

2001-02 TRANSFER CASES

MF2AV Diagnosis

APPLICATION

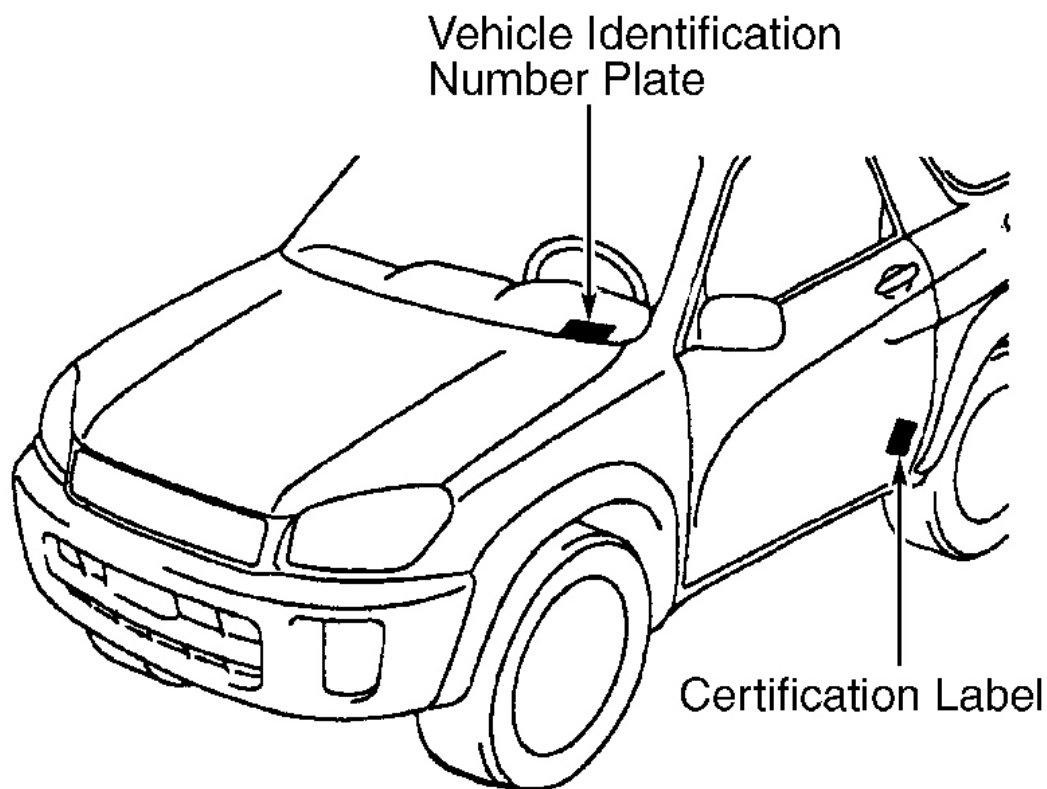
WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

TRANSFER CASE APPLICATION

Application	Transfer Case Model
Toyota Highlander & RAV4	MF2AV

IDENTIFICATION

Vehicle Identification Number (VIN) is used for current application of component parts and assemblies. VIN is stamped on vehicle identification plate, located at top left corner of dash, and on certification label, located on driver's door jam. See **Fig. 1** .



