

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.

Mixed Flow Louvered Rooftop Exhaust and Supply Fans

Fans are direct-driven with mixed flow wheels and feature rigid construction, high efficiency, and low sound levels. These fans are designed for clean air roof mounted supply or exhaust applications. The fans are available in twelve sizes (7-33) in exhaust configuration and eight sizes (7-22) in supply configuration. Fan construction features a galvanized steel base housing with an aluminum sheet metal exterior and extruded aluminum louver sections. Birdscreen is standard with model PSQE (exhaust), while PSQS (supply) is supplied with 2-inch aluminum or pleated MERV-13 filters.



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. 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. 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 max cataloged fan RPM. This could cause catastrophic wheel failure. 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.
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 or fan while the fan is running.
8. Never remove covers protecting electrical components while fan is energized.

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

Motors and variable frequency drives may be hot enough to cause pain or injury. Allow both to cool prior to servicing.

DANGER

Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien.

ATTENTION

Lors de toute intervention sur la soufflante, le moteur peut être suffisamment chaud pour provoquer une douleur voire une blessure. Laisser le moteur refroidir avant toute maintenance.

Receiving

Upon receiving the product, 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 local representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

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. Due to availability of transportation and truck space all items for the unit may not be shipped together. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Handling

The manufacturer is not liable for any damages that may occur during this process. Lift the fan with care to avoid damage to the housing and exterior components. Units are shipped fully assembled, upright, and with the louvered exterior installed. Remove the top panel to access the lifting U-bolts at the fan inlet (supply) or outlet (exhaust). Depending on fan size, a louver section may also need to be removed for access. See page 5 for “Lift Point Access and Unit Lifting”.

Use only the designated lifting U-bolts. Do not lift by louver sections, panels, or other non-structural components. Use proper lifting equipment and techniques to maintain unit stability and prevent injury or damage. Handle in such a manner as to keep from scratching or chipping the coating (if applicable). Damaged finish may reduce the ability of the fan to resist corrosion.

The unit may also be moved on its skid using a forklift. Once in place, verify the orientation of access panels, discharge, disconnect, and motor.

For ducted applications, provide at least 3 duct diameters of straight duct at the inlet or outlet before any obstruction. Refer to Dimensional Data on page 3 for unit dimensions.

Verify motor voltage and amperage match the power supply before final electrical connection. All wiring must comply with local and national codes.

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.

Storage Environment

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° to 110°F (-1° to 43°C) (wide temperature swings may cause condensation and “sweating” of metal parts). All accessories must be stored indoors in a clean, dry atmosphere.

The unit should be stored at least 3-1/2 inches 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 and Maintenance During Storage

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

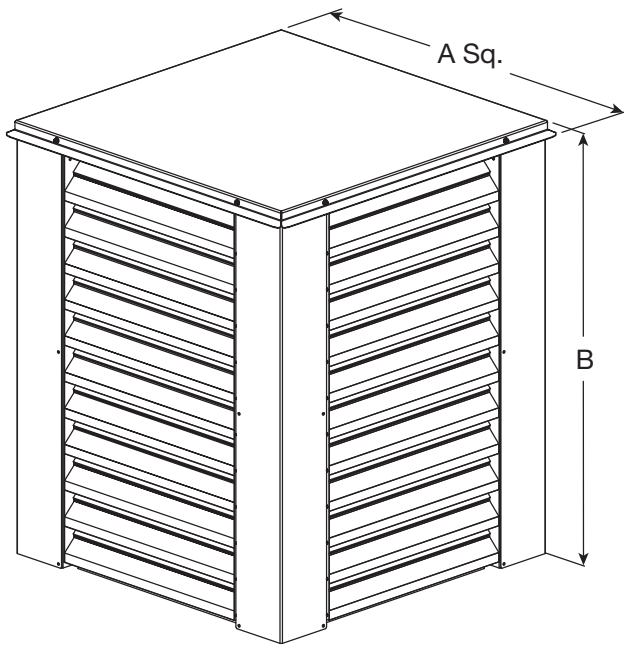
If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant in motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with 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. Thoroughly wipe clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

