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Introduction

The purpose of this manual is to provide instructions that complement good general practices when installing or operating fans manufactured by Twin City Fan and Blower Company. It is the responsibility of the purchaser to provide qualified personnel experienced in the installation, operation, and maintenance of air moving equipment.

Instructions given in the body of this manual are general in nature and apply to a variety of models manufactured by Twin City Fan and Blower Company. Most units can be installed and maintained with the instructions given.

Special applications may require additional information. These instructions are supplied in the form of attached appendices. Use the instructions in the appendix if the directions in the manual differ from instructions in the appendix.

As always, follow good safety practices when installing, maintaining and operating your air moving equipment. A variety of safety devices are available. It is the user's responsibility to determine adequate safety measures and to obtain the required safety equipment.

Shipping and Receiving

All Twin City Fan and Blower Company products are carefully constructed and inspected before shipment to insure the highest standards of quality and performance.

Compare all components with the bill of lading or packing list to verify that the proper unit was received.

Check each unit for any damage that may have occurred in transit. Any damage should be reported immediately to the carrier and the necessary damage report filed.

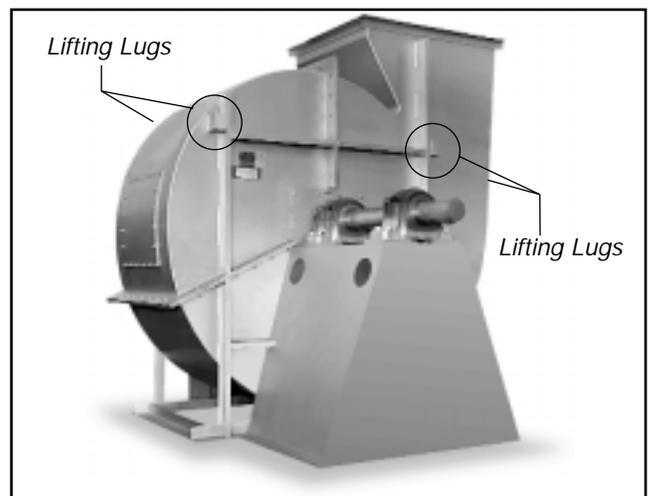
Handling

Handling of all air moving equipment should be conducted by trained personnel and be consistent with safe handling practices. Verify the lift capacity and operating condition of handling equipment. Maintain handling equipment to avoid serious personal injury.

Units shipped completely assembled may be lifted with slings and spreader bars. Use well-padded chains, cables or nylon straps. On most units, lifting lugs are provided for attaching chains (see Figure 1). Lift the fan in a fashion that protects the fan and fan coating from damage. Never lift a fan by the inlet or discharge flange, shafting or drives, wheel or impeller, motor or motor base, or in any other manner that may bend or distort parts.

Partial or disassembled units require special handling. All parts should be handled in a fashion which protects the coatings and parts from damage. Components should be handled such that forces are not concentrated and bending or distortion cannot occur.

Figure 1. Lifting Lug Locations

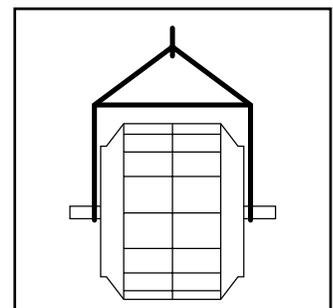


Housing should be lifted using straps and spreaders. Do not distort housing or side plates when lifting.

Bearing pedestals should be lifted using straps or padded chains. Under no circumstances should an attached or separated bearing pedestal be lifted by the shaft, bearings, drives, motor or wheel.

Figure 2. Moving Shaft and Wheel with Spreader Bar

The shaft and wheel assembly may be lifted using a hoist and a spreader with a sling around the shaft at points nearest the wheel (see Figure 2). Take care not to scratch the shaft where the wheel or bearings will be mounted. Never lift or support the assembly by the wheel. Always support the assembly by the shaft when lifting or storing. Do



not support the shaft or the wheel on housing sides. Use only the key provided with the shaft and wheel.

Wheels shipped separately can be lifted by slings running through the blades and around the hub. Never lift the wheel by blades or flanges. Always transport wheels by lifting. Do not roll the wheel as this can damage coatings and change the balance of the wheel.

Bent shafting is a source of vibration and bearing failure, so handle the shaft with care. Any scratches on the shaft may be removed with fine emery cloth or a stone.

