

# M.K. **Plastics** CORPORATION **AXIJET®** High Plume Exhaust

## INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

This publication contains the installation, operation and maintenance instructions for standard units of the AXIJET – High Plume Exhaust Systems:

- Steel Axijets, model Axijet-S size 1825 through 7300
- FRP Axijets, model Axijet-F size 1225 through 4900

MK Plastics catalog on AXIJET® High Plume Exhaust Systems provides additional information describing the equipment, fan performance, available accessories, and specifications.

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

### Receiving and Inspection

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

- Turn the wheel by hand to ensure it turns freely and does not bind.
- Inspect the dampers (if supplied) for free operation of all moving parts.

#### WARNING

This unit has rotating parts. Safety precautions should be exercised at all times during installation, operation, and maintenance. **ALWAYS** disconnect power prior to working on fan.

### Handling

Lift the fan by the base or lifting lugs. **Never lift by the shaft, motor, housing or wind band.** See Fig. 1 – Fan Lifting Lug Details.

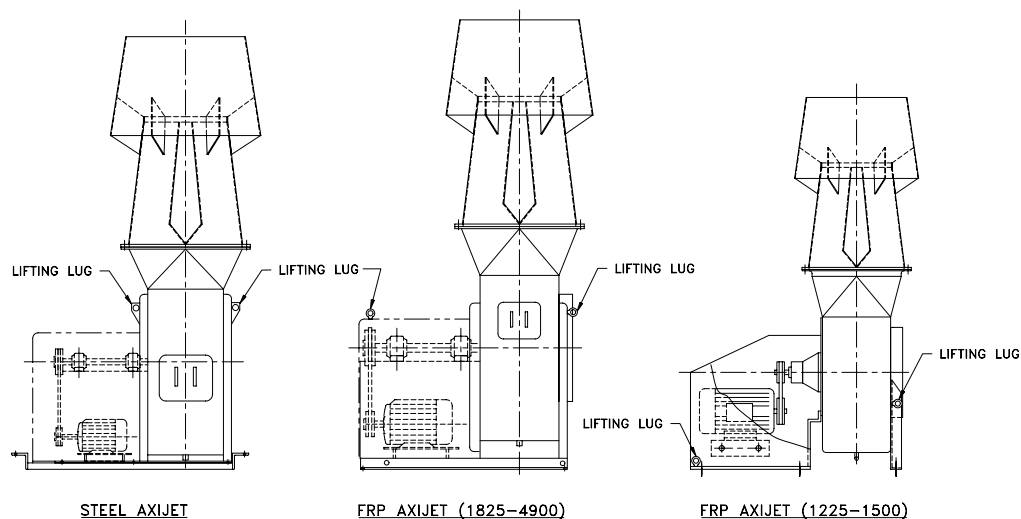
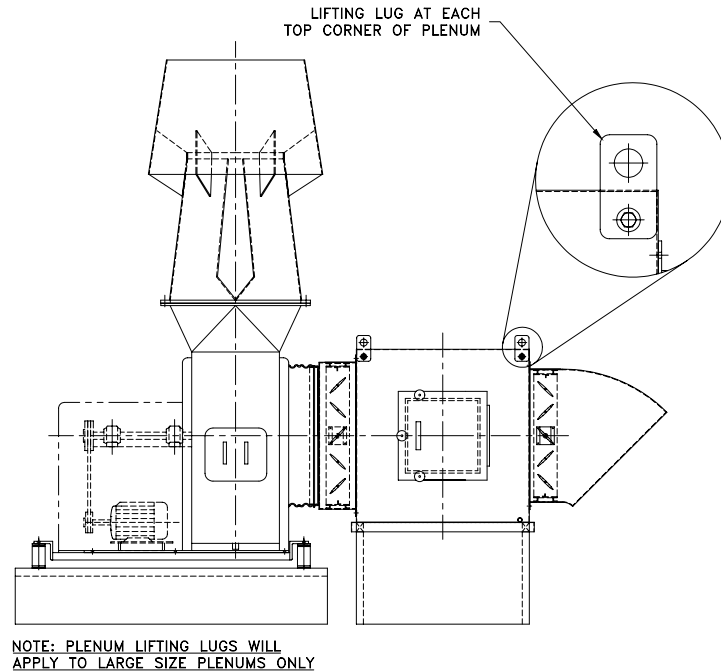


Fig. 1 – Fan Lifting Lug Details

Similar handling precautions must be used for the inlet plenum. **Never lift from the access door handle, outlet drain, and any dampers that might be attached.** Use rigging straps wrapped around the plenum from top to bottom if necessary; larger size plenums will be supplied with lifting lugs or ready to be assembled on the job site. See Fig. 2 – Plenum Lifting Lugs.



**Fig. 2 – Plenum Lifting Lugs**

### Storage

If the fan is stored for any length of time prior to installation, coat the bearings with grease or moisture inhibiting oil (refer to Lubricants on page 11). Rotate the wheel several revolutions every three to five days to keep a coating of grease on all internal bearing parts.

### Outdoor Storage

To maintain good working condition of the fan when it is stored outdoors, follow the additional instructions below.

1. Cover the inlet and outlet to prevent the accumulation of dirt and moisture in the housing.
2. Periodically rotate the wheel and operate dampers (if supplied).
3. Periodically inspect the unit to prevent damaging conditions.

