CV

Centri-Vane® Aluminum Inline and Roof Fans

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

This publication contains the installation, operation and maintenance instructions for standard units of the *CV: Centri-Vane® Aluminum Inline and Roof Fans*.

- CVD
- CVB
- CVR
- CVR-S
- CV/UCV-S
- CVS

Carefully read this publication and any supplemental documents prior to any installation or maintenance procedure.

Loren Cook catalog, *CV*, provides additional information describing the equipment, fan performance, available accessories and specification data.

For additional safety information, refer to AMCA Publication 410-96, *Safety Practices for Users and Installers of Industrial and Commercial Fans*.

All of the publications listed above can be obtained from:

- lorencook.com
- *info@lorencook.com*
- 417-869-6474 ext. 166

For information and instructions on special equipment, contact Loren Cook Company at 417-869-6474.

Receiving and Inspection

Carefully inspect the unit and accessories for any damage and shortage immediately upon receipt of the unit.

- Turn the propeller by hand to ensure it turns freely and does not bind.
- Record on the *Delivery Receipt* any visible sign of damage.

Handling

Lift the fan by the outside housing and support leg.

NOTICE! Never lift by the shaft, motor or housing.

CVB

Storage

If the fan is stored for any length of time prior to installation, store it in its original shipping crate and protect it from dust, debris and weather.

⚠WARNING

Rotating Parts & Electrical Shock Hazard:

Fans should be installed and serviced by qualified personnel only.

Disconnect electric power before working on unit (prior to removal of guards or entry into access doors).

Follow proper lockout/tagout procedures to ensure the unit cannot be energized while being installed or serviced.

A disconnect switch should be placed near the fan in order that the power can be swiftly cut off, in case of an emergency and in order that maintenance personnel are provided complete control of the power source.

Grounding is required. All field-installed wiring must be completed by qualified personnel. All field installed wiring must comply with National Electric Code (NFPA 70) and all applicable local codes.

Fans and blowers create pressure at the discharge and vacuum at the inlet. This may cause objects to get pulled into the unit and objects to be propelled rapidly from the discharge. The discharge should always be directed in a safe direction and inlets should not be left unguarded. Any object pulled into the inlet will become a projectile capable of causing serious injury or death.

When air is allowed to move through a non-powered fan, the impeller can rotate, which is referred to as windmilling. Windmilling will cause hazardous conditions due to unexpected rotation of components. Impellers should be blocked in position or air passages blocked to prevent draft when working on fans.

Friction and power loss inside rotating components will cause them to be a potential burn hazard. All components should be approached with caution and/or allowed to cool before contacting them for maintenance.

Under certain lighting conditions, rotating components may appear stationary. Components should be verified to be stationary in a safe manner, before they come into contact with personnel, tools or clothing.

Failure to follow these instructions could result in death or serious injury.

The attachment of roof mounted fans to the roof curb as well as the attachment of roof curbs to the building structure must exceed the structural requirements based on the environmental loading derived from the applicable building code for the site. The local code official may require variations from the recognized code based on local data. The licensed engineer of record will be responsible for prescribing the correct attachment based on construction materials, code requirements and environmental effects specific to the installation.

To maintain good working condition of a CV when it is stored outdoors, or on a construction site, follow the additional steps below:

- Cover the inlet and outlet, and belt tunnel opening to prevent the accumulation of dirt and moisture in the housing
- Periodically rotate the wheel and operate dampers (if supplied) to keep a coating of grease on all internal bearing parts

Installation

To prevent damage to the fan during shipping, motors 5 HP and larger, and extremely heavy motors (cast iron or severe duty) are shipped loose and must be field mounted by bolting the motor on the motor mounting plate in the existing mounting slots.

UCV Fan Installation

The fan support (roof curb) should provide a level surface for installation. If the roof is pitched more than 1/2:12, a sloped curb must be used to correct for the incline. If the unit is installed on a non-level surface, the damper door pivot should be positioned perpendicular to the peak of the roof.

Place fan over roof opening. Secure the fan with lag screws, anchor bolts, or other suitable fasteners.

Wiring Installation

Direct Drive

Wire the electrical box on the blower housing.

Belt Drive

The motor can be wired directly since the motor is external to the fan.

Leave enough slack in the wiring to allow for motor movement when adjusting belt tension. Some fractional motors have to be removed in order to make the connection with the terminal box at the end of the motor. To remove motor, remove bolts securing motor base to power assembly. Do not remove motor mounting bolts.

