



16584054
Edition 1
May 2006

Air Angle Wrench

7RL Series

Maintenance Information



Save These Instructions

IR *Ingersoll Rand*

WARNING

Always wear eye protection when operating or performing maintenance on this tool.
Always disconnect air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.

Note: When reading the instructions, refer to exploded diagrams in Parts Information Manuals when applicable (see under Related Documentation for form numbers).

Cushion Clutch

Adequate lubrication is very important for satisfactory clutch life. Use **Ingersoll Rand No. 67 grease**.
5LN2C-AH580 Adjustable Cushion Clutch

After each 50,000 cycles or every 100 hours of operation, whichever occurs first, lubricate the Cushion Clutch as follows:

1. Rotate the Adjustment Hole Cover to expose the adjusting hole.
2. Insert the Clutch Sprag Key into the adjusting hole and into one of the holes in the Clutch Adjusting Nut to keep the Nut from turning.
3. Using a wrench on the output end of the Angle Head, turn the wrench counterclockwise until the Clutch Adjusting Nut is loose or until the clicking sound stops.
4. Grasp the flats of the Gear Case and using a wrench, unscrew the Coupling Nut.
5. Remove the Clutch Housing and Angle Housing from the Gear Case.
6. Grasp the Clutch Shaft Support and pull the entire Clutch Assembly from the Housing.
7. Remove the Clutch Driver and Clutch Shaft Support from the Clutch. Work a small amount of the recommended grease between the Clutch Ball Spacer and Front Clutch Jaw and three strokes of grease (1.0cc) around the Clutch Balls of the jaw. Work a small amount of the recommended grease between the two front clutch spring seats and around the Spring Seat Bearing. This should be done every 50,000 cycles or 100 hours whichever occurs first.

7L3C-A580 Adjustable Cushion Clutch

After each 50,000 cycles or every 100 hours of operation, whichever comes first, lubricate the Cushion Clutch as follows:

WARNING

Disconnect the air supply hose at the tool before performing any maintenance.

1. Rotate the Adjusting Hole Cover to expose the adjusting hole.
2. Insert a 1/4" Allen Wrench into the Bit Holder or using a wrench on the output end of the Angle Head, rotate the Bit Holder until the hole in the Clutch Adjusting Nut is aligned with the slot in the Clutch Housing.
3. Insert the Clutch Adjusting Key into the hole in the Clutch Adjusting Nut and while holding the Nut against rotation, rotate the Bit Holder **counterclockwise** until there is no compression on the Clutch Spring.
4. Grasp the flats on the Clutch Housing in a vise, making certain not to distort the Housing.

NOTICE

The Clutch Housing has a left-hand thread.

5. Using an adjustable wrench, grasp the flats on the Gear Case and unscrew the entire power unit from the Clutch Housing.

WARNING

Do not get your fingers between the clutch components.

6. Withdraw the assembled clutch from the Clutch Housing and work some **Ingersoll Rand No. 67 Grease** around the Clutch Jaw Bearing Balls, Clutch Release Balls, Spring Seat Bearing and between the Adjusting Nut Lock and Clutch Adjusting Nut. To grease the Clutch Release Balls, index the Clutch Jaw until the Spring Seat lifts.

Changing the Clutch Spring**5LN2C-AH580 Clutch**

1. Carefully grasp the flats of the Coupling Nut in leather-covered or copper-covered vise jaws. Angle Attachment facing downward.

NOTICE

This is a left-hand thread.

2. Using a wrench on the flats of the Gear Case, loosen the Gear Case from the Coupling Nut. Remove the tool from the vise.
3. Unscrew the Coupling Nut and remove the Clutch Housing from the Gear Case.
4. Grasp the Clutch Shaft Assembly and pull the Assembly out of the Clutch Housing.
5. Grasp the spline of the Clutch Shaft Support in leather-covered or copper-covered vise jaws with the Clutch Adjusting Nut upward and the Clutch Driver against the top of the vise of the vise jaws.

NOTICE

This is a left-hand thread.

6. Using a Wrench on the flats of the Clutch Adjusting Nut, loosen and remove the Nut.

CAUTION

There are twenty-four Clutch Balls located between the Clutch Driver and the Clutch Spring Seat nearest the Clutch Driver. Failure to remove the remaining components carefully may result in the Balls falling out of position and becoming lost.

7. With the assembly in the vise and while applying slight downward pressure to the Clutch Spring Seat nearest the Clutch Driver, remove the Adjusting Nut Lock, first Clutch Spring Seat, Spring Seat Bearing, second Clutch Spring Seat and the Clutch Spring from the Clutch Shaft.

