



**16572638**  
Edition 1  
September 2008

## **Air Drill**

**7L Series**

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# **Maintenance Information**



**Save These Instructions**

 **Ingersoll Rand**

**WARNING**

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

**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.**

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

**Lubrication**

Each time the Series 7L Angle Drills are disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

1. **Motor**  
Use **Ingersoll Rand** No. 10 Oil for lubricating the motor. Inject a few drops of oil into the air inlet before attaching the air hose.
2. **Gearing**  
**For models with H, J, K or L gearing**, inject approximately 6 cc of **Ingersoll Rand** No. 28 Grease into the Grease Fitting (40).  
**For models with M or N gearing**, inject approximately 9 cc of **Ingersoll Rand** No. 28 Grease into the Grease Fitting (40).

3. **Angle Head**

**For models with 7L1A1, 7L1A3, 7L1A4, 7L1B1 and 7L1B4 Angle Attachment, after each 8 hours of operation**, inject 0.5 - 1.0 cc of **Ingersoll Rand** No. 67 Grease into Grease Fitting (102).

**For models with 7L2A4 or 7L3A4 Angle Attachment, after each 40 hours of operation**, inject 0.5 - 1.0 cc of **Ingersoll Rand** No. 67 Grease into Grease Fitting (102).

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

**Disassembly of the Angle Attachment**

1. Remove the Drill Chuck by inserting the Chuck Key in one of the holes in the Chuck and rapping the Key sharply with a hammer.
2. Carefully grasp the flats of the Coupling Nut (124) in leather-covered or copper-covered vise jaws, Angle Head (101) facing down.

**NOTICE**

**The Gear Case (39) has left-hand threads.**

3. Using a wrench on the flats of the Gear Case, loosen the Gear Case from the Coupling Nut.

**NOTICE**

**Remove the tool from the vise. Unscrew and remove the Coupling Nut from the Gear Case.**

4. Carefully grasp the Angle Head (101) in leather-covered or copper-covered vise jaws, Spindle (122) facing upward.

**NOTICE**

**The Spindle Bearing Cap (121) has left-hand threads.**

**NOTICE**

**Do not remove the Spindle from the Angle Head until the Bevel Pinion (122) is pulled outward against the Bevel Pinion Bearing (109). Failure to do so could damage the Spindle Upper Bearing (105), the Bearing will not be removable from the Spindle, or the Bevel Pinion will be damaged. If tightness or binding occurs. Check to make sure the Bevel Pinion as been pulled outward.**

5. **For 7L1A1 or 7L1A3 Angle Head**, using a wrench, remove the Spindle Bearing Cap.

**NOTICE**

**The Spindle Bearing Cap has left-hand threads. For 7L2A4 Angle Head**, use a wrench to remove the Spindle Bearing Cap. Withdraw the Spindle from the Angle Head.

**NOTICE**

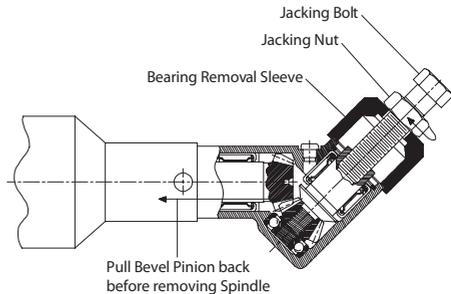
**The Spindle Bearing Cap has left-hand threads.**

**For 7L3A4 Angle Head**, use No. 85A32-26 Bearing Cap Wrench to remove the Spindle Bearing Cap. Withdraw the Spindle from the Angle Head.

**For 7L1B1 Angle Head**, use a thin blade screwdriver to pry out and under the tab of the Lower Spindle Bearing Retainer (119A). Rotate the screwdriver around the Spindle to spiral the retainer out of its groove.

**NOTICE**

**Do not remove the Spindle from the Angle Head until the Bevel Pinion (108) is pulled outward against the Bevel Pinion Bearing (109). Do not remove the Spindle unless a new Lower Spindle Bearing (119) is available for installation. This type of bearing is always damaged during removal and the bearing must be removed with the Spindle.** Each 7L1B1-955 Bearing Inserting Tool includes tooling to remove the Spindle and Lower Spindle Bearing from the 7L1B1 Angle Head. See Dwg. TPD792.



