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Nonreversible and Reversible MULTI–VANE® Geared Motors

92N and 92R Series

Operations and Maintenance Information

Save These Instructions

Ingersoll-Rand

WARNING

General Product Safety Information

- **Read and understand this manual before operating this motor.**
- **It is your responsibility to make this safety information available to others that will operate this motor.**
- **Failure to observe the following warnings could result in injury.**

WARNING

- **Always operate, inspect and maintain this motor 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 motor at 90 psig (6.2 bar/620 kPa) air pressure at the inlet with 1-1/4" (32 mm) air supply hose.**
- **Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this motor.**
- **Do not use damaged, frayed or deteriorated air hoses and fittings.**
- **Keep hands, loose clothing and long hair away from rotating end of motor.**
- **Anticipate and be alert for sudden changes in motion during start up and operation of any motor.**
- **Motor shaft may continue to rotate briefly after the throttle is released.**
- **Do not lubricate motor 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.**
- **This motor is not designed for working in explosive atmospheres.**
- **This motor is not insulated against electric shock.**

Safety Symbol Identification

(Dwg. MHP2454)

(Dwg. MHP2455)

(Dwg. MHP0884)

Safety Information - Explanation of Safety Signal Words

DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.
NOTICE	Indicates information or a company policy that relates directly or indirectly to the safety of personnel or protection of property.

Lubrication

Always use an air line lubricator with these motors. We recommend the following Filter-Regulator-Lubricator Unit: **No. C31-08-600**.
Install the Unit as close to the Motor as practical. Keep the Lubricator filled with **Ingersoll-Rand** No. 50 Oil.

NOTICE

If a sight feed lubricator is used, adjust the lubricator to feed 60 drops per minute for continuous duty operation. **Whenever the power unit is disassembled**, work some **Ingersoll-Rand** No. 28 Grease into the Rear Rotor Bearing (5).

Use a good quality SAE 90 Gear Lubricant in the gear box. The amount of lubricant required is dependent upon the size of gear box and the mounting position of the Motor. **When lubricating the gear box**, refer to Drawing TPB490 showing the various mounting positions and the fill plugs, vent plug and drain plug. In each case, fill the gear chamber up to the "Level" plug. If the Vent Plug (40) is not located at the position indicated for a given mounting, relocate the Vent Plug by interchanging it with the pipe plug at that location. **Whenever a Series 92NB or 92RB Motor is mounted with the Motor Shaft (36) pointing toward the floor or ceiling**, you must install a gravity feed lubrication to make certain the gears in the upper portion of the gear box get adequate lubrication. To do this, remove one of the pipe plugs other

than the Vent plug from the upper side of the motor and connect an oil line from a gravity feed reservoir. Connect an overflow line to the Level Plug opening and run it to a pump to return the lubricant to the gravity feed reservoir.

If the Motor is mounted in any position other than that illustrated, contact an **Ingersoll-Rand** Representative for oil level and venting recommendations.

Direction of Shaft Rotation

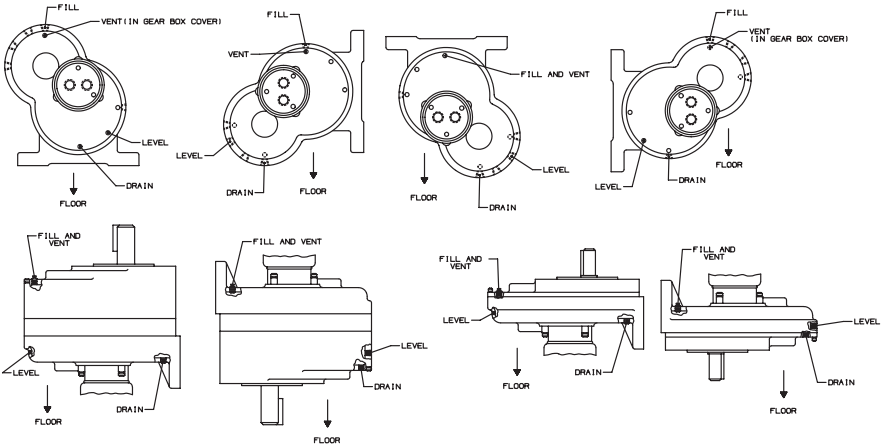
Series 92N Non–reversible Motors are assembled at the factory so that the Motor Shaft (36) rotates counterclockwise when facing the end of the Shaft. When desired, the direction of the shaft rotation can be changed as follows:

1. Stand the Motor upright on a workbench with the Motor Housing Cover (1) upward and secure it in position by clamping the base with a C–clamp.
2. Remove the four Housing Cover Cap Screws (2).
3. Being careful not to damage the Cylinder Seals (8A), pull the Motor Housing Cover and the Motor Housing (11) off the Gear Box (18).
4. Grasp the Cylinder (8) with both hands and carefully work the motor from the Gear Box.
5. While holding the Cylinder with one hand, drive against the splined end of the Rotor (12) with a soft hammer until the Front Rotor Bearing (13) comes free from the rotor shaft.
6. Withdraw the Front Rotor Bearing, Front Rotor Bearing Spacer Assembly (14) and Front End Plate (7).
7. Withdraw the Cylinder (8), turn it end–for–end, and slide it back over the Rotor.
8. Install the Front End Plate, Front Rotor Bearing Spacer Assembly and Front Rotor Bearing.

NOTICE

Press against the inner ring of the Bearing when pressing the Front Rotor Bearing on the rotor shaft.

9. Align the dowel hole in both End Plates and Cylinder, and insert the Cylinder Dowel (9) so that it protrudes from the Rear End Plate.
10. Place the Housing Cover Gasket (4) in the recess in the Housing Cover so that the dowel notch in the Gasket is aligned with the dowel hole in the Cover.
11. Set the motor assembly in the Cover so that the Cylinder Dowel enters the dowel hole.
12. Slide the Motor Housing (11) over the Cylinder and against the Motor Housing Cover.
13. Place the Gear Box Gasket (17) on the face of the Front End Plate.
14. Pick up the entire assembly and being careful not to damage the Cylinder Seals, work it into the pilot recess in the gear box.
15. Install the Housing Cover Cap Screws and, with the Motor running at a slow speed using air pressure of 30 to 40 psig (2.07 to 2.76 bar/207 to 276 kPa), alternately tighten the Screws to 28 to 31 ft–lb. (38.0 to 42.0 Nm) torque.

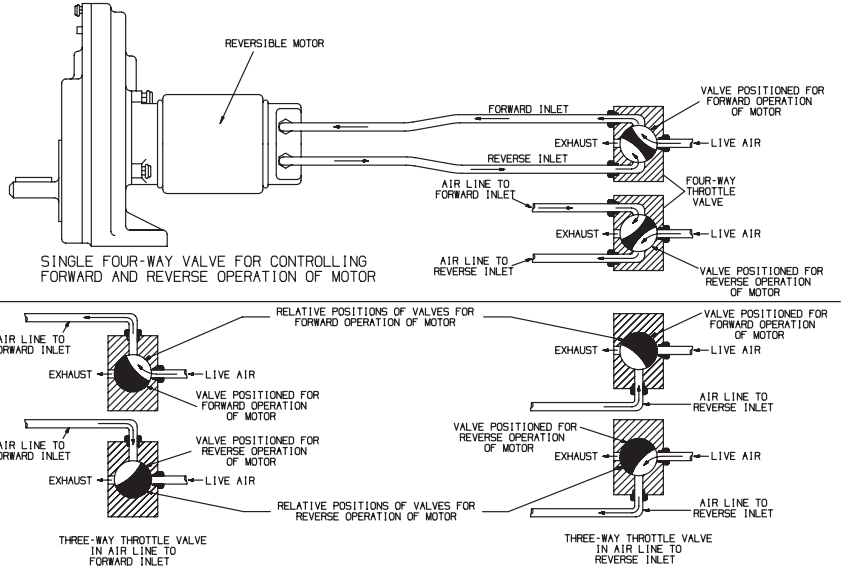


(Dwg. TPB490)