Unit Storage

If fan installation is to be delayed, store the unit in a protected area. Protect the fan and motor bearings from moisture and vibration (or shock loading). For extended storage, wrap entire unit in plastic.

Extended storage requires monthly inspections. Check for corrosion or damage to the unit and for debris within the fan. Rotate the fan wheel a few revolutions. Stop the wheel in a position other than the initial position. Grease the bearings every month with a grease compatible with the grease supplied with the bearings.

Foundations and Supporting Structures

Floor mounted fans should be installed on a flat, level, rigid concrete foundation with a mass at least three times that of the assembly supported. The plan area should be no more than twice that required by the equipment. Foundations with larger areas should have correspondingly larger mass. Anchor bolts should be "L" or "T" shaped with sufficient length for nuts, washers, shims, and threads for draw-down. Each bolt should be placed in a sleeve or pipe with diameter larger than the bolt to allow for adjustment.

Fans mounted to or within a structure should be placed as close as possible to a rigid member such as a wall or column. The structure must be designed for rotating equipment; static design for strength is not sufficient to insure proper operation. Supports for suspended fans must be cross-braced to prevent side sway. Structural resonance should be at least 20% from fan operating speed. Vibration isolators should be used where applicable.

Any ducting should have independent support; do not use the fan to support ducting. Isolating the fan from ductwork with flex connections eliminates transmission of vibration. Fans handling hot gases require expansion joints at both the inlet and discharge to prevent excessive loads caused by thermal growth.

Fan Installation, Factory Assembled Units

Follow proper handling instructions given earlier.

1. Move the fan to the final mounting position.
2. Remove skid, crates, and packing materials carefully.
3. If supplied, place vibration pads or isolation base on mounting bolts. Line up holes in fan base with bolts.
4. Place fan on mounting structure. Carefully level unit using shims as required at all mounting hole locations. Bolt down the unit.
5. Any grout may now be used. Bolt the fan in position before applying grout. Do not depend upon grout to support rotating equipment.
6. Continue with Operations Checklist.

Additional instructions may be given for some fan models, components and accessories in the appendix.

Fan Installation – Disassembled Units

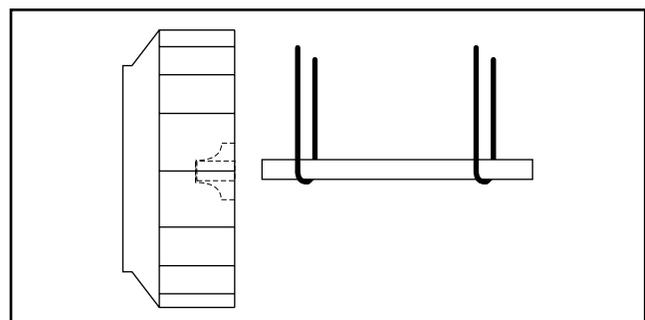
A unit is considered "disassembled" if any component

required for proper operation is shipped or supplied separately or in pieces. Reference earlier instructions concerning proper handling of fan components.

Instructions for Mounting and Assembly of Unit:

1. Move lower housing/framework to mounting location.
2. If vibration pads or bases are used, place on bolts first. Place lower housing assembly onto bolts.
3. Level and shim if required. Bolt into place.
4. If separated pedestal or bearing pedestal:
 - a. Bring bearing pedestal to desired location.
 - b. Place any vibration base or pads into place. Set bearing pedestal on bolts.
 - c. Never distort bearing pedestal by forcing it to align with a non-level surface. Shim beneath the pedestal as required.
 - d. Check bearing centerline height. Change centerline height to match centerline height of housing. High temperature units may require the housing centerline to be lower when cold so that it will be centered when hot.
 - e. Measure from housing to bearing pedestal to bring bearing pedestal into square with housing (a large square may also suffice).
 - f. Bolt into position.
5. Shaft and wheel assembly preparation:
 - a. Clean protective coating off shaft with solvent. Do not touch clean areas of shaft with hands. Perspiration can cause rust or pitting over time.
 - b. Remove keys from shaft.
 - c. Clean inside of wheel bore with solvent. Make sure setscrews will not interfere when inserting shaft into wheel bore.
6. Arrangement 1, 9 or 10: Drive Component Assembly (See Figure 3):
 - a. Insert shaft into wheel from back side of wheel.
 - b. When shaft is flush with wheel hub, put key into keyway and tighten wheel setscrews.
 - c. Insert shaft through opening in drive side. (If split housed unit, lower into position.)
 - d. Install bearings onto shaft. Do not tighten bearing setscrews at this time. The bearing housing should be perpendicular and the bearing base parallel to the axis of the shaft to prevent loads caused by misalignment.
 - e. Mount assembly, bolt bearings to drive stand. Shaft must be parallel with side of bearing pedestal. After aligning and bolting bearings to pedestal, tighten bearing setscrews. Continue with step 8.

