

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.

Square Inline Mixed Flow Fans

Fans are direct-driven with mixed flow wheels and feature ridged construction, high-efficiency and low sound levels. These compact inline fans are the ideal selection for indoor and outdoor clean air applications including intake, exhaust, return, or make-up air systems. The square housing design, compact size, and straight-thru airflow also provide the system designer the flexibility to mount in horizontal and vertical orientations. Each fan displays a permanently stamped metal nameplate with complete model number, mark, and unique serial number for future identification.



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

Lifting the fans must be done with care to avoid damaging the housing. Fans are to be rigged and moved by the isolator holes on top of the unit or by the skid when a forklift is used. Location of the isolator holes will always be on the top four corners. 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. Make sure the inlet and outlet have at least 3 times the wheel diameter of straight duct before any obstructions like an elbow or transition. Attach the fan to a suitable framework as specified by others; hanging or base vibration isolators are recommended. 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. Electrical lead-in wires are then connected to the electrical wires run to the external factory supplied junction box. 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.

Remove any accumulations of dirt, water, ice or snow and wipe dry before moving to indoor storage. To dry parts and packages, use a portable electric heater to get rid of any moisture buildup. Leave coverings loose to permit air circulation and to allow for periodic inspection.

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

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

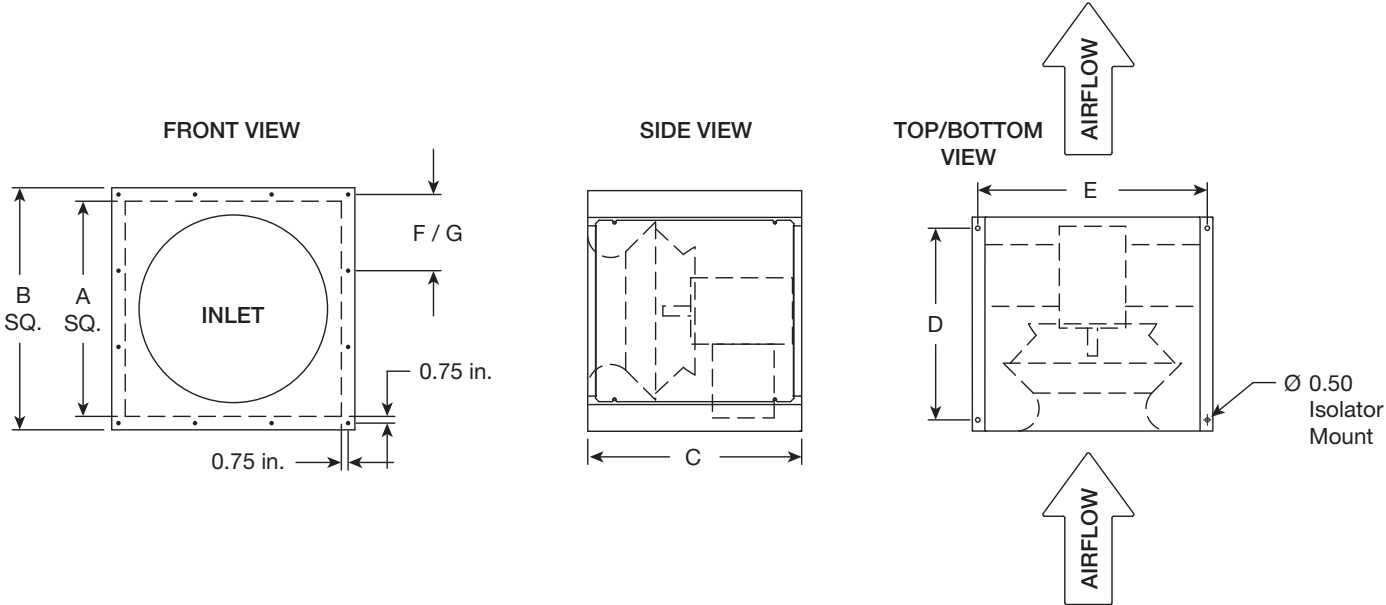
If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant in motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with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

