

AMERICAN FAN COMPANY

Standard Installation, Operation, and Maintenance Manual

This general manual has been prepared to assist you with installing and maintaining your American Fan equipment. By following these general instructions presented, you will prolong the life of the equipment, while preventing unexpected downtime.

The scope of this manual covers our standard product line and is not intended to cover engineered equipment.



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Section I

Receiving

All shipments are F.O.B. factory, Fairfield, Ohio. Please inspect all shipments for damage before they are accepted from the freight carrier, and ensure that all items listed on the bill of lading and packing list (attached to the shipment) have been received. Partial shipments are sometimes made.

Units are usually completely assembled except when specified as “less motor”. They are then skidded, boxed or crated to fully comply with rail or trucking requirements for shipment. Accessories are sometimes shipped separately due to handling space requirements.

Although all equipment is carefully inspected and prepared for shipment at the factory, damage to the fan and/or drive parts may occur due to rough handling during shipment. Any shortage, breakage or damage noticed at time of delivery should be indicated to the carrier’s representative. Damage noticed after delivery should be reported to the carrier at once. Request their inspection of the shipment and fill out a concealed damage inspection report.

Extended Storage

Units that will be held in storage for a period of up to two years should have special provisions so operation-readiness can be maintained. Motors should be equipped with internal space heaters, that are kept on continuously. Units should be crated and covered with polyethylene film. In addition, impellers should be rotated by hand once a month to distribute bearing grease. For best results, keep units sheltered in a cool dry location.

Handling

Small units should be handled carefully and lifted only by the base, **never by** the shaft, coupling, motor or housing. Large units must be lifted by the base or by lifting eyes when provided. Precaution should be taken to avoid dropping or bumping equipment as this can cause damage to the bearings, shaft or wheel, which may not be visibly noticeable, but can cause vibration problems.

Installation

Fans and motors should be mounted on a structurally sound foundation. Concrete is the best, however, other types designed properly are acceptable. Equipment should be leveled on the foundation and shimmed or grouted in place. This will prevent putting the fan structure into a bind by bolting down on an uneven surface.

If vibration isolators are used, it is important that the proper size and type are specified. Some smaller fans may be mounted directly to the isolators while the larger fans may require a unitary base. Isolators should be sized for specific weight distribution of the fan. Consult the factory for recommendations on type, size, and placement of isolators for your specific fan.

Arrangement 8 Blower Mounting Procedure

1. Motor and coupling should be mounted with the blower resting on level, flat surface, but not bolted to surface.
2. After blower is situated in it's final mounting location, feeler gauges should be used between the mounting feet and the mounting surface at each bolt hole location to determine the thickness of the shims required. The blower base is a weldment and may not be perfectly flat. If it is not shimmed to the foundation properly when bolted down, a bind in the frame will result. This may cause a bent shaft, coupling, motor and/or bearing misalignment resulting in high vibration levels and premature failure of the drive components.
3. After shimming is done, each frame mounting bolt should be finger tight. Then going from bolt to bolt, progressively tighten each one with a torque wrench until the proper torque value is achieved for the size foundation bolt being used.
4. After the unit is completely tightened down to the foundation, the coupling alignment should be rechecked. If the coupling is now misaligned, loosen foundation bolts and recheck the coupling alignment. If after loosening foundation bolts the coupling is aligned, then a bind was introduced in the bolt down procedure. It will be necessary to re-shim so that the bind is no longer present.
5. Once the unit is tightened down to foundation and coupling alignment is maintained, replace guards and check duct work, etc. The unit is now ready for start-up. (See Section II).

Section II

Before Start-Up

Note: Shipping and handling of a fan after it leaves the factory can sometimes cause items to come loose or shift. Therefore, the following items should be checked prior to starting any fan.

1. Fasteners - All foundation bolts, motor and bearing mounting bolts, wheel hub setscrews, wheel locking bolts, bearing locking collars, and all taper lock bushings must be tight.
2. Bearings - Check bearings for proper alignment and proper lubrication.
3. Fan Wheel - Turn over rotating assembly by hand to see that it rotates freely and does not bind or strike the fan housing. If the wheel strikes the housing, the wheel may need to be moved on the shaft or the bearings moved and realigned.
4. Motor - Check electrical wiring to the motor. The current characteristics of the supply line must agree with the motor nameplate rating. Motors should be wired and fused in accordance with the "National Electric Code" and all local codes for your location.
5. V-Belt Drives - Check for proper alignment and belt tension.
6. Duct Connections - (If required) Duct connections between the fan and duct work must not be distorted. Ducts should never be supported by the fan unit. Expansion joints between the fan and the duct connections should be used where expansion is likely to occur or where fan is mounted on vibration isolators. All duct joints should be sealed to prevent leaks. All debris should be removed from the fan and duct work.