Reversible Motor Applicatons Air Flow Information

NOTICE

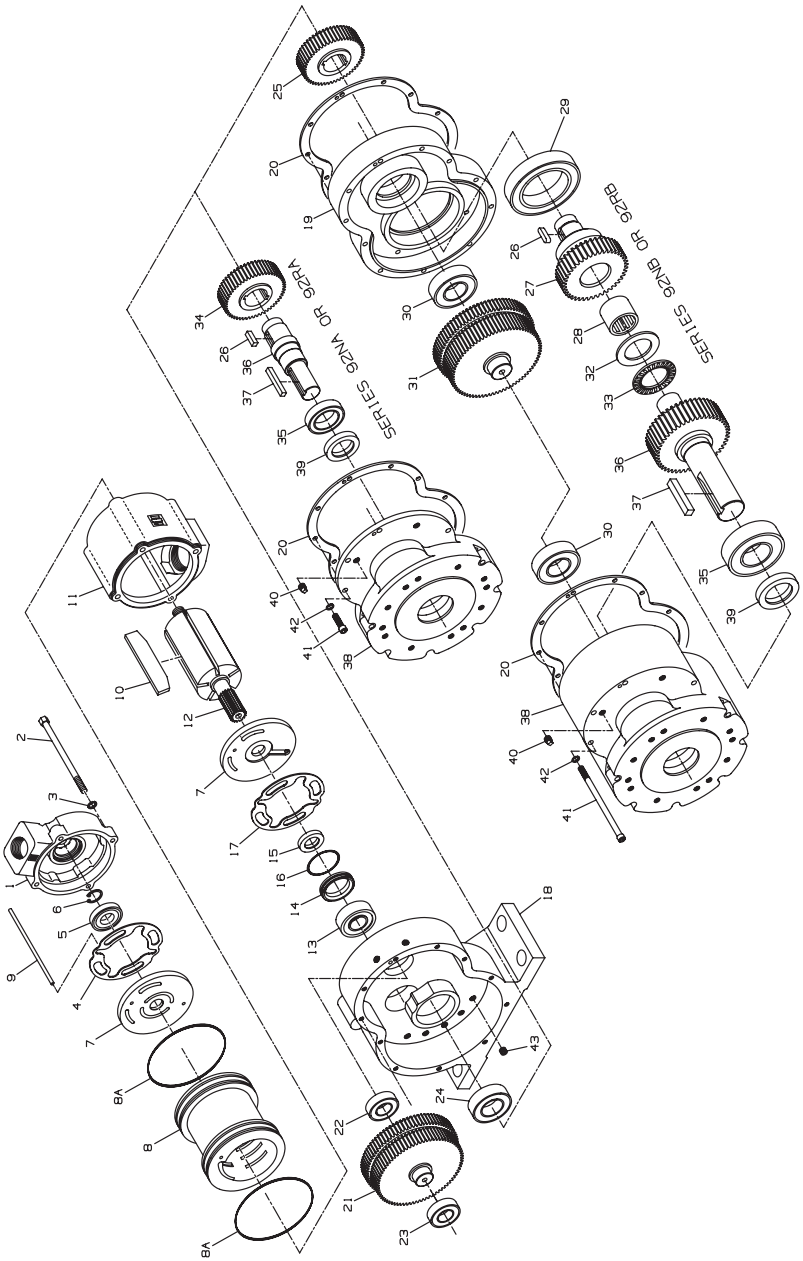
When these motors are used on applications requiring a reversible motor, a 4–way throttle valve or two 3–way throttle valves must be used in the air supply line in accordance with the following schematic diagram (TPB491).
When the application requires a non–reversible motor, a 2–way inline valve can be used in the air supply line. In either case, the inlet and outlet of the valve must be equal in size, and preferably one size larger, than the inlet of the motor.



(Dwg. TPB491)

Notes

92N and 92R Series Exploded Diagram



(Dwg. TPA551-1)

