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Air Drill

6 Series

Maintenance Information

Save These Instructions

Ingersoll Rand

Product Safety Information

⚠ WARNING

- **Failure to observe the following warnings, and to avoid these potentially hazardous situations, could result in death or serious injury.**
- **Read and understand this and all other supplied manuals before installing, operating, repairing, maintaining, changing accessories on, or working near this product.**
- **Always wear eye protection when operating or performing maintenance on this tool. The grade of protection required should be assessed for each use and may include impact-resistant glasses with side shields, goggles, or a full face shield over those glasses.**
- **Always turn off the air supply, bleed the air pressure and disconnect the air supply hose when not in use, before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool or any accessory.**

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 6 Drills are disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

1. Moisten all O-rings with O-ring lubricant.
2. Work approximately 1.5 cc of **Ingersoll Rand** No. 67 Grease into the Rear Rotor Bearing (35), Front Rotor Bearing (41) and the Spindle Bearing (62).
3. Work approximately 6 cc to 8 cc of **Ingersoll Rand** No. 67 Grease into the D, H, J, JJ, K or L ratio gear train and 10 cc to 12 cc of the grease into the R ratio gear train. Grease the Planet Gear Bearings (46, 49, and 55), the gear teeth inside the Gear Case (60) and the planet gear shafts on the Spindle (43) and Gear Head (54).

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 Gearing

1. **For L or R ratio**, loosen the Pinch Bolt (70) and remove the Dead Handle Assembly (69) and Handle Adapter (68).
2. Remove the Drill Chuck (67) by inserting the Chuck Key in one of the holes in the Chuck and tapping the Key sharply with a hammer.
3. Being careful not to distort the Motor Housing (1 or 15), grasp the flats on the Housing in leather-covered or copper covered vise jaws with the Gear Case (60) facing upward.
4. Using a wrench on the flats of the Gear Case, loosen, but do not remove the Gear Case.
5. Remove the tool from the vise and, while holding the tool horizontally, carefully unscrew the Gear Case and pull it away from the Motor Housing.

NOTICE

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

6. Using snap ring pliers, remove the Gear Retainer (50).
7. **For H or J ratio**, the Rotor Pinion (51) may come out with the Gear Case, or it may have remained with the Rotor (37) when the Gear Case was removed. Remove the Rotor Pinion.
8. **For R ratio**, remove the Gear Head Planet Gear Assembly (55), Gear Head (54) and Gear Head Spacer (53).
9. Remove the Spindle Planet Gear Assembly (46) or Spindle Planet Gear (48).
10. Push the Spindle from the Gear Case.
11. If it is necessary to remove the Spindle Bearing (62) from the front of the Gear Case, use a pair of internal snap ring pliers to remove the Spindle Bearing Retainer (63). Remove the Bearing Seal (62A).
12. Do not remove the Spindle Bearing from the Gear Case unless it is absolutely necessary and you have a new bearing for replacement. If you must remove the bearing from the Gear Case, position the Gear Case vertically in an arbor press, internally threaded end facing upward. Using a 3/4" (19 mm) diameter brass rod against the bearing, press the Spindle Bearing from the Gear Case.
13. Tap the front end of the Gear Case on a workbench to remove the Grease Shield (64).
14. Remove the Seal Support (44) from the Spindle.
15. If the Grease Shield Retainer (65) must be removed, insert a thin blade screwdriver under the tab, and 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 (37) in leather-covered or copper-covered vise jaws and pull the assembled motor from the Motor Housing (1 or 15).
2. Remove the Rear End Plate Gasket (32) from the Motor Housing.
3. Using a wrench, unscrew and remove the Rear Rotor Bearing Retaining Nut (33).
4. Remove the Rotor from the vise and remove the Bearing Thrust Washer (34), Rear End Plate (36), Cylinder (39) and Vanes (38).
5. Check the Front Rotor Bearing (41) for damage or roughness. If replacement is necessary, support the Front End Plate (40) between two blocks of wood on the table of an arbor press. Using a flat face punch on the inner ring, tap the Bearing out of the End Plate.
6. Check the Rear Rotor Bearing (35) 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 Lever Throttle Motor Housing