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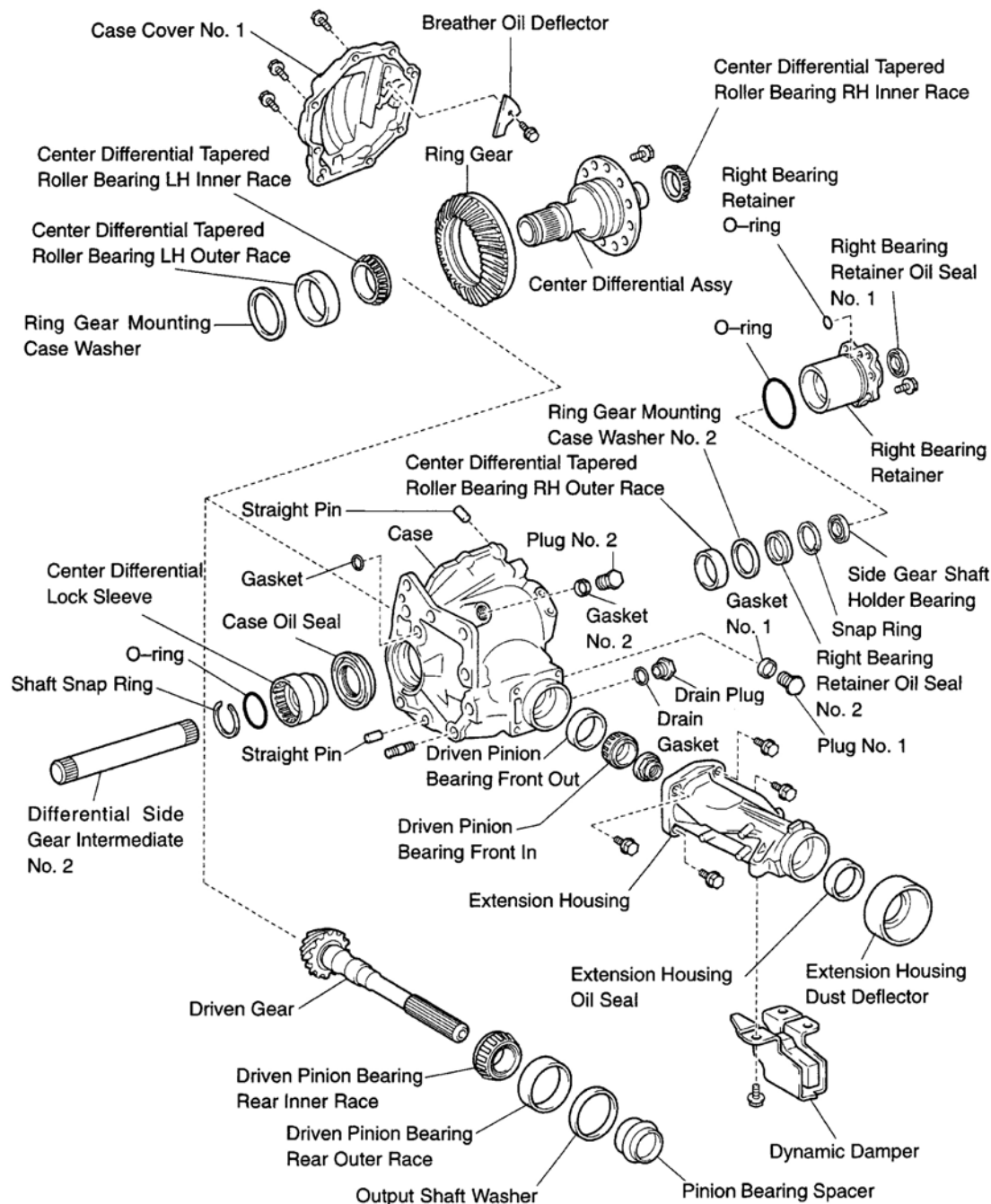
Fig. 1: Locating Vehicle Identification Number Plates
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DESCRIPTION & OPERATION

MF2AV transfer case is full-time 4-wheel drive and cannot be changed from 4-wheel drive to 2-wheel drive. Transfer case transmits drive force from transmission to front and rear wheels.

COMPONENT LOCATIONS

NOTE: For component location, refer to illustration. See Fig. 2 .



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Fig. 2: Exploded View Of Transfer Case Assembly Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

