

## INSTALLATION MANUAL



### **Adjustable Pitch Fan Assembly** **5' through 16' Diameter** **(Note: 15' & 16', W-Blade only)**

*Hudson Tuf-Lite® fan blades*

Hudson TufLite® (black) fan blades are made from fiberglass reinforced epoxy resin having a very high strength-to-weight ratio and corrosion resistance.

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
  - Retainer Ring Tool (Hudson Provided)

## 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 (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.

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 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. Coat all mating surfaces with an anti-seize or lubricating compound.

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"	70	90
3/4" NC	1-1/8"	125	130
1" NC	1-1/2"	150	160

NOTE: Retaining arrangement varies with gear shaft design.

## LOOSEN SCREWS AND REMOVE RINGS

Unscrew 3/8" blade socket cap screws until flush with inside of socket. Unscrew jam nuts back to near heads of cap screws. Remove lock screws in top and bottom retainer rings (See Figure 1). Mark ring and blade socket at center to indicate where lock screw goes. Use retainer ring tool to remove individual blade retainer ring halves. Insert end of tool into hole in end of retainer ring half and pry ring out of blade socket. (Note: If tool is not available, a 1/4" hook bent on the end of a piece of 1/8" diameter wire works).



Figure 1

## INSTALLATION OF TUF-LITE II<sup>®</sup> BLADES IN TUF-LITE<sup>®</sup> HUBS

To mount Tuf-Lite II<sup>®</sup> blades into the original Tuf-Lite<sup>®</sup> blade sockets, use our H-blade adapter (P/N K2300). Install both halves of adapter over blade. Make sure flange of blade is against inside shoulder of adapter. Tighten 3/8" cap screws to 30-35 ft-lb torque (See Figure 2).

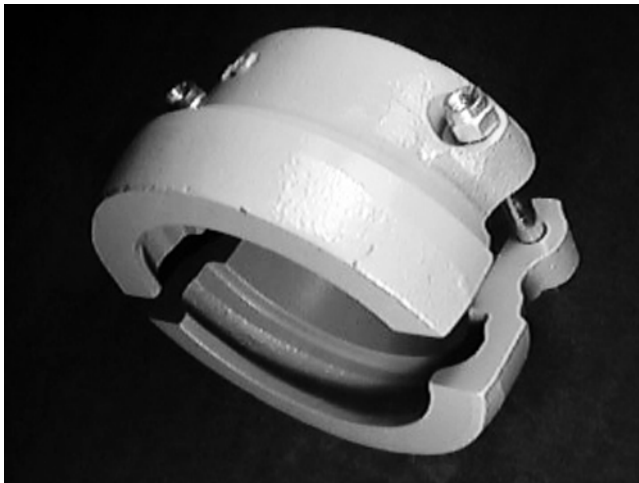


Figure 2

## BLADE INSTALLATION

Place blade in hub socket. Insert blade shank into socket far enough to allow blade retainer ring halves to be "snapped" into place (See Figure 3). If you are using the H-blade adapter with Tuf-Lite II<sup>®</sup> blades, make sure that the split in the adapter is horizontal. Position the blades' thick leading edge to the left and thin trailing edge to the right as you stand at the end of the blade.



Figure 3

## INSTALL RETAINER RINGS

Insert one end of retainer ring into groove and rotate ring into groove with end of screwdriver as shown in Figure 4.



Figure 4

Make sure rings are seated properly in groove and the mark drawn on ring lines up with the mark on the socket. Gaps between upper and lower retainer halves should be equal. Install lock screw into each retainer ring half. Hold ring in place with screwdriver while tightening screws. Hand tighten the blade socket cap screws. **DO NOT TIGHTEN JAM NUTS.**

### INSTALL SEVERE DUTY RETAINING RING (OPTIONAL EQUIPMENT)

If included, place severe duty retainer (SDR as shown in Figure 5A; for old recessed-ear hubs, both the old 65289 SDR and the D3246 retro-fit spacer are required) into the blade socket cavity by either pushing it directly into position on top of socket or by pushing it into the blade socket at 90° to one side and then rotating it into position on top (12:00) side. Refer to the following Figures 5A, 5B and 5C.



