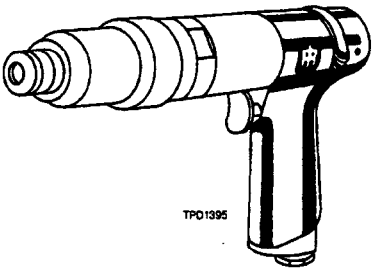
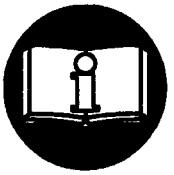
03534609

Form P6782
Edition 5
January, 1994

OPERATION AND MAINTENANCE MANUAL
for
SERIES 4R SCREWDRIVERS





⚠ WARNING

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

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

- 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 1/4" (6 mm) inside diameter air supply hose.
- 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.
- 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.
- Keep hands, loose clothing and long hair away from rotating end of tool.
- Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.
- Tool accessory may continue to rotate briefly after throttle is released.
- 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.
- Use accessories recommended by Ingersoll–Rand.

NOTICE

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

Ingersoll–Rand is not responsible for customer modification of tools for applications on which Ingersoll–Rand was not consulted.

Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll–Rand Authorized Servicenter.

It is the responsibility of the employer to place the information in this manual into the hands of the operator.

Refer All Communications to the Nearest
Ingersoll–Rand Office or Distributor.

Printed in U.S.A.

INGERSOLL-RAND®
PROFESSIONAL TOOLS

WARNING LABEL IDENTIFICATION

⚠ WARNING

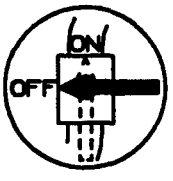
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

⚠ WARNING

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

⚠ WARNING

Always wear hearing protection when operating this tool.



⚠ WARNING

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.

⚠ WARNING

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.

⚠ WARNING

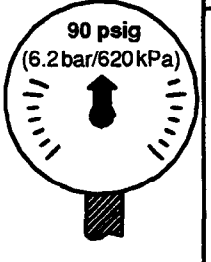
Do not carry the tool by the hose.

⚠ WARNING

Do not use damaged, frayed or deteriorated air hoses and fittings.

⚠ WARNING

Keep body stance balanced and firm. Do not overreach when operating this tool.



⚠ WARNING

Operate at 90 psig (6.2 bar/620 kPa) Maximum air pressure.

PLACING TOOL IN SERVICE

LUBRICATION


Ingersoll–Rand No. 10 **Ingersoll–Rand No. 28**
Ingersoll–Rand No. 67

Always use an air line lubricator with these tools.

We recommend the following Filter–Lubricator–Regulator Unit:

For USA – No. C05–02–G00

For International – No. C01–C2–T29

Before starting the tool and after each eight hours of operation, unless an air line lubricator is used, inject a few drops of Ingersoll–Rand No. 10 Oil into the air inlet. The cavity around outside of Rear Rotor Bearing (42) in Motor Housing (1) should be filled 50 to 75 percent capacity with Ingersoll–Rand No. 28 Grease.

Gearing

For models with L gearing, inject approximately 6 to 8 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting (51) in the Gear Case (50) after each 50 000 cycles or 100 hours of operation, whichever comes first.

For models with M, N or P gearing, inject approximately 10 to 12 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting (51) in the Gear Case (50) after each 50 000 cycles or 100 hours of operation, whichever comes first.

Clutch

Lubricate the 4C15, 4C17 or 4S1 Adjustable Clutch with 6 to 8 cc of Ingersoll–Rand No. 67 Grease after each 50 000 cycles or each 100 hours of operation, whichever occurs first. Lubricate the Clutches as follows:

⚠ WARNING

Turn off the air supply and disconnect the air supply hose at the tool before performing any maintenance.

1. Rotate the Adjusting Hole Cover (103, 219 or 252) to expose the slot in the Clutch Housing (101, 201 or 250).
2. **For 4C15 or 4S1,** insert a 1/4" Allen Wrench into the Bit Holder (106 or 270) and rotate the Bit Holder until the hole in the Clutch Adjusting Nut (113 or 256) is aligned with the slot in the Clutch Housing.
   For 4C17, insert a 1/4" Allen Wrench into the Bit Holder (217) and, while pushing against the Bit Holder to engage the clutch jaws, rotate the Bit Holder until the hole in the Clutch Adjusting Nut (214) is aligned with the slot in the Clutch Housing.
3. **For 4C15 or 4S1,** insert the Clutch Adjusting Key into the hole in the Clutch Adjusting Nut and, while holding the Nut against rotation, rotate the Bit Holder **clockwise** for the 4C15 and **counterclockwise** for the 4S1 until there is no compression on the Clutch Spring (112 or 261).
   For 4C17, insert the Clutch Adjusting Key into the hole in the Clutch Adjusting Nut and, while holding the Nut against rotation and pushing against the Bit Holder to engage the clutch jaws, rotate the Bit Holder counterclockwise until there is no compression on the Clutch Spring (209).
4. Using a wrench on the flats of the Gear Case and an adjustable spanner wrench in the slot of the Clutch Housing, unscrew the Clutch Housing from the Gear Case.

NOTICE

This is a left–hand thread; turn clockwise to remove.

5. **For 4C15,** using snap ring pliers, remove the Sleeve Spring Retainer (119) from the Bit Holder. Slide the Retaining Sleeve Spring (118) and Bit Retaining Sleeve (117) from the Bit Holder and remove the Bit Retaining Ball (116).
6. Withdraw the assembled clutch from the Clutch Housing and lubricate all bearing surfaces, bearings and balls with the recommended grease.

⚠ WARNING

Do not get your fingers between the clutch components.

7. To reassemble the Clutch, perform steps 3 through 6 in **Changing the Clutch Spring.**

CLUTCH ADJUSTMENT

The 4C15, 4C17 and 4S1 clutches can be externally adjusted within a certain range to ratchet when a predetermined torque has been delivered. To adjust the clutch, proceed as follows:

1. **Turn off the air supply and disconnect the air supply hose at the tool before proceeding.**
2. Rotate the Adjusting Hole Cover (103, 219 or 252) to expose the slot in the Clutch Housing (101, 201 or 250).
3. **For 4C15 or 4S1,** insert a 1/4" **Allen Wrench into the** Bit Holder (106 or 270) and rotate the Bit Holder until the hole in the Clutch Adjusting Nut (113 or 256) is aligned with the slot in the Clutch Housing.
   For 4C17, insert a 1/4" Allen Wrench into the Bit Holder (217) and, while pushing against the Bit Holder to engage the clutch jaws, rotate the Bit Holder until the hole in the Clutch Adjusting Nut (214) is aligned with the slot in the Clutch Housing.

4. **For 4C15 or 4S1,** insert the Clutch Adjusting Key into the hole in the Clutch Adjusting Nut and, while holding the Nut against rotation, rotate the Bit Holder to adjust the torque output.
   For 4C17, insert the Clutch Adjusting Key into the hole in the Clutch Adjusting Nut and, while holding the Nut against rotation and pushing against the Bit Holder to engage the clutch jaws, rotate the Bit Holder to adjust the torque output.
5. Rotating the Bit Holder clockwise increases the compression on the Clutch Spring (112, 209 or 261) and raises the torque at which the clutch will ratchet.

NOTICE

The most satisfactory adjustment is usually obtained by use of the tool on the actual application, and increasing or decreasing the delivered torque until the desired setting is reached. In any event, it is recommended that the final adjustment be made by gradual progression.

⚠ WARNING

These clutches, when equipped with a Heavy Spring, can he set beyond the torque capacity of the tool, in which case the tool will stall before the clutch ratchets. Do not adjust the clutch beyond the torque capacity of the tool.

— CHANGING THE CLUTCH SPRING —

Additional Clutch Springs are available for these clutches which allow the tools to be used when the desired torque does not fall within the torque range of the furnished Spring. To change a Clutch Spring (112, 209 or 261), proceed as follows:

1. Withdraw the assembled clutch from the Clutch Housing (101, 201 or 250) after performing steps 1 through 6 as described in the section **Clutch Lubrication.**
2. **To change the Clutch Spring in the 4C15 Clutch, proceed as follows:**
   a. Grasp the spline of the Clutch Shaft Support (120) in leather–covered or copper–covered vise jaws with the Bit Holder (106) upward.
   b. Using snap ring piers, remove the Bit Holder Stop (115).
   c. Using a wrench and keeping pressure against the Spring Seat (110) to prevent the Clutch Balls (108) from falling out of position, unscrew and remove the Clutch Adjusting Nut (113).

NOTICE

This is a left–hand thread; turn clockwise to remove.

   d. Lift off the Adjusting Nut Lock (114) and the Clutch Spring.
   e. Install the new Clutch Spring and replace the Adjusting Nut Lock.
   f. Thread the Clutch Adjusting Nut onto the Bit Holder and replace the Bit Holder Stop.
   g. Remove the assembled clutch from the vise.
3. **To change the Clutch Spring in the 4C17 Clutch, proceed as follows:**
   a. Carefully grasp the Front Clutch Jaw (204) in leather–covered or copper–covered vise jaws with the Clutch Adjusting Nut (214) upward.
   b. Using a wrench on the flats of the Clutch Adjusting Nut (214), loosen and remove the Nut.
   c. With the assembly in the vise and while applying slight downward pressure to the Clutch Ball Seat (208), remove the Adjusting Nut Lock (213), Spring Seat Bearing (212), Clutch Spring Seat (211) and the Clutch Spring from the Clutch Driver (203).
   d. Thoroughly grease the Bearing and Adjusting Nut Lock, and in the order named, slide the following over the Clutch Driver: the new Clutch Spring, the Clutch Spring Seat, the Spring Seat Bearing and the Adjusting Nut Lock, indented side trailing.
   e. Start the Clutch Adjusting Nut, detent side first, onto the Clutch Driver and run it finger tight against the compression of the Spring. With a wrench, tighten the Nut an additional one or two turns.
   f. Remove the assembled clutch from the vise.
4. **To change the Clutch Spring in the 4S1 Clutch,** proceed as follows:
   a. Grasp a 1/4" Allen Wrench in vise jaws with a section of the hex pointing upward. Position the Bit Holder (270) on the Allen Wrench so that the splined end of the Clutch Driver (253) is upward.
   b. Remove the Clutch Return Spring (254) and Return Spring Collar (255) from the Clutch Driver.
   c. Using snap ring pliers, remove the Spring Seat Stop (260) from the threaded section of the Clutch Driver.
   d. Using a wrench, unscrew and remove the Clutch Adjusting Nut (256).

e. Lift off the Adjusting Nut Lock (257), the Thrust Bearing (258), the Clutch Spring Seat (259) and the Clutch Spring from the Clutch Driver.
f. Thoroughly grease the Bearing and Adjusting Nut Lock, and in the order named, slide the following over the Clutch Driver: the new Clutch Spring, the Clutch Spring Seat, the Thrust Bearing and the Adjusting Nut Lock, indented side trailing.
g. Start the Clutch Adjusting Nut, detent side first, onto the Clutch Driver and run it finger tight against the compression of the Spring. With a wrench , tighten the Nut an additional one or two turns.
h. Using snap ring pliers, install the Spring Seat Stop on the Clutch Driver.
i. Place the Return Spring Collar, concave end trailing, and the Clutch Return Spring on the splined end of the Clutch Driver.
j. Remove the assembled clutch from the Allen Wrench and the wrench from the vise.

