SPX®
WHERE IDEAS MEET INDUSTRY

USER MANUAL

ultra quiet fan

INSTALLATION – OPERATION – MAINTENANCE

Z0414808 rev A ISSUED 02/2014

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.

Marley®

safety and handling

Safety

⚠ **Warning**

Because of the potential for property damage and/or danger to personnel, it is critical to follow the proper selection, installation and operating procedures.

Exposed rotating devices are potentially dangerous and can cause injury or death. They must be guarded in compliance with OSHA, ANSI and all other local standards for the specific application.

All personnel must follow applicable work safety standards, such as Lockout/Tagout procedures while working in or around power transmission devices.

Handling Considerations

1—Marley Ultra Quiet Fans are designed and manufactured to be very durable and can provide years of service if handled properly.

2—Minor aesthetic imperfections, such as surface abrasions or scuffs may be present from manufacturing or handling and will not affect performance. Heavy, concentrated impacts may cause gouges, penetration or dents in the blades. If any damage is observed, the fan should not be placed into service. Only SPX Cooling Technologies, Inc. engineering is authorized to evaluate any issues exceeding the above description of minor aesthetic imperfections.

3—The entire fan assembly should be inspected periodically or after any changes to the drive system components.

components

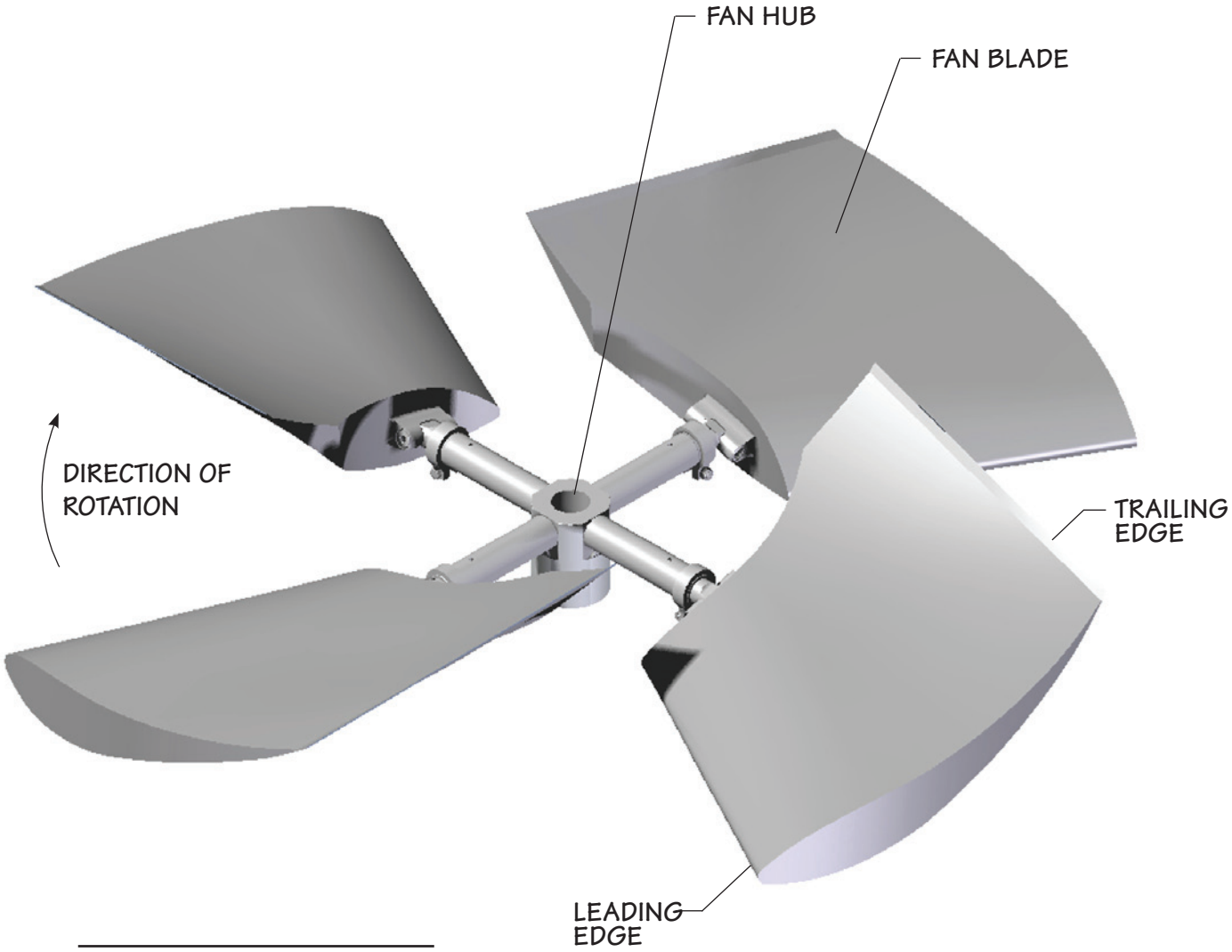


Figure 1

Order No. _____

Trial Pitch Angle _____

Final Pitch Angle _____

Speed-rpm _____