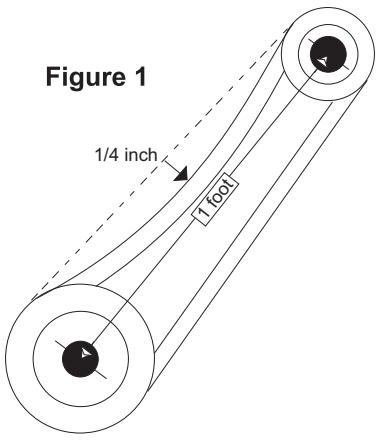
NOTICE! Follow the wiring diagram in the disconnect switch and the wiring diagram provided with the motor. Correctly label the circuit on the main power box and identify the closed switch to promote safety (i.e., red tape over a closed switch).

Belt and Pulley Installation

Belt tension is determined by the sound of the belts when the fan is first started. The belts will produce a loud squeal, which dissipates after the fan is operating at full capacity. If belt tension is too tight or too loose, lost efficiency and damage can occur.

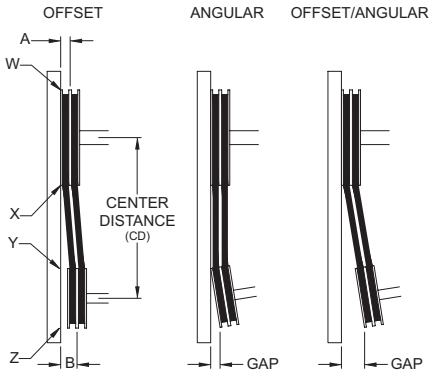
Do not change the pulley pitch diameter to change tension. The change will result in a different fan speed.

Figure 1



1. Loosen the motor plate adjustment nuts on motor base and move motor plate in order that the belts can easily slip into the grooves on the pulleys. Never pry, roll, or force the belts over the rim of the pulley.
2. Adjust the motor plate until proper tension is reached. For proper tension, a deflection of approximately 1/4” per foot of center distance should be obtained by firmly pressing the belt. See *Figure 3*.
3. Lock the motor plate adjustment nuts in place.
4. Ensure pulleys are properly aligned. See *Pulley Alignment*.

Figure 2



Tolerance

Center Distance	Maximum Gap
Up thru 12”	1/16”
12” up through 48	1/8”
Over 48”	1/4”

Pulley Alignment

Pulley alignment is adjusted by loosening the motor pulley setscrew and by moving the motor pulley on the motor shaft.

Figure 2 indicates where to measure the allowable gap for the drive alignment tolerance. All contact points (indicated by WXYZ) are to have a gap less than the tolerance shown in the above *Tolerance* table.

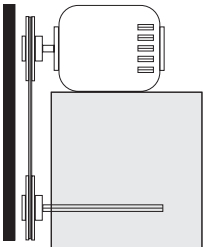


Figure 3

When the pulleys are not the same width, the allowable gap must be adjusted by half of the difference in width. *Figure 3* illustrates using a carpenter’s square to adjust the position of the motor pulley until the belt is parallel to the longer leg of the square.

Final Installation Steps

1. Inspect fasteners and setscrews, particularly fan mounting and bearing fasteners, and tighten according to the recommended torque shown in the table below, *Recommended Torque for Setscrews/Bolts*.
2. Inspect for correct voltage with voltmeter.
3. Ensure all accessories are installed.
4. Test the fan to be sure the rotation is the same as indicated by the arrow marked *Rotation*.

Wheel Rotation

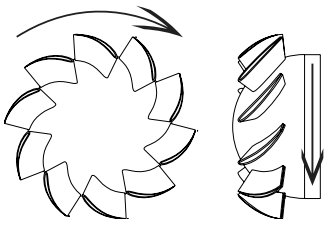
Test the fan to ensure the rotation of the wheel is the same as indicated by the arrow marked *Rotation*.

115 and 230 Single Phase Motors

Fan wheel rotation is set correctly at the factory. Changing the rotation of this type of motor should only be attempted by a qualified electrician.

208, 230, and 460, 3 Phase Motors

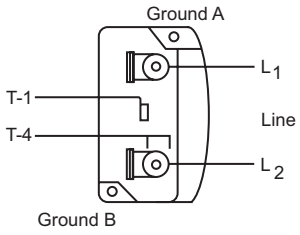
These motors are electrically reversible by switching two of the supply leads. For this reason, the rotation of the fan cannot be restricted to one direction at the factory. See *Wiring Diagrams* for specific information on reversing wheel direction.