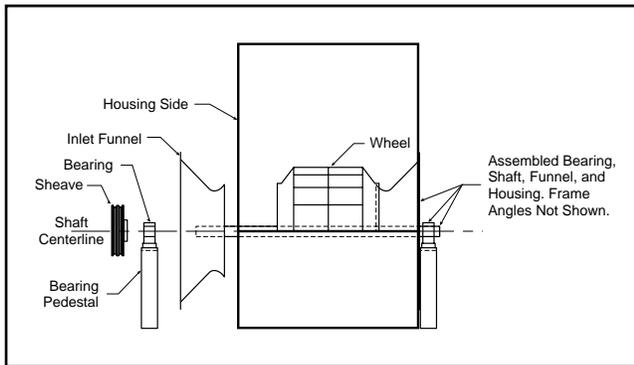
Figure 3. Drive Component Assembly



7. Arrangement 3 (Split-housed) units (see Figure 4):

- a. Parts on DWDI unit are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), funnel, drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. Center wheel in funnels.
- b. Parts on SWSI are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. (See Figure 6 for wheel-funnel overlap.)
- c. Assemble parts in above order on shaft.
- d. Move assembly into position. Lightly bolt bearings into place.
- e. Shaft should be parallel with discharge of housing. Move bearings to accommodate.
- f. Level shaft; shim bearings if required. Tighten bearing setscrews.

Figure 4. Split-housed Drive Component Assembly

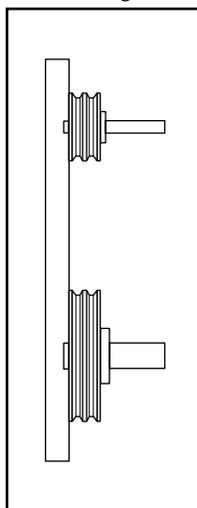


8. Install motor on base. Carefully align shafts for drive installation.

9. Mount drives as follows:

- a. Slip (do not pound) proper sheave onto corresponding shaft as close as possible to bearing. CAUTION: PLACING FAN SHEAVE ON MOTOR CAN OVERSPEED WHEEL AND CAUSE STRUCTURAL FAILURE.
- b. Align sheaves with straightedge extended along perimeters of both sheaves, just making contact in two places on outside perimeters of both sheaves (see Figure 5).
- c. Tighten down sheave bolts.
- d. Install matched set of belts. Slide the motor to obtain slack and tighten belts. Using a pry will damage belts.
- e. Tighten belts to proper belt tension. Ideal tension is just enough tension so that belts do not slip under peak load. Recheck sheave alignment.
- f. After initial installation of belts, recheck belt tension again after a few days to adjust belt tension. (New belts require a break-in period of operation.)

Figure 5. Sheave Alignment



10. Install any safety devices or accessories supplied. (Accessories commonly used are inlet vane, shaft seals and shaft coolers, plugs, dampers, and inlet or discharge screens. Refer to appropriate documents in appendix.)
11. Grout may now be applied. Grout is used to distribute loads and should not be used as the sole support of any rotating equipment.
12. When connecting fan to system, it is recommended that the inlet and discharge be isolated from the system with flex connections (where practical) to block transmitted vibration. All duct connections to the fan should be independently supported. Do not use fan to support duct.

Fan Operation – Safety

For general safety practices for air moving equipment, see AMCA Bulletin 410.

Twin City Fan and Blower Company has many safety accessories available. These safety devices include (but are not limited to) belt guards, shaft guards, inlet and discharge screens. The use, abuse, or non-use of safety devices is the responsibility of the purchaser.

