





# TECHNICAL BULLETIN

NUMBER  
ST211-004  
(Issue 6)

## WARRANTY:



**NOTE:** Repair procedures are under constant review, and therefore times are subject to change; those quoted here must be taken as guidance only. Always refer to DDW to obtain the latest repair time.

DDW requires the use of causal part numbers. Labor only claims must show the causal part number with a quantity of zero.

<i>Description</i>	<i>SRO</i>	<i>Time (hrs)</i>	<i>Condition Code</i>	<i>Causal Part</i>
Replace power steering gear pinion oil seal - VIN M44998 to N13088	<b>57.91.33</b>	<b>3.9</b>		XR8 55205
Replace power steering gear pinion oil seal - VIN N13089 to N38511	<b>57.91.33</b>	<b>3.4</b>		XR8 55205


*Normal warranty policy and procedures apply.*

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## REPAIR PROCEDURE


### REPLACE STEERING GEAR PINION OIL SEAL

 **NOTE:** This procedure is not to be undertaken with the steering gear in the vehicle.


 **NOTE:** Global Technical Reference (GTR) lookup sequence is as follows: GTR Home > NAS > Service Information/ X200 – S-TYPE/2003 > Workshop Manuals > Bookmark "Chassis/Steering System/211-02: Power Steering/Removal and Installation" Link "Steering Gear (57.10.01)"

1. Refer to GTR section 211-02 Steering Gear operation 57.10.01 and remove the steering gear.


 **CAUTION:** Before disconnecting or removing components, ensure the immediate area around the joint faces and connections are clean. Plug open connections to prevent contamination. Ensure that working surfaces are thoroughly clean, to avoid contamination of the hydraulic components.

 **CAUTION:** To avoid potential damage to the steering gear, the soft jaws of vice must be clamped on the ribs of the gear housing. (Figure 1)

2. Position the steering gear in a vice equipped with soft jaws, ensuring the gear is clamped on the body ribs. (Figure 1)

 **WARNING:** Avoid excessive skin contact with mineral oil. Mineral oils remove the natural fats from the skin, leading to dryness, irritation and dermatitis.

3. Remove and discard the pinion shaft dust cap/centralization device. (Figure 2)

 **WARNING:** A small amount of fluid loss is unavoidable. An absorbent cloth or container should be positioned to collect the fluid.

 **CAUTION:** Always install clean plugs to open connections to prevent contamination.

4. Remove external hydraulic fluid pipes as follows:
  - Remove the securing plate bolt and plate at the pinion housing. (Figure 3)
  - Undo pipe union connections to rack body and remove the external fluid pipes.
5. Remove and discard the four O-ring seals.

Figure 1

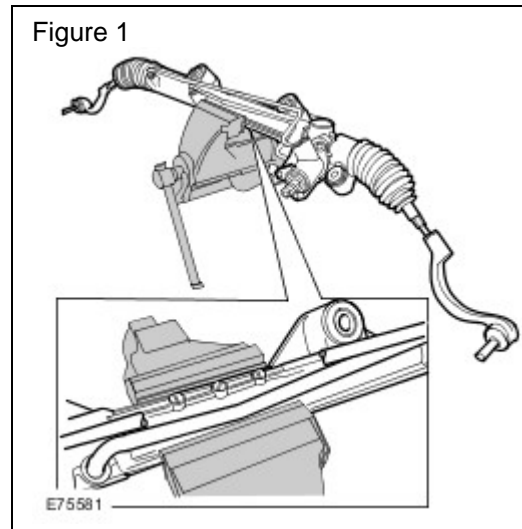


Figure 2

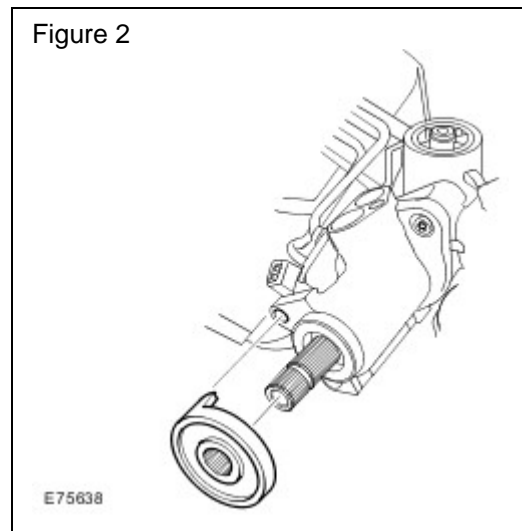
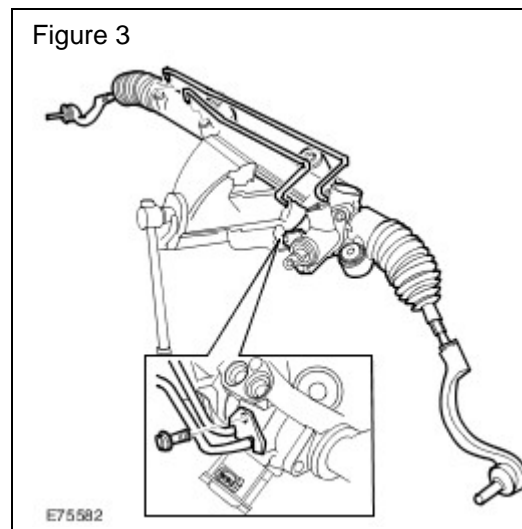


