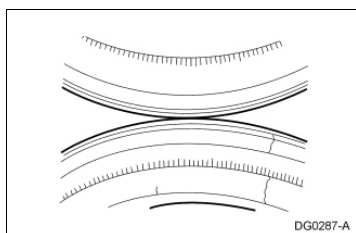


11. Check the seal for heat damage (bottom view). If the seal is stiff and brittle, and not pliable like the new seal (top view), it is probably heat damaged. Determine and fix the cause of excessive heat in the power steering system.

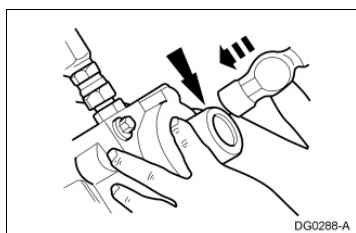


Installation

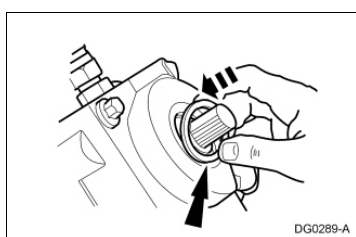
1. Apply grease between the seal lips on the inside diameter of the new input shaft seal and place it over the input shaft, garter spring side first.
2. **NOTICE: Do not use a socket to install the input shaft seal. If a socket is used, seal installation depth may be incorrect, possibly causing a fluid leak.**

Place a suitable input seal installer tool, such as Kent-Moore J37073, over the input shaft and against the seal, small diameter end first.

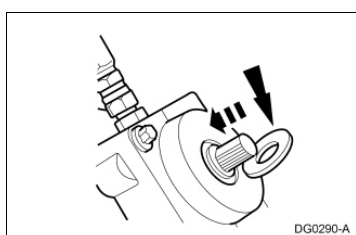
- Tap the seal installer tool until the tool shoulder is square against the valve housing.
- Remove any seal material that may have sheared off in the seal bore or retaining ring groove.



3. Insert a new retaining ring into the groove.



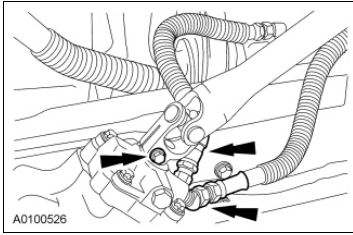
4. Apply grease to a new dirt and water seal and install it over the input shaft.
 - Pack the end of the valve housing bore around the input shaft with front axle and wheel bearing grease.
 - Seat the seal in the groove behind the serrations and against the valve housing.



5. **NOTE:** Always install a new steering column shaft pinch bolt.

Connect the steering column shaft and install a new steering column pinch bolt.

- Tighten to 55 Nm (41 lb-ft).



6. Connect the return hose-to-steering gear fitting.

- Tighten to 62 Nm (46 lb-ft).

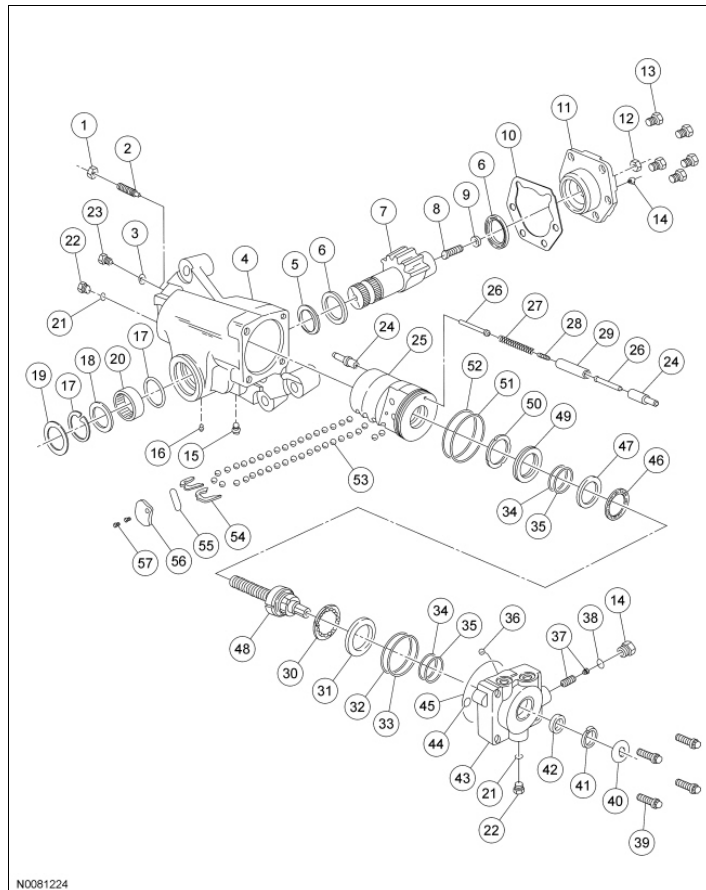
7. Carry out the Start Up Procedure After Pump/Gear Overhaul as outlined in this section.