1. Using a pin punch and hammer, drive the Throttle Lever Pin (18) out of the Rear Muffler (27) to release the Throttle Lever (17).
2. Being careful not to distort the Housing (15), grasp the flats on the Motor Housing in leather-covered or copper-covered vise jaws with the inlet upward.
3. Using a wrench on the flats, unscrew and remove the Inlet Bushing (24) and the Air Strainer Screen (26).
4. Remove the Throttle Valve Spring (23).
5. Remove the Rear Muffler (27), Inlet Bushing Spacer (25), two Exhaust Silencers (31), Muffler Element (28), Exhaust Deflector Seal (30) and the Silencer Seal Ring (29).
6. Lift out the Throttle Valve (22) and Throttle Plunger Assembly (19).
7. Remove the Throttle Plunger Seal (20) from the Throttle Plunger.
8. To remove the Throttle Valve Seat (21), insert a wire hook through the central hole of the Seat and hooking the underside of the Throttle Valve Seat pull the Seat out of the Motor Housing.

NOTICE

Only remove the Throttle Valve Seat when replacing it or when the Throttle Plunger Bushing (16) must be replaced.

9. Before removing the Throttle Plunger Bushing all seals and components must be removed from the Motor Housing. To remove the Throttle Plunger Bushing, proceed as follows:
   a. Grasp the rear hub of the Motor Housing in leather-covered or copper-covered vise jaws with the Throttle Plunger Bushing upward.
   b. 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.

   c. 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 pressing the bearing into a bearing recess.
3. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in a recess.
4. 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.
5. Always clean every part and wipe every part with a thin film of oil before installation.
6. Apply a film of O-ring lubricant to all O-rings before final assembly.
7. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in a 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.

Assembly of the Lever Throttle Motor Housing

1. If the Throttle Plunger Bushing (2) was removed, proceed as follows:
   a. Insert the Throttle Plunger Bushing into the Motor Housing (15) to a depth approximately one-half the length of the Bushing.
   b. Put a few drops of a quality liquid sealant in the counterbore surrounding the outside diameter of the Bushing.
   c. Rotate the Bushing approximately 180 degrees 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 the required length of time or about eight hours at room temperature.
2. Carefully grasp the flats on the Motor Housing in leather-covered or copper-covered vise jaws, inlet end facing upward.
3. If the Throttle Valve Seat (21) was removed, use a flat-faced rod 1/2" (13 mm) in diameter by 3" (76 mm) long to push the Seat into the Motor Housing until it seats.
4. Install the Throttle Plunger Seal (20) in the groove of the Throttle Plunger (19).
5. 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.
6. Using needle nose pliers to hold the short-stem end of the Throttle Valve (22), install the Valve inserting the long-stem end through the hole in the Throttle Valve Seat and Throttle Plunger.
7. After folding the Muffler Element (28) lengthwise, and with the fold trailing, install the Element by wrapping it horseshoe fashion around the inside of the Rear Muffler (27) covering all exhaust holes.
8. Install the Exhaust Deflector Seal (30) into the groove on the front end of the Rear Muffler.
9. Install the two Exhaust Silencers (31) over the hub at the rear of the Motor Housing and work the Silencers into the Housing.
10. Install the Silencer Seal Ring (29) over the hub of the Motor Housing approximately halfway down the hub.
11. Install the Rear Muffler over the hub of the Motor Housing, aligning the wide tab on the Rear Muffler with the throttle plunger hole in the Motor Housing.

NOTICE

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

12. Insert the Air Strainer Screen (26), closed end first, inside the external threaded end of the Inlet Bushing (24).
13. Insert the Throttle Valve Spring (23), large coil end first, into the Inlet Bushing making sure it contacts the Air Strainer Screen.
14. Install the Inlet Bushing Spacer (25) in the large hole in the Rear Muffler.
15. 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 26 ft-lbs (35 Nm) torque.** The Inlet Bushing must securely clamp the Rear Muffler.
16. Note that the throttle lever pinhole in the Rear Muffler is larger at one end than the other. Install the Throttle Lever (17) pressing the Throttle Lever Pin (18) into the large end of the pinhole.