#### Personal Safety

**Disconnect switches are recommended. Place the disconnect switch 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.**

### Installation

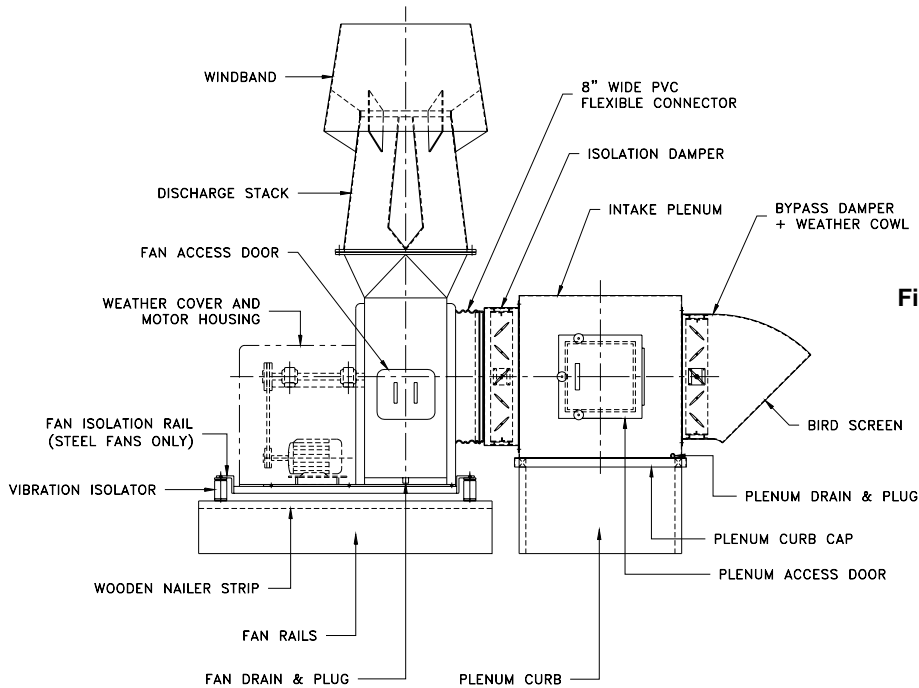
#### Mounting Instructions

MK Plastics can supply Axijet fans with two types of equipment supports (depending upon the application).

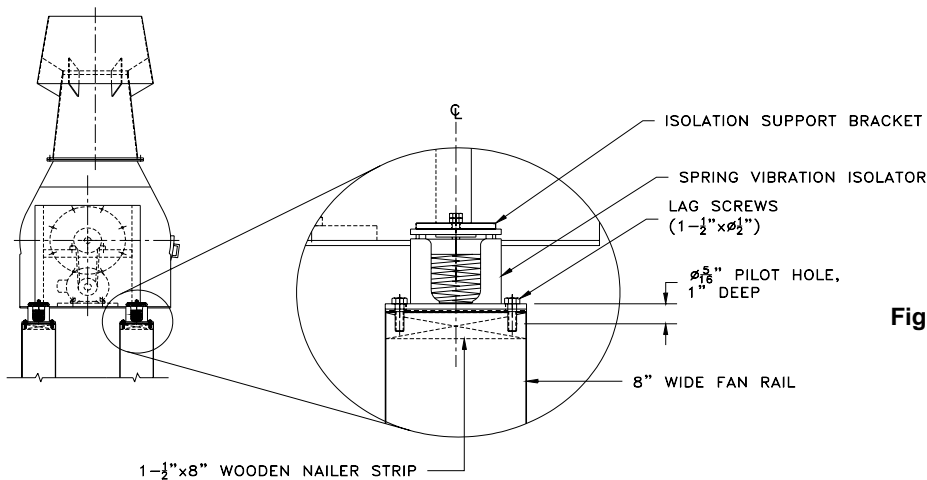
- Standard fan rails and plenum curb.
- Combined fan and plenum equipment support

For both types of equipment support, follow the instructions on the next few pages on how to mount the fans.

