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AMERICAN FAN CO. STD. INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

This general manual has been prepared to assist you in installing and maintaining your American Fan equipment. By following the 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 specially engineered equipment.

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Section I

RECEIVING

All shipments are F.O.B. factory, Fairfield, Ohio. It is, therefore, in the interest of the buyer to carefully inspect all shipments before they are accepted from the freight carrier. Upon delivery, be sure that all items listed on the bill of lading and packing list (inserted in the plastic envelope attached to the shipment) have been received. Partial shipments are sometimes made.

Units are usually completely assembled except when specifications call for unit 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 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 kept on continuously. Units should be crated and covered with polyethylene film. In addition, impellers should be hand-rotated once a month. 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. Precaution should be taken to avoid dropping or jarring equipment as this can cause damage to the shaft or wheel, which is not visibly noticeable, but can cause vibration problems.

INSTALLATION

Fans and motors should be mounted on structurally sound foundations. 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.

As a general rule, if vibration isolators are used, the fan should first be bolted to structural steel base and the isolation takes place between the structural steel base and the foundation. This prevents the fan base from floating due to uneven weight distribution and/or drive forces when mounted directly to vibration isolators.

ARRANGEMENT 8 BLOWER MOUNTING PROCEDURE

1. Motor and coupling should be mounted with blower resting on level, flat surface, but not bolted to surface.

2. After blower is situated in its final mounting location, feeler gauges should be used between mounting feet and mounting surface at each bolt hole location to determine thickness of shims required. Since the blower base is a weldment, it will be warped to some degree. 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 drive components.

3. After shimming is done, each frame mounting bolt should be finger snugged. 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 foundation, coupling alignment should be rechecked. If coupling is now mis-aligned, loosen foundation bolts and recheck coupling alignment. If after loosening foundation bolts, coupling is aligned, then a bind was introduced in the bolt-down procedure. It will then 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 duck work, etc. Unit is now ready for start-up.

6. Jog motor to make sure unit is rotating in proper direction. If so, bring up to speed and check amperage to motor to make sure enough static pressure is present in system to prevent motor from overloading.

7. Vibration levels should be checked and if they are above values shown in table on page 4, a qualified balancing technician should trim balance the unit to achieve these levels.

Section II

BEFORE START-UP

1. Fasteners – all foundation bolts, wheel hub setscrews, wheel locking bolts and bearing locking collars must be tight.
2. Bearings - check bearing alignment and make certain they are properly lubricated.
3. Fan Wheel – turn over rotating assembly by hand to see that it runs free and does not bind or strike fan housing. If wheel strikes housing the wheel may have to be moved on the shaft or the bearing pillow blocks moved and re-shimmed.
4. Motor – check electrical wiring to motor. The current characteristics of the supply line must agree with the motor nameplate rating. Motor should be wired and fused in accordance with the National Electric Code and local codes.
5. V-belt drive must be in alignment with belts at proper tension.
6. Duct connections (if required) from fan to duct work must not be distorted. Ducts should never be supported by the fan. Expansion joints between 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 air leaks. All debris should be removed from ductwork and fan.

START UP

1. "Jog" the motor to check for proper wheel rotation. The motor should be started in accordance with the manufacturer's recommendations. Arrows on fan indicate the proper direction of rotation and airflow.

2. Fan may now be brought up to speed. Watch for anything unusual such as vibration, overheating of bearings and motor, etc. Check fan speed on V-belt driven units and adjust motor sheave (on adjustable drives) to give desired RPM.

3. Check motor amperage against nameplate amperage to make sure motor is not overloading.

BALANCE AND VIBRATION

All fan impellers are dynamically balanced prior to installation in the fan assembly. After assembly, fans supplied with motors are test run and fine-tune balanced to reduce vibration levels to acceptable limits as shown in table below (from AMCA Standard 204-96). After field installation, fans will need to be checked prior to commissioning, to assure that the vibration levels do not change significantly from those achieved at the factory. It is recommended that the velocity values in the table below are not exceeded by more than 10% when field installed.

Fan Application Category	**Rigid Mounted**		**Flexible Mounted**	
	mm/sec.	(in./sec.)	mm/sec.	(in./sec.)
BV-3	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 normal start-up procedure described above, certain measures must be taken against thermal expansion deformation.