Figure 3



- Remove and discard the boot securing clip on the pinion end of the rack body and release the boot. (Figure 4)

**NOTE:** When installed, special tool (211-329-01) must be flush against the pinion housing.

**The pinion housing is not marked at this stage.**

- Align the split in the special tool over the centre of the flat on the pinion input shaft illustrated in Figure 5.
- Install the special tool (211-329-01) flush to the pinion housing, as pictured in Figure 6.
- Tighten the Allen bolt of the special tool (211-329-01) to **10 Nm (7.4 lbf-ft)**. (Figure 6)

**NOTE:** Note the orientation of the rack bar to the rack bar housing. Orientation marks will aid reassembly of the pinion housing to the rack housing after the seal has been replaced, by ensuring that the rack bar teeth are in the correct position to allow meshing of the pinion, when the pinion housing is reinstalled. (Figure 7)

- Mark the position of the rack bar in relation to the rack bar housing with corresponding marks. (Figure 7)

Figure 4

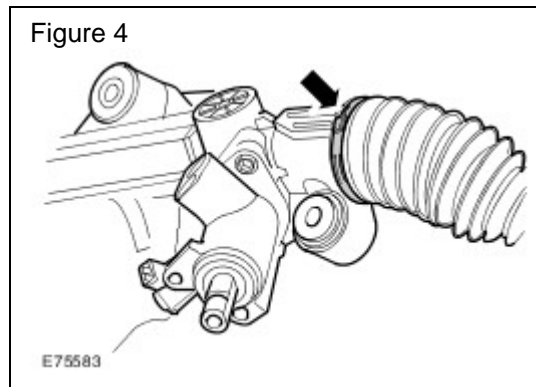


Figure 5

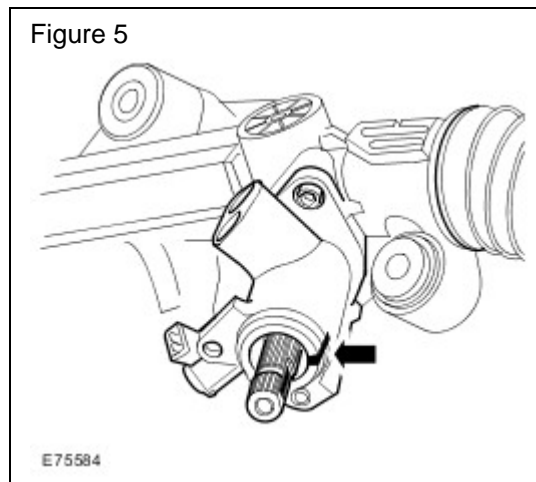


Figure 6

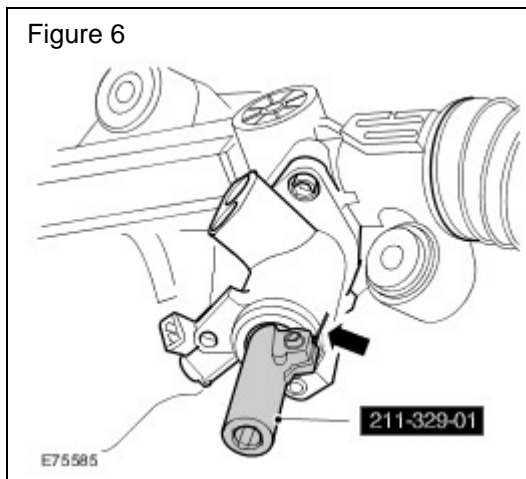
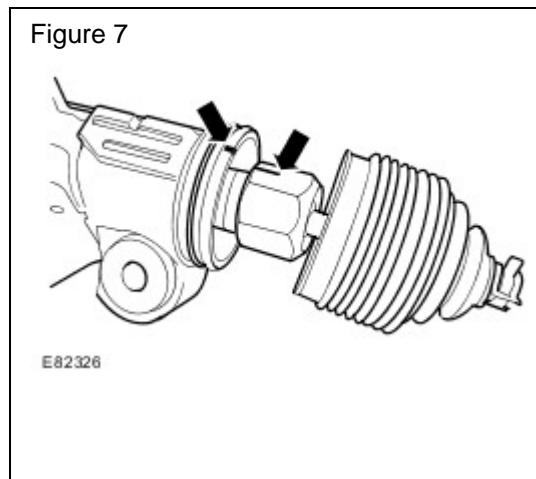


Figure 7



**CAUTION:** When using the special tool to align the steering gear, care must be taken to not damage the pinion splines.