## Axijet Standard Curb/Fan Rail Assembly



**Fig. 3 – Standard Support Layout**

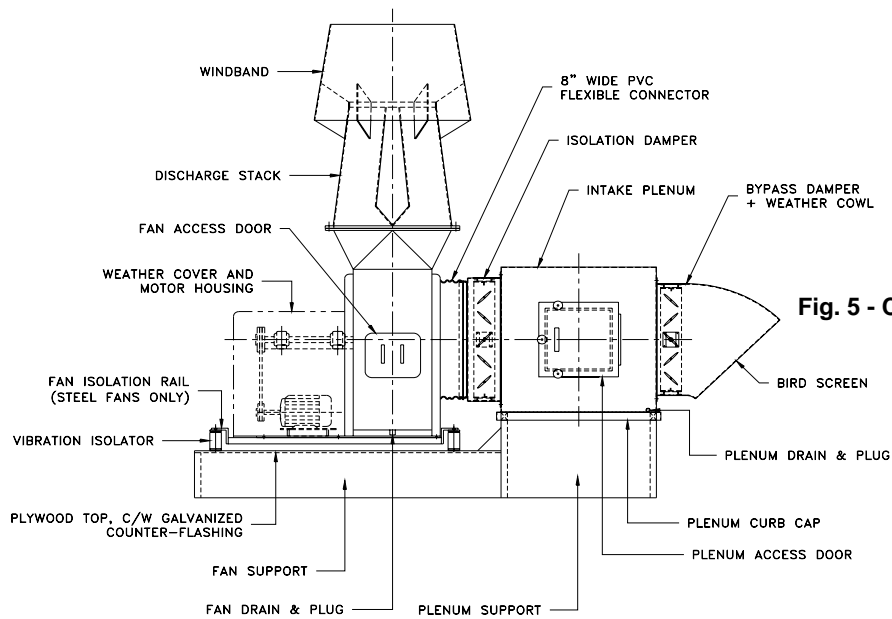


**Fig. 4 – Standard Rail Fixing Detail**

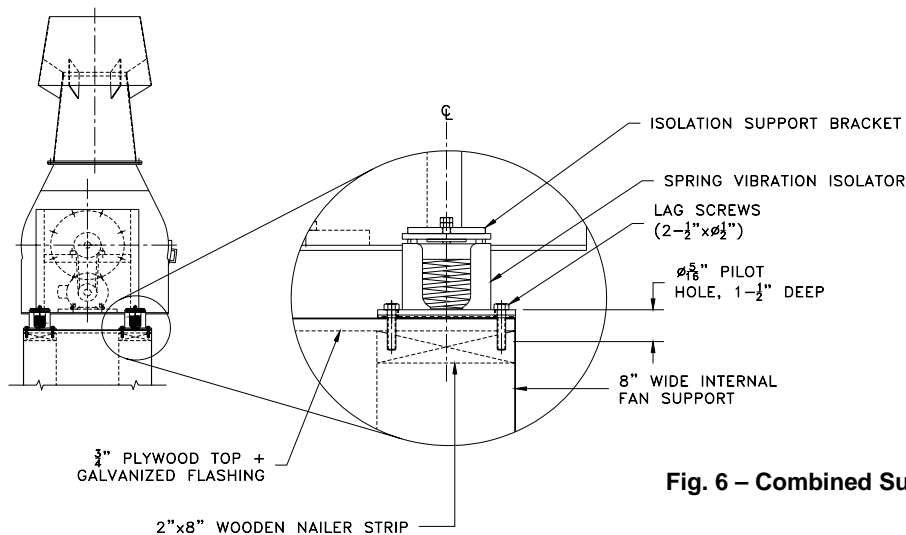
Refer to Fig. 3 & Fig. 4 for the following instruction.

1. Mount the isolators on the Axijet fan isolation support bracket (this bracket is only available on steel Axijet fans, on FRP Axijets the isolators will be mounted onto isolator holes on the underside of the fan stand).
2. Place the fan isolator assembly on the fan rails section. The centerline of the fan's isolation rails should line up with the centerline of the 8" wide fan rails – (see Fig No.4). Please refer to the 'Equipment Support Detail' drawing that is part of the submittal for further details.
3. Place the plenum on top of the plenum curb.
4. Line up the fan inlet with the isolation damper inlet transition, (round collar/sleeve), which is attached to the plenum.
5. Adjust and set the vibration isolators to correct operational height – (for further details, see spring vibration isolator assembly instructions – page 6).
6. Once the fan inlet sleeve and isolation damper sleeve are aligned, (there should be about a 4" gap between the two sleeves), attach the PVC flexible connector. The flexible connector, when attached, should have some slight slack to it. A set of stainless steel adjustable straps are included with the connector for attaching to both sleeves.
7. When the vibration isolators are in the correct location, drill 5/16" dia. pilot holes through the anchorage slot holes of the isolators to about 1" depth.
8. To prevent water penetration, fill in the entire pilot hole with a waterproof, external grade silicone caulk.
9. Secure the isolators down with 2" long by 1/2" dia. self-tapping steel lag screws. Some of the caulking will be forced out of the hole to form a barrier around the fixing.
10. Finally, caulk all around the base of the isolators to form a complete watertight seal.

## Axijet Combined Fan and Plenum Equipment Support Assembly



**Fig. 5 - Combined Support Layout**



**Fig. 6 - Combined Support Rail Fixing Detail**

Refer to Fig. 5 & Fig. 6 for the following instruction.

1. Mount the isolators on the Axijet fan isolation support bracket (this bracket is only available on steel Axijet fans, on FRP Axijets the isolators will be mounted onto isolator holes on the underside of the fan stand).
2. Place the fan isolator assembly on the fan support section of the fan/plenum curb assembly. The centerline of the fan's isolation rails should line up with the centerline of the 8" wide internal fan supports – (see Fig No. 6). Please refer to the 'Combined Fan/Support Detail' drawing that is part of the submittal for further details.
3. Place the plenum on top of the curb section of the fan/plenum curb assembly.
4. Line up the fan inlet with the isolation damper inlet transition, (round collar/sleeve), which is attached to the plenum.
5. Adjust and set the vibration isolator to correct operational height – (for further details, see spring vibration isolator assembly instructions – page 6).
6. Once the fan inlet sleeve and isolation damper sleeve are aligned, (there should be about a 4" gap between the two sleeves), attach the PVC flexible connector. The flexible connector, when attached, should have some slight slack to it. A set of stainless steel adjustable straps are included with the connector for attaching to both sleeves.
7. When the vibration isolators are in the correct location, drill 5/16" dia. pilot holes through the anchorage slot holes of the isolators to about 1/1/2" depth.
8. To prevent water penetration, fill in the entire pilot hole with a waterproof, external grade silicone caulk.
9. Secure the isolators down with 2-1/2" long by 1/2" dia. self-tapping steel lag screws. Some of the caulking will be forced out of the hole to form a barrier around the fixing.
10. Finally, caulk all around the base of the isolators to form a complete watertight seal.

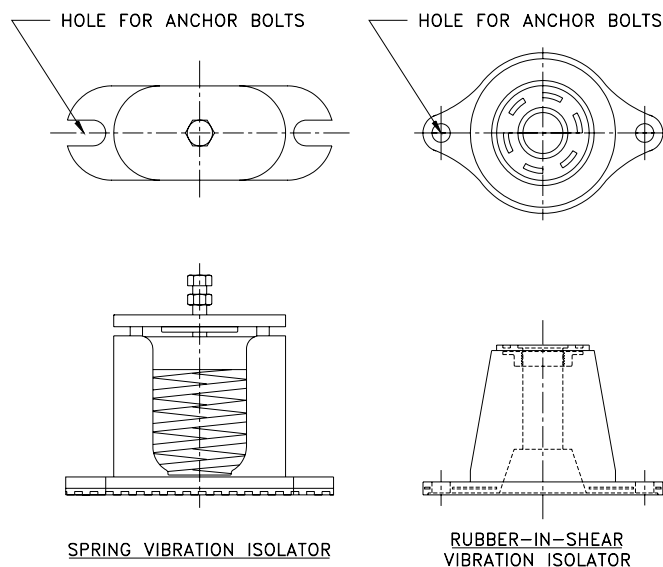
**Note:** In certain applications where seismic activity is a concern, special seismic equipment supports can be supplied, in this case it is recommended that 'toggle-bolts' be used instead of lag screws for securing the fan onto the rails.