Steering Gear

Material

Item	Specification
High Temperature 4x4 Front Axle and Wheel Bearing Grease XG-11	WSS-M1C267-A1
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

Power Steering Gear



Item	Part Number	Description
1	3610	Service sealing jam nut (part of service adjusting screw kit)
2	3577	Service poppet adjusting screw (part of service adjusting screw kit)

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3	-	Washer (stop screw) (part of 3548)
4	3548	Housing
5	3E560	Washer (spacer)
6	3557	Seals, output
7	3575	Sector shaft
8	3E617	Adjusting screw (shaft)
9	3575	Retainer (adjusting screw)
10	3581	Gasket (side cover)
11	3583	Side cover and bushing assembly
12	3583	Sector shaft adjusting screw jam nut
13	3E613	Special bolt (side cover) (6 required)
14	3E561	Relief valve cap/vent plugs
15	-	Plug (auto bleed) (part of 3548)
16	-	Grease fitting (part of 3548)
17	-	Retaining rings (part of 3E501)
18	3D519	Dirt seal
19	3738	Dirt and water seal (trunnion)
20	3B614	Roller bearings
21	-	O-rings (auxiliary port plug) (part of 3548)
22	-	Auxiliary port plugs (part of 3548)
23	-	Fixed stop screw (poppet) (part of 3548)
24	3E623	Poppet and sleeve assembly (2 required)
25	3K748	Rack piston
26	3E622	Poppets (2 required)
27	3E624	Poppet spring
28	3K651	Spacer rod
29	3E625	Push tube
30	-	Ball bearing assembly - valve worm (part of 3D517)
31	3321	Thrust washer (thick) (alternate construction)
32	-	Seal ring (part of 3E501)
33	-	O-ring (valve housing) (part of 3E501)
34	-	Seal rings (part of 3E501)
35	3754	O-rings
36	3E614	Check ball (float valve gear) (alternate construction)
37	3K527	Relief valve (2-piece)
38	3589	O-ring (relief valve)
39	3E617	Bolt (4 required) (valve housing)
40	3K665	Dirt and water seal (input)
41	3C617	Retaining ring
42	3D631	Seal (input shaft)
43	3D517	Valve housing
44	3329	Seal ring (valve housing)
45	-	Seal ring (valve housing) (part of 3E501)
46	3B673	Thrust bearing (2 required)

47	3321	Thrust washer (thin)
48	3D517	Input shaft, valve, worm assembly
49	3K653	Bearing adjuster
50	-	Bearing adjuster lock nut (part of 3E501)
51	3B541	Teflon® seal ring (rack piston)
52	3B541	O-ring (backup, rack piston)
53	3647	Ball
54	3523	Ball return guide half (2 required)
55	-	Seal (ball return guide cap) (part of 3E501)
56	-	Ball return guide cap (alternate construction) (part of 3E501)
57	-	Ball return guide Torx® screw (2 required) (cap) (part of 3E501)

Disassembly

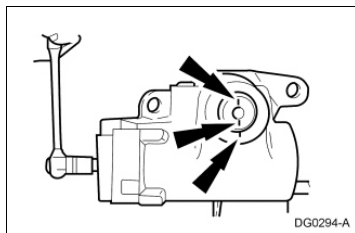
1. **NOTICE:** Do not clamp against the body of the housing as this may damage the housing and cause difficulties during the disassembly and assembly procedures. If mounting boss or flange is not accessible, fabricate and attach a mounting plate to the housing mounting bosses.

NOTE: Install all new seals, seal rings and gaskets every time the gear is disassembled.

Put the steering gear in a vise so that the input shaft is in a horizontal direction.

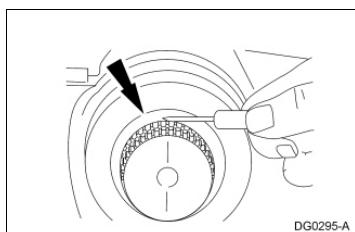
- Tighten the jaws of the vise on the mounting flange or the boss of the housing.