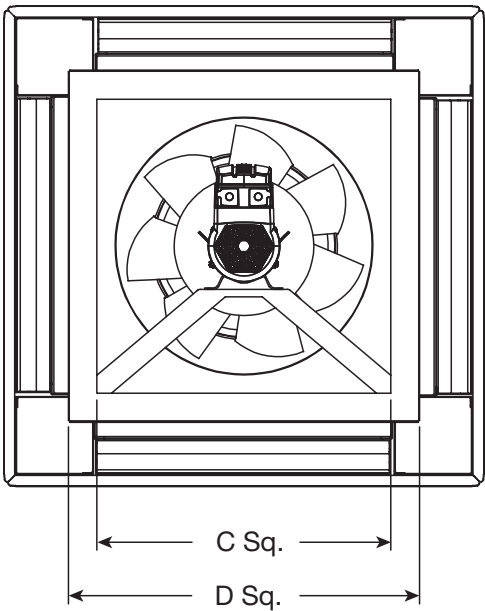
Removing From Storage

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.

Dimensional Data



SUPPLY OR EXHAUST



BOTTOM VIEW

Fan Size	Supply or Exhaust				Max. Fan Weight
	A Sq.	B	C Sq.	D Sq.	
7	27-1/4	25-1/4	11-3/8	15-7/8	81
9	31	30-1/2	15-1/8	19-5/8	99
12	34-1/8	36-3/4	18-1/4	22-3/4	157
15	37-7/8	44-1/2	22	26-1/2	215
16	39-7/8	47-1/4	24	28-1/2	238
18	42-1/2	50-1/2	26-5/8	31-1/8	277
20	45-1/8	55-3/8	29-1/4	33-3/4	331
22	48	60-3/4	32	36-1/2	397
24	51-3/8	53-1/8	35-1/2	40	409
27	54-7/8	58-1/8	39	43-1/2	523
30	58-7/8	63-7/8	43	47-1/2	686
33	63-1/4	70-1/8	47-1/4	51-3/4	778

All dimensions in inches and weight is shown in pounds.

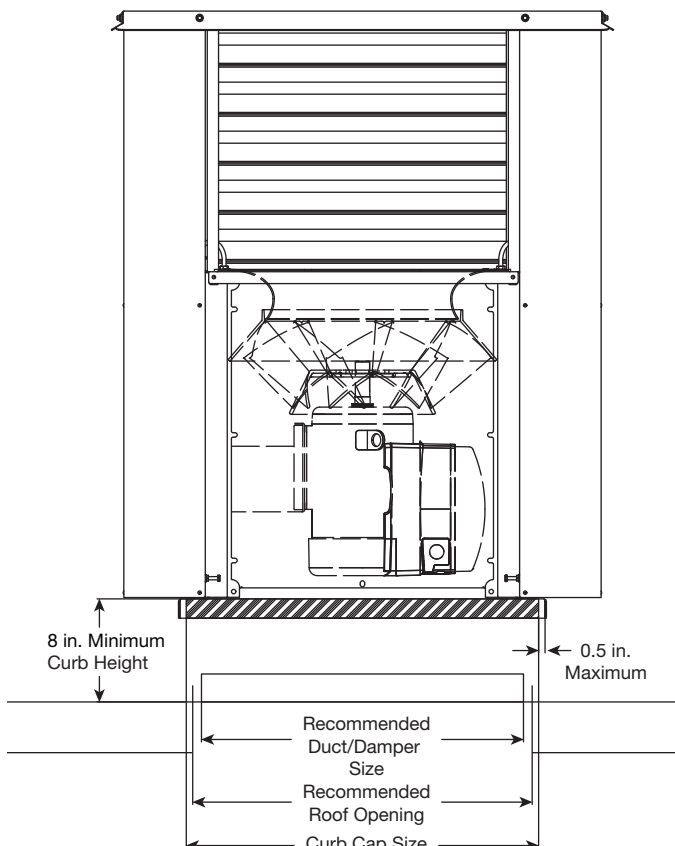
Typical Installation

NOTE: For units supplied or used with a Variable Frequency Drive (VFD), reference the VFD documentation for installation requirements, start-up settings, parameter adjustments and troubleshooting. VFDs provided by the manufacturer are factory programmed for basic motor parameters, incoming voltage parameters and maximum operating speed (Hz).