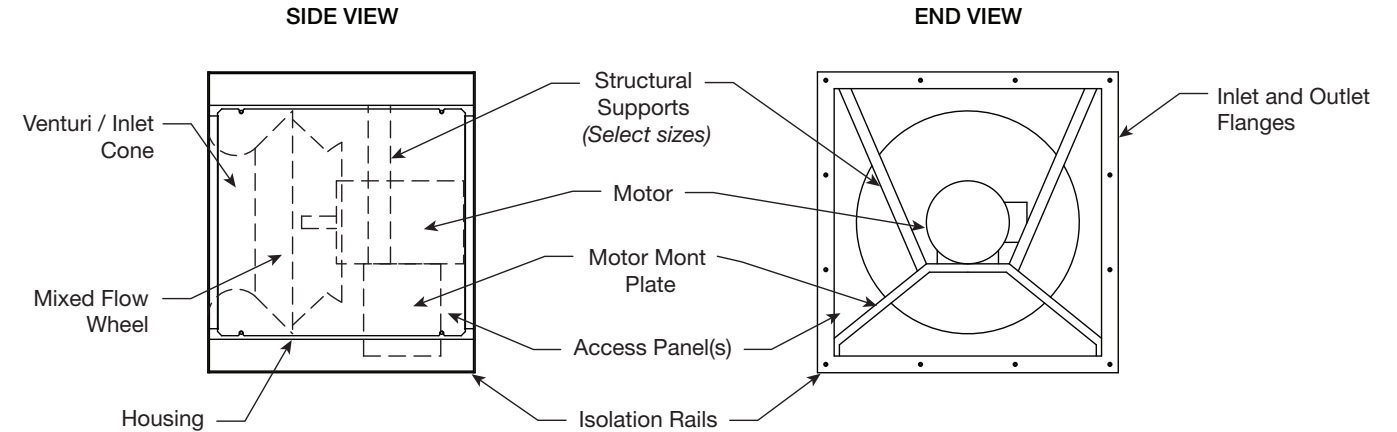


Fan Size	A Sq.	B Sq.	C	D (Isolator)	E (Isolator)	F (Hole Spacing)	G (Holes Per Side)	Max. Fan Weight [^]
7	11-3/8	14-3/8	14-1/2	12	13-1/8	6-1/2	3	41
9	15-1/8	18-1/8	16-1/2	14	16-7/8	8-1/4	3	52
12	18-1/4	21-1/4	20	17-1/2	20	9-7/8	3	145
15	22	25	24-1/2	22	23-3/4	11-3/4	3	163
16	24	27	25-1/2	23	25-3/4	8-1/2	4	171
18	26-5/8	29-5/8	26-5/8	24-1/8	28-3/8	9-3/8	4	203
20	29-1/4	32-1/4	29-1/4	26-5/8	31	10-1/4	4	218
22	32	35	32	29-1/2	33-3/4	11-1/4	4	389
24	35-1/2	38-1/2	35-1/2	33	37-1/4	9-1/4	5	415
27	39	42	39	36-1/2	40-3/4	10-1/8	5	596
30	43	46	43	40-1/2	44-3/4	11-1/8	5	643
33	47-1/4	50-1/4	47-1/4	44-3/4	49	9-3/4	6	866

All dimensions in inches and weight is shown in pounds. [^]Weight shown is standard galvanized construction and largest cataloged totally enclosed motor. Dimensions A and B are same for height and width.

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 structural supports.

Typical Installation

Mounting Options

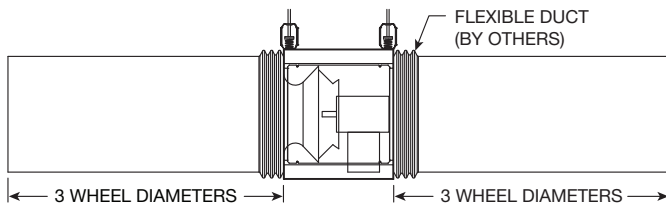
Mounting position allows fan to be installed for vertical or horizontal airflow. In addition, the fan can be rotated 90 degrees either direction (access doors on the bottom and top). Isolation is recommended.



