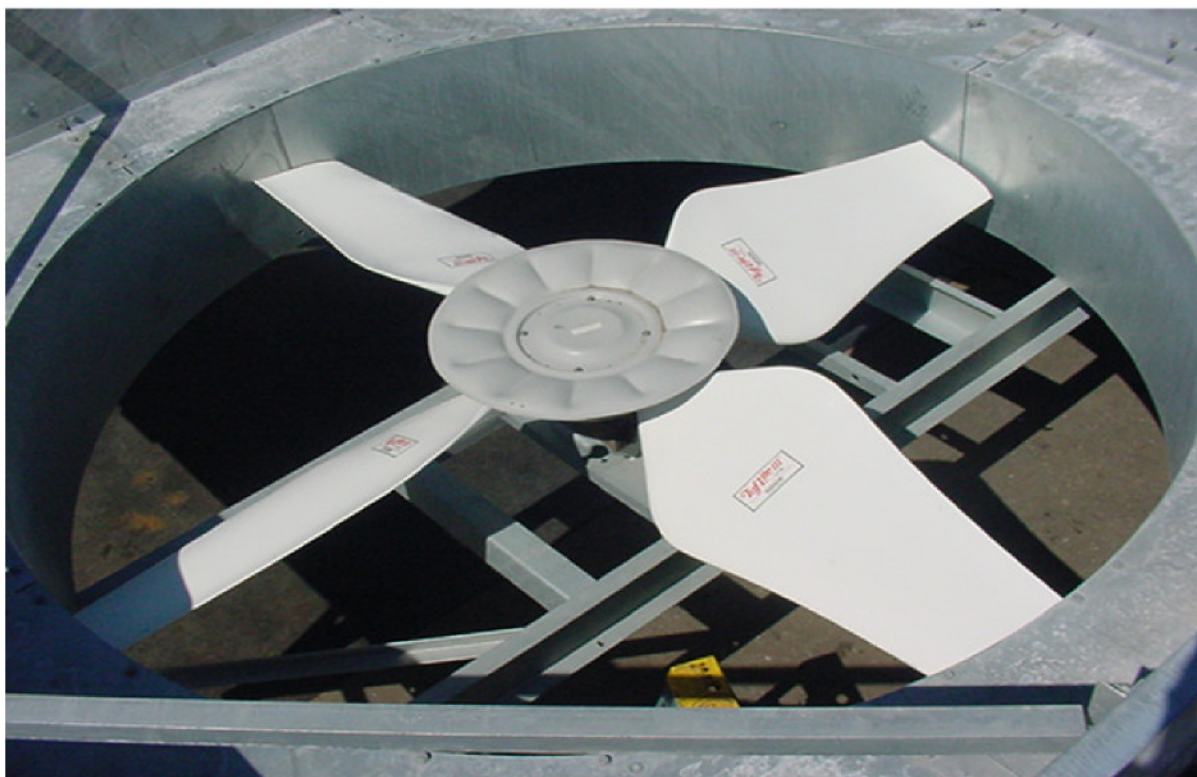


### INSTALLATION MANUAL



### Adjustable Pitch Fan Assembly 11' thru 15' Diameter

#### *Hudson Tuf-Lite III<sup>®</sup> fan blades*

Hudson Tuf-Lite III<sup>®</sup> fan blades are of single piece fiberglass reinforced plastic (FRP) construction optimized for performance, reliability, noise, and cost effectiveness. Tuf-Lite III<sup>®</sup> fan blades are constructed of light weight, corrosion resistant, fiberglass reinforced vinyl-ester resin, with materials, thickness, and processes determined from finite element analysis modeling. Tuf-Edge<sup>®</sup> leading edge erosion and UV protection is a standard with this blade.

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

This is a new manual showing the latest Hudson fan line. This fan line includes 11 ft - 15 ft diameter and blade counts from 4 - 15 inclusive. For the original Series 3000 fans in the 11 ft - 14 ft diameter range having 4 - 9 blades, the hubs are identical to the original 3000H family, which means that the K blades can be used to replace the H blades in those fans - if all blades are changed at one time. For those new fans outside this core family, different hub and seal disc sizes are utilized, as shown in the Parts List on Page 6 of 8. This same list shows the original fans highlighted.

## 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. Slide bushing and key onto shaft until flush with end of shaft. The shaft size determines the bushing type (Q2 or R2). Lock bushing on shaft by tightening the set screw in flange with an Allen Wrench. (Note: Q2 bushings have no set screws.) 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. Cap screw(s) for retainer plate are not required for bushing application.