Start - Up

1. Energize, (bump) the motor on and off (quickly) to check for proper wheel rotation. The motor should be started in accordance with the manufacturer's recommendations. Arrows on the fan will show the proper direction of rotation and air flow. If the direction of rotation is not correct, follow directions on the motor nameplate to change the motor's rotation.
2. The fan may now be brought up to operating speed. Watch for anything unusual such as vibration, overheating of the bearings or the motor, or unexpected noises. Check fan speed on V-belt driven units. If a speed change is required, de-energize the fan and lock out. Adjust the motor sheave (on adjustable drives) to obtain the desired RPM.
3. Check the motor amperage against nameplate amperage to make sure the motor is not overloading.

Balance and Vibration

All fan impellers are dynamically balanced prior to installation into the fan assembly. After assembly, fans supplied with motors are tested at their operational speed and balanced as an assembly to AMCA 204, BV-3. Fans will need to be checked during commissioning, to assure that the vibration levels have not changed significantly from those achieved at the factory. It is recommended that the velocity values in the table below are not exceeded by more than 20% when measuring the vibration “Filter In”, at the fan’s rotational speed or frequency after the field installation is complete.

Rigid Mounting		Isolation Mounting	
mm/sec.	(in./sec.)	mm/sec.	(in./sec.)
3.8	(0.15)	5.1	(0.20)

The installed vibration level of any fan is not solely dependent on the balance grade. Installation factors such as the mass and stiffness of the supporting system, will influence the “as installed” vibration level (Refer to AMCA Publication 202, Troubleshooting). Therefore, the “as installed” fan vibration level is not the responsibility of the fan manufacturer unless specified in the purchase contract.



Start - Up of High Temperature Construction Fans and Blowers

In addition to the normal start-up procedure described on the previous page, certain measures must be taken against thermal expansion deformation.

1. The fan or blower should be brought to speed between 40 degrees F and 150 degrees F. It may be necessary to throttle back the air entering the fan or blower while slowly bleeding in heated air to accomplish this.

NOTE: If the motor horsepower is sized for the high temperature operation condition and not cold start-up, throttling of the inlet air will be mandatory to prevent motor overloading. It is recommended that the motor's amperage be monitored during this procedure.

2. The maximum recommended rate of temperature rise is 15 degrees F per minute.
3. The reverse situation at shut-off also applies. Therefore, the temperature must be lowered slowly before turning the fan or blower off to prevent damage.



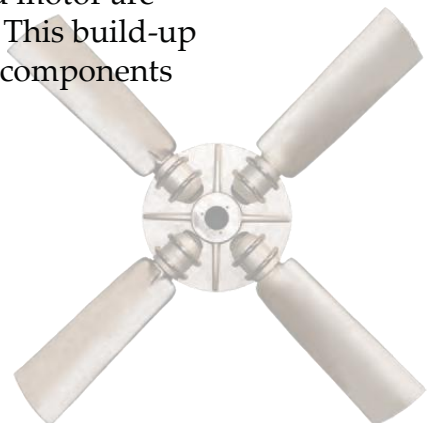
Section III

General Maintenance

1. A definite time schedule for inspecting all rotating parts and accessories should be established. The frequency of inspection depends on the severity of operation and locality of the fan. Inspections might be weekly at first in order to set up your particular schedule.
2. Alignment - Check the shaft to bearing alignment. Check the coupling alignment on arrangement 8 fans. Misalignment can cause overheating, wear to shaft seals, bearing failure and vibration.
3. Hardware - Check the tightness of all bolts and setscrews.
4. Lubrication - Add lubrication according to the bearing and motor manufacturer's recommendations. **Do not over grease.** Too much grease will cause excessive bearing temperatures and premature failures.
5. Air Flow - Make sure there is no debris and no unnecessary obstructions to the air flow in the outlet or inlet duct work.
6. Wheel - Inspect the wheel blades for any accumulation of dust and dirt and remove it.

NOTE: Material stuck to the blades can cause an unbalanced condition. Check the wheel for proper clearances between the wheel and the housing. Inspect the wheel carefully for any wear or damage. Never run the fan at a higher speed or temperature than what is shown on the nameplate. Contact American Fan Company with any questions.

7. General Housekeeping - Make sure the outside of the fan and motor are kept relatively clean and free from build-up of dust and dirt. This build-up may cause a fire, create an explosion hazard or cause the fan components to overheat.



Fan Bearing Maintenance

Bearings operating in high speed fans tend to run hot. Therefore, do not replace a bearing because it feels hot to the touch. Measure the actual running temperature with a pyrometer on the bearing housing. Pillow block and flange mount bearings can have periodic housing surface temperatures as high as 190 degrees F without cause for concern. Adding new grease to the bearing can cause the temperature to rise for some period of time. That time will depend on the bearing type and size.