Follow NEC and local codes for VFD wiring and installation. If the wire length between the VFD and the controlled motor exceeds 100 ft (30.5 m), DV/DT filters or VFD cabling may be required. Calculations and proper application of DV/DT filters and VFD cabling is by others; failing to do so may result in premature motor failure.

Weather Infiltration Disclosure

Louvered penthouses provide a level of defense against weather infiltration, however; louvered penthouses cannot be considered weather proof. Greenheck recommends provisions to manage weather infiltration be present beyond the louvered penthouse so as to mitigate weather passage and prevent water related damage to building conditions or equipment. Design of materials as required to manage weather infiltration are not provided by Greenheck. Greenheck also recommends sound product application/engineering practice(s) be employed when applying louvered penthouses. Such practice(s) may include, but are not limited to, conservative throat and louver free area velocities. Greenheck shall not be held liable for water related damage to building conditions or equipment.



Fan Size	Recommended Duct/Damper Size	Recommended Roof Opening	Curb Cap Size
7	11-1/4 x 11-1/4	13-3/4 x 13-3/4	15-7/8 x 15-7/8
9	15 x 15	17-1/2 x 17-1/2	19-5/8 x 19-5/8
12	18-1/4 x 18-1/4	20-3/4 x 20-3/4	22-3/4 x 22-3/4
15	22 x 22	24-1/2 x 24-1/2	26-1/2 x 26-1/2
16	24 x 24	26-1/2 x 26-1/2	28-1/2 x 28-1/2
18	26-1/2 x 26-1/2	29 x 29	31-1/8 x 31-1/8
20	29-1/4 x 29-1/4	31-3/4 x 31-3/4	33-3/4 x 33-3/4
22	32 x 32	34-1/2 x 34-1/2	36-1/2 x 36-1/2
24	35-1/2 x 35-1/2	38 x 38	40 x 40
27	39 x 39	41-1/2 x 41-1/2	43-1/2 x 43-1/2
30	43 x 43	45-1/2 x 45-1/2	47 1/2 x 47 1/2
33	47-1/4 x 47-1/4	49-3/4 x 49-3/4	51-3/4 x 51-3/4

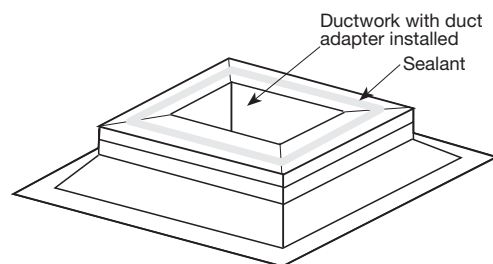
All dimensions in inches.

Rooftop Installation

Good duct practices should be followed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. The discharge should have approximately 3 duct diameters of straight duct to achieve cataloged performance (see table to the right).

The ductwork should extend far enough above the roofline to meet the unit once it is installed. A duct adapter is recommended for bottom discharge units to align ductwork with the unit. The duct adapter is only a guide and is not to be used as a support for the ductwork. Fans may be configured with a damper, and the ductwork may not be able to run up to the bottom of the unit. In this case, mount the ductwork beneath the damper.

1. Cut an appropriately sized opening in the roof surface.
2. Position the roof curb over the opening and install it according to the curb manufacturer's recommendations.
3. Caulk and flash the roof curb to ensure a watertight seal.
4. Before setting the unit on the curb, apply a continuous bead of sealant around the perimeter of the opening to isolate the fan and minimize vibration.



5. Install the fan on top of the roof curb. Use proper equipment, lifting techniques, and safety measures to avoid injury or damage to the fan or surroundings. Reference page 5 for "Lift Point Access and Unit Lifting".

6. Verify where the disconnect switch is located on the unit and orient fan so the disconnect switch is in a code compliant location. Use self-tapping sheet metal screws to fasten the unit to the curb through provided holes in the curb cap.
7. Remove the louver section with the electrical disconnect labeled.
8. Connect power and control wires (if applicable) to fan.
9. Reinstall all disassembled fan components. Ensure all fasteners are installed and securely tightened.