## Floor Mounted Vibration Isolators

To prevent vibration and noise from being transferred to the building, vibration isolators are recommended. Isolators should be located between the fan and the rails. MK Plastics supplies two main types of isolators for Axijet fans:

- Floor Mounted Spring Isolators (steel & FRP Axijets)
- Floor Mounted Rubber-In-Shear Isolators (FRP Axijets)

In applications where seismic isolators are required, contact MK Plastics directly for further details

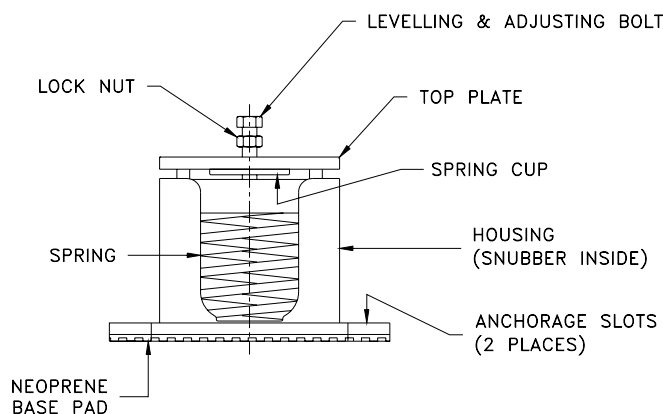


**Fig. 7 – Floor Mounted Vibration Isolators – (Typical)**

### Floor Mounted Rubber-In-Shear Isolators

1. Mount fan on rail supports (if supplied).
2. Elevate fan to provide room to insert isolators between the fan base and supports and block in position.
3. Position isolators under fan and secure bolts.
4. Remove blocks and allow fan to rest on the isolators. Isolators must be installed on a level surface (leveling should not be required).
5. Secure isolators to mounting surface.

### Floor Mounted Spring Vibration Isolators (Refer to Fig. 8)



**Fig. 8 – Spring Vibration Isolators (Assembly Detail - Typical)**

1. Locate the isolators in their proper position under the fan. The equipment support should be flat and level. Shims, if required, should be full size.
2. Before the isolators are adjusted, the weight of the fan will cause the top plate to come to rest on the housing. The isolators should be adjusted to provide a minimum clearance of  $\frac{1}{4}$ " between the top plate and the housing.
3. Install the adjusting and leveling bolts through the equipment mounting holes until the bolt comes into contact with the spring cup. Back off the lock nut and compress the springs by turning the adjusting bolt clockwise. Start at one isolator and make four turns on the adjusting bolt, move to the next isolator and make four turns, etc., until all isolators have been adjusted four turns. Repeat this procedure until a  $\frac{1}{4}$ " clearance is obtained between top plate and housing.
4. Check the level of the fan. The fan may now be leveled by making small adjustments of individual isolators at the high and low points. The sleeves of the fan and isolation damper should be in line.
5. After the fan is level, visually check each isolator to make sure spring coils are not closed solid and there is sufficient clearance between the top plate and housing.

## Drains

Axijet fans and bypass air plenums are provided with integral drains. These drains are plugged at the factory prior to shipment. Properly designed systems operating under normal conditions should experience no problems with entrained moisture or condensation. The Axijet system should not be operated with these connections open to the atmosphere.

Unique design practices, facility policy, or a specific application may require that these drains have the addition of a manual valve or automatic drain trap.

In all situations, it is important to be aware of local piping codes and the fact that condensation from laboratory or process exhausts can be hazardous and corrosive, paying special attention to the building roofing and drainage system.

## Stack

Place the stack and the gasketing provided in the position as shown in the submittal layout drawings. **Never lift the stacks by the wind band vanes as this could cause damage.** Secure the stack onto the fan discharge flange with the appropriate bolts and washers provided.

## Inlet Plenum

Check the roof curb dimensions and position relative to the fan. Compare the values with those marked on MK Plastics Certified drawings. The plenum shall be attached to the curb by means of 1/4" lag screws or bolts. Heavier fasteners may be required by code in your area.

Check the position of the backdraft (isolation) and bypass dampers. Refer to MK Plastics Certified drawings for damper positions

## Duct Installation

Efficient fan performance relies on the proper installation of inlet ducts (where factory inlet plenums are not provided). For duct inlets, allow at least 3 fan wheel diameters between duct turns or elbows and the fan inlet. See Fig. 9 below.

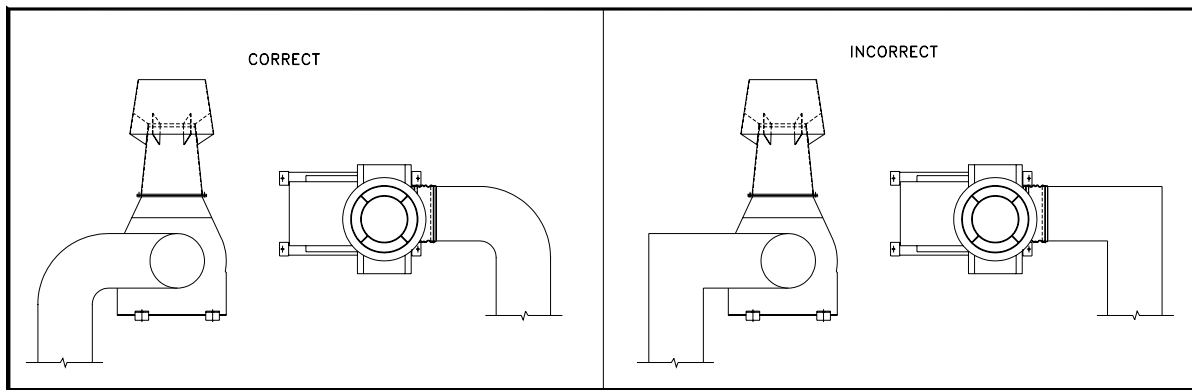


Fig. 9 – Inlet Duct Turns

## Wheel-to-Inlet Overlap

The correct wheel-to-inlet overlap is critical to proper fan performance. This overlap should be verified before initial start-up since rough handling during shipment could cause a shift in fan components. Refer to Fig. 10 - Wheel/Inlet Overlap for details.

