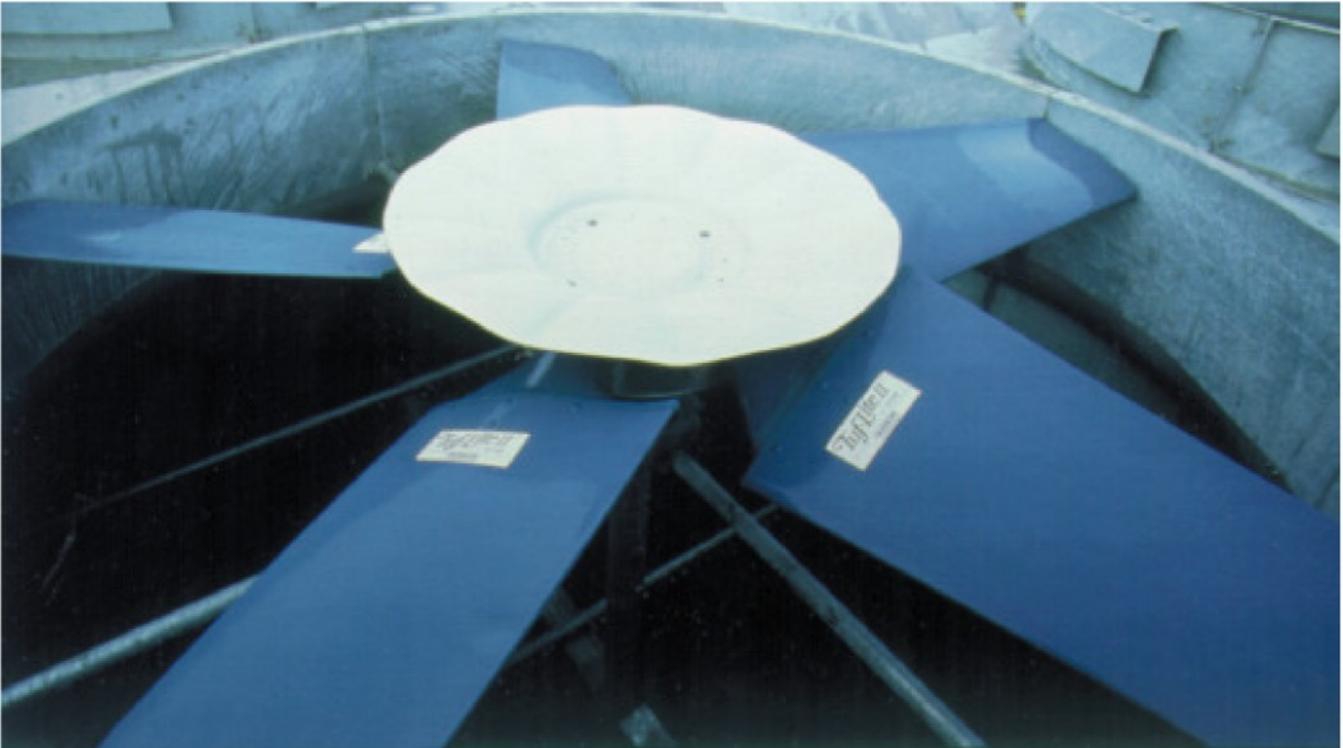


INSTALLATION MANUAL



Adjustable Pitch Fan Assembly 5' through 14' Diameter

Hudson Tuf-Lite II[®] Hi Temp Fan Blades

Hudson Tuf-Lite II[®] Hi Temp fan blades (Red) are made from fiberglass reinforced epoxy 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 (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. 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, belleville spring washers, 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 and belleville spring washers on bottom, lock washers and nuts on top (See Figure 2). Tighten lightly.

NOTE: Two belleville spring washers should be cupped upward and stacked in the same direction as shown on Figure 2A.

