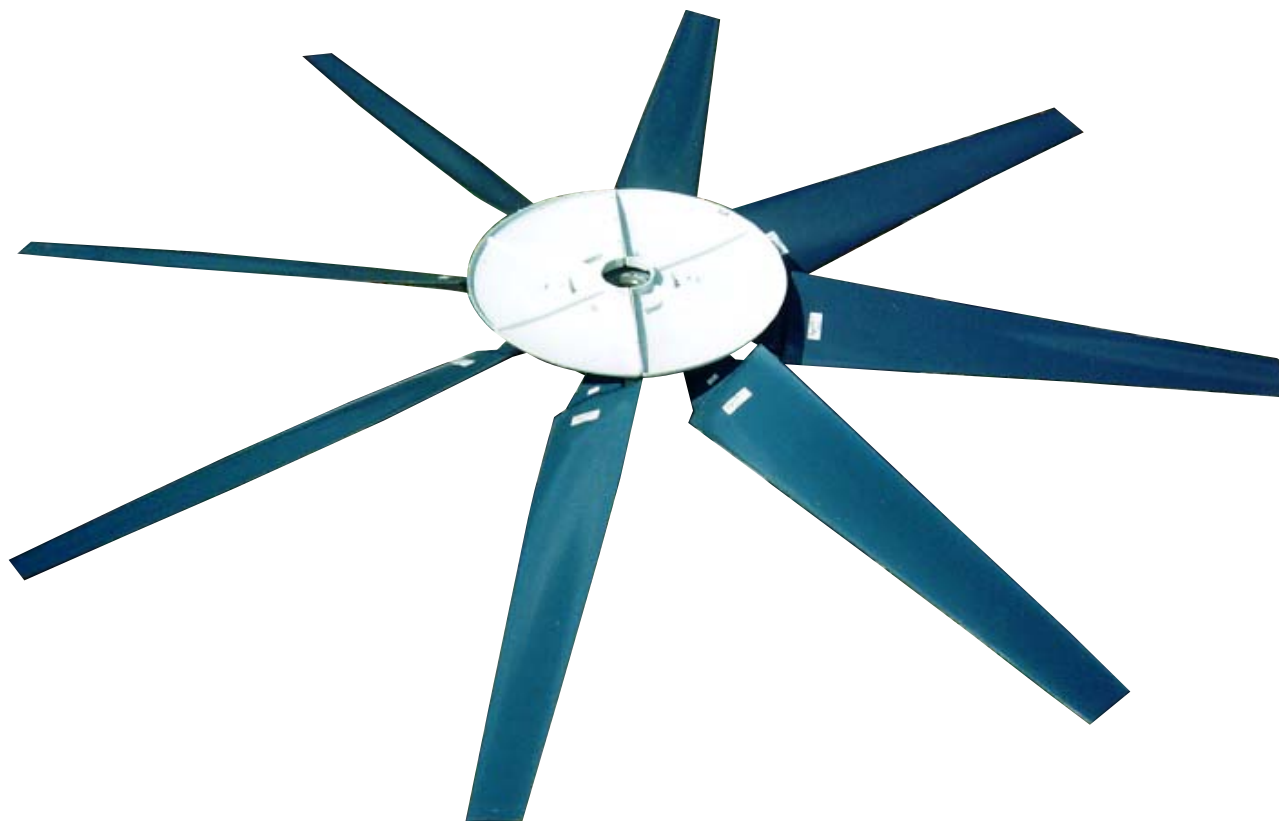


INSTALLATION MANUAL



Adjustable Pitch Fan Assembly 32' Diameter

Hudson Tuf-Lite® and Tuf-Lite II® fan blades

Hudson Tuf-Lite® (black) fan blades are made from fiberglass reinforced epoxy resin having a very high strength-to-weight ratio and corrosion resistance (not shown).

Hudson Tuf-Lite II® (white, prev. blue***) fan blades are made from fiberglass reinforced vinyl-ester resin having a very high strength-to-weight ratio and superior ultra-violet and corrosion resistance. An elastomeric blade/holder joint cover (not shown) prevents moisture from entering the blade (shown above).