Figure 5A

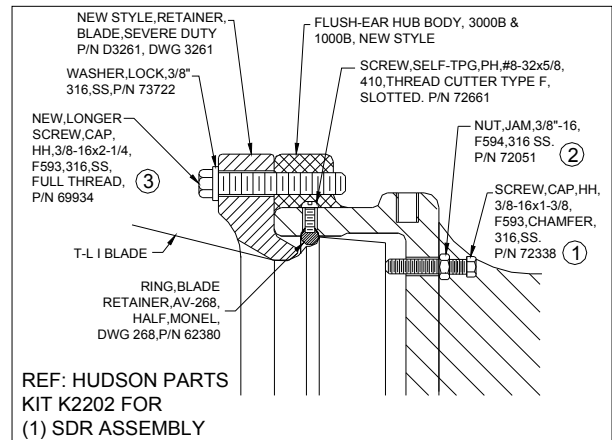


Figure 5B (new style hub & SDR)

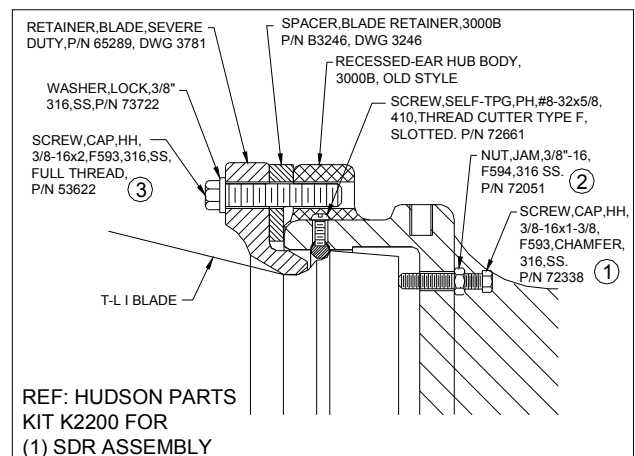


Figure 5C (old style hub & retro-fit SDR)

It may be necessary to partially loosen the four (4) blade socket cap screws (labels 1 & 2 in Figure 5B and/or jostle the blade slightly to initially place the SDR part into its assigned position as shown in Figure 5B or 5C.

Now insert the two (2) 3/8" cap screws (labeled 3 in Figure 5B or 5C) and lock washers into the SDR and finger tighten only.

**Note A:** The four (4) blade socket cap screws and the two (2) SDR cap screws are maintained finger-tight until the blade(s) is (are) adjusted for both blade pitch and blade track. After a gradual trial & error series of adjustments, occurring in subsequent portions of this manual, these same cap screws shall at completion achieve final tightness to specified torque values.

## SET PITCH AND TRACK

Use Hudson's EXACT-A-PITCH® digital protractor (See Figure 6) 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 6

Rotate blade in socket 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 and pull blade outward so it sits against retainer rings.

Check to see that blade retainer rings are properly seated in both hub and blades grooves. It may be necessary to back cap screws off about one turn and re-tighten them in order to force ring to fit properly in groove.

Start tightening the four blade socket cap screws by alternating the sequence of tightening (like tightening lug nuts on a car wheel). The torque applied to any one cap screw shall be no more than 5 ft-lb, greater than the torque on any of the other (3) cap screws during the tightening process. All cap screws are to be tightened to 15-20 ft-lb. Make sure shoulder on blade neck fits tightly into and against retainer ring. **DO NOT OVERTIGHTEN CAP SCREWS.** After cap screws are tight, tighten jam nuts against socket to 15-20 ft-lb.

**Note B:** If a severe duty retainer (SDR, Figure 5A) is used, it may be necessary to loosen the SDR fasteners as necessary for proper retainer ring seating at the outset. See cap screws labeled as (3) in Figure 5B or 5C.