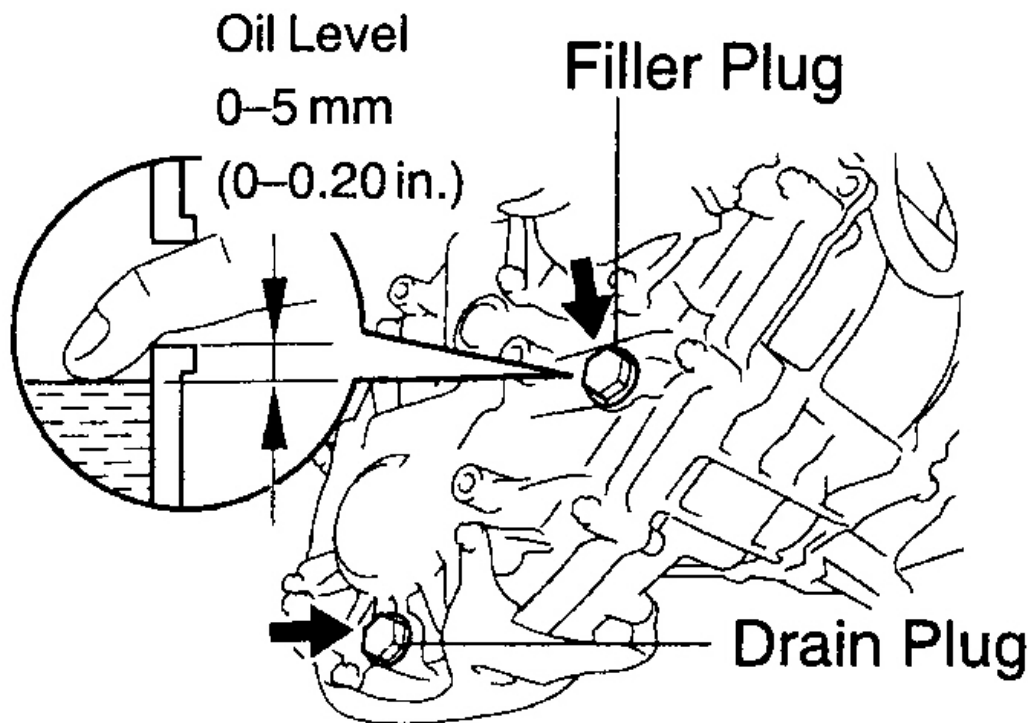
TROUBLE SHOOTING

NOTE: Any diagnosis should begin with confirming the customer's complaint. If

possible, road test vehicle first, and note transfer case operation for future reference during diagnosis.

PRELIMINARY INSPECTION

Road test vehicle to determine if the problem can be duplicated. Transfer case malfunctions may be caused by low fluid level or failure of mechanical components. Prior to diagnosing transfer case concerns, always begin by checking fluid level and condition. See **Fig. 3** . If fluid level needs to be adjusted or changed, see appropriate **SERVICING** article. Tighten drain plug to specification. See **TORQUE SPECIFICATIONS** . If area of fault cannot be located or repaired during preliminary inspection, see **SYMPTOM DIAGNOSIS** .



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Fig. 3: Checking Transfer Case Fluid Level
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYMPTOM DIAGNOSIS

NOTE: Perform **PRELIMINARY INSPECTION** prior to diagnosing by symptom.

NOTE: Use the following symptoms to aid in preliminary diagnosis. If a listed symptom matches the customer's concern, check the applicable items for possible cause.

Transfer Case Noise

Incorrect fluid or fluid level low. See **Fig. 3** . Check backlash, preload or tooth contact adjustment. Transfer driven pinion bearing or ring gear mounting case bearing worn.

Transfer Case Fluid Leaks

Fluid level too high. See **Fig. 3** . Damaged gasket. Damaged or worn right bearing retainer oil seal. Damaged or worn transfer case oil seal. Damaged or worn extension housing oil seal. Damaged or worn O-ring(s).

REMOVAL & INSTALLATION

WARNING: Vehicle is equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

TRANSFER CASE

NOTE: Transfer case is removed from transaxle once complete assembly is removed from vehicle. See appropriate REMOVAL & INSTALLATION article.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Drain & Fill Plug	36 (49)

2001-03 TRANSFER CASES

MF1A Overhaul

APPLICATION

TRANSFER CASE APPLICATION

Application	Transfer Case Model
Highlander	MF2AV
RAV4	MF2AV

DESCRIPTION & OPERATION

INTRODUCTION

Transfer assembly is a hypoid-type gear that is connected to transaxle differential. Drive shaft from rear differential is connected to transfer assembly at output shaft (drive pinion).

LUBRICATION

NOTE: See appropriate **SERVICING** article.

OVERHAUL

TRANSFER ASSEMBLY DISASSEMBLY

1. Remove gasket from mounting face of transfer assembly case. See **Fig. 1**.
2. Remove No. 2 intermediate differential side gear.

NOTE: Be careful not to damage the transfer case and No. 1 case cover.

3. Remove No. 1 case cover. Remove the 8 bolts. Using a brass bar and hammer, remove the No. 1 case cover. Remove bolt and breather oil deflector from the No. 1 case cover.
4. Remove the 4 pins from the transfer case.
5. Remove the 4 stud bolts from the transfer case.
6. Install transfer case on appropriate holding fixture.

NOTE: Be careful not to damage the extension housing.

7. Using plastic hammer, remove the dust deflector from the extension housing. Using appropriate puller and slide hammer, remove the oil seal from the extension housing.
8. Remove 4 bolts securing extension housing. Using a plastic hammer, remove the extension housing.