5. Insert the assembled clutch, Bit Holder end first, into the Clutch Housing.
6. **For 4C15,** insert the Bit Retaining Ball into the hole in the Bit Driver. Install the Bit Retaining Sleeve on the hub of the Bit Holder against the Bit Retaining Sleeve Stop (123). Install the Retaining Sleeve Spring on the Bit Holder and inside the Sleeve. Using snap ring pliers and compressing the Spring, install the Sleeve Spring Retainer in the external groove near the output end of the Bit Holder.
7. Thread the assembled Clutch onto the Gear Case.

NOTICE

This is a left-hand thread; turn clockwise to remove.

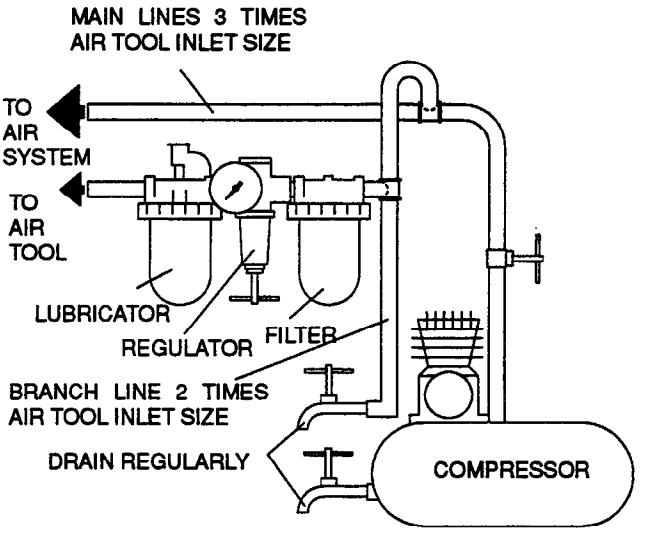
Tighten the Clutch Housing between 2 to 5 ft-lb (3 to 7 Nm) torque.

8. Adjust the Clutch as directed in the section **Clutch Adjustment.**

INSTALLATION

Air Supply and Connections

Always use clean dry air. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool. An air line filter can greatly increase the live of an air tool. The filter removes dust and moisture. Low pressure (under 90 psig; 6.2 bar/620 kPa) reduces the speed of all air tools. Low air pressure not only wastes time, but also costs money. High air pressure (over 90 psig; 6.2 bar/620 kPa) raises performance beyond the rated capacity of the tool and could cause injury. Be sure all hoses and fittings are the correct size and are tightly secured.
See Dwg. TPD905-1 for a typical piping arrangement.



(Dwg. TPD905-1)

The Model 4R Screwdriver is designed for fastening applications in automotive and appliance assembly, the electronic and aerospace industries and for woodworking.

HOW TO ORDER A SCREWDRIVER

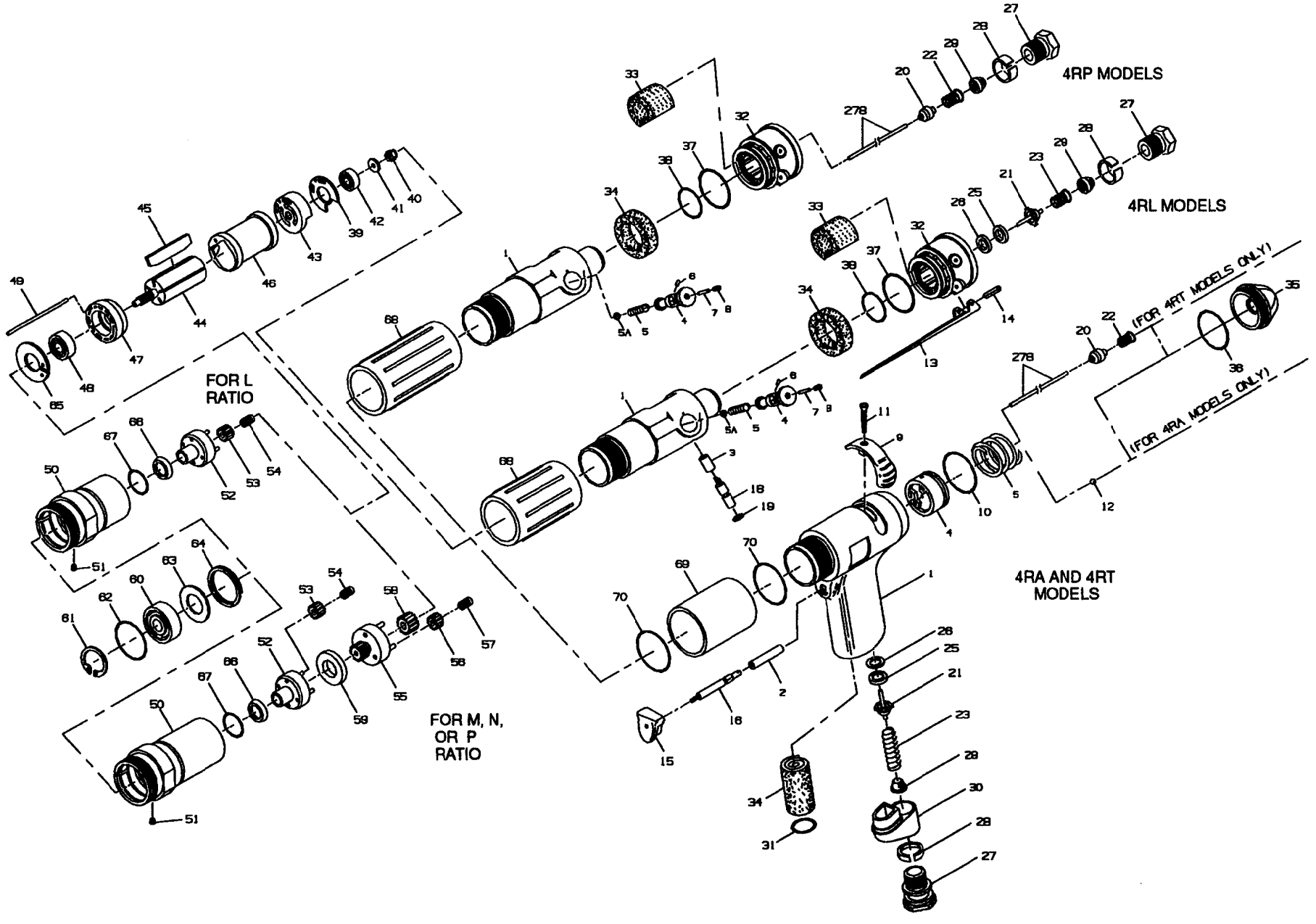
REVERSIBLE WITH PISTOL GRIP HANDLE AND ADJUSTABLE CUSHION CLUTCH

Model	Torque Range (Soft Draw) in-lb	Nm
4RALC1	15–40	1.7–4.6
4RAMC1	15–65	1.7–7.4
4RANC1	20–80	2.3–9.1
4RAPC1	20–105	2.3–11.9

REVERSIBLE WITH IN-LINE HANDLE, PUSH THROTTLE AND SHUT-OFF CLUTCH		
	Torque Range (Soft Draw)	
Model	in-lb	Nm
4RPLS1	15–40	1.7–4.6
4RPMS1	15–65	1.7–7.4
4RPNS1	15–80	1.7–9.1
REVERSIBLE PISTOL GRIP HANDLE AND SHUT-OFF CLUTCH		
4RTLS1	15–40	1.7–4.6
4RLMS1	15–65	1.7–7.4
4RTNS1	14–80	1.7–9.1
4RTPS1	15–105	1.7–11.9
REVERSIBLE LEVER THROTTLE AND IN-LINE HANDLE WITH ADJUSTABLE CUSHION CLUTCH		
4RLLC1	15–40	1.7–4.6
4RLMC1	15–65	1.7–7.4
4RTNC1	20–80	2.3–9.1
REVERSIBLE PISTOL GRIP HANDLE WITH POSITIVE JAW CLUTCH		
4RALP1	22	2.5
4RAMP1	36	4.1
4RANP1	44	5.0
4RAPP1	58	6.6

REVERSIBLE WITH PISTOL GRIP HANDLE AND DIRECT DRIVE				
	Torque Range (Soft Draw) 50 psi		Torque Range (Soft Draw) 90 psi	
Model	in-lb	Nm	in-lb	Nm
4RALD1	22	2.5	40	4.6
4RAMD1	36	4.1	65	7.4
4RAND1	44	5.0	80	9.1

MOTOR AND GEARING



(Dwg. TPA1153–3)

		PART NUMBER FOR ORDERING
	Motor Housing Assembly	
	for 4RA Models	4RA–A40
	for 4RL Models	4RL–A40
	for 4RP Models	4RP–A40
	for 4RT Models	4RT–A40
*	Warning Label	WARNING–7–99
1	Motor Housing	
	for 4RA and 4RT Models	4RA–B40
	for 4RL Models	4RL–B40
	for 4RP Models	4RP–B40
*	Nameplate	4RA–301
*	Nameplate Rivet (2)	BN403–302
2	Trigger Bushing (for 4RA and 4RT Models)	4RA–91
3	Plunger Bushing (for 4RL Models)	5RLK2C–91
4	Reverse Valve	
	for 4RA Models	4RA–329
	for 4RL and 4RP Models	55RP–329
	for 4RT Models	4RT–A329
♦ 5	Reverse Valve Spring	
	for 4RA and 4RT Models	4RA–515
	for 4RL and 4RP Models	55RP–515
5A	Reverse Valve Bushing Seal (for 4RL and 4RP Models)	6WRS–290
6	Reverse Valve Lock Pin (for 4RL and 4RP Models)	SPA1024–668
7	Lock Pin Retainer (for 4RL and 4RP Models)	7RL–56

		PART NUMBER FOR ORDERING
8	Retainer Setscrew (for 4RL and 4RP Models)	7RL–669
9	Reverse Valve Switch (for 4RA and 4RT Models)	4RA–658
♦• 10	Reverse Valve Seal (for 4RA and 4RT Models)	R000A2–103
11	Reverse Valve Screw (for 4RA and 4RT Models)	4RA–665
12	Reverse Valve Plug (for 4RA Models)	4RA–266
13	Throttle Lever (for 4RL Models)	7L–L273
14	Throttle Lever Pin (for 4RL Models)	7L–120
	Trigger Assembly (for 4RA and 4RT Models)	7AH–A93
15	Trigger	5RA–93
16	Trigger Pin	7AH–94
18	Throttle Plunger Assembly (for 4RL Models)	5RLK2C–A94A
19	Throttle Plunger Seal	8SL–259
♦ 20	Push Throttle Valve Assembly (for 4RP and 4RT Models)	4RP–A302
♦ 21	Throttle Valve (for 4RA, 4RL and 4RT Models)	7RAK–302
♦ 22	Pushrod Throttle Valve Spring	
	for 4RP Models	7L–51
	for 4RT Models	4RT–51