IMPORTANT: Flex duct is recommended for mounting to the inlet of the fan to allow for fitting adjustments. If the inlet cone (venturi) requires adjustment, it can be detached from the unit via the fasteners located on the inlet panel.

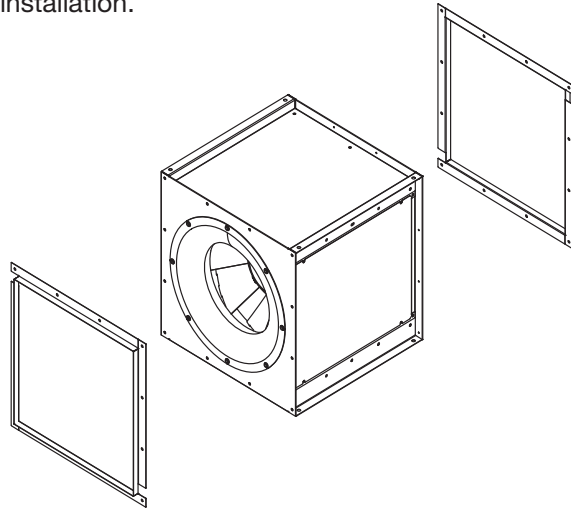


IMPORTANT: The inlet and outlet duct should have approximately three wheel diameters of straight duct before and after the fan to achieve cataloged performance.

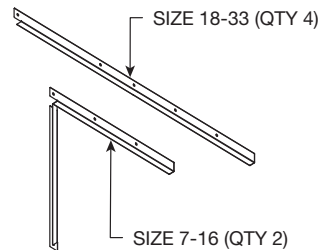


Square Duct Mounting Collars

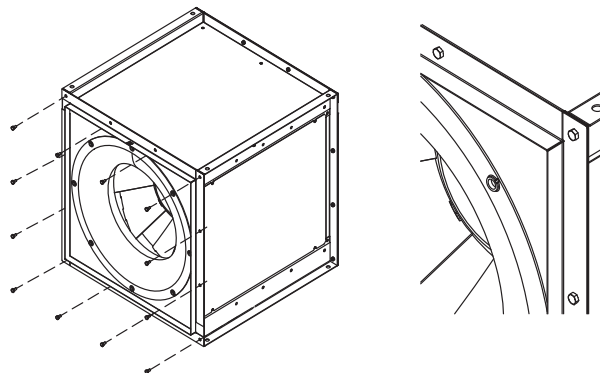
Inlet and outlet square duct mounting collars are provided for easy slip fit duct connection. Square duct mounting collars are shipped separate for field installation.



1. Square duct adapter will come in 2 piece or 4 piece designs per inlet/outlet depending on unit size . See Side Discharge on page 5, Step 3 for details on mounting left and right discharge square duct mounting collars.



- SQ-7 to SQ-16 will consist of 2 pieces per inlet/outlet
 - SQ-18 to SQ-33 will consist of 4 pieces per inlet/outlet
2. Mount square duct adapter to inlet and/or outlet using appropriate number of flange pieces and 5/16 inch semi-gimlet fasteners provided in hardware kit (no nuts required).