Bushing Size	Allen Wrench Size	Cap Screw Size	Socket Size	Torque (ft-lb) Dry
Q2	-	3/8"	9/16"	29
R2	3/16"	3/8"	9/16"	29

### 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. 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"	80	90
3/4" NC	1-1/8"	100	110
1" NC	1-1/2"	150	160

NOTE: Retaining arrangement varies with gear shaft design.

## BLADE INSTALLATION

To prevent installation problems, work on one blade at a time. Remove blade clamp bolts, nuts, lock washers, and blade clamp halves from hub. Discard the plastic shipping spacers between the upper and lower blade clamp halves. Assemble blade clamp halves over groove in blade neck, and install into hub (See Figure 1). 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 1

Install clamp bolts through hub plates and blade clamp, putting bolt heads on top, lock washers and nuts on bottom (See Figure 2). Tighten lightly.



Figure 2

## SET PITCH AND TRACK

Use Hudson's EXACT-A-PITCH<sup>®</sup> digital protractor (See Figure 3) 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 midpoint between high and low readings, and set pitch at that point.



Figure 3

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 65 ft-lb (lubricated) or 80 ft-lb (dry). Re-check 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 the same place first blade was marked. If marks differ by more than 1/2", adjust blade.



## CHECK TRACK

After fan is installed in fan stack cylinder ring, outline the top side of each blade onto fan stack cylinder ring with a marker (See Figure 4). The difference between levels of highest and lowest outlines should not be more than 1/2". Correct blade track by loosening clamp bolts and adjusting blade to match track of other blades. Re-tighten bolts and re-check track and pitch angle setting. Re-tighten blade clamp bolts to recommended standard of 65 ft-lb (lubricated) or 80 ft-lb (dry) torque.



Figure 4

## SEAL DISC INSTALLATION

### For 4 to 9 Blades

Fasten seal disc to top of hub with four (4) 3/8" cap screws, as shown in figures 5 and 6. Tighten to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry).

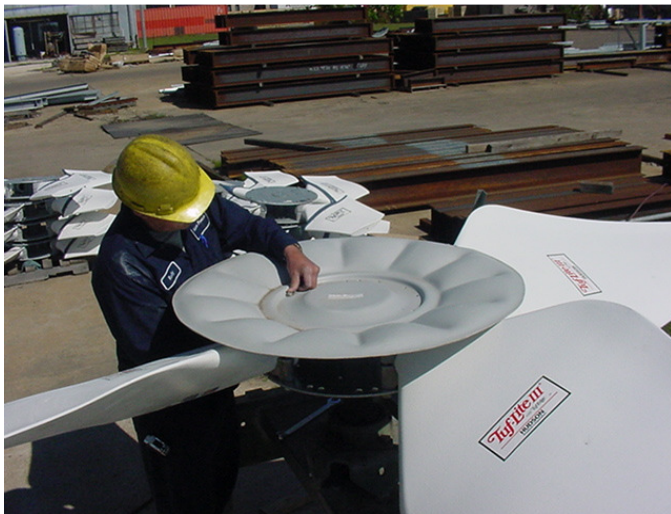


Figure 5

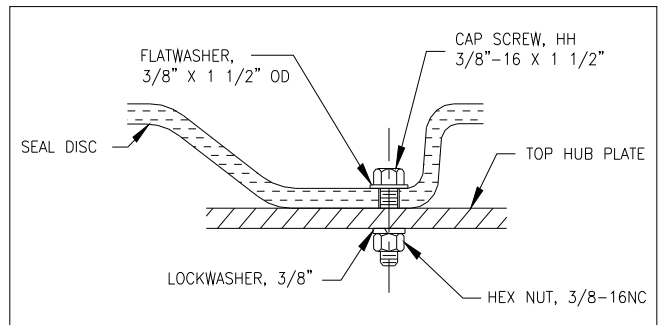


Figure 6

### For 10 to 15 Blades:

Install 3/8" NC bolts at six (6) places on top hub plate (See Figure 6a & 6b). 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 re-tighten to 15 ft-lb (lubricated) or 20 ft-lb (dry).