* Not illustrated

♦ Indicates Tune–up Kit part.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend taht you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

		PART NUMBER FOR ORDERING
♦ 23	Throttle Valve Spring	
	for 4RA and 4RT Models	3RA–51
	for 4RL Models	7L–51
♦ 25	Throttle Valve Seat (for 4RA, 4RL and 4RT Models)	7RAK–303
♦ 26	Throttle Valve Seat Support (for 4RA, 4RL and 4RT Models)	7RAK–304
27	Inlet Bushing	
	for 4RA and 4RT Models	7AH–565
	for 4RL and 4RP MOdels	7L–565
♦ 28	Inlet Bushing Spacer	7AH–65
♦• 29	Air Strainer Screen	R0A2–61
30	Muffler Assembly (for 4RA and 4RT Models)	3RA–A123
♦• 31	Muffler O–ring	85H–167
32	Muffler Assembly (For 4RL and 4RP Models)	6WS–A23
• 33	Muffler Element	3RA–310
♦• 34	Muffler Element	
	for 4RA and 4RT Models	3RA–310
	for 4RL and 4RP Models	4RL–311
35	Housing Back Cap (for 4RA and 4RT Models)	4RA–202
♦• 36	Back Cap Seal (for 4RA and 4RT Models)	AF120–294
♦• 37	Exhaust Deflector Seal (for 4RL and 4RP Models)	6AH–103
♦• 38	Silencer Seal Ring (for 4RL and 4RP Models)	WWV100A1–43
♦• 39	Rear End Plate Gasket	4RL–739
♦• 40	Rear Rotor Bearing Retaining Nut	6WT–118
• 41	Bearing Thrust Washer	6WT–117
♦ 42	Rear Rotor Bearing	DG20–22
43	Rear End Plate	4RL–12
44	Rotor	
	for 4RA and 4RL Models	4RLL–53
	for 4RP and 4RT Models	4RPL–53
♦• 45	Vane Packet (set of 5 Vanes)	4RL–42–5
46	Cylinder	4RL–3
47	Front End Plate	4RL–11
♦• 48	Front Rotor Bearing	WWA100–97
49	Cylinder Dowel	88V60–98
50	Gear Case Assembly	
	for L ratio	4RLL–B37
	for M, N or P ratio	4RLM–B37
51	Grease Fitting	D0F9–879
52	Spindle	
	for L ratio	4RLL–8
	for M or P ratio	4RLM–8
	for N ratio	4RLN–8

♦ Indicates Tune–up Kit part.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

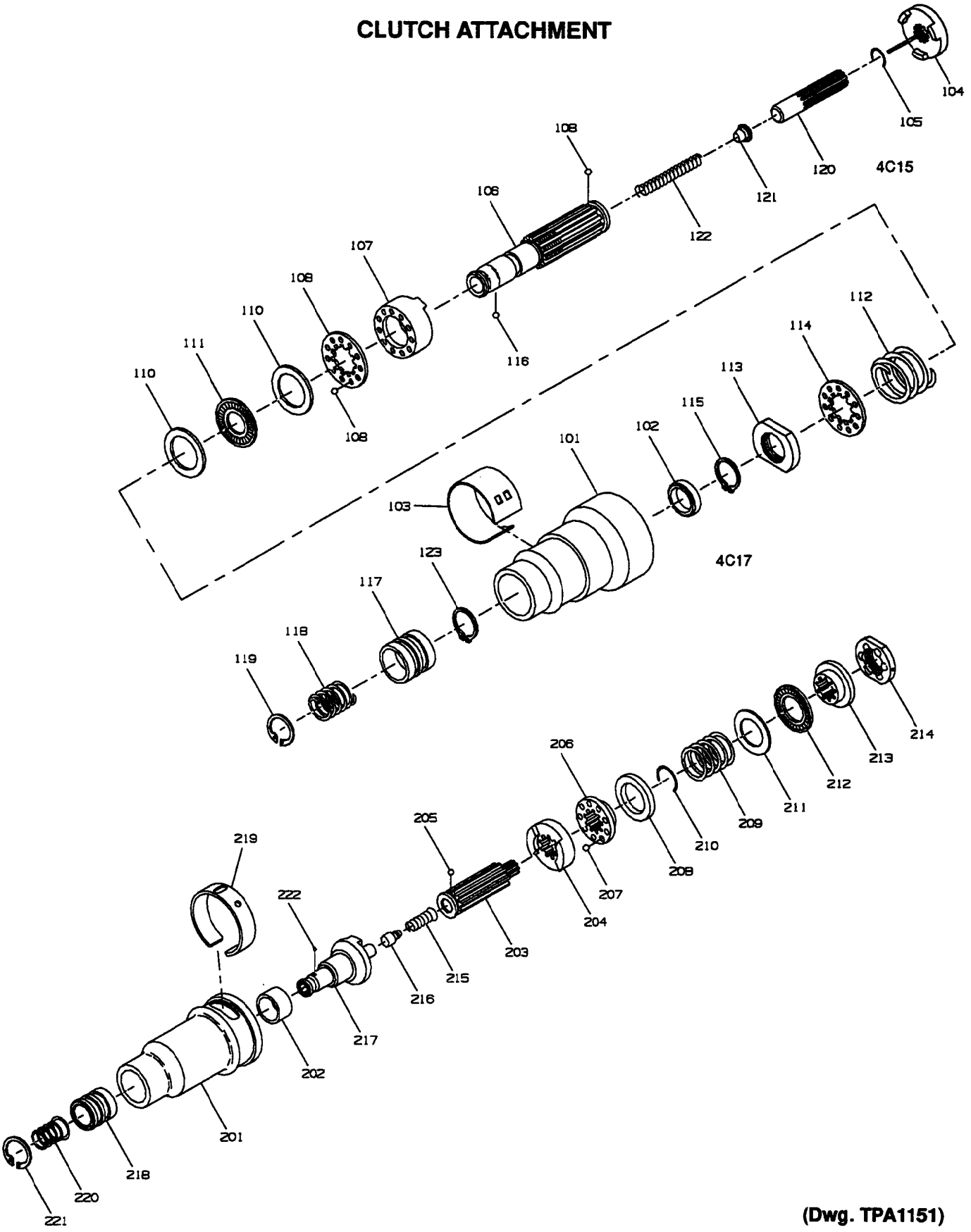
		PART NUMBER FOR ORDERING
53	Spindle Planet Gear (3 for L or N ratio; 4 for M or P ratio)	
	for L ratio (20 teeth)	4RLL–10A
	for M or P ratio (14 teeth)	4RLM–10A
	for N ratio (17 teeth)	4RLN–10A
54	Spindle Planet Gear Bearing (3 for L or N ratio; 4 for M or P ratio)	6WTM–500
55	Gear Head	
	for M ratio	4RLM–216
	for N ratio	4RLN–216
	for P ratio	4RLP–216
56	Gear Head Planet Gear (3)	
	for M or N ratio (14 teeth)	4RLM–10A
	for P ratio (20 teeth)	4RLL–10A
57	Gear Head Planet Gear Bearing (3)	6WTM–500
58	Rotor Pinion (for M or N ratio)	4RLM–17
59	Gear Head Spacer (for M, N or P ratio)	6LM–80
60	Spindle Bearing	R1L–24
61	Spindle Bearing Retainer	7L–28
♦ 62	Spindle Bearing Seal	6AH–103
63	Grease Shield	5R–701
64	Grease Shield Retainer	6LL–343
65	Gear Retainer	6LL–81
66	Seal Support	5RAK–5
♦• 67	Seal	182A53–610
68	Housing Grip (for 4RL and 4RP Models)	
	for L ratio	4RLL–747
	for M, N or P ratio	4RLM–747
69	Housing Sleeve (for 4RA and 4RT Models)	
	for L ratio	4RAL–747
	for M, N or P ratio	4RAM–747
♦ 70	Sleeve Support (for 4RA and 4RT Models) (2)	R00A2–103
*	Vertical Hanger (for 4RL and 4RP Models)	7L–365
*	Horizontal Hanger (for 4RA and 4RT Models)	R00H–365
*	Piped–Away Exhaust Kit (for 4RL and 4RP Models)	7L–K284
*	Grease Gun	R000A2–228
*	Tune–up Kit (for Models 4RA and 4RT) (includes illustrated items: 5, 10, 20, 21, 22, 23, 25, 26, 28, 29, 31, 34, 36, 39, 40, 42, 45, 48, 62, 67 and 70)	4RA–TK1
*	Tune–up Kit (for Models 4RL and 4RP) (includes illustrated items: 5, 20, 21, 22, 25, 26, 28, 29, 34, 37, 38, 39, 40, 42, 45, 48, 62, 67 and 70)	4RL–TK1
*	Dead Handle	R1A–48
*	Handle Adapter (2)	4R–49
*	Handle Bolt	510–638

* Not illustrated

♦ Indicates Tune–up Kit part.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

CLUTCH ATTACHMENT



(Dwg. TPA1151)

	PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING	
	Adjustable Clutch Attachment (for Models 4RLLC1, 4RLMC1, 4RPLC1, 4RPMC1, 4RALC1, and (4RAMC1)	4C15	113	Clutch Adjusting Nut	5C1–582A
			114	Adjusting Nut Lock	5C1–588
			• 115	Bit Holder Stop	5C1–729
			• 116	Bit Retaining Ball	RX1–629
101	Clutch Housing Assembly	4C17–A580	• 117	Bit Retaining Sleeve	5C1–930–4
102	Housing Bushing	7C3–781	• 118	Sleeve Return Spring	5C1–931–4
103	Adjusting Hole Cover	5C1–415	119	Sleeve Spring Retainer (Blue)	5C1–853
• 104	Clutch Driver	4C3–581	120	Clutch Shaft Support	4C3–584
• 105	Clutch Driver Retainer	W22–6	121	Disengaging Plunger	7P1–584
	Bit Holder Assembly	5C1–AL586	• 122	Plunger Spring	4C–626
106	Bit Holder	5C1–586	• 123	Bit Retaining Sleeve Stop	5C1–729
• 107	Front Clutch Jaw	5C1–589A	*	Heavy Clutch Spring (Green)	5C1–H583
• 108	Clutch Ball (24)	RX1–629	*	Clutch Adjusting Key	5C1–416
• 109	Clutch Ball Spacer	5C1–401A	278	Pushrod	
• 110	Clutch Spring Seat (2)	5C1–627		for Model 4RPLC1	4RPL–435
111	Spring Seat Bearing	5C1–105		for Model 4RPMC1	4RPM–435
112	Light Clutch Spring (Black)	5C1–L583			

* Not illustrated.