92N and 92R Series Parts List

Sl. No.	Description	Part Number
1	Motor Housing Cover	
	for Series 92N	92N-102
	for Series 92R	92R-102
2	Short Housing Cover Cap Screw (4 for 92N; 2 for 92R)	12BMP-634
*	Long Housing Cover Cap Screw (2 for 92R)	107-25
3	Copper Seal Washer (4)	D02-504
• 4	Motor Housing Cover Gasket	92R-283
• 5	Rear Rotor Bearing	92RMG10-22
6	Rear Rotor Bearing Retainer	R380Q-6
7	End Plate (2)	92RMG10-11
8	Cylinder Assembly	
	for Series 92N	92RMG10-A3
	for Series 92R	92R-A3
8A	Cylinder Seal (2)	92RMG10-103
9	Cylinder Dowel	92R-98
• 10	Vane Packet (set of 5 Vanes)	R5H-42-5
11	Motor Housing	92N-40
12	Rotor	92N-53
• 13	Front Rotor Bearing	T02-33
14	Front Rotor Bearing Spacer Assembly	92N-A65
• 15	Front Rotor Seal	48N-758
• 16	Bearing Spacer Seal	AF160-294
• 17	Gear Case Gasket	92R-283
	Gear Box Assembly	
	for Model 92NA005 or 92RA005	92NA-A750-005
	for Model 92NA008 or 92RA008	92NA-A750-008
	for Model 92NA011 or 92RA011	92NA-A750-011
	for Model 92NA014 or 92RA014	92NA-A750-014
	for Model 92NA017 or 92RA017	92NA-A750-017
	for Model 92NA022 or 92RA022	92NA-A750-022
	for Model 92NB029 or 92RA029	92NB-A750-029
	for Model 92NB036 or 92RA036	92NB-A750-036
	for Model 92NB045 or 92RA045	92NB-A750-045
	for Model 92NB078 or 92RA078	92NB-A750-078
18	Gear Box	92NA-750
19	Gear Box Frame (for Series 92NB or 92RB)	48NB-763
• 20	Gear Box Gasket	48NA-752
21	First Stage Intermediate Gear	
	for Model 92NA005 or 92RA005	48NA-755-005
	for Model 92NA008 or 92RA008	48NA-755-008
	for Model 92NA011 or 92NA011	48NA-755-011
	for Model 92NA014 or 92RA014	48NA-755-014
	for Model 92NA017 or 92RA017	48NA-755-017
	for Model 92NA022 or 92RA022	48NA-755-022
	for Series 92NB or 92RB	
• 22	First Stage Intermediate Gear Rear Bearing	R1AP-97
• 23	First Stage Intermediate Gear Front Bearing	R38P-97
• 24	Motor Shaft Rear Bearing or Intermediate Gear Pinion Rear Bearing	48NA-510
25	Second Stage Intermediate Gear (for Series 92NB or 92RB)	48NA-756-022
26	Second Stage Intermediate Gear Key or Motor Shaft Gear Key (2)	R4H-410
27	Intermediate Gear Pinion	
	for Model 92NB029 or 92RB029	48NB-760-029
	for Model 92NB036 or 92RB036	48NB-760-036
	for Model 92NB045 or 92RB045	48NB-760-045
	for Model 92NB078 or 92RB078	48NB-760-078
• 28	Intermediate Gear Pinion Roller Bearing (for Series 92NB or 92RB)	48NB-765
• 29	Intermediate Gear Pinion Front Bearing (for Series 92NB or 92RB)	48NB-764
• 30	Third Stage Intermediate Gear Bearing (for Series 92NB or 92RB)(2)	C6H20A-518
31	Third Stage Intermediate Gear	
	for Model 92NB029 or 92RB029	48NB-761-029
	for Model 92NB036 or 92RB036	48NB-761-036
	for Model 92NB045 or 92RB045	48NB-761-045
	for Model 92NB078 or 92RB078	48NB-761-078

92N and 92R Series Parts List (Continued)

Sl. No.	Description	Part Number
• 32	Motor Shaft Thrust Bearing Race	
	for Series 92NB or 92RB	48NB-767
• 33	Motor Shaft Thrust Bearing	
	for Series 92NB or 92RB	48NB-769
34	Motor Shaft Gear	
	for Model 92NA005 or 92RA005	48NA-756-005
	for Model 92NA008 or 92RA008	48NA-756-008
	for Model 92NA011 or 92RA011	48NA-756-011
	for Model 92NA014 or 92RA014	48NA-756-014
	for Model 92NA017 or 92RA017	48NA-756-017
	for Model 92NA022 or 92RA022	48NA-756-022
• 35	Motor Shaft Front Bearing	
	for Series 92NA or 92RA	C6H20A-518
	for Series 92NB or 92RB	48NB-766
36	Motor Shaft	
	for Series 92NA or 92RA	48NA-757-4
	for Model 92NB029, 92RB029, 92NB036, 92RB036, 92NB045, or 92RB045	48NB-762-029
	for Model 92NB078 or 92RB078	48NB-762-078
37	Motor Shaft Key	
	for Series 92NA or 92RA	107-54
	for Series 92NB or 92RB	R5H51-768
38	Gear Box Cover Assembly	
	for Series 92NA or 92RA	48NA-A751
	for Series 92NB or 92RB	48NB-A751
• 39	Motor Shaft Seal	
	for Series 92NA or 92RA	48NA-759
	for Series 92NB or 92RB	48NB-759
40	Vent Plug	48NA-368
41	Gear Box Cover Cap Screw (11)	
	for Series 92NA or 92RA	R0H-354-4
	for Series 92NB or 92RB	48NB-354
42	1/4 Lock Washer (11)	8U-58
43	Oil Plug (12 for Series 92NB or 92RB; 11 for others)	R2-227
*	Nameplate	92N-301
*	Nameplate Screw (3)	20BM-302