Facility-related safety conditions include fan accessibility and location. How easily can non-service personnel access the unit? Is the fan in a hazardous duty environment? Was the unit ordered for this duty? Other concerns must also be addressed. All fans should be powered through switches which are easily accessible to service personnel from the fan. Every switch should have the ability to be “locked-off” by the service person and the key to be retained by this person to prevent accidental power of the fan while service is in process.

Operation Check List

Verify that proper safety precautions have been followed:

- Electrical power must be locked off.

Check fan mechanism components:

- Nuts, bolts and setscrews are tight.
- System connections are properly made and tightened.
- Bearings are properly lubricated.
- Wheel, drives and fan surfaces are clean and free of debris.
- Rotate the impeller by hand to verify it has not shifted in transit.
- Drives on correct shafts.

Check fan electrical components:

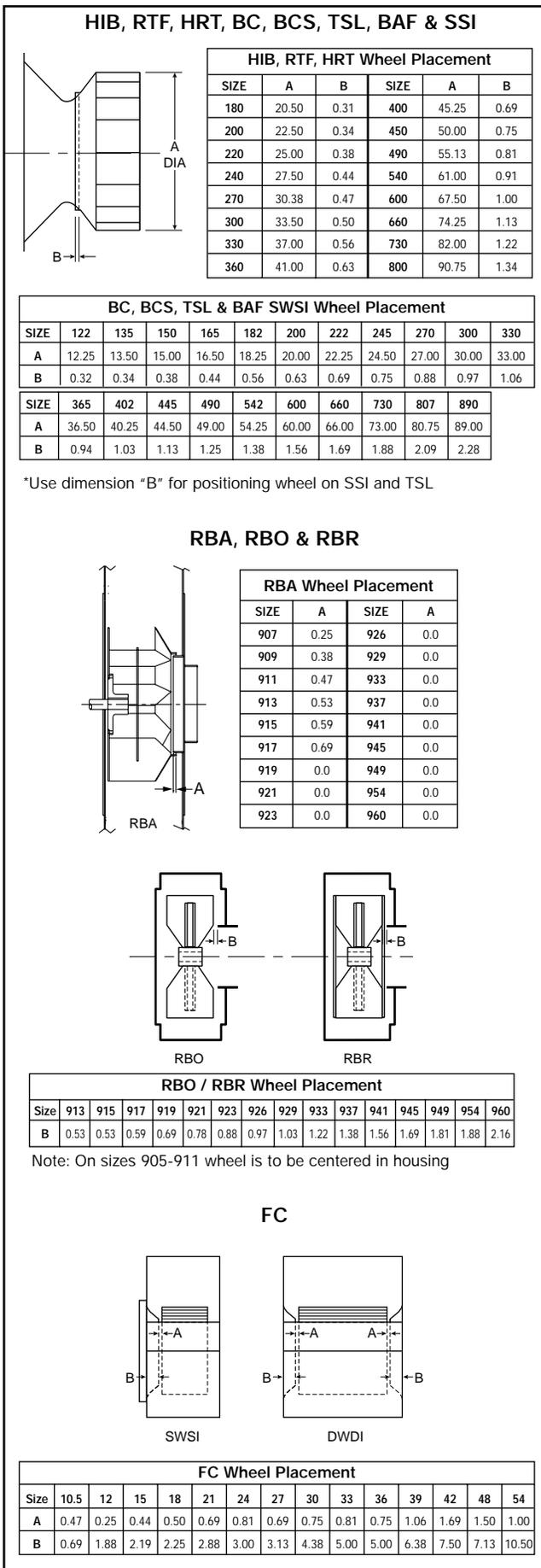
- Motor is wired for proper supply voltage.
- Motor was properly sized for power and rotational inertia of rotating assembly.
- Motor is properly grounded.
- All leads are properly insulated.

Trial “bump”:

- Turn on power just long enough to start assembly rotating.
- Check rotation for agreement with rotation arrow. Does the assembly make any unusual noise? (See Figure 7)
- Check drive alignment and tension. Does this meet with drive manufacturer’s recommendations?
- Correct any problems which may have been found. (Follow safety guidelines - shut power off). Perform checklist again until unit is operating properly.
- Run unit up to speed.

After one week of operation, check all nuts, bolts and setscrews and tighten if necessary.

Figure 6. Wheel-Funnel Overlap



Maintenance of Fans

This section contains general maintenance instructions for your Twin City Fan and Blower Company unit. For specific information about maintenance of components, particularly for special application fans, see the attached documents.