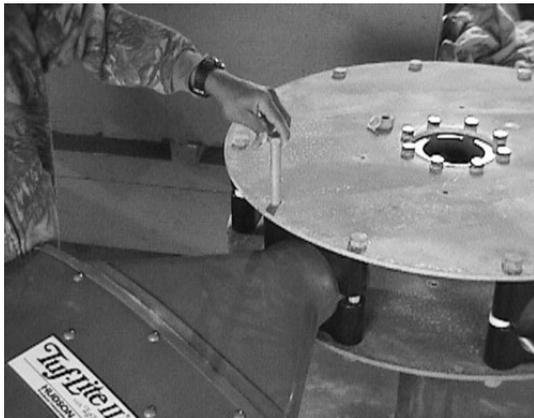


Figure 2

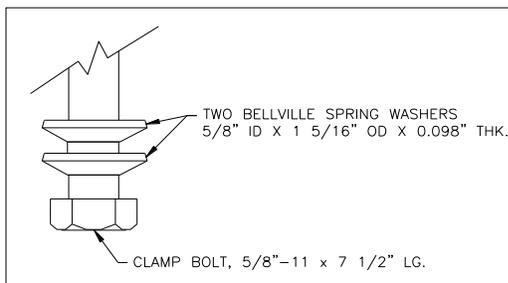


Figure 2A

SET PITCH AND TRACK

Use Hudson's EXACT-A-PITCH® 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 mid-point between high and low readings, and set pitch at that point.



Figure 2

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 mid-point 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

CHECK SWEEP

Measure the distance from trailing edge at blade tip of one blade to trailing edge at blade tip of the adjacent blade (See Figure 4a). This distance should be within 1/2" of each other for all successive blades. Correct blade sweep by loosening clamp bolts and adjusting blade to match sweep of other blades. Re-tighten bolts and re-check sweep and pitch angle setting. Re-tighten blade clamp bolts to recommended standard of 65 ft-lb (lubricated) or 80 ft-lb (dry) torque.

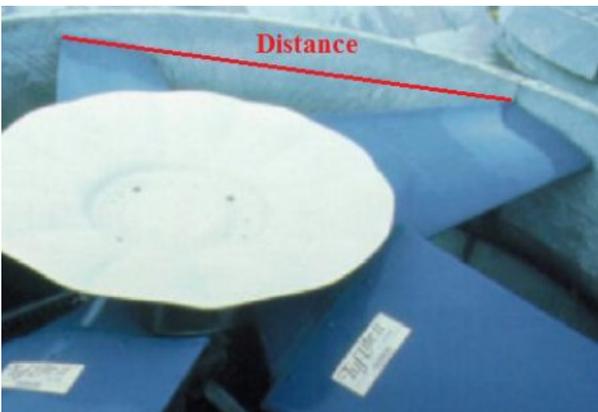


Figure 4a

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

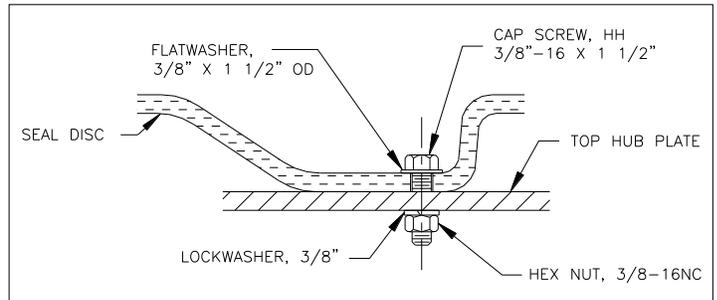


Figure 6

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).