NOTICE! Do not allow the fan to run in the wrong direction. This will overheat the motor and cause serious damage. For 3-phase motors, if the fan is running in the wrong direction, check the control switch. It is possible to interchange two leads at this location so that the fan is operating in the correct direction.

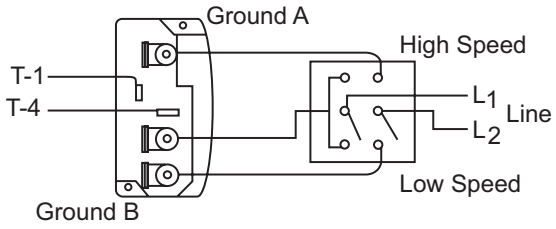
Wiring Diagrams

Single Speed, Single Phase Motor



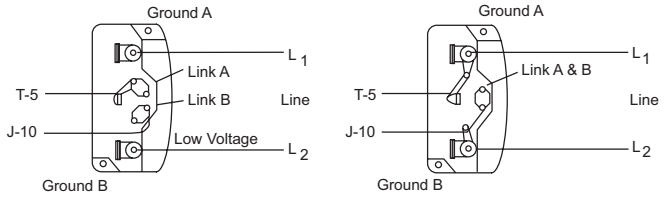
When ground is required, attach to ground A or B with no. 6 thread forming screw. To reverse, interchange T-1 and T-4.

2 Speed, 2 Winding, Single Phase Motor



When ground required, attach to ground A or B with No. 6 thread forming screw. To reverse, interchange T-1 and T-4 leads.

Single Speed, Single Phase, Dual Voltage

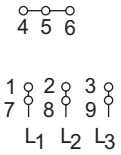


When ground required, attach to ground A or B with No. 6 thread forming screw. To reverse, interchange T-5 and J-10 leads.

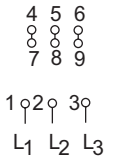
3-Phase, 9 Lead Motor

Y-Connection

Low Voltage 208/230 Volts

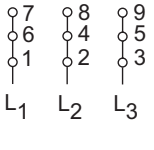


High Voltage 460 Volts

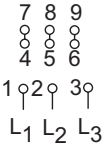


Delta-Connection

Low Voltage 208/230 Volts

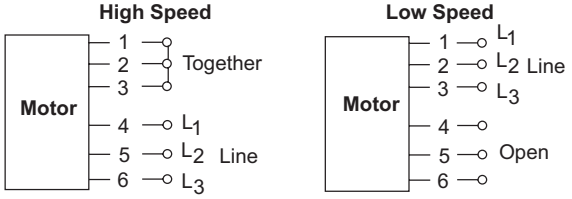


High Voltage 460 Volts



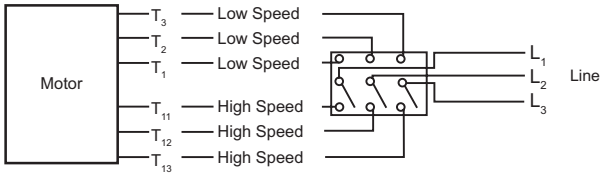
To reverse, interchange any two line leads.

2 Speed, 1 Winding, 3 Phase Motor



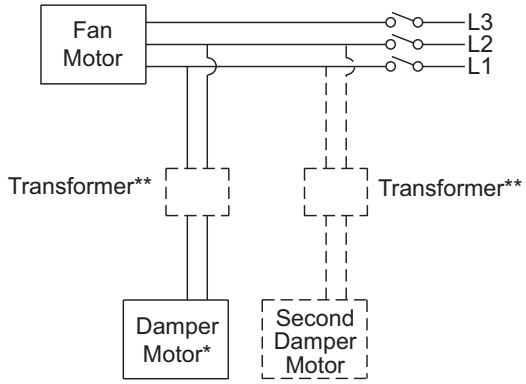
To reverse, interchange any two line leads. Motors require magnetic control.

2 Speed, 2 Winding, 3 Phase



To reverse:
High Speed - interchange leads T_{11} and T_{12}.
Low Speed - interchange leads T_1 and T_2.
Both Speeds - interchange any two line leads.

Typical Damper Motor Schematic



For 3 phase, damper motor voltage should be the same between L_1 and L_2. For single phase application, disregard L_3. *Damper motors may be available in 115, 230 and 460 volt models. The damper motor nameplate voltage should be verified prior to connection. **A transformer may be provided in some installations to correct the damper motor voltage to the specified voltage.

