

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.

Hooded Mixed Flow Roof Fans

Fans are direct-driven with mixed flow wheels and feature rigid construction, high efficiency, and low sound levels. These fans are designed for roof supply or exhaust applications. The fans are available in twelve sizes and feature a hinged fabra hood and optional 1-inch washable aluminum filters in supply applications.



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

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before 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, 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 local representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

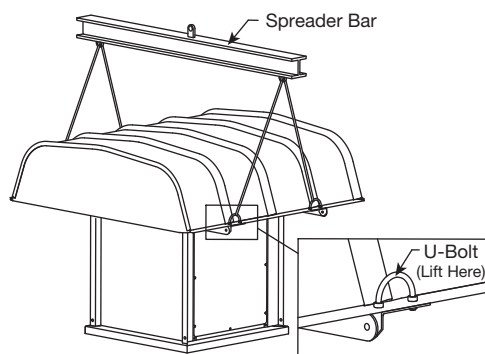
Unpacking

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

IMPORTANT: Hoods are shipped knocked down and packaged separately from the fan. Hood assembly instructions can be found on pages 5 and 6. Base fans are shipped assembled in a horizontal orientation and must be rotated vertically for final installation. The manufacturer is not liable for any damages that may occur during this process.

Lifting the fan must be done with care to avoid damaging the housing. Fans without the hood attached are to be rigged and moved by the holes in the heavy gauge rails running along the unit. The fans can also be moved via the skid when a forklift is used. The holes located in the heavy gauge rails can be used to assist in rotating the fan. Use proper equipment, lifting techniques, and safety measures to avoid injury or damage to the fan or surroundings. Fans with the hood installed should be lifted from the U-bolts located above the hinge brackets on the hood. Use a minimum of four lifting straps. 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.



Move fan to desired location and determine position of access panels, discharge, and motor. In ducted applications, make sure the inlet/outlet (depending on

configuration) has at least 3 times the wheel diameter of straight duct before any obstructions like an elbow or transition. See Dimensional Data (page 3) for physical dimensions. The motor's amperage and voltage ratings must be checked for compatibility to supply power prior to final electrical connection. All wiring must conform to 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.

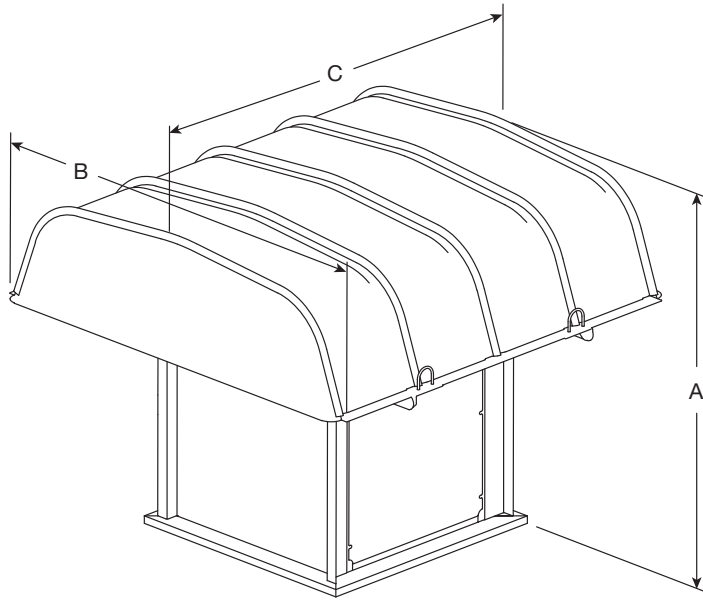
Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper 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

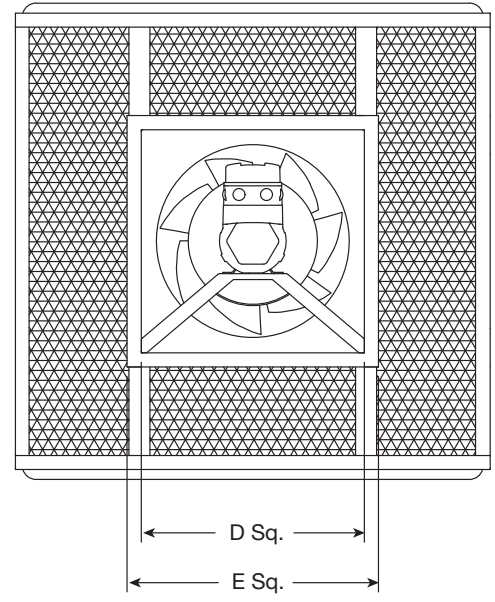
As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the fan equipment goes into operation.