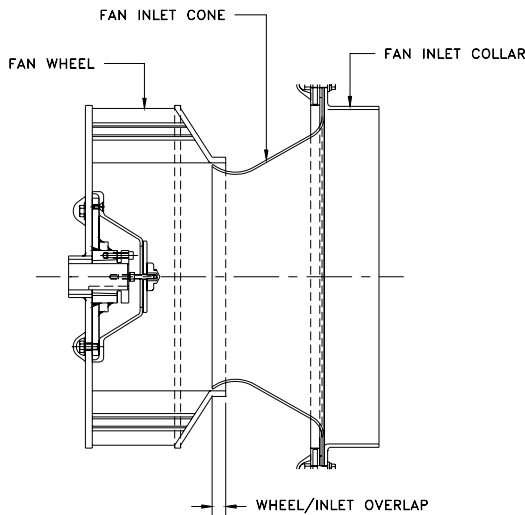


Fig. 10 – Wheel/Inlet Overlap

Fan Size	Overlap	
	FRP Axijets	Steel Axijets
1225	9/16"	
1500	11/16"	
1825	3/4"	5/8"
2450	1-1/32"	3/4"
3000	1-5/16"	
3650	1-1/2"	
4025	1-21/32"	
4450	1-13/16"	1-1/4"
4900	2"	
5425		
6000		
6600		
7300		

## Belt and Pulley Installation

Belt tension is determined by the sound the belts make when the fan is first started. Belts will produce a loud squeal, which dissipates after the fan is operating at full capacity. If the belt tension is too tight or too loose, lost efficiency and possible damage can occur. Do not change the pulley pitch diameter to change tension. This will result in a different fan speed than desired.

1. Loosen motor plate adjustment nuts on L-bolts 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. Slide the motor plate back until proper tension is reached. For proper tension a deflection of approximately  $\frac{1}{4}$ " per foot of center distance should be obtained by firmly pressing the belt. Refer to Fig. 11.
3. Lock the motor plate adjustment nuts in place.
4. Ensure pulleys are properly aligned. Refer to Fig. 12

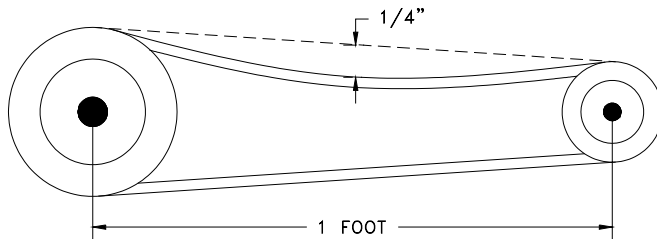


Fig. 11 – Belt & Pulley Tension

## Pulley Alignment

Pulley alignment is adjusted by loosening the motor pulley setscrew and by moving the motor pulley on the motor shaft, or by moving the entire motor along the motor mounting bracket. Fig. 12 illustrates correct and incorrect pulley alignment.

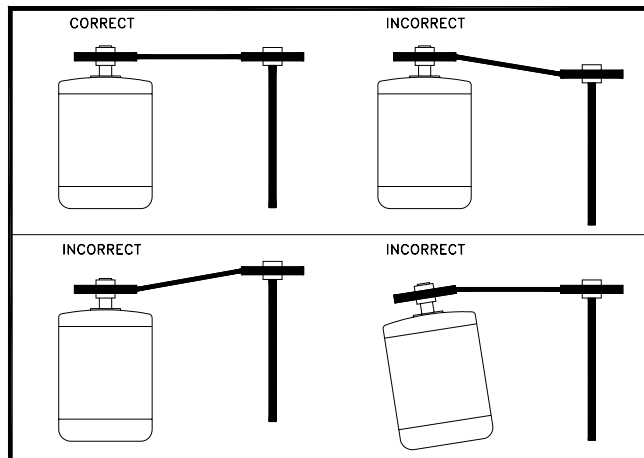


Fig. 12 – Pulley Alignment

A recommended method of inspecting the pulley alignment is shown in Fig. 13. With the shorter leg of a carpenter's square or other straight edge lying along the case of the motor, adjust the position of the motor pulley (or the motor) until the longer leg of the square is parallel to the belt.

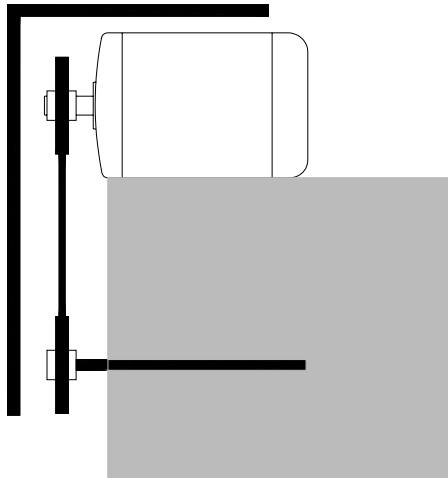


Fig. 13 – Pulley Alignment Method

**Wiring Installation**

All wiring should be in accordance with local ordinances and the National Electrical Code, NFPA 70. Ensure the power supply (voltage, frequency, and current carrying capacity of wires) is in accordance with the motor nameplate.

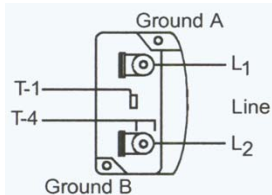
**Shut off all power sources before unit is wired to power source.**

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 the motor, remove bolts securing motor base to power assembly. Do not remove motor mounting bolts. Axijets will have a hole provided at the base of the bearing pedestal to accommodate wiring.