- Thoroughly grease the Bearing and Adjusting Nut Lock and, in the order named, slide the following over the Clutch Shaft: the new Clutch Spring, a Clutch Spring Seat and the Adjusting Nut Lock, indented side trailing.

NOTICE

This is a left-handed thread.

- Start the Clutch Adjusting Nut, detent side first, onto the Clutch Shaft and run it finger tight against the compression of the Spring. With a wrench, tighten the Nut an additional one or two turns.
- Remove the assembly Clutch from the vise.
- Install the Clutch Shaft Assembly into the Clutch Housing with the splined end of the Clutch Shaft Support trailing.
- Install the Clutch Housing Assembly into the Gear Case Assembly matching the spline of the Clutch Housing with that of the Gear Case.
- Thread the Coupling Nut onto the Gear Case, hand tight. Grasp the flats of the Gear Case in copper-covered vise jaws and using a wrench on the flats of the Coupling Nut, tighten it to 25ft.-lb. (34 N-m) torque.
- Adjust the Clutch as directed in the Clutch Adjustment Section in Product Information Manuals Form 80167497 or Form 80227531.

7L3C-A580 Clutch

- Carefully grasp the flats of the Clutch Housing in copper-covered or leather-covered vise jaws, Angle Head facing downward.

NOTICE

This is a left-hand thread.

- Using a wrench on the flats of the Gear Case, loosen the Gear Case from the Clutch Housing. Remove the tool from the vise.
- Unscrew and remove the Clutch Housing from the Gear Case.
- Grasp the Clutch Driver and pull the assembly out of the Clutch Housing.

Lubrication

Each time a Series 7RL Angle Wrench is disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

- Inject a few drops of **Ingersoll Rand** No. 10 Oil into each vane slot in the Rotor bore before inserting the Vanes.
- Moisten all O-rings with O-ring lubricant.
- Work approximately 1.5 cc of **Ingersoll Rand** No. 28 Grease into the Rear Rotor Bearing (2), Front Rotor Bearing (31) and Spindle Bearing (49).
- Work approximately 3 cc to 6 cc of **Ingersoll Rand** No. 28 Grease into the gear train. Grease the Planet Gear Bearings (38) or (43), the teeth on the Planet Gear Bearings (37) or (42), the gear teeth inside the Gear

- Carefully grasp the Front Clutch Jaw in leather-covered or copper-covered vise jaws with the Clutch Adjusting Nut upward.

NOTICE

This is left-hand thread.

- Using a wrench on the flats of the Clutch Adjusting Nut, loosen and remove the Nut.
- With the assembly in the vise and while applying slight downward pressure to the Clutch Ball Seat, remove the Adjusting Nut Lock, Spring Seat Bearing, Clutch Spring Seat and the Clutch Spring from the Clutch Driver.
- 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.

NOTICE

This is a left-hand thread.

- 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.
- Remove the assembled Clutch from the vise.
- Install the Clutch Driver Assembly into the Clutch Housing with the splined end of the Clutch Driver trailing.

NOTICE

This is a left-hand thread.

- Thread the assembled clutch onto the Gear Case. Tighten the Clutch Housing between 2 to 5 ft.-lb. (2.7 to 6.8 Nm) torque.
- Adjust the Clutch as directed in the Clutch Adjustment section in Product Information Manuals Form 80167497 or Form 80227531.

Case (46) and the planet gear shafts on the Spindle (34) and Gear Head (41).

- Work approximately 0.5 cc of **Ingersoll Rand** No. 67 Grease into the Lower Spindle Bearing (214) of the Angle head.
- Work approximately 0.5 cc to 1 cc of **Ingersoll Rand** No. 67 Grease into the Upper Spindle Bearing (204), Bevel Pinion Bearing (206) and Bevel Pinion Thrust Bearing (212).
- Apply a light coat of **Ingersoll Rand** No. 67 Grease to the Bevel Gear (205), Bevel Pinion (205) and bevel pinion spline.

Disassembly

General instruction

- Do not disassemble the tool any further than necessary to replace or repair damaged parts.
- 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.
- Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.

- Do not disassemble the tool unless you have a complete set of new gaskets and O-rings for replacement.
- 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.

Disassembly of the Angle Attachment

- Carefully grasp the flats of the Coupling Nut (225) in leather-covered or copper-covered vise jaws so that the Angle Attachment (201) is facing downward.

NOTICE

This is a left-hand thread.

- Using a wrench on the flats of the Gear Case (46), loosen the Gear Case from the Coupling Nut. Remove the tool from the vise. Unscrew and remove the Coupling Nut from the Gear Case.
- Carefully grasp the Angle Attachment in leather-covered or copper-covered vise jaws so that the Spindle (219 or 220) is facing upward.