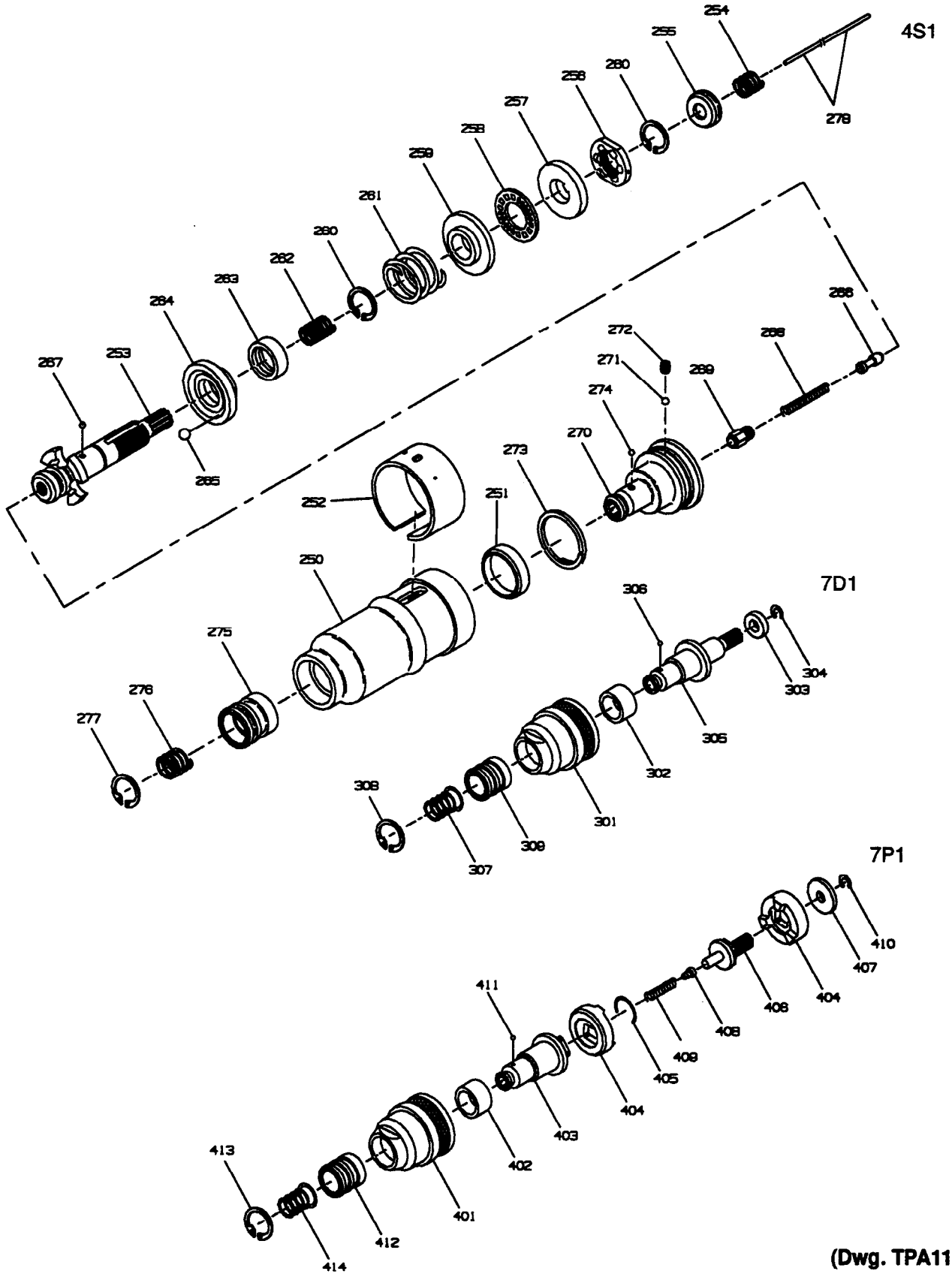
• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

	PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING	
	Adjustable Clutch Attachment (for Models 4RLNC1, 4RLPC1, 4RPNC1, 4RANC1 and 4RAPC1)	4C17	210	Spring Seat Stop	7C–704B
			211	Clutch Spring Seat	7C–623
			212	Spring Seat Bearing	R02W–696
201	Clutch Housing Assembly	4C17–A580	213	Adjusting Nut Lock	7C–588A
202	Housing Bushing	7P1–781	214	Clutch Adjusting Nut	7C–582A
	Clutch Driver Assembly		• 215	Plunger Spring	4C–626
	(Assembled with Medium		• 216	Disengaging Plunger	7P1–584
	Clutch Spring)	7C–A581A	217	Bit Holder	7C1–586A
• 203	Clutch Driver	7C–581A	• 218	Bit Retaining Sleeve	5C1–930–4
• 204	Front Clutch Jaw	7C1–589A	219	Adjusting Hole Cover	4C3–415
• 205	Jaw Bearing Ball (12)	2U–696	• 220	Retaining Sleeve Spring	5C1–931–4
• 206	Clutch Ball Spacer	7C–401A	• 221	Sleeve Spring Retainer (Blue)	5C1–853
• 207	Clutch Release Ball (9)	4U–31	222	Bit Retaining Ball	RX1–629
• 208	Clutch Ball Seat	7C–627	*	Clutch Adjusting Key	5C1–416
209	Clutch Spring		278	Pushrod (for Model 4RPNC1)	4RPM–438
	Light (Black)	7C–L583A			
	Medium (Yellow)	7C–583A			
	Heavy (Green)	7C–H583A			

* Not illustrated

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

CLUTCH ATTACHMENTS



(Dwg. TPA1148)

	PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING	
	Adjustable Clutch Attachment		264	Clutch Ball Seat	4S3–627
	(for Models ending in S1)	4S1	• 265	Clutch Cam Ball (4)	G601–65
250	Clutch Housing Assembly	4S1–A580	266	Shutoff Plunger	4RTPSS–408
251	Housing Bushing	4S3–781	267	Shutoff Plunger Ball (4)	R000B–263
252	Adjusting Hole Cover	4S3–415	268	Plunger Return Spring	55S1–420
253	Clutch Driver	4S3–581	269	Return Spring Retainer	4S3–95
• 254	Clutch Return Spring	4S3–591	270	Bit Holder	4S1–586
255	Return Spring Collar	4S3–592	• 271	Bit Holder Ball Bearing (12)	2U–696
256	Clutch Adjusting Nut	4S3–582	272	Ball Bearing Retainer	4S3–669
257	Adjusting Nut Lock	4S3–588	273	Ball Retaining Spring	4S3–625
• 258	Thrust Bearing	55S1–105	274	Bit Retaining Ball	AV1–255
259	Clutch Spring Seat	4S3–626	275	Bit Retaining Sleeve	5C1–930–4
260	Spring Seat Stop (2)	5C1–853X	276	Retaining Sleeve Spring	5C1–931–4
• 261	Clutch Spring		277	Sleeve Spring Retainer (Blue)	5C1–853
	Light (Black)	4S3–L583	*	Clutch Adjusting Key	5C1–416
	Medium (Yellow)	4S3–583	278	Pushrod	
	Heavy (Green)	55S1–H583		for L ratio	4RPL–435
• 262	Shutoff Collar Return Spring	55S1–405		for for M, N or P ratio	4RPM–435
263	Shutoff Collar	4S3–402			

* Not illustrated

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

	PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING	
	Direct Drive Attachment		• 305	Bit Holder	7D1–586
	(for Models ending in D1)	7D1	• 306	Bit Retaining Ball	RX1–629
301	Housing Assembly	7P1–A580	• 307	Retaining Sleeve Spring	5C1–931–4
302	Housing Bushing	7P1–781	308	Sleeve Spring Retainer (Blue)	5C1–853
303	Spacer	7D1–211	309	Bit Retaining Sleeve	5C1–930–4
304	Spacer Retainer	7AH–118			

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

		PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING
	Positive Drive Attachment (for Models ending in P1)	7P1	407	Clutch Driver Spacer	7P1–211
			408	Disengaging Plunger	7P1–584
401	Clutch Housing Assembly ...	7P1–A580	409	Plunger Spring	RX2–626
402	Housing Bushing	7P1–781	• 410	Clutch Driver Spacer Retainer	7AH–118
403	Bit Holder	7P1–586	• 411	Bit Retaining Ball	RX1–629
• 404	Clutch Jaw (2)	PX3–587	• 412	Bit Retaining Sleeve	5C1–930–4
• 405	Clutch Jaw Retaining Ring ...	R2–285	• 413	Sleeve Spring Retainer (Blue)	5C1–853
• 406	Clutch Driver	7P–581	414	Retaining Sleeve Spring	5C1–931–4

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

CLUTCH SPRING SELECTION CHART

Model		TORQUE RANGE (Soft Draw)	
	Light Clutch Spring (Black)	Medium Clutch Spring (Yellow)	Heavy Clutch Spring (Green)
4RALC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 40 in–lb (2.3 to 4.5 Nm)	
4RAMC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	35 to 65 in–lb (3.9 to 7.3 Nm)
4RANC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 80 in–lb (4.5 to 9.0 Nm)
4RAPC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 105 in–lb (4.5 to 11.8 Nm)
4RLLC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 40 in–lb (2.3 to 4.5 Nm)	
4RLMC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	35 to 65 in–lb (3.9 to 7.3 Nm)
4RLNC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 80 in–lb (4.5 to 9.0 Nm)
4RLPC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 105 in–lb (4.5 to 11.8 Nm)
4RPLC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 40 in–lb (2.3 to 4.5 Nm)	
4RPMC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	35 to 65 in–lb (3.9 to 7.3 Nm)
4RPNC1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 80 in–lb (4.5 to 9.0 Nm)
4RPLS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 40 in–lb (2.3 to 4.5 Nm)	
4RPMS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	35 to 65 in–lb (3.9 to 7.3 Nm)
4RPNS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 80 in–lb (4.5 to 9.0 Nm)
4RTLS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	
4RTMS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	35 to 65 in–lb (3.9 to 7.3 Nm)
4RTNS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 80 in–lb (4.5 to 9.0 Nm)
4RTPS1	15 to 30 in–lb (1.7 to 3.4 Nm)	20 to 55 in–lb (2.3 to 6.2 Nm)	40 to 105 in–lb (4.5 to 11.8 Nm)

⚠ WARNING

Always wear protective eyewear when operating or performing maintenance on this tool.

Always turn off the air supply and disconnect air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.

DISASSEMBLY

General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. Whenever 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 press any needle bearing from a part unless you have a new needle bearing on hand for installation. Needle bearings are always damaged during the removal process.
4. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repair or replacement.