The individually balanced blades can be replaced independently – matched sets are not required.

RECOMMENDED TOOLS

- Long T-Handle Allen Wrench Set (3/16" to 3/8")
 - Medium Size Flat Head Screw Driver
 - Brass Ball Peen Hammer
 - Flat Bastard File
 - 240 Grit Sand Paper
 - Anti-Seize Lubricant
 - WD-40
 - 12" Crescent Wrench
- Shop Towels
 - Exact-A-Pitch® Digital Protractor (P/N 62375)
 - 25 ft. Measuring Tape
 - Pencil or Marker
 - Open/Box End Wrench Set (1/2" - 1-1/2")
 - Socket Set for 1/2" Drive (1/2" - 1-1/2")
 - Torque Wrench(s) Rated for 0-200 ft-lb.

INSTALLATION PROCEDURES

ASSEMBLY WITH BUSHING

Clean all mating surfaces between hub, bushing and shaft. All grease and lubricant should be removed, leaving the mating surfaces dry.

If there is no shoulder on shaft to prevent bushing from sliding down shaft, slide spacer/sleeve (not provided) on shaft before bushing or use a thrust retainer (optional equipment) on top of hub. Slide bushing and key onto shaft until flush with end of shaft. The shaft size determines the bushing type (U1). Lock bushing on shaft by tightening the set screw in flange with an Allen Wrench. Line up key and set hub on bushing. Engage the three (3) cap screws in flange of bushing into hub spool, using a torque wrench with a socket, and tighten evenly. Use the following table to determine the proper tools and torque values.

| Bushing Size | Allen Wrench Size | Cap Screw Size | Socket Size | Torque (ft-lb) Dry |
|--------------|-------------------|----------------|-------------|--------------------|
| U1 | 3/16" | 5/8" | 15/16" | 140 |

ASSEMBLY WITH STRAIGHT SHAFT (NO BUSHING)

Clean all mating surfaces between the hub and the shaft. If there is no shoulder on shaft to prevent hub from sliding down shaft, slide spacer/sleeve (not provided) on shaft before hub or use a thrust retainer (optional equipment) on top of hub. Install key in shaft. Line up key and keyway and set hub on shaft. Tighten set screw(s) in hub.

ASSEMBLY WITH TAPERED SHAFT (NO BUSHING REQUIRED)

Clean all mating surfaces between the hub and shaft.

Align keyways and install hub. Install retainer plate and cap screw(s) with lock washer(s). Shaft size determines what size cap screw is necessary. Using a torque wrench with a socket, evenly tighten cap screw to recommended standard per table below.

| Cap Screw Size | Socket Size | Torque Value (ft-lb) | |
|----------------|-------------|----------------------|-----|
| | | Lubricated | Dry |
| 5/8" NC | 15/16" | 100 | 110 |
| 3/4" NC | 1-1/8" | 125 | 130 |
| 1" NC | 1-1/2" | 150 | 160 |

NOTE: Retaining arrangement varies with gear shaft design.

THRUST RETAINER (optional equipment)

Install proper load bolt (not provided) into top of fan shaft and tighten (See Figure 1). Install thrust retainer channel on top hub plate using existing hub spool cap screws. Torque cap screws to 60-65 ft-lb. Install thrust retainer eyebolt and jam nut. Hand tighten eyebolt. Tighten jam nut securely against top of thrust retainer channel.