Operation

Pre-Start Checks

1. Lock out all the primary and secondary power sources.
2. Inspect fasteners and setscrews, particularly those used for mounting the unit, and tighten if necessary.
3. Inspect belt tension and pulley alignment. (Remember, if belt tension is correct, a loud squeal occurs as the fan increases to full power.)
4. Inspect motor wiring.
5. Ensure the belt touches only the pulleys.
6. Rotate the prop to ensure it does not rub against the venturi.
7. Ensure fan and ductwork are clean and free of debris.
8. Test the fan to ensure the rotation of the propeller is the same as indicated by the rotation label.
9. Close and secure all access doors.
10. Restore power to unit.

Start Up

Turn the fan on. In variable speed units, set the fan to its lowest speed. Inspect for the following:

- Direction of rotation
- Excessive vibration
- Unusual noise
- Bearing noise
- Improper belt alignment or tension (listen for a continuous squealing noise)
- Improper motor amperage or voltage

NOTICE! If a problem is discovered, immediately shut off the fan. Lock out all electrical power and check for the cause of the trouble. Refer to Troubleshooting.

Inspection

Inspection of the fan should be conducted at the first **30 minute**, **8 hour** and **24 hour** intervals of satisfactory operation. During the inspections, stop the fan and inspect as per the following directions.

30 Minute Interval

Inspect bolts, setscrews, and motor mounting bolts. Adjust and tighten as necessary.

8 Hour Interval

Inspect belt alignment and tension. Adjust and tighten as necessary.

24 Hour Interval

Inspect belt tension. Adjust and tighten as necessary.

Maintenance

Establish a schedule for inspecting all parts of the fan. The frequency of inspection depends on the operating conditions and location of the fan.

Inspect fans exhausting corrosive or contaminated air within the first month of operation. Fans exhausting contaminated air (airborne abrasives) should be inspected every three months. Clean the propeller and air inlets if material build-up is excessive. Excessive build-up can cause imbalance and failure of the propeller. Regular inspections are recommended for fans exhausting non-contaminated air. **It is recommended the following inspections be conducted twice per year.**

- Inspect bolts and setscrews for tightness. Tighten as necessary
- Inspect belt wear and alignment. Replace worn belts with new belts and adjust alignment as needed. See *Belt and Pulley Installation*, page 2
- Bearings should be inspected as recommended in the Conditions Chart
- Inspect for cleanliness. Clean exterior surfaces only. Removing dust and grease on motor housing assures proper motor cooling

Lubricants

Loren Cook Company uses petroleum lubricant in a lithium base conforming to NLGI grade 2 consistency. Other grades of grease should not be used unless the bearings and lines have been flushed clean. If another grade of grease is used, it should be lithium-based.

An NLGI grade 2 grease is a light viscosity, low-torque, rust-inhibiting lubricant that is water resistant. Its temperature range is from -30°F to +200°F and capable of intermittent highs of +250°F.

Fan Bearings

The fan bearings are provided prelubricated. Any specialized lubrication instructions on fan labels supersedes information provided herein. Bearing grease is a petroleum lubricant in a lithium base conforming to an NLGI #2 consistency. If user desires to utilize another type of lubricant, they take responsibility for flushing bearings and lines, and maintaining a lubricant that is compatible with the installation.

An NLGI #2 grease is a light viscosity, low-torque, rust-inhibiting lubricant that is water resistant. Its temperature range is from -30°F to 200°F and capable of intermittent highs of 250°F.

Bearings should be relubricated in accordance with the conditions chart below.

Conditions Chart

RPM	Temp °F	Greasing Interval
Up to 1000	-30 to 120	6 months
	120 to 200	2 months
1000 to 3000	-30 to 120	3 months
	120 to 200	1 month
Over 3000	-30 to 120	1 month
	120 to 200	2 weeks
Any Speed	< -30	Consult Factory
Any Speed	> 200	1 week

For moist or otherwise contaminated installations; divide the interval by a factor of three. For vertical shaft installations divide the interval by a factor of two.

For best results, lubricate the bearing while the fan is in operation. Pump grease in slowly until a slight bead forms around the bearing seals. Excessive grease can damage seal and reduce life through excess contamination and/or loss of lubricant.

In the event that the bearing cannot be seen, use no more than three injections with a hand operated grease gun.

Motor Bearings

Motors are provided with prelubricated bearings. Any lubrication instructions shown on the motor nameplate supersede instructions below.