General Motor Maintenance

The three basics of motor maintenance are to keep the motor clean, dry and properly lubricated.

Keeping motors and windings clean is important because dirt and dust serve as thermal insulators. Heat normally dissipated by the motor is trapped causing overheating and/or premature failure. Blow dust and dirt out of windings and off the motor periodically. Use low pressure (50 psig) airstream so that winding damage does not occur. Keep the area surrounding the motor open so the air can circulate through the motor cooling fan. Follow normal maintenance schedule given below.

Motors should be kept dry to avoid electrical short circuits. Motors kept in storage for long periods of time can have moisture condense on the windings. Be certain the motor is dry before using.

Some smaller motors are lubricated for life. Motor bearing lubrication, if required, must follow a rigorous schedule. Motors less than 10 hp running about eight hours a day in a clean environment should be lubricated once every five years; motors 15 to 50 hp, every 3 years; and motors 50 to 150 hp, yearly. For motors in a dusty or dirty environment or running 24 hours a day, divide the service interval by 2. If the environment is very dirty or high temperatures exist, divide the service interval by 4. Lubrication requirements are normally attached to the motor. Do not overlubricate.

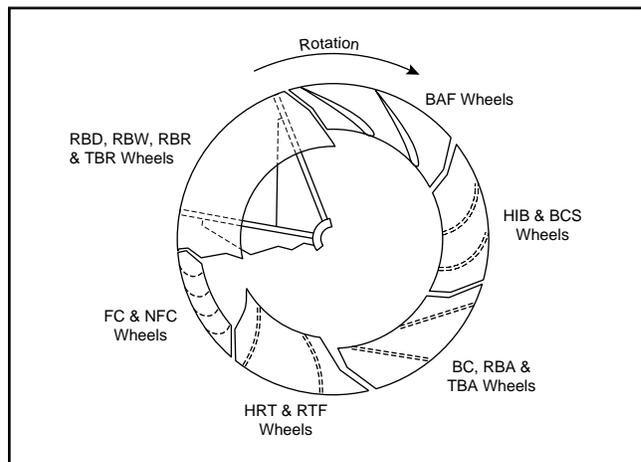
Drive Maintenance

V-belt drives need periodic inspection and occasional belt replacement. When inspecting drives, look for dirt buildup, burrs or obstructions which can cause premature belt or drive replacement. If burrs are found, use fine emery cloth or a stone to remove the burr. Be careful that dust does not enter the bearings.

Check the sheaves for wear. Excessive slippage of belts on sheaves can cause wear and vibration. Replace worn sheaves with new ones. Carefully align sheaves to avoid premature sheave failure.

Observe belts for wear. If fraying or other wear is observed to be mostly on one side of the belts, the drives may be misaligned. Reinstall the drives according to instructions given for Fan Installation of Disassembled Units, part 9. Never use belt dressing on any belts.

Figure 7. Proper Wheel Rotation



When replacing belts, replace the entire set. After initial replacement and tensioning, recheck belt tension after a few days to adjust belt tension again. (New belts require a break in period of operation.)

Bearing Maintenance

For instructions covering special lubrication intervals, bearing assembly or disassembly, or installation details, see attached documents. Any bearing which is disassembled should be kept separate from other bearing parts as components may not be interchangeable. Maintain cleanliness of components and bearings to prevent bearing contamination.

Bearing failure can occur from many causes. See Troubleshooting section for details.

Note: All speeds shown do not apply to all shaft sizes in that group. Consult the factory if in doubt of maximum speed for a particular bearing.

Lubrication

Proper lubrication of bearings helps assure maximum bearing life. All fans are equipped with decals indicating relubrication intervals for normal operating conditions. However, every installation is different and the frequency of lubrication should be established accordingly.

Experience has shown that airborne moisture and heavy dust will dramatically reduce the life of the bearing lubricant. If any of these adverse conditions exist, it is recommended that bearings be regreased after several days of operation. Lubrication intervals can then be adjusted based on the condition of the purged grease.

Figure 8 illustrates the decal for ball bearings, Figure 9 the decal for solid pillow block spherical roller bearings, and Figure 10 shows the decal for split pillow block spherical roller bearings. Observation of the condition of the grease expelled from the bearings at the time of relubrication is the best guide as to whether regreasing intervals and amount of grease added should be altered. This observation is particularly important when bearings operate continuously over 160 degrees Fahrenheit.