* 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 motors in service.

Maintenance Section

Disassembly

General Instructions

1. Do not disassemble the motor any further than necessary to replace or repair damaged parts.
2. Do not disassemble the motor unless you have a complete set of new gaskets and O–rings for replacement.
3. When grasping a motor or part in a vise,always use leather–covered or copper–covered vise jaws to protect the surface of the part or motor and help prevent distortion. This is particularly true of threaded members and housings.
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 repairs or replacement.
5. 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 Motor

1. Remove the Vent Plug (40) and positioning the Drain Plug (43) over a container, remove the Drain Plug and drain the lubricant from the Gear Box (18). Clamp the mounting foot of the Gear Box to the work bench.
2. Remove the Housing Cover Cap Screws (2) and Washers (3).
3. Grasp the Motor Housing (11) and Motor Housing Cover (1) and separate the motor parts from the Gear Box.
4. Separate the Motor Housing Cover from the Motor Housing and being careful not to damage the Cylinder Seals (8A), grasp the spline end of the Rotor (12) and pull the assembled motor out of the Motor Housing.
5. Pull the Front Rotor Bearing (13), Front Rotor Bearing Spacer Assembly (14) and Front End Plate (7) off the hub of the Rotor.
6. Peel the Gear Case Gasket (17) from the End Plate. If portions of the Gasket remain adhered to the End Plate, use a scrapper made from a non–damaging material such as nylon, to scrap the Gasket and adhesive from the End Plate.
7. Pull the Cylinder (8) and Cylinder Dowel (9) off the Rotor and remove the Vanes (10) from the vane slots in the Rotor.
8. Remove the two Cylinder Seals (8A) from the grooves in the large flanges of the Cylinder.
9. Using snap ring pliers, remove the Rear Rotor Bearing Retainer (6) and pull the Rear Rotor Bearing (5) and End Plate off the rear hub of the Rotor.
10. Peel the Motor Housing Cover Gasket (7) from the End Plate. If portions of the Gasket remain adhered to the End Plate, use a scrapper made from a non–damaging material such as nylon, to scrap the Gasket and adhesive from the End Plate.

Disassembly of Series 92NA and 92RA Gearing

1. Unscrew and remove the eleven Gear Box Cover Cap Screws (41) and Lock Washers (42).
2. Remove the Motor Shaft Key (37) and lay the assembled gear box on a workbench with the Motor Shaft (36) upward.
3. Carefully separate the Gear Box Cover Assembly (38) from the Gear Box (18) and set it aside. If the Intermediate Gear (21) remains with the Gear Box Cover, make certain it does not drop onto any hard surfaces or other gearing.
4. Remove the Gear Box Gasket (20).
5. Lift the Intermediate Gear out of the Gear Box. Pull the First Stage Intermediate Gear Rear Bearing (22) and First Stage Intermediate Gear Front Bearing (23) off the hubs of the Intermediate Gear. If the Bearings are frozen on the hubs, use a bearing puller to remove them.
6. Push the assembled Motor Shaft out of the Gear Box Cover Assembly.
7. Pull the Motor Shaft Rear Bearing (24) off the rear hub of the Motor Shaft.
8. Pull the Motor Shaft Front Bearing (35) off the front hub of the Motor Shaft.
9. Using a gear puller, pull the Motor Shaft Gear (34) off the rear of the Motor Shaft. Remove the two Shaft Keys (26).
10. Using a hooked tool, pull the Motor Shaft Seal (39) out of the Gear Box Cover.