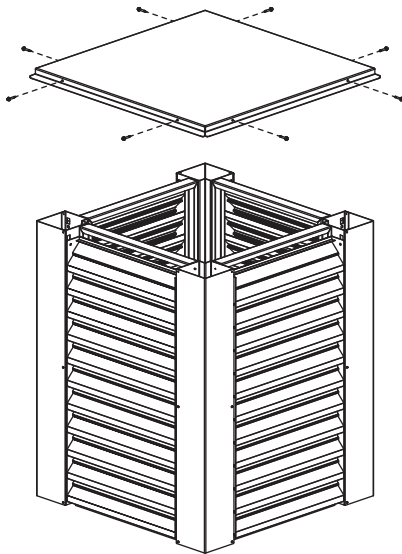
Lift Point Access and Unit Lifting

IMPORTANT: Use proper equipment, lifting techniques, and safety measures to avoid injury or damage to the fan or surroundings. The manufacturer is not liable for any damages that may occur during this process.

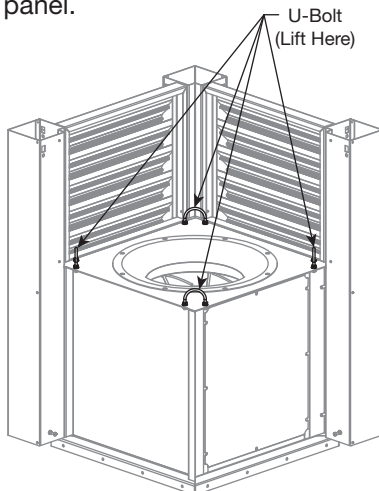
NOTE: Four U-bolts are provided as lift points to help lift the unit into place on the curb and in the correct orientation.

NOTE: Always use all four U-bolts when lifting.

1. Remove the sheet metal screws securing the top panel. Lift the top panel off to access the U-bolts for lifting.

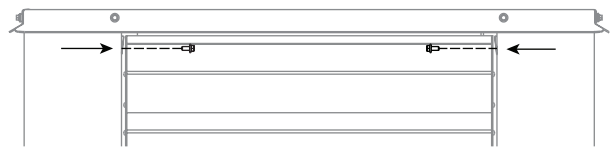


2. Locate the four lifting U-bolts on top of the fan inlet or outlet panel.

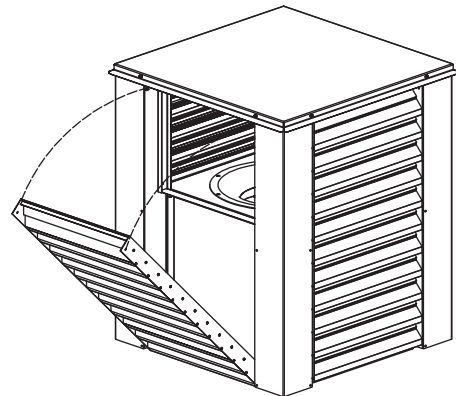


On larger units, it may be necessary to remove one of the louver sections to reach the lifting U-bolts.

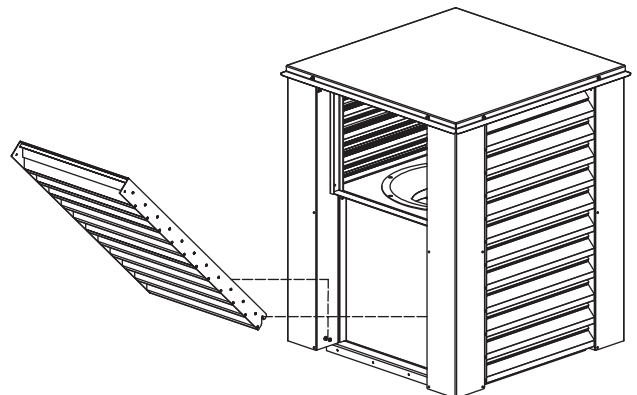
- a. Remove the exposed 1/4 inch hex bolt at the top of the louver section.



- b. Pivot the louver section away from the fan and pull upward to release it from the bottom studs.



- c. Lift up to detach the section from the assembly.