NOTICE

This is a left-hand thread.

- Using the Housing Cap Wrench (51), unscrew and remove the Spindle Bearing Cap (223). Withdraw the Spindle from the Angle Attachment.
- Inspect the Lower Spindle Bearing (214) for looseness or roughness. If either of these conditions exists, replace the bearing as follows:
 - Grasp the output end of the Spindle in copper-covered vise jaws.
 - Unscrew or unstrap the Bevel Gear Retainer (215) and lift off the Bevel Gear (205).
 - Press the Spindle from the Lower Spindle Bearing.

NOTICE

Do not remove the Upper Spindle Bearing unless you have a new Bearing ready to install. This type of bearing is always damaged during the removal process.

- If the Upper Spindle Bearing (203) appears rough or loose, press it from the Angle Housing (201).
- For 5L2C6 Angle Attachment**, remove the Bearing Retainer (213) and slide off the Bevel Pinion Thrust Bearing (212).
For 7L3D6 Angle Attachment, remove the Bearing Seat Retainer (208). Slide off the Rear Thrust Bearing Seat (207), Bevel Pinion Thrust Bearing (212) and Front Thrust Bearing Seat (209).
- For 5L2C6 Angle Attachments**, use snap ring pliers to remove the Bearing Spacer Retainer (211). Remove the Pinion Bearing Spacer (210).
For 7L3D6 Angle Attachment, use a screwdriver to remove Bearing Spacer Retainer (211) and remove Bevel Pinion Bearing Spacer (216).

NOTICE

Do not remove the pinion shaft and Bevel Pinion Bearing (206) unless you have a new bearing on hand.

- Grasp the spline of the pinion shaft in leather-covered or copper-covered vise jaws and while gently tapping the rear face of the Angle Attachment with a soft hammer, pull the Bevel Pinion and Bearing (206) from the Angle Attachment.
After the Angle Attachment is disassembled, check all parts for damage or wear.

NOTICE

If the gear teeth on either the Bevel Gear (205) or Bevel Pinion (205) are worn or chipped, replace both parts. These are matched set and must be replaced with a matched set.

Disassembly of the Clutch

- Carefully grasp the flats of the Coupling Nut (67) in leather-covered or copper-covered vise jaws, Clutch Housing (51) facing downward.

NOTICE

This is a left-hand thread.

- Using a wrench on the flats of the Gear Case (46), loosen the Gear Case from the Coupling Nut. Remove the tool from the vise.
- Unscrew the Coupling Nut and remove the Clutch Housing from the Gear Case.
- Grasp the Clutch Shaft Assembly and pull the Assembly out of the Clutch Housing.

**CAUTION**

When the Clutch Adjusting Nut (60) is loosened enough to relieve the spring pressure, hold the assembly over a container to catch the twenty-four Clutch Balls (56) that will be free to drop out and might otherwise be lost.

NOTICE

This is a left-hand thread.

- Working over a workbench, unscrew and remove the Clutch Adjusting Nut.
- Remove the Adjusting Nut Lock (61), Clutch Spring Seat (58), Spring Seat Bearing (59) and another Clutch Spring Seat (58).
- Slide the Clutch Spring (63), the third Clutch Spring Seat (58) and Clutch Ball Spacer (57) off the Clutch Shaft (54).
- Remove the Front Clutch Jaw (55).
- Remove the Clutch Driver Retainer (66) and slide the Clutch Driver (65) from the Clutch Shaft Support (64).

NOTICE

This is a slip fit.

- Using needle nose pliers or a wire hook, remove the Clutch Engaging Spring (62).

Disassembly of the Gearing

- Using a pin punch and hammer, drive out the Throttle Lever Pin (5) to release the Throttle Lever (4).
- Grasp the flats of the Motor Housing in leather-covered or copper-covered vise jaws. Gear Case facing upward, being careful not to distort the Motor Housing.

NOTICE

This is a right-hand thread.

- Using a wrench on, the flats of the Gear Case, loosen, but do not remove the Gear Case.

**CAUTION**

Be certain to hold the tool over a workbench so that you will not lose any parts.

- Remove the tool from the vise and, while holding the tool horizontally, carefully unscrew the Gear Case by hand and pull it away from the Motor Housing.
- For M or N ratio**, the Rotor Pinion (39) and Rotor Pinion Spacer (40) may come out with the Spindle, or they may have remained with the Rotor (26) when the Gear Case was removed. Remove the Rotor Pinion and Rotor Pinion Spacer.