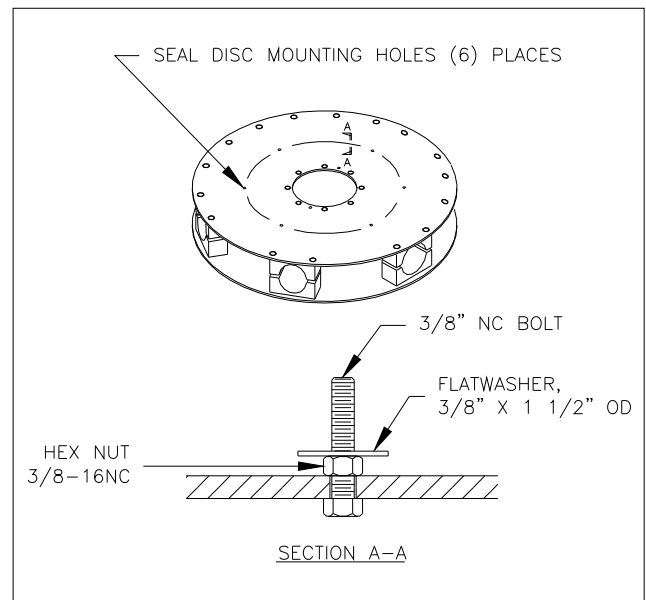


Figure 6a

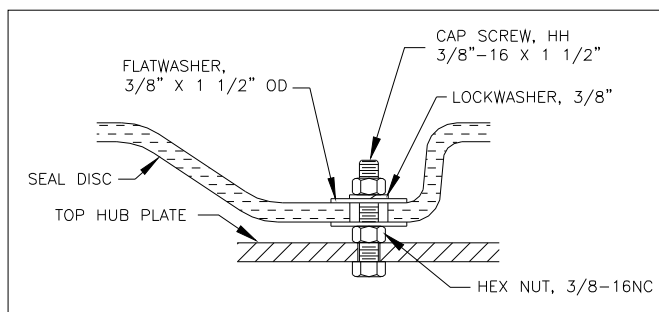


Figure 6b

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

## CHECKING TIP CLEARANCE

Rotate fan in position inside fan ring or fan stack to check tip clearance (See Figure 7). The recommended tip clearance is shown in the table below. Check for spots where fan blade clearance is not within the recommended tolerance.

Fan Diameter	Minimum	Maximum
11'	1/4"	5/8"
12' through 15'	1/4"	3/4"

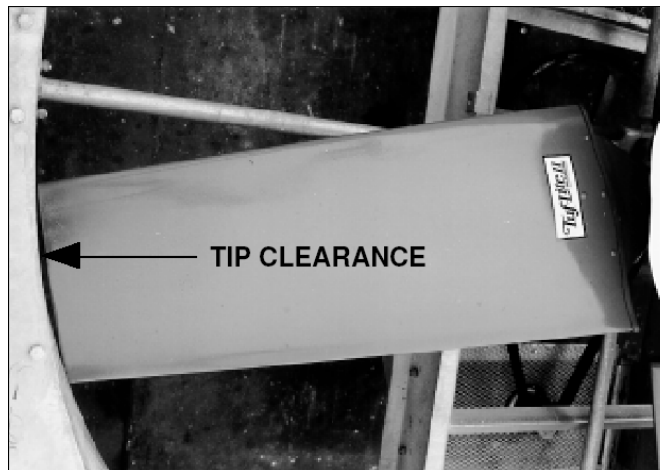


Figure 7

If necessary, adjust fan ring or fan stack by shimming to obtain proper clearance. For heat exchangers, spacers may be added at the fan ring joints to increase clearance (See Figure 8). Use a chisel to maintain the correct gap until the bolts on the ring are re-tightened.



Figure 8

If a small adjustment is needed, tighten or loosen nut on fan strut in section requiring adjustment (See Figure 9).



