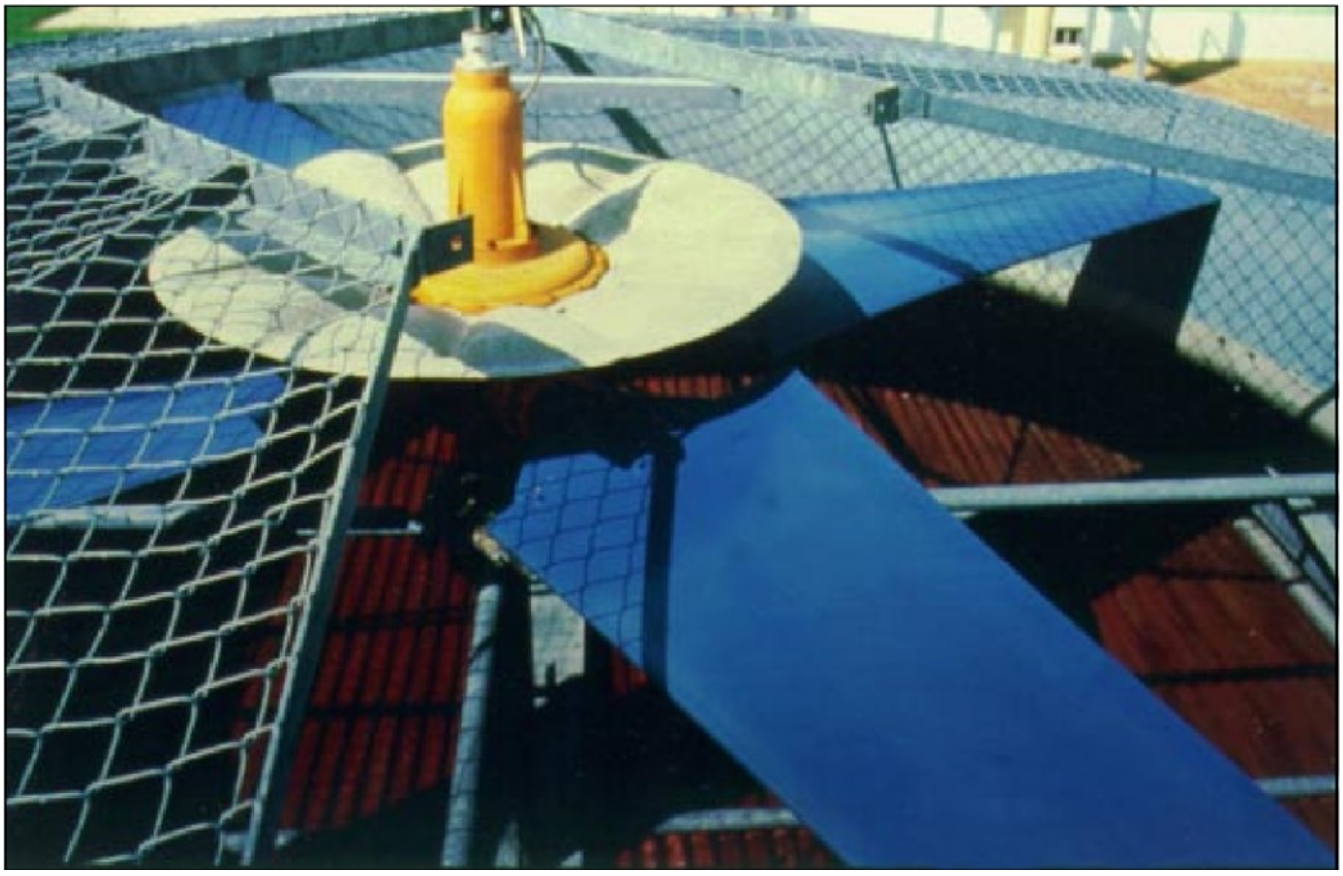
HUDSON
Products Corporation

Tuf-Lite II® Fans 1000H & HW Series AVCT Hub

INSTALLATION MANUAL



Hudson Auto-Variable® Hubs and Tuf-Lite II® Fan Blades (11HW-16HW & 15H-20H)

Hudson Auto-Variable® (AVCT) hubs feature Timken tapered roller bearings and synthetic lubricants. All components are suitable for high and low temperature operation and are interchangeable (except hub bodies) in 4, 5, or 6 blade configurations. Hudson AVCT hubs are durable and designed for low maintenance and energy saving operation.