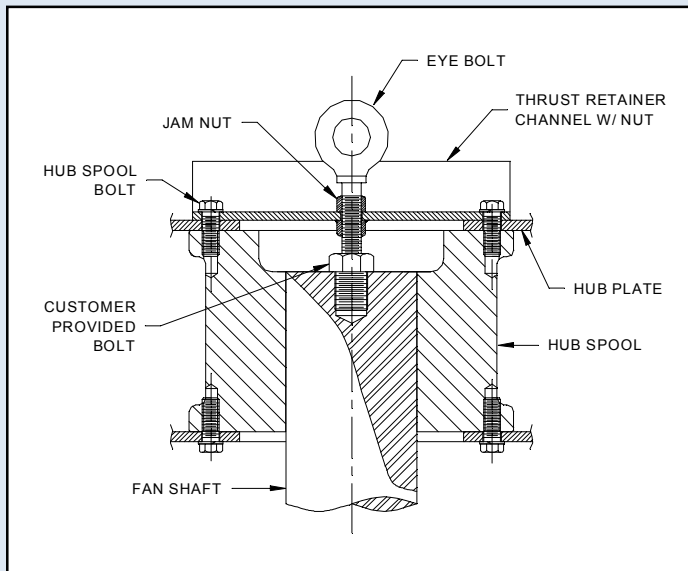


Figure 1

BLADE INSTALLATION

Remove blade clamp bolts, nuts, lock washers, and blade clamp halves from hub. Assemble blade clamp halves over groove in blade neck, and install into hub (See Figure 2). The thick leading edge will be to your left and thin trailing edge will be to your right as you stand at end of blade.



Figure 2

Install clamp bolts through hub plates and blade clamp, putting bolt heads on top, lock washers and nuts on bottom. Tighten lightly (See Figure 3).



Figure 3

SET PITCH AND TRACK

Use Hudson EXACT-A-PITCH® digital protractor (See Figure 4) or a bubble protractor to set blade pitch. Mount protractor on a flat bar as a base and place it approximately 1" from tip of blade. Note pitch on protractor. Rotate fan 360°, noting high and low pitch readings. Locate place where pitch reading is at mid-point between high and low readings, and set pitch at that point.



Figure 4

Rotate blade in clamp until digital protractor shows specified pitch angle to within $\pm 0.2^\circ$. Fan pitch angle is shown on fan specification sheet for design duty. After desired pitch angle is set, raise and lower end of fan blade and find midpoint of blade travel. Hold blade at the midpoint. Pull blade outward so that the blade neck flange rests against the back of the blade clamps. Push blade to the right to remove all slack.

Use torque wrench to tighten clamp bolts to 100 ft-lb (lubricated) or 125 ft-lb (dry). Recheck pitch setting. Blade must be set within $\pm 0.2^\circ$ of desired pitch angle. Tighten clamp bolts evenly. **DO NOT OVER-TORQUE CLAMP BOLTS.**

When bolts are tightened, hold a pencil against top end of blade and mark the level onto a fixed object, such as a pole or the fan ring.

Install remaining blades at same place as first blade, following the instructions above. After tightening bolts, mark top end of each blade in same place first blade was marked. If marks differ by 1" or more, adjust blade.

CHECK TRACK

After fan is installed in fan stack cylinder ring, outline top side of each blade onto fan stack cylinder ring with a marker (See Figure 5). The difference between levels of highest and lowest outlines should not be more than 1". Correct blade track by loosening clamp bolts and adjusting blade to match track of other blades. Retighten bolts and recheck track and pitch angle setting. Retighten blade clamp bolts to recommended standard of 100 ft-lb (lubricated) or 125 ft-lb (dry) torque.



Figure 5

SEAL DISC ASSEMBLY AND INSTALLATION

Install self adhesive rubber gaskets on both flanges of one seal disc half. Bolt two halves of seal disc together, using $3/8''$ NC bolts, flat washer, lock washer, and nut. Torque to 15 ft-lb (lubricated) and 20 ft-lb (dry).

Install $3/8''$ NC bolts at six (6) places on top hub plate (See Figure 6). Threaded portion of bolts must be pointing up to mount seal disc. Install lock washer, nut, and flat washer on each bolt. Tighten $3/8''$ NC nuts to 15 ft-lb (lubricated) and 20 ft-lb (dry).