NOTE: Ensure torque wrench has a fulcrum length of 6.3" (160 mm). Torque value is most accurate when torque wrench is parallel with adapter.

9. Using appropriate adapter and INCH lb. torque wrench, measure the driven pinion preload of the backlash between the driven pinion and ring gear. See **Fig. 2** . Starting preload should be 7.8-11.5 INCH lbs. (.9-1.3 N.m).
10. Continue to rotate torque wrench to measure total preload. Total preload should be 8.9-14.2 INCH lbs. (1.0-1.6 N.m).
11. Using dial indicator, measure the ring gear backlash. See **Fig. 3** . Backlash should be .004-.006" (.10-.15 mm).
12. Remove center differential lock sleeve. Using snap ring pliers, remove the shaft snap ring. See **Fig. 1** . Using appropriate puller and slide hammer, remove the center differential lock sleeve.

NOTE: Be careful not to damage the center differential lock sleeve.

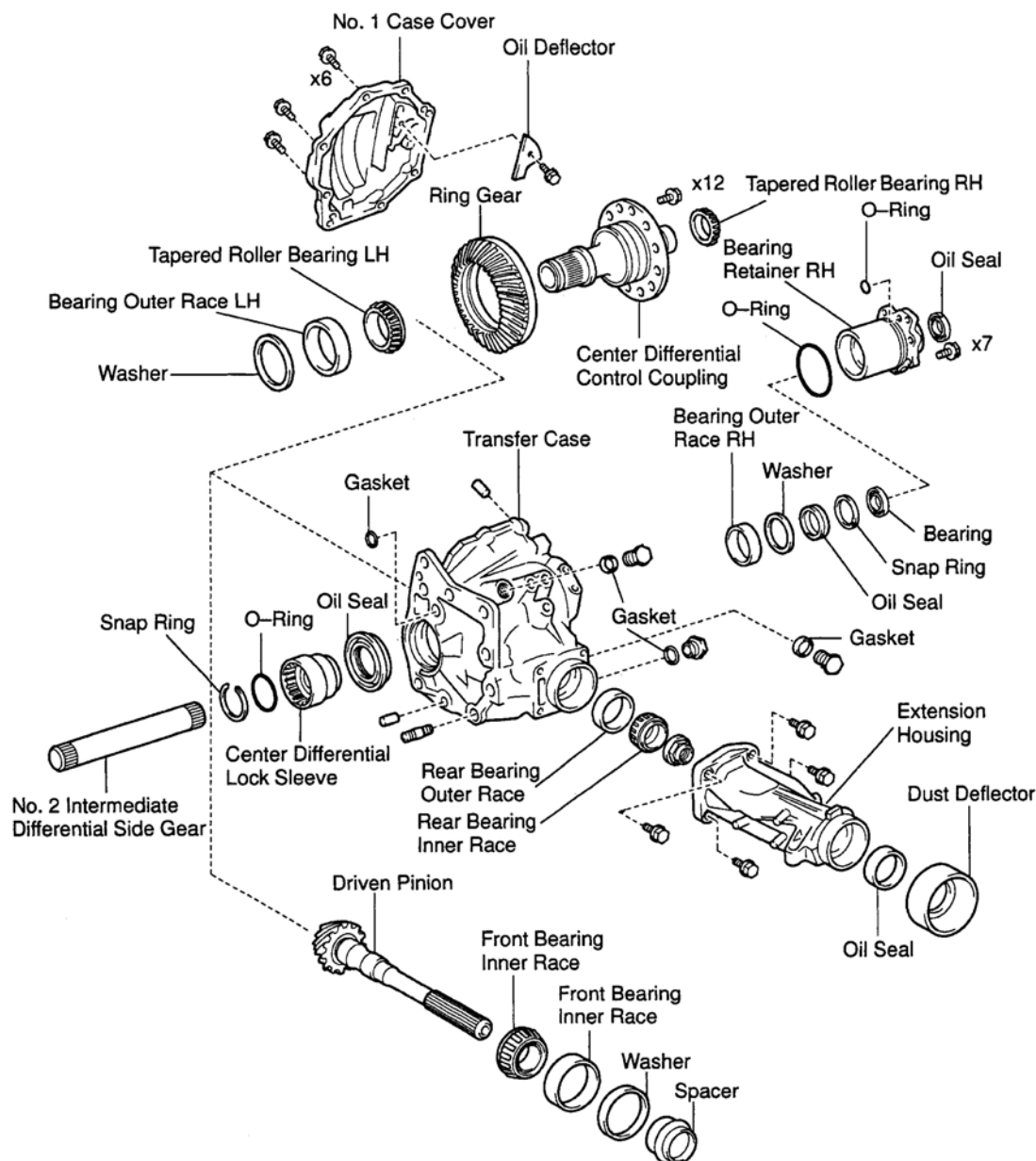
13. Using a screwdriver or pick, remove the "O" ring from the center differential lock sleeve. See **Fig. 4** .
14. Remove oil seal. Using appropriate puller and slide hammer, remove the oil seal from the bearing retainer RH.
15. Remove 7 bearing retainer RH bolts. Using a screwdriver and hammer, make clearance by hitting gap between the bearing retainer RH and transfer case.
16. Using appropriate puller and slide hammer, remove the bearing retainer RH from the transfer case.

