GREENHECK
Building Value in Air.

Document 485181
Model RV-D
Roof Ventilator Downblast

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. 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 these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

Model RV-D

General Safety Information

Only qualified personnel should install this fan. 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 seismic activity is present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable.
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 max 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.

DANGER
Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.
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.

Table of Contents

Receiving

Upon receiving the product check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make a notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your Greenheck representative. 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. 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 in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce the ability of the fan to resist corrosion. Fans should never be lifted by the shaft, fan housing, or accessories. Avoid lifting fans in a way that will bend or distort fan parts.

Storage

- Rotate fan wheel monthly and purge bearings once every three months
- Energize fan motor once every three months
- Store belts flat to keep them from warping & stretching
- Store unit in location which does not have vibration
- After storage period, purge grease before putting fan into service

If storage of fan is in a humid, dusty or corrosive atmosphere, rotate the fan and purge the bearings once a month. Improper storage which results in damage to the fan will void the warranty.

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.

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.

Inspection & Maintenance during Storage

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

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. 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 fully assembling and installing the fan and system components, inspect the fan assembly to make sure it is in working order.

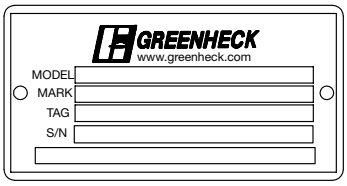
1. Check all fasteners, set screws, wheel, bearings, drive, motor base and accessories for tightness.
2. Rotate the fan wheel by hand and assure not parts are rubbing. Access to the wheel is obtained through an access panel located on the side of the fan housing.
3. Ensure proper wheel settings for radial gap and alignment.

General Information

To ensure a successful installation, the instructions in this manual should be read and adhered to. Failure to comply with proper installation procedures may void the warranty.

Unit and System Identification Tags

Each fan has a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.



The tag shown is an example of an identification nameplate 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 cabinet.

Pre-Installation Information

Before installation, it is important to be certain the mounting surface will bear the operating weight of the unit. For proper unit operation, it is also important that it be operated in a completely level position.

For further details on safety practices involving industrial and commercial fans, please refer to AMCA Publication 410.

Electrical Disconnects

All fan motors should have disconnects located in close visual proximity to turn off electrical service. Service disconnects shall be locked-out when maintenance is being performed.

Moving Parts

All moving parts must have guards to protect personnel. Refer to local codes for requirements as to the number, type and design. Fully secure fan wheel before performing any maintenance. The fan wheel may start "free wheeling" even if all electrical power has been disconnected. Before the initial start-up or any restart, check the following items to make sure that they are installed and secure.

- Do not spin fan wheel faster than the maximum cataloged fan rpm.
- Adjustments to fan speed significantly affects 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.

Air Pressure and Suction

In addition to the usual hazards associated with rotating machinery, fans also create a dangerous suction at the inlet. Special caution needs to be used when moving around a fan, whether it is in operation or not. Before start-up, make sure the inlet area is clear of personnel and loose objects.

Dimensional Data

Figure 1

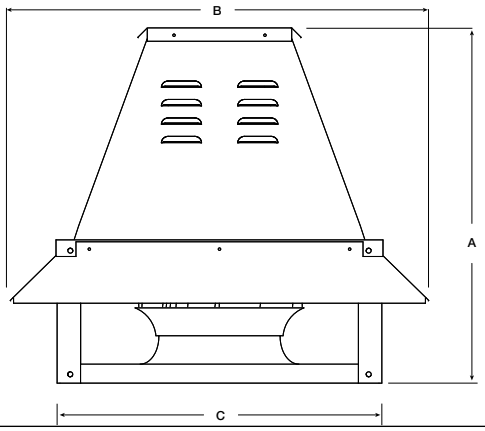


Table 1: Dimensional Data			
Model	A	B	C
RV-D-315	673 *(26½)*	794 *(31¼)*	610 *(24)*
RV-D-400	775 *(30½)*	933 *(36¾)*	686 *(27)*
RV-D-500	838 *(33)*	1086 *(42¾)*	25 *(30¼)*
RV-D-630	965 *(38)*	1270 *(50)*	864 *(34)*

All dimensions in millimeters (inches).