Dimensional Data

Fan Dimensions



SUPPLY OR EXHAUST



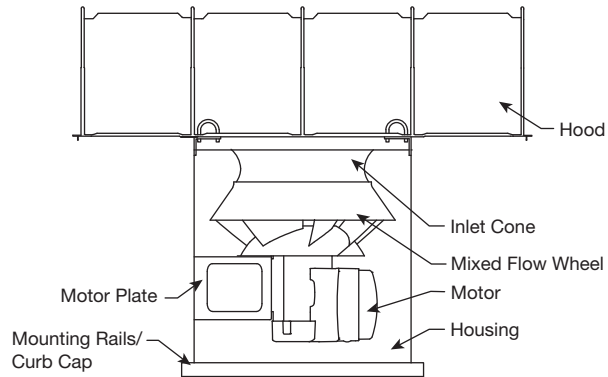
BOTTOM VIEW

Fan Size	Supply or Exhaust					Max. Fan Weight [^]
	A	B	C	D Sq.	E Sq.	
7	25	30-1/4	27-1/8	11-3/8	15-7/8	109
9	27	34-7/8	39-1/8	15-1/8	19-5/8	141
12	35-1/2	40-1/4	39-1/8	18-1/4	22-3/4	183
15	40	42-3/4	51-1/8	22	26-1/2	253
16	41	51	51-1/8	24	28-1/2	282
18	42-1/8	50-1/8	63-1/8	26-5/8	31-1/8	355
20	44-3/4	61-3/8	63-1/8	29-1/4	33-3/4	481
22	47-1/2	61-1/2	75-1/8	32	36-1/2	544
24	55	74-1/2	75-1/8	35-1/2	40	617
27	58-1/2	76	87-1/8	39	43-1/2	832
30	64-1/2	89-3/8	87-1/8	43	47-1/2	929
33	69-3/4	93-7/8	99-1/8	47-1/4	51-3/4	1049

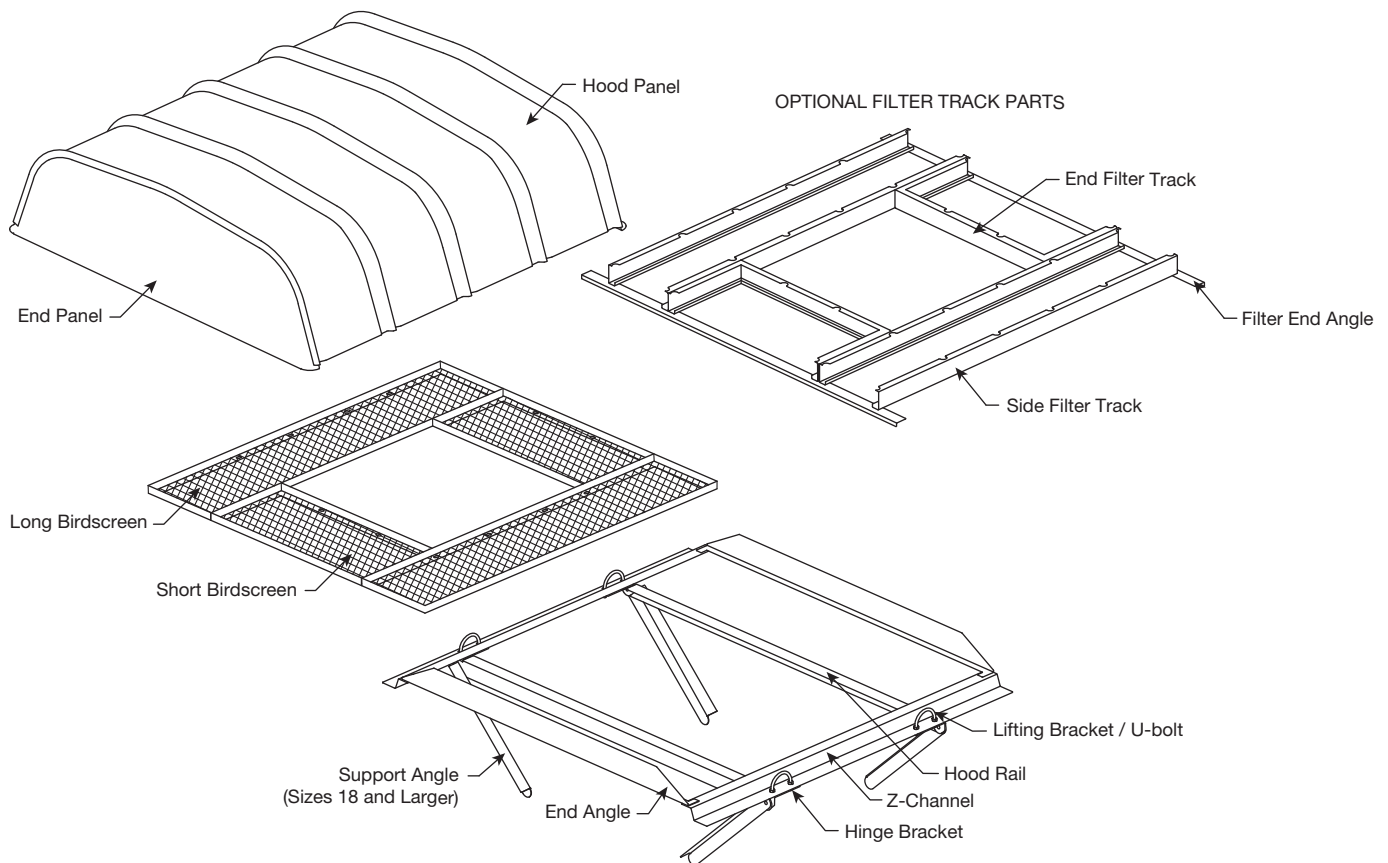
All dimensions in inches and weight is shown in pounds. [^]Weight shown is filtered galvanized construction and largest cataloged totaled enclosed EC motor.