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 cap screws, mark top end of each blade in same place first blade was marked. If marks differ by more than  $3/4"$ , adjust blade.

**Note C:** It is more important to positively seat the retainer ring pair into the blade shank ring groove than to achieve perfectly consistent tracking between all blades. If there is a conflict in achieving both blade seating and blade tracking, ignore the tracking specification.

## 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 7). The difference between levels of highest and lowest outlines should not be more than  $3/4"$ . To raise blade track, loosen blade socket cap screws on top half of socket and tighten cap screws on bottom half. To lower blade track, loosen bottom screws and tighten top ones. Tighten  $3/8"$  cap screws to 15-20 ft-lb torque. Re-tighten jam nuts after adjustment.



Figure 7

**Note D:** It is more important to positively seat the retainer ring pair into the blade shank ring groove than to achieve perfectly consistent tracking between all blades. If there is a conflict in achieving both blade seating and blade tracking, ignore the tracking specification.

## COMPLETE SEVERE DUTY RETAINER (SDR) INSTALLATION (OPTIONAL EQUIPMENT)

If the SDR is installed, the blade socket jam nuts & blade socket cap screws (labeled 1 and 2 in Figure 5B, 5C) must now be finally tightened to the recommended standard of 15 ft-lbs (lubricated) or 20 ft-lbs (dry) and the SDR cap screws (labeled 3 in Figure 5B, 5C) must now be finally tightened to 20 ft-lbs (lubricated) or 25 ft-lbs (dry).

## FINAL INSTALLATION CHECK (IMPORTANT)

Double check and make final adjustments as necessary by essentially going through the provisions of those paragraphs entitled “Blade Installation” on page 3 through “Complete Severe Duty Retainer Installation” on page 6 inclusively.

In so doing, one shall check the following setup criteria for all blade positions:

0. blade seated in hub socket.
1. retainer rings fully seated in blade neck grooves and hub socket grooves.
2. if applicable, SDR’s properly mounted into hub sockets and onto blade necks.
3. blade pitch set within +/-0.2 degrees of design value.
4. tracking, if possible (see note above), set within +/-0.3 75” (3/4” max spread).
5. all (4 per blade pos) blade retainer cap screws torqued to spec, 15 ft-lbs (lubricated) or 20 ft-lbs (dry).
6. all (4 per blade pos) blade retainer cap screws jam nuts torqued to spec, 15 ft-lbs (lubricated) or 20 ft-lbs (dry).
7. if applicable, SDR cap screws torqued to spec, 20 ft-lbs, (lubricated) or 25 ft-lbs (dry).

## SEAL DISC INSTALLATION

Fasten seal disc to top of hub with four (4) 3/8” cap screws, placing flat washers between seal disc and lock washer (See Figure 8). Tighten to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry).



Figure 8

## CHECKING TIP CLEARANCE

Rotate fan in position inside fan ring or fan stack to check tip clearance (See Figure 9). The recommended tip clearance is between 1/2” and 1”. Check for spots where fan blade clearance is not within the recommended tolerance.

Fan Diameter (ft)	Minimum	Maximum
6’ through 9’	1/4”	1/2”
>9’ through 11’	1/4”	5/8”
>11’ through 14’	1/4”	3/4”



Figure 9

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 10). Use a chisel to maintain the correct gap until the bolts on the ring are re-tightened.