Disassembly of the Tool

1. Each Series 4R Screwdriver is comprised of three modules or units–a motor housing and motor unit, a gear unit, and an adjustable clutch unit. Each module or unit can be removed, disassembled for repairs and reassembled independently of the other units.
2. Unscrew and remove the Clutch Housing Assembly (101, 201, 250, 301 or 401) from the Gear Case Assembly (50).

NOTICE

This is a left–hand thread and should only be hand–tight. Turn clockwise to remove.

3. Unscrew the Gear Case Assembly from the Motor Housing, and lift off the entire gear unit.

NOTICE

This is a right–hand thread. Turn counterclockwise to remove.

NOTICE

When the Gear Cases and Motor Housings are separated on Models 4RA and 4RT, the Housing Sleeve (69) and one Sleeve Support (70) will remain with the Gear Case. The other Sleeve Support will remain on the Motor Housing. When the Gear Cases and Motor Housings are separated on Models 4RL and 4RP, the Housing Grip (68) will remain on the Gear Case. If it must be removed, cut the Grip off the Gear Case with a sharp knife. Make certain a new Grip is available for installation.

4. **For Models 4RP and 4RT,** remove the pushrod (278).

Disassembly of the 4C15 Adjustable Cushion Clutch

1. Using snap ring pliers, remove the Sleeve Spring Retainer (119) from the Bit Holder (106) and slide the Retaining Sleeve Spring (118) and Bit Retaining Sleeve (117) from the Bit Holder and remove the Bit Retaining Ball (116).
2. Using snap ring pliers, remove the Bit Retaining Sleeve Stop (123) from the Bit Holder.
3. Withdraw the assembled clutch from the Clutch Housing (101) and grasp the spline of the Clutch Shaft Support (120) in copper–covered vise jaws with the Bit Holder upward.
4. Using snap ring pliers, remove the Bit Holder Stop (115).
5. Using a wrench on the flats of the Clutch Adjusting Nut (113) and keeping pressure against the Spring Seat (110) to prevent the Clutch Balls (108) from falling out of position, unscrew and remove the Clutch Adjusting Nut.

NOTICE

This is a left–hand thread.

6. Carefully remove the clutch from the vise and while holding it over a container to catch the twenty–four Clutch Balls, remove the Adjusting Nut Lock (114), Clutch Spring (112), two Clutch Spring Seats (110), Spring Seat Bearing (111), Clutch Ball Spacer (109) and Front Clutch Jaw (107) from the Bit Holder.
7. Slide the Clutch Driver (104) off the Clutch Shaft Support and pull the Support out of the Bit Holder.
8. To remove the Disengaging Plunger (121) and Plunger Spring (122) from the Bit Holder, rap the plunger end of the Bit Holder against a block of wood as often as necessary until the Plunger can be grasped and pulled with the Spring from the Bit Holder.

9. If the Housing Bushing (102) must be replaced, press it from the Clutch Housing.

Disassembly of the 4C17 Adjustable Cushion Clutch

1. Using snap ring pliers, remove the Sleeve Spring Retainer (221) and slide the Retaining Sleeve Spring (220) and Bit Retaining Sleeve (218) from the Bit Holder and remove the Bit Retaining Ball (222).
2. Withdraw the assembled clutch from the Clutch Housing (201) and grasp the flats of the Clutch Adjusting Nut (214) in copper–covered vise jaws with the Bit Holder (217) upward.
3. Insert a 1/4" Allen Wrench into the Bit Holder and rotate the Holder counterclockwise until the tension on the Clutch Spring (209) is relieved.
4. Remove the assembly from the vise and, while holding it over a small box or container, unscrew the Clutch Adjusting Nut from the Clutch Driver (203). Remove the Adjusting Nut Lock (213), Spring Seat Bearing (212), Clutch Spring Seat (211), Clutch Spring (209), Clutch Ball Seat (208) and Clutch Release Balls (207).
5. If it is necessary to replace the Clutch Ball Spacer (206), Front Clutch Jaw (204) or Jaw Bearing Balls (205), remove the Spring Seat Stop (210) from the groove in the Clutch Driver.
6. To remove the Disengaging Plunger (216) and Plunger Spring (215) from the Clutch Driver, rap the plunger end of the Driver against a block of wood as often as necessary until the Plunger can be grasped and pulled with the Spring from the Clutch Driver.
7. If the Housing Bushing (202) must be replaced, press it from the Clutch Housing.

Disassembly of the 4S1 Adjustable Shutoff Clutch

1. Grasp the splined shaft of the Clutch Driver (253) and pull the assembled clutch from the Clutch Housing (250). Remove the Clutch Return Spring (254) and Return Spring Collar (255).
2. Using snap ring pliers, remove the Spring Seat Stop (260) from the threaded section of the Clutch Driver.
3. Grasp the flats of the Clutch Adjusting Nut (256) in copper–covered vise jaws with the Bit Holder (270) upward.
4. Insert a 1/4" Allen Wrench into the Bit Holder and rotate the Holder counterclockwise until the tension on the Clutch Spring (261) is relieved.
5. Remove the assembly from the vise and remove the Clutch Adjusting Nut, the Adjusting Nut Lock (257), the Thrust Bearing (258), the Clutch Spring Seat (259) and the Clutch Spring from the Clutch Driver.
6. Holding the assembly over a container and using snap ring pliers, remove the remaining Spring Seat Stop. Remove the Shutoff Collar Return Spring (262), the Shutoff Collar (263), the Clutch Ball Seal (264), four Clutch Balls (265) and four Shutoff Plunger Balls (267).
7. Use a thin bladed screwdriver to spiral the Ball Retaining Spring (273) out of the groove in the Bit Holder.
8. Use a 1/8" Allen Wrench to remove the Ball Bearing Retainer (272). With the Retainer opening downward over a container, rotate the Clutch Driver allowing the twelve Bit Holder Ball Bearings (271) to fall out the opening one at a time.

NOTICE

If the Bearings are stuck in grease, tap the Driver lightly after aligning each Bearing with the opening.

9. Pull the Clutch Driver from the Bit Holder, and using a wrench, unscrew the Return Spring Retainer (269) and remove the Plunger Return Spring (268) and the Shutoff Plunger (266).
10. Using snap ring pliers, remove the Sleeve Spring Retainer (277) and slide the Retaining Sleeve Spring (276) and Bit Retaining Sleeve (275) from the Bit Holder and remove the Bit Retaining Ball (274).
11. If the Housing Bushing (251) must be replaced, use a flat face drill around the edge of the Bushing to tap the Bushing out the large end of the Clutch Housing.

Disassembly of the 7D1 Direct Drive Attachment

1. Using snap ring pliers, remove the Sleeve Spring Retainer (308) from the Bit Holder (305) and slide the Retaining Sleeve Spring (307) and Bit Retaining Sleeve (309) from the Bit Holder. Remove the Bit Retaining Ball (306).
2. Pull the Bit Holder from the Clutch Housing (301) and remove the Spacer Retainer (304) and Spacer (303).
3. If the Housing Bushing (302) requires replacement, press it from the Clutch Housing.

Disassembly of the 7P1 Positive Jaw Clutch

1. Pull the Clutch Driver (406) out of the Bit Holder (403) or out of the gearing if it remained with the Gear Case (50) during separation.
2. Remove the Clutch Driver Spacer Retainer (410) from the Clutch driver and withdraw the Clutch Driver Spacer (407) and rear Clutch Jaw (404).

3. Using snap ring pliers, remove the Sleeve Spring Retainer (413) from the Bit Holder and slide the Retaining Sleeve Spring (414) and Bit Retaining Sleeve (412) from the Bit Holder. Remove the Bit Retaining Ball (411).
4. Pull the Bit Holder out of the Clutch Housing (401) and remove the Clutch Jaw Retaining Ring (405).
5. Pull the front Clutch Jaw from the Bit Holder.
6. To remove the Disengaging Plunger (408) and Plunger Spring (409), tap the plunger end of the Bit Holder against a block of wood as often as necessary until the Plunger can be grasped and pulled with the Spring from the Bit Holder.
7. If the Housing Bushing (402) requires replacement, press it from the Clutch Housing.

Disassembly of the Gear Case

1. Using snap ring pliers, remove the Gear Retainer (65).
2. **For M or N ratio,** the Rotor Pinion (58) may come out with the Gear Case (50), or it may have remained with the Rotor (44) when the Gear Case was removed. Remove the Rotor Pinion.
3. **For M, N or P ratio,** remove the Gear Head Planet Gears (56), Gear Head Planet Gear Bearings (57), Gear Head (55) and Gear Head Spacer (59).
4. Remove the Spindle Planet Gears (53) and Spindle Planet Gear Bearings (54).
5. Position the Gear Case vertically in an arbor press, with the motor end down. Using a 7/16" (11 mm) diameter brass rod against the outer rim of the Spindle (52), press the Spindle from the Gear Case.
6. Using snap ring pliers, remove the Spindle Bearing Retainer (61).
7. Tap the externally threaded end of the Gear Case on a workbench to remove the Grease Shield (63), Spindle Bearing (60) and Spindle Bearing Seal (62).
8. Remove the Seal (67) and Seal Support (66) from the Spindle.
9. If the Grease Shield Retainer (64) must be removed, insert a thin blade screwdriver under the tab and using a rotary motion, spiral the Retainer out of the groove in the Gear Case.

Disassembly of the Motor

1. Grasp the splined end of the Rotor (44) in copper–covered vise jaws and pull the assembled motor from the Motor Housing (1).
2. Remove the Rear End Plate Gasket (39) from the Motor Housing .
3. Using a wrench, unscrew and remove the Rear Rotor Bearing Retaining Nut (40).
4. Remove the Rotor from the vise and remove the Bearing Thrust Washer (41), Rear End Plate (43), Cylinder (46), Cylinder Dowel (49) and Vanes (45).
5. Check the Front Rotor Bearing (48) for damage or roughness. If replacement is necessary, support the Front End Plate (47) between two blocks of wood on the table of an arbor press. Press the Rotor from the Front Rotor Bearing. Using a flat face punch on the inner ring, tap the Bearing out of the End Plate.
6. Check the Rear Rotor Bearing (42) for damage or roughness. If replacement is necessary, use a flat face punch on the inner ring and tap the Bearing out of the End Plate.

Disassembly of the Pistol Grip Motor Housing

For Models 4RA and 4RT

1. Using a 1/16" Allen Wrench, unscrew and remove the Reverse Valve Screw (11). Remove the Reverse Valve Switch (9).
2. Lightly grasp the handle of the Motor Housing (1) in copper–covered vise jaws so that the Inlet Bushing (27) is upward. Unscrew the Inlet Bushing.
3. Remove the Muffler Assembly (30), Muffler Element (34), Inlet Screen (29), Throttle Valve Spring (23), Throttle Valve (21) and Trigger Assembly (15 and 16).
4. To remove the Throttle Valve Seat (25), insert a wire hook through the central hole of the Seat and hooking the underside of the Throttle Valve Seat Support (26), pull the Seat and Support out of the handle.