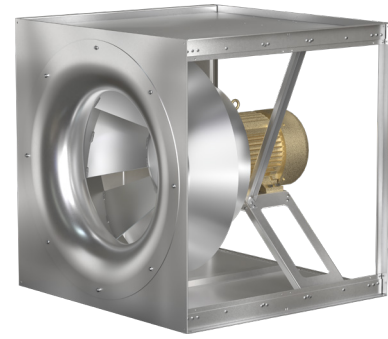
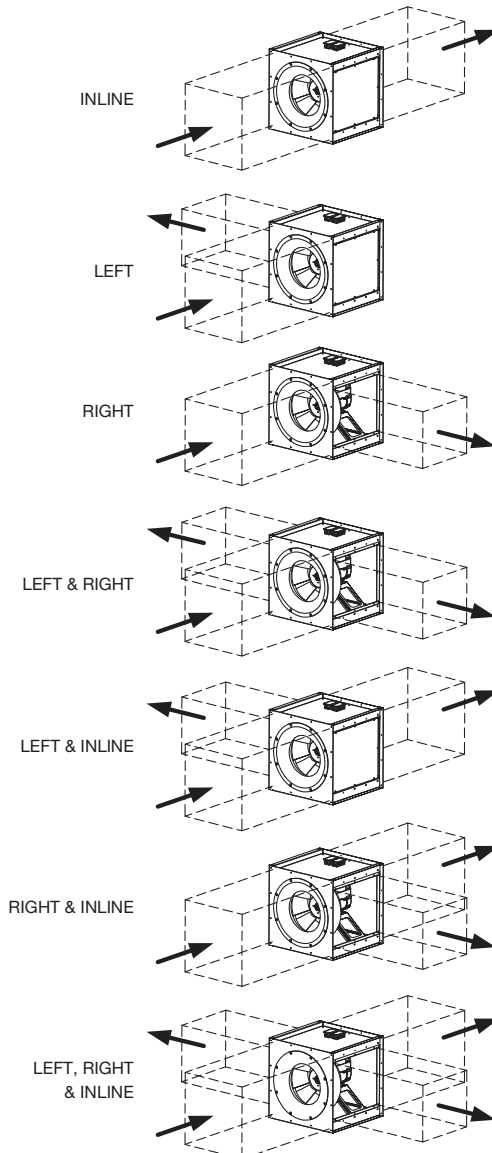
3. Repeat previous step for outlet of fan.
4. Tighten to 132 in-lbs (11 ft-lbs) 1/2 inch socket. **Do not over-tighten.**

Side Discharge

Fans are configurable with a variety of discharge options - inline, left, right or any combination of the three. This option can help to reduce system effect the overall footprint of the ductwork.

Side Discharge (R&L) Outlet Dimensions

Size	Width (In.)	Height (In.)
7	11-1/4	6-3/4
9	13-1/4	10-1/8
12	16-3/4	13-1/4
15	21-1/4	17
16	22-1/4	19
18	23-3/8	21-5/8
20	26	24-1/4
22	28-3/4	27-1/8
24	32-1/2	30-1/2
27	35-3/4	34
30	39-3/4	38
33	44	42-3/8

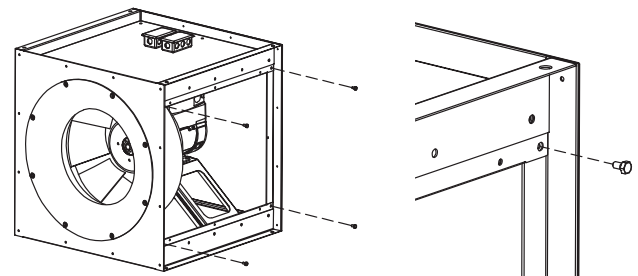


STEP 1 - Remove Access Door(s)

1. Determine the proper discharge configuration based on application and how the fan was ordered from the factory (see to the right).
2. Use an Impact driver and a 1/2 inch socket to remove the 5/16 inch fasteners and access door(s) on left and/or right side of unit if airflow is desired in that direction.
3. The number of access doors and fasteners will change depending on unit size.
4. Save all fasteners from access door to install duct work or square duct adapter flanges.
5. Left and Right discharges will have a blank off panel installed on the inline discharge of the unit.
6. **Do not power up fan without removing at least one discharge panel.**

STEP 2 - Remove Housing Fasteners

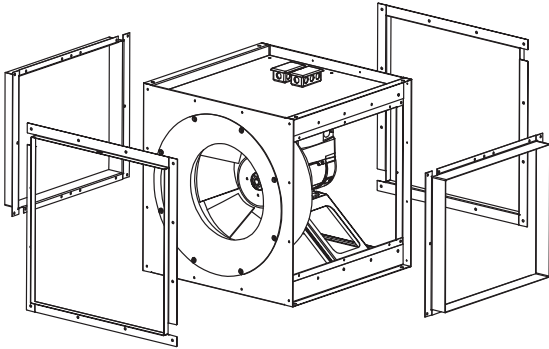
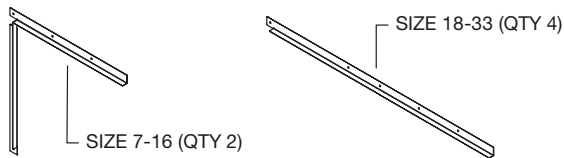
1. Remove (4) additional 5/16 inch fasteners per side on the left and/or right sides of the unit to allow installation of duct work or square duct adapter flanges (see below).
2. Save all fasteners to install duct work or square duct adapter flanges.