Figure 9

## 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.

# HUDSON PRODUCTS CORPORATION

## Adjustable Pitch Fan Assembly 11' Thru 15' Diameter

### Series 3000K HUB

PARTS LIST															
ITEM	DESCRIPTION	TYPE	PART NO.	NO. OF BLADES											
				4	5	6	7	8	9	10	11	12	13	14	15
	1" Diameter Thru 2.62" Diameter Shaft	Q-2	11K-14K Hub Assy. No. Part No.	3104H H3410	3105H H3510	3106H H3610	3107H H3710	3108H H3810	3109H H3910	3110H/K 79210	3111H/K 79212	3112H/K 79214	3113H/K 79216	3114H/K 79218	3115H/K 79220
			15K Hub Assy. No. Part No.	3104H/K 79222	3105H/K 79224	3106H/K 79226	3107H/K 79228	3108H/K 79230	3109H/K 79232	3110H/K 79234	3111H/K 79236	3112H/K 79238	3113H/K 79240	3114H/K 79242	3115H/K 79244
	2.68" Diameter Thru 3.62" Diameter Shaft	R-2	11K-14K Hub Assy. No. Part No.	3204H H3420	3205H H3520	3206H H3620	3207H H3720	3208H H3820	3209H H3920	3210H/K 79211	3211H/K 79213	3212H/K 79215	3213H/K 79217	3214H/K 79219	3215H/K 79221
			15K Hub Assy. No. Part No.	3204H/K 79223	3205H/K 79225	3206H/K 79227	3207H/K 79229	3208H/K 79231	3209H/K 79233	3210H/K 79235	3211H/K 79237	3212H/K 79239	3213H/K 79241	3214H/K 79243	3215H/K 79245
1	Hub Plate (2 Per Hub)	Q-2	11K-14K Part No.	C3216	61705	C3216	61707	C3216	C3399	C3410	C3411	C3412	C3413	C3414	C3415
		R-2		C3215	61715	C3215	61717	C3215	C3299	C3400	C3401	C3402	C3403	C3404	C3405
		Q-2	15K Part No.	C3578	C3580	C3582	C3584	C3578	C3579	C3580	C3581	C3582	C3583	C3584	C3585
		R-2		C3568	C3570	C3572	C3574	C3568	C3569	C3570	C3571	C3572	C3573	C3574	C3575
ITEM	DESCRIPTION	TYPE	PART NO	QUANTITY PER ASSEMBLY											
2	Hub Spool	Q-2	65101	1	1	1	1	1	1	1	1	1	1	1	1
		R-2	65102												
3	Bushing	Q-2	Specify Bore	1	1	1	1	1	1	1	1	1	1	1	1
		R-2													
4	Blade Clamp Half, Un-painted Aluminum (Standard) Option 1, Epoxy coated Aluminum Option 2, Epoxy coated Ductile Iron Option 3, Machined stainless steel		65003 65003S 65016 C3006	8	10	12	14	16	18	20	22	24	26	28	30
5	Blade Clamp Bolt 5/8"-11 x 7" with Nut (Mech. Galv.)		70701	8	10	12	14	16	18	20	22	24	26	28	30
6	5/8" Lock washer (Mech. Galv.)		73730	8	10	12	14	16	18	20	22	24	26	28	30
7	Stop Plate Sub-Assembly	Q-2	65007	1	1	1	1	1	1	1	1	1	1	1	1
		R-2	65008												
8	Stop Plate Bolt 3/4"-16 x 4 1/2" (Mech. Galv.)		72427	1	1	1	1	1	1	1	1	1	1	1	1
9	3/4" Lock washer (Mech. Galv.)		73738	1	1	1	1	1	1	1	1	1	1	1	1
10	3/4" Flat Washer (Mech. Galv.)		73640	1	1	1	1	1	1	1	1	1	1	1	1
11	Hub Spool Bolt 3/8"-16 x 7" with Nut (Mech. Galv.)		70700	6	6	6	6	6	6	6	6	6	6	6	6
12	3/8" Lock washer (Mech. Galv.)		73723	6	6	6	6	6	6	6	6	6	6	6	6
13	Seal Disc Bolt 3/8"-16 X 1 1/2" (316 SS)		60274	4	4	4	4	4	4	6	6	6	6	6	6
14	3/8" Flat Washer (316 SS)		73623	4	4	4	4	4	4	12	12	12	12	12	12
15	3/8" Lock washer (316 SS)		73722	4	4	4	4	4	4	6	6	6	6	6	6
16	3/8" Hex Nut (316 SS)		72050	4	4	4	4	4	4	12	12	12	12	12	12
17	50" Dia. Seal Disc (11K-14K with 4-9 blades)		D3439	1	1	1	1	1	1	1	1	1	1	1	1
	53" Dia. Seal Disc (11K-14K with 10-12 Blades)		81114												
	64" Dia. Seal Disc (11K-14K with 13-15 Blades and 15K with 4-15 Blades)		81115												
18	Tuf-Lite III® Fan Blade (White)		Varies	4	5	6	7	8	9	10	11	12	13	14	15

 Highlighting shows original 3000H fans having the 23" hub encompassing 11 -14 ft dia and 4-9 blades where the new K blades can replace the H blades. K blades and H blades are interchangeable for this original hub group (if all blades changed at one time).