(Dwg. TPD792)

Install the Jacking Nut on the Jacking Bolt near the head of the Bolt. Position the Bearing Removal Sleeve on the face of the Angle Head with the large open end toward the Spindle. With the Angle Head nested in the shallow counterbore of the Sleeve, screw the Jacking Bolt into the Spindle through the Sleeve. While keeping the Jacking Bolt stationary with a wrench on the head of the Bolt, use another wrench to rotate the Jacking Nut clockwise pulling the Spindle, Lower Spindle Bearing and Spindle Upper Bearing (105) from the Angle Head.

6. Inspect the Lower Spindle Bearing for looseness or roughness. If either of these conditions exists, replace the bearing as follows:

- For **7L1A1, 7L1A3 or 7L1B1 Angle Head**, slip the Lower Spindle Bearing from the Spindle.
- For **7L2A4 Angle Head**, grasp the threaded end of the Spindle in leather-covered or copper-covered vise jaws.
- Unscrew the Bevel Gear Retainer (120) and lift off the Bevel Gear (107).
- Press the Spindle from the Lower Spindle Bearing.
- For **7L3A4 Angle Head**, remove the Bevel Gear Retainer.
- Press off the Bevel Gear. Press the Spindle from the Lower Spindle Bearing.

#### NOTICE

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

#### NOTICE

**7L3A4 Angle Head will require a new Angle Housing Cap (103) when the Spindle Upper Bearing is installed.**

- For **7L1A1, 7L1A3 or 7L1B1 Angle Head**, if the Spindle Upper Bearing appears rough or loose, press or pull it off the Spindle. For **7L2A4 or 7L3A4 Angle Head**, if the Spindle Upper Bearing (104) appears rough or loose, press it from the Angle Head.
- Remove the Bearing Seat Retainer (110) and slide off the Rear Thrust Bearing Seat (111), Bevel Pinion Thrust Bearing (112) and Front Thrust Bearing Seat (113) from the pinion shaft.
- For **7L2A4 Angle Head**, use snap ring pliers to remove the Pinion Bearing Spacer Retainer (114). Remove the Bevel Pinion Bearing Spacer (116).
- For **7L3A4 Angle Head**, use a thin blade screwdriver to pry out and under the tab of the Pinion Bearing Spacer Retainer. Rotate the screwdriver around the pinion shaft to spiral the retainer out of its groove. Using a hooked tool, reach into the Bevel Pinion Bearing Spacer (116) and hook the drilled cross-hole in the Spacer. Pull the Spacer from the Angle Head. Remove the Rear Seal (117) and Front Seal (118).

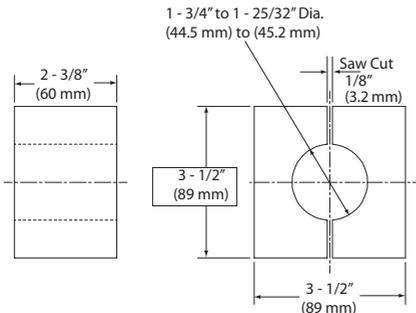
#### NOTICE

**Do not remove the pinion shaft and bearing unless you have a new bearing on hand. After the Angle Head is disassembled, check all parts for damage or wear.**

- Grasp the spline of the pinion shaft in leather-covered or copper-covered vise jaws and gently tap the rear face of the Angle Head with a soft hammer to pull the Bevel Pinion Bearing.

#### Disassembly of Gearing

- Using a pin punch and hammer, drive out the Throttle Lever Pin (4) to release the Throttle Lever (3).
- Make a set of hardwood blocks. See Dwg. TPD681.



(Dwg. TPD681)

- Place the hardwood blocks around the Motor Housing (1).
- With the Motor Housing in a vertical position and Gear Case (39) upward, securely clamp the blocks in a vise taking care not to distort the Motor Housing.