6. **For K or L ratio**, remove the Spindle Planet Gears (37). Position the Gear Case vertically in an arbor press, planet gear end down. Using a 7/16" (11 mm) diameter brass rod against the outer rim of the Spindle, press the Spindle from the Gear Case.
For M or N ratio, remove the Gear Head Planet Gears (42), Gear Head (41), Gear Head Spacer (44) and Spindle Planet Gears (37). Position the Gear Case vertically in an arbor press, planet gear end down. Using a 7/16" (11 mm) diameter brass rod against the outer rim of Spindle, press the Spindle from the Gear Case.
7. Using snap ring pliers, remove the Spindle Bearing Retainer (50).
8. Tap the externally threaded end of the Gear Case on a workbench to remove the Grease Shield (48) and Spindle Bearing (49).
9. Remove the Seal (36), Seal Support (35) and Seal Retaining Washer (34A) from the Spindle.

Disassembly of the Motor and Throttle

1. Remove the Rotor Bearing Housing (33) from the Motor Housing (1).
2. Grasp the splined end of the Rotor (26) and pull the assembled motor from the Motor Housing.
3. Remove the Rear End Plate Gasket (24) from the Motor Housing.



CAUTION

Make certain the Rear End Plate Retainer (25) does not fly when it is slipped off the hub of the Rotor.

4. Using a pair of external snap ring pliers with just the tip of the pliers inserted between the ends of the Rear End Plate Retainer, spread the Retainer enough to remove it from the groove in the hub of the Rotor.
5. Remove the Rear End Plate (23), Cylinder (28) and Vanes (27).
6. Check the Front Rotor Bearing (31) for damage or roughness. If replacement is necessary, support the Front End Plate (29) between the two blocks of wood on

the table of an arbor press. Press the Rotor from the Front Rotor Bearing.

7. Do not remove the Rear Rotor Bearing (2) unless you have a new bearing on hand for replacement. The old bearing will be damaged during the removal process. To remove the Rear Rotor Bearing, refer to step 14 below.
8. Grasp the flats of the Motor Housing in leather-covered or copper-covered vise jaws, inlet facing upward.
9. Using a wrench on the flats, unscrew and remove the Inlet Bushing (16).
10. Remove the Throttle Valve Spring (6) and Air Strainer Screen (17).
11. Remove the Exhaust Deflector (13), Inlet Bushing Spacer (15), Exhaust Silencer (12), Muffler Element (14), Exhaust Deflector Seal (11) and Silencer Seal Ring (10).
12. Lift out the Throttle Valve (8) and the Throttle Valve Plunger (9).
13. If removal of the Throttle Valve Seat (7) is necessary, use a wire hook to pull the Throttle Valve Seat from the Motor Housing.
14. If removal of the Rear Rotor Bearing is necessary, thread No. 10-24 thread cap screw through the Bearing and into the Rear Rotor Bearing Nut (3) to jack the Bearing from the bearing recess.

Disassembly of the Reverse Valve

1. Using a 3/32" Allen Wrench, remove the Retainer Setscrew (21).
2. Remove the Lock Pin Retainer (19).

NOTICE

Be careful not to lose the Reverse Valve Spring (22) when removing the Reverse Valve (18).

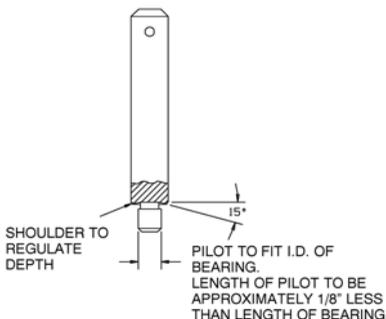
3. While holding the Motor Housing horizontally with the throttle plunger hole downward, tap the top side of the Housing with a plastic hammer to dislodge the Reverse Valve Lock Pin (20) allowing the Reverse Valve to be withdrawn from the Housing.

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 pressing the bearing into a bearing recess.
3. Whenever grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws. Take extra care with threaded parts and housings.
4. Always clean every part and wipe every part with a thin film of the recommended oil before installation.
5. 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 not be cleaned.** Work grease into every open bearing before installation.
6. Apply a film of O-ring lubricant to all O-rings before installation.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in a recess. Using the bearing inserting tool similar to the one shown in Dwg. TPD786.

Needle Bearing Inserting Tool



(Dwg. TPD786)

Assembly of the Motor and Throttle

1. If the Rear Rotor Bearing (2) was removed, install a new one as follows:
 - a. Install the Rotor Bearing Ejecting Nut (3) in the hexagon recess in the bore of the Motor Housing.
 - b. Using a bearing inserting tool that has a pilot extending into the Bearing and a shoulder that contacts the outer radius of the bearing shell, press

new Rear Rotor Bearing (2) into the Motor Housing until it is about 0.010" to 0.020" (0.25 mm to 0.50 mm) below flush. Inject 0.5 cc of grease into the Bearing.