Installation

Typical Roof Mounting Installation

1. On the roof surface, cut an appropriate sized hole and follow manufacturer's instructions on curb installation. Caulk and flash the curb to ensure a water tight seal.
2. Remove motor cover. Access to the motor compartment is accomplished by removing the screws. See Figure 2.
3. Lift and place the unit on top of roof curb using the mounting hooks located on the exterior of the fan.
4. Secure fan to curb using a minimum of eight lag screws, metal screws or other suitable fasteners. Shims may be required depending upon curb installation and roofing material.
5. Verify power line wiring is de-energized before connecting fan motor to power source.
6. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Check the power source for compatibility with the requirements of your equipment.
7. Check fan wheel for free rotation, recenter if necessary. Check setscrew(s) for tightness.
8. Check all fasteners for tightness.
9. Mount and wire safety disconnect switch under motor cover.
10. Replace motor cover.

IMPORTANT

Installation, troubleshooting and parts replacement are to be performed only by qualified personnel. Consult and follow all applicable national, state and local codes. They will supersede this document.

Roof Curb Installation

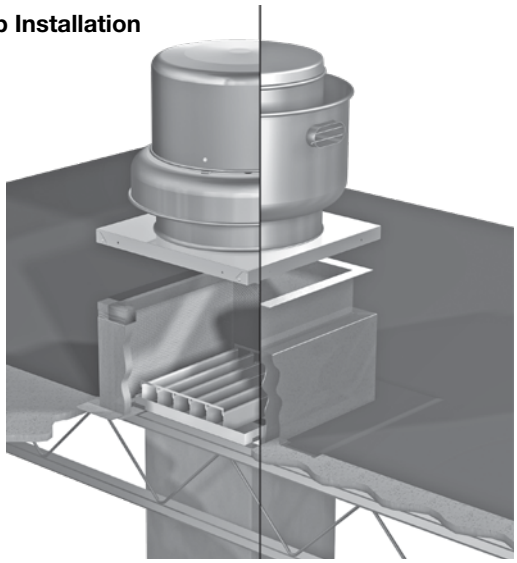
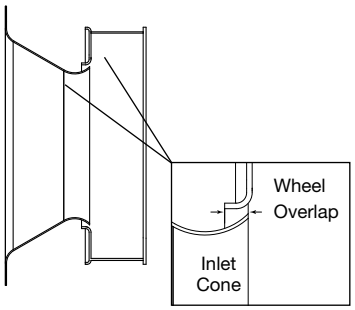


Figure 2

Pre-Starting Checks

1. Check all fasteners and setscrews for tightness. The wheel should rotate freely and be aligned as shown in diagram below.

Wheel Overlap Dimensions	
Model	G - Overlap mm (in.)
RV-D-315	7 (¼)
RV-D-400	9 (⅜)
RV-D-500	12 (½)
RV-D-630	15 (⅝)



2. Wheel position is preset and the unit is test run at the factory. Movement may occur during shipment and realignment may be necessary.
3. Wheel and inlet cone overlap can be adjusted by loosening the setscrews in the wheel hub and moving the wheel to the desired position. For models with wheel hubs utilizing a tapered bushing interface, reference page 6 for the tapered bushing removal and move the wheel to the desired position.

   Fan RPM should be checked and verified with a tachometer.
4. Check wheel rotation (viewing from the shaft side) by momentarily energizing the unit. Rotation should be clockwise as shown in Figure 3 and correspond to rotation decal on the unit.

   If wheel rotation is incorrect, reverse two of the wiring leads or check motor wiring for single phase. Fan RPM should be checked and verified with a tachometer.

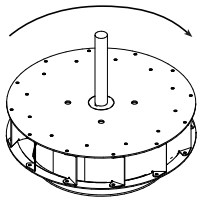


Figure 3

WARNING

Correct direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible motor burnout.

IMPORTANT

The fan has been checked for mechanical noises at the factory prior to shipment. If mechanical noise should develop, suggested corrective actions are offered in the Troubleshooting section.

Operation

1. Before starting up or operating fan, check all fasteners for tightness. In particular, check the setscrews in the wheel hub.
2. While in the OFF position or before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking the venturi or any obstacle.
3. Start the fan and shut it off immediately to check rotation of the wheel with directional arrow in the motor compartment, see Figure 3.
4. When the fan is started, observe the operation and check for any unusual noises.
5. With the system in full operation and all ductwork attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.
6. Keep inlets and approaches to fan clean and free from obstruction.

Inspection

Inspection of the fan should be conducted at the first 30 minute and 24 hour intervals of satisfactory operation.

30 Minute Interval: Inspect bolts, setscrews and motor mounting bolts. Adjust and tighten as necessary.

24 Hour Interval: Check all internal components.

Maintenance

DANGER

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.

WARNING

This unit should be made non-functional when cleaning the wheel or housing (fuses removed, disconnect locked off).