#### NOTICE

**This Gear Case has left-hand threads.**

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

#### NOTICE

**Be certain to hold the Angle Drill over the workbench so that you will not lose any parts.**

- Remove the tool from the vise and, while holding the Angle Drill horizontally, carefully unscrew the Gear Case by hand and pull it away from the Motor Housing.
- If the Bearing Housing Spacer (29) remained in the Gear Case (39), remove it from the Gear Case.
- For **H, J, M or N ratio**, the Rotor Pinion (33) and Rotor Pinion Spacer (34) may come out with the Spindle, or they may have remained with the Rotor (20) when the Gear Case was removed. Remove the Rotor Pinion and Rotor Pinion Spacer.
- For **H, J, K or L ratio**, remove the Spindle Planet Gears (31). Position the Gear Case vertically in an arbor press, planet gear end down. Using a brass rod and contacting the end of the Spindle, press the Spindle from the Gear Case. For **M or N ratio**, remove the Planet Gears (36), Gear Head (35), Gear Head Spacer (33) and Spindle Planet Gears (31). Position the Gear Case vertically in an arbor press, Planet Gear end down. Using a brass rod and contacting the end of the Spindle, press the Spindle from the Gear Case.
- Using snap ring pliers, remove the Spindle Bearing Retainer (43).
- Remove the Spindle Bearing (42) from the Gear Case.
- Withdraw the Grease Shield (41) from the Gear Case.

#### Disassembly of Motor and Throttle

- If the Bearing Housing Spacer (29) remained with the Front Rotor Bearing Housing, remove it from the Housing.
- Remove the Front Rotor Bearing Housing (27) and the two Bearing Spring Washers (26).
- Grasp the splined end of the Rotor (20) and pull the assembled motor from the Motor Housing (1).
- Remove the Rear End Plate Gasket (17) from the Motor Housing.

#### NOTICE

**Make certain the End Plate Retainer (19) does not fly when it is slipped off the hub of the Rotor.**

- Using a pair of external snap-ring pliers with just the tips of the pliers inserted between the ends of the End Plate Retainer (19), spread the Retainer enough to remove it from the groove in the hub of the Rotor.
- Remove the Rear End Plate (18), Cylinder (22) and Vanes (21).

#### NOTICE

**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.**

- Check the Front Rotor Bearing (23) for wear or roughness. If replacement is necessary, support the Front End Plate (23) between two blocks of wood on the table of an arbor press. Press the Rotor from the Front Rotor Bearing.
- To remove the Rear Rotor Bearing, refer to step 15.
- Using hardwood blocks placed around the Motor Housing (see Dwg. TPD681), clamp the blocks in a vise, positioning the handle so the inlet is upward.
- Using a wrench on the flats, unscrew and remove the Inlet Bushing (15).
- Remove the Throttle Valve Spring (8) and Air Strainer Screen (16).
- Remove the Exhaust Deflector (12), Inlet Bushing Spacer (14), Exhaust Silencer (11), Muffler Element (13), Exhaust Deflector Seal (10) and Silencer Seal Ring (9).
- Lift out the Throttle Valve (7) and the Throttle Plunger (5).

## NOTICE

The Throttle Valve Seat (6) is reversible. Mark the side of the Throttle Valve Seat so the side that faced up toward the inlet will be the underside on reinstallation.

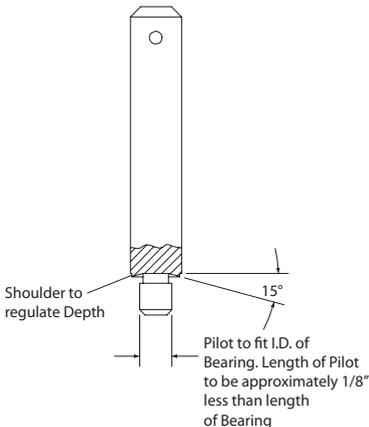
14. If removal of the Throttle Valve Seat is necessary, use a hooked tool to pull the Seat from the Housing.

## 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 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 bearing should never be cleaned.** Work grease thoroughly into every open bearing before installation.
6. Apply a film of O-ring lubricant to all O-rings before final assembly.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in a recess. Use a bearing inserting tool similar to the one in Dwg. TPD786.