Contract hp _____

assembly

Note

The following instructions apply to installations having straight bores or tapered output shafts without split taper bushings.

It is convenient to preassemble the fan prior to installation.

Ultra Quiet fans are statically balanced as a complete assembly and shipped unassembled. To ensure proper reassembly, blades and hubs are match-marked.

1—Select a large open area corresponding to the fan diameter.

2—Position the fan hub in the center of the work area with the hub taper down. See **Figure 1**.

Note

Proper assembly, with particular attention to tightening hardware to the specified torque is essential to maintain the design integrity of the fan.

3—Install one blade with the trailing edge curved up. Clean any dirt or grease from the rod end and the surfaces of the resilient mounts. Align the rod end hole with the holes in the resilient mounts and insert the blade-mounting bolt — first through the resilient mount with the recess to accept the bolt head, then through the rod end hole. See **Figure 2**. Screw the bolt into the second resilient mount lightly. A ¾" drive torque wrench with a short extension may be useful. The blade-mounting bolt is supplied from the factory with grease on the threads and conical face. ***Do not remove the grease from the bolt.***

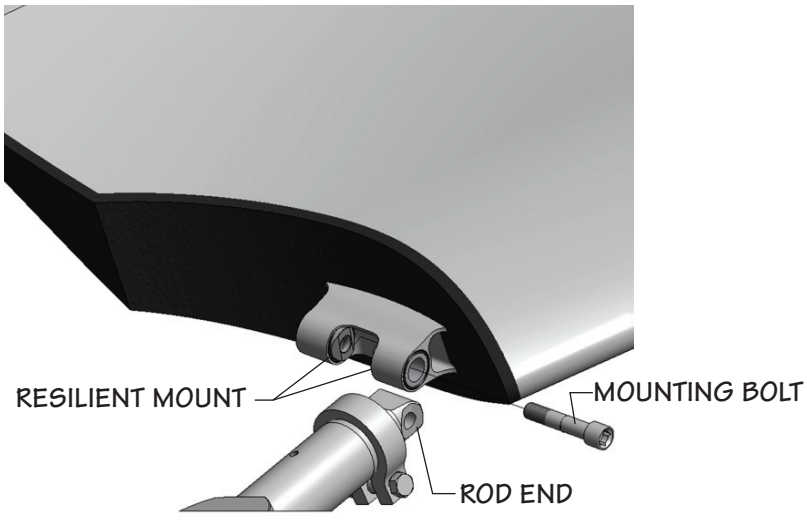


Figure 2

4—Complete the installation by holding the blade so that it extends straight out from the hub tube. While holding the blade in this position, tighten the bolt to 200 ft-lb (271 N·m) making sure the rod end and the resilient mounts seat.

