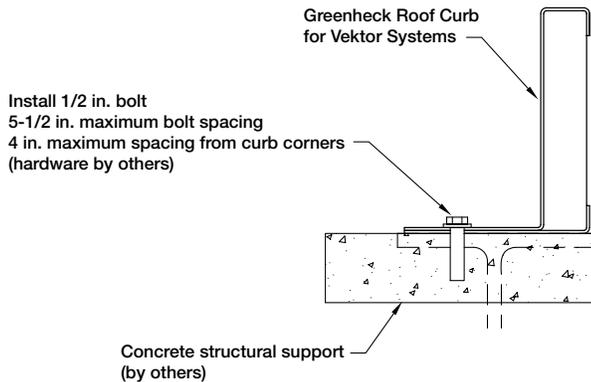
Greenheck supplies gasketing material for all multi-section curbs and/or plenums. Install gasketing prior to bolting split curbs and or plenums together.

NOTE: Steel, concrete or wood support is per structural engineer and in accordance with load requirements and applicable building codes.

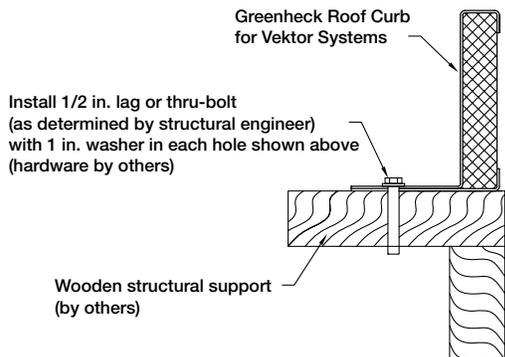
Structural Steel



Concrete Deck



Wood Deck

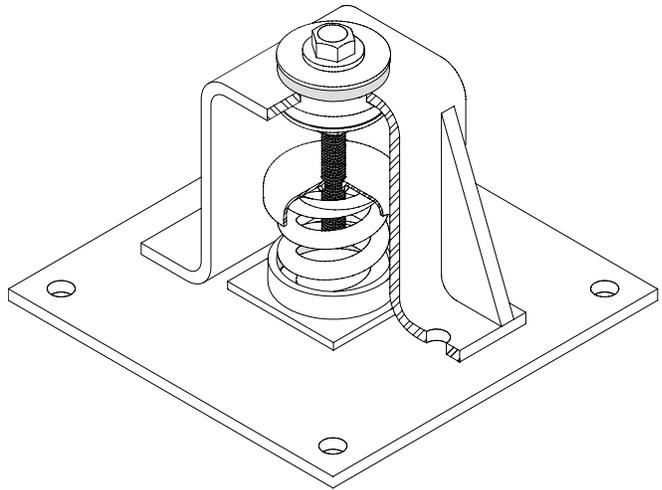


Bases—Foundation and Isolation

Critical to every fan installation is a strong, level foundation. A reinforced poured concrete pad with a structural steel base or inertia base provides an excellent foundation. Structural bases must be sturdy enough, with welded construction, to prevent flexing and vibration.

To eliminate vibration and noise from being transferred to the building, vibration isolators should be used. The fan is mounted directly on the isolation base and must be supported for the entire length of the fan base angle (Refer to the installation manual for structural bases if the base was supplied by Greenheck). Isolators are installed between the isolation base and the foundation.

After the fan, isolation base and isolators are installed, the entire assembly must be leveled. Position the level on the isolation base, not the fan shaft, for proper leveling. Additionally, the motor and fan shafts must be level and parallel relative to each other for proper alignment.

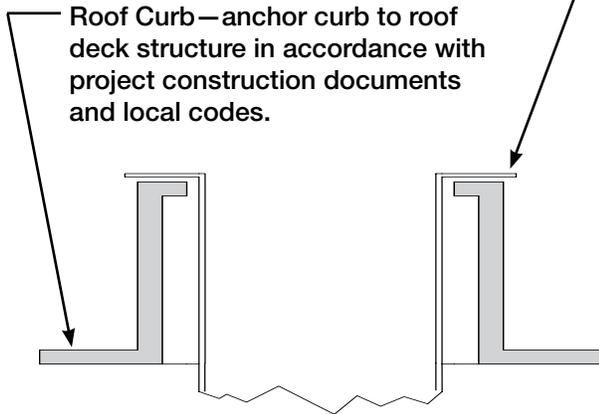


Riser Installation

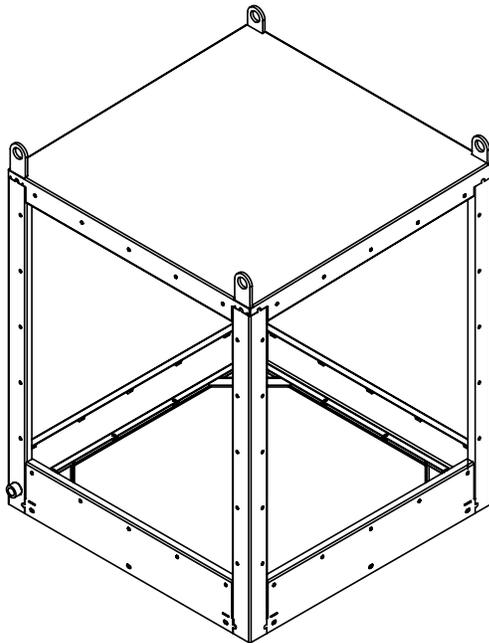
Check curb or structural supports for levelness. Both must be level to ensure proper drainage from plenum and fan(s).