### Needle Bearing Inserting Tool



(Dwg. TPD786)

### Assembly of the Retaining Mechanism

1. If the Rear Rotor Bearing (2) was removed, install a new one as follows:
  - a. Using a bearing inserting tool (See Dwg. TPD786) that has a pilot extending into the Bearing, and a shoulder that contacts the outer radius on the bearing shell, press the Rotor Bearing, closed end first, into the bearing recess of the Motor Housing (1) until it is about .010" (0.25 mm) below flush.
  - b. Inject 0.5 cc of grease into the Bearing.
2. Using hardwood blocks placed around the Motor Housing (See Dwg. TPD681), clamp the blocks in a vise, positioning the handle so the inlet is upward.

## NOTICE

Make sure the reverse side of the Throttle Valve Seat (6) when disassembling now becomes the side facing the inlet.

15. To remove the Rear Rotor Bearing, proceed as follows:
  - a. Insert a 1/4" (6 mm) diameter by 6" (152 mm) long, flat faced steel rod into the air inlet until it contacts the Rear Rotor Bearing.
  - b. Press the end of the steel rod to remove the Rear Rotor Bearing out of the front end of the Motor Housing.

3. If the Throttle Valve Seat was removed, use a flat-faced rod 1/2" (13 mm) in diameter by 3" (75 mm) long to press the Throttle Valve Seat into the handle until it seats.
4. Install the Throttle Valve Plunger (5) 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 (7), install the Valve long-stem end through the hole in the Throttle Valve Seat and the Throttle Valve Plunger.
6. Install the Muffler Element (13) by wrapping it horseshoe fashion around the inside of the Exhaust Deflector (12).
7. Snap the Exhaust Silencer (11) into the large open end of the Exhaust Deflector.
8. Install the Exhaust Deflector Seal (10) into the groove on the front end of the Exhaust Deflector.
9. Install the Silencer Seal Ring (9) over the hub of the Motor Housing and flush with the base of the hub.

## NOTICE

Tabs on the Exhaust Deflector and notches in the Motor Housing are designed so they can only be mated correctly.

10. Install the Exhaust Deflector over the hub of the Motor Housing, aligning the tabs on the Exhaust Deflector with the notches in the Motor Housing.
11. Insert the Air Strainer Screen (16), closed end first, inside the external threaded end of the Inlet Bushing (15).
12. Insert the Throttle Valve Spring (8), large coil end first, into the Inlet Bushing making sure it is flush with the Air Strainer Screen.
13. Install the Inlet Bushing Spacer (14) over the threaded end of the Inlet Bushing.
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.

## NOTICE

The throttle lever pin hole is stepped on the left side of the Exhaust Deflector, when facing the air inlet end of the tool, for ease of installation of the Throttle Level Pin (4). Operate the Lever to check for free movement.

15. Install the Throttle Lever (3) from left to right using the Throttle Lever Pin.
16. Slide the Front End Plate (23), flat side first, over the splined end of the Rotor (20).
17. Using a sleeve that contacts only the inner ring of the Front Rotor Bearing (25), press the Front Rotor Bearing onto the splined hub of the Rotor until it seats against the Front End Plate.
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 the short hub of the Rotor is upward.
20. Wipe each Vane (21) with a film of the recommended oil and place a Vane in each slot in the Rotor.
21. For 7LJ1B1 or 7LK1B1, place the Cylinder (22) down over the Rotor and against the Front End Plate with the end of the Cylinder having the large bevel at the rear of the shoulder trailing. For all others, place the Cylinder down over the Rotor and against the Front End Plate with the end of the Cylinder having the straight face at the rear of the shoulder trailing.
22. Place the Rear End Plate (18), flat side first, over the short hub of the Rotor.

## NOTICE

**Make certain the End Plate Retainer (19) 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 (17) into the bottom of the Motor Housing bore so the 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 (24) until the Cylinder Dowel is slightly below the surface of the Front End Plate.
27. Place the two Bearing Spring Washers (26) inside the Front Rotor Bearing Housing (27) and against the Front Rotor Bearing Retainer.
28. Slide the Front Rotor Bearing Housing over the Front Rotor Bearing.