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 size 18 and larger have additional internal and external structural supports.



Typical Installation

Units can be installed on the roof deck prior to assembling the hood.

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 trouble shooting. VFDs provided by the manufacturer are factory programmed for basic motor parameters, incoming voltage parameters and maximum operating speed (Hz).

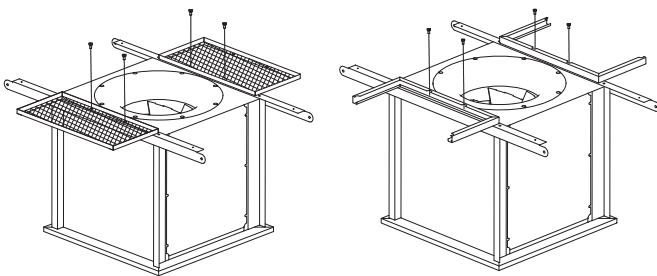
Follow NEC and local codes for VFD wiring and installation. If the wire length between the VFD and the controlled motor exceeds 100 ft (30.5 m), DV/DT filters or VFD cabling may be required. Calculations and proper application of DV/DT filters and VFD cabling is by others; failing to do so may result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

Hood Assembly

STEP 1 - Install Hood Rails and Short Birdscreen or End Filter Tracks

NOTE: For larger fan sizes, short filter tracks may be divided into two sections per-side.

- Place the hood rail along the top edge of the fan without access doors.
- Place the birdscreen panel or end filter track over the hood rail.
- Align the holes in the hood rail and the birdscreen panel or end filter track with the pilot holes in the top of the fan.
- Mount the components using the provided 5/16 inch fasteners.

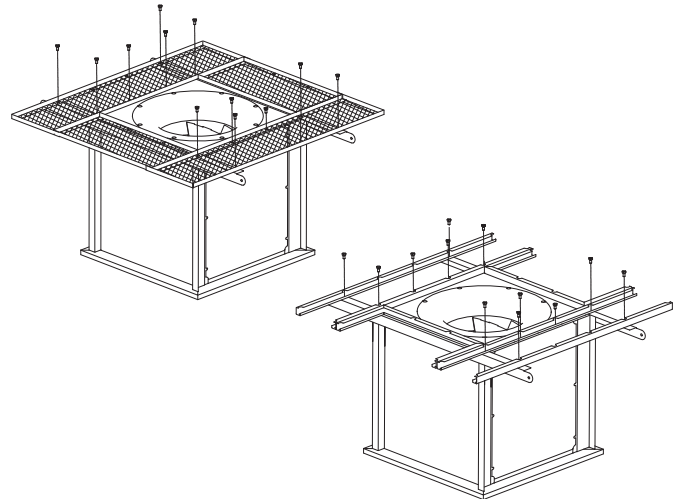


STEP 2 - Install Long Birdscreen or Side Filter Tracks

NOTE: When mounting the birdscreen or side filter tracks to only the hood rails, use sheet metal screws. 5/16 inch fasteners will be used when mounting through the birdscreen or side filter tracks, hood rails, and fan.