Lab Exhaust Riser

Riser duct(s) run up through the curb and are flanged over the curb. (by contractor)



Plenum Isometric View



For side inlet fans, remove panel at end of plenum. This opening is the designed connection spot for user connected ductwork from building.

Plenum Assembly

Note: Gasketing material (shipped with fan) should be placed on the top edge of already installed roof curb prior to placing the plenum or individual plenum sections on the curb.

If the plenum is shipped disassembled, the plenum sections can be assembled together into one single piece before lifting onto the roof and then fitted on the roof curb / support structure, or each section can be placed on individually. The method used would be dependent on the lifting capacity for the equipment on-site. If moving each piece separately onto the roof curb or support structure, each section should be joined to its mating part before moving another section into place.

For a 1x1 system there is only a single plenum section and no multiple plenum assembly would be required.

Determine the placement of the plenum sections relative to each other (Multiple Fan Systems)

When looking at the individual section one will notice that each plenum section is missing at least one side panel. These areas are the locations where the sections are to be joined together. If you have two plenum sections, then each one would be missing a side panel. If you have a three-fan system, there are three plenum sections. The two end plenum sections would each be missing one side panel and the middle section would not have panels on two sides. Please refer to the submittal drawing for the orientation of any Bypass Air Plenum (BAP) dampers or air inlet locations.

Putting the plenum together

After identifying the plenum sections arrangement order, one of the two mating sections has weld nuts on the inside of the plenum. The assembly hardware (stainless steel bolts) required to join the sections is located here for shipping purposes. These bolts should be removed and set-aside prior to placing the mating sections together. The bolts are located every 6 to 10 inches to provide the best seal between the mating sections.

Before moving the sections into position, gasketing must be installed to seal the plenum sections against leakage. This silicone gasketing is supplied with the fans and only needs to be applied to one of the two mating plenum sections. The bands or strips of gasketing should be attached around the perimeter of the joining face and with an additional strip making a triangular area in each corner.

After the gasketing has been attached and the hardware has been removed, place the two mating sections together. The stainless steel bolts, which were set aside earlier, are now run first through the holes of the plenum section without the weld nuts and tighten into the weld nuts on the other plenum section.

Plenum Assembly *continued*

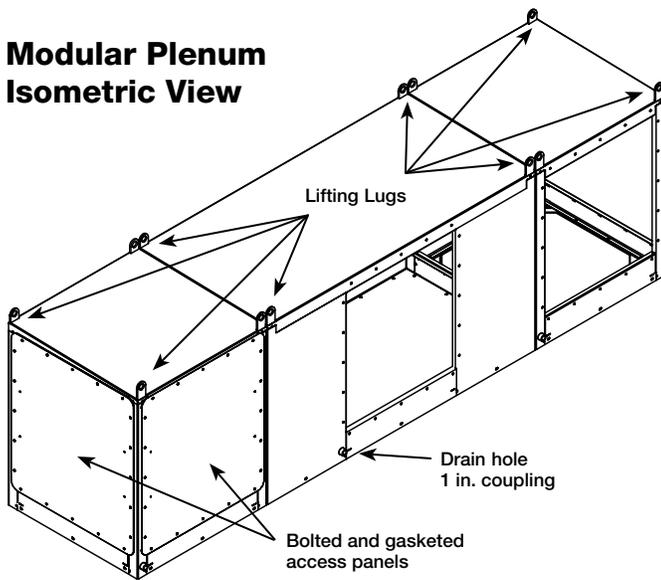
An additional side (or access) panel may need to be removed in order to gain access to the inside of the plenum assembly. The bolts should be tightened in an even and consistent manner as to pull the two sections together and compress the gasketing.

After the plenum is assembled

Use all provided hardware to tighten and join the mating sections together. Any side panels removed to gain access to the interior of the plenum should be reattached. The assembled plenum has holes in the curb cap to fasten the plenum to the already installed roof curb.

The plenum is now ready to have gasketing placed in the mounting location between the plenum and the fan. After the gasketing has been attached the fans can be lifted and set into place.

Modular Plenum Isometric View



Plenum Installation

The figures depicted illustrate three common methods used to install Vektor-CD bypass plenums. Methods used to attach a Vektor unit are dependent on local codes, roof construction design and roof construction materials. Consult an architect or structural engineer for proper means of attachment.