2. Put a pan under the steering gear, unplug the hydraulic ports on the gear and drain the fluid.
3. Use a 3/4-in or 11/16-in 12-point socket to rotate the input shaft and valve worm assembly until the timing mark on the end of the sector shaft is aligned with the timing mark on the end of the housing trunnion.



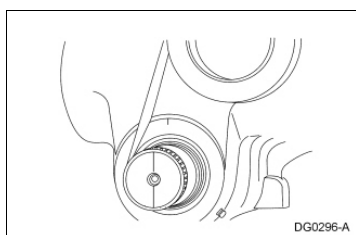
4. **NOTE:** Remove any paint or corrosion from the exposed area of the sector shaft with a fine grade of emery cloth.

Use a suitable tool, such as a small screwdriver, to remove the dirt and water seal from the housing trunnion.

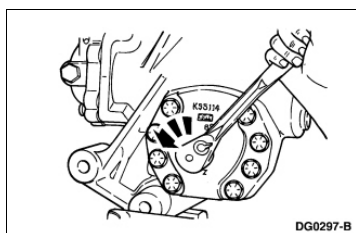


5. Tape the serrations and the bolt groove of the sector shaft with one layer of masking tape.

- The tape must not extend onto the diameter of the sector shaft bearing.

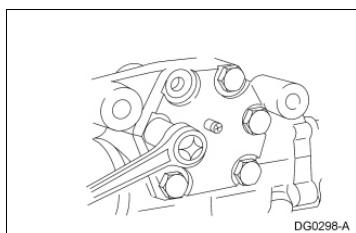


6. Remove the jam nut from the sector shaft adjusting screw.



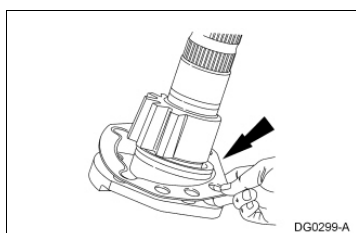
7. **NOTE:** The bolts that fasten the side cover to the housing are equipped with a ring or a washer under the head of the bolt. If one or more new bolts must be installed, use new bolts of the same design and length as the bolts being removed. Do not use a substitute.

Be prepared for more fluid drainage and remove the 6 bolts that fasten the side cover to the housing.



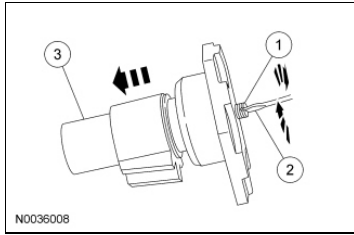
8. Remove the side cover and sector shaft assembly as a unit from the gear.

- If necessary, lightly tap on the end of the shaft with a soft mallet.
- Remove and discard the side cover gasket.



9. Remove the sector shaft.

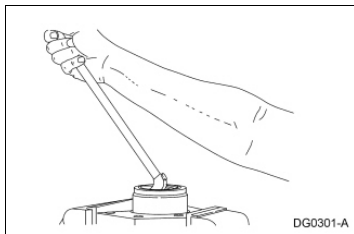
1. Remove and discard the relief valve cap/vent plug.
2. Remove the reverse threaded sector shaft adjusting screw by turning the screw clockwise through the side cover.
3. Pull the sector shaft out of the side cover.



10. **NOTICE:** Use care when removing the steering gear seal or damage to the bore or bushing may occur.

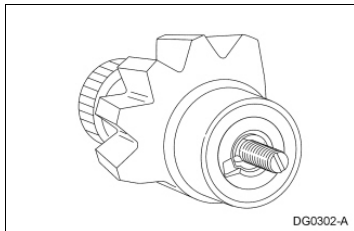
Remove the seal.

- Clamp the side cover in a vise.
- Place a standard 5/8-inch or 11/16-inch 3/8-drive socket in the center of the side cover.
- Pry the seal out with a rolling head pry bar using the socket for support.
- Discard the seal and remove the socket.



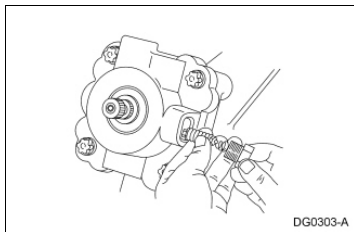
11. **NOTE:** The staked retainer must be locked in place and have no cracks. The adjusting screw must rotate by hand with no perceptible end play (lash).