For most applications, a lithium base grease (such as Mobilith AW2) conforming to a NLGI grade 2 consistency should be used. This type of grease inhibits rust, is water resistant, and has a temperature range of -30 degrees F to 200 degrees F with intermittent highs of 250 degrees F. For extreme duty and higher temperature applications, use Mobilith SH220, synthetic hydrocarbon grease.

Because oil lubricated bearings are usually used on high-speed or high temperature applications, refer to American Fan Company for the type of oil you should use in your particular application.

When greasing bearings, it is important not to over-grease. It is recommended to follow the bearing manufacturer's lubrication schedule for the particular bearing supplied. The lubrication schedule can be found on the bearing manufacturer's website or contact Howden American Fan for a copy. It is very important that fan bearings are greased while the fan is in operation. Caution should be taken while working on and near rotating equipment to avoid personal injury.

Always "Lock Out" / "Tag Out" when working on rotating equipment.

Oil should be added to the fan bearings with the fan off. When adding new oil to oil-lubricated bearings, oil should be poured into the oil cup at the top of the bearing until it reaches the overflow point at the lower oil cup at the bottom of the bearing.

Motor Maintenance

Lubricate motor bearings to the manufacturer's recommendations. Lubrication recommendations are included with the packet attached to the fan. Should this packet be missing, the following will apply.

A. Fractional Horsepower Sleeve Bearing Motors:

Under normal operation (up to 12 hours a day) at ordinary temperatures and clean surroundings, these motors will operate for three years without re-lubrication. Then re-lubricate annually with electric motor oil or SAE 10 oil. Fans operating continuously at higher temperatures should be re-lubricate annually.

B. Fractional Horsepower Ball Bearing Motors:

Under normal conditions, ball bearing motors will operate for five years without re-lubrication. Under continuous operation at higher temperatures, (but not to exceed 104 degrees F ambient), re-lubricate after one year. To re-lubricate where motors are not equipped with pressure fittings, disassemble the motor and clean the bearings thoroughly. Fill each bearing one-third full with ball bearing grease.

C. Integral Horsepower Ball Bearing Motors:

Motors having pipe plugs or grease fittings should be re-lubricated while warm and at a standstill. Replace one pipe plug on each end shield with grease fitting. Remove the other plug for grease relief. Using low pressure grease gun, rotate by hand and lubricate until new grease appears at grease relief. Allow motor to run for ten minutes to expel excess grease. Replace pipe plugs. Motors not having pipe plugs or grease fittings can be re-lubricated by removing end shield, cleaning grease cavity and refilling three-fourths of the circumference of the cavity.

Recommended Motor Greases

Polyrex EM - Exxon Oil Company / SRI #2 - Chevron Oil Company

Recommended re-lubrication intervals (general guide only)

H.P. Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty-Dusty	Extreme Duty Very Dirty High Ambients
1-1/2 to 7-1/2	5 yrs.	3 yrs.	9 mos.
10 to 40	3 yrs.	1 yr.	4 mos.
50 to 150	1 yr.	9 mos.	4 mos.

Fan Motors used with Variable Frequency Drives

1. Specify “Inverter Duty Motors” only.
2. Specify insulated bearings or provide shaft grounding to prevent shaft currents from causing bearing damage and premature failure. This is critical on motors that are 75 hp and larger. Follow manufacturer’s recommendations for each item.
3. All VFDs should be fitted with a “Radio Frequency Interference” (RFI) filter.
4. The switching frequency of the IGBT’s in the VFD should be kept as low as practical to prevent higher temperatures in the motor and the VFD. However, lower switching frequencies cause higher noise levels in the motor. Therefore the application noise level versus the higher temperature must be carefully weighed.
5. Good industrial wiring practices, including proper grounding, that meet local and national electric codes must be followed.
6. It is best to limit the minimum frequency to the motor to 10 Hz or more for extended periods of time.

NOTE: Shaft currents can occur on any motor HP rating when used with a variable frequency drive.

NOTE: These are general recommendations only. Each application is different, you **MUST** consult the motor and drive manufacturer for specific requirements as they apply to your installation. If you have any questions or concerns, please contact the factory.

WARNING: Shaft currents are phenomena created by the interaction between motors and variable frequency drives that can cause premature motor bearing failures. The occurrence of shaft currents is common and can not be predicted. Motor bearing failures can be positively identified as “shaft current” problems due to the distinctive failure pattern seen in the failed bearings.