2. Carefully grasp the flats of the Motor Housing in a copper-covered vise jaws, inlet end facing upward.
3. If the Throttle Valve Seat (7) was removed, use a flat faced rod 1/2" (11 mm) in diameter by 3" (75 mm) long to push the Throttle Valve Seat into the Motor Housing until it seats.
4. Install the Throttle Valve Plunger (9) until the hole in the Plunger aligns dead center with the hole in the Throttle Valve Seat.
5. Using needle nose pliers to hold the short-stem end of the Throttle Valve (8), install the Valve, long-stem end through the hole in the Throttle Valve Seat and the Throttle Plunger.
6. Install the Muffler Element (14) by wrapping it horseshoe fashion around the inside of the Exhaust Deflector (13) covering all exhaust holes.
7. Snap the Exhaust Silencer (12) into the large open end of the Exhaust Deflector.
8. Install the Exhaust Deflector Seal (11) into the groove on the front end of the Exhaust Deflector.
9. Install the Silencer Seal Ring (10) over the hub of the Motor Housing and flush with the base of the hub.
10. Install the Exhaust Deflector over the hub of the Motor Housing, aligning the wide tab on the Exhaust Deflector with the throttle plunger hole in the Motor Housing.

NOTICE

Tabs on the Exhaust Deflector match notches in the Motor Housing. Do not force the Exhaust Deflector in place.

11. Insert the Air Strainer Screen (17) closed end first, inside the external threaded end of the Inlet Bushing (16).
12. Insert the Throttle Valve Spring (6) large coil end first, into the Inlet Bushing, making sure it contacts the Air Strainer Screen.
13. Install the Inlet Bushing Spacer (15) in the large hole in the Exhaust Deflector.
14. Thread the Inlet Bushing into the Motor Housing making certain the Throttle Valve Spring encircles the short-stem end of the Throttle Valve. Tighten the Inlet Bushing to a minimum of 25 ft.-lb. (33.9 Nm) torque.
15. Note that the throttle lever pin hole in the Exhaust Deflector is larger at one end than the other. Install the Throttle Lever (4), pressing the Throttle Lever Pin (5) into the large end of the pin hole.
16. Slide the Front End Plate (29), flat side first, over the splined end of the Rotor (26).
17. Using a sleeve that contacts only the inner ring of the Front Rotor Bearing (31), press the Front Rotor Bearing onto the splined hub of the Rotor until it seats against the Front End Plate. Inject 0.5 cc of grease into the bearing.
18. The clearance between the Front End Plate and the Rotor is critical. While holding the Front End Plate, gently tap the splined end of the Rotor until you can insert a 0.001" feeler gauge or shim between the face of the Rotor and End Plate.
19. Grasp the splined end of the Rotor in copper-covered vise jaws so that the short hub of the Rotor is upward.
20. Wipe each Vane (27) with a film of **Ingersoll Rand** No. 10 Oil and place a Vane in each slot in the Rotor.
21. Place the Cylinder (28) down over the Rotor and against the Front End Plate so that the tapered section on the rim faces the Front End Plate.
22. Place the Rear End Plate (23), flat side first, over the short hub of the Rotor.



CAUTION

Make certain the End Plate Retainer (25) does not fly as you slip it on the hub of the Rotor:

23. Install the End Plate Retainer in the groove on the rotor hub.
24. Position the Rear End Plate Gasket (24) into the bottom of the motor housing bore so that dowel hole and air inlet port in the Gasket align with the dowel hole and air inlet in the housing bore face.
25. Using an assembly dowel 3/32" in diameter by 10" long (2.3 mm x 254 mm), align the dowel groove in the Front End Plate, Cylinder and Rear End Plate. Place the assembly rod in the aligned grooves so that about 3" (75 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.
26. Withdraw the assembly dowel and insert the Cylinder Dowel (30) until the Cylinder Dowel is lightly below the surface of the Front End Plate.
27. Place the two Bearing Spring Washers (32) inside the Rotor Bearing Housing (33).
28. Slide the Rotor Bearing Housing into the Motor Housing and over the Front Rotor Bearing until it seats.