Inspect the sector shaft assembly for damaged adjusting screw threads.

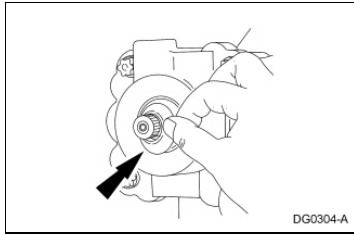


12. If a new adjusting screw is required, refer to Steering Gear Adjusting Screw and Retainer in this section. If no damage was noted, proceed to Step 13.

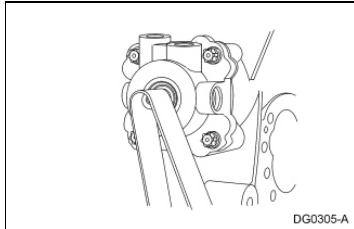
13. Remove the relief valve cap/vent cap, O-ring and 2-piece relief valve, if so equipped, from the valve housing. Discard the O-ring.



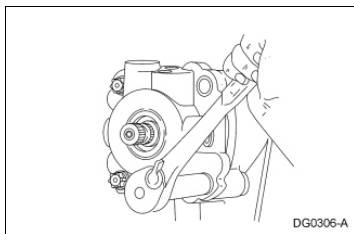
14. Remove and discard the dirt and water seal from the input shaft.



15. Clean any paint or corrosion from the exposed area of the input shaft.



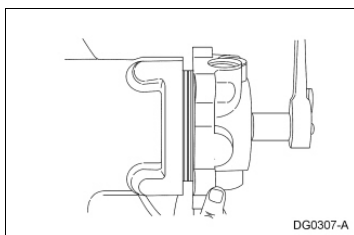
16. Remove the 4 Torx head valve housing bolts.



17. **NOTICE:** If the automatically set poppets are not to be removed or reset for automatic repositioning after the next installation, care must be used that the set position of the poppet adjuster seat and sleeve assembly is not disturbed. If disturbed, incorrect poppet automatic repositioning and damage to components may result. The steering gear must be identified to the vehicle from which it is removed and noted that the poppet adjuster seat and sleeve assemblies are set for that particular vehicle only.

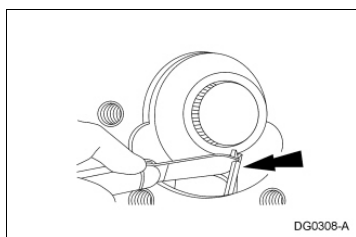
NOTE: Be prepared for more fluid drainage.

Remove the rack piston subassembly and place the assembly on a clean cloth.

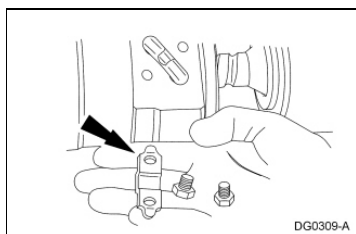


18. **NOTE:** If the Teflon® rack piston seal is on the end of the rack piston away from the rack piston bore opening, cut the seal. Remove the seal ring from the rack piston when it is exposed in the sector shaft cavity of the housing during the removal of the rack piston assembly, the input shaft valve, worm assembly and the valve piston. This prevents the seal from "hanging up" as it exits the housing sector shaft cavity.

Remove and discard the seal rings from the valve housing.

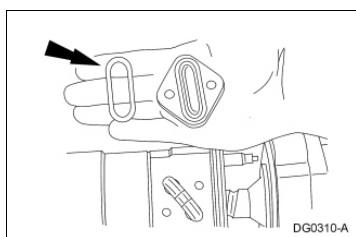


19. Remove the bolts and the clip and discard the clip.



20. **NOTE:** If a cap-type ball return guide is used, remove and discard the 2 special sealing screws that fasten the cap to the piston.

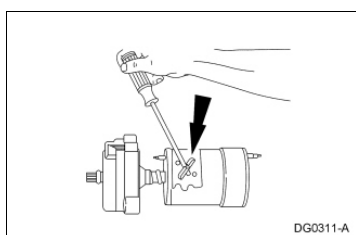
Remove the cap and the cap seal and discard the seal.



21. **NOTE:** Left ball return guide halves are copper-plated for identification and right guides are not plated.

NOTE: Make sure the rack piston is on a cloth so the steel balls that fall out will not roll very far.

Remove the ball return guide halves by carefully inserting a suitable tool, such as a screwdriver, between the rack piston and the guides.