## Assembly of Gearing

1. Install the Grease Shield (41) into the front end of the Gear Case (39) until it seats in the recess.
2. Slip the Spindle Bearing (42) into the Gear Case until it seats and is flush against the Grease Shield.
3. Using snap ring pliers, install the Spindle Bearing Retainer (43) in the groove in front of the Spindle Bearing.
4. If the Spindle Planet Gear Bearings (32) were removed, press in new Spindle Planet Gear Bearings using a bearing inserting tool (See Dwg. TPD786) that has a pilot and that contacts the outer radius of the Bearing. Press against the stamped end of the Bearing.

**For J or 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 H, J, K or 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 (30) into the Spindle Bearing until the shoulder of the Spindle is seated against the Bearing.
  - b. Place a Spindle Planet Gear (31) on each gear shaft of the Spindle.
  - c. Work 3 cc to 6 cc of the recommended grease into the gear train.
6. **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. If the Gear Head Planet Gear Bearings (37) were removed, press in new Gear Head Planet Gear Bearings using a bearing inserting tool (See Dwg. TPD786) that has a pilot and that contacts the outer radius of the Bearing. Press against the stamped end of the Bearing.
  - d. Install the Gear Head Spacer (38) into Gear Case flush against the face of the Spindle Planet Gears.
  - e. Install the assembled Gear Head (35) into the Gear Case, entering the spline of the Gear Head into mesh with the Spindle Planet Gears.
7. Insert the Bearing Housing Spacer (29) into the Gear Case.
8. **For H, J, M or N ratio**, place the Rotor Pinion Spacer (34) and Rotor Pinion (33) over the splined end of the Rotor.

## NOTICE

**The Gear Case has left-hand threads.**

## NOTICE

**Run the motor at free speed while tightening the Gear Case. Listen to make sure there is no scoring.**

9. Thread the assembled Gear Case onto the Motor Housing and tighten it to 40 ft-lb (54.1 Nm) torque.

## Assembly of Angle Attachment

### NOTICE

**For 7L1A1, 7L1A3, 7L1A4, 7L1B1 and 7L1B4, the Bevel Pinion (122) and the Bevel Gear/Spindle (122) are specially matched. Replace these parts only as a matched set.**

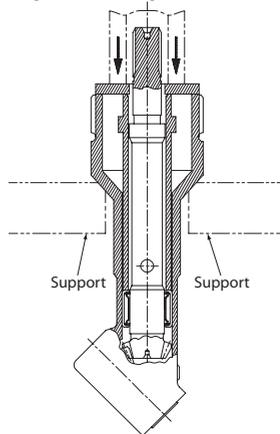
**For 7L2A4 and 7L3A4, the Bevel Pinion (107) and Bevel Gear (107) are specially matched. Replace these parts only as a matched set.**

1. Lubricate the Bevel Pinion (107 or 122) as instructed on Page 2 and insert it, gear end first, into the long bore of the Angle Head (101).
2. Lubricate the Bevel Pinion Bearing (109) as instructed on Page 2 and insert it, unstamped end first, into the bore of the Angle Head, after the Bevel Pinion.
3. **For 7L1A1 or 7L1A3 Angle Head**, use No. 7L1A-950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 2.40" (61 mm) but not less than 2.38" (60.5 mm) below the end face of the Angle Head.

**For 7L2A4 Angle Head**, use No. 7L2A-950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.65" (42.0 mm) but not less than 1.64" (41.75 mm) below the end face of the Angle Head.

**For 7L3A4 Angle Head**, use No. 7L3A-950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.35" (34.4 mm) but not less than 1.34" (34.1 mm) below the end face of the Angle Head.

**For 7L1B1 Angle Head**, use the long Bearing Inserting Sleeve included in the 7L1B1-955 Bearing Inserting Tool package and press the Bevel Pinion Bearing so the stamped face is a maximum of 2.12" (54 mm) but not less than 2.11" (53.5 mm) below the end face of the Angle Head. See Dwg. TPD793.