3. Attach the lifting device to all four lifting U-bolts and hoist the unit to its installation location.

Pre Start-Up Checks

Before Fan Start-Up

Before starting up or operating fan, check all fasteners for tightness. In particular, check the cap screws in wheel bushing.

Wheel Alignment

1. Rotate the fan wheel by hand and ensure no parts are rubbing. The wheel should rotate freely and be aligned as shown in Figure 1. Wheel position is preset and the unit is tested at the factory.
2. Movement may occur during shipment, and realignment may be necessary.

Radial Gap - If necessary, adjust inlet cone position such that the radial gap between the wheel cone and inlet cone is evenly distributed around the wheel.

Alignment - If necessary, adjust wheel position by loosening the wheel hub (see Tapered Bushing Hub, Removal and Replacement, on page 7) from the motor shaft so that a straight edge held tight to the wheel cone just touches the inlet cone. Refer to Figure 1.

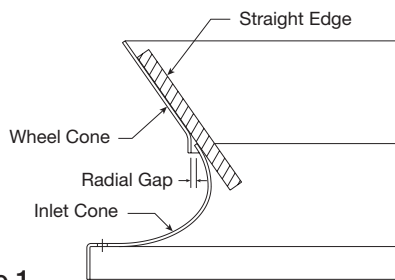


Figure 1

Recommended Fastener Torque

Size	Type	Recommended Torque in-lb (ft-lb)		Application
		Min.	Max.	
#12	Sheet Metal Screw	25 (2)	30 (2.5)	Top Panel
1/4 in.	Hex Bolt	12 (1)	24 (2)	Louver Section
1/4 in.	Hex Bolt	12 (1)	36 (3)	Filter Channel Cover
1/4 in.	Hex Bolt	96 (8)	108 (9)	Ductwork and Accessory Mounting
1/4 in. x 20	Cap Screw	120 (10)	120 (10)	QT Bushing (Size 7-24)
1/4 in. x 20	Cap Screw	108 (9)	108 (9)	SD Bushing (Size 27-33)
5/16 in.	Semi-Gimlet Bolt	132 (11)	144 (12)	Fan Construction
3/8 in.	Serrated Flange Bolt/Nut	252 (21)	288 (24)	Motor Mount
1/2 in.	Serrated Flange Bolt/Nut	564 (47)	636 (53)	Motor Mount

Operation

IMPORTANT: The fan has been checked for mechanical noise at the factory prior to shipment. If mechanical noise should develop, suggested corrective actions are offered in the Troubleshooting section, see page 11.

1. After the fan is installed, disconnect and lock-out all power switches to fan.
2. Before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking the inlet cone or any obstacle.
3. Start the fan and shut it off immediately to check rotation of the wheel, see Figure 2.

Wheel Rotation - Direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible burnout. Rotation should be counterclockwise when viewed from the fan inlet as shown in Figure 2. If wheel rotation is incorrect for single phase power, consult manufacturer. If wheel rotation is incorrect for 3 phase power, swap two of the wiring leads and check rotation again. Fan RPM should be checked and verified with a tachometer.

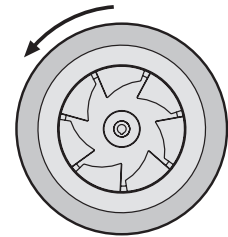


Figure 2

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.

IMPORTANT: When system balancing model PSQS, do not exceed the maximum airflow (cfm) values listed. Running the fan above the maximum airflow will exceed the max face velocity of the filters and may result in unwanted water penetration. Failure to comply with these airflow limits may affect product performance and is the responsibility of the balancing contractor and/or installer.

Fan Size	Max Airflow CFM
7	1,227
9	2,310
12	3,482
15	5,188
16	6,242
18	7,755
20	9,392
22	11,429

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, cap screws, setscrews, and motor mounting bolts. Adjust and tighten as necessary.

24 Hour Interval - Check all internal components.

Maintenance

DANGER

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

WARNING

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

DANGER

Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien.

AVERTISSEMENT

L'appareil doit être rendu non opérationnel lors du nettoyage de la turbine ou du caisson (fusibles retirés, sectionneur verrouillé).