## STANDARD MATERIALS & FINISHES

**Blades:** Fiberglass reinforced vinyl ester  
**Hub Spool:** Ductile Iron, Zinc Rich Coating  
**Plates:** Steel, Galvanized  
**Bushing:** Malleable Iron  
**Seal Disc:** Fiberglass Reinforced Polyester

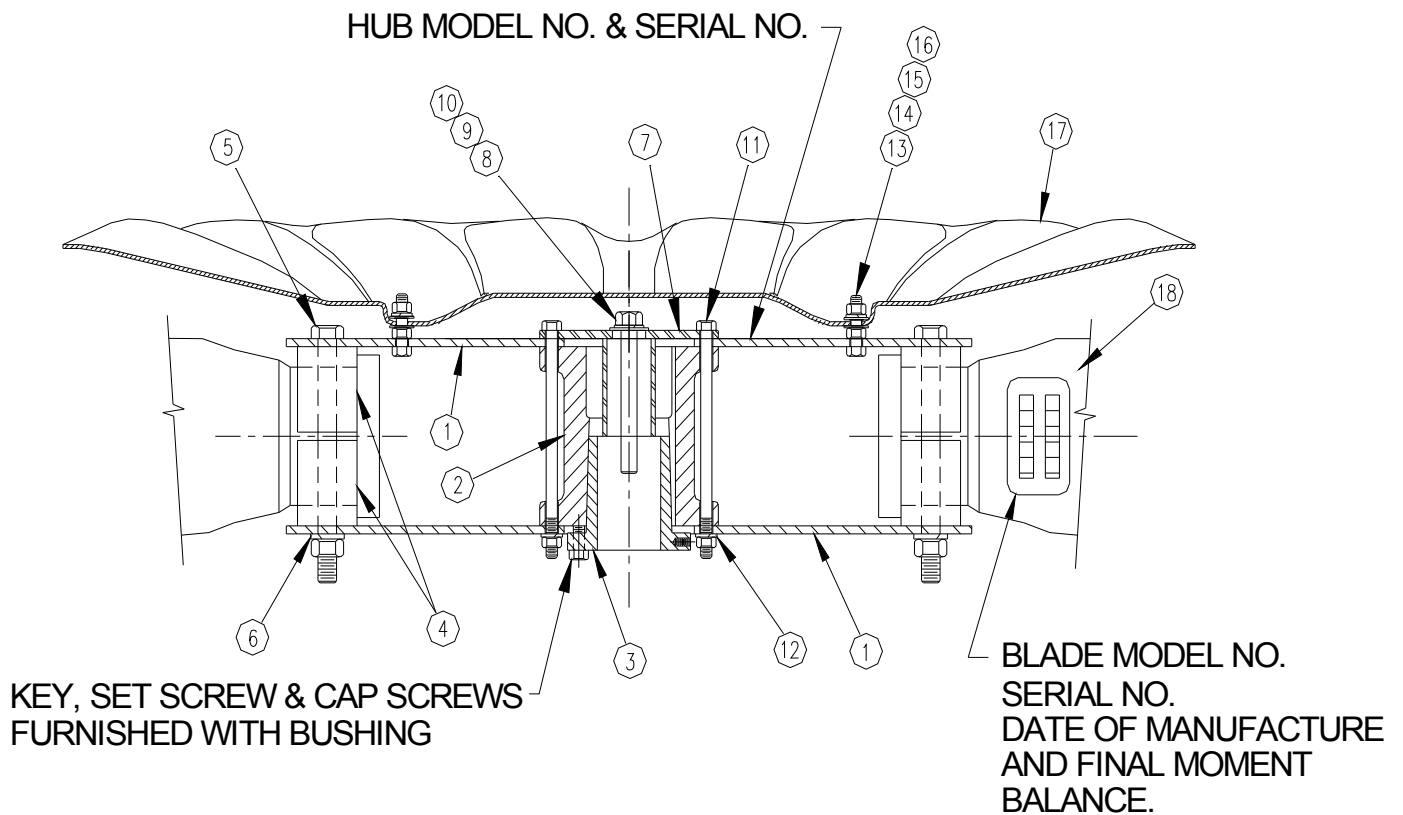
**Blade Clamps:**  
 Un-painted Aluminum (Standard)  
 Epoxy Coated Aluminum (Option 1)  
 Epoxy Coated Ductile Iron (Option 2)  
 Machined Stainless Steel (Option 3)

**Fasteners:**  
 Steel, Mech. Galvanized & 316 SS Opt.  
 Complete Fan with 316 SS (Option 1)  
 Complete Fan with K500 Monel (Option 2)

## WHEN ORDERING, SPECIFY FAN DIAMETER, TYPE & NUMBER OF BLADES & SHAFT DIAMETER

**EXAMPLE:**    APT                      14K                      6                      2 7/8" BORE

Fan Model                      Fan Diameter & Blade Type                      Number                      Shaft Diameter  
 Adjustable Pitch                      (Specify "K" for Tuf-Lite III® Blades)                      of Blades



**HUDSON PRODUCTS CORPORATION**  
Adjustable Pitch Fan Assembly 11' Thru 15' Diameter  
Series 3000K HUB

# **HUDSON**

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