NOTE: Be careful not to damage the bearing retainer RH.

17. Using a screwdriver, remove 2 "O" rings from the bearing retainer RH.
18. Using the soft jaws, hold the bearing retainer RH in a vise. Using appropriate puller and slide hammer, remove the outer race, washer and oil seal from the bearing retainer RH.
19. Using snap ring pliers, remove the snap ring. See **Fig. 1** . Remove the side gear shaft holder bearing from the bearing retainer RH.
20. Remove center differential control coupling assembly. Remove tapered roller bearing LH and RH. Using appropriate bearing puller, remove tapered roller bearing inner race LH and RH.
21. Place center differential control coupling assembly on "V" blocks. See **Fig. 5** . Using a dial indicator, check the ring gear runout. Maximum runout is .004" (.1 mm).
22. Remove ring gear. Place matchmarks on both the ring gear and the center differential control coupling. Remove 12 bolts in crisscross pattern.
23. Using a plastic hammer, remove the ring gear.
24. Place center differential control coupling assembly back on "V" blocks. Using a dial indicator, check the coupling runout. Maximum runout is .003" (.07 mm).
25. Remove driven pinion. Using appropriate punch and hammer, unstake the lock nut. Using driven pinion holding adapter, remove the lock nut. See **Fig. 6** .

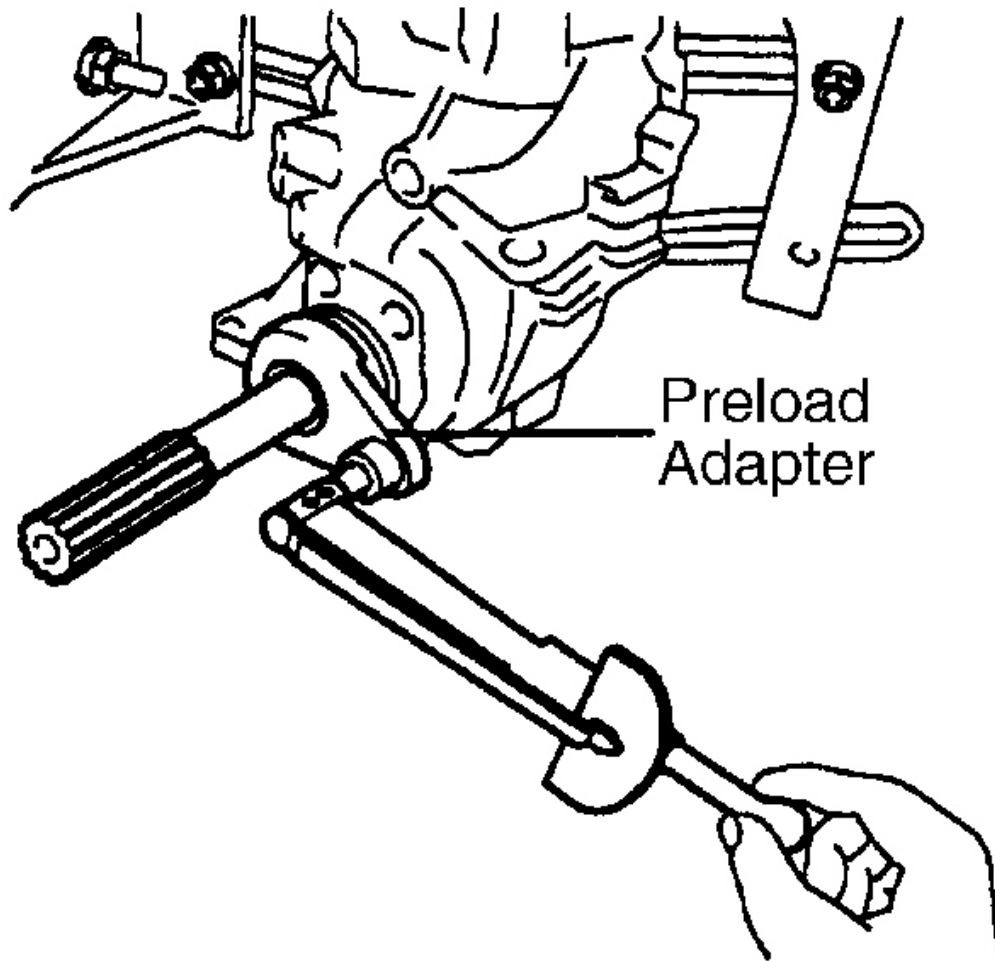
NOTE: Do not allow driven pinion to drop on floor.