**Personal Safety**  
**Disconnect switches are recommended. Place the disconnect switch 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.**

**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 leads.



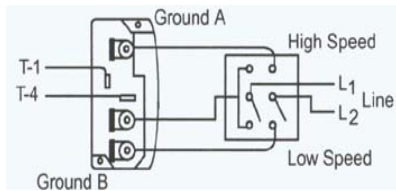
**3 Phase, 9 Lead Motor**

To reverse, interchange any 2 line leads.



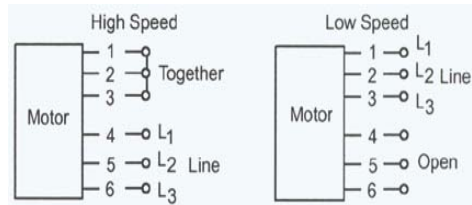
**2 Speed, 2 Winding, Single Phase Motor**

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



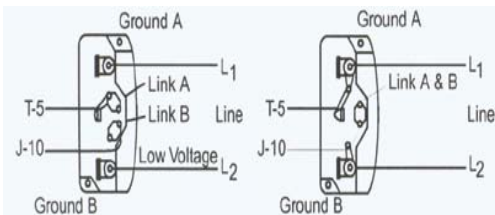
**2 Speed, 1 Winding, 3 Phase Motor**

To reverse, interchange any 2 line leads.  
 Motors require magnetic control.



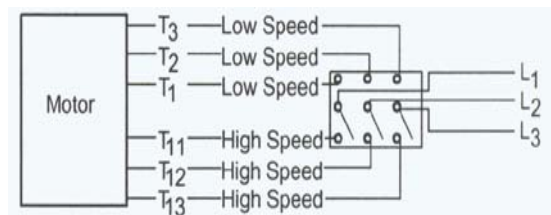
**Single Speed, Single Phase, Dual Voltage**

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

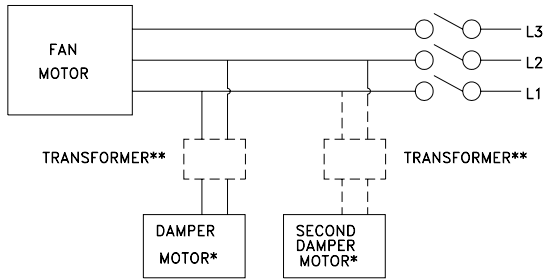


**2 Speed, 2 Winding, 3 Phase**

To reverse: High speed-interchange leads T11 & T12.  
 Low speed-interchange leads T1 & T2.  
 Both speeds-interchange any 2 line leads.



### Typical Damper Motor Schematic



For 3 phase, damper motor voltage should be the same between L1 and L2. For single phase application, disregard L3. \*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.

### 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 Recommended Torque for Setscrews/Bolts.
2. Inspect for correct voltage with voltmeter.
3. Ensure all accessories are installed

Setscrews				Hold Down Bolts	
Size	Key Hex Across Flats	Recommended Torque (Inch-lbs)		Size	Wrench Torque Inch-lbs
		Min.	Max.		
No. 10	3/32"	28	33	3/8"-16	240
1/4"	1/8"	66	80	1/2"-13	600
5/16"	5/32"	126	156	5/8"-11	1200
3/8"	3/16"	228	275	3/4"-10	2100
7/16"	7/32"	348	384	7/8"-9	2040
1/2"	1/4"	504	600	1"-8	3000
5/8"	5/16"	1104	1200	1-1/8"-7	4200
3/4"	3/8"	1440	1800	1-1/4"-7	6000

**Recommended Torque for Setscrews/Bolts (IN/LB)**

**WARNING**  
 This unit has rotating parts. Safety precautions should be exercised at all times during installation, operation, and maintenance.  
**ALWAYS** disconnect power prior to working on fan.

### Operation

#### Pre-Start Checks

1. Shut off all primary and secondary power sources.
2. Ensure fasteners and setscrews, particularly those used for mounting the fan, are tightened.
3. Inspect belt tension and pulley alignment.
4. Inspect motor wiring.
5. Ensure belt touches only the pulleys.
6. Ensure fan and ductwork are clean and free of debris.
7. Inspect wheel-to-inlet clearance. The correct wheel-to-inlet clearance is critical to proper fan performance.
8. Close and secure all access doors.
9. Restore power to the fan.

## Start Up

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

1. Direction of rotation.
2. Excessive vibration.
3. Unusual noise.
4. Bearing noise.
5. Improper belt alignment or tension (listen for squealing).
6. Improper motor amperage or voltage.

***If a problem is discovered, immediately shut the fan off. Shut off all electrical power and check for the cause of the trouble. See **Troubleshooting**.***

## Inspection

Inspection of the fan should be conducted in the first **30 minutes**, **8 hour** and **24 hour** intervals of satisfactory operation. During the inspections, stop the fan and inspect as per the *Conditions Chart*.

### **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, bolts, setscrews, and motor mounting bolts. 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 particles) should be inspected every three months or sooner. Regular inspections are also recommended for fans exhausting non-contaminated air.

It is recommended the following inspection be conducted twice per year.

- Inspect bolts and setscrews for tightness. Tighten as necessary. Worn setscrews should be replaced immediately.
- Inspect belt wear and alignment. Replace worn belts with new belts and adjust alignment as needed. See Belt and Pulley Installation on page. 7.
- Inspect springs and rubber isolators for deterioration and replace as needed.
- Inspect for cleanliness. Clean exterior surfaces only. Removing dust and grease on motor housing assures proper motor cooling. Removing dirt from the wheel and housing prevents imbalance and damage.

## Motor Bearings

Motor bearings are pre-lubricated and sealed. Under normal conditions they will not require further maintenance for a period of 10 years. However, it is advisable to have your maintenance department remove and disassemble the motor, and lubricate the bearings after 3 years of operation in excessive heat and/or in a contaminated air stream consisting of airborne particles.