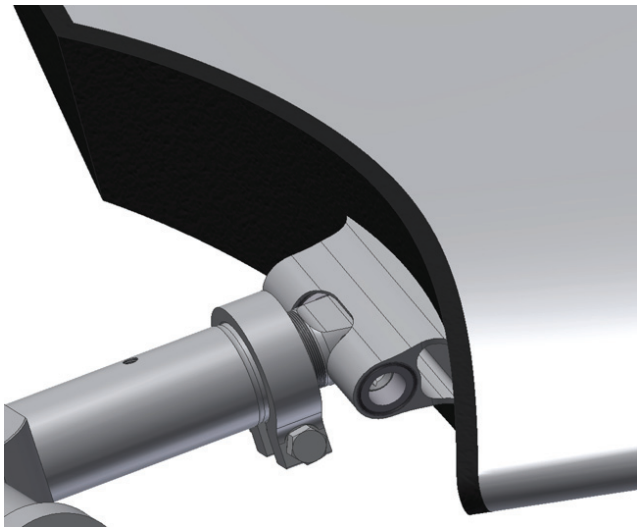


Figure 3

5—Install the other blades. See **Figure 3** for completed blade connection. All bolts should be tightened to 200 ft-lb (271 N·m). If blades are installed properly, they will return to their undisturbed position if the tips are pressed in the axial direction with moderate force (10 to 20 lb).

installation

1—Be sure the fan motor is locked out.

2—Clean the hub bore and drive fan shaft extension for the full length of the key.

3—Insert the key in the keyway. The top of the key must be below the top of the shaft by not more than ⅛" (3mm). The key is a tight fit across the width and must never be altered.

4—After cleaning, apply a coat of anti-seize compound to the engagement portion of the shaft.

5—Raise the fan assembly above the shaft and slowly lower the hub onto the shaft with the keyways aligned. Make certain the key does not slide down during installation.

6—Tighten two set-screws to 30 ft-lb (41 N·m) over key.

Note

Installation is applicable to the fan being installed on a gear drive or belt drive fan shaft

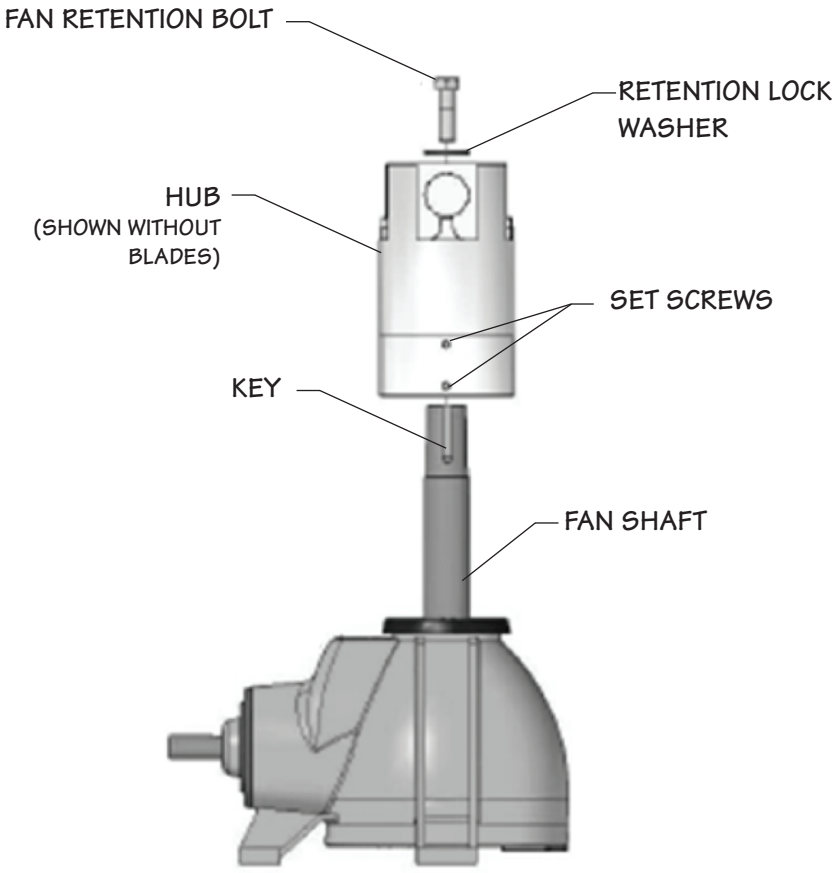


Figure 4

7—Install the hub retention bolt with the lock washer and torque to 50 ft-lb (68 N·m). If the standard hub retention bolt is too short, locate a longer one in the fan retention hardware kit.