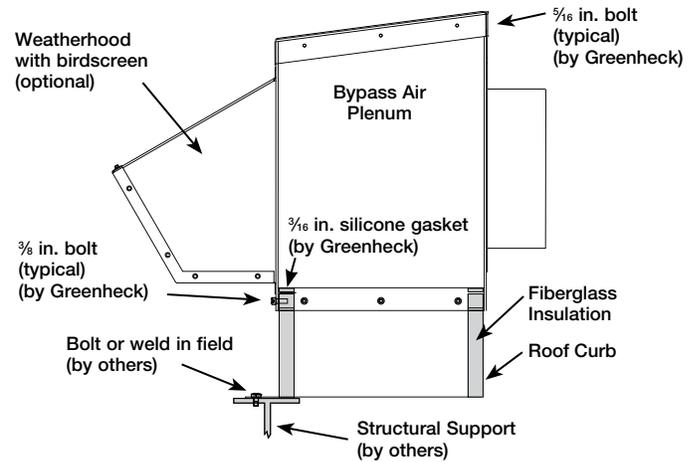
Place 1/2 inch thick x 1/2 inch wide silicone gasket around the perimeter of top edge of curb, adhesive side down (gasket provided in Vektor-CD hardware kit).

To align holes properly, the plenum needs to be centered on the curb.

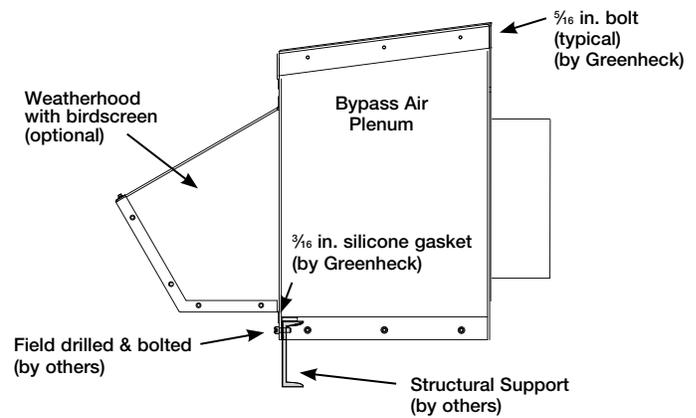
When holes are provided in the curb, install 316 stainless steel screws (provided) in all holes. Use anti-seize gel (provided) to prevent galling / welding of all stainless steel fasteners.

When holes are not provided in the curb (non Greenheck curb): Drill 0.28 in. diameter holes in curb using bypass air plenum holes as a template. Install 5/16 in. self-tapping screws (provided) in all the holes.

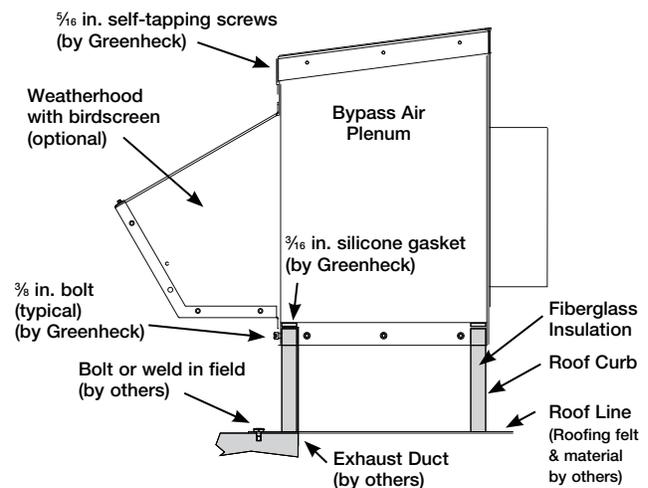
Plenum and Curb to Structural Steel



Plenum (no Curb) to Channel Base

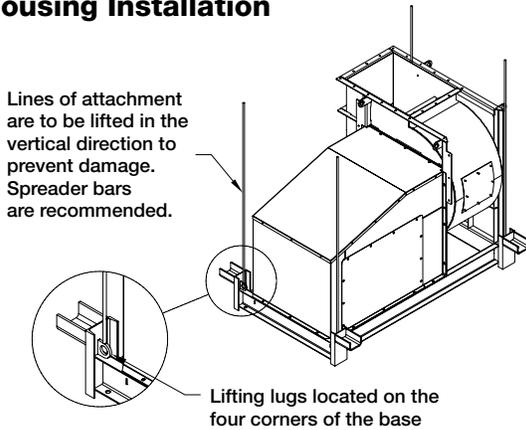


Fan, Plenum, and Curb to Roof Deck



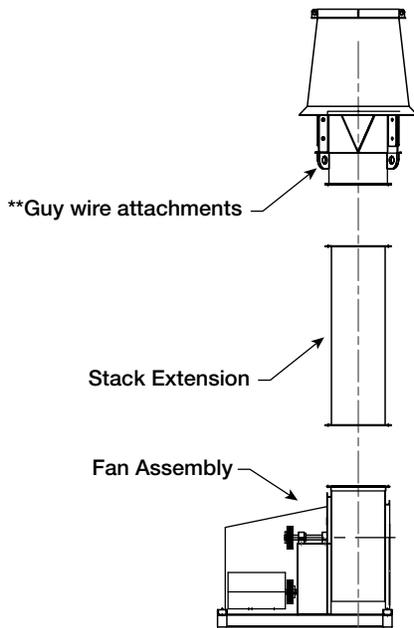
Fan Installation

Fan Housing Installation



If the windband is shipped attached to the fan housing or if the windband is secured to the fan housing prior to mounting to the plenum, the fan / windband assembly should be lifted by the lifting lugs located on the fan housing. **Do not lift this assembly by the lifting lugs located on the windband.** Connect fan to plenum using Excelon™ flex connector found in the Vektor-CD hardware kit.