IMPORTANT

Uneven cleaning of the wheel will produce an out of balance condition that will cause vibration in the fan.

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and who are experienced with this type of equipment.

Motor maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to exterior surfaces only. Removing dust buildup on motor housing ensures proper motor cooling.

Greasing of motors is only intended when fittings are provided. Many fractional horsepower motors are permanently lubricated and should not be lubricated after installation. Motors supplied with grease fittings should be greased in accordance with manufacturer’s recommendations. Where motor temperatures do not exceed 104ºF *(40ºC)*, the grease should be replaced after 2,000 hours of running time as a general rule.

Wheels require very little attention when moving clean air. Occasionally, oil and dust may accumulate causing imbalance. When this occurs, the wheel and housing should be cleaned to ensure smooth and safe operation.

All fasteners should be checked for tightness each time maintenance checks are performed prior to restarting unit.

A proper maintenance program will help these units deliver years of dependable service.

Tapered Bushing Hub Installation and Removal

For wheel hubs and shaft pulleys utilizing a tapered bushing interface, follow this procedure for installation and removal. There are two possible setups for the tapered bushing, both have the same procedure, but orientation of the hub varies.

Tapered Bushing Removal:

1. If present, loosen the setscrew holding the bushing and shaft key in place.
2. Loosen and remove the socket head cap screws which fasten the bushing to the hub as shown in the section views and examples of Figures 4-7.

Standard Mounting	Reverse Mounting

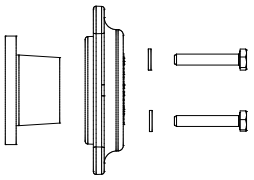
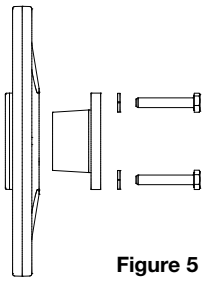
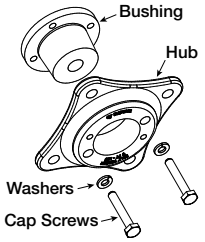
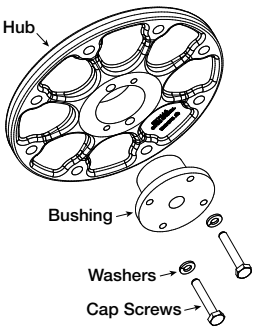

	

Figure 4	**Figure 5**
	
	
Figure 6 Standard Bushing Orientation	**Figure 7** Reverse Bushing Orientation

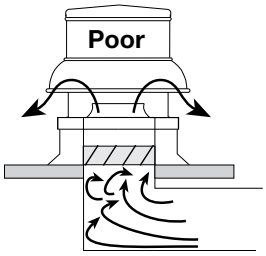
3. **Standard Mounting:** Take the two socket head cap screws that were removed and install them into the visibly threaded holes on the wheel hub.
   Reverse Mounting: Install the two socket head cap screws into the visibly threaded holes of the bushing flange.
4. Once both socket head cap screws are installed, tighten them an eighth of a turn at a time, alternating between the two until the hub comes loose from the bushing.

Bushing Installation:

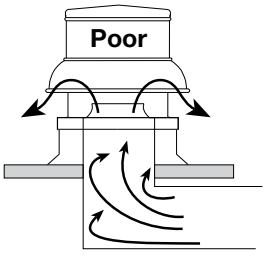
1. Clean all surfaces of hub and bushing to remove any oil or residue present. Do not use any lubricant to install bushing into the hub. For both standard and reverse mounting styles, the socket head cap screws are adjustable from the inlet of the fan.
2. **Standard Mounting:** Slide the bushing and shaft key onto the fan shaft followed by the wheel and hub assembly. If present, use the keyway setscrew to hold the shaft key and bushing in place but DO NOT overtighten as this can damage the bushing. Align the unthreaded holes of the hub with the threaded holes of the tapered bushing. **Reverse Mounting:** Slide the wheel and hub assembly on to the fan shaft followed by the bushing and shaft key. If present, use the keyway setscrew to hold the shaft key and bushing in place but DO NOT overtighten as this can damage the bushing. Align the unthreaded holes of the tapered bushing with the threaded holes of the hub.
3. Install the two bushing socket head cap screws into the aligned holes by hand (or without excessive torque) until the heads of the socket head cap screws are seated against the mating surface.
4. Adjust the height of the wheel in the fan relative to the inlet venturi then tighten the two socket head cap screws an eighth turn at a time in an alternating fashion and reach a torque of 13.5 Nm.