Hudson Tuf-Lite II® 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 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
- Dial Indicator

INSTALLATION PROCEDURES

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

ASSEMBLY WITH BUSHING

Slide bushing and key onto straight fan shaft. Depending on shaft size, an R-2 bushing or a Q-2 bushing will be supplied. Tighten set screw in R-2 bushing flange to lock it on shaft. Q-2 bushings have no set screw. Set coupling squarely on bushing and install the three (3) 3/8" cap screws. Using torque wrench with 9/16" socket, tighten bolts evenly to recommended standard of 29 ft-lb (dry) (See Figure 1).

Figure 1

ASSEMBLY WITH TAPERED SHAFT

Align keyways and install coupling evenly on tapered shaft. Install key in keyways, then install retainer plate. Install 3/4" cap screw and lock washer through coupling into fan shaft. Tighten with 1-1/4" socket torque wrench to 125 ft-lb (lubricated), 130 ft-lb (dry) torque (See Figure 2).

Figure 2

INSTALLATION OF BOTH TAPERED AND STRAIGHT SHAFTS

Clean mating surfaces of hub and coupling or flanged shaft, if used, and apply a light coating of anti-seize and lubricating compound.

Rigidly attach dial indicator and measure the run-out of top face of coupling (See Figure 3). Rotate coupling and check for alignment. **Adjust coupling until run-out is less than 0.003".**

MINIMUM VIBRATION
THE FOLLOWING FOUR STEPS ARE EXTREMELY CRITICAL

Figure 3

Install hub onto coupling and fasten in place with the four (4) 3/4" cap screws and lock washers used on the hub-shipping pallet (See Figure 4). Make sure coupling is pulled down evenly. Tighten cap screws to recommended standard of 125 ft-lb (lubricated) or 130 ft-lb torque.

Figure 4

Rigidly attach dial indicator to the air line support or other stationary object. Measure run-out of the rotary joint (See Figure 5). Rotate hub 360° to locate point of minimum reading on the dial; set indicator to read zero at this point.

Figure 5

Rotate hub 360° while watching indicator at rotary joint for misalignment reading. Total indicated run-out should be 0.005" or less. If run-out is over 0.005", mark low point on face of coupling. Install shims under hub at low point (See Figure 6).

Figure 6

INSTALL TUF-LITE II® BLADES

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 with thick leading edge to left and thin trailing edge to right as you stand at end of blade. Install clamp bolts through hub plates and blade clamp, putting bolt heads on top side, lock washers and nuts on bottom (See Figure 7). Tighten lightly.

Figure 7

SET PITCH AND TRACK

Use Hudson EXACT-A-PITCH® digital protractor (See Figure 8) 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 a mid-point between high and low pitch readings, and set pitch at that point.

Figure 8

Rotate blade in socket until digital protractor shows specified pitch angle to within ±0.2°. *Fan pitch angle is shown on fan specification sheet for design duty.* For reverse acting hubs (fails to minimum air flow on loss of instrument air pressure), pitch angle should be set with 15 psi instrument signal and 85 psi supply air pressure applied (See "INSTALLING AIR LINES").

After desired pitch angle is set, raise and lower end of fan blade and find mid-point of blade travel. Hold blade at the mid-point. Pull blade back so that it sits against blade clamp. Push blade to the right to remove all slack.

Use torque wrench to tighten clamp bolts to recommended standard of 120 ft-lb (lubricated) or 130 ft-lb (dry). Re-check pitch setting. Blade must be set within ±0.2° 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 procedures above. After tightening bolts, mark top end of each blade in same place first blade was marked. (See table below).

CHECK TRACK

After fan is installed in fan ring, outline top end of each blade onto fan ring with a marker. The difference between levels of highest and lowest outlines should be within ±1” if the fan diameter is 11ft - 15ft and within ±1.5” if the fan diameter is 16ft - 20ft.