8—After installing the fan, manually rotate it while moving the blade tips up and down to be sure they clear the cylinder ring or throat at all points. When a blade is held in alignment with the blade tube — i.e. straight outward from the hub — it should clear the fan cylinder by a distance adequate to provide for any relative motion between the fan and the cylinder. Excess clearance between the blade tips and the cylinder should be avoided to prevent backflow, which seriously reduces fan efficiency. Correct blade tip clearance dimensions are shown in **Table 1** on page 11.

9—Install the air seal.

Air Seal Installation

The air seal is a thin sheet metal disc that is required to prevent the back flow of air through the center of the fan to maximize the fan's efficiency. See **Figure 5**.

1—Locate the air seal installation hardware.

2—Install the air seal studs on the hub tube – finger tighten.

3—Place one resilient washer on each stud as shown in **Figure 6**.

4—Place the air seal onto the studs and install the remaining hardware following the sequence shown. Do not lubricate the studs.

5—Note that the diameter of the resilient washers before they are compressed is slightly less than the diameter of the aluminum washer. Tighten each nut until the resilient washer's diameter is the same as the aluminum washer. Do not over tighten.

Figure 5

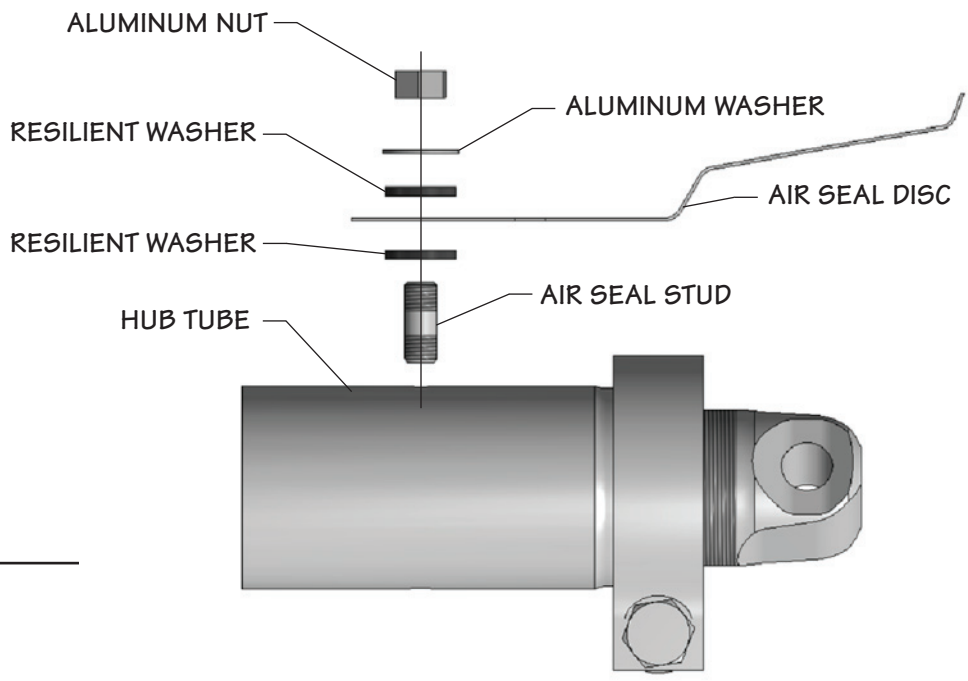


Figure 6

blade pitch adjustment

Hubs are shipped from the factory with the rod end set for the blade angle (pitch) required for design performance. A change in blade angle is sometimes necessary to adjust to actual site conditions. Failure to adjust the blade angle when required may result in blade overload. To adjust, loosen the clamp nut just enough to allow the blade to be turned. Place an inclinometer on the flat surface of the blade as shown in **Figure 7**. Turn the blade until the desired angle is achieved. Make a permanent record of the final angle selected and make sure that all blades are set at the same angle. A typical adjustment may be ± 3°.