Assembly of the Reverse Valve

1. Install the Reverse Valve Lock Pin (20) into the hole in the side of the Reverse Valve (18).
2. Slip the Reverse Valve Spring (22) into the end of the Reverse Valve opposite the reverse valve knob.
3. Hold the Motor Housing (1) horizontally with the Throttle Lever on top. Insert the Reverse Valve and Spring in the reverse valve bushing, so that the Reverse Valve Lock Pin is on top. Rotate the Reverse Valve one-half turn (180°) to allow the Lock Pin to drop into the slot in the wall of the Bushing. Release the Reverse Valve and install the Lock Pin Retainer (19) and Retainer Setscrew (21). Tighten Retainer Setscrew to 20 in-lb (27 Nm).

NOTICE

The Setscrew must not protrude from the Reverse valve.

4. Operate the Reverse Valve to make sure it functions smoothly.

Assembly of the Gearing

1. Install the Grease Shield (48) into the front end of the Gear Case (46) until it seats in the recess.
2. Slip the Spindle Bearing (49) into the Gear Case until it seats and is flush against the Grease Shield.
3. Using snap ring pliers, install the Spindle Bearing Retainer (50) in the groove in front of the Spindle Bearing.
4. If the Spindle Planet Gear Bearings (38) were removed, press in new Spindle Planet Gear Bearings using a bearing inserting tool similar to the one in the Dwg. TPD786 that has a pilot and that contacts the outer radius of the bearing. Press against the stamped end of the Bearing.
For M ratio, press the new Spindle Planet Gear Bearings into the Spindle Planet Gear to a depth of 0.02" to 0.03" (0.50 mm to 0.75 mm) from the face of the Spindle Planet Gear.
5. **For L ratio**, proceed as follows:
 - a. While supporting the inner race of the Spindle Bearing in an arbor press, external threads of the Gear Case facing downward, press the spindle into the Spindle Bearing until the shoulder of the Spindle is seated against the Bearing.
 - b. Place a Spindle Planet Gear (37) on each gear shaft of the Spindle.

c. Work 3 cc to 6 cc of the recommended grease into the gear train.

For M or N ratio, proceed as follows:

- a. While supporting the inner race of the Spindle Bearing in an arbor press, external threads of the Gear Case facing downward, press the Spindle into the Spindle Bearing until the shoulder of the Spindle is seated against the bearing.
 - b. Place a Spindle Planet Gear on each gear shaft of the Spindle.
 - c. Work 3 cc to 6 cc of the recommended grease into the gear train.
 - d. If the Gear Head Planet Gear Bearings (43) were removed, press in new Gear Head Planet Gear Bearings using a bearing inserting tool similar to that one in Dwg. TPD786 that has a pilot and that contacts the outer radius of the Bearing. Press against the stamped end of the Bearing.
 - e. Install the Gear Head Spacer (44) into the Gear Case flush against the face of the Spindle Planet Gears.
 - f. Install the assembled Gear Head (41) into the Gear Case, entering the spline of the Gear Head into mesh with the Spindle Planet Gears.
6. Insert the Bearing Housing Spacer (33B) into the Gear Case.
 7. **For M or N ratio**, place the Rotor Pinion Spacer (40) and Rotor Pinion (39) over the splined end of the Rotor.

NOTICE

This is a right-hand thread.

8. Thread the assembled Gear Case into the Motor Housing and tighten to 40 ft.-lb (54 Nm) torque.

NOTICE

Run the motor at free speed on low air pressure while tightening the Gear Case. Listen while tightening to make sure there is no scoring.

Assembly of the Cushion Clutch

1. Install the Clutch Driver (65), flat side first, onto the spline end of the Clutch Shaft Support (64) and retain with the Clutch Driver Retainer (66). Set the Clutch Driver Assembly aside.
2. Slide the Front Clutch Jaw (55), jaw end first, over the end of the Clutch Shaft (54) and along the splines to the groove at the opposite end.
3. Coat the grooved end with the recommended grease and insert 13 Clutch Balls (56) (9/64" diameter) between the Jaw and into the groove of the Clutch Shaft. Pull the Clutch Jaw down to lock the Bearings into the groove of the Shaft.
4. While holding the Clutch Jaw firmly on the Clutch Balls, insert the Clutch Driver Assembly, spline end trailing, into the bore of the Clutch Shaft.

NOTICE

Make certain the jaws of the Clutch Driver engage the Front Clutch Jaw.

5. Carefully grasp the spline of the Clutch Shaft Support in leather-covered or copper-covered vise jaws so that the spline end of the Clutch Shaft faces upward.
6. Lightly coat the face of the Front Clutch Jaw with the recommended grease.
7. Slide the Clutch Ball Spacer (57) over the splined end of the Clutch Shaft, aligning the holes in the Spacer with the holes in the Clutch Jaw. Put some grease in the holes in the Spacer.