**NOTE:** To centralize the steering rack/pinion assembly, the special tool (211-329-01) is used to position the steering gear.

11. Taking care not to damage the pinion splines, rotate the special tool and position the steering gear to the 65 mm (2.5 in) measurement illustrated in Figure 8.
12. Noting the position of the split in the special tool (211-329-01), place a corresponding mark on the pinion housing aligned to the split in the special tool. (Figure 9)

**CAUTION:** A lint-free cloth is to be positioned over the hydraulic ports and a suitable container positioned beneath the ports to collect residual fluid. To avoid excessive hydraulic pressure being generated, the steering gear must be cycled slowly.

13. Position a lint-free cloth over the hydraulic ports.
14. Place a suitable container beneath the ports to collect residual fluid.
15. Using a ratchet in the special tool, manually operate the steering gear to expel any residual fluid from the steering gear. (Figure 10)
16. Reposition the steering gear to align the mark on the steering gear pinion housing to the slit in the special tool. (Figure 9)
17. Check the rack travel measurement is 65 mm (2.5 in). (Figure 8)

Figure 8

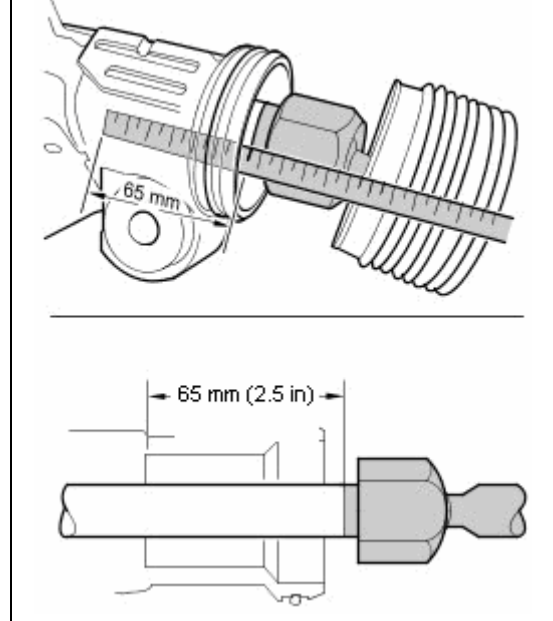


Figure 9

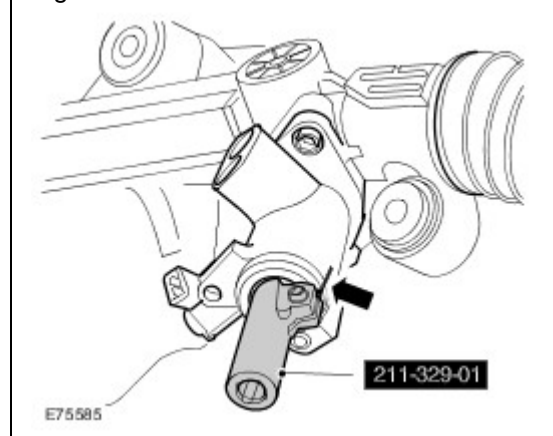
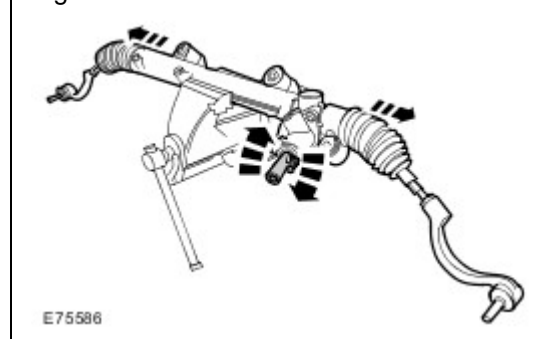


Figure 10



**NOTE:** The O-ring seal is not to be removed at this stage.

18. Using special tool 211-329-04, remove the pinion pre-load nut and collect the pre-load tension spring. (Figure 11)
19. Remove and discard the two pinion housing securing bolts. (Figure 12)

**CAUTION:** Make sure the working surfaces are thoroughly clean to avoid contamination of the sensitive hydraulic components. Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

**CAUTION:** Do not tap on the servotronic solenoid as this will cause internal solenoid damage. Do not use a lever in this operation as it will damage the housing.

