

## IMPULSE WRENCH

MODELS: PG227A-A5, PG267A-A5 AND PG287A-B1

### NOTICE

Models PG227A-A5, PG267A-A5 and PG287A-B1 Impulse Wrenches are designed for use in assembly operations requiring consistent torque. They are ideally suited to appliance assembly and applications requiring low noise levels.

ARO is not responsible for customer modification of tools for applications on which ARO was not consulted.

### ▲ WARNING

**IMPORTANT SAFETY INFORMATION ENCLOSED.  
READ THIS MANUAL BEFORE OPERATING TOOL.**

**IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION  
IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.**

**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.**

#### PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1)
- For safety, top performance, and maximum durability of parts, operate this tool at 90 psig (6.2 bar/620 kPa) maximum air pressure at the inlet with 3/8" (10 mm) inside diameter air supply hose.
- Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.
- Do not use damaged, frayed or deteriorated air hoses and fittings.
- Be sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905-1 for a typical piping arrangement.
- Always use clean, dry air at 90 psig (6.2 bar/620 kPa) maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool.
- Do not lubricate tools with flammable or volatile liquids such as kerosene, diesel or jet fuel.
- Do not remove any labels. Replace any damaged label.

#### USING THE TOOL

- Always wear eye protection when operating or performing maintenance on this tool.

- Always wear hearing protection when operating this tool.
- Keep hands, loose clothing and long hair away from rotating end of tool.
- Note the position of the reversing lever before operating the tool so as to be aware of the direction of rotation when operating the throttle.
- Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.
- Keep body stance balanced and firm. Do not over-reach when operating this tool. High reaction torques can occur at or below the recommended air pressure.
- Tool shaft may continue to rotate briefly after throttle is released.
- Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.
- Use accessories recommended by ARO.
- Use only impact sockets and accessories. Do not use hand (chrome) sockets or accessories.
- Impact wrenches are not torque wrenches. Connections requiring specific torque must be checked with a torque meter after fitting with an impact wrench.
- This tool is not designed for working in explosive atmospheres.

### NOTICE

The use of other than genuine ARO replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest ARO Tool Products Authorized Servicenter.

For parts and service information, contact your local ARO distributor, or the Customer Service Dept. of the Ingersoll-Rand Distribution Center, White House, TN at PH: (615) 672-0321, FAX: (615) 672-0801.

#### ARO Tool Products

**Ingersoll-Rand Company**

1725 U.S. No. 1 North • P.O. Box 8000 • Southern Pines, NC 28388-8000

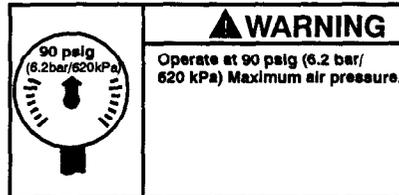
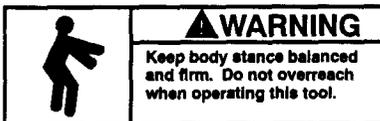
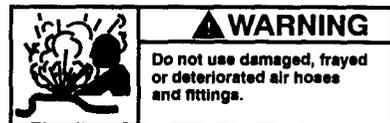
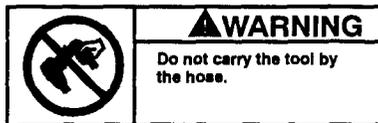
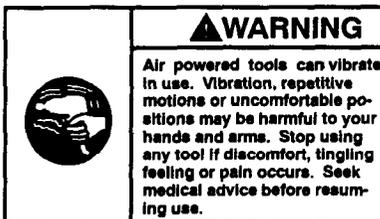
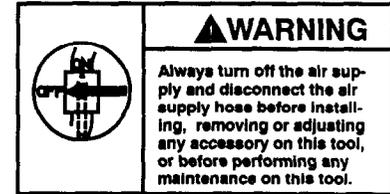
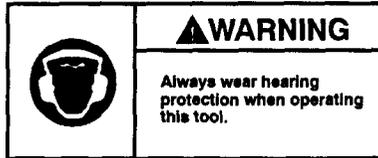
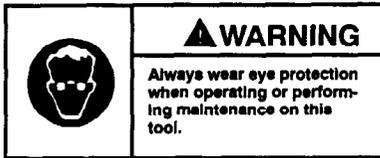
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# ARO®

## WARNING LABEL IDENTIFICATION

### ▲ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



## ADJUSTMENTS

### TORQUE ADJUSTMENT

To adjust the torque on these Twin Blade Impulse Wrenches, proceed as follows:

1. Remove the Adjustment Hole Plug.
2. Rotate the Drive Shaft until the Torque Adjustment Screw is visible in the opening.
3. Using a 1.5 mm hex wrench, rotate the Adjustment Screw clockwise to increase the torque output and counterclockwise to decrease the torque output. Do not rotate the Oil Plug.

### NOTICE

Make all final adjustments at the job.

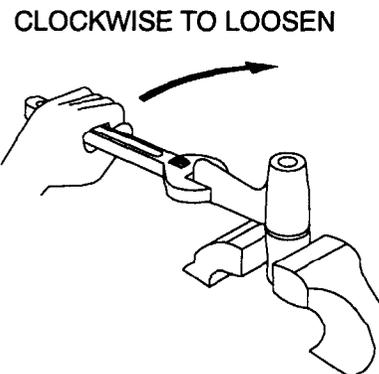
4. Replace the Adjustment Hole Plug.

### CHANGING THE MECHANISM FLUID

To change the Mechanism Fluid in the Impulse Mechanism, proceed as follows:

1. For model PG227A-A5 or PG287A-B1, use a pointed probe to push the Spring Seat against the Retaining Sleeve Spring. While the Spring is compressed, use another pointed probe or thin blade screwdriver to remove the Retaining Ring. Lift the Spring Seat, Spring and Bit Retaining Sleeve off the Drive Shaft and remove the Bit Retaining Ball.
2. Remove the Rubber Housing Boot.

3. Using copper-covered vise jaws, carefully grasp the flats of the Mechanism Cover with the output end of the Drive Shaft downward.
4. Using an adjustable wrench, unscrew the the Motor Housing Assembly from the Mechanism Cover. This is a **left-hand thread**, rotate the Motor Housing **clockwise** to remove it. See Dwg. TPD1264.



(Dwg. TPD1264)

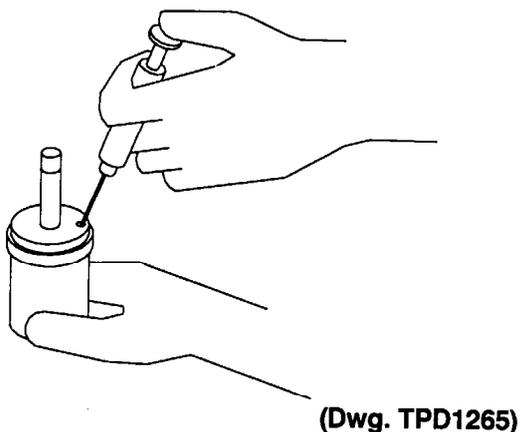
5. Lift the assembled motor off the Mechanism Cover and pull the mechanism assembly out of the Cover.
6. Using a 1.5 mm hex wrench, rotate the Torque Adjustment Screw clockwise until the Screw stops. Rotate the Screw counterclockwise until it stops or makes six complete revolutions.
7. Using the special Tee Wrench furnished in the Tool Kit (Part No. 180PQ-99), remove the Oil Plug and Oil Plug Seal.