Disassembly of Series 92NB and 92RB Gearing

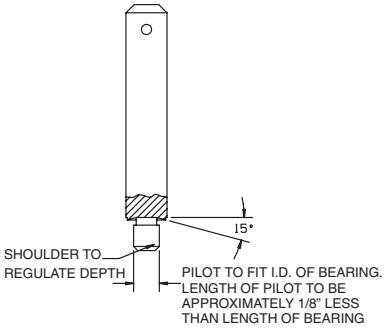
1. Unscrew and remove the eleven Gear Box Cover Cap Screws (41) and Lock Washers (42).
2. Remove the Motor Shaft Key (37) and lay the assembled gear box on a workbench with the Motor Shaft (36) upward.
3. Grasp the Gear Box Frame (19) and carefully separate the assembled Frame and Gear Box Cover Assembly (38) from the Gear Box (18) and set it aside. If the First Stage Intermediate Gear (21) remains with the Gear Box Frame, make certain it does not drop onto any hard surfaces or other gearing.
4. Remove the Gear Box Gasket (20).
5. Lift the First Stage Intermediate Gear out of the Gear Box. Pull the First Stage Intermediate Gear Rear Bearing (22) and First Stage Intermediate Gear Front Bearing (23) off the hubs of the Intermediate Gear. If the Bearings are frozen on the hubs, use a bearing puller to remove them.
6. Carefully separate the Gear Box Cover Assembly from the Gear Box Frame and remove the Gear Case Gasket. Be careful not to allow the Motor Shaft Thrust Bearing Race (32) or the Motor Shaft Thrust Bearing (33) to slide off the Motor Shaft and become damaged.
7. Remove the Third Stage Intermediate Gear (31) and the two Third Stage Intermediate Gear Bearings (30) from either the Gear Box Frame or the Gear Box Cover Assembly. Pull the two Bearings from the shafts of the Gear. If the Bearings are frozen on the shafts, use a bearing puller to remove them.
8. Pull the Intermediate Gear Pinion Rear Bearing (24) off the rear hub of the Intermediate Gear Pinion (27).
9. Using a gear puller, pull the Second Stage Intermediate Gear (25) from the rear hub of the Intermediate Gear Pinion. Remove the two Shaft Keys (26).
10. Push the Intermediate Gear Pinion out the motor shaft end of the Gear Box Frame.
11. Pull the Intermediate Gear Pinion Front Bearing (29) off the Pinion and if the Intermediate Gear Pinion Roller Bearing (28) must be replaced, pull it from the Pinion.
12. If the Motor Shaft Thrust Bearing and Bearing Race have not been removed, remove them from the Shaft.
13. Push the assembled Motor Shaft out of the Gear Box Cover Assembly.
14. Pull the Motor Shaft Front Bearing (35) off the front hub of the Motor Shaft.
15. Using a hooked tool, pull the Motor Shaft Seal (39) out of the Gear Box Cover.

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 not to damage threads or distort housings.
4. Except for bearings, 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 clean suitable solution and dry with a clean cloth. Sealed or shielded bearings should not be cleaned. Work grease into every bearing before installation.
6. Apply a film of O–ring lubricant to every O–ring before installation.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing a needle bearing into a recess. Use a bearing inserting tool similar to the one shown in Dwg. TPD786.

NEEDLE BEARING INSERTING TOOL



(Dwg. TPD786)