## Motor Service

Should the motor prove defective within one-year period, contact MK Plastics directly, or your nearest motor service representative.

## Changing Shaft Speed

All belt driven fans with motors up to and including 5 hp (184T max.) are equipped with variable pitch driver pulleys. To change the fan speed, perform the following:

1. Loosen setscrews on driver (motor) pulley and remove key, if equipped.
2. Turn the pulley rim to open or close the groove facing. If the pulley has multiple grooves, all must be adjusted to the same width.
3. After adjustment, inspect for proper belt tension and alignment.

### **Speed Reduction**

Open the pulley in order that the belt rides deeper in the groove (smaller pitch diameter).



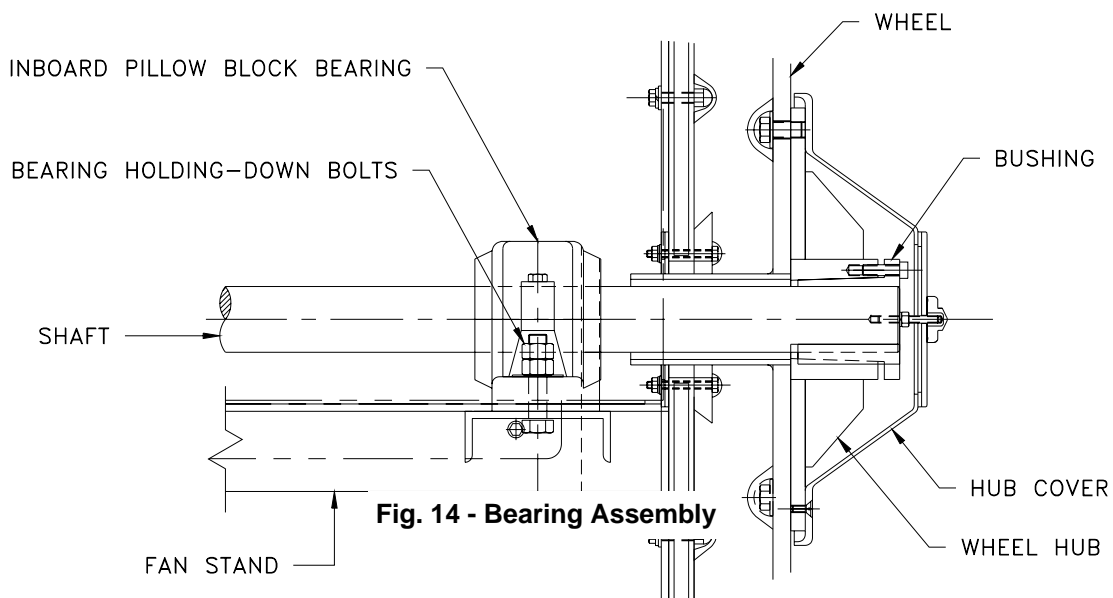
## Bearing Replacement

The fan bearings are pillow block ball bearings (Axijet 1225 & 1500 models have flange bearing assemblies). An emery cloth or file may be needed to remove imperfections in the shaft left by the setscrews.

*NOTE: In applications where contact with the contaminated exhaust surface poses a health hazard, the bearings can be removed with the wheel and inlet cone staying in place. In this case, the shaft must be held in place with suitable straps or bracings firmly secured around the bearing support frame. The shaft must be supported to restrict any lateral movement of both shaft and impeller. In this case, review but skip steps 2, 4, 6, & 14.*

1. Mark the position of the shaft of both bearing races, setscrews, and the wheel and pulley.
2. Mark the location and orientation of the inlet cone. Note the clearance between the wheel and the inlet cone.
3. Remove the fan pulley.
4. Remove the inlet cone. Remove the wheel from the shaft – a 2-jaw puller may be needed.
5. Remove bearing hold-down bolts.
6. Remove shaft and bearings as one unit.
7. Remove anti-corrosion coating from the shaft with a suitable degreaser.
8. Remove the bearing from the shaft using a bearing puller. If a bearing puller is not available, tap on the bearing with a wood block and hammer to remove it.
9. Smooth and clean the shaft and bearing bore thoroughly.
10. Place the bearings into position making sure they are not on a worn section of the shaft. Tapping the inner ring face with a soft driver may be required. **Do not hammer on the housing.**
11. The outer ring of the bearing is spherical and swivels in the housing to compensate for misalignment. Secure hold down bolts, but **do not fully tighten.**
12. Align the setscrews on the bearings and tighten one setscrew on each bearing.
13. Rotate the shaft to allow the bearing outer rings to find their center of free movement.
14. Install the wheel on the shaft. Install the inlet cone in its original location. And adjust bearing position and inlet cone to center the wheel in the inlet cone.
15. Tighten the hold-down bolts to proper torque.
16. Turn the shaft by hand. Resistance should be the same as it was before the hold-down bolts were fully tightened.
17. Tighten the bearing setscrews. Refer to torque chart on Page 9.
18. Re-install the pulley and adjust the belt tension.
19. Test run and retighten all setscrews and hold-down bolts; trim balance as necessary (.0785 in/sec max.)

After 24 hours of operation, retighten the setscrews to the appropriate torque. Make sure the socket key or driver is in good condition with no rounded corners. The key should be fully engaged in the setscrew and held squarely to prevent rounding out of the setscrew socket when applying maximum torque.