# ADJUSTMENTS

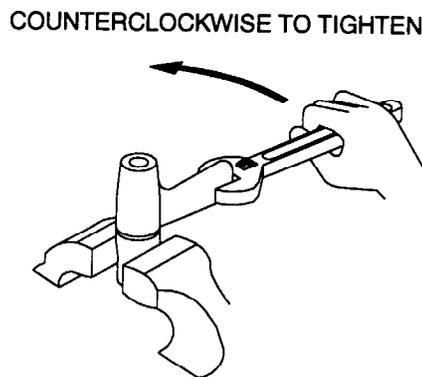
8. With the oil plug opening downward over a container, rotate the Drive Shaft to purge the fluid from the mechanism.
9. Using the syringe and fluid from the Fluid Replacement Kit (Part No. EQ106S-K400), fill the mechanism with the fluid furnished in the Kit. See Dwg. TPD1265.

**NOTICE**

**DO NOT SUBSTITUTE ANY OTHER FLUID.**  
**Failure to use the fluid provided could damage the tool, increase maintenance and decrease performance.**  
**Use only clean fluid in these tools.**



12. Using a 1.5 mm hex wrench, turn the Torque Adjustment Screw clockwise until it stops. This is the maximum torque position.
13. Wipe the outside of the mechanism dry and clean and remove the Oil Chamber Plug. Using the syringe, withdraw .25 cc of fluid from PG227A-A5 models and .3 cc of fluid from PG287A-B1 and PG267A-A5 models.
14. Install the Oil Chamber Plug and tighten it between 20 and 25 in-lb (2.3 and 2.8 Nm) torque.
15. Insert the mechanism assembly, output end leading, into the Mechanism Cover clamped in the vise jaws.
16. Insert the hex end of the rotor shaft into the hex recess at the rear of the Drive Shaft and thread the assembled Motor Housing onto the Mechanism Cover. This is a **left-hand thread**. Rotate the Housing **counter-clockwise** to tighten it. See Dwg. TPD1266.



(Dwg. TPD1266)

10. Submerge the fill opening in the remainder of the fluid, and using a wrench, rotate the Drive Shaft to purge any remaining air from the system.
11. Thread the Oil Plug with the Oil Plug Seal into the mechanism until it is snug.

## PLACING TOOL IN SERVICE

### LUBRICATION



Ingersoll-Rand No. 50



Ingersoll-Rand No. 67

Ingersoll-Rand Fluid Part No. EQ106S-400-1

Always use an air line lubricator with these tools.  
 We recommend the following Filter-Lubricator-Regulator Unit:

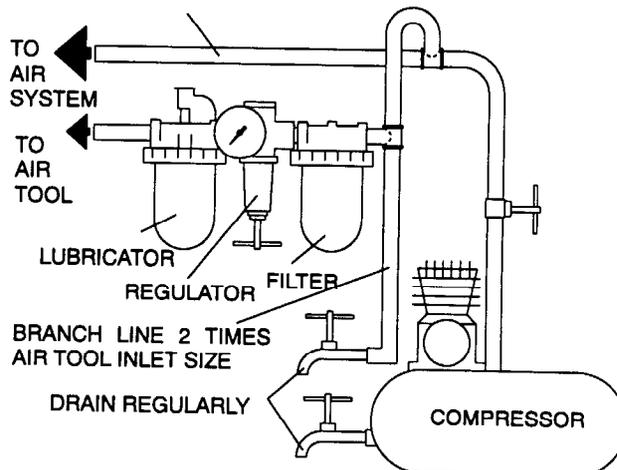
For USA - No. C11-03-G00

For International - No. C16-C3-A29

After each 20 000 cycles, or as experience indicates, drain and refill the Impulse Unit Drive Assembly as instructed in this manual using the Fluid Replacement Kit

(Part No. EQ106S-K400). Lubricate the hex drive and the output shaft before assembly.

MAIN LINES 3 TIMES  
 AIR TOOL INLET SIZE



(Dwg. TPD905-1)

**HOW TO ORDER AN IMPULSE WRENCH**

Model	Free Speed	Recommended Torque Range			
		Soft Draw		Hard Slam	
		ft-lb	Nm	ft-lb	Nm

**PISTOL GRIP with 1/4" INSERT BIT CHUCK**

PG227A-A5	10 500	6-11	8-15	14-22	19-30
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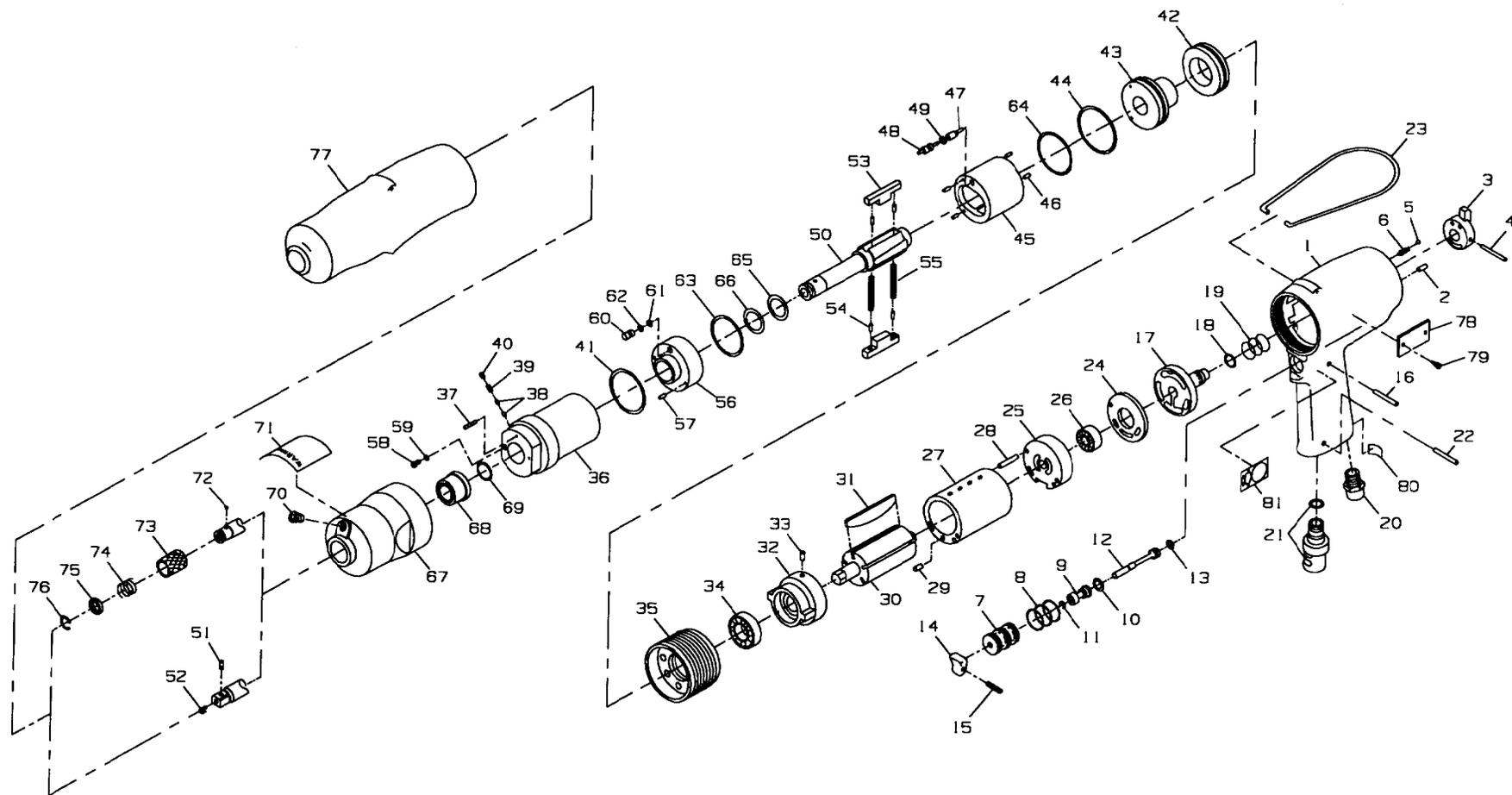
**PISTOL GRIP with 3/8" INSERT BIT CHUCK**