**NOTE:** On removal, the pinion shaft will rotate approximately 90 degrees counter-clockwise.

20. Using a nylon mallet, carefully rotate the housing to the side to release the seal and carefully release the pinion housing. (Figure 13)
21. Once the pinion is removed from the housing, remove and discard the O-ring seal. (Figure 13)
22. Place the pinion housing assembly in a clean plastic bag, and seal to prevent contamination.
23. Place the pinion away from the area to avoid damage occurring during the repair operations.

Figure 11

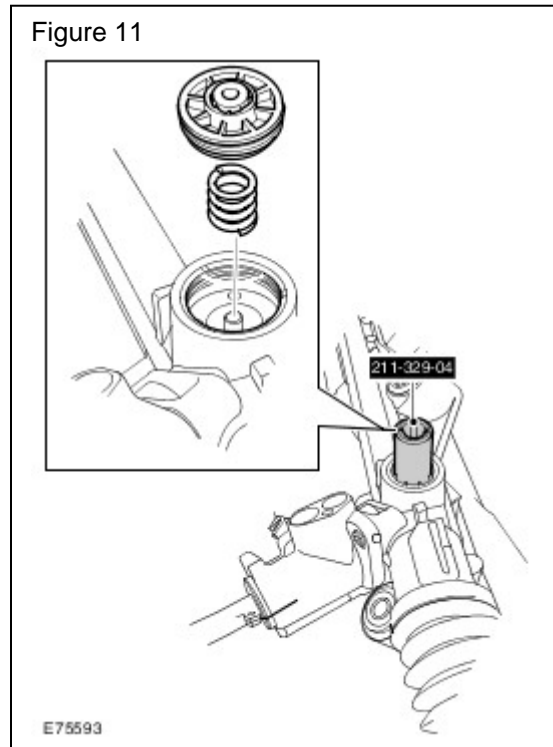


Figure 12

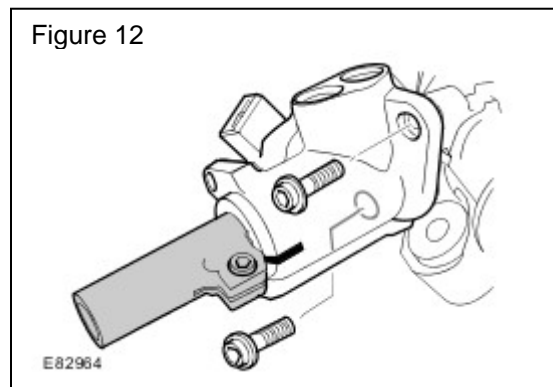
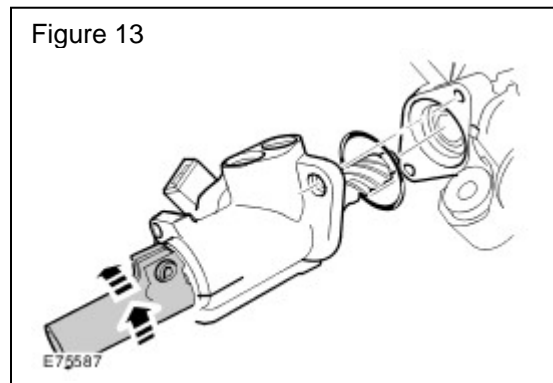


Figure 13





**⚠ CAUTION:** It is imperative that no damage or scoring occurs to the seal register when removing the seal. Care must be taken to ensure that neither the heel nor the toe of the bar comes in contact with the seal register or housing. Scoring or damage to the seal register will result in an internal leak to the bellows, which can cause oil to track past the new seal when replaced. It is imperative that no damage is caused to the seal register when removing the seal. Protect the seal register using lint free cloth. (Figure 14)

24. Carefully remove the pinion shaft inner seal, taking care not to score the seal register.
25. Clean the seal register and thoroughly inspect for damage.