NOTICE

Only remove the Throttle Valve Seat when replacing it or when the Trigger Bushing (2) must be replaced.

5. Using a wrench on the flats of the Housing Back Cap (35), unscrew and the Back Cap from the Housing.

⚠ CAUTION

The Back Cap is under spring tension. Remove it carefully to prevent parts from becoming lost.

6. **For 4RT Models,** remove the Pushrod Throttle Valve Spring (22), Push Throttle Valve Assembly (20).
7. If the Pushrod Seal (24) must be replaced, make certain a new Seal is available at assembly because it may be damaged during removal. The Seal may be removed by using a wire entering the motor end of the Reverse Valve to pry the Seal out the Back Cap end of the Valve.
8. Remove the Reverse Valve Spring (5) and Reverse Valve (4) from the Housing.

9. If the Trigger Bushing must be replaced, proceed as follows:
   a. Remove all Seals and components from the Motor Housing.
   b. Carefully grasp the Motor Housing in copper–covered vise jaws with the Trigger Bushing upward.
   c. Using a torch, apply heat to the Motor Housing around the Bushing.

⚠ CAUTION

Apply enough heat to warm the Housing but not enough heat to distort it.

   d. Thread a 12–28 tap into the Bushing and pull the Bushing out of the Housing with the tap.

Disassembly of the Lever Throttle Motor Housing

For Models 4RL and 4RP

1. **For 4RL Models,** using a pin punch and hammer, drive the Throttle Lever Pin (14) out of the Muffler Assembly (32) and remove the Throttle Lever (13).
2. Using a 3/32" Allen Wrench, unscrew and remove the Retainer Setscrew (8) from the Reverse Valve (4).
3. Remove the Lock Pin Retainer (7).
4. Hold the Motor Housing (1) horizontally with the throttle plunger hold downward. While applying light inward pressure to the Reverse Valve, tap the top side of the Housing with a plastic hammer to dislodge the Reverse Valve Lock Pin (6).
5. Withdraw the Reverse Valve from the Housing.

NOTICE

Be careful not to lose the Reverse Valve Spring (5) when removing the Reverse Valve.

6. Being careful not to distort the Housing, grasp the flats on the Motor Housing in copper–covered vise jaws with the inlet upward.
7. Using a wrench on the flats, unscrew and remove the Inlet Bushing (27).
8. **For 4RL Models,** remove the Air Strainer (29), Throttle Valve Spring (23), Muffler Assembly (32), Inlet Bushing Spacer (28), Exhaust Deflector Seal (37). Silencer Seal Ring (38) and Muffler Element (34).
   For 4RP Models, remove the Air Strainer (29), Pushrod Throttle Valve Spring (22), Muffler Assembly (32), Inlet Bushing Spacer (28), Exhaust Deflector Seal (37), Silencer Seal Ring (38) and Muffler Element (34).
9. **For 4RL Models,** lift the Throttle Valve (21) out of the Housing and remove the Throttle Plunger Assembly (18).
   For 4RP Models, lift the Push Throttle Valve Assembly (20) out of the Housing.
10. **For 4RL Models,** to remove the Throttle Valve Seat (25), insert a wire hook through the central hole of the Seal and hooking the underside of the Throttle Valve Seat Support (26), pull the Seat and Support out of the Motor Housing.

NOTICE

Only remove the Throttle Valve Seat when replacing it or when the Throttle Plunger Bushing (3) must be replaced.

11. **For 4RL Models,** to remove the Throttle Plunger Bushing, proceed as follows:
    a. Remove all Seals and components from the Motor Housing.
    b. Carefully grasp the Motor Housing in copper covered vise jaws with the Throttle Plunger Bushing upward.
    c. Using a torch, apply heat to the Motor Housing around the Bushing.

⚠ CAUTION

Apply enough heat to warm the Housing, but not enough heat to distort it.

    d. Thread a 10–32 tap into the Bushing and pull the Bushing out of the Housing with the tap.

ASSEMBLY

General Instructions

1. Always press on the **inner** ring of a ball–type bearing when installing the bearing on a shaft.
2. Always press on the **outer** ring of a ball–type bearing when installing the hearing in a bearing recess.
3. Whenever 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.
4. Always clean every part and wipe every part with a thin film of oil before installation.
5. Apply O–ring lubricant to each O–ring before assembly.

6. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in a clean, suitable, cleaning solution and dry with a clean cloth. **Sealed or shielded bearings should never he cleaned.** Work grease thoroughly into every open bearing before installation.

Assembly of the Lever Throttle Motor Housing

For Models 4RL and 4RP

1. **For 4RL Models,** if the Throttle Plunger Bushing (3) was removed, proceed as follows:
   a. Insert the new Throttle Plunger Bushing into the Motor Housing (1) to a depth approximately one–half the length of the Bushing.
   b. Put a few drops of Loclite®* No. 601 sealant in the counterbore surrounding the outside diameter of the Bushing.
   c. Rotate the Bushing approximately 180° to make certain the sealant makes complete contact around the outside of the Bushing.
   d. Push the Bushing into the Housing until it bottoms against the shoulder inside the Housing.
   e. Allow the sealant to cure for eight hours at room temperature.
2. Carefully grasp the flats on the Motor Housing (I) in copper–covered vise jaws, inlet end racing upward.
3. **For 4RL Models,** if the Throttle Valve Seat (25) and Throttle Valve Seat Support (26) were removed, use a flat–faced rod 1/2" (12.7 mm) in diameter by 3" (76 mm) long to push the Seat Support into the Motor Housing until it seats. Use the same rod to push the Seat into the Housing until it seats against the Seat Support.
4. **For 4RL Models,** install the Throttle Plunger Seal (19) in the groove of the Throttle Plunger (18). Insert the Throttle Plunger into the Plunger Bushing and rotate the Plunger until the hole in the Plunger aligns dead center with the hole in the Throttle Valve Seat.
5. **For 4RL Models,** using needle nose pliers to hold the short–stem end of the Throttle Valve (21), install the Valve inserting the long–stem end, through the hole in the Throttle Valve Seat and Throttle Plunger.
   For 4RP Models, install the Push Throttle Valve Assembly (20), large end first, in the central opening at the inlet end of the Motor Housing.
6. Insert the C–shaped Muffler Element (32A) into the Muffler Assembly (32) making certain it covers all exhaust holes.
7. After holding the Muffler Element (33) lengthwise, and with the fold trailing, install the Element by wrapping it horseshoe fashion around the inside of the Muffler Assembly against the C–shaped Muffler Element.
8. Install the Exhaust Deflector Seal (37) in the groove on the front end of the Muffler Assembly.
9. Install the Muffler Element (34) over the hub at the rear of the Motor Housing and work the Element into the Housing.
10. Install the Muffler Assembly over the hub of the Motor Housing, aligning the wide tab on the Muffler with the throttle plunger hole in the Motor Housing.

NOTICE

Tabs on the Muffler match notches on the Motor Housing. Do not force the Muffler Assembly into place.

12. Insert the Air Strainer Screen (29), closed end first, inside the external threaded end of the Inlet Bushing (27).
13. Insert the Valve Spring (22 or 23), large coil end first, into the Inlet Bushing making sure it contacts the Air Strainer Screen.
14. Install the Inlet Bushing Spacer (28) in the large hole in the Muffler Assembly.
15. Thread the Inlet Bushing into the Motor Housing, making certain the Valve Spring encircles the stem of the Throttle Valve. Tighten the Inlet Bushing to a minimum 26 ft–lbs (35 Nm) torque. The Inlet Bushing must securely clamp the Muffler Assembly.
16. Insert the Reverse Valve Lock Pin (6) into the hole in the side of the Reverse Valve (4).
17. Slip the Reverse Valve Spring (5) into the end of the Reverse Valve opposite the reverse valve knob.
18. Holding the Reverse Valve with the Lock Pin upward, align the L–shaped slot inside the reverse valve bushing with the Lock Pin. Slide the Reverse Valve into the bushing until the Reverse Valve Spring is slightly compressed. Rotate the assembled Housing and Valve one–half turn (180°) and tap the Housing opposite the Lock Pin with a plastic hammer until the Lock Pin drops into the L–shaped slot. Slowly release the Reverse Valve.

NOTICE

If the Reverse Valve comes out of the Housing, the Lock Pin did not enter the L–shaped slot. Repeat the procedure until the Valve remains in the Housing.

* Registered trademark of Loctite Corp.

19. install the Lock Pin Retainer (7) and Retainer Setscrew in the end of the Reverse Valve.

NOTICE

The Setscrew must not protrude from the Reverse Valve. Tighten the Setscrew between 10 to 20 in–lb (1.1 to 2.3 Nm) torque.

20. Operate the Reverse Valve to make certain it functions properly.
21. **For 4RL Models,** observe that the throttle lever pinhole in the Muffler Assembly is larger at one end than the other. Position the Throttle Lever (13) on the Muffler Assembly and secure it by pressing the Throttle Lever Pin (14) into the large end of the pinhole.

Assembly of the Pistol Grip Motor Housing

For Models 4RA and 4RT

1. If the Trigger Bushing (2) was removed, proceed as follows:
   a. Put a few drops of Loctite No. 601 sealant on the end of a thin stick and insert the stick into the trigger bushing hole of the Motor Housing. Work the stick so that the sealant flows against the shoulder inside the Housing.
   b. Insert the Trigger Bushing into the Motor Housing (1) to a depth approximately one–half the length of the Bushing.
   c. Put a few drops of Loctite No. 601 sealant in the counterbore surrounding the outside diameter of the Bushing
   d. Rotate the Bushing approximately 180° to make certain the sealant makes complete contact around the outside of the Bushing.
   e. Push the Bushing into the Housing until it bottoms against the shoulder inside the Housing.
   f. Allow the sealant to cure for eight hours at room temperature.
2. Carefully grasp the Motor Housing in copper–covered vise jaws, inlet end facing upward.
3. If the Throttle Valve Seat (25) and Throttle Valve Seat Support (26) were removed, use a flat–faced rod 1/2" (12.7 mm) in diameter by 3" (76 mm) long to push the Seat Support into the Motor Housing until it seats. Use the same rod to push the Seat into the Housing until it seats against the Seat Support.
4. Install the Trigger Pin Seal (17) in the groove of the Trigger Pin (16).
5. Press the Trigger (15) onto the grooved end of the Trigger Pin so that it is at right angles to the hole in the opposite end of the Pin.
6. Insert the Trigger Assembly into the Trigger Bushing so that the hole in the Trigger Pin aligns dead center with the hole in the Throttle Valve Seat.
7. Roll the Muffler Element (34) and work it into the exhaust cavity in the handle of the Motor Housing.
8. Using needle nose pliers to hold the short stem end of the Throttle Valve (21), install the Valve inserting the long stem end through the hole in the Throttle Valve Seat and Trigger Pin.
9. Place the Air Strainer Screen (29), closed end first, inside the large end coil of the Throttle Valve Spring (23).
10. Insert the Throttle Valve Spring and Screen, small coil end first, so that the Spring encircles the end of the Throttle Valve.
11. Apply a thin coat of O–ring lubricant to the Muffler O–ring (31) and install the O–ring on the hub of the Muffler (30).
12. Install the Inlet Bushing Spacer (28) in the large hole in the Muffler Assembly (30).
13. Place the Muffler Assembly on the face of the handle so that the hub with the Muffler O–ring extends into the handle.
14. Thread the air Inlet Bushing (27) into the large hole in the Muffler Assembly. Tighten the Bushing to a minimum of 26 ft–lb (35 Nm) torque.
15. Install the Reverse Valve Seal (10) in the external groove on the Reverse Valve (4).
16. **For 4RA Models,** install the Reverse Valve Plug (12) in the central opening at the rear of the Reverse Valve.