Assembly of the Motor

1. Using a sleeve that contacts the outer ring of the Rear Rotor Bearing (35), press the Rear Rotor Bearing into the Rear End Plate (36) if the Bearing was removed.
2. Place the Rear End Plate, Bearing end trailing, on the threaded hub of the Rotor (37). Insert a 0.001" feeler gauge or shim between the face of the Rotor and End Plate. Place the Bearing Thrust Washer (34) on the threaded hub of the Rotor. Thread the Rear Rotor Bearing Retaining Nut (33) onto the hub of the 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 leather-covered or copper-covered vise jaws with the splined hub upward.
4. Wipe each Vane (38) with a film of light oil and place a Vane in each slot in the Rotor.
5. Looking down the axis of the Rotor and Cylinder (39), position the Cylinder over the Rotor with the cylinder dowel hole at twelve o'clock, the notch in cylinder face at ten o'clock and the two slots in the side of the Cylinder at two o'clock. Place the Cylinder down over the Rotor and Vanes and against the Rear End Plate.
6. Push the Front Rotor Bearing (41) into the recess in the Front End Plate (40).
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 (32) 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.
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 (42) until the Cylinder Dowel is slightly below the surface of the Front End Plate.

Assembly of the Gearing

1. Stand the Gear Case (60), end with the flats upward, on a workbench.
2. If the Shield Retainer (65) was removed, install it in the second groove below the front face of the Gear Case.
3. Place the Grease Shield (64) in the Gear Case so that it butts against the Shield Retainer.
4. Using a sleeve that contacts the outer ring of the Bearing, press the Spindle Bearing (62) into the Gear Case until it butts against the Grease Shield. Install the Spindle Bearing Seal (62A).
5. Using snap ring pliers, install the Spindle Bearing Retainer (63) against the Bearing Seal and into the groove in front of the Spindle Bearing.
6. Turn the Gear Case over so that the internal threaded end faces upward.
7. Install the Seal Support (44), large end first, over the hub of the Spindle (43).
8. Slide the Spindle into the Gear Case, threaded end first, until the Seal Support contacts the inner ring of the Spindle Bearing.

NOTICE

For K, L or R ratio, make certain the Spindle Seal does not get pinched between the Seal Support and the Spindle Bearing.

9. **For H Ratio,** push the Spindle Planet Gear Bearings (49) into the Spindle Planet Gears (48). Grease the assembled Spindle Planet Gears and Bearings and install them on the pins of the Spindle.
10. **For J, JJ, K, L or R ratio,** grease the bearings and gears of the Spindle Planet Gear Assemblies (46) and install them on the pins of the Spindle.
11. **For R ratio,** install the Gear Head Spacer (53) in the Gear Case against the Spindle Planet Gears.
12. **For R ratio,** grease the splined hub of the Gear Head (54) 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.
13. **For R ratio,** grease the bearings and gears of the Gear Head Planet Gear Assemblies (55) and install them on the pins of the Gear Head.
14. **For H or J ratio,** grease the Rotor Pinion (51) and install it in the center of the Spindle Planet Gears. Make certain the teeth of the Pinion and Planet Gears mesh.
15. Using snap ring pliers, install the Gear Retainer (50) in the shallow internal groove in the Gear Case behind the Drive Plate, Spindle Planet Gears or Gear Head Planet Gears.
16. Thread the assembled Gear Case onto the assembled Motor Housing until it is hand tight. Make certain the gear teeth on the Spindle mesh with the gear teeth of the Rotor Pinion, Gear Head Planet Gears or Spindle Planet Gears.
17. Tighten the Gear Case between 30 to 35 ft-lb (41 to 47 Nm) torque.

NOTICE

Run the motor at free speed on low air pressure while final tightening the Gear Case. Listen while tightening to make certain the gears mesh properly.

18. **For H, J, JJ, K or L ratio,** install one Drill Chuck Spacer (66) onto the drill spindle.
    For R ratio, install two Drill Chuck Spacers (66) onto the drill spindle.
19. Thread the Drill Chuck (67) onto the drill spindle and tighten.
20. **For L or R ratio,** install the Dead Handle Adapter (68) and Dead Handle Assembly (69) onto the front end of the Gear Case. Tighten the Pinch Bolt (70) to 10 to 20 in. lb (1.4 to 2.3 Nm) torque.

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 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 **complete** 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.
	Improper lubrication or dirt build-up	Clean the Motor Unit parts and lubricate as instructed.
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 3cc of a clean, suitable cleaning solution in the air inlet and operate the tool for about 30 seconds. **Immediately** pour 3cc 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.

Related Documentation

For additional information refer to:
Product Safety Information Manual 04580353.
Product Information Manual 16572190.
Parts Information Manual 16572828.

Manuals can be downloaded from ingersollrandproducts.com

Notes

Notes

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