**⚠ CAUTION:** A soft faced hammer should be used to avoid damaging the special tool (211-329-03) and creating debris. (Figure 15)

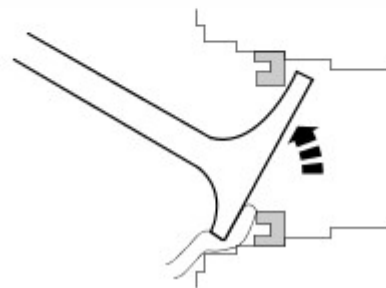
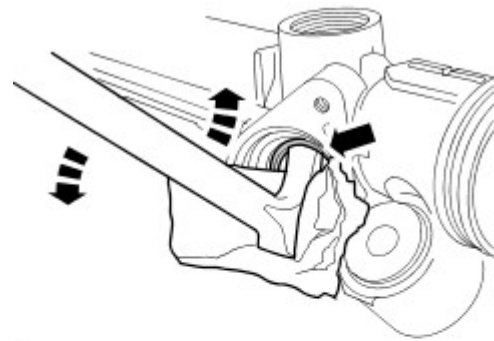
**△ NOTE:** Ensure that the flat part of the seal is installed into the rack, and the spring is facing you. (Figure 15)

26. Lightly apply lubricant (Petroleum Jelly), to the seal lip and outer surface to assist seal installation.
27. Using special tool 211-329-03, install the new steering gear pinion housing seal. (Figure 15)
28. Install alignment pins (211-329-07), illustrated in Figure 16, to the steering rack housing at the pinion fixing locations.
29. Align the steering gear to the 65 mm (2.5 in) measurement illustrated in Figure 8.
30. Remove the steering gear pinion housing from the plastic bag.

**△ NOTE:** Care must be taken to avoid damage to the new seal. The pinion shaft, at the point of contact with seal, must have all old seal material removed.

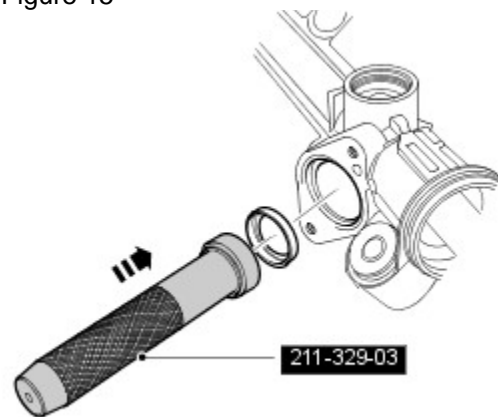
31. Ensure the pinion shaft, at point of contact with seal, is clean from all old seal material.
32. Lubricate and install the new O-ring seal.

Figure 14



E75588

Figure 15



E75589

Figure 16



E82325

33. Rotate the pinion and align the mark on the steering gear pinion housing to the split in the special tool. (Figure 17)
34. Before attempting to install the pinion housing, align the mark on the rack bar to the mark on the rack housing, marked at step 10 and illustrated in Figure 7.
35. Rotate the steering gear pinion counter-clockwise so that the alignment mark on the pinion housing and the slit in the special tool (211-329-01) are 90 degrees apart. (Figure 18)

Figure 17

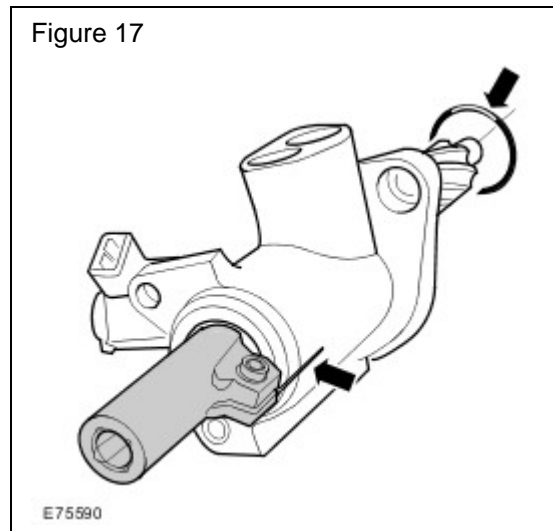
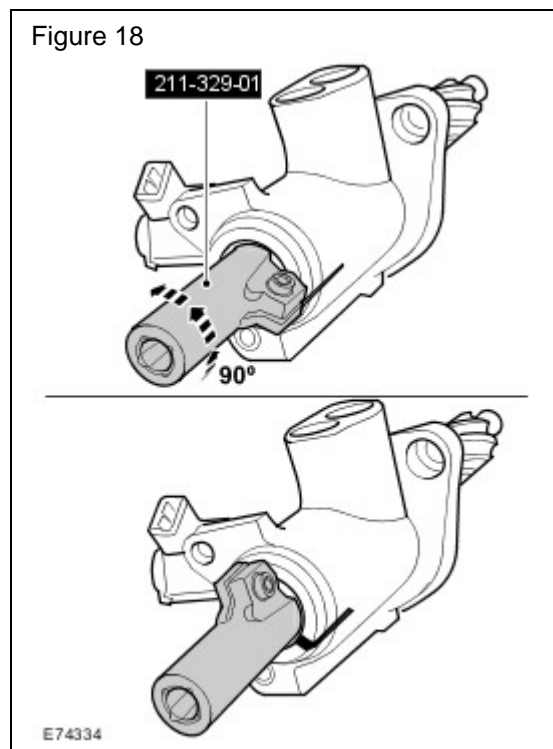