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.

Fan

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. Greenheck recommends a 90-day maintenance cycle, especially for supply units containing any level of filtration. Ensure power is turned off prior to performing any maintenance on the fan.

Motor

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 manufacturers' recommendations. As a general rule where motor temperatures do not exceed 104°F (40°C), the grease should be replaced after 2,000 hours of running time.

Wheel

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.

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

Tapered Bushing Hub

For wheel hubs utilizing a tapered bushing interface, follow this procedure for installation and removal.

Bushing Removal

1. If present, loosen the setscrew holding the bushing and shaft key in place.
2. Loosen and remove the cap screws which fasten the bushing to the hub as shown in Figure 3.
3. Take the cap screws that were removed and install them into the visibly threaded holes on the wheel hub.
4. Once cap screws are installed, tighten them an eighth of a turn at a time, alternating until the bushing comes loose.

Bushing Replacement

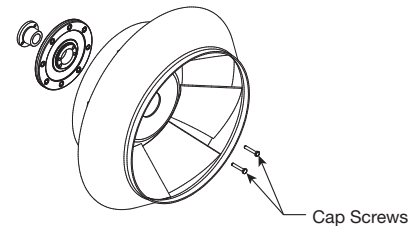


Figure 3

1. Clean all surfaces of hub and bushing to remove any oil or residue present and do not use any lubricant to install bushing into the hub.
2. 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.
3. The cap screws are adjustable from the inlet of the fan. Install the bushing cap screws into the aligned holes by hand (or without excessive torque).
4. Adjust the axial location of the wheel in the fan relative to the inlet cone as shown in Figure 1, page 6. Then tighten the cap screws an eighth turn at a time in an alternating fashion and to a torque of 10 ft·lbs for QT bushings and 9 ft·lbs for SD bushings.

NOTE: QT or SD is labeled on the outer edge of the bushing. QT bushings have 2 cap screws and SD bushings have 3 cap screws.

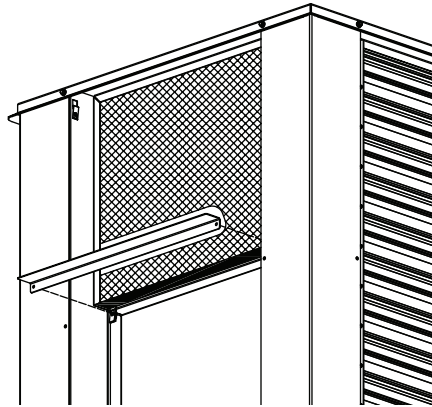
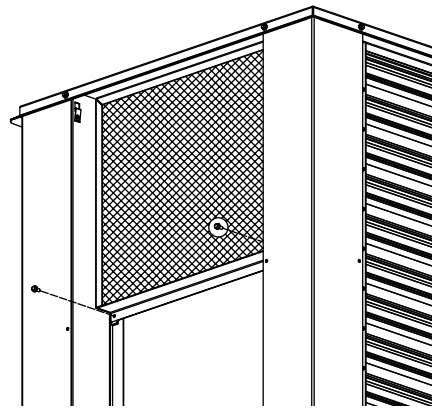
Filters

Two-inch aluminum or pleated MERV-13 filters are available in supply configurations. Filters should be cleaned and/or replaced on a regular basis for optimum efficiency. Aluminum filters can be washed in a mild detergent solution. If desired, an adhesive spray available at most filter distributors can be applied to increase filter efficiency.

Access and Replacement

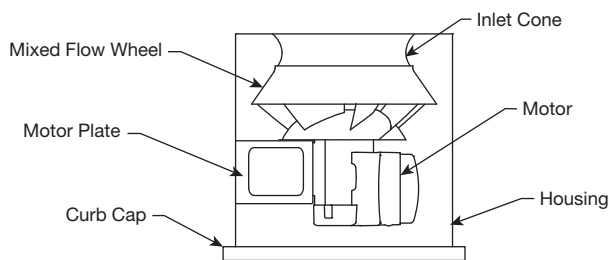
1. Remove the louvered section to access the filter channels. Refer to Steps 2a., 2b., and 2c. on page 5.
2. With the louvered section removed, locate the filter channel cover at the bottom of the aluminum or MERV-13 filter.
3. Remove the (2) 1/4 inch hex bolts securing the filter channel cover and set it aside.
4. Gently slide the filter out through the bottom opening.
5. Install new or cleaned filter.
6. Reinstall the filter channel cover.
7. Reattach the louvered section.