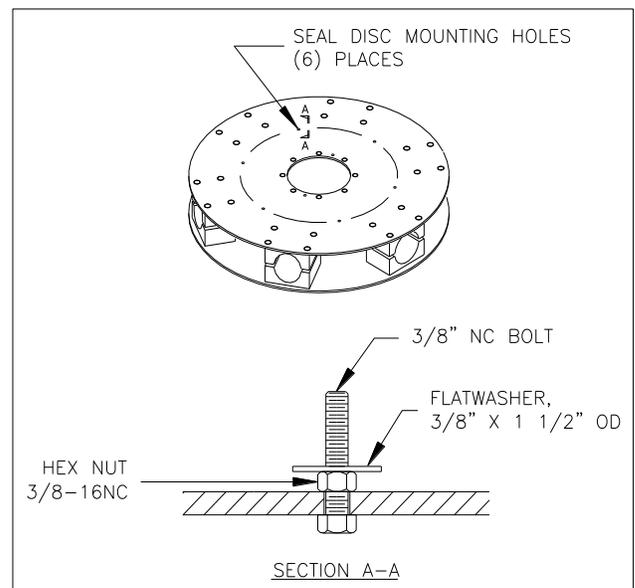


Figure 6a

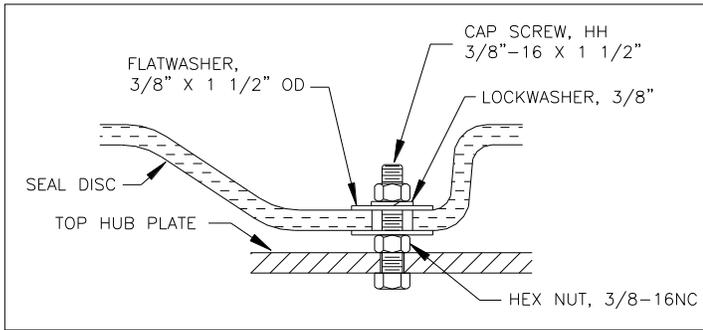


Figure 6b

NOTE: The purpose of the seal disc is to prevent hot air from recirculating 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
5' through 9'	1/4"	1/2"
>9' through 11'	1/4"	5/8"
>11' through 14'	1/4"	3/4"

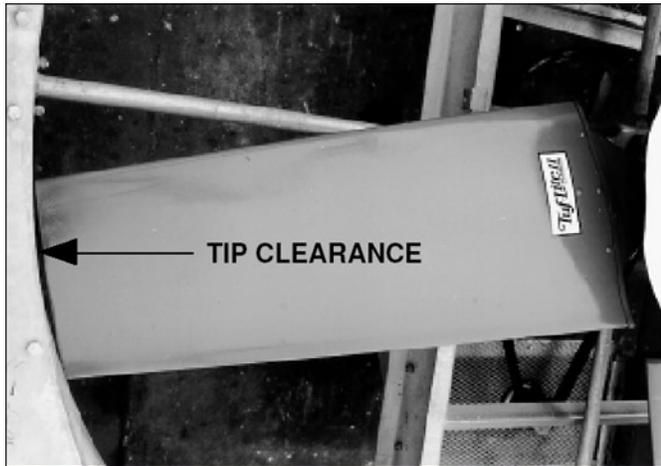


Figure 7

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.

For the fans that have remained idle (such as a shut-down or turn-around), it is highly recommended to re-verify the torque on the blade clamps before putting it back into operation.

Parts List
HUDSON PRODUCTS CORPORATION
Adjustable Pitch Fan Assembly 5' Thru 14' Diameter
Series 3000HT HUB