Direct Drive 1050/1075, 1200, 1300 & 1500 RPM units use a prelubricated sleeve bearing that has a oil saturated wicking material surrounding it. The initial factory lubrication is adequate for up to 10 years of operation under normal conditions. However, it is advisable to add lubricant after three years. Use only LIGHT grade mineral oil or SAE 10W oil up to 30 drops.

If the unit has been stored for a year or more it is advisable to lubricate as directed above. For units in severe conditions, lubrication intervals should be reduced to half.

Motors without sleeve bearings (as described above) will have grease lubricated ball or roller bearings. Motor bearings without provisions for relubrication will operate up to 10 years under normal conditions with no maintenance. In severe applications, high temperatures or excessive contaminates, it is advisable to have the maintenance department disassemble and lubricate the bearings after 3 years of operation to prevent interruption of service.

For motors with provisions for relubrication, follow intervals of the table below.

Relubrication Intervals

Service Conditions	Nema Frame Size					
	Up to and Including 184T		213T-365T		404T and Larger	
	1800 RPM and Less	Over 1800 RPM	1800 RPM and Less	Over 1800 RPM	1800 RPM and Less	Over 1800 RPM
Standard	3 yrs.	6 months	2 yrs.	6 months	1 yr.	3 months
Severe	1 yr.	3 months	1 yr.	3 months	6 months	1 month

Motors are provided with a polyurea mineral oil NGLI #2 grease. All additions to the motor bearings are to be with a compatible grease such as Exxon Mobil Polyrex EM and Chevron SRI.

The above intervals should be reduced to half for vertical shaft installations.

Motor Services

Should the motor prove defective within a one-year period, contact your local Loren Cook representative or your nearest authorized electric motor service representative.

Changing Shaft Speed

All belt driven Propeller Wall fans with motors up to and including 5 HP are equipped with variable pitch pulleys. To change the fan speed, perform the following:

1. Loosen setscrew on driver (motor) pulley and remove key, if equipped.
2. Open or close the groove facing to change the pitch diameter.

Speed Reduction

Open the pulley in order that the belt rests deeper in the groove.

Speed Increase

Close the pulley in order that the belt rests higher in the groove. Ensure RPM limits of the fan and the horsepower limits of the motor are maintained.

3. Retighten pulley setscrew on one of the flat areas of the motor shaft.
4. After the adjustment is made, check for proper belt tension. See the *Belt and Pulley Installation* section.

Pulley and Belt Replacement

1. Remove pulleys from their respective shafts.
2. Clean the motor and fan shafts.
3. Clean bores of pulleys and coat the bores with heavy oil.
4. Remove grease, rust, or burrs from the pulleys.
5. Clean the bores of the pulleys and place a light coat of oil on the bores.
6. Remove burrs from shaft by sanding.
7. Place fan pulley on fan shaft and motor pulley on its shaft.

   Do not hammer the pulleys onto the shafts because this may damage the bearings.
8. Tighten in place.
9. Install belts on pulleys and align as described in the *Belt and Pulley Installation* section.

Recommended Torque for Setscrews/Bolts (IN-LB)

Setscrews				Hold Down Bolts	
Size	Key Hex Across Flats	Recommended Torque		Size	Recommended Torque
		Min.	Max.		
#8	5/64”	15	21	3/8”-16	324
#10	3/32”	27	33	1/2”-13	780
1/4	1/8“	70	80	5/8”-11	1440
5/16	5/32”	140	160	3/4”-10	2400
3/8	3/16”	250	290	7/8”-9	1920
7/16	7/32”	355	405	1”-8	2700
1/2	1/4“	560	640	1-1/8”-7	4200
5/8	5/16”	1120	1280	1-1/4”-7	6000
3/4	3/8”	1680	1920	-	-
7/8	1/2”	4200	4800	-	-
1	9/16”	5600	6400	-	-

Bearing Replacement

The fan bearings are flange ball bearings.

1. Loosen the motor plate adjustment bolts, then slide the motor plate so the belt will easily slip off.
2. Remove the driven pulley by loosening the setscrew.
3. Separate the outer housing halves.
4. Remove wheel, then loosen the setscrews on the hub that holds the shaft and remove the hub plate. (Refer to hub removal instructions below.)
5. Remove the bolts next to the straightening vanes and pull the inner housing out.
6. Loosen the bearing setscrews and hold-down bolts, then slide shaft out.
7. Sand the burrs on the shaft where the setscrews were located.
8. Slide new bearings onto the shaft to the desired location and loosely mount bearings onto the bearing support. Bearing bolts and setscrews should be loose enough to allow shaft positioning.
9. Replace the hub plate and wheel, align properly and then tighten bearing hold-down bolts securely to the bearing supports.
10. Align setscrews bearing to bearing and secure tightly to the shaft.