1. Fan or blower should be brought to speed between 40°F and 150°F. It may be necessary to throttle back air entering fan or blower and slowly bleeding in heated air to accomplish this. (Note: If motor horsepower is sized for high temperature operation condition and not cold start-up, throttling inlet air will be mandatory to prevent motor overloading. It is recommended motor amperage be monitored during this procedure.

2. The maximum recommended rate of temperature rise is 15°F per minute.

3. The reverse situation of fan or blower shut-off also applies. That is the temperature must be lowered slowly before turning 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 the locality. Inspections might be weekly at first in order to set up the schedule.

2. Alignment – shaft must not be cocked in the bearings. Misalignment can cause overheating, wear to dust seals, bearing failure and vibration.

3. Hardware – check tightness of all bolts and setscrews.

4. Lubrication – check fan and motor bearings and add lubricant if necessary. Be careful not to over grease as this can damage bearing seals.

5. Air flow – make sure there is no debris and no unnecessary obstructions to airflow in outlet or inlet ductwork.

6. Bearings on high-speed fans tend to run hot. Therefore, do not replace a bearing because it feels hot to the touch. Place a pyrometer or contact thermometer against the pillow block and check the temperature. Pillow block and flange mount bearings can have housing surface temperatures of 200°F (93°C) before the cause of overheating be investigated.

7. Wheel- inspect wheel blades for accumulation of dust and dirt. Clean thoroughly with stream of water jet, compressed air or a wire brush. This will help prevent an unbalanced condition. If blades are aluminum, be careful not to damage them. Cover the bearings so water won't enter the pillow block. The wheel should have proper clearances to prevent the blades from striking the housing. Make sure wheel is rotating in proper direction. Never run the fan at a higher speed or temperature than is shown on the fan nameplate. Contact American Fan Company with any questions.

8. General Housekeeping- Make sure the outside of the fan and motor are kept relatively clean and free of build-up of dust and dirt. At no time should a layer of dust and/or dirt exceed 3 mm (0.12") thick. Thick layers of dust and/or dirt are a fire and/or explosive hazard. Build-up can cause overheating of the fan and motor.

FAN BEARING MAINTENANCE

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°F to 200°F with intermittent highs of 250°F. For extreme duty and higher temperature applications, use Mobilith SHC220, synthetic hydrocarbon grease.

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

When greasing bearings, it is important not to over-grease. This is especially true if the bearings are equipped with extended grease lines and the bearings are not visible. In this case, more bearing failures occur due to over-greasing than under-greasing. It is best to give the bearing just one "shot" of grease periodically if the bearings are not visible. When the bearings are visible, pump in grease until a small bead of grease forms around the bearing seals. It is very important that fan bearing greasing take place while the fan is operating. Caution should be taken while working on and near rotating equipment to avoid personal injury.

When oiling oil-lubricated bearings, oil should be poured into cup at top of bearing until it reached the overflow point at the lower oil cup.

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 at ordinary temperatures and clean surroundings, these motors will operate for three years without re-lubrication. Then lubricate annually with electric motor oil or SAE 10 oil. Under continuous operation higher temperatures (but not to exceed 104°F ambient) 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°F ambient) re-lubricate after one year. To re-lubricate where motors are not equipped with pressure fittings, disassemble motor and clean the bearings thoroughly. Repack each bearing one-third full with ball bearing grease.

C. Integral Horsepower Ball Bearings Motors:

Motors having pipe plugs or grease fittings should be re-lubricated while warm and at standstill. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. On low pressure, grease, run 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 or circumference of cavity.

Recommended re-lubrication intervals (General guide only)

H.P Range	Standard Duty 8 Hr./Day	Severe Duty 25 Hr./Day Dirty-Dusty	Extreme Duty Very Dirty High Ambients
1 ½ - 7 ½	5 Yrs.	3Yrs.	9 Mos.
10 – 40	3 Yrs.	1 Yr.	4 Mos.
50 – 150	1 Yr.	9 Mos.	4 Mos.