American Fan Company recommends the adoption of the above list of design constraints for any fan/motor/VFD combination. Regardless if any or all precautions are taken, American Fan Company accepts no responsibility for shaft current related motor bearing failures and will extend only the warranties of the motor and/or variable frequency drive manufacturer (when supplied by American Fan Company).

Further, American Fan Company will not be held liable for any consequential damages under any circumstances resulting from premature bearing failures due to shaft currents.

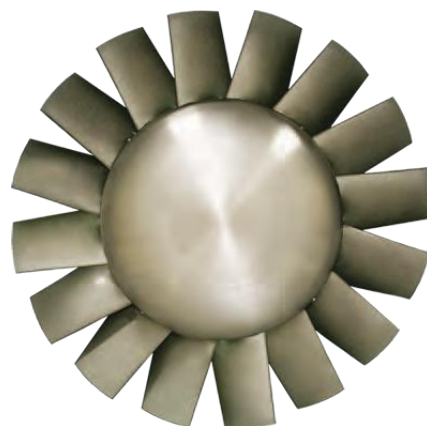
V-Belt Maintenance

If belts squeal at start-up, they are too loose and should be tightened. Periodically check belt and sheave wear, alignment and tension. When belts show wear, replace all belts at once with a new matched set of belts. New belts will not work in conjunction with used belts due to differences in length. Belts and sheaves should be clean and free from grease. After installing new belts, check tension midway between sheaves. Belts should deflect about 1/64" per inch of span length with approx. 20-lbs. force. Allow unit to run for 4 - 6 hours, then re-check the tension as some types of belts may stretch initially.

Section IV

Vibration Levels of Replacement Impellers

All replacement impellers and wheels are dynamically balanced at our factory prior to shipment. Occasionally, an impeller that has been factory-balanced will yield poor balance/vibration results when installed and operated. This does not mean that the impeller was incorrectly balanced at the factory. Once the impeller is installed in the fan unit, it becomes part of the entire rotating element, including the motor, shaft, coupling, and/or sheaves, which may all have some unbalance as well. Because of this, vibration levels must be checked after installing a replacement impeller and trim balanced as needed in order to achieve vibration levels found on page 4.



Troubleshooting

In the event that trouble is experienced in the field, listed below are the most common fan difficulties. These points should be checked prior to contacting our factory service for assistance.

1. Capacity or Pressure Rating

- A. Total resistance of system is higher than anticipated.
- B. Speed too low.
- C. Dampers or variable inlet vanes not properly adjusted.
- D. Poor fan inlet or outlet conditions.
- E. Air leaks in system.
- F. Damaged wheel.
- G. Incorrect direction or rotation.
- H. Wheel mounted backwards on shaft.

2. Vibration and Noise

- A. Misalignment of bearings, coupling, wheel, or V-belt drives
- B. Unstable or uneven foundation, fan not shimmed or grouted.
- C. Foreign material or material build-up on fan wheel.
- D. Worn bearings.
- E. Damaged wheel or motor.
- F. Broken or loose bolts or setscrews.
- G. Bent shaft.
- H. Worn or misaligned coupling (arr. 8).
- I. Fan wheel or driver unbalanced.
- J. 120 cycle magnetic hum due to electrical input. Check for high or unbalanced voltage.
- K. Total resistance of system is higher than anticipated.
- L. Fan delivering more than rated capacity.
- M. Loose dampers or variable inlet vanes.
- N. Speed too high or rotating in wrong direction.
- O. Vibration transmitted to fan from some other source.

3. Overheated Bearings

- A. Too much grease or dirt in bearings.
- B. Poor alignment or bent shaft.
- C. Unbalance in wheel or drivers.
- D. Excessive belt tension.
- E. Abnormal end thrust.



Safety Checklist

The following safety checklist items should be followed to insure proper and safe equipment operation. Some items in this checklist may not be applicable to your specific fan. Please refer to the details of construction and those items actually furnished to insure all applicable items are followed.

1. Flexible couplings (if applicable) must have guards. Do not start the unit with guards removed.
2. V-belt drives (if applicable) must have guards that completely encase the sheaves and drives. Do not start the unit with guards removed.
3. All guards should extend from the housing to the end of the base to cover all rotating parts.
4. Use inlet and/or outlet screens on fan inlet and/or discharge whenever they are open or not connected to duct work.
5. Accessories with moving parts must have guards.
6. Before starting fan, make sure all fasteners and parts are tight, that all tools and materials are removed, and that all personnel are clear.
7. The periodic maintenance and lubrication procedures must be faithfully followed and records should be maintained.
8. Do not operate the fan in excess of the maximum limit shown on the fan assembly drawing and the fan nameplate.
9. Provide a disconnect switch at the fan with capabilities for "Lock-out/Tag-out" for safety during fan maintenance.
10. Provide limiting switches to detect sudden changes in the operation of the fan.