PG267A-A5	9 500	10-16	14-22	16-26	22-35
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**PISTOL GRIP with 3/8" SQUARE DRIVE**

PG287A-B1	9 500	12-18	16-24	18-28	24-38
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**MODELS PG227A-A5, PG267A-A5 AND PG287A-B1**



5

**MAINTENANCE SECTION**

**(Dwg. TPA1612-1)**

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

	Motor Housing Assembly		22	Deflector Retaining Pin .....	EQ106P-152
	for model PG227A-A5 .....	180PQ-A40	23	Suspension Bail .....	EQ106S-365
	for model PG287A-B1 or		23	Suspension Bail .....	EQ106S-365
	PG267A-A5 .....	280PQ-A40	24	Rear End Plate Spacer .....	180PQ-43
1	Motor Housing			Rear End Plate Assembly .....	180PQ-A12
	for model PG227A-A5 .....	180PQ-40	25	Rear End Plate .....	180PQ-12
	for model PG287A-B1 or		25	Rear End Plate .....	180PQ-12
	PG267A-A5 .....	280PQ-40	+ 26	Rear Rotor Bearing .....	500A-22
2	Reverse Lever Alignment Pin .....	EQ104S-299	27	Cylinder Assembly	
3	Reverse Lever .....	180PQ-328		for model PG227A-A5 .....	180PQ-A3
4	Reverse Lever Pin .....	380PQ-298		for model PG287A-B1 or	
5	Reverse Lever Detent Ball .....	EQ104S-333		PG267A-A5 .....	280PQ-A3
6	Reverse Lever Detent Spring .....	180PQ-566	28	Rear End Plate Alignment Pin .....	180PQ-152
7	Throttle Bushing Assembly .....	EQ106P-A503	29	Front End Plate Alignment Pin .....	2400P-152
8	Throttle Bushing Seal (3) .....	EQ106P-283	30	Rotor	
9	Throttle Valve Assembly .....	EQ106P-A304		for model PG227A-A5 .....	180PQ-53
10	Throttle Valve Seal .....	EQ106S-159		for model PG287A-B1 or	
11	Valve Retaining Ring .....	EQ106P-303		PG267A-A5 .....	280PQ-52
12	Throttle Rod Assembly .....	EQ106P-A302	+ 31	Vane Packet (set of 5 Vanes)	
13	Throttle Rod Seal .....	EQ106P-288		for model PG227A-A5 .....	180PQ-42-5
14	Trigger .....	EQ106P-93		for model PG287A-B1 or	
15	Trigger Pin .....	EQ106P-265		PG267A-A5 .....	280PQ-42-5
16	Throttle Retaining Pin .....	180PQ-120		Front End Plate Assembly .....	180PQ-A11
17	Reverse Valve Assembly .....	180PQ-A329	32	Front End Plate .....	180PQ-11
18	Reverse Valve Assembly .....	180PQ-67	33	Alignment Pin .....	380SQ-298
19	Reverse Valve Spring .....	180PQ-567	+ 34	Front End Plate Bearing .....	500P-22
20	Inlet Bushing .....	EQ106S-565	35	Front End Plate Spacer .....	180PQ-41
21	Exhaust Deflector Assembly .....	180PQ-A23			

+ Indicates Motor Tune-up Kit part.

MAINTENANCE SECTION

PART NUMBER FOR ORDERING

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	Impulse Unit Drive Assembly		51	Socket Retaining Pin .....	5020-716
	for model PG227A-A5 ...	180PQ-A200	52	Retaining Pin Spring .....	401-718
	for model PG287A-B1 ...	280P-A200	53	Blade Assembly (2)	
	for model PG267A-A5 ...	280PQ-A200		for model PG227A-A5 .....	180PQ-A267
36	Housing Assembly			for model PG287A-B1 or	
	for model PG227A-A5 ...	180PQ-A31		PG267A-A5 .....	280PQ-A267
	for model PG287A-B1 or		54	Blade Assembly Pin	
	PG267A-A5 .....	280PQ-A31		(2 per assembly) .....	500A-120
37	Torque Adjustment Screw .....	180PQ-230	◆55	Blade Spring (2) .....	180PQ-568
38	Adjustment Screw Plug Lock (2) ..	180PQ-283	56	Front Liner Cover Assembly .....	180PQ-A211
39	Plug Lock Spring .....	180PQ-219	57	Liner Cover Pin .....	180PQ-232
40	Plug Lock Screw .....	500A-230	58	Oil Plug .....	180PQ-277
◆41	Liner O-ring .....	180PQ-236	◆59	Oil Plug Seal .....	EQ110P-288
42	Housing Cap .....	180PQ-207	60	Oil Stop Cap Assembly .....	180PQ-A38
43	Rear Liner Cover Assembly .....	180PQ-A212	61	Stop Cap O-ring .....	EQ106P-288
◆44	Liner Cover O-ring .....	180PQ-240	◆62	Back-up Ring .....	380SQ-272
45	Liner Assembly		◆63	Front Liner Seal .....	EQ104S-236
	for model PG227A-A5 ...	180PQ-A203A	◆64	Rear Liner Seal .....	180PQ-273
	for model PG287A-B1 or		◆65	Drive Shaft Seal .....	180PQ-271
	PG267A-A5 .....	280PQ-A203A	◆66	Seal Back-up Ring .....	380PQ-272
46	Liner Pin (4) .....	180PQ-298		Mechanism Cover Assembly	
47	Relief Valve .....	180PQ-298		for model PG227A-A5 .....	180PQ-A727
	for model PG227A-A5 ...	180PQ-222		for model PG287A-B1 or	
	for model PG287A-B1 or			PG267A-A5 .....	280PQ-727
	PG267A-A5 .....	280PQ-222	67	Mechanism Cover	
48	Spring Guide Assembly			for model PG227A-A5 .....	180PQ-727
	for model PG227A-A5 ...	180PQ-A255		for model PG287A-B1 or	
	for model PG287A-B1 or			PG267A-A5 .....	280PQ-727
	PG267A-A5 .....	280PQ-A255	68	Cover Bushing .....	180PQ-641
◆49	Spring Guide Seal .....	180PQ-272	69	Bushing Spacer .....	180PQ-229
50	Drive Shaft		70	Adjustment Hole Plug .....	180PQ-95
	for model PG227A-A5 ...	180PQ-626A	71	Warning Label .....	WARNING-2-99
	for model PG267A-A5 ...	280PQ-626C			
50	Drive Shaft Assembly (for				
	model PG287A-B1) .....	280P-A626A			

◆ Indicates Mechanism Tune-up Kit part.