Figure 18





**⚠ CAUTION:** Care must be taken when locating the pinion housing assembly to avoid damaging the new seal. If the pinion housing has to be removed for realignment, the seal must be checked for damage and replaced if necessary. (Figure 19)

**△ NOTE:** Carefully lifting the rack bar upwards by hand against the body can reduce the tension on the pinion shaft and aid installation of the pinion housing.

36. Install the pinion housing to the steering gear body, allowing the pinion shaft to rotate clockwise as it enters the body. (Figure 19)
37. Verify that the marks on the pinion and the 65 mm (2.5 in) measurement are all aligned at the end of the installation.
38. Install the two new bolts securing the pinion housing and tighten to **17 Nm (12 lbf-ft)**. (Figure 19)

**⚠ CAUTION:** Care must be taken to ensure any open connections are plugged to prevent contamination.

39. Using a M35 x 1.5 tap, clean the pinion pre-load nut thread.
40. Remove any debris from the steering gear.
41. Remove and discard the O-ring seal.
42. Lubricate the new O-ring seal with Petroleum Jelly.
43. Install the new O-ring seal. (Figure 20)
44. Install the steering gear pre-tension spring to the steering gear body. (Figure 20)

Figure 19

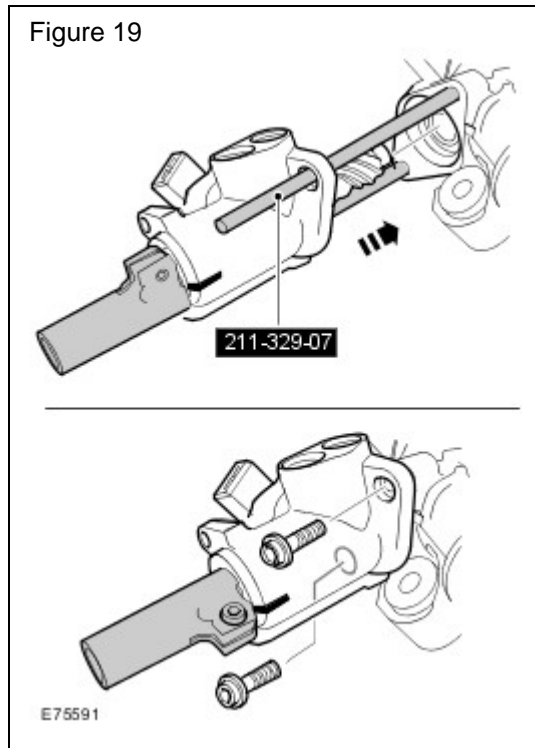
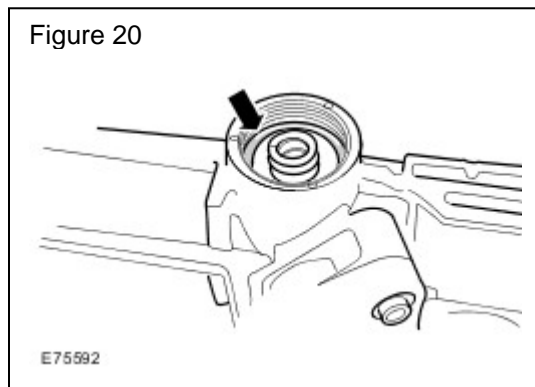


Figure 20



45. Using special tool 211-329-04, install the new pinion pre-load adjusting nut and tighten to **20 Nm (15 lbf-ft)**. (Figure 21)
46. Mark the smooth face of the steering gear body at a division mark on the pre-load adjusting nut. (Inset in Figure 21)
47. Using special tool 211-329-04, back-off the pinion pre-load adjusting nut, counter-clockwise, four small divisions. (Inset in Figure 21)

**⚠ CAUTION: The center punch operation must be made in the middle of the material to ensure no fragmentation of the housing occurs.**

48. Center punch the adjusting nut housing at three equidistant points. (Figure 22)
49. Using special tool 211-329-04, back-off the pinion pre-load adjusting nut, counter-clockwise, an additional four small divisions. (Inset in Figure 23)