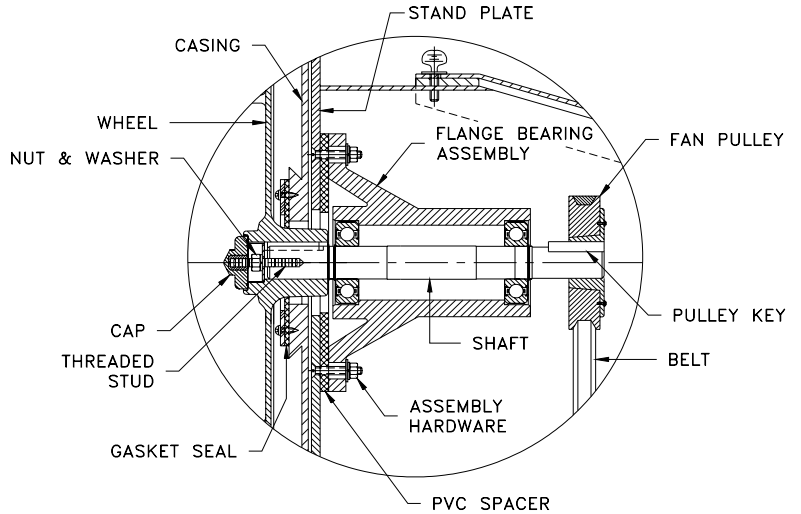


## Flange Bearing Replacement

(AxiJet-F 1225 & 1500 only)

Please refer to Fig. 15 for the following procedures. The fan bearings are housed inside the flange bearing assembly, which includes the shaft. It is easier and quicker to replace the entire assembly, rather than the bearings themselves.

1. Remove the fan drive belt and pulley.
2. Remove by unscrewing the front protective cap, and then the nut, washers and threaded stud. Removal of the inlet collar on the front of the fan will give you better access.
3. Remove the wheel from the shaft – a 2-jaw puller may be needed.
4. Remove the assembly hardware that holds the entire assembly to the stand plate. The flange bearing assembly can now be removed, complete with the shaft.
5. Before replacing the assembly, make sure the shaft and keys are clean and smooth.
6. Re-attach the flange bearing assembly to the stand plate, but make sure the PVC spacer is in good condition. Replace if necessary.
7. Inspect and clean the bore of the wheel. Gently slide the wheel onto the shaft after inserting the pulley key, and re-install the threaded stud, nut and washers to the shaft, and tighten. Make sure the wheel hub is sitting well against the snap ring on the shaft. Re-install the cap and tighten well.
8. Re-attach all the pulleys and adjust the belt tension.
9. Test run and retighten all screws and bolts if necessary.

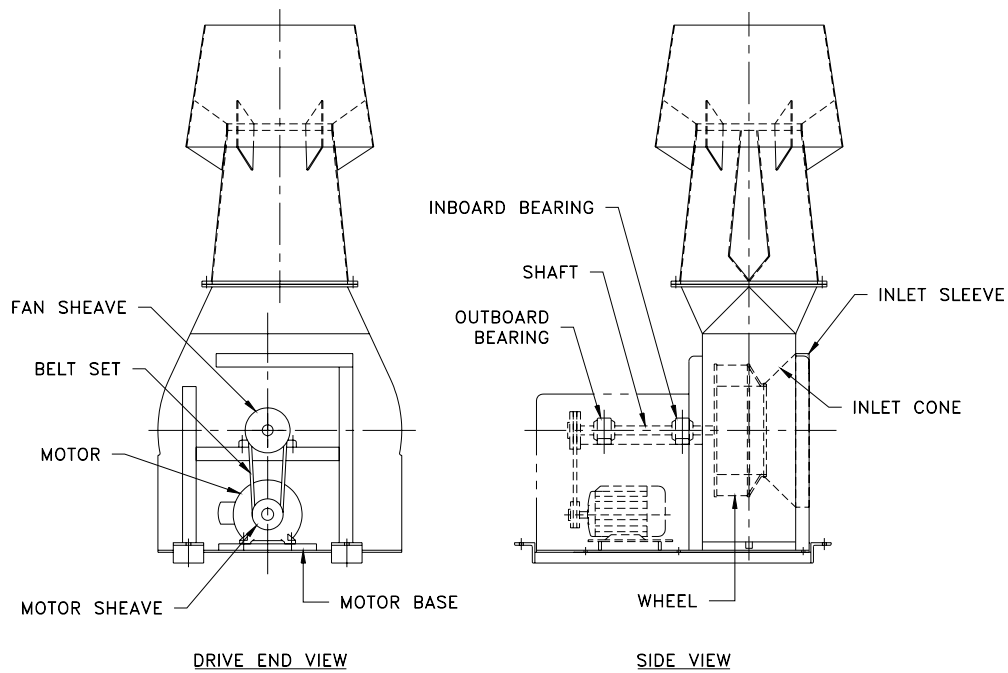


**Fig. 15 – Flange Bearing Assembly**

## Troubleshooting

Problem and Potential Cause	
<b>Low Capacity or Pressure</b>	<ul style="list-style-type: none"> <li>• Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or drive belt assembly.</li> <li>• Poor fan inlet conditions. There should be a straight clear duct at the inlet.</li> <li>• Improper wheel alignment.</li> </ul>
<b>Excessive Vibration and Noise</b>	<ul style="list-style-type: none"> <li>• Damaged or unbalanced wheel.</li> <li>• Belts too loose; worn or oily belts.</li> <li>• Speed too high.</li> <li>• Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or drive belt assembly.</li> <li>• Bearings need lubrication or replacement.</li> <li>• Fan surge or incorrect inlet condition.</li> </ul>
<b>Overheated Motor</b>	<ul style="list-style-type: none"> <li>• Motor improperly wired.</li> <li>• Incorrect direction of rotation. Make sure the fan rotates in same direction as the arrows on the motor or drive belt assembly.</li> <li>• Cooling air diverted or blocked.</li> <li>• Improper inlet clearance.</li> <li>• Incorrect fan RPM.</li> <li>• Incorrect voltage.</li> </ul>
<b>Overheated Bearings</b>	<ul style="list-style-type: none"> <li>• Improper bearing lubrication.</li> <li>• Excessive belt tension.</li> </ul>

## Parts List



**Fig. 14 – Steel Axijet Fans (FRP Axijets 1825 to 4900, similar parts)**

**Fig. 14—FRP Axijet Fans (Size 1225 to 1500 only)**