Fan Inlet Connections

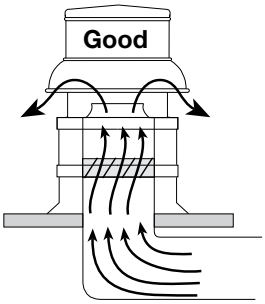
In order to ensure proper fan performance, caution must be exercised in fan placement and connection to the ventilation system. Obstructions, transitions, poorly designed elbows, improperly selected dampers, etc., can cause reduced performance, excessive noise and increased mechanical stress. For performance to be as published, the system must provide uniform and stable airflow into the fan.



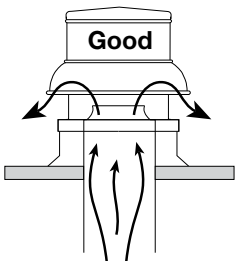
Dampers must open fully. Use motorized dampers in low airflow applications to reduce losses.



Avoid sharp turns or entrance conditions which cause uneven flow. Use turning vanes in elbows to reduce adverse effects.



Provide uniform airflow at fan inlet and through the damper to ensure optimum performance. Curb cap should be three wheel diameters from the radius. Use turning vanes in duct when possible.



Provide uniform airflow at fan inlet to ensure optimum performance.

Variable Frequency Drive (VFD) Operation

Fan vibration levels differ with the method of installation. Operating a fan on a variable frequency drive (VFD) may experience certain speed ranges with excessively high vibration levels and possible resonant frequencies. Problem speed ranges or resonant frequencies can be determined during the commissioning process. Either run through this resonant range as quickly as possible, program out operation at determined Hz to skip over these speeds, or find alternative remedy.

It is the responsibility of the installing body to perform coast-down tests and identify any resonant frequencies after the equipment is fully installed. These resonant frequencies are to be removed from the operating range of the fan by using the “skip frequency” function in the VFD programming. Failure to remove resonant frequencies from the operating range will decrease the operating life of the fan and void the warranty.

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.

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 providing there is access to the fan wheel. Any correction weights added to the wheel should be attached securely.

Common Sources of Vibration

1. Wheel Unbalance
2. Mechanical Looseness
3. Drive Component Unbalance
4. Poor Inlet/Outlet Conditions
5. Foundation Stiffness

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 maximum allowable vibration for model RV-D (direct drive) is 0.15 in/sec. peak 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.

Generally, fan vibration and noise is transmitted to other parts of the building by the duct work. To eliminate this undesirable effect, the use of heavy canvas connectors is recommended. If fireproof material is required, Flexweave™ 1000, Type FN-30 can be used.

Motors

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

Troubleshooting

WARNING

Before taking any corrective action, make certain unit is not capable of operation during repairs.

PROBLEM	CAUSE	CORRECTIVE ACTION
Excessive noise or vibration	Wheel rubbing inlet	Adjust wheel and/or inlet cone.
	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
	Wheel improperly aligned and rubbing	Center wheel on inlet.
	Foreign objects in wheel or housing	Remove objects, check for damage or unbalance.
	Fan base not securely anchored	Secure properly.
	Motor hood loose and rattling	Tighten fasteners to secure the motor hood.
	Defective or loose motor bearings	Replace motor with same frame size, RPM-HP.
High horsepower	Fan	Check rotation of wheel, see Figure 3. Reduce fan speed.
	Duct system	Resize ductwork. Check proper operation of face and bypass dampers. Check filters and access doors.
Fan does not operate	Electrical supply	Check fuses/circuit breakers. Check for switches off. Check for correct supply voltage.
	Motor	Ensure motor is correct horsepower and not tripping overload protector.
Motor overloads or overheats	Over/Under line voltage	Contact power company.
	Incorrect wheel rotation	Check motor wiring. Confirm wheel rotation, see, Figure 3.
	Undersized motor	Check motor ratings with catalog speed and air capacity chart.
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor.
Reduced airflow	System resistance too high	Check system: Proper operation of backdraft or control dampers, obstruction in ductwork, clean dirty filters.
	Unit running backwards	Correct as shown, see Figure 3.
	Excessive dirt buildup on wheels	Clean wheel.
	Improper wheel alignment	Center wheel on inlet, see “Pre-Starting Checks” on page 5.
	Dampers closed	Inspect and repair.
	Blocked duct/clogged filter	Clean or replace.
	Speed too slow	Check for correct drives.

Maintenance Log

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Our Commitment

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

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

Greenheck Centrifugal Roof Downblast Exhaust Fans catalog 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.

GREENHECK
Building Value in Air.

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