Figure 9

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 100 ft-lb (lubricated) or 125 ft-lb (dry) torque.

INSTALL SEAL DISC

Making sure hole in seal disc is over oil filler assembly, fasten seal disc to top of hub with six (6) 3/8" cap screws. Put flat washer against seal disc and lock washer between flat washer and cap screw. Tighten to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry). Make sure seal disc is not inverted and not touching blades (See Figure 10).

Figure 10

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 to check tip clearance (See Figure 11). Tip clearance recommendations for specific fan diameters are noted in table.

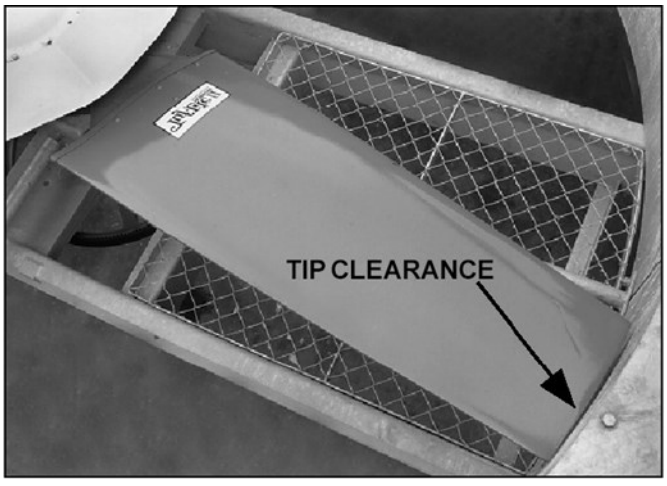


Figure 11

Fan Size (ft)	Minimum	Maximum
11HW-16HW	1/4"	3/4"
15H-20H	1"	1-1/2"

Increase tip clearance for Cooling Towers with very flexible fan stacks. Adjust fan ring for proper clearance at all points around its circumference. To increase clearance on Heat Exchangers, add spacers at fan ring joints. Use a chisel to maintain correct distance until bolts on ring are re-tightened (See Figure 12).

Figure 12 (Heat Exchangers)

If a small adjustment is needed, tighten or loosen nut on fan strut in area of incorrect clearance (See Figure 13). Make sure to re-tighten inside jam nut

Figure 13 (Heat Exchangers)

INSTALLING AIR LINES

Remove protective shipping cover and install air line(s).

All 1000 series hubs are shipped completely pre-adjusted for specified spring pre-load and pitch travel.

ROTARY JOINT

Hook up instrument line to connection on rotary joint (See Figure 14).

Figure 14

Rotary joint assembly used to deliver controlled pressure to hub has mechanical seal with ball bearings to assure alignment. It is very important that the air line is installed with some slack. *IMPORTANT: Do not pull air line to rotary air joint tight when installing hub. Instrument air pressure should be 3-15 psi.*

VALVE POSITIONER

Connect instrument line to connection marked INSTRU. Connect supply line to connection marked SUPPLY (See Figure 15). Instrument line hookup is all that is necessary before operating. Instrument air pressure should be 3-15 psi. Valve positioners are adjusted for 3 psi instrument starting point. Supply air pressure should be set to level according to table below.

Figure 15

BIAS RELAY

Connect both supply and instrument lines. Check instructions included with bias relay. If problems are encountered, contact Hudson fan engineer. Instrument air pressure should be 3-15 psi. Bias relays are adjusted for 3 psi instrument starting point. Supply air pressure should be set to level according to table below.

SUPPLY PRESSURE FOR VALVE POSITONER OR BIAS RELAY

Hub Type	Fan Diameter (ft)	Blade Type	Hub Spring	Supply Pressure (psi)	
				To Vary Pitch	To Check Blade Pitch Travel at Rest
Standard Acting Hub	15-20	H	Brown/Black	75	85
	11-16	HW	Brown/Black	75	85
Reverse Acting Hub	All Sizes	All	White	45	55

OPERATING INSTRUCTIONS

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

Hudson recommends to re-verify the blade clamp torque after the initial 10-15 minutes of cold operation (i.e., the fan doesn't need to be exposed to the working temperature of the process). This will ensure that the blades are settled within the clamps after the centrifugal forces have acted.