MAINTENANCE SECTION

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

	Bit Chuck Assembly (for model PG227A-A5 or PG267A-A5)	180PQ-A667	*	Mechanism Tune-up Kit (includes illustrated items 41, 44, 49, 55, 59, 62, 63, 64, 65 and 66)	180PQ-K600
72	Bit Retaining Ball	EQ104S-929			
73	Bit Retaining Sleeve	EQ104S-930	*	Fluid Replacement Kit (includes Fluid Syringe, Fill Tube and 4 oz. [31mL] of Replacement Fluid)	EQ106S-K400
74	Retaining Sleeve Spring	EQ104S-931			
75	Spring Seat	EQ104S-932			
76	Retaining Ring	EQ104S-933	*	Replacement Fluid (4 oz.)	EQ106S-400-1
77	Rubber Housing Boot		*	Tool Kit (includes all the specialized tooling required to repair these tools and consists of two Spanner Plugs a Tee Wrench with a special tip, an O-ring Installer Fixture and a pressing fixture that has a Disassembly Arbor and Pressing Sleeve.)	180PQ-99
	for model PG227A-A5	180PQ-2			
	for model PG287A-B1 or PG267A-A5	280PQ-2			
78	Nameplate				
	for model PG227A-A5	PG227A-A5-301			
	for model PG287A-B1	PG287A-B1-301			
	for model PG267A-A5	PG267A-A5-301	*	Square Drive Anvil (for model PG227A-A5)	180P-626
79	Nameplate Driver Screw (for model PG287A-B1)	EQ106S-322	*	Drive Shaft/Liner Replacement Kit (includes illustrated items 45 and 50)	
80	Oil Daily Label	500P-69			
81	Two Speed Throttle Label	180PQ-68			
*	Motor Tune-up Kit (includes illustrated items, 26, 31 and 34)				
	for model PG227A-A5	180PQ-K500		for model PG227A-A5	180PQ-K203
	for model PG287A-B1 or PG267A-A5	280PQ-K500		for model PG267A-A5	280PQ-K203
				for model PG287A-B1	280P-K203

\* Not illustrated.

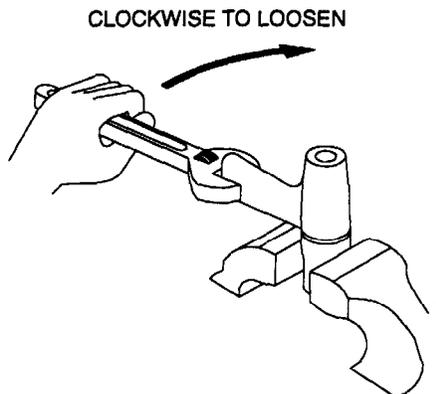
MAINTENANCE SECTION

## MAINTENANCE SECTION

### CHANGING THE MECHANISM FLUID

To change the Mechanism Fluid in the Impulse Mechanism, proceed as follows:

1. For model PG227A-A5 or PG267A-A5, use a pointed probe to push the Spring Seat (75) against the Retaining Sleeve Spring (74). While the Spring is compressed, use another pointed probe or thin blade screwdriver to remove the Retaining Ring (76). Lift the Spring Seat, Spring and Bit Retaining Sleeve (73) off the Drive Shaft (50) and remove the Bit Retaining Ball (72).
2. Remove the Rubber Housing Boot (77).
3. Using copper-covered vise jaws, carefully grasp the flats of the Mechanism Cover (67) with the output end of the Drive Shaft downward.
4. Using an adjustable wrench, unscrew the the Motor Housing Assembly (1) from the Mechanism Cover. This is a **left-hand thread**, rotate the Motor Housing **clockwise** to remove it. Refer to Dwg. TPD1264

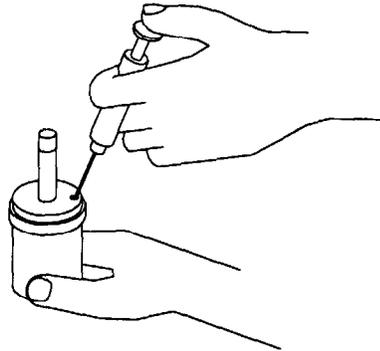


(Dwg. TPD1264)

5. Lift the assembled motor off the Mechanism Cover and pull the mechanism assembly out of the Cover.
6. Using a 1.5 mm hex wrench, rotate the Torque Adjustment Screw (37) clockwise until the Screw stops. Rotate the Screw counterclockwise until it stops or makes six complete revolutions.
7. Using the special Tee Wrench furnished in the Tool Kit (Part No. 180PQ-99), remove the Oil Plug (58) and Oil Plug Seal (59).
8. With the oil plug opening downward over a container, rotate the Drive Shaft to purge the fluid from the mechanism.
9. Using the syringe and fluid from the Fluid Replacement Kit (Part No. EQ106S-K400), fill the mechanism with the fluid furnished in the Kit. Refer to Dwg. TPD1265

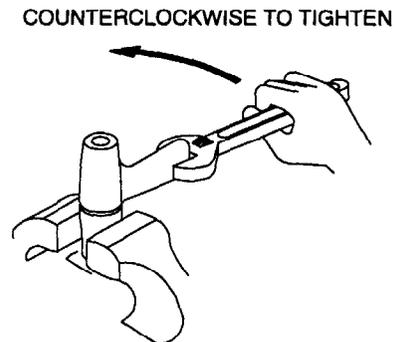
### NOTICE

**DO NOT SUBSTITUTE ANY OTHER FLUID.** Failure to use the fluid provided could damage the tool, increase maintenance and decrease performance. Use only clean fluid in these tools.