⚠ Caution

The fan is designed to consume the horsepower stated on the Fan Specification Sheet. Too great an increase in blade angle can cause serious blade overload which will stall the blades. In this condition, the fan will actually deliver less air and blade life may be compromised.

The maximum recommended blade angle is 30°. Retighten the clamp nut to 100 ft-lb (136 N·m) for fan diameters 8'-0" (244cm) and smaller or 200 ft-lb (271 N·m) for fan diameters 9'-0" (274cm) and larger. Recheck blade angles after tightening.

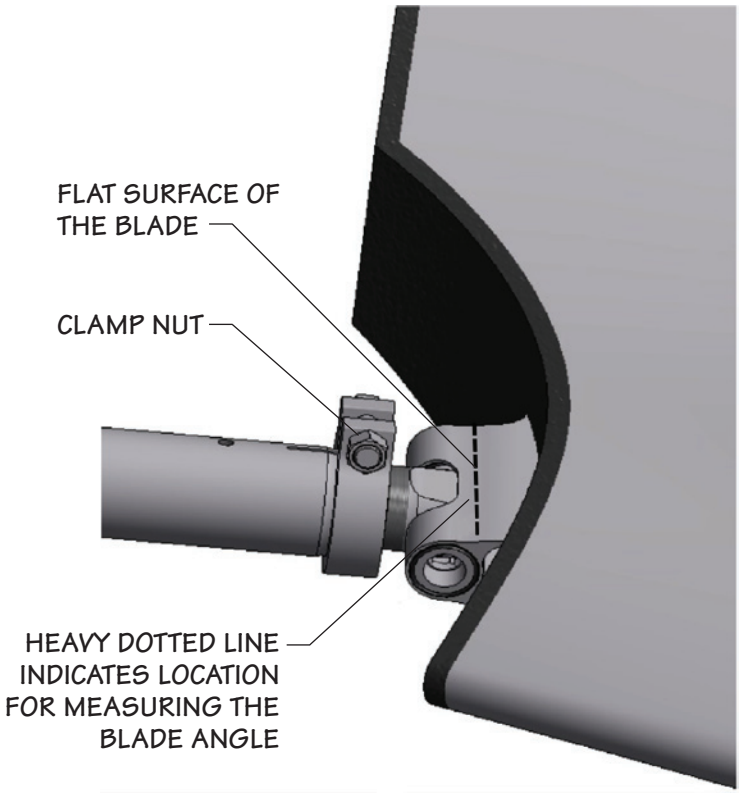


Figure 7

blade tip clearance adjustment

It may be necessary to adjust the fan diameter to suit a particular fan cylinder ring. See **Figure 8.** The tip clearance of the blades should be in the range of the fan diameter listed in **Table 1**. If the tip clearance is found to be outside of this range the fan diameter can be adjusted.

First remove the fan blade and loosen the clamp nut so that the rod end can be rotated in the hub tube. One complete revolution will increase or decrease the radius of the fan by .079" (2mm). Take care that the clevis is returned to the exact factory-set angle unless it is intended that the blade pitch be changed as discussed in the previous section. A match mark may be made at a point on the threads and the tube before turning to assure that exactly one revolution is made.

Tighten the clamp nut to 100 ft-lb (136 N·m) for fan diameters 8'-0" (244cm) and smaller or 200 ft-lb (271 N·m) for fan diameters 9'-0" (274cm) and larger. Maximum adjustment possible is about ± 0.75" (19mm) radially (1½" on diameter). At least 1½" (38mm) of rod end threads must remain in the tube (rod end threads must fully engage tube threads). Repeat for all fan blades so that the tip clearance is within the listed range.