Fan Stack Installation

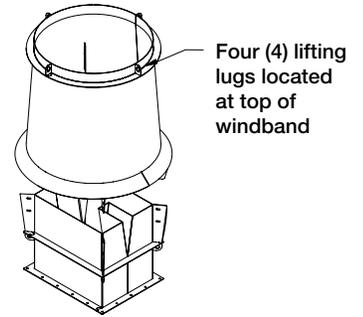


If fan requires a stack or stack extension, install on fan before installing nozzle and windband. Place gasketing between any sections, blower housing and initial stack. Use lifting lugs to position each piece into place. Attach stack or stack extension to blower housing using 316 stainless steel bolts (provided) through flanges aligning bolt patterns. Use anti-seize gel (provided) to prevent galling/welding of all stainless steel fasteners.

Greenheck strongly recommends the use of guy wires on any system that incorporates the usage of a stack extension including inline attenuators. Subsequent guy wires are to be designed and installed by others.

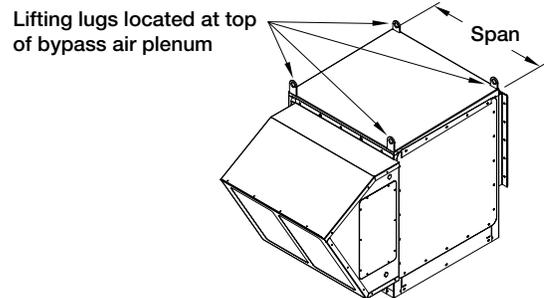
Windband Installation

Using the windband lifting lugs, place windband over blower discharge, aligning windband support bracket holes with bolt holes in blower housing. Attach windband to blower discharge using 316 stainless steel bolts (provided) through support brackets welded to the inside of the windband. Use anti-seize gel (provided) to prevent galling / welding of all stainless steel fasteners.



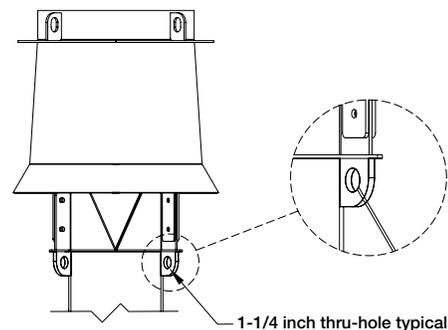
Bypass Air Plenum Installation

Span determines the number of lifting lugs to be used during installation:



Span	No. of Lifting Lugs
12 inches or less	Minimum of 4 lifting lugs
12 to 18 inches	Minimum of 6 lifting lugs
18 inches or greater	Minimum of 8 lifting lugs

Guy Wire Locations



NOTE: Guy wires to be supplied by others. Fastening to building structure to be provided and engineered by others.

If your fan requires stack extensions, the use of guy wires is recommended. See drawing for guy wire connection locations.

Note: Keep 36 inches minimum spacing around unit to provide adequate clearance for servicing or repairing unit.

Duct Connections to the Bypass Air Plenum (BAP)

Connecting primary exhaust air ducts is allowed through the roof curb or through one or more of the side access panels. To reduce the potential for system effects in the plenum, the duct connection should be sized to have a maximum air velocity of 1500 fpm when entering. When attaching ductwork to the plenum, care should be taken to ensure a tight fit and proper seal to prevent leakage of the contaminated airstream.

Ductwork that is a different size than the removable access panel can either use a transition to the plenum's opening size, or the access panel can be field modified by cutting an opening to the size of the ductwork.

Vektor Field Coating Repair Procedure for Scratched Areas

Standard coating and color for the Vektor laboratory exhaust system is Greenheck's Hi-Pro Polyester Gray (041).

The procedure below details the correct method for repairing minor scratches in the coating. Each Vektor unit is supplied with a repair kit for use after the initial installation.

The kit includes:

- 1 pint Kem Kromik® Universal Metal Primer
 - 1 pint industrial enamel (Industrial 041 Gray)
 - 4 disposable foam brushes
 - 1 sheet of sandpaper
 - 2 tech data sheets for the two paints
 - 1 repair procedure.
1. Scuff affected area to be repaired using medium sandpaper (provided). Feather the edges.
 2. Clean affected area to be touched up using an alkaline based cleaner and rinse.
 3. Apply Kem Kromik® primer using the 1 inch foam brush (provided). Follow technical data sheet instructions.
 4. Allow primer to dry a minimum of 2-1/2 hours before top coating.
 5. Topcoat with Industrial enamel using 1 inch foam brush (provided). Follow technical data sheets instructions. Allow painted units to air-dry and cure before putting into service. See enclosed Technical Data sheets for detailed drying and cure schedules at different temperatures.