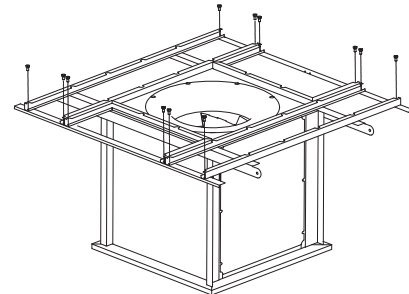
- Place the birdscreen or side filter tracks across the opposing hood rails, aligning the holes in the birdscreen or side filter tracks with the holes in the hood rails and fan.

- Attach the birdscreen or side filter tracks.



STEP 3 (Filtered Units Only) – Install Filter End Angles

- Mount the filter end angles to the free-hanging ends of the filter tracks with the short flange down and away from the filter tracks using the provided sheet metal screws.



STEP 4 (Filtered Units Only) – Install Filters

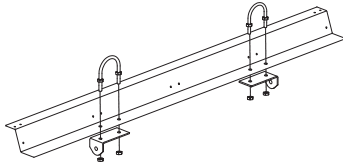
- Slide the filters into the filter tracks ensuring all flow direction arrows on filters point upward.
- TAKE CARE NOT TO DAMAGE THE FILTERS THROUGH THE ASSEMBLY PROCESS.**

Fan Size	End Filter		Side Filter	
	Size	Qty.	Size	Qty.
7	5-1/2 x 11-3/8	2	23-1/4 x 5-3/4	2
9	9-5/8 x 15	2	35-1/4 x 6-1/4	2
12	8-1/8 x 18-1/4	2	35-1/4 x 7-1/4	2
15	12-1/4 x 22	2	23-5/8 x 6-3/4	4
16	11-1/4 x 24	2	23-5/8 x 9-3/4	4
18	15-7/8 x 26-1/2	2	29-5/8 x 8-1/8	4
20	14-5/8 x 29-1/8	2	29-5/8 x 12-3/8	4
22	19-1/8 x 32	2	35-5/8 x 11	4
24	17-1/2 x 35-1/2	2	35-5/8 x 15-3/4	4
27	21-3/4 x 38-7/8	2	27-3/4 x 14-7/8	6
30	19-3/4 x 21-1/4	4	27-3/4 x 19-1/2	6
33	23-1/2 x 23-3/8	4	31-3/4 x 19-5/8	6

All dimensions in inches.

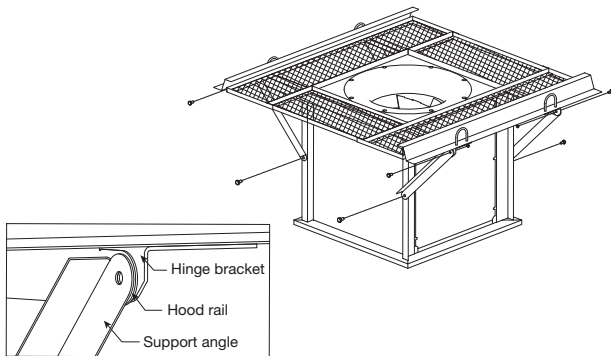
STEP 5 – Install Hinge Brackets and U-Bolts to Z-Channels

- Using the provided U-bolts and nuts, attach the two hinge brackets and U-bolts to the holes in each of the hood Z-channels as seen in illustration. No rubber grommets are required.