Check motor power consumption to make 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 horsepower. This ensures that the motors will not be overloaded at lowest winter temperatures if preset pitch remains unaltered.

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.

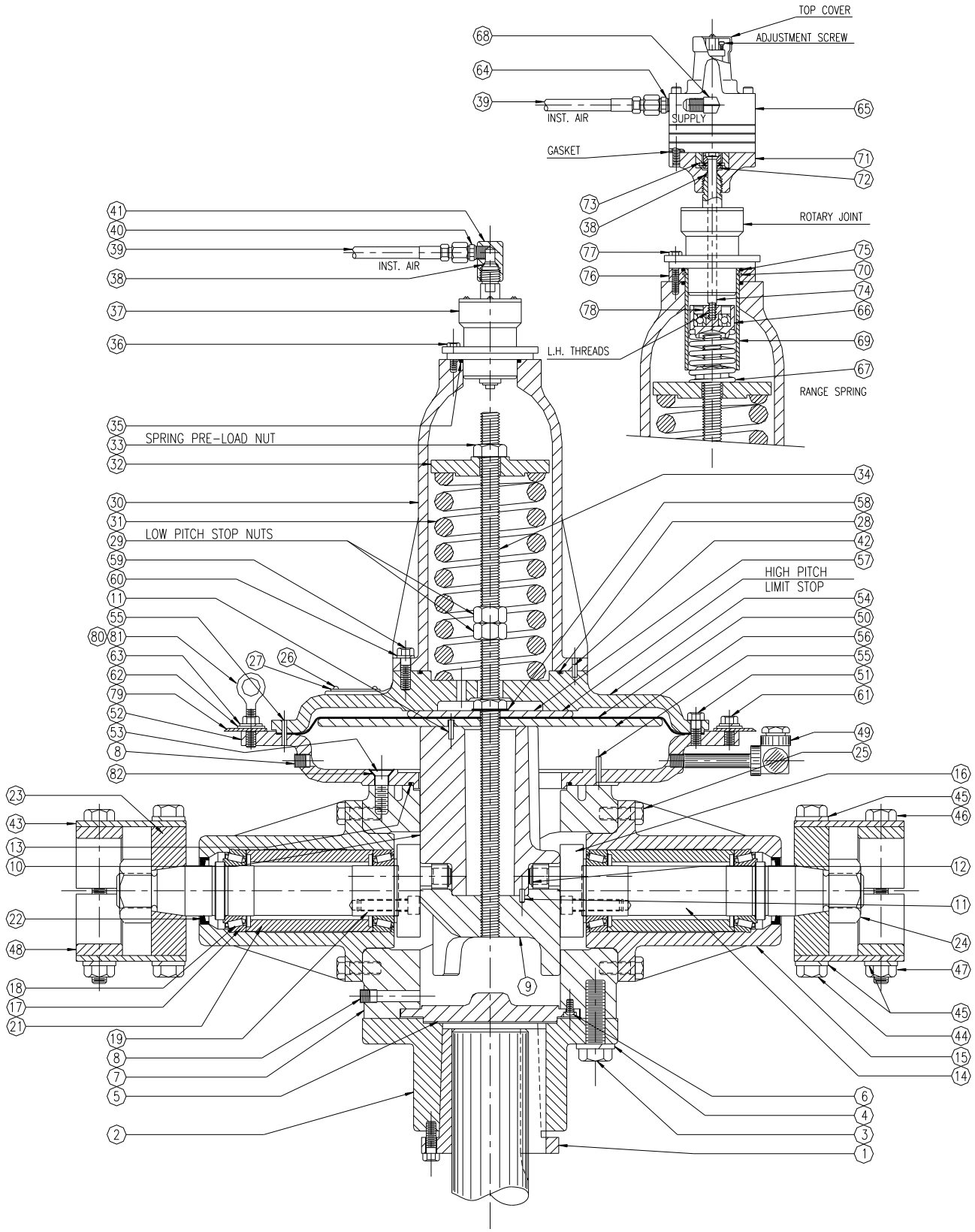
HUB MAINTENANCE

Hub is designed for oil lubrication and is filled with Summit Syngear 7150 or Shell Omala RL 150 synthetic oil for minimum oxidation and very low evaporation over wide temperature ranges. For minimum maintenance, Hudson strongly recommends using only synthetic oil. Under normal conditions oil level should be checked on a yearly basis.