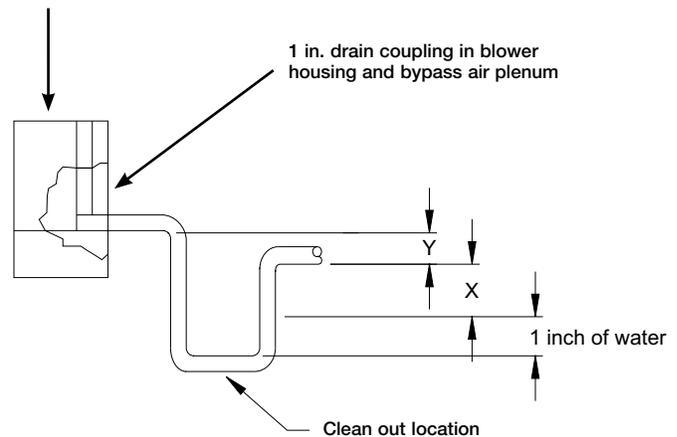
To order additional coating repair kits please reference Greenheck's part number, HAZ2037 HI-PRO GRAY FIELD DAMAGE REPAIR KIT. Please contact factory with your fan's serial number for colors other than our standard Gray (041).

Plenum and Fan Drainage Piping and Trap Detail (by others)

There are multiple locations for pipe connections, one on each plenum section, and another on each tubular fan housing located at the bottom of the scroll. Each drain should be properly connected to a drainage system to ensure proper disposal of any water or condensate that may occur.

- Installed piping to have a downward angle to allow for drainage
- Fill trap to recommended level before start-up

Detail of bypass air plenum and blower housing



Y Dim \geq System Pressure

X Dim \geq 1/2 System Pressure

Dimension of X and Y are inches.

Note: Refer to local codes for proper disposal of potential hazardous drainage.

Bypass Air Plenum (BAP), Isolation Damper Access & Actuator Mounting

Depending on the configuration and intended operation of the system supplied, every Vektor plenum section may not have a weatherhood and bypass air damper. Typically systems that include a fan which is on standby will have one less weatherhood and BAP damper assembly than plenum sections. Refer to submittal drawings for additional information. The appropriate guard / cover needs to be removed for installation, inspection and maintenance.

For Vektor Fans with a Weatherhood

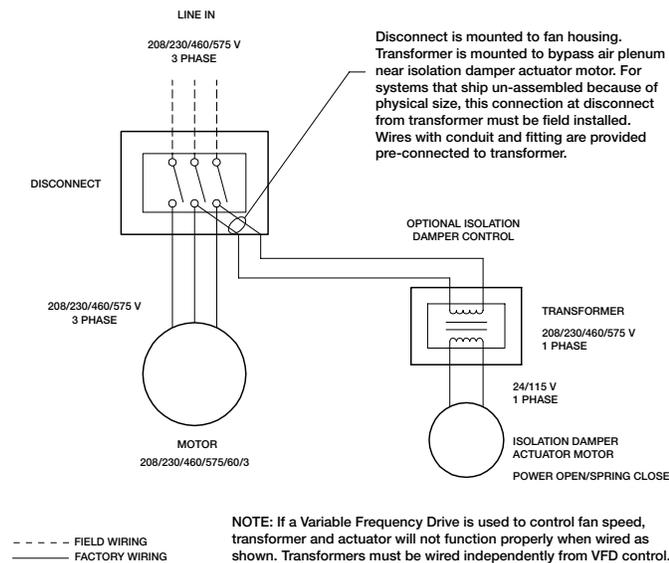
Access to the bypass air plenum damper and the isolation damper, actuator(s) (optional from factory), and voltage transformer (optional from factory) is gained through the removal of the weatherhood guard / cover. The isolation damper assembly can be removed from its location by unbolting the frame from the plenum and removing the flex connector.

For Vektor Fans without a Weatherhood

A guard / cover is located on the side of the plenum section. Removal of the guard / cover gains access to the damper linkages, actuator (optional from factory) and transformer (optional from factor). The entire bypass damper assembly can be removed through this opening. The isolation damper assembly can be removed from its location by unbolting the frame from the plenum and removing the flex connector.

If the Vektor units were not supplied with optional actuators, the dampers have an extended jackshaft for field mounting a customer supplied actuator.

Motor Disconnect Wiring & Isolation Damper Wiring Diagram



Applications with Variable Frequency Drives (VFD)

For Vektor systems with single-point, three-phase wiring per blower, the isolation damper actuator will be powered via a step-down transformer, which is wired to the fan disconnect, as shown in the diagram above.

If fan flow (motor speed) is to be controlled using a VFD, the reduced voltage and frequency supplied to the fan will cause control problems with the isolation damper actuator.

When a Vektor control sequence requires the use of a VFD, it is suggested that the control contractor supply the isolation damper actuator voltage — independent of the power supplied to the Vektor fan motor.

Isolation Damper Control

Isolation dampers on de-energized fans are to be closed to maintain system negative pressure and prevent reverse “free-wheeling” of de-energized blower(s). Isolation dampers shall be opened immediately upon fan energizing.

Unit Start-Up

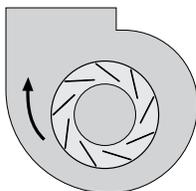
WARNING

Disconnect and secure to the "Off" position all electrical power to the fan prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

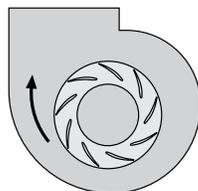
1. Disconnect and lock-out all power switches to fan.
2. Check for bearing alignment and lubrication.
3. Check the V-belt drive for proper alignment and tension (belt drive).
4. Check rigid coupling for proper alignment and connect between motor shaft and fan shaft (direct drive).
5. Check all guarding to ensure that it is securely attached and not interfering with rotating parts.
6. Check operation of isolation and bypass dampers (if supplied) for freedom of movement.
7. Check all electrical connections for proper attachment.
8. Check housing and ductwork, if accessible, for obstructions and foreign material that may damage the fan wheel.
9. Fill drainage piping trap.
10. Check all fasteners, set screws and locking collars on the fan, bearings, drive, motor base and accessories for tightness.
11. Rotate the fan wheel by hand and assure no parts are rubbing.