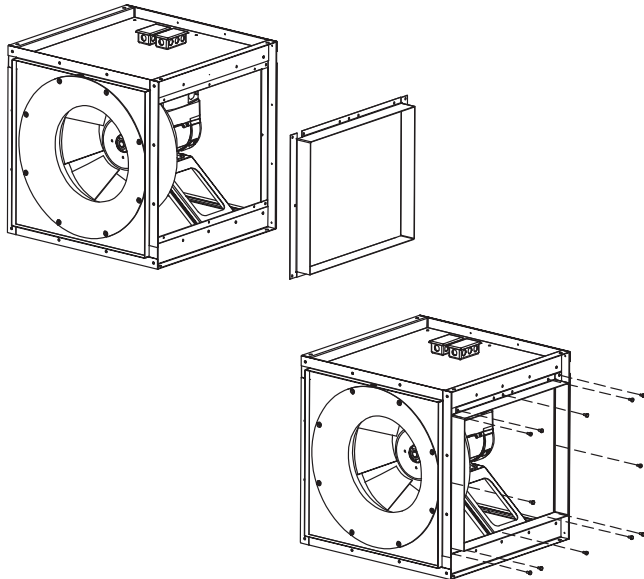
STEP 3 (Optional) - Mount Square Duct Mounting Collars

1. If purchased, square duct adapter flanges are provided for the specific discharge configuration that was ordered (Inline, Left, Right, Left & Right, Left and Inline, Right and Inline, or Left, Right & Inline).

- Square duct adapter will come in (2) or (4) piece designs depending on unit size (see below).



- Mount square duct adapters to inlet and outlet(s) depending on discharge configuration using appropriate number of flange pieces and 5/16 semi-gimlet fasteners removed in Steps 1 and 2.
- Reinstall fasteners that were removed in Step 2 in the corners of the left and right discharge flanges, not doing so will void warranty and could lead to structural issues with the fan.**

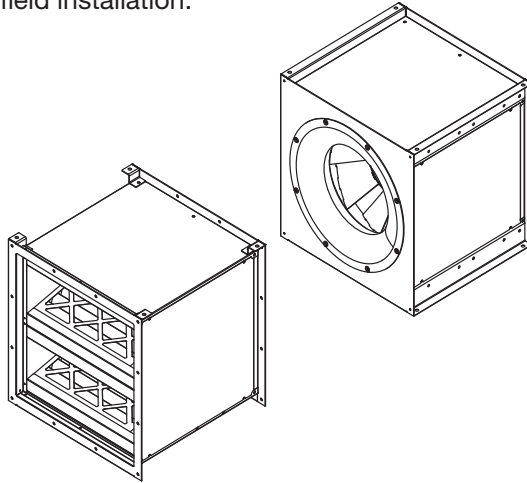


STEP 4 - Install Ductwork to Fan

- Using holes on inlet and outlet(s) or using square duct adapter flanges, mount ductwork to fan in all desired locations.
- For Left and Right discharges reuse the 5/16 inch semi-gimlet fasteners removed in Steps 1 and 2.
- Reinstall fasteners that were removed in Step 2 in the corners of the left and right discharge flanges, not doing so will void warranty and could lead to structural issues with the fan.
- Hardware for the inlet and Inline discharge is supplied by the others.