(Dwg. TPD1265)

10. Submerge the fill opening in the remainder of the fluid, and using a wrench, rotate the Drive Shaft to purge any remaining air from the system.
11. Thread the Oil Plug with the Oil Plug Seal into the mechanism until it is snug.
12. Using a 1.5 mm hex wrench, turn the Torque Adjustment Screw clockwise until it stops. This is the maximum torque position.
13. Wipe the outside of the mechanism dry and clean and remove the Oil Chamber Plug. Using the syringe, withdraw .4 cc of fluid.
14. Install the Oil Chamber Plug and tighten it between 20 and 25 in-lb (2.3 and 2.8 Nm) torque.
15. Insert the mechanism assembly, output end leading, into the Mechanism Cover clamped in the vise jaws.
16. Insert the hex end of the rotor shaft into the hex recess at the rear of the Drive Shaft and thread the assembled Motor Housing onto the Mechanism Cover. This is a **left-hand thread**. Rotate the Housing **counterclockwise** to tighten it. Refer to Dwg. TPD1266



(Dwg. TPD1266)

# MAINTENANCE SECTION

## DISASSEMBLY

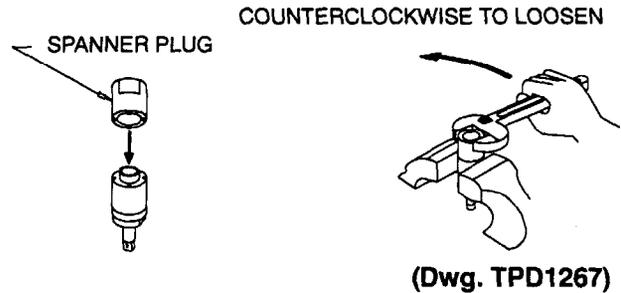
### General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. When grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
3. Do not remove any part which is a press fit in or on an assembly unless the removal of that part is necessary for repairs or replacement.
4. Do not disassemble the tool unless you have a complete set of new gaskets and O-rings for replacements.

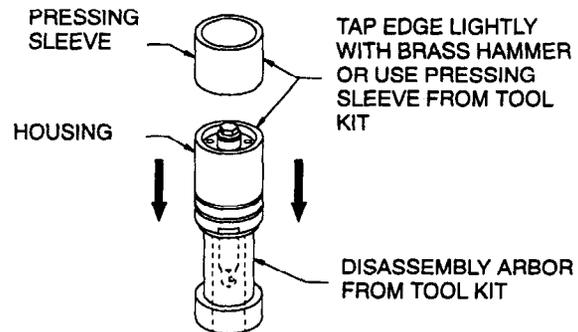
### Disassembly of the Impulse Mechanism

1. For model PG227A-A5 or PG267A-A5, use a pointed probe to push the Spring Seat (75) against the Retaining Sleeve Spring (74). While the Spring is compressed, use another pointed probe or thin blade screwdriver to remove the Retaining Ring (76). Lift the Spring Seat, Spring and Bit Retaining Sleeve (73) off the Drive Shaft (50) and remove the Bit Retaining Ball (72).  
For model PG287A-B1, use a hooked wire to pull the Retaining Pin Spring (52) out of the end of the Drive Shaft (50) and remove the Socket Retaining Pin (51).
2. Remove the Rubber Housing Boot (77).
3. Using copper-covered vise jaws, carefully grasp the flats of the Mechanism Cover (67) with the output end of the Drive Shaft downward.
4. Using an adjustable wrench, unscrew the the Motor Housing Assembly (1) from the Mechanism Cover. This is a **left-hand thread**, rotate the Motor Housing **clockwise** to remove it. Refer to Dwg. TPD1264.
5. Lift the assembled motor off the Mechanism Cover and pull the mechanism assembly out of the Cover. Remove the Bushing Spacer (69).

6. Grasp the flats of the Housing Assembly (36) in vise jaws with the output end of the Drive Shaft downward.
7. Insert the pins of the spanner plug from the No. 180PQ-99 Tool Kit into the two holes in the Housing Cap (42). Using a wrench on the plug, unscrew and remove the Housing Cap from the Housing Assembly. Refer to Dwg. TPD1267



8. Stand the disassembly arbor from the Tool Kit, large end downward, on a workbench or the table of an arbor press. Insert the output end of the Drive Shaft into the central opening and either tap the Housing downward off the components or use the pressing sleeve in the Kit to press the Housing downward off the components. Refer to Dwg. TPD1268

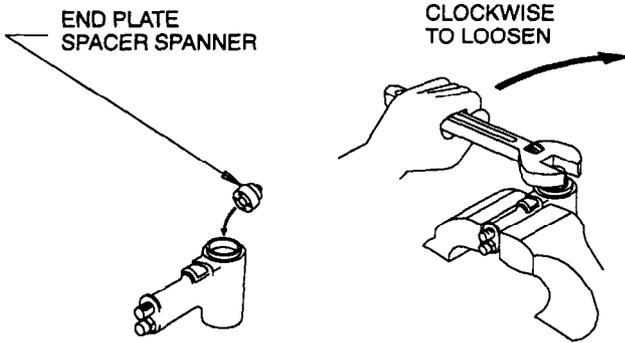


9. Disassemble the components of the mechanism in the sequence shown in Drawing TPA1612 on Page 5.

## MAINTENANCE SECTION

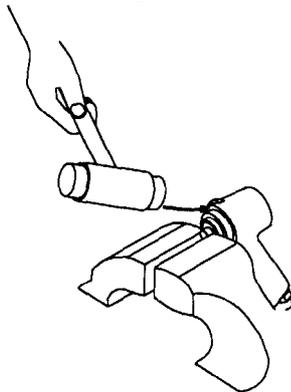
### Disassembly of the Motor

1. Grasp the Motor Housing (1) in vise jaws with the shaft of the Rotor (30) upward.
2. Insert the pins of the end plate spacer spanner into the holes in the Front End Plate Spacer (35). Using a wrench, unscrew and remove the Spacer. This is a **left-hand thread**; rotate the wrench **clockwise** to remove the Spacer. Refer to Dwg. TPD1269



(Dwg. TPD1269)

3. Reposition the Motor Housing in the vise jaws so that the vise jaws grip the end of the rotor shaft and the handle grip of the Housing is downward. Tap the edges of the Housing surrounding the motor bore with a plastic hammer to separate the Housing from the motor. Refer to Dwg. TPD1270

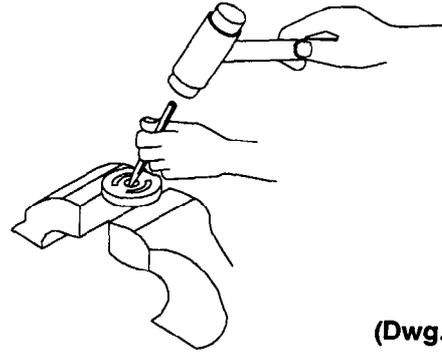


(Dwg. TPD1270)

4. Remove the motor from the vise jaws and remove the Front End Plate (32), Front End Plate Bearing (34), Cylinder Assembly (27) and Vanes (31) from the Rotor.
5. On the table of an arbor press, support the Rear End Plate (25) with blocks as close to the Rotor as possible and press the Rotor out of the Rear End Plate and Rear Rotor Bearing (26).
6. To remove the Rear Rotor Bearing from the Rear End Plate, use a small drift or pin punch through the central opening of the Rear End Plate to tap the Bearing out of the End Plate. Refer to Dwg. TPD1271

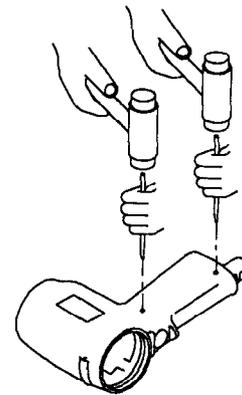
### NOTICE

**Do not enlarge or damage the shaft hole in the End Plate.**



(Dwg. TPD1271)