Locate the six (6) mounting holes in seal disc and install over the six (6) bolts pointing up on upper hub plate. If difficulty is encountered, loosen bolts on seal flanges until seal disc can be mounted, then retighten to 15 ft-lb (lubricated) or 20 ft-lb (dry).

NOTE: The purpose of the seal disc is to prevent hot air from recirculating back down through the hub, increasing efficiency.

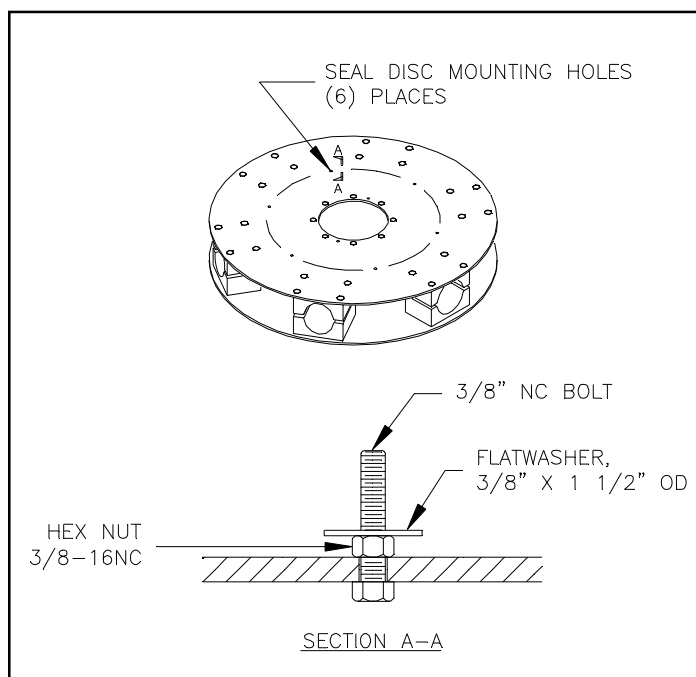


Figure 6

After mounting, install flat washer, lock washer, and 3/8" NC nuts. Tighten to 15 ft-lb (lubricated) or 20 ft-lb (dry). (See Figure 7)

Note: Refer to instructions included with seal disc for further details.

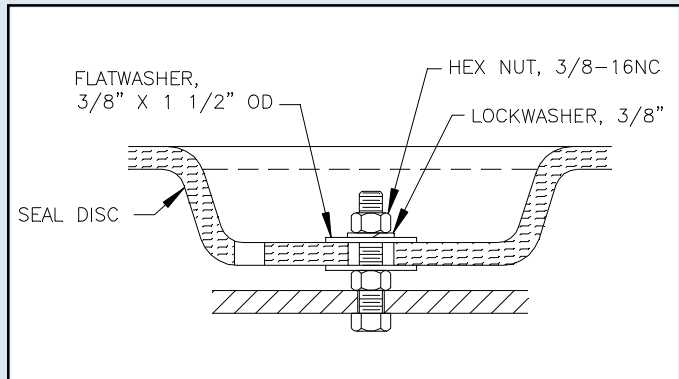


Figure 7

CHECKING TIP CLEARANCE

Rotate fan in position inside fan stack to check tip clearance (See Figure 8). The recommended tip clearance is between 1" and 1 1/2". Check for spots where fan blade clearance is not within the recommended tolerance. If necessary adjust fan stack by shimming to obtain proper clearance.



Figure 8

OPERATING INSTRUCTIONS

Start fan and check rotation. Viewed from top (discharge), fan blades should rotate clockwise.