8. Insert a Clutch Ball (56) 9/64" diameter) into each of the eleven holes in the Spacer, and, **in the order named**, slide the following over the Clutch Shaft: one Clutch Spring Seat (58), the Spring Seat Bearing (59), the third Clutch Spring Seat (58) and the Adjusting Nut Lock (61), indented side trailing. Thoroughly grease the Clutch Balls, Bearing and Adjusting Nut Lock.
9. Start the Clutch Adjusting Nut (60), detent side first, onto the Clutch Shaft and run it finger right against the compression of the Spring.

NOTICE

This is a left-hand thread.

10. Remove the assembled Clutch from the vise.
11. Install the Clutch Shaft Assembly into the Clutch Housing (51) with the splined end of the Clutch Shaft Support trailing.
12. Install the Clutch Housing Assembly into the Gear Case Assembly matching the spline of the Clutch Housing with that of the Gear Case (46).
13. Thread the Coupling Nut (67) onto the Gear Case, hand tight. Grasp the flats of the Gear Case in leather-covered or copper-covered vise jaws and using a wrench on the flats of the Coupling Nut, tighten it to 25 ft.-lb (34 Nm) torque.

Assembly of the Angle attachment

1. Lubricate the Bevel Pinion (205) with 0.5 cc of the recommended grease and insert it, gear end first, into the long bore of the Angle Attachment (201).
2. Lubricate the Bevel Pinion (206) with a light coat of the recommended grease and insert it, unstamped end first, into the bore of the Angle Attachment and onto the bevel pinion shaft.
3. **For 5L2C6 Angle Attachment**, press the Bevel Pinion Bearing, stamped face outward, using the Pinion Bearing Spacer (210).

NOTICE

The outward face of the Spacer must be flush with the internal groove in the Angle Housing.

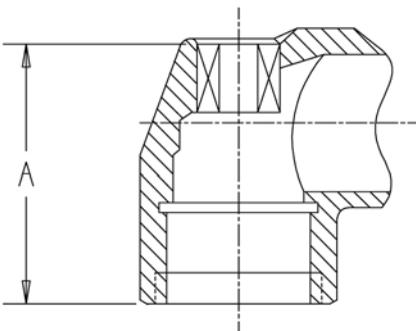
Using snap ring pliers, install the Bearing Spacer Retainer (211).

For the 7L3D6 Angle Attachment, use the Bearing Inserting

tool (227) and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.35" (34.40 mm) but not less than 1.34" (34.14 mm) below the end of the face of the Angle Head. Install the Bevel Pinion Bearing Spacer (216) and install the Bearing Spacer Retainer (211).

4. **For 5L2C6 Angle Attachment**, lubricate the Bevel Pinion Thrust Bearing (212) with 0.5 cc to 1 cc of the recommended grease. Install the Bearing over the splined end of the Bevel Pinion and retain it with the Bearing Retainer (213).
- For 7L3D6 Angle Attachment**, lubricate the Bevel Pinion Thrust Bearing (212) with 0.5 cc of the recommended grease. Install in order named the Front Thrust Bearing Seat (209), Bevel Pinion Thrust Bearing, and Rear Thrust Bearing Seat (207) over the splined end of the Bevel Pinion and retain with the Bearing Seat Retainer (208).
5. If the Lower Spindle Bearing (214) has been removed, work 0.5 cc to 1 cc of the recommended grease into the bearing. Use a sleeve that will contact only the inner ring of the Bearing and press the Lower Spindle Bearing, sealed side first, onto the Spindle (219 or 220).

6. Lubricate the Bevel Pinion Gear (205) with 0.5 cc to 1 cc of the recommended grease and slide the Bevel Gear onto the Spindle.
7. Apply a thin coat of thread locking compound to the threads of the Bevel Gear Retainer and tighten it on the Spindle to 10 ft.-lb (13.5 Nm) torque.
For 7L3D6 Angle Attachment, snap Bevel Gear Retainer in place on Spindle to retain Bevel Gear on Spindle.
8. Lubricate a new Upper Spindle Bearing (204) with 0.5 cc to 1 cc of the recommended grease. Press the closed end of the Upper Spindle Bearing entering the Bearing into the small bore opposite the threaded end of the Angle Housing (201) to the dimension shown in Drawing TPD680.
For 7L3D6 Angle Attachment, press Angle Housing Cap (203) flat and flush with surface of Angle Housing.
9. Lubricate the Spindle Upper Bearing, Bevel Gear and Lower Spindle Bearing with 0.5 cc to 1 cc of the recommended grease and install the Spindle into the Angle Attachment.