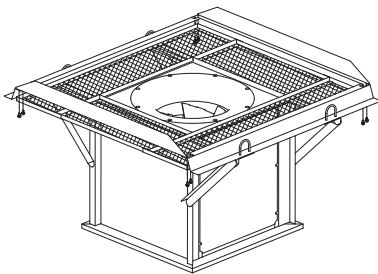
STEP 6 – Install Z-Channel on Hood Rails

- (Sizes 18-33 only) Mount the support angle to the fan using the holes halfway down the height of the fan using 5/16 inch fasteners.
- Align the hole in the small flange of the hinge bracket with the hole at the end of the hood rail and the support angle (if applicable.)
- Attach the three parts using the provided nuts and bolts. No rubber grommets are required.



STEP 7 – Attach Hood End Angles

- Attach the hood end angles from below using the provided sheet metal screws.



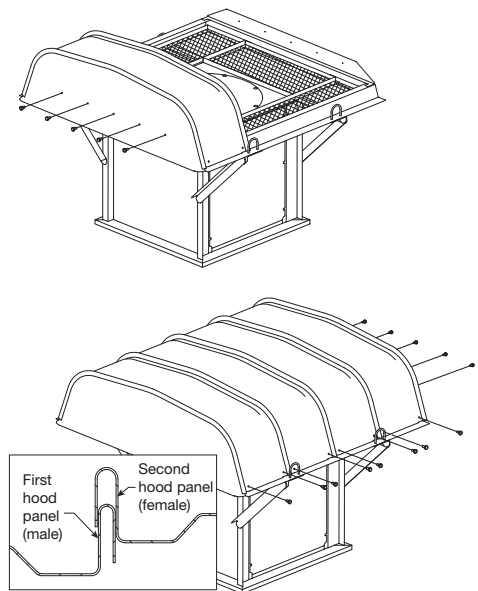
STEP 8 – Attach Hood Panels

NOTE: Overlapping flanges improve hood weatherproofing and strength. Start with the hood panel with the end panel attached equipped with the male flange.

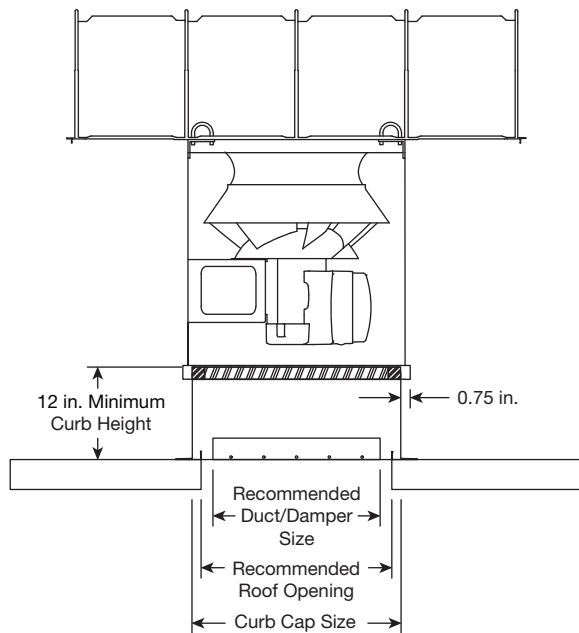
- Place the hood panel with end panel attached and male flange at one end of the hood over the end angle and z-channels.
- Mount the end panel to the end angle using the provided sheet metal screws.
- Place hood panel with female flange over the male flange on the initial hood panel.
- Repeat previous step until the opposite hood panel with the end panel attached is placed (See table below for panel quantity).
- Mount the other end panel to the opposite end angle.
- Using the provided sheet metal screws, fasten all holes to connect each hood panel to the z-channels.

Fan Size	Hood Panels
7	2
9	3
12	3
15	4
16	4
18	5
20	5
22	6
24	6
27	7
30	7
33	8

All dimensions in inches.



Roof Mounting



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.

STEP 1 - Roof Opening

- Cut an appropriately sized hole in the roof surface.

STEP 2 - Install Roof Curb

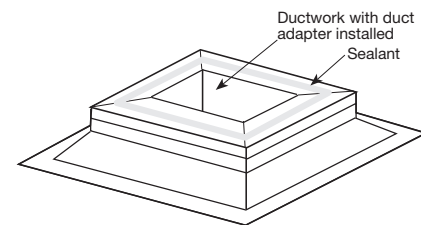
- Position curb on the roof and install curb per manufacturer's instructions. Caulk and flash the curb to ensure a water tight seal.