Figure 21

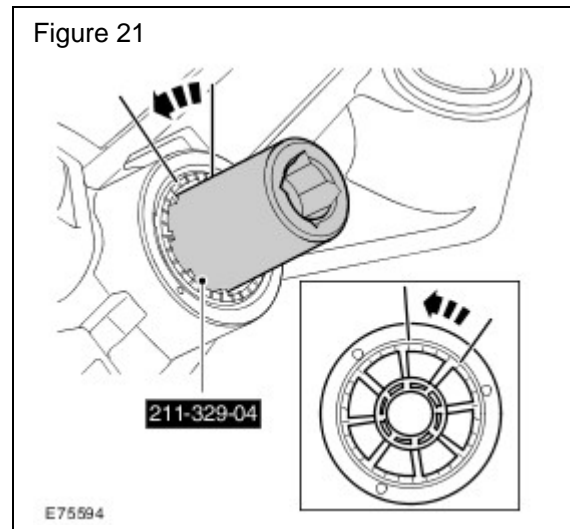


Figure 22

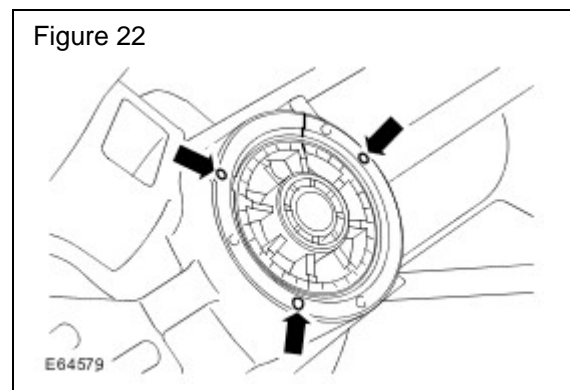
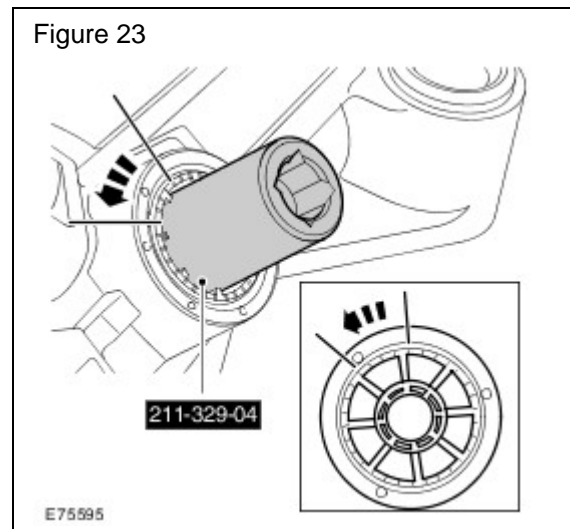


Figure 23



**NOTE:** Care must be taken to complete the next step with all marks aligned to ensure the rack and pinion are in the central position.

50. Install a suitable dial test indicator to the steering gear dial gauge with an extension to the needle through special tool 211-329-05 directly onto the back of the pre-tensioner pad. (Figure 24)

**NOTE:** Care must be taken to prevent the steering gear body from moving when checking the pre-load. The clearance must be minimum 0.05 mm (0.002 in) and maximum 0.1 mm (0.004 in). To avoid damage to the ball joint, the rack should be lifted using the inner ball joint nut. (Figure 25)

51. Grasping the inner ball joint nut, lift the rack bar by hand to check the pre-load. (Figure 25)
52. If the clearance is not minimum 0.05 mm (0.002 in) and maximum 0.1 mm (0.004 in), move the pre-load adjusting nut by a single division at a time to achieve the correct clearance.

**NOTE:** From the central position, the steering gear turns lock-to-lock should be equal.

53. Using the tool (211-329-01) on the pinion shaft, rotate the steering gear lock-to-lock to ensure there is no significant resistance or rough motion felt. (Figure 26)
54. If there is any roughness or resistance felt, recheck the clearance, adjust as necessary, and check again.
55. Once the correct clearance is achieved, remove the dial test indicator gauge and special tools.
56. Install the new sealing plug to the adjustment nut.
57. Lubricate the O-ring on the end of the steering gear body and re-install the gaiter with the new clip.
58. Ensure that the external pipes are clean.
59. Install the new O-rings to the pipes and install pipes to the steering gear body.
60. Tighten pipe unions to **10 Nm (7 lbf-ft)**.
61. Tighten the pinion pipe retaining plate to **12 Nm (9 lbf-ft)**.