Greases are made with different bases. There are synthetic base greases, lithium base, sodium base, etc. Avoid mixing greases with different bases. They could be incompatible and result in rapid deterioration or breakdown of the grease.

All bearings are filled with grease before leaving the factory. When the fans are started, the bearings may discharge excess grease through the seals for a short period of time. Do not replace the initial discharge because leakage will cease when the excess grease has worked out. Sometimes the bearing has a tendency to run hotter during this period and one should not get alarmed unless it lasts over 48 hours or gets above 220°F. When relubricating, use a sufficient amount of grease to purge the seals. Rotate bearings during relubrication where good safety practice permits.

For bearings with oil lubrication, sight gauges are installed so the a proper level can be reviewed and maintained. Sight gauges should be read with bearing not rotating.

Wheel and Shaft Maintenance

Periodically inspect the shaft and wheel for dirt buildup, corrosion, and signs of excess stress or fatigue. Clean the components and, when appropriate, apply new coatings. (Any addition of coatings or weld can create an imbalance.) Check the balance of the assembly.

Figure 8.

WARNING

- This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
- Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Ball Bearing Pillow Blocks									
Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1/2" thru 1 1/16"	6	6	5	3	3	2	2	2	1
1 5/16" thru 2 7/16"	6	5	4	2	2	1	1	1	1
2 1/16" thru 2 5/16"	5	4	3	2	1	1	1		
3 7/16" thru 3 5/16"	4	3	2	1	1	1			

*Suggested initial greasing interval: Relubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

- Lubricate with a high quality NLGI No. 2 or No. 3 multipurpose ball bearing grease having rust inhibitors and antioxidant additives. Some greases having these properties are:
 - Shell - Alvania No. 2 Mobil - Mobilith 22/Mobilith SHC100
 - Gulf - Gulfcrown No. 2 Amoco - Rykon Premium 2
- Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Figure 9.

WARNING

- This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
- Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Spherical Roller Bearing - Solid Pillow Blocks									
Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1 3/16" thru 1 7/16"	6	4	4	2	1	1	1	1	1/2
1 1/16" thru 2 3/16"	4	2	1 1/2	1	1/2	1/2	1/2	1/2	1/2
2 7/16" thru 3 7/16"	3	1 1/2	1	1/2	1/2	1/4	1/4		
3 5/16" thru 4 5/16"	2 1/2	1	1/2	1/4					

*Suggested initial greasing interval: Relubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

- Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:
 - Shell - Alvania No. 2 Texaco - Premium RB2
 - Mobil - Mobilith SHC100 Amoco - Rykon Premium 2
- Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Figure 10.

WARNING

- This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
- Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Spherical Roller Bearing - Split Pillow Blocks										Grease to be added at each interval
Speed (RPM)	500	750	1000	1500	2000	2500	3000	3500	4000	
Shaft DIA										
1 7/16" thru 1 15/16"	6	4 1/2	4	4	3 1/2	2 1/2	2 1/2	1	1	0.50 oz.
2 3/16" thru 2 11/16"	5	4 1/2	4	2 1/2	2 1/2	1 1/2	1/2	1/4	1/4	0.75 oz.
2 15/16" thru 3 15/16"	4 1/2	4	3 1/2	2 1/2	1 1/2	1	1/2			2.00 oz.
4 7/16" thru 4 15/16"	4	4	2 1/2	1	1/2					4.00 oz.
5 7/16" thru 5 15/16"	4	2 1/2	1 1/2	1						7.00 oz.

*Suggested initial greasing interval: Remove bearing cap and observe condition of used grease after lubricating. Adjust lubrication frequency as needed. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required. Clean and repack bearings annually. Remove old grease, pack bearing full and fill housing reservoirs on both sides of bearing to bottom of shaft.

- Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:

Shell - Alvania No. 2	Texaco - Premium RB2
Mobil - Mobilith SHC100	Amoco - Rykon Premium 2
- Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Static Oil Lubrication

- Use only highest quality mineral oil with a minimum viscosity of 100 SSU at the oil's operating temperature. The oil's operating temperature is approximately 10° greater than the bearing's housing. SAE values having this viscosity at the following operating temperature are:

150° - SAE 20	160° - SAE 30	180° - SAE 40
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- Static oil level should be at the center of the lowermost roller (Do not overfill).
- Complete lubrication change should be made annually.