Fan Diameter	Blade Tip Clearance
5'-0"	⅜" (10mm)
5'-6"	⅜" (10mm)
6'-0"	⅜" (10mm)
7'-0"	7/16" (11mm)
9'-0"	½" (13mm)
10'-0"	⅝" (16mm)
11'-0"	⅝" (16mm)
12'-0"	11/16" (17mm)

Table 1

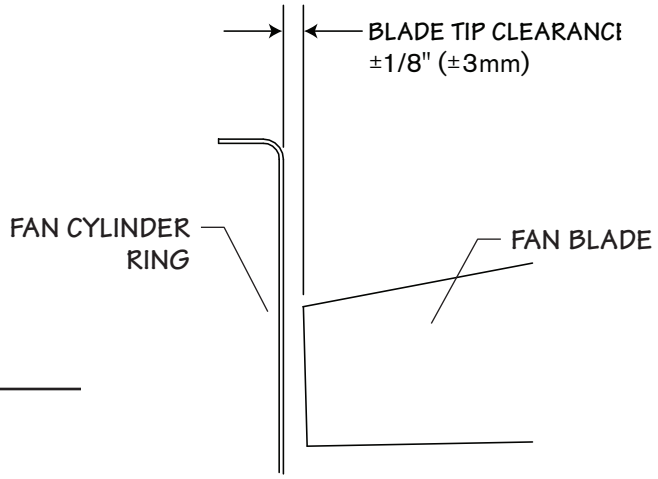


Figure 8

maintenance

Maintenance

Preventative maintenance will prolong useful life and assure continued trouble-free operation. After the first week and subsequently at six month intervals:

- Check all hardware torque to specifications referenced in this manual.
- Visually inspect the fan for airborne debris damage, contact with fan cylinder segments and corrosive attack. Correct any situations determined detrimental to the fan operation.
- Remove any accumulated scale or dirt.
- Clear the blade drain holes at the fan tip.

Service

Proper identification of your fan is necessary to ensure you receive correct replacement parts. The Marley cooling tower serial number can be used to determine the fan and any components installed and maintained as original equipment on a Marley cooling tower. Please provide the Marley sales representative the necessary information when ordering replacement fans or components.

Replacement of individual fan blades may require rebalancing the entire fan. If rebalancing is desired, contact the Marley sales representative in your area.

motor load

The corrected horsepower should be close to, but not exceed the contract horsepower specified by SPX Cooling Technologies, Inc. Determine corrected horsepower using the following equation.

Actual volts and amperage must be obtained with the fan running and the specified rate of water flowing over the tower after the motor and drive system have reached operating temperature (approximately 30 minutes of operation).

$$HP_C = \frac{VOLTS_A \times AMPS_A \times DENSITY_D}{VOLTS_N \times AMPS_N \times DENSITY_A} \times HP_N$$