(Dwg. TPD680)

Minimum Dimension "A"		
Angle Attachment	in	mm
5L2C6	1.21	30.75
7L3D6	.72	18.25
Maximum Dimension "A"		
5L2C6	1.37	31.25
7L3D6	.73	18.50

10. Clean the threads on the Angle Attachment and the Spindle Bearing Cap (223), and apply a thin coat of thread locking compound to the threads.
11. Install the Spindle Bearing Cap.
For 5L2C6, tighten to 15 ft.-lb (20.0 Nm) torque.
For 7L3D6, tighten to 25 ft.-lb (34.0 Nm) torque.
12. Slide the Coupling Nut (225), threaded end trailing, over the splined end of the Angle Attachment.
13. Apply the Coupling Nut Retainer (224) to the external groove on the splined end of the Angle Attachment.
14. **For 5L2C6 Angle Attachment**, engage the spline on the Bevel Pinion with the matching spline in the Clutch Shaft (54) and thread the Coupling Nut onto the Clutch Attachment. Tighten the Coupling Nut to a minimum of 25 ft.-lb (34 Nm) torque. Make certain the output end of the Spindle is on the same side of the tool as the Throttle Lever (4).
15. **For 7L3D6 Angle Attachment**, engage the spline on the Bevel Pinion with the matching spline in the Spindle (34) and thread the Coupling Nut onto the Gear Case (46). Tighten the Coupling Nut to a minimum of 25 ft.-lb (34 Nm) torque. Make certain the output end of the Spindle is on the same side of the tool as the Throttle Lever.

Troubleshooting Guide

Trouble	Probable Cause	Solution
Low power or low free speed	Low air pressure	Check the air line pressure at the inlet. The pressure must not exceed 90 psig (6.2 bar/620 kPa) at the inlet.
	Plugged Inlet Bushing Screen or Air Strainer Screen	Clean the Screen in a clean, suitable, cleaning solution. If it cannot be cleaned, replace it.
	Worn or broken Vanes	Replace the complete set of Vanes.
	Loose Rotor Bearing Retaining Nut	Tighten the Nut.
	Worn or broken Cylinder	Replace the Cylinder if it is worn or broken or if the bore is scored or wavy.
	Scoring of End Plates	Replace End Plates if they are scored.
	Improper lubrication or dirt build-up in the motor.	Lubricate the Wrench as instructed in LUBRICATION . If lubrication does not result in satisfactory operation, disassemble the motor inspect and clean all parts.
	Clogged Muffler	Clean the Muffler Element in a clean, suitable, cleaning solution. If it cannot be cleaned replace it.
Leaky Throttle Valve	Worn Throttle Valve and/or Throttle Valve Seat	Install a new Throttle Valve and/or a Throttle Valve Seat.
	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 oil in the air inlet and operate the tool for 30 seconds to lubricate all cleaned parts.
Scoring	Improper assembly	Make certain that all motor or Cylinder parts are properly aligned prior to clamping the motor assembly.

Trouble	Probable Cause	Solution
Gear Case gets hot	Excessive grease	Clean and inspect the Gear Case gearing parts and lubricate as instructed in LUBRICATION .
	Worn or damaged parts	Clean and inspect the Gear Case and gearing. Replace worn or broken components.
Angle Attachment gets hot	Excessive grease	Clean and inspect the Angle attachment and gearing parts. Lubricate as instructed in Lubrication.
	Inadequate grease	Inject 0.5 to 1.5 cc of grease into the Grease Fitting.
	Worn or damaged parts	Clean and inspect the Angle Attachment and gearing. If the Bevel Gear and/or Bevel Pinion is worn or broken, replace both parts as they are a matched set.
Inconsistent disengagement of Clutch Attachment	Improper lubrication	Lubricate the Attachment in accordance with the instructions in Lubrication.
	Worn or damaged part	Replace the worn or damaged parts.
	Worn Clutch Spring (using a Heavy Spring on a light torque application)	Install a light Clutch Spring in place of the Heavy Spring.
Motor stalls	Improper adjustment of Attachment or incorrect gearing ratio for the application.	Check the adjustment of the Attachment and review the Tool performance compared to torque requirements.
Motor shuts off before peak torque is reached	Improper adjustment of Attachment or incorrect gearing ratio for the application.	Check the adjustment of the Attachment and review the Tool performance compared to torque requirements.

Related Documentation

For additional information refer to:
 Product Safety Information Manual Form 04585006.
 Product Information Manuals Form 80167497 or Form 80227531.
 Product Parts List Manual Form 16574047.

Manuals can be downloaded from www.irtools.com.

Notes

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