PARTS LIST
Tuf-Lite II® Fans - Auto-Variable® Hubs (AVCT)
1000H & HW Series

ITEM NO.	P/N	DESCRIPTION	QTY. BLDS PER HUB 4	5	6
1	Specify Bore	Q2 Bushing (up to 2 5/8 bore) R2 Bushing (2 11/16 to 3/5 bore)	1	1	1
2	65450 65455	Coupling for Q2 Bushing Coupling for R2 Bushing (Specify Bushing)	1	1	1
3	72424	Cap Screw, 3/4 NC x 2 1/2	4	4	4
4	73738	3/4" Lock Washer	4	4	4
5	65425	Seal Plate	1	1	1
6	70505	Bolt, Stove, Rnd H, 1/4 x 1/2 long	4	4	4
7	65128 65129 65130	Hub Body, 4 Blades Hub Body, 5 Blades Hub Body, 6 Blades	1	1	1
8	71405	1/4 NPT Pipe Plug	2	2	2
9	65272	Lower Piston	1	1	1
10	65270	Upper Piston	1	1	1
11	74423	Roll Pin 3/16 x 1/2	3	3	3
12	K2030 62210 65175 73331	Actuator Bearing Assembly Consisting of: 1 – Actuator Stud 1 – Actuator Bearing 1 – Retainer Ring	4	5	6
13	73114	Oil Seal Silicone O-Ring #2-258	1	1	1
14	65245	Blade Shaft	4	5	6
15	65202	Bearing Housing	4	5	6
16	65244	Bearing Cap	4	5	6
17	70180	Roller Bearing Cup	8	10	12
18	70181	Roller Bearing Cone	8	10	12
19	72600	1/2 NC x 1 1/2 Socket Screws, Self-Locking	8	10	12
20	62369	Bearing Shim (as required)	4	5	6
21	65215	Blade Spacer	4	5	6
22	73475	Bearing Housing Oil Seal	4	5	6
23	65601	Blade Socket Block	4	5	6
24	72126	Blade Shaft Nut	4	5	6
25	72376	Cap Screw, Self Locking	16	20	24
26	72610	Drive Screw	4	4	4
27	62750	Name Plate	1	1	1
28	73250	Silicone O-Ring #2-253	1	1	1
29	72110	Low Pitch Stop Nut	2	2	2
30	65150	Spring Housing	1	1	1
31	63115 63116 63117 63101	Spring (To Suit Fan Dia.) W- White HH Inner – Black HH outer – Brown H - Yellow	1	1	1
32	63126	Spring Washer	1	1	1
33	72110	Spring Pre-load Nut 3/4	1	1	1
34	K2080	Spring Rod Assembly	1	1	1
35	73213	Silicone O-Ring #2-227	1	1	1
36	72312	Cap Screw 1/4 NC x 1	6	6	6
37	64100	2702D Rotary Joint Assembly	1	1	1
38	64530	Copper Flare Gasket	1	1	1
39	62215	Air Hose	1	1	1
40	64535	Male Connector	1	1	1
41	64300	Rotary Joint Adapter	1	1	1
42	74423	Roll Pin 3/16 x 1/2	1	1	1
43	65600	Blade Socket Plates	8	10	12
44	72419	Cap Screw, 3/4-10NC x 1 1/2	16	20	24
45	73737	Lock Washer, 3/4 NC	24	30	36
46	79299	Blade Clamp Bolt 3/4-10NC x 10	8	10	24
47	16020	Nut 3/4 NC-10	8	10	24
48	C4742A 65010	Blade Clamp Half (Aluminum) Std. Blade Clamp Half (Ductile Iron) Opt.	8	10	12
49	71066 71064 71065	Oil Filler Assembly 1 – 3/8 NPT Nipple 1 – 3/8 NPT Elbow 1 – 3/8 NPT Plug	1	1	1
50	62599	Silicone Diaphragm	1	1	1
51	72332	Cap Screw, Self Locking	20	20	20
52	65320	Lower Diaphragm Cover	1	1	1
53	72522	F.H. Cap Screw, Self Locking	6	6	6