7. Press the Reverse Lever Pin (4) out of the Reverse Lever (3) and remove the Reverse Lever Detent Ball (5), Reverse Lever Detent Spring (6), Reverse Valve Assembly (17) and the Reverse Valve Spring (19).
8. Using a pin punch, tap the Throttle Retaining Pin (16) and the Deflector Retaining Pin (22) out of the Handle. The Throttle Retaining Pin is protected by an embossed circular pad of metal. Insert the pin punch into the middle of the pad to locate the Pin. Refer to Dwg. TPD1272



(Dwg. TPD1272)

9. Grasp the Trigger (14) and pull the assembled throttle out of the Motor Housing.
10. Using a pin punch and without damaging the Trigger (14), remove the Trigger Pin (15).
11. Slide the Throttle Bushing Assembly (7) off the shaft of the Throttle Rod Assembly (12).
12. Using a thin blade screwdriver, remove the Valve Retaining Ring (11) and slide the Throttle Valve Assembly (9) off the shaft of the Throttle Valve Rod.
13. Grasp the Exhaust Deflector Assembly (21) and pull it out of the Housing.
14. Unscrew and remove the Inlet Bushing (20).

# MAINTENANCE SECTION

## ASSEMBLY

### General Instructions

1. When grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
2. Always press on the inner ring of a ball-type bearing when installing the bearing on a shaft.
3. Always press on the outer ring of a ball-type bearing when pressing the bearing into a bearing recess.
4. Except for bearings and mechanism parts, always clean every part and wipe every part with a thin film of oil before installation.
5. Wipe a thin film of mechanism fluid on all internal mechanism components before installing them in the mechanism.
6. Apply a film of o-ring lubricant to every o-ring before installation.

### Assembly of the Motor

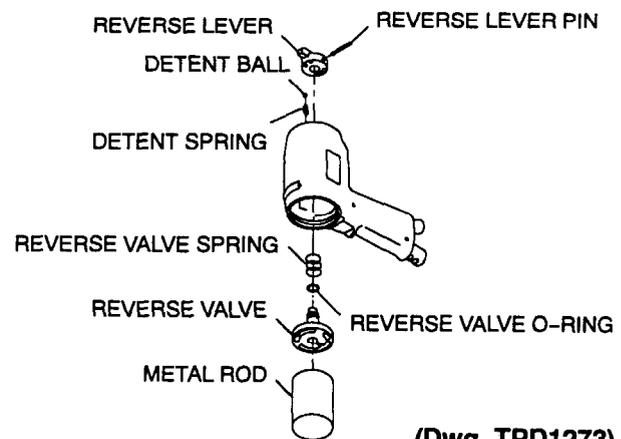
1. Thread the Inlet Bushing (20) into the bottom of the handle of the Motor Housing (1) and tighten it between 30 and 35 ft-lb (40 and 47 Nm) torque.
2. Position the Exhaust Deflector Assembly (21) in the bottom of the motor housing handle and install the Deflector Retaining Pin (22) to secure it in position.

### NOTICE

It may be necessary to slide the Assembly in or out in order to align the groove in the Assembly with the pin hole.

3. Install the Throttle Rod Seal (13) in the groove on the large hub of the Throttle Rod (12).
4. Install the Throttle Valve Seal (10) in the groove on the large hub of the Throttle Valve (9).
5. Slide the Throttle Valve, Valve Seal end first, onto the Throttle Valve Rod.
6. Secure the Throttle Valve Assembly by installing the Valve Retaining Ring (11) in the small groove on the Throttle Valve Rod.
7. Install the three Throttle Bushing Seals (8) in the grooves on the Throttle Bushing (7).
8. Slide the Throttle Bushing Assembly onto the shaft of the Throttle Valve Rod and position the Trigger (14) on the same shaft. Install the Trigger Pin (15).

9. Insert the assembled Trigger into the Housing. Make certain the widest end of the Trigger is nearest the motor bore and the narrowest portion of the Throttle Valve aligns with hole for the Throttle Retaining Pin (16). Install the Pin making certain it captures the Throttle Valve and secures the assembled Trigger.
10. Install the Reverse Valve Seal (18) on the hub of the Reverse Valve (17).
11. Place the Reverse Valve Spring (19) over the hub of the Reverse Valve and insert the assembly, small hub leading, into the motor bore of the Housing. Insert the small hub through the Housing until it protrudes through the rear of the Housing. Position a 1-1/4" (32 mm) diameter metal rod about 3" (75 mm) long against the face of the Reverse Valve and stand the rod on a workbench with the weight of the Housing compressing the Reverse Valve Spring.
12. Place the Reverse Lever Detent Spring (6) followed by the Reverse Lever Detent Ball (5) into the hole in the face at the rear of the Motor Housing. Capture the Ball and Spring in position by installing the Reverse Lever (3) onto the hub of the Reverse Valve. Make certain the Reverse Lever Alignment Pin (2) enters the notch on the face of the Lever and that the crosshole in the hub of the Reverse Valve aligns with the crosshole in the Lever. Refer to Dwg. TPD1273

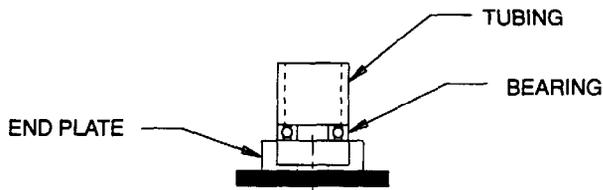


(Dwg. TPD1273)

13. Lightly tap the Reverse Lever Pin (4) into the hole in the Lever and into the hole in the hub of the Reverse Valve. Remove the assembly from the metal rod and work the Lever several times to make certain all parts function smoothly.

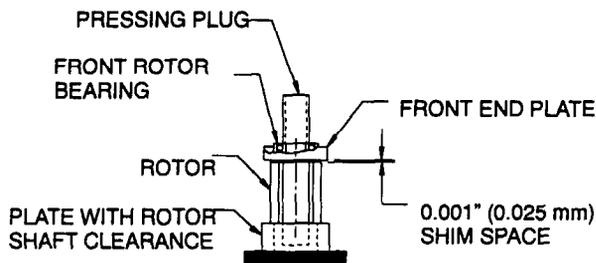
## MAINTENANCE SECTION

14. Using an arbor press and a piece of tubing that contacts the outer ring of the bearings, press the Front End Plate Bearing (34) into the Front End Plate (32) and the Rear End Plate Bearing (26) into the Rear End Plate (25). Refer to Dwg. TPD1274



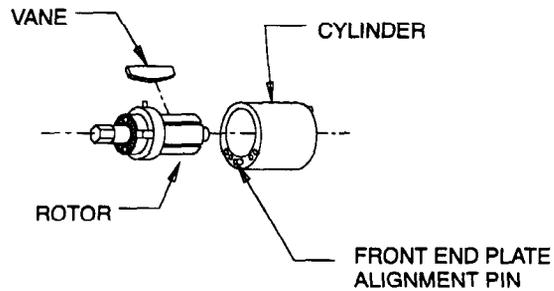
(Dwg. TPD1274)