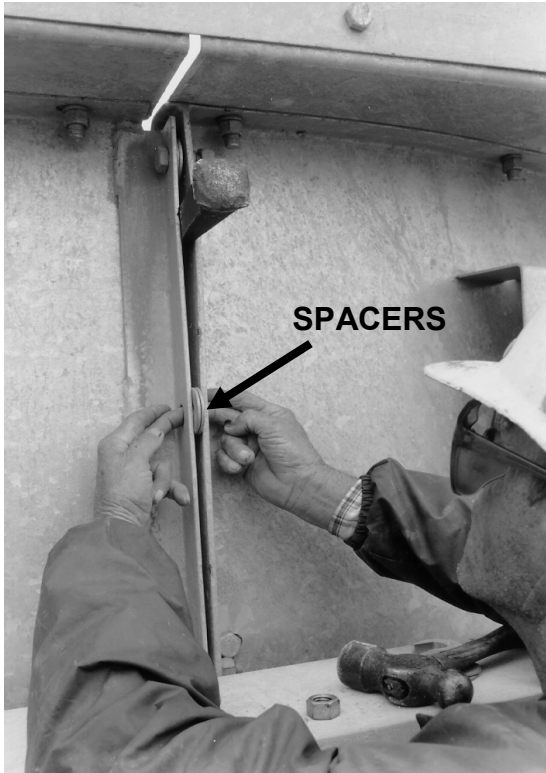


Figure 10

If a small adjustment is needed, tighten or loosen nut on fan strut in section requiring adjustment (See Figure 11).



Figure 11

## OPERATING INSTRUCTIONS

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

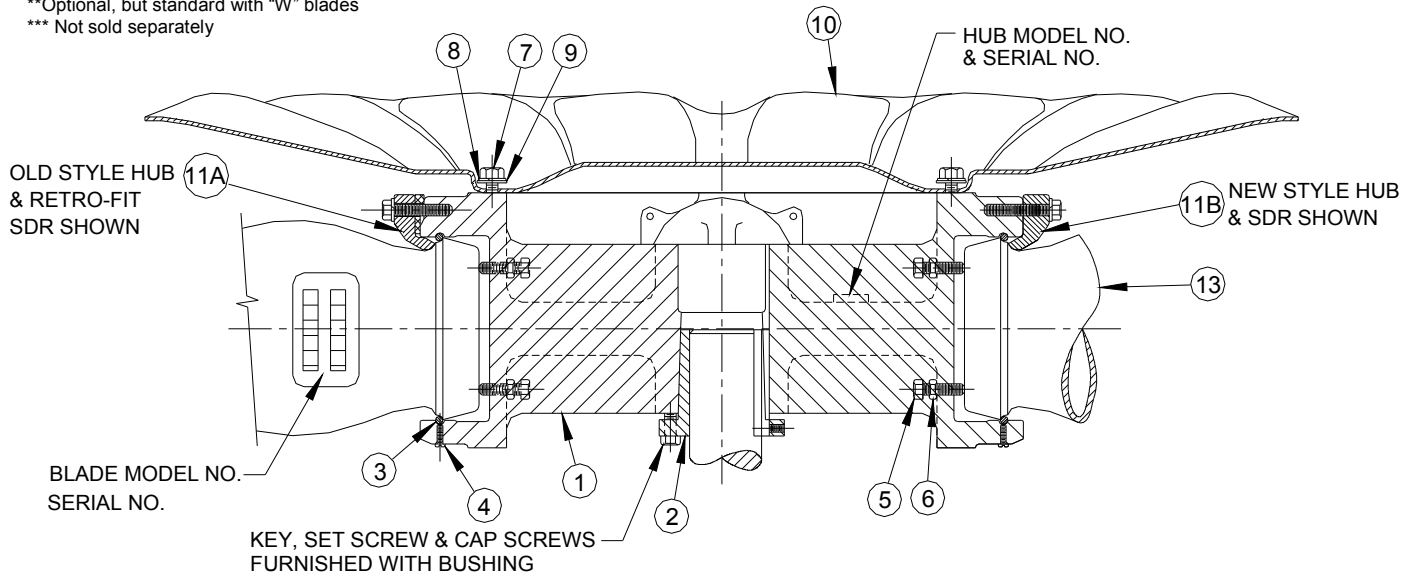
Check motor power consumption to be sure fan is pulling desired load. **CAUTION:** *If positive pitch is set in summer to use all available motor amps (nameplate rating), motor could be overloaded in winter.* Design pitch angles usually do not use all of the available motor horsepower. This ensures that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