Additional steps for initial start-up

1. Check for proper wheel rotation by momentarily energizing the fan. Rotation is always determined by viewing the wheel from the drive side and should correspond to the rotation decal affixed to the unit.



Centrifugal
Backward Inclined



Centrifugal
Airfoil

CW Rotation - always viewed from the drive side.

One of the most frequently encountered problems with Centrifugal Fans are motors which are wired to run in the wrong direction. This is especially true with 3-phase installations where the motor will run in either direction, depending on how it has been wired. To reverse rotation of a 3-phase motor, interchange any two of the three electrical

leads. Single phase motors can be reversed by changing internal connections as described on the motor label or wiring diagram.

2. If the fan has inlet vanes, they should be partially closed to reduce power requirements. This is especially important if the fan is designed for a high temperature application and is being started at room temperature.
3. Fans with multi-speed motors should be checked on low speed during initial start-up.
4. Check for unusual noise, vibration or overheating of bearings. Refer to the "Troubleshooting" section of this manual if a problem develops.
5. Grease may be forced out of the bearing seals during initial start-up. This is a normal self-purging feature of this type of bearing.

Vibration

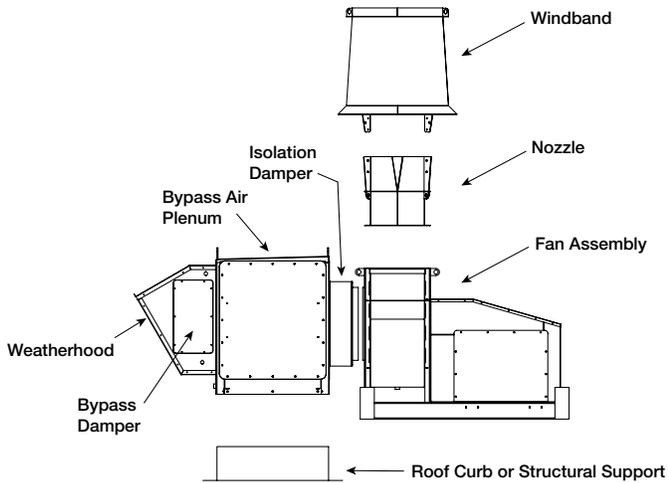
Excessive vibration is the most frequent problem experienced during initial start-up. Left unchecked, excessive vibration can cause a multitude of problems, including structural and/or component failure. The most common sources of vibration are listed below.

- Wheel Unbalance
- Drive Pulley Misalignment
- Incorrect Belt Tension
- Bearing Misalignment
- Mechanical Looseness
- Faulty Belts

Many of these conditions can be discovered by careful observation. Refer to the troubleshooting section of this manual for corrective actions. If observation cannot locate the source of vibration, a qualified technician using vibration analysis equipment should be consulted. If the problem is wheel unbalance, in-place balancing can be done through the access panel located on the side of each fan's tubular housing. Any correction weights added to the wheel should be welded to either the wheel back (single-plane balance) or to the wheel back and wheel cone (two-plane balance).

Greenheck performs a vibration test on all centrifugal fans before shipping. Three vibration readings are taken on each bearing in the horizontal, vertical, and axial directions. The allowable maximum vibration for belt drive units is 0.10 in./sec. peak (0.08 in./sec. direct drive) velocity filter-in at the fan rpm per AMCA Standard 204. These vibration signatures are a permanent record of how the fan left the factory and are available upon request.

Serviceable Components



Routine Maintenance & Operation

Once the unit has been put into operation, a routine maintenance schedule should be set up to accomplish the following:

1. Lubrication of bearings and motor.
2. Bypass air dampers should be checked for freedom of operation and wear.
3. Wheel, housing, bolts and set screws on the entire fan should be checked for tightness.
4. Any dirt accumulation on the wheel or in the housing should be removed to prevent unbalance and possible damage.
5. Inspect fan impeller and housing looking for fatigue, corrosion, or wear.

CAUTION

When operating conditions of the fan are to be changed—speed, pressure, temperature, etc.—consult Greenheck to determine if the unit can operate safely at the new conditions.

Fan Operation

All fans should be run every thirty (30) days, or at least “bumped” every thirty days. It is preferred that each fan is run as this causes all electrical and mechanical components to get up to temperature, displacing any formed condensation, redistributes load on bearings, and redistributes grease in the bearings (motor and shaft bearings).