Structural Maintenance

All structural components or devices used to support or attach the fan to a structure should be checked at regular intervals. Vibration isolators, bolts, foundations, etc., are subject to failure from corrosion, erosion, and other causes. Improper mounting can lead to poor operation characteristics or fan fatigue and failure.

Check metallic components for corrosion, cracks, or other signs of stress. Concrete should be checked to insure the structural integrity of the foundation.

Troubleshooting Guidelines

Use current safety practices when investigating fan or system performance problems. General safe practices and performance troubleshooting guidelines can be found in AMCA Publications 410 and 202, respectively. Fan application and field measurement procedures can be found in AMCA Publications 201 and 203.

Troubleshooting Performance Problems

The lists below indicate possible areas to check when air or sound values do not match expectations. Most fan problems can be pinpointed to one of these common causes.

Air Capacity Problems:

- Resistance of system not at design rating. If resistance is lower than expected, both airflow and horsepower may be up. If resistance is higher than anticipated, air volume will be down.
- Fan speed is not at design speed.
- Air density not at design values. Also check air performance measurement techniques/procedures.
- Devices for air modulation are closed or plugged. Also check filters.
- Wheel mounted improperly or is rotating in reverse.
- Parts of system or fan have been damaged or need cleaning.

Noise Problems:

- Air performance is incorrect and fan is not at design point of operation. Fan forced to operate in an unstable flow region.
- Bearing failure. Check bearings (lubrication).
- Supply voltage high or inconsistent supply frequency. Adjustable frequency controllers can generate motor noise.
- Objects which are installed in a high velocity airstream can generate noise. This includes flow sensors, turning vanes, etc.
- Poor fan inlet conditions.
- Acoustics or sound measurement procedure incorrect.

Vibration Problems:

- Misalignment of drive components.
- Poor foundations or mounting structure (resonances).
- Foreign material attached to rotating components.
- Damaged rotating components (bearings, shaft, fan, wheel, sheaves).
- Broken, loose or missing setscrews.
- Loose bolts.
- Vibration transmitted by another source.
- Water accumulating in airfoil blades.
- Fan is operating in stall or unstable flow region.

Motor Problems:

- Incorrect wiring.
- Speed of fan too high.
- Parts improperly installed - binding.
- Bearings improperly lubricated.
- WR2 capability of motor too low for application.
- Protection devices may be improperly sized.

Drive Problems:

- Belts improperly tensioned.
- Drive alignment is poor.

Limitation of Warranties and Claims

Seller warrants to the original purchaser that the goods sold hereunder shall be free from defects in workmanship and material under normal use and service (except in those cases where the materials are supplied by the buyer) for a period of one year from the date of original installation or eighteen (18) months from the date of shipment, whichever occurs first. The liability of seller under this warranty is limited to replacing, repairing, or issuing credit (at cost, F.O.B. factory and at seller's discretion) for any part or parts which are returned by buyer during such period provided that:

- a. seller is notified in writing within ten (10) days following discovery of such defects by buyer, or within ten (10) days after such defects should reasonably have been discovered, whichever is less;
- b. the defective unit is returned to seller, transportation charges prepaid by buyer.
- c. payment in full has been received by seller or said products; and
- d. seller's examination of such unit shall disclose to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair, alteration, act of God, or accident.

No warranty made hereunder shall extend to any seller product whose serial number is altered, effaced or removed. Seller makes no warranty, express or implied, with respect to motors, switches, controls, or other components of seller's product, where such components are warranted separately by their respective manufacturers. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable to buyer for indirect, incidental collateral, or consequential damages of any kind. (BUYER'S FAILURE TO PAY THE FULL AMOUNT DUE WITHIN SIXTY (60) DAYS OF DATE OF INVOICE SHALL OPERATE TO RELEASE SELLER FROM ANY AND ALL LIABILITY OR OBLIGATION ARISING PURSUANT TO ANY WARRANTY, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, MADE IN CONNECTION WITH ANY CONTRACT FORMED HEREUNDER. BUYER AGREES THAT SUCH FAILURE TO PAY SHALL CONSTITUTE A VOLUNTARY WAIVER OF ANY AND ALL SUCH WARRANTIES ARISING PURSUANT TO SUCH CONTACT.)

Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (612) 551-7600 · Fax (612) 551-7601