## PARTS LIST

				NO. OF BLADES		
ITEM	DESCRIPTION	TYPE	INV. NO	4	5	6
	1" Dia. Thru 2.62 Dia	Q-2	Hub Assy. No. Part No.	3104 H3100	3105 H3150	3106 H3110
	2.68 Dia Thru 3.62 Dia	R-2	Hub Assy. No. Part No.	3204 H3200	3205 H3250	3206 H3210
1	Hub Body *** (1 Per Hub)	Q-2	Part No	65100	65106	65110
		R-2	Part No	65105	65108	65115
ITEM	DESCRIPTION	TYPE	INV. NO	QTY PER ASSEMBLY		
2	Bushing	Q-2	Specify Bore	1	1	1
		R-2	Specify Bore	1	1	1
3	Blade Retainer Half		62380	8	10	12
4	Lock Screw (#8-32 X 5/8)		72661	8	10	12
5	Blade Socket Cap Screw (3/8 X 1-1/2), 316 SS		60274	16	20	24
6	3/8 Jam Nut, 316 SS		72051	16	20	24
7	Cap Screw (3/8 X 5/8), 316 SS		72330	4	3	3
8	3/8 Lock Washer, 316 SS		73722	4	3	3
9	3/8 Flat Washer, 316 SS		73623	4	3	3
10	30" Dia Seal Disc (6'-10' Dia Fans, 6B-10B Blades)		81100	1	1	1
	38" Dia Seal Disc (6'-12' Dia Fans, 6C-10C, 6D-10D & 11B-12B Blades)		81105	1	1	1
	42" Dia Seal Disc (11'-14' Dia Fans, 11W-12W & 13B-14B Blades)		81110	1	1	1
	53" Dia Seal Disc (13'-16' Dia Fans, 13W-16W Blades)		81114	1	1	1
11A  OR  11B	Old Style Severe Duty Blade Retainer Assembly Consisting of ** (1) - Severe Duty Blade Retainer (P/N 65289) (2) - Cap Screws 3/8-16x2, 316 SS (P/N 53622) (2) - Lock Washers 3/8,316 SS (P/N 73722) (1) - Blade Retainer Spacer (P/N B3246)		K2200	4	5	6
	New Style Severe Duty Blade Retainer Assembly Consisting of ** (1) - Severe Duty Blade Retainer (P/N D3261) (2) - Cap Screws 3/8-16x2 1/4, 316 SS (P/N 69934) (2) - Lock Washers 3/8, 316 SS (P/N 73722)		K2202			
12	Retainer Ring Removal Tool		62379	1	1	1
13	Tuf-Lite® Blade (Black)		(Varies)	4	5	6

\*\*Optional, but standard with "W" blades

\*\*\* Not sold separately



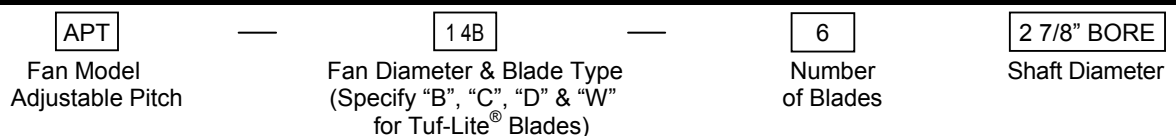
### STANDARD MATERIALS & FINISHES

**Blades:** Fiberglass reinforced epoxy  
**Hub Body:** Cast Iron, Enamel Finish  
**Seal Disc:** Fiberglass Reinforced Polyester

**Bushing:** Malleable Iron  
**Fasteners:** 316 Stainless Steel

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

**EXAMPLE:**



### HUDSON PRODUCTS CORPORATION

Adjustable Pitch Fan Assembly 5' Thru 16' Diameter  
Series 3000B HUB



# **HUDSON**

## **Products Corporation**

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Sugar Land, Texas 77479-4072 Post Office Box 20029  
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Fax: 281-275-8388  
1-800-634-9160 (24 Hours)  
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<http://www.HUDSONproducts.com>

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