(Dwg. TPD793)

4. **For 7L2A4 Angle Head**, install the Bevel Pinion Bearing Spacer (116). Using snap ring pliers, install the Pinion Bearing Spacer Retainer (114).
- For 7L3A4 Angle Head**, install the Front Seal (118) and Rear Seal (117) into their respective grooves on the Bevel Pinion Bearing Spacer (116). Insert the Spacer Assembly over the splined end of the Bevel Pinion and into the Angle Head until it is beyond the Spacer Retainer groove. Using a thin blade screwdriver, start the end of the Pinion Bearing Spacer Retainer (114) opposite the tab end in the groove of the Angle Head. Rotate the screwdriver around the pinion shaft to spiral the Retainer into the groove.

**NOTICE**

**Check to make sure the Retainer is completely seated.**

5. Lubricate the Bevel Pinion Thrust Bearing (112) as instructed on Page 2. Install in order named the Front Thrust Bearing Seat (113), Bevel Pinion Thrust Bearing (112) and Rear Thrust Bearing Seat (111) over the splined end of the Bevel Pinion and retain with the Bearing Seat Retainer (110).
6. If the Lower Spindle Bearing (119) has been removed, proceed as follows:
  - a. **For 7L2A4 Angle Head**, using a sleeve that will contact only the inner ring of the Bearing, press the Lower Spindle Bearing, sealed side first, onto the Spindle (122).
  - b. **For 7L3A4 Angle Head**, using a sleeve that will contact only the inner ring of the Bearing, press on the stamped face of the Bearing, red side toward the shoulder on the Spindle.
7. **For 7L2A4 Angle Head**, slide the Bevel Gear (107) onto the Spindle.  
**For 7L3A4 Angle Head**, press the Bevel Gear (107) onto the Spindle.
8. **For 7L2A4 Angle Head**, apply a thread-locking compound to the thread on the Bevel Gear Retainer Nut (120) and tighten it on the Spindle to 10 ft-lb (13.5 Nm) torque.  
**For 7L3A4 Angle Head**, spread the Bevel Gear Retainer (107) and slip it over the end of the Spindle. Slide the Retainer down the Spindle and into the groove of the Spindle to retain the Bevel Gear.
9. If the Spindle Upper Bearing (104 or 105) was removed, install a new Bearing as follows:

**⚠ CAUTION**

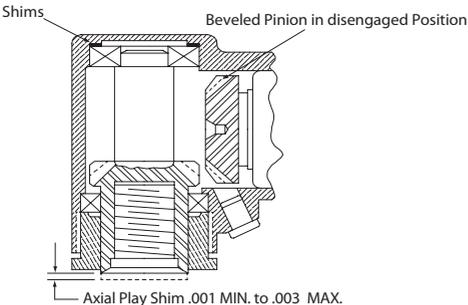
**Do not get any Loctite in the bearing; damage to the bearing could result.**

- a. **For 7L1A1 or 7L1A3 Angle Head**, apply a small drop of thread-locking compound to the small outside diameter of the Upper Spindle Bearing Shaft.
- b. Press the Spindle Upper Bearing (105) onto the Spindle (122) and allow the thread-locking compound to dry for a minimum of 10 minutes.

**NOTICE**

**Make sure the Bevel Pinion (122) is pulled outward toward the Bevel Pinion Bearing before inserting the Spindle into the Angle Head.**

- c. Insert the Spindle into the Angle Head until the Upper Spindle Bearing seats into the recess of the Angle Head.
- d. Slip the Lower Spindle Bearing over the end of the Spindle and into the Angle Head recess.
- e. Install the Spindle Bearing Cap (121) finger-tight.
- f. Spindle must turn freely.
- g. With the Bevel Gear out of mesh with the Bevel Pinion, measure the axial play of the Spindle (use + 0.25 lb. loads). Subtract 0.002" (0.051 mm) from the reading for required shim thickness. See Dwg. TPD682-1.



