

### INSTALLATION MANUAL



## Adjustable Pitch Fan Assembly 32' Diameter

### *Hudson Tuf-Lite III® fan blades*

Hudson Tuf-Lite III® fan blades are of single piece fiberglass reinforced plastic (FRP) construction optimized for performance, reliability, noise, and cost effectiveness. Tuf-Lite III® 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® 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.

## 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.

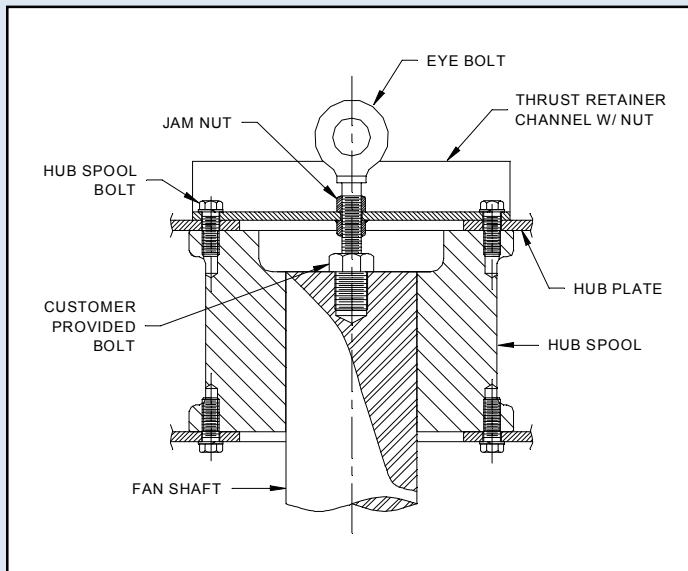


Figure 1

## ***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.

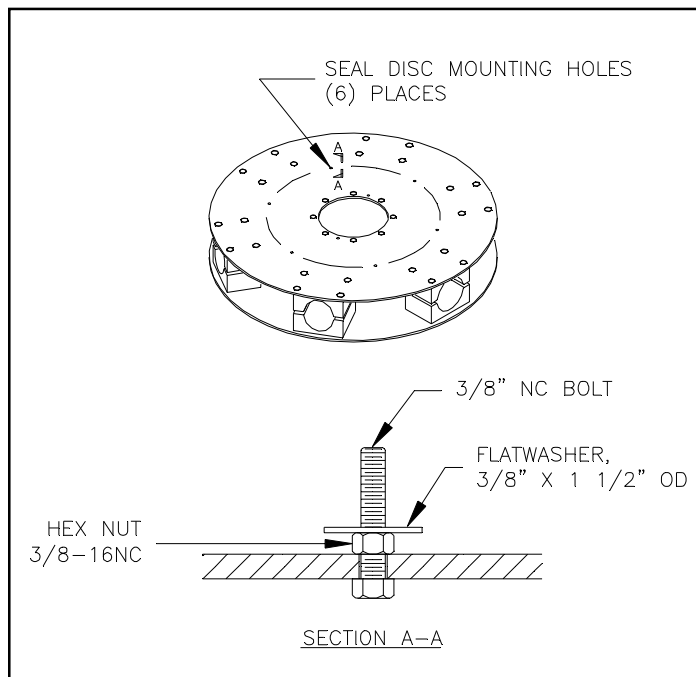


Figure 6

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.

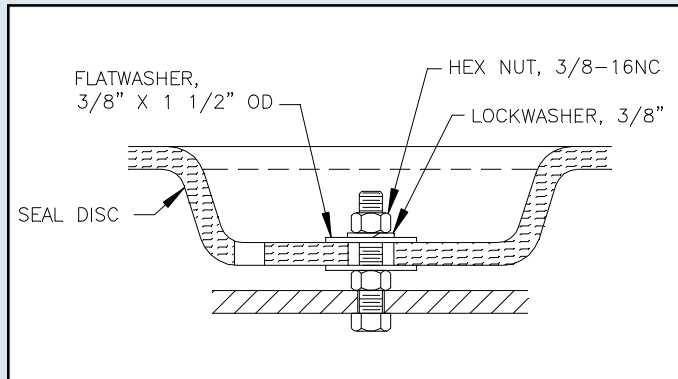


Figure 7

### 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																			
ITEM	DESCRIPTION	TYPE	PART. NO	NO. OF BLADES															
				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	6806	6807	6808	6809	6810	6811	6812	6813	6814	6815	6816	6817	6818	6819	6820	
			Part No	D6066	D6067	D6068	D6069	D6070	D6071	D6072	D6073	D6074	D6075	D6076	D6077	D6078	D6159	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 9 1/2" (Mech. Galv.)		70600	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	100" Diameter "K" Seal Disc Kit *		D6043	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	Tuf-Lite III® Fan Blade (Teal Green)		(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.





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