Recommended Motor Greases

Polyrex EM – Exxon Oil Company
SRI #2 – Chevron Oil Company

FAN MOTORS USED WITH VARIABLE FREQUENCY DRIVES

1. Specify “Inverter Duty Motors” whenever possible. If this is not practical, premium efficiency motors *must* be specified.
2. Specify motors with inverter spike resistant magnet wire when possible.
3. 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 50 HP and larger since the cost of downtime and bearing replacement is typically much greater on larger motors, than the initial cost of one of these preventative measures. **Note:** Shaft currents can occur on any motor HP rating when used with a variable frequency drive.
4. Specify the same manufacturer for both the motor and variable frequency drive, if possible, for single-source responsibility.
5. A load reactor should be installed in series in the power leads between the VFD and the motor, located as closely as possible to the VFD. This is an inexpensive preventative measure, especially if the VFD is more than 75 feet from the motor.
6. 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. Generally, 2.5 Khz is optimal.
7. Good industrial wiring practices, including proper grounding, that meet local and national electric codes must be followed.
8. It is best to limit the minimum frequency to the motor to 10 Hz or more for extended periods of time.

Note: These are general recommendations only. As each application is different, you must consult the motor and drive manufacturer for specific requirements as they apply to your installation.

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 cannot be predicted. American Fan Company has experienced many motor bearing failures that have been 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 DRIVE 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 properly in conjunction with used belts due to difference 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-lb. force. Allow unit to run for 4 – 6 hours, then it will be necessary to re-tighten belts again because new belts tend to stretch initially.

Section IV

VIBRATION LEVEL OF REPLACEMENT IMPELLERS

All replacement impellers 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. It can result from differences between test-stand conditions and operating conditions. A factory test stand has different bearings, bearing spans, structural response, stiffness, mechanical impedance, and by necessity, running speed. The test stand cannot duplicate the actual "fan system" and its response. For these reasons, the "fan system" vibration levels must be checked after installing a replacement impeller. Refer to page 4 for acceptable vibration levels.

PROBLEM TROUBLESHOOTING

In the event that trouble is experienced in the field, listed below are the most common fan difficulties. These points should be checked in order to prevent needless delay and expense of factory service.

1. CAPACITY OR PRESSURE RATING
   A. Total resistance of system 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 & NOISE
   A. Misalignment of bearings, couplings, wheel, or V-belt drive.
   B. Unstable foundation, fan bolted to uneven foundation, not shimmed or grouted.
   C. Foreign material in fan causing unbalance.
   D. Worn bearings.
   E. Damaged wheel or motor.
   F. Broken or loose bolts and setscrews.
   G. Bent shaft.
   H. Worn Coupling.
   I. Fan wheel or driver unbalanced.
   J. 120 cycle magnetic hum due to electrical input. Check for high or unbalanced voltage.
   K. Fan delivering more than rated capacity.
   L. Loose dampers or variable inlet vanes.
   M. Speed too high or fan rotation in wrong direction.
   N. Vibration transmitted to fan from some other source.

3. OVERHEATED BEARINGS
   A. Too much grease.
   B. Poor alignment.
   C. Damaged wheel or driver.
   D. Bent shaft.
   E. Abnormal end thrust.
   F. Dirt in bearings.
   G. Excessive belt tension.

ORDERING SPARE PARTS

Service and Parts:

Phone: (513) 874-2400, Dial 2
Fax: (513) 870-6249
e-mail: greg.robinson@flaktwoods.com

Contact the local American Fan Co. sales representative or AFC Service and Parts Department and supply the following information:

1. Fan serial number stamped on nameplate.
2. Fan code and model stamped on nameplate.
3. Fan arrangement.
4. Description of part required.
5. Part number if part is a casting.
6. Special materials, paints or coatings.

WHEEL – Be sure to indicate direction of rotation as viewed from drive side, type of wheel and the operating speed.

SHAFT – Length and diameter.

MOTORS – The name of the motor manufacturer, motor model number, and serial number from the motor nameplate must be supplied to the factory for repairs or replacement.

BEARINGS – The following information should be indicated when ordering various types of bearings:

ANTI-FRICTION BEARINGS
1. State whether ball or roller.
2. Manufacturer.
3. Size and number.
4. Fixed or floating.

RECOMMENDED SPARES:
1. V-belts on V-belt driven fans.
2. Fan bearings
3. Wheel (s)
4. Motor (if blower is critical to your operation).

Section V

AMERICAN FAN COMPANY TERMS OF SALE AND WARRANTY

For details, please contact factory:

American Fan Company
2933 Symmes Road
Fairfield, OH 45014

Phone: (513) 874-2400
Fax: (513) 870-6249