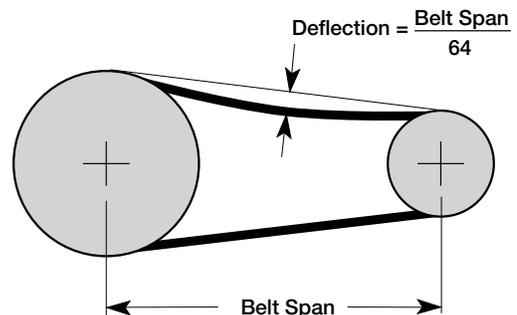
V-Belt Drives

V-belt drives must be checked on a regular basis for wear, tension, alignment and dirt accumulation. Premature or frequent belt failures can be caused by improper belt tension (either too loose or too tight) or misaligned sheaves. Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings. Conversely, loose belts will cause squealing on start-up, excessive belt flutter, slippage and overheated sheaves. Either excessively loose or tight belts may cause fan vibration.

When replacing V-belts on multiple groove drives all belts should be changed to provide uniform drive loading. Use a set of matched belts whenever possible. Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting the belts off the sheaves. After replacing belts, ensure that slack in each belt is on the same side of the drive. Belt dressing should never be used.

Do not install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed.

The proper tension for operating a V-belt drive is the lowest tension at which the belts will not slip at peak load conditions. Belts are adjusted by raising or lowering the motor pivot plate. For initial tensioning, the proper belt deflection halfway between sheave centers is $1/64$ inch for each inch of belt span. For example, if the belt span is 64 inches, the belt deflection should be 1 inch using moderate thumb pressure at mid-point of the drive. Check belt tension two times during the first 24 hours of operation and periodically thereafter.



Motors

Motor maintenance is generally limited to cleaning and lubrication. Cleaning should be limited to exterior surfaces only. Removing dust and grease buildup on the motor housing assists proper motor cooling. Never wash-down motor with high pressure spray.

Greasing of motors is only intended when fittings are provided. Many fractional motors are permanently lubricated for life and require no further lubrication. Motors supplied with grease fittings should be greased in accordance with the manufacturer's recommendations. When motor temperature does not exceed 104°F (40°C), the grease should be replaced after 2000 hours of running time.

Direct drive systems have extended grease lines to lubricate the motor without removal of any guarding.

Bearings

The bearings for Greenheck fans are carefully selected to match the maximum load and operating conditions of the specific class, arrangement, and fan size. The instructions provided in this manual and those provided by the bearing manufacturer will minimize any bearing problems. Bearings are the most critical moving part of the fan, therefore, special care is required when mounting them on the unit and maintaining them.

Greenheck Fan Corporation recommends bearings to be relubricated quarterly at a minimum. All Vektor-CD fans use Mobil Mobilith SHC 100 synthetic grease conforming to NCGI Grade 2. Never mix greases made with different bases. This will cause a breakdown of the grease and possible failure of the bearing. For specific information, contact the factory representative or the fan system submittals.

Service

V-Belt Drives

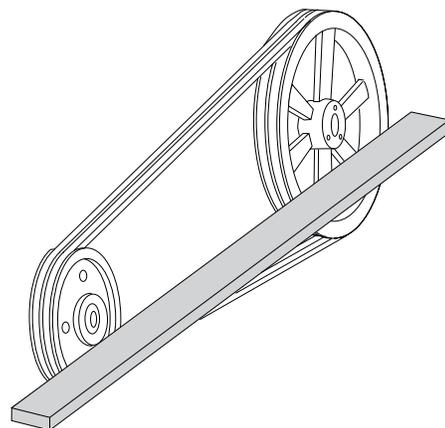
The V-belt drive components, when supplied by Greenheck Fan Corporation, have been carefully selected for this unit's specific operating condition.

Caution: Changing V-belt drive components could result in unsafe operating conditions which may cause personal injury or failure of the following components:

- Fan Shaft
- Fan Wheel
- Bearings
- V-belt
- Motor

V-Belt Drive Installation – Belt Drive

1. Remove the protective coating from the end of the fan shaft using mineral spirits or another similar solvent. Check to ensure that the shaft is free of nicks and burrs.
2. Slide sheaves on shafts - do not drive sheaves on as this may result in bearing damage.
3. Align fan and motor sheaves with a straight-edge or string and tighten.
4. Place belts over sheaves. Do not pry or force belts, as this could result in damage to the cords in the belts.
5. Adjust the tension until the belts appear snug. Run the unit for a few minutes and allow the belts to "set" properly.
6. With the fan off, adjust the belt tension by moving the motor pivot plate. When in operation, the tight side of the belts should be in a straight line from sheave to sheave with a slight bow on the slack side.



Aligning sheaves with a straight edge

Bearing Replacement

Both drive bearings are accessible from the ground on all Vektor-CD fans. Whether direct or belt driven, the bearings, along with other serviceable drive components (belts, motors, sheaves) are accessible by removing the motor cover panel. Please contact Greenheck Fan Corporation for specific instructions on the replacement of the bearings specific for each Vektor-CD fan. Please include fan identification numbers with the request to ensure that proper instructions are received.