15. Stand the Rotor (30) on the table of an arbor press. It should be upright on a flat metal plate having a clearance hole for the shaft. The shaft with the hex must be upward.
16. Place a 0.001" (0.025 mm) shim on the upward surface of the large portion of the rotor body. Using a piece of tubing that contacts the inner ring of the bearing, press the Front Rotor Bearing and Front End Plate, End Plate leading, onto the shaft of the Rotor until the End Plate contacts the shim. Remove the shim. Refer to Dwg. TPD1275



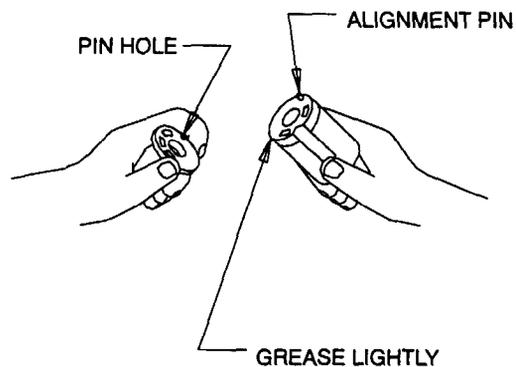
(Dwg. TPD1275)

17. Coat each Vane (31) with a thin film of oil and insert a Vane into each of the rotor vane slots with the straight edge of the Vane outward.
18. Install the Cylinder (27) over the Vanes and Rotor with the end of the Cylinder having the Alignment Pin (29) in the middle of the four holes positioned toward the Front End Plate. (Refer to Dwg. TPD1276). Make certain the Pin enters the hole in the face of the Front End Plate.



(Dwg. TPD1276)

19. Place the Rear End Plate and Bearing against the face of the Cylinder, Bearing end trailing. Make certain the Rear End Plate Alignment Pin (28) protrudes through hole in the End Plate.
20. Apply a thin film of Ingersoll-Rand No. 67 Grease to the face of the Rear End Plate and place the Rear End Plate Spacer (24) against the end plate face. Make certain the Alignment Pin enters the hole in the Spacer and there is sufficient grease to hold the Spacer against the End Plate. Refer to Dwg. TPD1278



(Dwg. TPD1278)

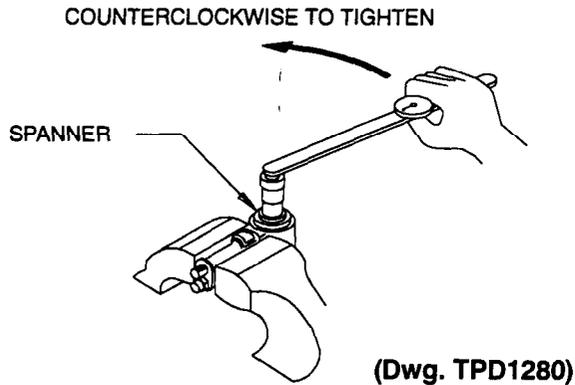
21. Insert the assembly, End Plate Spacer leading, into the Motor Housing making sure the Alignment Pin protruding through the Spacer enters the proper hole in the Reverse Valve. It may be necessary to tap the assembly into position with a brass or plastic hammer. Refer to Dwg. TPD1279



(Dwg. TPD1279)

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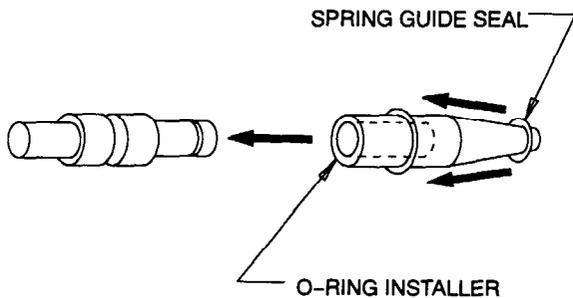
22. Grasp the handle of the Motor Housing in vise jaws with the rotor shaft upward. Thread the Front End Plate Spacer (35) into the Housing and using the end plate spacer spanner, tighten the Spacer to 12 ft-lb (16 Nm) torque. This is a **left-hand thread**; rotate the wrench **counterclockwise** to tighten. Refer to Dwg. TPD1280



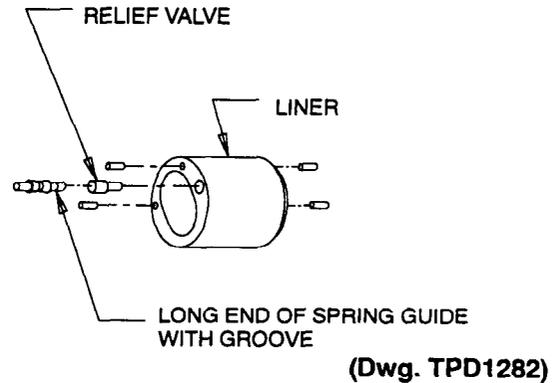
23. After installing the Front End Plate Spacer, grasp the shaft of the Rotor and rotate it by hand. If the Rotor does not turn easily, disassemble the motor unit and determine where the assembly is binding. The motor must rotate freely before proceeding further with the assembly.

### Assembly of the Impulse Mechanism

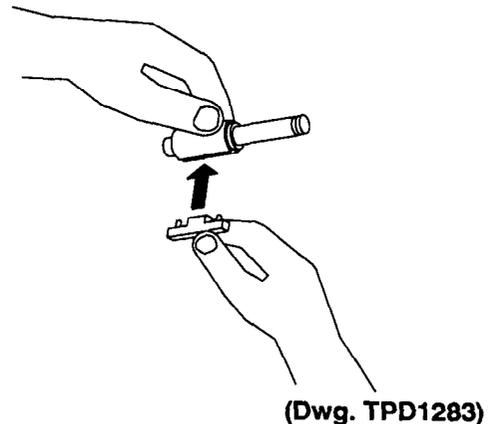
1. Insert the long shaft with the annular groove of the Spring Guide (48) into the central opening of the O-ring installer furnished with the Tool Kit (Part No. 180PQ-99). Place the Spring Guide Seal (49) on the tapered end of the installer and roll the Seal up the taper and into the groove on the large body of the Spring Guide. Refer to Dwg. TPD1281



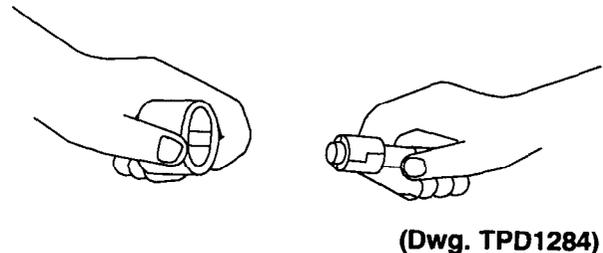
2. Insert the Relief Valve (47), large end trailing, into the Liner (45). Insert the assembled Spring Guide, long hub with annular groove leading, into the Liner against the Relief Valve. Refer to Dwg. TPD1282



3. Place a Blade (53) into one of the slots of the Drive Shaft (50) with the Blade Assembly Pins (54) inward.  
 4. From the opposite side of the Shaft, encircle each Pin with a Blade Spring (55).  
 5. Install the Assembly Pins of the remaining Blade in the open ends of the Springs. Refer to Dwg. TPD1283

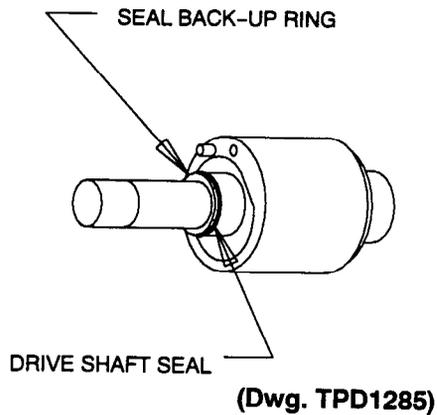


6. Compress the Springs with the Blades until both Blades are flush with the Drive Shaft and install the assembly in the Liner with the output end of the Drive Shaft protruding out the end of the Liner containing the Spring Guide. (Refer to Dwg. TPD1284). Make certain the ends of the Blades are flush with the ends of the Liner.