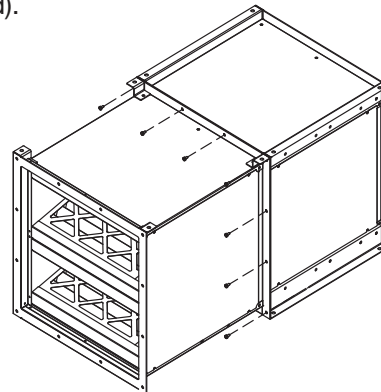
Filtration

The filter box is designed to provide a compact and convenient clean air solution while eliminating the costly process of designing, fabricating, and installing custom filter assemblies. The filter section features removable access panels on both sides, allows for simple and fast filter maintenance. The filter box is shipped separate for field installation.



STEP 1 - Mount Filter Section to Fan

- Filter section and fan have "Airflow" decals on the exterior of the units, ensure the arrows are aligned with the airflow.
- Mount the filter section to the inlet of the fan using appropriate number of provided 5/16 inch semi-gimlet fasteners provided in hardware kit (no nuts required).

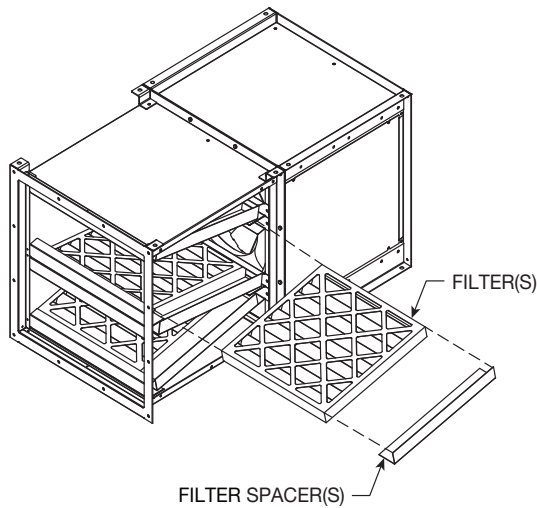


- Tighten to 132 in-lbs (11 ft-lbs) with 1/2 inch socket. **Do not over-tighten.**
- Fan sizing and performance is designed for the filter section to be mounted directly to the INLET of the fan.



STEP 2 - Filter Replacement and Cleaning

Follow filter replacement and or cleaning intervals recommended by filter supplier.



1. Remove access door using 1/2 inch socket. It is only necessary to remove one access door to replace filters.
2. Remove filter spacers and dirty filters.
3. Install new filters in unit and replace filter spacers. Ensure filters are installed in correct orientation for proper airflow (marked on filters). Locate spacers towards the outside of the unit to reduce any unnecessary blockage in airflow.
4. Reinstall access door using 1/2 inch socket, torque to 132 in·lbs (11 ft·lbs). **Do not over-tighten.**

Outdoor Cover

The outdoor cover can be applied to any ducted horizontal base mount outdoor application. UL/cUL 705 listed for outdoor use. The components for this kit are shipped separate from the fan for field installation.

STEP 1 - Mount Unit to Structure

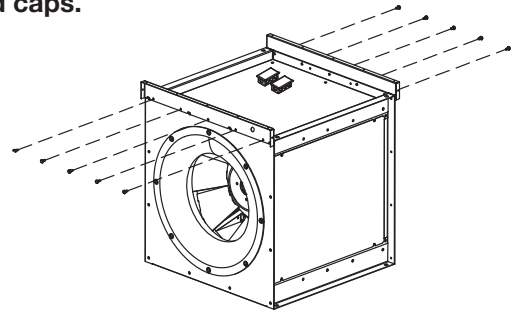
1. Place unit in desired location and mount to structure (outdoor units are horizontal base mount only).