NOTICE

Do not lubricate this Plug.

For 4RT Models, use O–ring lubricant on the Pushrod Seal (24) and install the Seal in the central opening at the rear of the Reverse Valve.

17. Being careful not to damage the Seal, insert the Reverse Valve, with the Seal end trailing, into the rear of the Motor Housing. Make certain the threaded hole on the side of the Valve aligns with the switch opening.
18. Position the Reverse Valve Switch (9) in the housing opening and fasten the Switch to the Valve with the Reverse Valve Screw (11). Tighten the Screw between 9 to 11 in–lbs (1 to 2 Nm) torque.
19. Install the Reverse Valve Spring (5) in the rear of the Housing against the Reverse Valve.

20. **For 4RT Models,** install the small end of the Pushrod Throttle Valve Spring (22) on the small hub of the Push Throttle Valve Assembly (20). Insert the Assembly, Valve Spring trailing, into the Housing against the Reverse Valve.
21. Install the Back Cap Seal (36) over the threads of the Housing Back Cap (35).
22. Apply grease to the threads of the Back Cap and using a wrench on the flats of the Cap, tighten the Back Cap between 5 to 10 ft–lbs (7 to 14 Nm) torque.

Assembly of the Motor

1. Using a sleeve that contacts the outer–ring of the Rear Rotor Bearing (42), press the Rear Rotor Bearing into the Rear End Plate (43) if the Bearing was removed.
2. Place the Rear End Plate, Bearing end trailing, on the threaded hub of the Rotor (44). Insert a 0.001" feeler gauge or shim between the face of the Rotor and End Plate. Place the Bearing Thrust Washer (41) on the threaded hub of the Rotor. Thread the Rear Rotor and tighten it until the feeler gauge has a slight drag during removal. Remove the feeler gauge.

NOTICE

The Rotor must spin freely while holding the End Plate.

3. Lightly grasp the threaded hub of the Rotor in copper–covered vise jaws with the splined hub upward.
4. Wipe each Vane (45) with a film of light oil and place a Vane in each slot in the Rotor.
5. The Cylinder (46) has a lengthwise string of three drilled holes perpendicular to the central axis. At one end of the string, a punch mark is in line with the holes. With the end of the Cylinder near the punch mark leading, slide the Cylinder down over the Rotor and Vanes and against the Rear End Plate.
6. Push the Front Rotor Bearing (48) into the recess in the Front End Plate (47).
7. Remove the assembled Rotor from the vise and using a sleeve that contacts the inner ring of the Front Rotor Bearing, press the Bearing, flat side of the Front End Plate first, onto the rotor shaft.

NOTICE

Align the cylinder dowel hole in the Rear End Plate, Cylinder and Front End Plate before pressing the Bearing onto the shaft.

After pressing the Bearing onto the shaft, lightly rap the end of the splined hub with a plastic hammer to relax the load on the Bearing. The Rotor must rotate in the Bearing without drag.

8. Position the Rear End Plate Gasket (39) in the bottom of the motor housing bore so that the dowel hole and air inlet port in the Gasket align with the dowel hole and air inlet in the housing bore face. The cavity around the outside of the Rear Rotor Bearing (42)) in the Motor Housing should be filled 50 to 75 percent capacity with Ingersoll–Rand No. 28 Grease.
9. Using an assembly dowel 3/32" in diameter by 10" long (2.3 mm x 254 mm), align the dowel holes in the Front End Plate, Cylinder and Rear End Plate. Insert the assembly rod through the aligned holes so that about 3" (76 mm) of the rod extends beyond the Rear End Plate. Insert the extension into the dowel hole at the bottom of the housing bore, and slide the motor into the Motor Housing until it seats.
10. Withdraw the assembly dowel and insert the Cylinder Dowel (49) until the Cylinder Dowel is slightly below the surface of the Front End Plate.

Assembly of the Gearing

1. If the Grease Shield Retainer (64) was removed, install it in the third groove below the front face of the Gear Case (50).
2. Support the face of the Spindle (52), pin end downward on the table of an arbor press.
3. Install the Seal Support (66), large end first, Spindle Seal (67) and Grease Shield (63) over the hub of the Spindle.
4. Using a sleeve that contacts the inner ring of the Bearing, press the Spindle Bearing (60) onto the hub of the Spindle until the Bearing seats against the Seal Support.
5. Install the Spindle Bearing Seal (62) in the second groove below the front face of the Gear Case.
6. Insert the assembled Spindle, pin end first, into the front end of the Gear Case until the Grease Shield is flush against the Grease Shield Retainer.
7. Using snap ring pliers, install the Spindle Bearing Retainer (61) in the groove ahead of the Spindle Bearing.
8. Push the Spindle Planet Gear Bearings (54) into the Spindle Planet Gears (53).
9. Grease the assembled Spindle Planet Gears and Bearings and install them on the pins of the Spindle from the rear of the Gear Case.
10. **For M, N or P ratio,** install the Gear Head Spacer (59) in the Gear Case against the Spindle Planet Gears.
11. **For M, N or P ratio,** grease the splined hub of the Gear Head (55) and insert it into the Gear Case. The splined hub must pass through the Gear Head Spacer and mesh with the teeth of the Spindle Planet Gears.

12. **For M, N or P ratio,** push the Gear Head Planet Gear Bearings (57) into the Gear Head Planet Gears (56).
13. **For M, N or P ratio,** grease the assembled Gear Head Planet Gears and Bearings and install them on the pins of the Gear Head.
14. **For M or N ratio,** grease the Rotor Pinion (58) and install it in the center of the Gear Head Planet Gears. Make certain the teeth of the Pinion and Planet Gears mesh.
15. Using snap ring pliers, install the Gear Retainer (65) in the shallow internal groove in the Gear Case behind the Spindle Planet Gears or Gear Head Planet Gears.

Assembly of the 7P1 Positive Jaw Clutch

1. Slide a Clutch Jaw (404), jaw side first, over the splined end of the Clutch Driver (406) until it seats.
2. Slide the Clutch Driver Spacer (407), large diameter first, over the splined end of the Clutch Driver and against the Clutch Jaw.
3. Install the Clutch Driver Spacer Retainer (410) on the splined end of the Clutch Driver against the Clutch Driver Spacer.
4. Slide the second Clutch Jaw (404), plain side first, on the short hub end of the Bit Holder (403). Retain it with the Clutch Jaw Retaining Ring (405).
5. Insert the small end of the Disengaging Plunger (408) into the Disengaging Plunger Spring (409).
6. Insert the Disengaging Plunger and Spring, spring end first, into the bore of the Bit Holder. Smear this bore of the Bit Holder with a thin film of grease.
7. If the Housing Bushing (402) was removed, press a new Housing Bushing into the Clutch Housing (401) until it is flush with the face of the shoulder at the bottom of the clutch chamber. Smear the inside of the Housing Bushing with grease.
8. Insert the Bit Holder, hexagon recess first, into the Clutch Housing.
9. Insert the Bit Retaining Ball (411) in the hole in the side of the Bit Holder.
10. Slide the Bit Retaining Sleeve (412), small inside diameter first, and the Retaining Sleeve Spring (414) onto the end of the Bit Holder.
11. Using snap ring pliers, install the Sleeve Spring Retainer (413) in the groove near the end of the Bit Holder.
12. Insert the assembled Clutch Driver, jaw end first, into the Clutch Housing so that the pilot of the Clutch Driver enters the bore of the Bit Holder.

Assembly of 7D1 Direct Drive Attachment

1. If the Housing Bushing (302) was removed, press a new Housing Bushing into the Clutch Housing (301) until it is flush with the face of the shoulder at the bottom of the clutch chamber. Smear the inside of the Housing Bushing with grease.
2. Slide the Spacer (303) over the splined end of the Bit Holder (305) and install the spacer Retainer (304) to hold it in position.
3. Insert the Bit Holder, hexagon recess first, into the Clutch Housing.
4. Insert the Bit Retaining Ball (306) into the hole in the side of the Bit Holder.
5. Slide the Bit Retaining Sleeve (309), small inside diameter first, and the Retaining Sleeve Spring (307) onto the end of the Bit Holder.
6. Using snap ring pliers, install the Sleeve Spring Retainer (308) in the groove near the end of the Bit Holder.

Assembly of the 4S1 Adjustable Shutoff Clutch

1. If the Housing Bushing (251) was removed, press a new Housing Bushing into the Clutch Housing (250) until it is flush with the face of the shoulder at the bottom of the clutch chamber. Smear the inside of the Housing Bushing with grease.
2. Insert the Shutoff Plunger (266), face with the hole first, into the end of the Clutch Driver (253).
3. Push the Plunger Return Spring (268) into the Clutch Driver and contain the Spring and Plunger by installing the Return Spring Retainer (269). Tighten the Retainer between 60 to 70 in–lbs (7 to 8 Nm) torque.
4. Lay a bead of grease into the annular groove on the Clutch Driver between the Spring Retainer and largest shoulder. Insert the Driver, retainer end first, into the large end of the Bit Holder (270).
5. Insert the twelve Bit Holder Ball Bearings (271) into the threaded opening in the larger hub of the Bit Holder. Rotate the Clutch Driver after inserting two or three Bearings to position them around the groove in the Driver.
6. Secure the Bearings by screwing the Ball Bearing Retainer (272) into the Bit Holder until the Retainer contacts the Bearings and then screw the Retainer out of the Bit Retainer one and one half turns. Make certain the Bit Holder rotates freely.
7. Using a thin bladed screwdriver, spiral the Ball Retaining Spring (273) into the groove in the Bit Holder so that it the Ball Bearing Retainer.
8. Insert the Bit Retaining Ball (274) into the hole in the side of the Bit Holder.