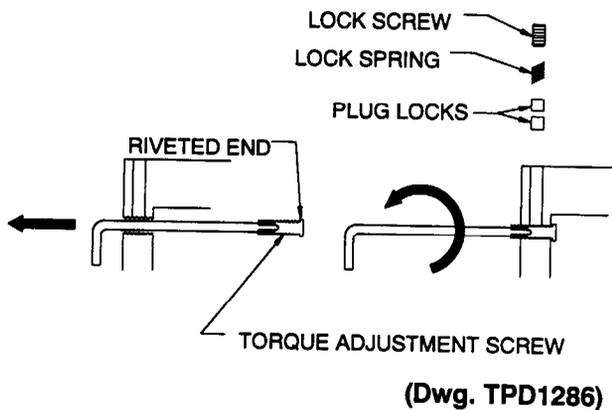


## MAINTENANCE SECTION

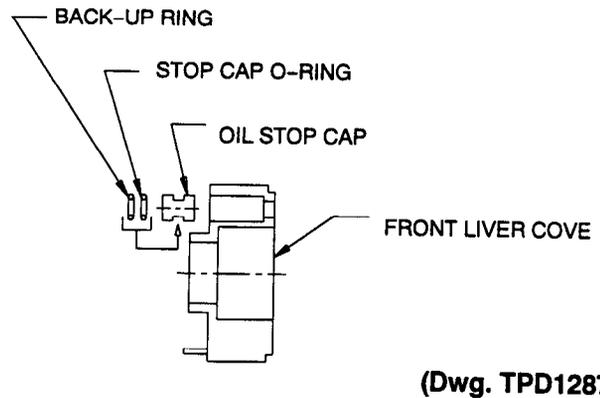
7. Install the Drive Shaft Seal (65) followed by the Seal Back-up Ring (66) on the Drive Shaft against the hub. Refer to Dwg. TPD1285



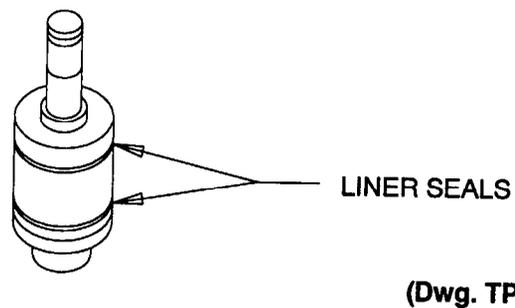
8. The Torque Adjustment Screw (37) can only be installed from the liner end of the Impulse Housing (35). If the Torque Adjustment Screw was removed, proceed as follows:
- Insert a 1.5 mm hex wrench into the threaded hole for the Torque Adjustment Screw from the oil plug end of the Housing.
  - From the opposite end of the Housing, install the hex of the Torque Adjustment Screw onto the hex wrench.
  - Push the Screw and wrench toward the threaded hole until it contacts the face of the Housing.
  - While applying finger pressure to the rivet end of the Screw, rotate the wrench counterclockwise to thread the Screw into the Housing. Continue rotating the Screw until the rivet end stops against the face of the Housing.
  - Insert the two Adjustment Screw Plug Locks (38) and the Plug Lock Spring (39) into the crosshole leading to the Adjustment Screw. Thread the Plug Lock Screw (40) into the same hole to capture the components. Refer to Dwg. TPD1286



9. If the Oil Stop Cap Assembly (60) was removed from the Front Liner Cover (56), install the Stop Cap O-ring (61) and Back-up Ring (62) in the groove of the Cap and insert the assembly into the Cover. Refer to Dwg. TPD1287



10. Install the Liner Cover O-ring (44) in the groove on the large hub of the Rear Liner Cover (43). Align the pin holes in the face of the Cover with the two Liner Pins (46) at the rear of the Liner and place the Cover against the Liner. A groove will be formed between the Liner and Cover for the Rear Liner Seal (64). Do not attempt to put the Seal in the groove at this time.
11. Align the pin holes in the Front Liner Cover (56) with the Pins in the front face of the Liner and place the Cover against the face of the Liner. Another groove will be formed between the Liner and Cover for the Front Liner Seal (63). Install both the Front and Rear Liner Seals in the grooves at this time and stand the assembly on the workbench with the output end of the Drive Shaft upward. Refer to Dwg. TPD1288



12. Apply a thin film of grease to the Liner O-ring (41) and install it in the forward bore of the Housing.
13. Lubricate the Front and Rear Liner Seals and after orienting the Housing to the proper position, install the Housing over the Liner.

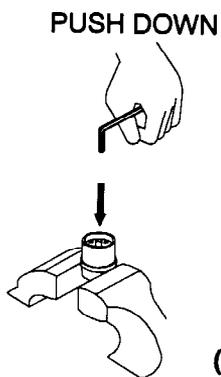
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14. Grasp the flats of the Housing in vise jaws with the output spindle downward. Remove the Rear Liner Cover Assembly and put grease in the central opening of the Cover. Refer to Dwg. TPD1289



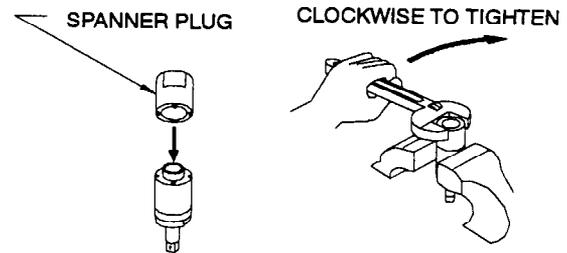
(Dwg. TPD1289)

15. Reinstall the Cover Assembly and use a hex wrench to push it below the threads at the rear of the Housing. Refer to Dwg. TPD1290



(Dwg. TPD1290)

16. Install the Housing Cap (42) and using the spanner plug furnished in the Tool Kit, tighten the Cap between 5 and 6 ft-lb (8 and 9 Nm) torque. Refer to Dwg. TPD1291



(Dwg. TPD1291)

17. Make certain the Drive Shaft rotates freely and then fill the mechanism with fluid and reassemble the tool as instructed in the section, **CHANGING THE MECHANISM FLUID.**