STEP 3 - Install Ductwork

- Good duct practices should be followed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. The discharge should have approximately three duct diameters of straight duct to achieve cataloged performance (see table below). The ductwork should extend far enough above the roofline to meet the supply unit once it is installed. A duct adapter is recommended for bottom discharge 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 supply unit. In this case, mount the ductwork beneath the damper.

STEP 4 - Apply Sealant

- Before installing the unit, apply a sealant around the perimeter of the supply duct to isolate the fan and minimize vibration.



STEP 5 - Install Unit

NOTE: Always use all four U-bolts when using a sling.

- Use a crane and set of spreader bars hooked to the U-bolts located on the hood to lift and center the unit on the curb in the correct orientation. Use self-tapping sheet metal screws to fasten the unit to the curb through provided holes in the curb cap. Electrical connections can be made at this time.

STEP 6 - Mount Disconnect Switch (if applicable)

- Determine ideal location for the disconnect switch.
- Install disconnect per manufacturer's suggestions.

STEP 7 - Install Conduit

- Connect the provided flexible metal conduit (FMC) to the power junction box.

STEP 8 - Route Wiring to Junction Box

- Route the wiring from the junction box to the disconnect switch through all conduit, fittings, and conduit leads.

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 assure 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 Installation and Removal on pages 9 and 10) from the motor shaft so that a straight edge held tight to the wheel cone just touches the inlet cone. Refer to Figure 1.

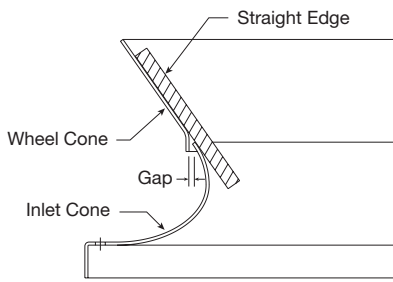


Figure 1

Recommended Fastener Torque

Size	Type	Recommended Torque in-lb (ft-lb)		Application
		Min.	Max.	
#12	Sheet Metal Screw	25 (2)	30 (2.5)	Hood Panels
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 (page 12).

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 (venturi) 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, switch two of the wiring leads for 3 phase power supply or check motor wiring for single phase power supply. Fan RPM should be checked and verified with a tachometer.

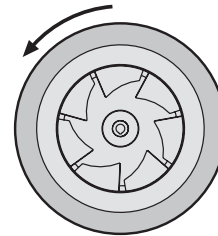


Figure 2

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.
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
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.

Filters

One-inch washable aluminum mesh filters an optional replacement to bird screen. Filters should be cleaned and/or replaced on a regular basis for optimum efficiency. To remove the filters, disconnect the hinge brackets on one side of the hood and tilt the hood upward. Then slide the filters out of the filter tracks. 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.

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 socket head cap screws which fasten the bushing to the hub as shown in Figure 3.
3. Take the socket head cap screws that were removed and install them into the visibly threaded holes on the wheel hub.
4. Once socket head cap screws are installed, tighten them an eighth of a turn at a time, alternating until the bushing comes loose.

Bushing Installation

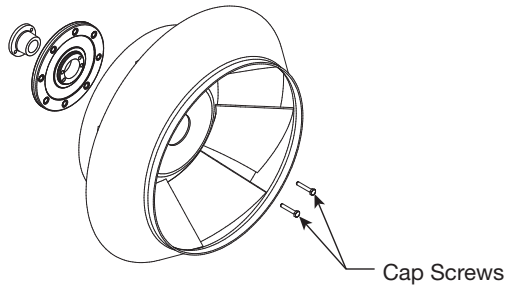


Figure 3

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 socket head cap screws are adjustable from the inlet of the fan. Install the bushing socket head 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 (venturi) as shown in Figure 1, page 8. Then tighten the socket head 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 two cap screws and SD bushings have three cap screws.

Maintenance Log

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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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 rotation, see page 8, step 3 to correct wheel rotation
	Excessive dirt build up on wheel	Clean wheel
	Improper wheel alignment	Center wheel on inlet cone, see figure 1 (page 8)
	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)
System resistance too high	Check system: proper orientation and operation of backdraft or control dampers, obstructions in ductwork.	
Excessive Noise or Vibration	Accumulation of material on wheel	Clean wheel
	Loose wheel	Tighten set screws
	Wheel improperly aligned and rubbing	Center wheel on inlet cone, see figure 1 (page 8)
	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 Installation, Operation, and Maintenance 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 410-96, 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.