NOTE: For MERV-13 configurations, a 0.09 inch aluminum filter is included for additional weather protection. Install the aluminum filter on the outward side of the MERV-13 filter (using the same filter channel).

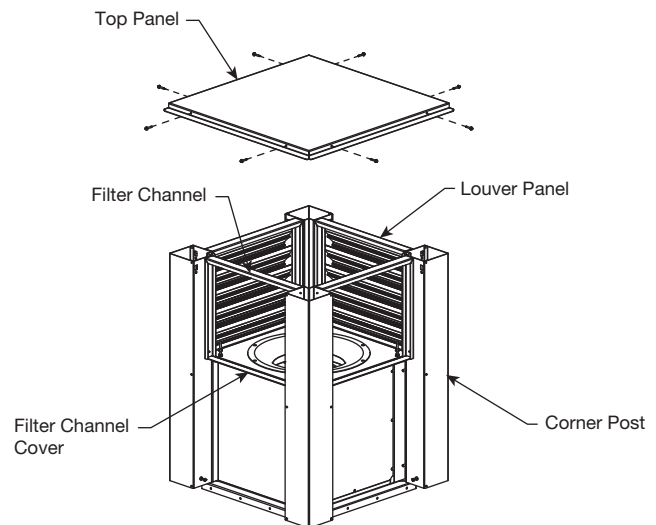


Parts List

Each fan bears a manufacturer's nameplate with model number and serial number embossed. This information will assist the local representative and the factory in providing service and replacement parts. Before servicing, assure unit is not capable of operation during repairs.



NOTE: Fan sizes 18 and larger have additional internal structural supports (not shown).



NOTE: Filters or Birdscreens (not shown).

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
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____



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
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Date _____ Time _____ AM/PM
Notes: _____

Troubleshooting

WARNING

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

AVERTISSEMENT

Avant d'entreprendre toute action corrective, s'assurer que l'appareil ne pourra pas fonctionner durant les réparations.

PROBLEM	CAUSE	CORRECTIVE ACTION
Ventilator Inoperative	Blown fuse or breaker	Replace or repair
	Incorrectly wired	Shut power OFF and check wiring for proper connections
	Defective motor	Replace or repair
Insufficient Airflow	Clogged filters	Clean or replace
	Incorrect wheel rotation	Correct wheel rotation, see page 6, Operation step 3
	Excessive dirt build up on wheel	Clean wheel
	Improper wheel alignment	Center wheel on inlet cone, see page 6 and Figure 1
	Fan RPM too slow	Adjust speed with Vari-Green® control or VFD (if applicable)
	Damper closed	Inspect/repair damper
	Loose fitting duct sections permitting air loss	Check for secure connection where duct sections are joined (suggest duct tape at seams for sealed closure)
Excessive Noise or Vibration	System resistance too high	Check system: proper orientation and operation of backdraft or control dampers, obstructions in ductwork.
	Accumulation of material on wheel	Clean wheel
	Loose wheel	Tighten set screw and cap screws
	Wheel improperly aligned and rubbing	Center wheel on inlet cone, see page 6 and Figure 1
	Wheel out of balance	Check wheel balance, rebalance in place if necessary
	Foreign objects in wheel or housing	Remove objects and check for damage or imbalance
	Ventilator base not securely anchored	Secure properly
Motor Overloads or Overheats	Incorrect wheel rotation	Check motor wiring
	Shorted motor winding	Replace motor
	Over/Under line voltage	Contact power company

For Vari-Green® motor troubleshooting, refer to the Vari-Green Motor and Controls Installation, Operation, and Maintenance (IOM) Manual .

Our Commitment

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

Product warranties can be found online at Greenheck.com, either on the specific product page or in the literature section of the website at Greenheck.com/Resources/Library/Literature.

AMCA Publication 410-25, 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.