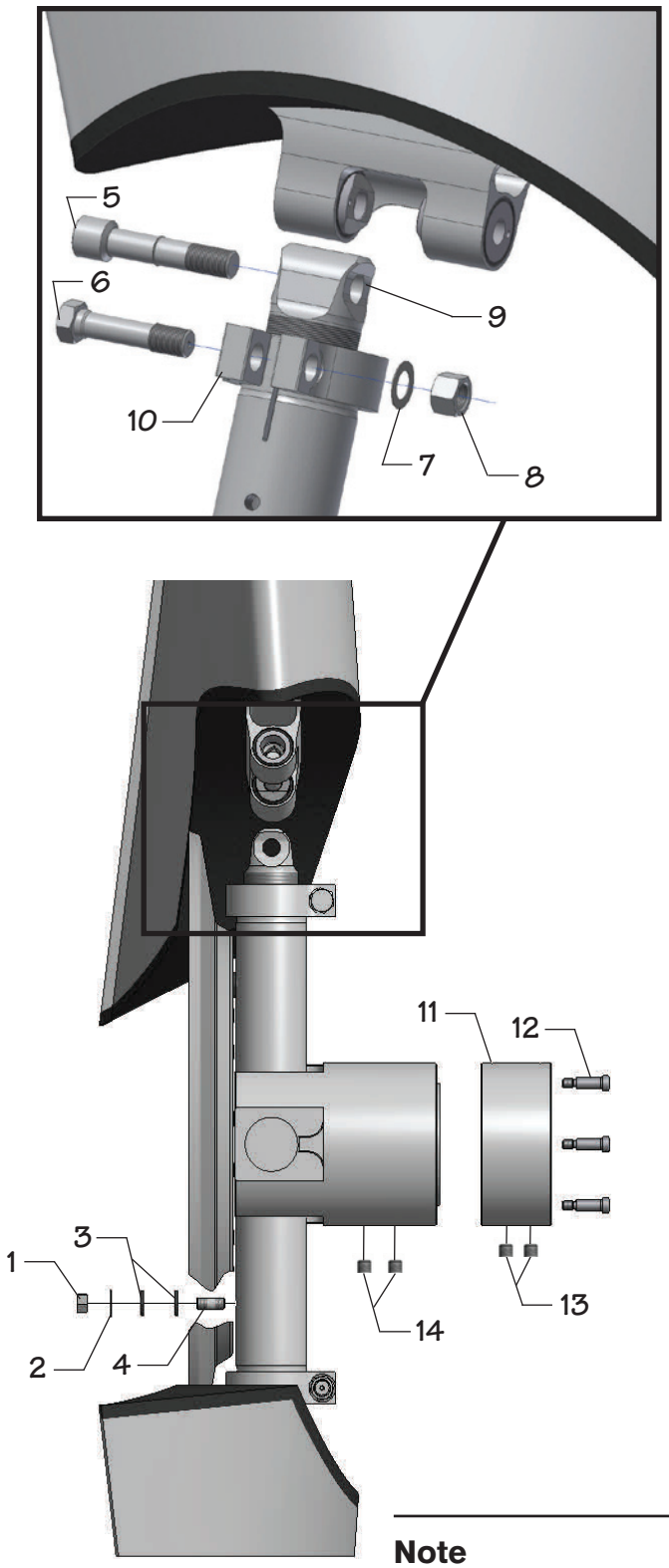
HP_C	=	Corrected Horsepower	$VOLTS_N$	=	Nameplate Volts
$VOLTS_A$	=	Actual Volts	$AMPS_N$	=	Nameplate Amperage
$AMPS_A$	=	Actual Amperage	HP_N	=	Nameplate Horsepower
$DENSITY_A$	=	Actual Air Density	$DENSITY_D$	=	Design Air Density

Note

Measurements taken on motors operating with Variable Frequency Drive controls may read up to 15% high from errors in measuring the approximated sine wave. Instruments capable of measuring a squared off wave-form accurately should be used for measuring power in this situation.

Do not start the motor more than four to five times per hour (each low speed start and each high speed start count as one start).

parts list



1	ALUMINUM NUT
2	ALUMINUM FLAT WASHER
3	RESILIENT WASHER
4	AIR SEAL STUD
5	ALUMINUM BLADE BOLT (9' - 12' FAN DIA)
5	ALUMINUM BLADE BOLT (5'-8' FAN DIA)
6	CLEVIS CLAMP BOLT (9'-14' FAN DIA)
6	CLEVIS CLAMP BOLT (5'-8' FAN DIA)
7	SS FLAT WASHER (9'-14' FAN DIA)
7	SS FLAT WASHER (5'-8' FAN DIA)
8	CLEVIS CLAMP NUT (9'-14' FAN DIA)
8	CLEVIS CLAMP NUT (5'-8' FAN DIA)
9	MAG ROD END (9'-14' FAN DIA)
9	MAG ROD END (5'-8' FAN DIA)
10	MAG CLEVIS CLAMP (9'-14' FAN DIA)
10	MAG CLEVIS CLAMP (5'-8' FAN DIA)
11	GRDR-2000 SHAFT ADAPTOR
11	GRDR-2200 SHAFT ADAPTOR
11	GRDR-2400 SHAFT ADAPTOR
11	GRDR-3000 SHAFT ADAPTOR
12	1.5" SS SHOULDER BOLT (6)
13	SS SET SCREW (2) (9'-14' FAN DIA.)
14	SS SET SCREW (2) (5'-8' FAN DIA.)

Note

When ordering parts always provide the cooling tower serial number and if possible, the fan serial number located on the fan hub.

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