STEP 2 - Install Ductwork to Fan

1. Using holes on inlet and outlet, mount ductwork to fan (hardware supplied by others).

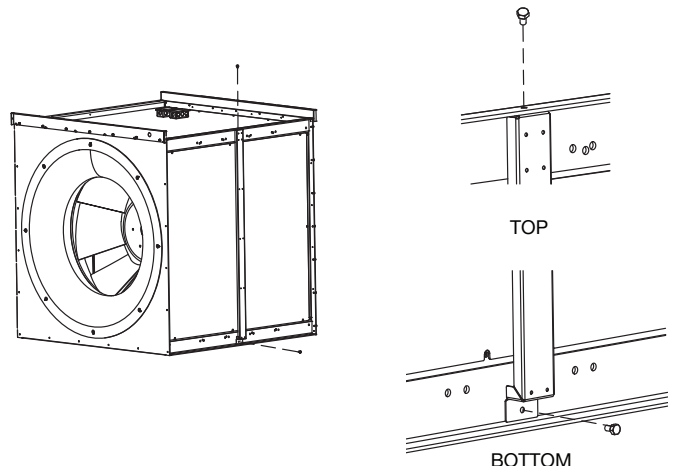
STEP 3 - Install End Caps

1. Locate the end cap that has a 7/8 inch conduit hole, this is for running power to the fan.
2. Determine which side of the unit (inlet or outlet) the power will be run through.
3. With the flanges away from the fan, mount the end cap with conduit hole to the top of the inlet or outlet depending on where the power will be run, use provided self-tapping sheet metal screws and 5/16 inch impact driver. **Do not over-tighten.**
4. Install remaining plate on opposite side (inlet or outlet) using provided self-tapping sheet metal screws and 5/16 inch impact driver. **Do not over-tighten.**
5. **Take care not to damage the foam tape on end caps.**



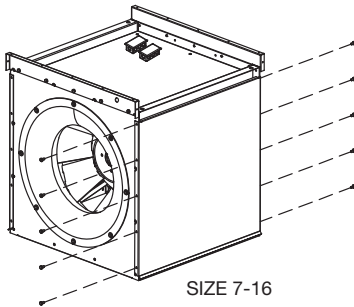
STEP 4 (Sizes 18-33 Only) - Install Side Mullions

1. Install left and right side mullions using (2) self-tapping sheet metal screws per side.

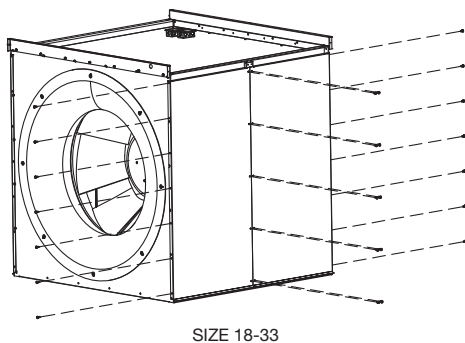


STEP 5 - Install Side Panels

1. Install one side of outdoor cover to fan with drip edge down, use provided self-tapping sheet metal screws and 5/16 inch impact driver.
2. Repeat for opposite side.



3. Sizes 18-33 have (2) panels per side, they are fastened to the mullion, inlet, and outlet plate.



STEP 6 - Mount Disconnect Switch (if applicable)

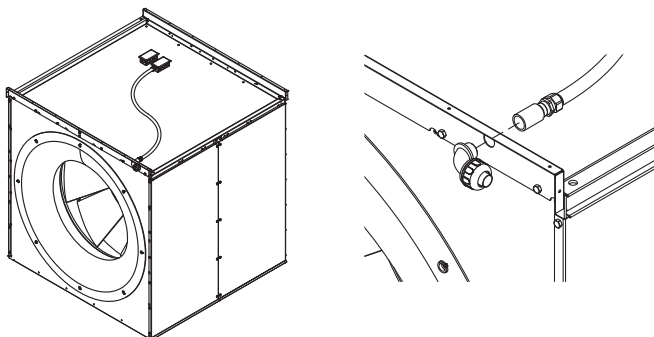
1. Determine ideal location for disconnect switch.
2. Install per disconnect manufacturer's guidelines.

STEP 7 - Install Conduit

1. Connect the provided flexible metal conduit (FMC) and fitting assembly to the junction box with power.
2. Route opposite end of conduit assembly (with female connector) to hole in end cap.
3. Insert liquid-tight connector into hole in end cap and screw into the female connector, as shown below.
4. Cut liquid-tight conduit (supplied by others) to length and install from elbow to disconnect switch or power supply.