Never tighten both pairs of setscrews before securing bearing mounting bolts. This may damage the shaft.

11. Reassemble the unit.
12. Inspect the wheel position again. If necessary, readjust by loosening the bearing bolts and setscrews and repeat from step 5.

Hub Removal

1. Drill two 1/4” diameter holes, 180° apart centered approximately between the shaft and the outside diameter of the hub, 3/8” to 1/2” in depth.
2. Tap 1/4” holes to 5/16” thread with a 5/16” hole tap. Do not drill or tap greater than recommended.
3. Screw the puller arms to the full depth of the threads into the tapped holes. Align center of the puller with the center of the shaft. Ensure all setscrews in the hub, normally two, are fully removed.
4. Slowly remove wheel from the shaft.

Recommended Puller

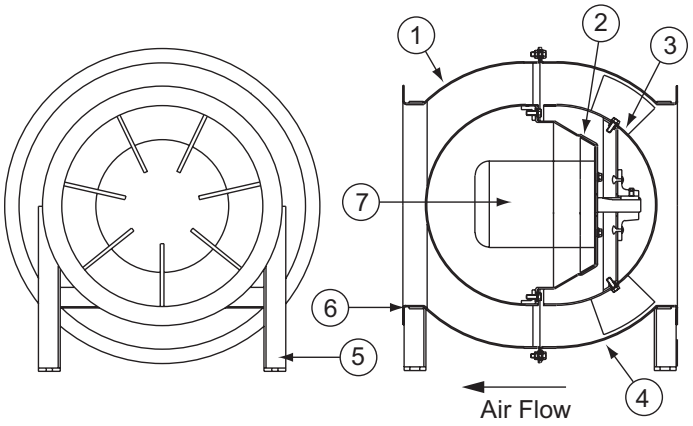
Lisle No. 45000 Steering Wheel Puller. This puller is available at most automotive parts retail outlets.

Troubleshooting

Problem and Potential Cause
Low Capacity or Pressure: • Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly • Poor fan inlet conditions. There should be a straight clear duct at the inlet • Improper wheel alignment
Excessive Vibration and Noise: • Damaged or unbalanced wheel • Belts too loose; worn or oily belts • Speed too high • Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly • Bearings need lubrication or replacement • Fan surge
Overheated Motor: • Motor improperly wired • Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or belt drive assembly • Cooling air diverted or blocked • Improper inlet clearance • Incorrect fan RPMs • Incorrect voltage
Overheated Motor: • Improper bearing lubrication • Excessive belt tension

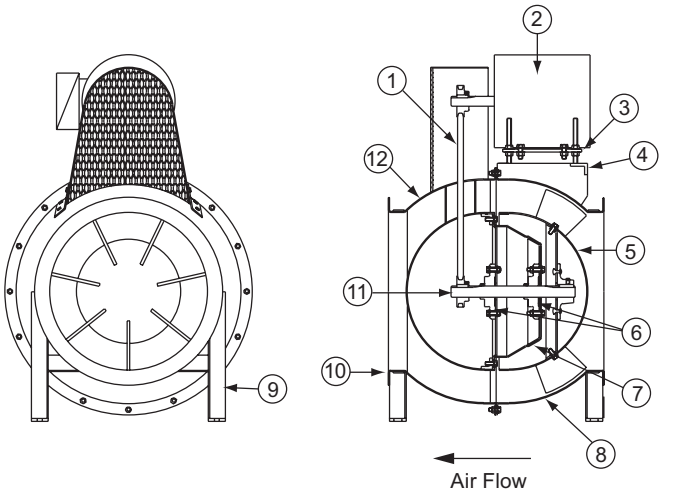
Parts List

CVD



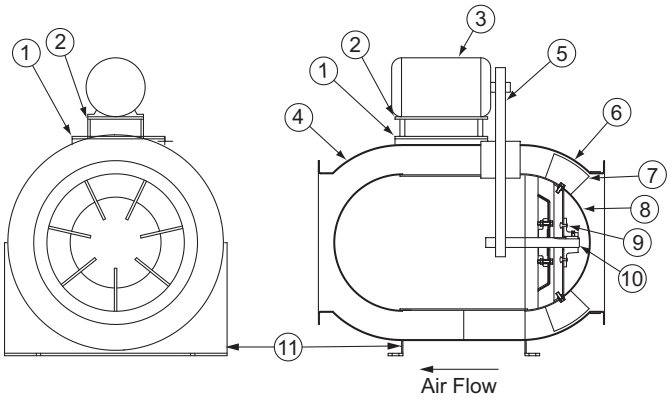
Part No.	Part Description (Sizes 70-180)
1	Outer Discharge Housing
2	Motor Plate
3	Wheel Assembly
4	Outer Inlet Housing
5	Support Leg
6	Rubber Channel Isolator
7	Motor