Assembly of Series 92NB and 92RB Gearing

1. Using a bearing inserting tool, press the Intermediate Gear Pinion Roller Bearing (28) into the Intermediate Gear Pinion (27).
2. Using a piece of tubing that contacts the outer ring of the Intermediate Gear Pinion Bearing (29), press the Bearing into the large bearing recess in the spindle side of the Gear Box Frame (19).
3. Insert the shaft of the Intermediate Gear Pinion through the Bearing and Frame, and rest the assembly on the table of an arbor press with the pinion shaft upward and the gear end face of the pinion supported.
4. Insert the two Second Stage Intermediate Gear Keys (26) into the slots in the shaft and press the Second Stage Intermediate Gear (25) onto the pinion shaft capturing the Gear Box Frame within the assembly.
5. Using a piece of tubing that contacts the inner ring of the Third Stage Intermediate Gear Bearing (30), press a Bearing onto each shaft of the Third Stage Intermediate Gear (31).
6. Place the assembled Gear Box Frame on a workbench with the roller bearing end of the Pinion upward.
7. Position the Bearing nearest the large spline on the shaft of Third Stage Intermediate Gear above the bearing recess in the Gear Box Frame. Engage the large spline of the Gear with the spline of the Pinion while pushing the Bearing into the recess.
8. Using a piece of tubing that contacts the inner ring of the Motor Shaft Front Bearing (35), press the Bearing onto the output end of the Motor Shaft (36).
9. Install the Motor Shaft Thrust Bearing (33) followed by the Motor Shaft Thrust Bearing Race (32) onto the opposite end of the Motor Shaft and insert the assembled Shaft, Bearing Race leading, into the Pinion Roller Bearing.
10. Place one of the Gear Box Gaskets (20) onto the Gear Box Frame making certain the Gasket fits over the alignment pin in the Frame and fits well around the large, raised alignment hub.
11. Using a dowel, push the Motor Shaft Seal (39), small opening leading, into the recess in the Gear Box Cover Assembly (38).
12. Position the Cover over the Box Frame and install the Seal on the Motor Shaft by bringing the Cover down against the Gasket. Make certain the alignment pin and hub on the Frame enter the hole and recess in the Cover.
13. Turn the assembly over so that the output end of the Motor Shaft is downward.
14. Using a piece of tubing that contacts the inner ring of the First Stage Intermediate Gear Front Bearing (23), press the Bearing onto the shaft adjacent to the small spline of the First Stage Intermediate Gear (21).
15. Using a piece of tubing that contacts the inner ring of the First Stage Intermediate Gear Rear Bearing (22), press the Bearing onto the shaft adjacent to the large spline of the First Stage Intermediate Gear (21).
16. Position the Bearing nearest the smaller spline on the shaft of the First Stage Intermediate Gear above the bearing recess in the Gear Box Frame. Engage the smaller spline of the Gear with the spline of the Second Stage Intermediate Gear while pushing the Bearing into the recess.
17. Using a piece of tubing that contacts the inner ring of the Intermediate Gear Pinion Rear Bearing (24), press a Bearing onto the shaft of the Intermediate Gear Pinion.
18. Place the remaining Gear Box Gasket onto the Gear Box Frame making certain the Gasket fits over the alignment pin in the Frame and fits well around the large, raised alignment hub.
19. Position the Gear Box (18) over the assembly and bring the Gear Box down against the Gasket while making sure the Bearings enter the bearing recesses in the Gear Box. Make certain the alignment pin and hub on the Frame enter the hole and recess in the Gear Box.
20. While keeping the assembly together, turn it over and insert the eleven Gear Box Cover Cap Screws (41) with their Lock Washers (42) through the holes of the Cover and Frame and into the Gear Box. Tighten the Screws evenly, a little at a time, using an alternating pattern. Use the Screws to draw the assembly together without distortion and without binding.

Assembly of Series 92NA and 92RA Gearing

1. Insert the two Motor Shaft Gear Keys (26) into the slots in the Motor Shaft (36) and press the Motor Shaft Gear (34) onto the Motor Shaft.
2. Using a dowel, push the Motor Shaft Seal (39), small opening leading, into the recess in the Gear Box Cover Assembly (38).
3. Using a piece of tubing that contacts the inner ring of the Motor Shaft Front Bearing (35), press the Bearing onto the output end of the Motor Shaft.
4. Using a piece of tubing that contacts the inner ring of the Motor Shaft Rear Bearing (24), press a Bearing onto the motor end of the Motor Shaft.
5. Insert the output end of the Motor Shaft through the Motor Shaft Seal and push it into the into the gear Box Cover Assembly until the Motor Shaft Front Bearing seats in the bearing recess.