STEP 8 - Route Wiring to Junction Box

1. Route wiring from junction box on top of fan to switch through all conduit and fittings.

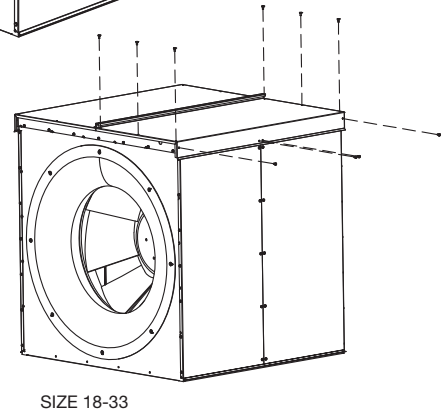
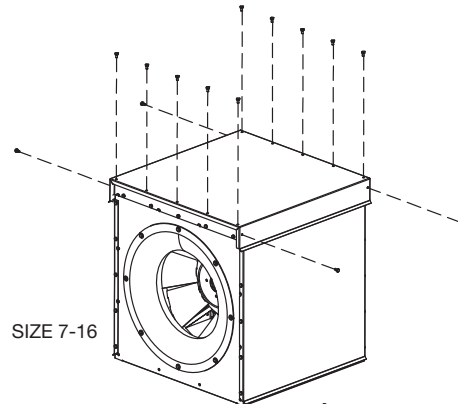


2. Connect wiring to motor leads in junction box on top of the fan, replace the junction box cover.
3. Connect wiring to disconnect or power supply
4. Junction boxes (and "Dial on Fan" if Vari-Green®) on top of the fan are inaccessible when outdoor cover is fully installed.

STEP 9 - Install Top Panel(s)

Size 7-16, install top panel of outdoor cover to fan using provided self-tapping sheet metal screws.

Sizes 18-33, install the first top panel with single return flange using provided self-tapping sheet metal screws (reference number 1 below).



1. Install the second top panel with double return flange by hinging it around the first panel as shown.
2. Use self-tapping sheet metal screws to mount second panel, filling all holes.

NOTE: Take care not to damage the foam tape on these parts.



Pre Start-Up Checks

Before Fan Installation

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 page 10) from the fan shaft so that a straight edge held tight to the wheel cone just touches the inlet cone. Refer to Figure 1.

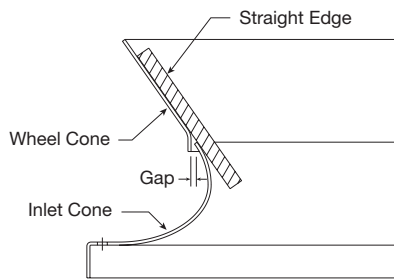


Figure 1

Recommended Fastener Torque

Size	Type	Recommended Torque in-lb (ft-lb)		Application
		Min.	Max.	
#12	Self-Drilling Sheet Metal Screw	25 (2)	30 (2.5)	Outdoor 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 noises 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.

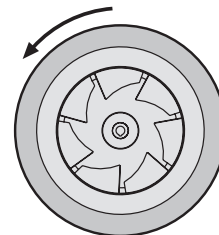


Figure 2

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.

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.

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.

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 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

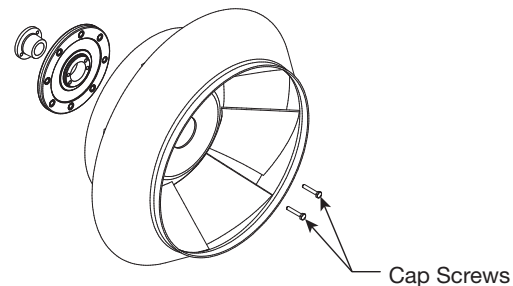


Figure 3

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 9. 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

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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
Excessive noise or vibration	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
	Wheel improperly aligned and rubbing	Center wheel on inlet cone, see Figure 1 (page 9).
	Foreign objects in wheel or housing	Remove objects, check for damage or unbalance.
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. See Operation (page 9), step 4, to correct wheel rotation.
	Excessive dirt buildup on wheel	Clean wheel.
	Improper wheel alignment	Center wheel on inlet cone, see Figure 1 (page 9).

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.