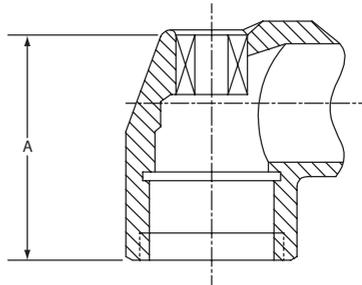
(Dwg. TPD682-1)

- h. Unscrew and remove the Spindle Bearing Cap. While pulling the Bevel Pinion outward toward the Bevel Pinion Bearing (109). Remove the Spindle from the Angle Head.

**NOTICE**

**The Shim Packet contains three 0.002" (0.05 mm) Shims and two 0.005" (0.13 mm) Shims.**

- i. Insert the required number of shims, as determined from step (g), into the upper bearing recess of the Angle Head.
- j. Reassemble and test the Angle Head as indicated in steps (c) through (f).
- k. **For 7L2A4 Angle Head**, press on the closed end of a new Spindle Bearing entering the Bearing into the small bore opposite the threaded end of the Angle Head to the dimension shown. See Dwg. TPD680.



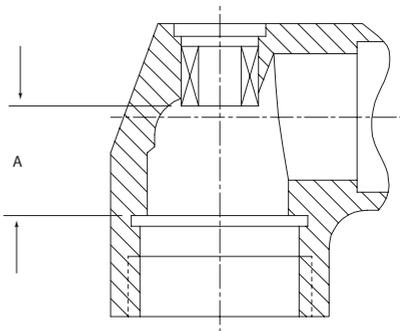
(Dwg. TPD680)

Minimum Dimension		Maximum Dimension	
"A"		"A"	
in	mm	in	mm
1.21	30.75	1.27	31.25

**⚠ CAUTION**

**Press on the stamped face of the Bearing. Failure to do so will cause damage to the Bearing. Install a new Angle Housing Cap (103) into the top of the Angle Head.**

- i. **For 7L3A4 Angle Head**, press a new Spindle Bearing into the Angle Head from the large threaded end to the dimension shown. See Dwg. TPD636.

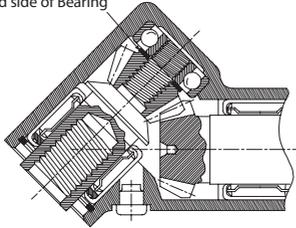


(Dwg. TPD636)

Minimum Dimension		Maximum Dimension	
"A"		"A"	
in	mm	in	mm
0.718	18.25	0.728	18.50

- m. **For 7L1B1 Angle Head**, install all the shims provided with each Spindle Upper Bearing on the Spindle against the Bevel Gear. See Dwg. TPD787.

Place Shims between Bevel Gear and marked side of Bearing



(Dwg. TPD787)

**CAUTION**

**Do not get any thread-locking compound in the bearing; damage to the bearing could result.**

- n. Apply a small drop of thread-locking compound to the small outside diameter at the upper end of the Spindle.  
 o. Press the Spindle Upper Bearing, stamped side against the shims, onto the Spindle and allow the thread-locking compound to dry for a minimum of 10 minutes.

**CAUTION**

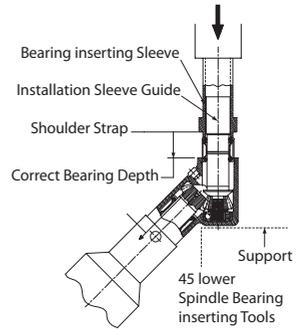
**Make sure the Bevel Pinion is pulled outward toward the Bevel Pinion Bearing before inserting the Spindle into the Angle Head.**

- p. Lubricate the Spindle as previously instructed and insert the Spindle into the Angle Head until the Spindle Upper Bearing seats into the recess of the Angle Head.  
 q. Slip the Lower Spindle Bearing, stamped end out, over the end of the Spindle and against the face of the Angle Head.