6. Using a piece of tubing that contacts the inner ring of the First Stage Intermediate Gear Front Bearing (23), press the Bearing onto the shaft adjacent to the small spline of the First Stage Intermediate Gear (21).
7. Using a piece of tubing that contacts the inner ring of the First Stage Intermediate Gear Rear Bearing (22), press the Bearing onto the shaft adjacent to the large spline of the First Stage Intermediate Gear (21).
8. Place the Gear Box Cover Assembly on a workbench with the output end of the Motor Shaft downward.
9. Position the Bearing nearest the smaller spline on the shaft of the First Stage Intermediate Gear above the bearing recess in the Gear Box Cover. Engage the smaller spline of the Gear with the spline of the Motor Shaft Gear while pushing the Bearing into the recess.
10. Place the Gear Box Gasket (20) onto the Gear Box Cover making certain the Gasket fits over the alignment pin in the Cover and fits well around the large, raised alignment hub.
11. Position the Gear Box (18) over the assembly and bring the Gear Box down against the Gasket while making sure the Bearings enter the bearing recesses in the Gear Box. Make certain the alignment pin and hub on the Frame enter the hole and recess in the Gear Box.
12. While keeping the assembly together, turn it over and insert the eleven Gear Box Cover Cap Screws (41) with their Lock Washers (42) through the holes of the Cover into the Gear Box. Tighten the Screws evenly, a little at a time, using an alternating pattern. Use the Screws to draw the assembly together without distortion and without binding.

Motor Assembly

1. The Gear Case Gasket (17) has adhesive on one side of the Gasket. Place one End Plate (7) flat on a clean surface with the face having the channel going from the central opening to the outer edge upward. Orient the Gasket to the End Plate, making certain the cylinder dowel hole openings align, and attach it to the End Plate by bringing the gasket adhesive into contact with the face of the End Plate. Press it flat onto the face.
2. Slip the End Plate, gasket face trailing, onto the spline end of the Rotor (12).
3. Install the Front Rotor Bearing Spacer Assembly (14) and the Front Rotor Bearing (13) onto the splined shaft of the Rotor and against the End Plate. If the Bearing is a tight fit on the shaft, use a piece of tubing that contacts the inner ring of the Bearing and clears the rotor shaft to press the Bearing onto the shaft.
4. While holding the Rotor in a vertical position, grasp the spline in copper–covered vise jaws.
5. Place a Vane (10) in each vane slot.
6. Install new Cylinder Seals (8A) in the grooves in the large hubs of the Cylinder (8).
7. For Series 92N Non–reversible Motors, the direction of rotation of the Motor depends on the relationship of the Cylinder and End Plates. To obtain desired shaft rotation, proceed as follows:
   a. Rotate the End Plate until the 17/64” (6.75 mm) through hole (dowel hole) is facing you. Note there is a similar hole extending lengthwise through the Cylinder, and at about 40 to one side of the hole is an air port.
   b. Hold the Cylinder upright, facing the dowel hole and with the air port to the right for clockwise shaft rotation, to the left for counterclockwise shaft rotation. Then place it over the Rotor so that the dowel hole in the Cylinder and End Plate are in alignment. For Series 92R Reversible Motors, place the Cylinder over the Rotor so that the dowel hole in the Cylinder and End Plate are in alignment.
8. The Gear Case Gasket has adhesive on one side of the Gasket. Place the remaining End Plate flat on a clean surface with the face having the channel going from the central opening to the outer edge upward. Orient the Gasket to the End Plate, making certain the cylinder dowel hole openings align, and attach it to the End Plate by bringing the gasket adhesive into contact with the face of the End Plate. Press it flat onto the face.
9. Install the End Plate, Gasket side trailing, onto the short hub of the Rotor. Rotate it so that the cylinder dowel hole is aligned with the corresponding hole in the Cylinder. Insert the Cylinder Dowel (9) to maintain the alignment with the Dowel protruding through the Rear End Plate.
10. Slide the Rear Rotor Bearing (5) on the short hub of the Rotor and against the End Plate. Using snap ring pliers, install the Rear Rotor Bearing Retainer (6) to keep the Bearing and End Plate in position.
11. Position the Motor Housing Cover (1) over the Rear Rotor Bearing and End Plate. Make certain the cylinder dowel holes and porting are aligned correctly. Remove the assembly from the vise jaws.
12. Carefully slide the Motor Housing (11) over the assembled motor and position it against the Motor Housing Cover.
13. Position the assembled Gear Box (18) against the face of the Motor Housing. Make certain the spline of the Rotor engages the teeth of the First Stage Intermediate Gear(21) properly.
14. Install the Housing Cover Cap Screws (2) along with the Washers (4). With the motor running at a slow speed (30 to 40 psig) (267 to 276 kPa) alternately tighten the Screws to 28 to 31ft–lb. (38.0 to 42.0 Nm) torque.

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