54	65300	Upper Diaphragm Cover	1	1	1
55	74430	Roll Pin 3/16 x 1	1	1	1
56	65290	Bottom Diaphragm Plate	1	1	1
57	65276	Top Diaphragm Plate	1	1	1
58	73495	Air Seal Washer 3/4	1	1	1
59	72342	Cap Screw 3/8 NC x 1 1/4, SS	4	4	4
60	73722	Lock Washer, 3/8	4	4	4
61	72330	Cap Screw 3/8 NC x 5/8, SS	6	6	6
62	73623	Flat Washer 3/8, SS	6	6	6
63	73722	Lock Washer 3/8, SS	6	6	6
		OPTIONAL EXTRA VALVE POSITIONER ASSEMBLY INCLUDES:			
39	62215	Air Hose	1	1	1
64	64535	Male Connector	1	1	1
65	64510	Model 73N12F Positioner (Low Temp/High Temp Diaphragms and O-rings)	1	1	1
66	M2040	Range Spring Holder Sub Assembly	1	1	1
67	64251 64252 64253 64255	Range Spring (as required) 15 Deg. Travel B-W-B 20 Deg. Travel P-W-P 25 Deg. Travel Y-W-Y 30 Deg. Travel R-W-R	1	1	1
68	64540	Male Elbow, 5/16 Tube	1	1	1
69	65515	Range Spring Guide	1	1	1
70	73307	Retainer Ring	1	1	1
	54406	Supply Pressure Regulator 0-100 psi, 1/4 NPT (Not Shown)	1	1	1
71	65525	Base Plate	1	1	1
72	64580	Torque Sleeve	1	1	1
73	64565	Spring Pin (1/8 x 1 1/8)	1	1	1
74	65500	Feedback Rod (5 7/8)	1	1	1
75	73213	Silicone O-Ring Seal #2-227 (Furnished when Rotary Joint Spacer is required)	1	1	1
76	65535	Rotary Joint Spacer 4 Blades: Required when Yellow Hub Spring is used. (1104W, 1204W) 6 Blades: Required when Yellow Hub Spring is used. (1106W, 1206W)	1	1	1
77	72315	Cap Screw, 1/4 NC x 1 1/4 (When Rotary Joint Spacer is required)	6	6	6
78	64525	Bearing Seat	1	1	1
79	81107 81112 81117 81117	38" Dia Seal Disc 6' – 10' H Blades 42" Dia Seal Disc 11' – 14' H Blades 64" Dia Seal Disc 16',18',20' H Blades 64" Dia Seal Disc 11' - 16' HW Blades	1	1	1
80	70325	Eye Bolt, 3/8-16 x 1 1/4, A489	3	3	3
81	72050	Nut, Hex, 3/8-16, SS	3	3	3
82	64529	Gasket, 5/8 Tube Size	6	6	6

Note:
1. Items 80 & 81 for shop handling only, remove after paint.


TOP COVER
ADJUSTMENT SCREW
INST. AIR
SUPPLY
GASKET
ROTARY JOINT
INST. AIR
L.H. THREADS
RANGE SPRING
SPRING PRE-LOAD NUT
LOW PITCH STOP NUTS
HIGH PITCH
LIMIT STOP

HUDSON
Products Corporation

9660 Grunwald Rd.
Beasley, Texas 77417-8600
Phone: 281-396-8100
Fax: 281-396-8388
1-800-634-9160 (24 Hours)
EMAIL: hudsonproducts@hudsonproducts.com
http://www.hudsonproducts.com

Hudson, Auto-Variable, Combin-Aire, Exact-A-Pitch, Fin-Fan, Heatflo, Hy-Fin, Split-Flo, Solo Aire, Stac-Flo, Steamflo, Thermflo, Tuf-Edge, Tuf-Lite, Tuf-Lite II, and *Tuf-Lite III* are registered trademarks of Hudson Products Corporation.

©2012 Hudson Products Corp. All Rights Reserved.