**CAUTION**

**Do not attempt to press the Bearing into the housing with this guide. It is only to be used for alignment.**

- r. Insert the smaller diameter of the Installation Sleeve Guide (see Dwg. TPD794-1) into the Lower Spindle Bearing until it stops against the face of the Spindle.  
 s. Slide the shouldered end of the long Bearing Inserting Sleeve onto the Guide until the end of the Sleeve contacts the Lower Spindle Bearing.  
 t. With the closed end of the Angle Head resting on a flat surface, press the Lower Spindle Bearing into the housing until the shoulder of the Sleeve stops against the face of the Angle Head or until the stamped face of the Bearing is a maximum of 0.113" (2.88 mm) but not less than 0.108" (2.75 mm) below the face of the Angle Head.



(Dwg. TPD794-1)

\* Registered trademark of ND Industries.

- u. Using a thin blade screwdriver, start one end of the Lower Spindle Bearing Retainer (119A) into the groove in the Angle Head. Rotate the screwdriver around the Spindle to spiral the Retainer into the groove.
- Lubricate the Spindle Upper Bearing, Bevel Gear and Lower Spindle Bearing as previously instructed and install the Spindle into the Angle Head.
  - Clean the threads on the Angle Head and the Spindle Bearing Cap (121), apply a film of Vibra-Tite® VC3 to the threads.
  - For 7L1A1 or 7L1A3 Angle Head**, tighten the Spindle Bearing Cap to a minimum of 35 in-lb (3.9 Nm) torque.  
**For 7L2A4 Angle Head**, install the Spindle Bearing Cap and tighten the Cap to a minimum of 15 ft-lb (20.3 Nm) torque.  
**For 7L3A4 Angle Head**, using No. 85A32-26 Bearing Cap Wrench, install the Spindle Bearing Cap and tighten the Cap to a minimum of 25 ft-lb (34 Nm) torque.
  - Slide the Coupling Nut (124), threaded end trailing, over the splined end of the Angle Head.
  - Apply the Coupling Nut Retainer (123) to the external groove on the splined end of the Angle Head.
  - Engage the spline on the Bevel Pinion with the matching spline in the Spindle (30) and thread the Coupling Nut onto the Gear Case. Tighten the Coupling Nut to a minimum of 25 ft-lb (34 Nm) torque. Check to make sure the Angle Head (101) aligns with the Throttle Lever (3).
  - For 7L2A4 or 7L3A4 Angle Head**, thread the Drill Chuck onto the Spindle and tighten.

\* Registered trademark of ND Industries.

## Troubleshooting Guide

Trouble	Probable Cause	Solution
Loss of Power	Low air pressure	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 or Inlet Screen	Clean the Air Strainer or Inlet Screen in a clean, suitable, cleaning solution. If the Screen cannot be cleaned, replace it.
	Clogged Muffler or Exhaust Silencer	Clean the Muffler Element in a clean, suitable, cleaning solution. If it cannot be cleaned, replace it.
	Worn or broken Vanes	Replace the <b>complete</b> set of Vanes.
	Damaged Rear End Plate Gasket	Install a new Rear End Plate Gasket.
	Worn or broken Cylinder	Replace the Cylinder if it is cracked or if the bore appears wavy or scored.
Leaky Throttle Valve	Improper lubrication or dirt build up	Clean the Motor Unit parts and lubricate as instructed.
	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 Valve for about 30 seconds. <b>Immediately</b> pour 3 cc of the recommended oil in the air inlet and operate the tool for 30 seconds to lubricate all the cleaned parts.
Gear Case gets hot	Excessive grease	Clean and inspect the Gear Case and gearing parts and lubricate as instructed.
	Worn or damaged parts	Clean and inspect the Gear Case and gearing. Replace worn or broken components.
Angle Head gets hot	Excessive grease	Clean and inspect the Angle Head and gearing. Lubricate as instructed.
	Inadequate grease	Inject 0.5 to 1.0 cc of grease into the Grease Fitting.
	Worn or damaged parts	Clean and inspect the Angle Head and Gearing. If the Bevel Gear and/or Bevel Pinion is worn or broken, replace <b>both</b> parts as they are a matched set.

### Related Documentation

For additional information refer to:  
 Product Safety Information Manual 04580353.  
 Product Information Manual 16572174.  
 Parts Information Manual 16572794.

Manuals can be downloaded from [www.irtools.com](http://www.irtools.com).

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