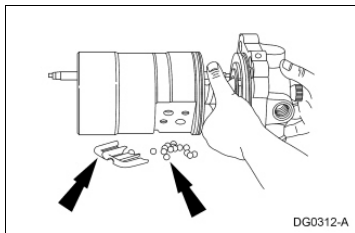


22. **⚠ WARNING:** The correct number of balls are required for correct gear operation. Count balls and insert each one carefully. Failure to follow this instruction may result in loss of steering control and serious injury to vehicle occupant(s).

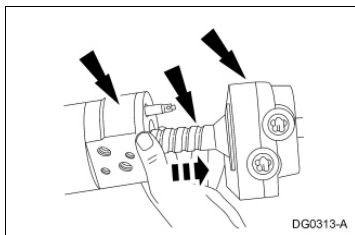
NOTE: If any of the balls are lost, service balls must be installed in their place. Number of factory balls installed: TAS40-29, TAS66-32.

Remove the steel balls from the rack piston by rotating the input shaft, valve and worm assembly until the balls fall out.

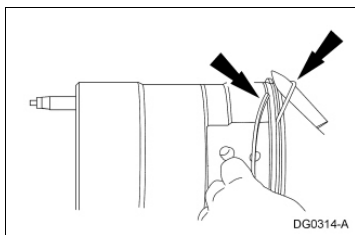
- Make sure all the balls have been removed.
- Count and record the number of balls removed.
- Place the balls and return guides in a cup or other container.



23. Remove the input shaft, valve worm and valve housing subassembly from the rack piston.



24. Cut and remove the Teflon® seal ring and the O-ring from the rack piston if not removed during Step 17.



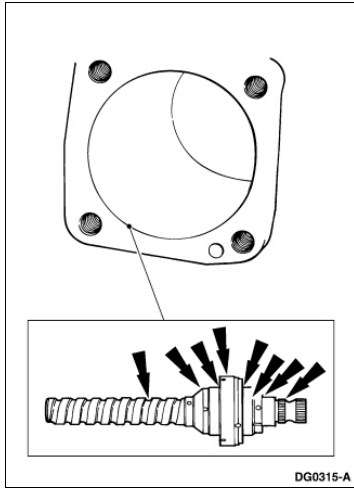
25. **NOTE:** TRW recommends the poppet adjuster seat and sleeve assemblies not be removed unless new poppet components are required.

Inspect the poppet stems and the seat and sleeve assemblies for damage.

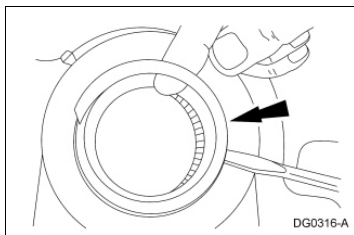
- Push the poppet stems; they should spring back.
- Push the poppet seat; it should **not** move by hand.
- If components are bent or broken, the poppet stems do not spring back or the poppet seat moves by hand, refer to Steering Gear Poppet Component Replacement in this section. Otherwise, proceed to Step 26.

26. Inspect the valve housing/worm screw subassembly for heat damage or bearing roughness.

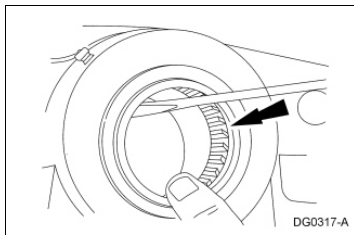
- If these conditions are present, if there is excessive internal leakage, or if preload adjustment is required, refer to Steering Gear Worm and Valve Sleeve in this section. If not, proceed to Step 27.



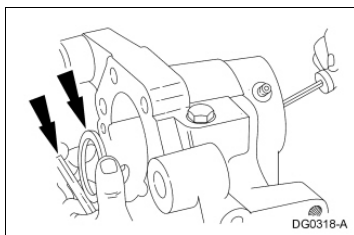
27. Remove the retaining ring that is closest to the output end of the housing trunnion.



28. Remove and discard the dirt seal from the housing trunnion.



29. Insert a suitable tool, such as a screwdriver, from the trunnion end of the housing and carefully push the seal and the spacer washer out of the other end of the housing without damaging the sealing area or the spacer washer and discard the seal.



30. Inspect the roller bearing in the housing for brinelling or spalling and inspect the retaining ring for damage.

- If either part must be installed new, refer to Steering Gear Housing Roller Bearing or Retaining Ring Replacement in this section. If not, proceed to Step 31.