Figure 24

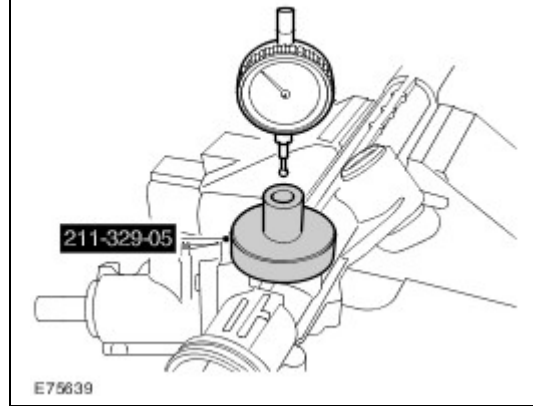


Figure 25

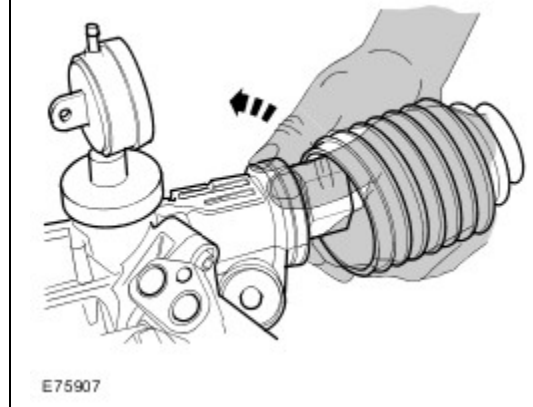
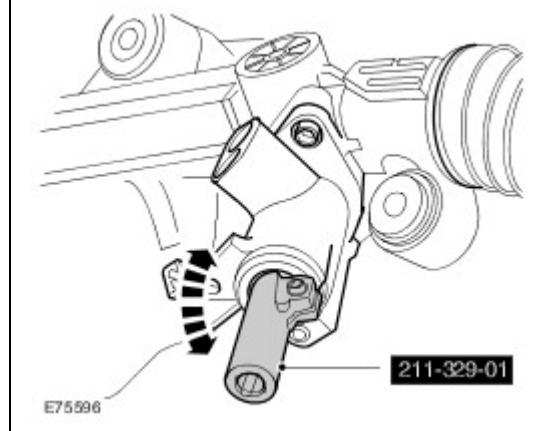


Figure 26



**CAUTION:** Care must be taken when installing the seal dust cover. The seal dust cover fits tightly over the splines.

**NOTE:** The centralizing pin on the dust cover must locate in the pinion housing recess. (Figure 27)

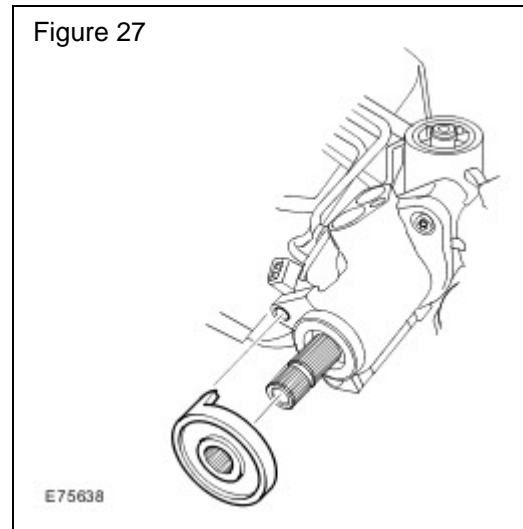
62. Ensure the rack is centralized and install the new pinion shaft seal dust cover, ensuring the centralizing pin on the dust cover locates in the pinion housing recess. (Figure 27)

63. Refer to GTR section 211-02 Steering Gear operation 57.10.01 and install the steering gear.

64. Road test the vehicle and check the following:

- Steering wheel is aligned in the straight ahead position.
- Steering self-centering ability coming off left and right-hand lock.
- Steering operation is smooth from lock to lock.
- No noise is heard while turning lock to lock.

Figure 27



**NOTE:** The following checks must be completed prior to the vehicle being returned to the owner.

65. Open the hood and install fender protectors.

66. Check the power steering system fluid reservoir level.

67. If the reservoir level shows a major drop and there is no sign of external leakage the replacement pinion seal lip area may have been damaged during installation or the seal has been installed incorrectly or reversed.

68. Raise vehicle on 'twin-post' ramp.

69. Check power steering system components disturbed during seal replacement procedure and ensure no fluid leaks from the following:

- Hydraulic connections on fluid transfer pipes
- Pinion housing
- Rack housing
- Rack end bellows

70. Verify the security of the rack end bellows fit to rack bar housing.

71. Check for power steering system fluid migration into the rack bellows causing them to expand/balloon/inflate (associated with major fluid loss from reservoir without external fluid loss).

72. Lower ramp.

73. Remove fender protectors and close hood.