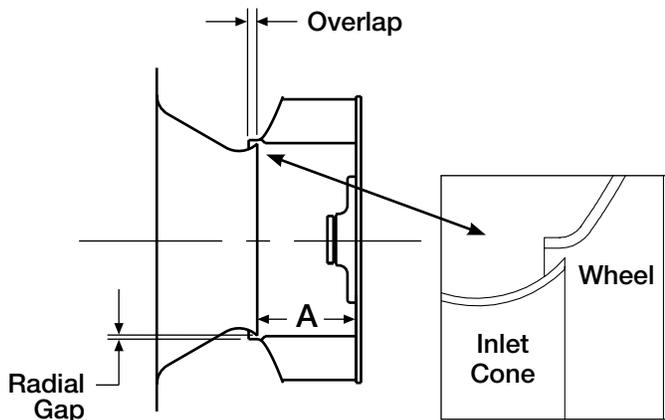
Note: Bearing replacement could require moving of fan wheel. See Radial Gap, Overlap & Alignment section to re-align wheel upon bearing reinstallation.

Radial Gap, Overlap & Wheel Alignment

Efficient fan performance can be maintained by having the correct radial gap, overlap and wheel alignment. These items should be checked after the fan has been in operation for 24 hours and before start-up after the unit has been serviced.

Radial gap is adjusted by loosening the inlet cone/ring bolts and centering the cone/ring on the wheel. If additional adjustment is required to maintain a constant radial gap, loosening the bearing bolts and centering the wheel is acceptable as a secondary option.

Overlap is adjusted by loosening the wheel hub from the shaft and moving the wheel to the desired position along the shaft. The transition between the inlet cone and wheel should be as shown; there is a smooth feel to the profile when moving from one component to the other. Overlap on double width fans is set by having equal spacing on each side of the wheel.



Inlet Cone to Backplate Distance		
Unit Size	"A" Dimension (inches)	
12	4	± 1/8
15	5	± 1/8
18	6 ³ / ₈	± 1/8
22	7 ¹³ / ₁₆	± 3/16
24	8 ⁵ / ₈	± 1/4
27	9 ⁷ / ₁₆	± 1/4
30	10 ⁹ / ₁₆	± 3/8
33	11 ⁷ / ₁₆	± 3/8
36	12 ³ / ₄	± 3/8
40	14 ³ / ₁₆	± 3/8
44	15 ⁹ / ₁₆	± 3/8
49	17 ¹ / ₈	± 1/2
54	18 ¹³ / ₁₆	± 1/2
60	20 ¹⁵ / ₁₆	± 1/2
66	22 ⁷ / ₈	± 1/2

Troubleshooting

Problem	Cause	Corrective Action
Excessive noise	Wheel rubbing inlet	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	V-belt drive	Tighten sheaves on motor/fan shaft. Adjust belt tension. Align sheaves properly (see procedure). Replace worn belts or sheaves.
	Bearings	Replace defective bearing(s). Lubricate bearings. Tighten collars and fasteners.
	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, replace if necessary.
Low CFM	Fan	Check wheel for correct rotation. Check blade position of bypass air plenum (BAP) damper, increase fan speed.*
	Duct system	Higher pressure than design. Filters need replacement.
High CFM	Fan	Decrease fan speed.
	Duct system	Increase BAP damper blade open position. Resize ductwork. Access door, filters, dampers not installed.
Static pressure wrong	Duct system has more or less restriction than anticipated	Change obstructions in system. Use correction factor to adjust for temperature/altitude. Adjust set point used to control BAP damper modulation. Resize ductwork. Clean filters/coils. Change fan speed.*
High horsepower	Fan	Check rotation of wheel. Reduce fan speed.
	Duct system	Resize ductwork. Check proper operation of isolation and bypass dampers. Check filters and access doors.
Fan doesn't operate	Electrical supply	Check fuses/circuit breakers. Check for switches turned off or disconnected. Check for correct supply voltage.
	Drive	Check for broken belts. Tighten loose pulleys.
	Motor	Assure motor is correct horsepower and not tripping overload protector.
Overheated bearing	Lubrication	Check for excessive or insufficient grease in the bearing.
	Mechanical	Replace damaged bearing. Relieve excessive belt tension. Align bearings. Check for bent shaft.
Excessive vibration	Belts	Adjust tightness of belts. Replacement belts should be a matched set.
	System unbalance	Check alignment of shaft, motor and pulleys. Adjustable pitch pulleys with motors over 15 hp are especially prone to unbalance. Check wheel balance, rebalance if necessary.

*Always check motor amps and compare to nameplate rating. Excessive fan speed may overload the motor and result in motor failure. Do not exceed the maximum cataloged rpm of the fan.

Unit Identification

The tag below is an example of an identification label on the fan. The information provides general details about the fan, as well as containing specific information unique to the unit. When contacting your Greenheck representative with future needs or questions, please have the information on this label available.

Tags are mounted in an area which is clearly visible—usually on the side of the fan housing.



MODEL

S/N

MARK

- Model — General description of fan
- S/N — Serial Number assigned by Greenheck, which is a unique identifier for every unit
- Mark — Customer supplied identification

Maintenance Log

Date _____ Time _____ AM/PM

Notes: _____

Date _____ Time _____ AM/PM

Notes: _____

Date _____ Time _____ AM/PM

Notes: _____

Date _____ Time _____ AM/PM

Notes: _____

Date _____ Time _____ AM/PM

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Date _____ Time _____ AM/PM

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Date _____ Time _____ AM/PM

Notes: _____

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of three years from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Greenheck Catalog Vektor-CD provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at: www.amca.org.



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