			NO. OF BLADES												
ITEM	DESCRIPTION	TYPE	PART NO.	4	5	6	7	8	9	10*	11*	12*	13*	14*	15*
	1" Diameter Thru 2.62" Diameter Shaft	Q-2	6H-14H Hub Assy. No. Part No.	3104H H3410HT	3105H H3510HT	3106H H3610HT	3107H H3710HT	3108H H3810HT	3109H H3910HT	3110H 79210HT	3111H 79212HT	3112H 79214HT	3113H 79216HT	3114H 79218HT	3115H 79220HT
			5H Hub Assy. No. Part No.	3104HM7 79200HT	3105HM7 79202HT	3106HM7 79204HT	3107HM3 79206HT	3108M3 79208HT							
	2.68" Diameter Thru 3.62" Diameter Shaft	R-2	6H-14H Hub Assy. No. Part No.	3204H H3420HT	3205H H3520HT	3206H H3620HT	3207H H3720HT	3208H H3820HT	3209H H3920HT	3210H 79211HT	3211H 79213HT	3212H 79215HT	3213H 79217HT	3214H 79219HT	3215H 79221HT
			5H Hub Assy. No. Part No.	3204HM7 79201HT	3205HM7 79203HT	3206HM7 79205HT	3207HM3 79207HT	3208HM3 79209HT							
1	Hub Plate (2 Per Hub)	Q-2	6H-14H Part No.	C3216	61705	C3216	61707	C3216	C3399	C3410	C3411	C3412	C3413	C3414	C3415
			5H Part No.	C3394	C3395	C3396	C3077	C3078							
		R-2	6H-14H Part No.	C3215	61715	C3215	61717	C3215	C3299	C3400	C3401	C3402	C3403	C3404	C3405
			5H Part No.	C3294	C3295	C3296	61722	61723							
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)		65003	8	10	12	14	16	18	20	22	24	26	28	30
	Option 1, Epoxy coated Aluminum		65003S												
	Option 2, Epoxy coated Ductile Iron		65016												
	Option 3, Machined stainless steel		C3006												
5	Blade Clamp Bolt 5/8"-11 x 7 1/2" (Mech. Galv.)		79326	8	10	12	14	16	18	20	22	24	26	28	30
6	Belleville Spring Washer, 5/8"ID x 1 5/16"OD x 0.098"THK, 301SS		78104	16	20	24	28	32	36	40	44	48	52	56	60
7	5/8" Hex Nut (Mech. Galv.)		72086	8	10	12	14	16	18	20	22	24	26	28	30
8	5/8" Lock washer (Mech. Galv.)		73730	8	10	12	14	16	18	20	22	24	26	28	30
9	Stop Plate Sub-Assembly	Q-2	65007	1	1	1	1	1	1	1	1	1	1	1	1
		R-2	65008												
10	Stop Plate Bolt 3/4"-10 x 4 1/2" (Zinc Plated)		72427	1	1	1	1	1	1	1	1	1	1	1	1
11	3/4" Lock washer (Mech. Galv.)		73738	1	1	1	1	1	1	1	1	1	1	1	1
12	3/4" Flat Washer (Mech. Galv.)		73640	1	1	1	1	1	1	1	1	1	1	1	1
13	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
14	3/8" Lock washer (Mech. Galv.)		73723	6	6	6	6	6	6	6	6	6	6	6	6
15	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
16	3/8" Flat Washer (316 SS)		73623	4	4	4	4	4	4	12	12	12	12	12	12
17	3/8" Lock washer (316 SS)		73722	4	4	4	4	4	4	6	6	6	6	6	6
18	3/8" Hex Nut (316 SS)		72050	4	4	4	4	4	4	12	12	12	12	12	12
19	30" Dia. Seal Disc with Spacer Mounting (5H)		81100	1	1	1	1	1							
	Seal Disc Spacer Assy		B3565	1	1	1	1	1							
	Cap Screw,HH, 3/8"-16 x 3 1/2" (316 SS)		66216	4	4	4	4	4							
	3/8" Hex Nut (316 SS)		72050	4	4	4	4	4							
	3/8" Flat Washer (316 SS)		73623	4	4	4	4	4							
	3/8" Lock washer (316 SS)		73722	4	4	4	4	4							
with 13-15 blades)	38" Dia. Seal Disc (6H-10H)		81105HT	1	1	1	1	1	1						
	42" Dia. Seal Disc (11H-14H)		81110HT							1	1	1	1	1	1
	50" Dia. Seal Disc (9H-10H-1 1H)		D3439HT										1	1	1
20	Tuf-Lite II® Hi Temp Blade (Red)		Varies	4	5	6	7	8	9	10	11	12	13	14	15

*10-15 Blade counts are for 9'-11' fans only.

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