9. Slide the Bit Retaining Sleeve (275), small inside diameter first, and the Retaining Sleeve Spring (276) onto the end of the Bit Holder.
10. Using snap ring pliers, install the Sleeve Spring Retainer (277) in the groove near the end of the Bit Holder.
11. Inject some grease into the semicircular openings in the large flange of the Clutch Driver and install a Clutch Cam Ball (265) in each opening.
12. Slide the Clutch Ball Seat (264), hub end trailing, onto the shaft of the Clutch Driver and against the Cam Balls.
13. Insert two Shutoff Plunger Balls (267) in one of the crossholes in the Clutch Driver. While holding these two Balls in position, rotate the Driver 180° and install the remaining two Balls in the other crosshole.
14. Slide the Shutoff Collar (263), counterbored end first, and the Shutoff Collar Return Spring (262) onto the shaft of the Clutch Driver.
15. Using snap ring pliers and while compressing the Shutoff Collar Return Spring, install one of the Spring Seat Stops (260) in the Clutch Driver annular groove nearest to the Bit Holder.
16. Install the Clutch Spring (261) on the shaft of the Clutch Driver against the Clutch Ball Seat.
17. Install the Clutch Spring Seat (259), hub end first, Thrust Bearing (258) and Adjusting Nut Lock (257), dimpled end trailing, onto the Clutch Driver.
18. Thread the Clutch Adjusting Nut (256), detent end first, onto the Clutch Driver until the Nut is beyond the annular groove through the threads.
19. Using snap ring pliers, install the second Spring Seat Stop in the groove.
20. Install the Return Spring Collar (255), concave end trailing, and the Clutch Return Spring (254) on the Clutch Driver.
21. Install the assembled clutch, Bit Holder first, into the Clutch Housing from the rear.

Assembly of the 4C17 Adjustable Cushion Clutch

1. Hold the Clutch Driver (203) in a vertical position with the large diameter end upward.
2. Slip the Front Clutch Jaw (204), pocket side first, over the end of the Clutch Driver far enough so that the large groove in the Clutch Driver is fully exposed. Smear a liberal amount of grease in the large groove.
3. Place the twelve Jaw Bearing Balls (5/32" diameter) (205) in the large groove, and then slide the Front Clutch Jaw against them to retain them. Invert the Clutch Driver.
4. With the Clutch Driver inverted, set the Clutch Ball Spacer (206), pocket side first, down over the Clutch Driver and against the Front Clutch Jaw. Align the pockets in the Front Clutch Jaw with those in the Clutch Ball Spacer, and smear the pockets with a liberal amount of grease.
5. Install the Spring Seat Stop (210) in the small groove on the Clutch Driver.
6. Place a Clutch Release Ball (3/16" diameter) (207) in each pocket.
7. Slip the Clutch Ball Seat (208) down over the Clutch Driver and against the Clutch Release Balls.
8. Set the Clutch Spring (209) on top of the Clutch Ball Seat.

NOTICE

Make certain you install the correct Clutch Spring. These are color coded as follows:

Light Spring	**Black**
Medium Spring	**Yellow**
Heavy Spring	**Green**

9. Smear some grease on the flat surface of the Adjusting Nut Lock (213). Set the Spring Seat Bearing (212) on this surface and smear some grease on the Bearing. Place the Clutch Spring Seat (211) against the Bearing.
10. Grasp the Adjusting Nut Lock, Bearing and Spring Seat as a unit, and slide it Spring Seat first over the Clutch Driver and against the Clutch Spring.
11. Smear a liberal amount of grease on the pocket face of the Adjusting Nut Lock.
12. Thread the Clutch Adjusting Nut (214), detent side first, onto the Clutch Driver and against the Adjusting Nut Lock. The trailing end of the Clutch Adjusting Nut must not extend over the threaded end of the Clutch Driver.
13. If the Housing Bushing (202) was removed, press a new Housing Bushing into the Clutch Housing (201) until it is flush with the face of the shoulder at the bottom of the clutch chamber. Smear the inside of the Housing Bushing with grease.
14. Insert the Bit Holder, hexagon recess first, into the Clutch Housing.
15. Insert the Bit Retaining Ball (9/64" dia.) (222) in the hole in the side of the Bit Holder (217).
16. Slide the Bit Retaining Sleeve (218), diameter first, and the Retaining Sleeve Spring (220) onto the end of the Bit Holder.
17. Using snap ring pliers, install the Sleeve Spring Retainer (221) in the groove near the end of the Bit Holder.
18. Work the small-coil end of the Plunger Spring (215) over the small end of the Disengaging Plunger (216).

19. Insert the Plunger and Spring, spring end first, into the bore of the assembled Clutch Driver. Smear the bore of the Clutch Driver with a thin film of grease.
20. Insert the assembled Clutch Driver, jaw end first, into the Clutch Housing so that the pilot on the Bit Holder enters the bore of the Clutch Driver.

Assembly of the 4C15 Adjustable Cushion Clutch

1. Slide the Front Clutch Jaw (107), jaw end first, over the hexagon recess end of the Bit Holder (106) and move it along over the splines to the groove near the large hub of the Holder.
2. Coat the grooved end with grease and insert thirteen Clutch Balls (108) between the Jaw and Holder.
3. Stand the Holder, hexagon recess end up, on the workbench and slide the Clutch Ball Spacer (109) over it.
4. Enter a Clutch Ball (108) into each of the eleven holes in the Spacer, and, in the order named, slide the following over the Holder: one Clutch Spring Seat (110), the Spring Seat Bearing (111), the second Clutch Spring Seat, the Clutch Spring (112) and the Adjusting Nut Lock (114) dimpled side trailing.
5. Start the Clutch Adjusting Nut (113), flat side trailing, onto the Holder and run it finger tight against the compression of the Spring. With a wrench, give the Nut an additional one or two turns.
6. Install the Bit Holder Stop (115) in the groove on the Bit Holder near the Nut.
7. If the Housing Bushing (102) was removed, press a new Housing Bushing into the Clutch Housing (101) until it is flush with the face of the shoulder at the bottom of the clutch chamber. Smear the inside of the Housing Bushing with grease.
8. Insert the Bit Holder, hexagon recess first, into the Clutch Housing.
9. Using snap ring pliers, install the Bit Retaining Sleeve Stop (123) on the shaft of the Bit Holder.
10. Insert the Bit Retaining Ball (116) in the hole in the side of the Bit Holder.
11. Slide the Bit Retaining Sleeve (117), small inside diameter first, and the Retaining Sleeve Spring (118) onto the end of the Bit Holder.
12. Using snap ring pliers, install the Sleeve Spring Retainer (119) in the groove near the end of the Bit Holder.
13. Install the Clutch Diver Retainer (105) in the annular groove through the spline of the Clutch Shaft Support (120).
14. Work the small coil end of the Plunger Spring (122) over the small end of the Disengaging Plunger (121).
15. Insert the Plunger and Spring, spring end first, into the bore of the assembled Bit Holder. Smear the bore of the Bit Holder with a thin film of grease.
16. Insert the Clutch Shaft Support, splined end trailing, into the Bit Holder and install the Clutch Driver (104) on the spline of the Support, jaw end first, against the Clutch Driver Retainer.

Assembly of the Tool

1. **For Models 4RA and 4RT,** install one Sleeve Support (70) on the threaded hub of the Motor Housing (1) and the other Sleeve Support in the annular groove on the Gear Case (50). Slide the Housing Sleeve (69) onto the rear of the Gear Case over the Sleeve Support.
   For Models 4RL and 4RP, wipe all oil and grease from the exterior surfaces of the Motor Housing (1) and Gear Case (50) at the area for the Housing Grip (68) and from the interior of the Housing Grip. Slide the Housing Grip onto the Gear Case.
2. Clean the threads on the Motor Housing and Gear Case to remove all oil and grease. Screw the assembled Gear Case onto the Motor Housing and tighten the Gear Case between 25 to 30 ft–lbs (34 to 41 Nm) torque.

NOTICE

Make certain the Pushrod passes through the center of the Gear Case on 4RP and 4RT Models.

3. **For Models 4RL and 4RP,** using a probe that will not damage the Housing Grip, lift the gear case end of the Grip at several points, and at each point, inject several drops of Loctite Superbonder®** No. 495 between the Grip and Gear Case.
4. **For Models 4RP and 4RT,** insert the Pushrod (278) through the gearing and into the central hole in the Rotor (44) and push it toward the rear of the Tool until resistance from the Pushrod Throttle Valve Spring (22) is encountered.
5. Screw the Clutch Housing Assembly (101, 201, 250, 301 or 401) onto the Gear Case hand tight.

NOTICE

This is a left–hand thread.

** Registered trademark of Loctite Corp.

TROUBLESHOOTING GUIDE

Trouble	Probable Cause	Solution
Low power or low free speed	Low air pressure at the inlet	Check air supply. For top performance, the air pressure must be 90 psig (6.2 bar/620 kPa) at the inlet.
	Plugged Air Strainer Screen	Clean the Air Strainer Screen (29) in a clean, suitable, cleaning solution. If the Screen cannot be cleaned, replace it.
	Clogged Muffler or Exhaust Silencer	Clean the Muffler Element (33 or 34) in a clean, suitable, cleaning solution. If it cannot be cleaned, replace it.
	Worn or broken Vanes	Replace the **complete** set of Vanes (45).
	Damaged Rear End Plate Gasket	Install a new Rear End Plate Gasket (39).
	Worn or broken Cylinder	Replace the Cylinder (46) if it is cracked or if the bore appears wavy or scored.
	Improper lubrication or dirt buildup	Clean the Motor Unit parts and lubricate them as instructed on Page 3.
Leaky Throttle Valve	Worn Throttle Valve and/or Throttle Valve Seat	Install a new Throttle Valve (20 or 21) and/or Throttle Valve Seat (25).
	Dirt accumulation on Throttle Valve and/or Throttle Valve Seat	Pour about 3 cc of a clean, suitable , cleaning solution in the air inlet and operate the tool for about 30 seconds. **Immediately** pour 3 cc of the recommended oil in the air inlet and operate the tool for 30 seconds to lubricate all parts cleaned by the solvent.
Gear Case gets hot	Excessive grease	Clean and inspect the Gear Case (50) and gearing parts and lubricate as instructed on Page 3.
	Worn or damaged parts	Clean and inspect the Gear Case (50) and gearing. Replace worn or broken components.
Inconsistent disengagement of Adjustable Clutch	Improper lubrication	Remove Adjustable Clutch mechanism and check. Lubricate as instructed on Page 3.
	Worn or damaged parts	Remove Adjustable Clutch mechanism and examine parts.
	Wrong Clutch Spring (using Heavy Clutch Spring on light torque application)	Change to Medium or Light Clutch Spring.
Motor stalls before Adjustable Clutch ratchets	Improper Clutch adjustment or improper tool ratio for application	Check Clutch Adjustment and review tool performance vs. requirements.
	Low air pressure at the inlet	Check air supply. For top performance, the air pressure must be 90 psig (6.2 bar/620 kPa) at the inlet.
	Insufficient grease	Lubricate the Clutch as instructed on Page 3.

NOTES