CVB



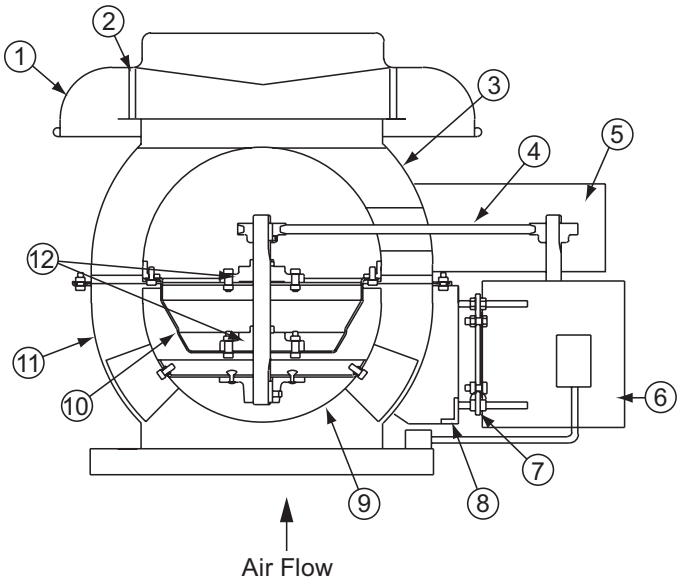
Part No.	Part Description (Sizes 12-36)
1	Belt Set
2	Motor
3	Motor Plate
4	Motor Plate Saddle
5	Wheel Assembly
6	Bearings
7	Bearing Plate
8	Outer Inlet Housing
9	Support Legs
10	Rubber Channel Isolator
11	Shaft
12	Outer Discharge Housing

CVS



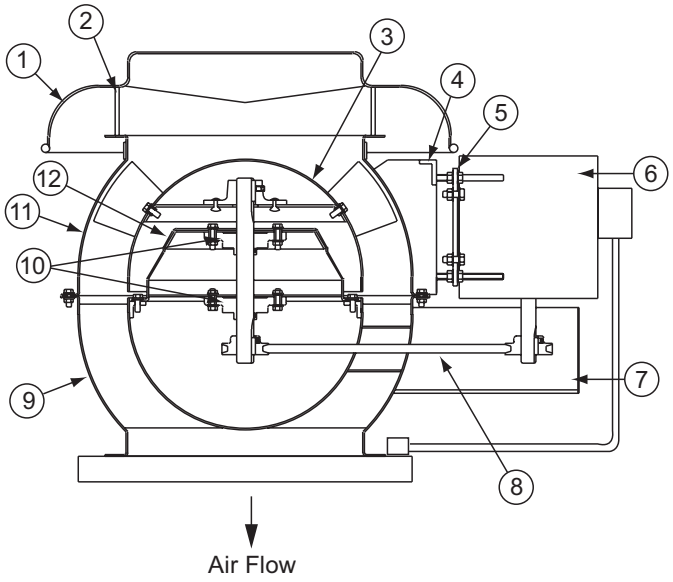
Part No.	Part Description (Sizes 12-36)
1	Belt Set
2	Motor Plate
3	Motor
4	Outer Discharge Housing
5	Belt
6	Outer Inlet Housing
7	Wheel Assembly
8	Hub
9	Bearings
10	Shaft
11	Mounting Feet