Check motor power consumption to be sure fan is pulling desired load. **CAUTION:** If positive pitch is set in summer to use all available motor amps (nameplate rating), motor could be overloaded in winter. Design pitch angles usually do not use all of the available motor horsepower. This ensures that the motors will not be overloaded at low winter temperatures.

| PARTS LIST | | NO. OF BLADES | | | | | | | | | | | | | | | | | | | |
|------------|--|---------------|--------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--|--|--|
| ITEM | DESCRIPTION | TYPE | PART. NO | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | |
| | 32 Ft. Diameter Fan Shaft: 4.25" to 5.50" Diameter | U-1 | Hub Assy. No. Part. No. | 6806 D6066 | 6807 D6067 | 6808 D6068 | 6809 D6069 | 6810 D6070 | 6811 D6071 | 6812 D6072 | 6813 D6073 | 6814 D6074 | 6815 D6075 | 6816 D6076 | 6817 D6077 | 6818 D6078 | 6819 D6159 | 6820 D6160 | | | |
| 1 | Hub Plate (2 Per Hub) | U-1 | Part. No. | D6046 | D6047 | D6048 | D6049 | D6050 | D6051 | D6052 | D6053 | D6054 | D6055 | D6056 | D6057 | D6058 | D6059 | D6060 | | | |
| ITEM | DESCRIPTION | TYPE | PART. NO | QUANTITY PER ASSEMBLY | | | | | | | | | | | | | | | | | |
| 2 | Hub Spool | U-1 | 65058 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| 3 | Bushing | U-1 | Specify Bore | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| 4 | Blade Clamp Half, Powder Epoxy Coated Die Cast Alum (Standard) Option 1: Powder Epoxy Coated Ductile Iron** Option 2: Coal Tar Epoxy Coated Ductile Iron** | | D5131 65013 65013C | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | | | |
| 5 | Blade Clamp Bolt W/ Nut 3/4"-10 x 10" (Mech. Galv.) | | 79299 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 | 68 | 72 | 76 | 80 | | | |
| 6 | 3/4" Flat washer (316 SS) | | 73720 | 54 | 62 | 70 | 78 | 86 | 94 | 102 | 110 | 118 | 126 | 134 | 142 | 150 | 158 | 166 | | | |
| 7 | 3/4" Lock washer (Mech. Galv.) | | 73738 | 27 | 31 | 35 | 39 | 43 | 47 | 51 | 55 | 59 | 63 | 67 | 71 | 75 | 79 | 83 | | | |
| 8 | Hub Spool Cap Screw 5/8"-11 x 1 1/2" (316 SS) | | 72402 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | | | |
| 9 | 5/8" Flat washer (316 SS) | | 73719 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | | | |
| 10 | 5/8" Lock washer (316 SS) | | 73731 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | | | |
| 11 | Stiffener Ring | | D6004 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| 12 | Stiffener Ring Bolt W/ Nut 5/8"-11 x 1 3/4" (Mech. Galv.) | | 15347 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | | | |
| 13 | 5/8" Lock washer (Mech. Galv.) | | 73730 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | | | |
| 14 | Eye Bolt W/ Nut 3/4"-10 x 2" (Mech. Galv.) | | 59547 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| 15 | Pin, Grooved, 1/2" X 1-1/2" | | 74540 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | |
| 16 | 112" Diameter Seal Disc Kit * | | D6022 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| 17 | Tuf-Lite II® Blade (White) *** Tuf-Lite® Blade (Black) | | (Varies) (Varies) | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | | |

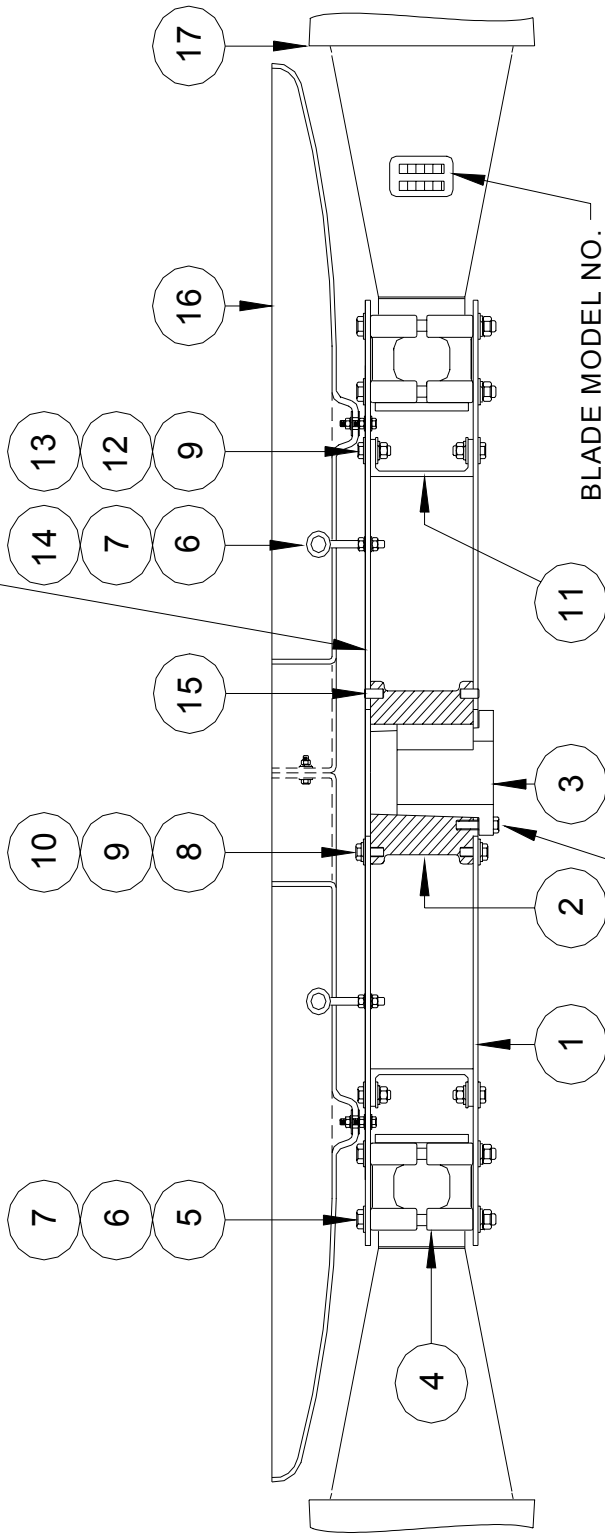
* Includes all hardware (316 SS) to assembly and mount.

** Recommended on concrete and round towers, or corrosive environments. Contact Hudson for pricing.

*** Blade color was blue prior to March 2006.

HUDSON PRODUCTS CORPORATION
Adjustable Pitch Fan Assembly 32' Diameter
Series 6000 HUB

HUB MODEL NO. & SERIAL NO.



BLADE MODEL NO.
SERIAL NO.
DATE OF MANUFACTURE
AND FINAL MOMENT
BALANCE. (TUF-LIFE II® BLADES ONLY)

KEY, SET SCREW & CAP SCREWS
FURNISHED WITH BUSHING

STANDARD MATERIALS & FINISHES:

- Blades:** Fiberglass reinforced vinyl ester or epoxy
- Hub Spool:** Ductile Iron, Zinc Rich Coating
- Plates:** Coal Tar Epoxy coated steel
- Bushing:** Malleable Iron
- Seal Disc:** Fiberglass Reinforced Polyester

Blade Clamps:

- Powder Epoxy Coated Die Cast Alum (Standard)
- Powder Epoxy Coated Ductile Iron (Option 1)
- Coal Tar Epoxy Coated Ductile Iron (Option 2)

Fasteners:

- Steel, Mech. Galvanized & 316 SS Opt.
- Complete Fan W/316 SS (Option 1)
- Complete Fan W/K500 Monel (Option 2)

EXAMPLE: APT ————— 32H ————— 3 1/2" BORE
 Fan Model ————— Number of Blades
 Adjustable Pitch ————— Shaft Diameter
 Fan Diameter & Blade Type
 (Specify "H" for Tuf-Lite III® Blades)
 (Uses 30H Blades)
 (Specify "B" for Tuf-Lite® Blades)
 (Uses 30B Blades)

HUDSON PRODUCTS CORPORATION
 Adjustable Pitch Fan Assembly 32' Diameter
 Series 6000 HUB

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