CVR



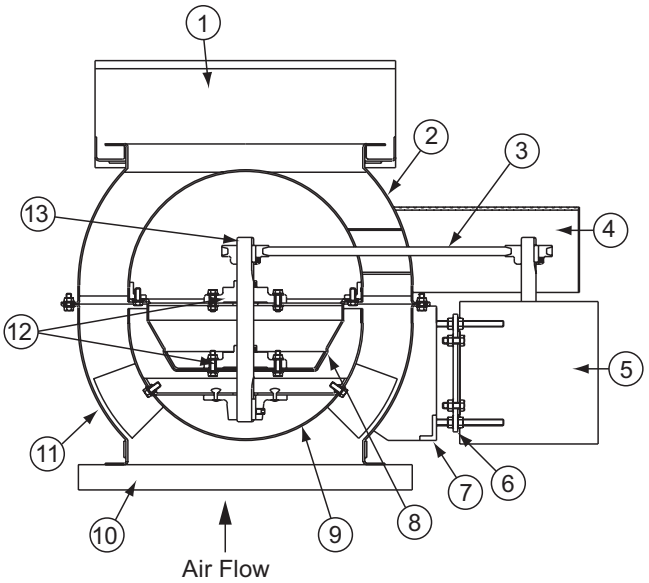
Part No.	Part Description (Sizes 10-36)
1	Topcap Assembly
2	Post
3	Outer Discharge Housing
4	Belt Set
5	Belt Guard
6	Motor
7	Motor Plate
8	Motor Plate Saddle
9	Wheel Assembly
10	Bearing Plate
11	Outer Inlet Housing
12	Bearings

CVR-S



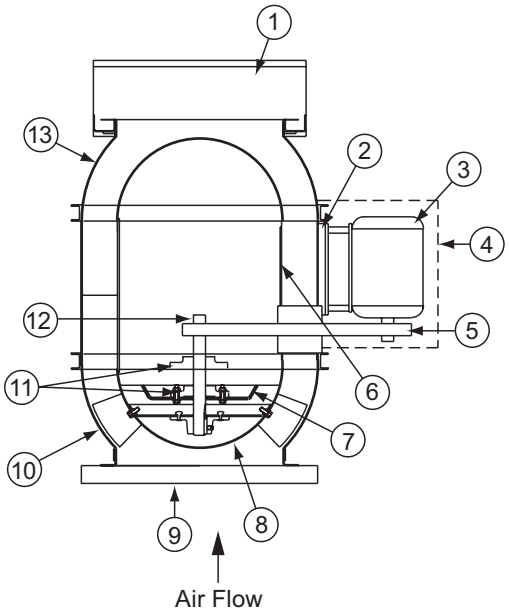
Part No.	Part Description (Sizes 10-36)
1	Topcap Assembly
2	Post
3	Wheel Assembly
4	Motor Plate Saddle
5	Motor Plate
6	Motor
7	Belt Guard
8	Belt Set
9	Outer Discharge Housing
10	Bearings
11	Outer Inlet Housing
12	Bearing Plate

UCV



Part No.	Part Description (Sizes 10-36)
1	Damper Assembly
2	Outer Discharge Housing
3	Belt Set
4	Belt Guard
5	Motor
6	Motor Plate
7	Motor Plate Saddle
8	Bearing Plate
9	Wheel Assembly
10	Base
11	Outer Inlet Housing
12	Bearings
13	Shaft

UCV-S



Part No.	Part Description (Sizes 10-36)
1	Damper Assembly
2	Motor Plate Mount
3	Motor
4	Weather Cover
5	Belt Set
6	Main Housing
7	Bearing Plate
8	Wheel Assembly
9	Base
10	Outer Inlet Housing
11	Bearings
12	Shaft
13	Outer Discharge Housing

Limited Warranty

Loren Cook Company warrants that your Loren Cook fan was manufactured free of defects in materials and workmanship, to the extent stated herein. For a period of five (5) year after date of shipment, we will replace any parts found to be defective without charge, except for shipping costs which will be paid by you. This warranty is granted only to the original purchaser placing the fan in service. This warranty is void if the fan or any part thereof has been altered or modified from its original design or has been abused, misused, damaged or is in worn condition or if the fan has been used other than for the uses described in the company manual. This warranty does not cover defects resulting from normal wear and tear. To make a warranty claim, notify Loren Cook Company, General Offices, 2015 East Dale Street, Springfield, Missouri 65803-4637, explaining in writing, in detail, your complaint and referring to the specific model and serial numbers of your fan. Upon receipt by Loren Cook Company of your written complaint, you will be notified, within thirty (30) days of our receipt of your complaint, in writing, as to the manner in which your claim will be handled. If you are entitled to warranty relief, a warranty adjustment will be completed within sixty (60) business days of the receipt of your written complaint by Loren Cook Company. This warranty gives only the original purchaser placing the fan in service specifically the right. You may have other legal rights which vary from state to state.

LOREN COOK COMPANY

Corporate Offices: 2015 E. Dale St. Springfield, MO 65803

Phone 417-869-6474 | Fax 417-862-3820 | lorencook.com