26. Using a press, remove the driven pinion, rear bearing inner race and spacer.
27. Using an appropriate bearing spreader and press, remove the front bearing inner race from the driven pinion.
28. Remove bearing outer race LH. Using a brass bar and a hammer, remove the outer race and the washer.
29. Remove front bearing outer race. Using a brass bar and a hammer, remove outer race and washer.
30. Remove rear bearing outer race. Using a brass bar and a hammer, remove outer race.



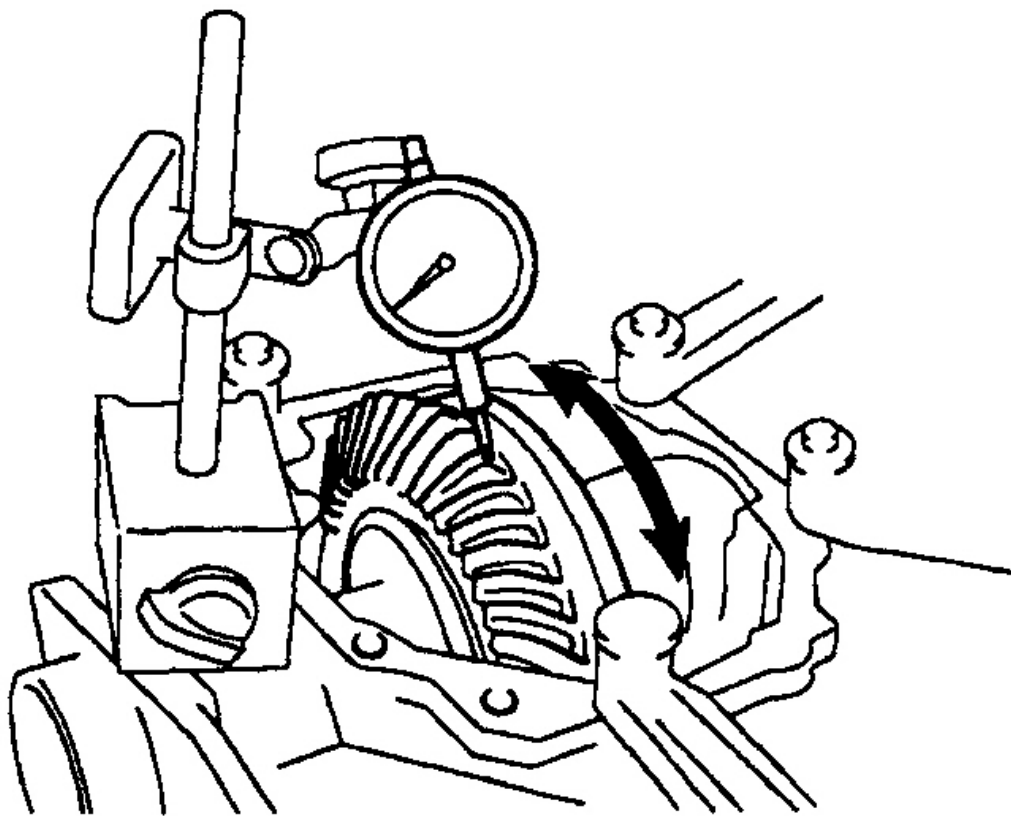
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Fig. 1: Exploded View Of Transfer Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



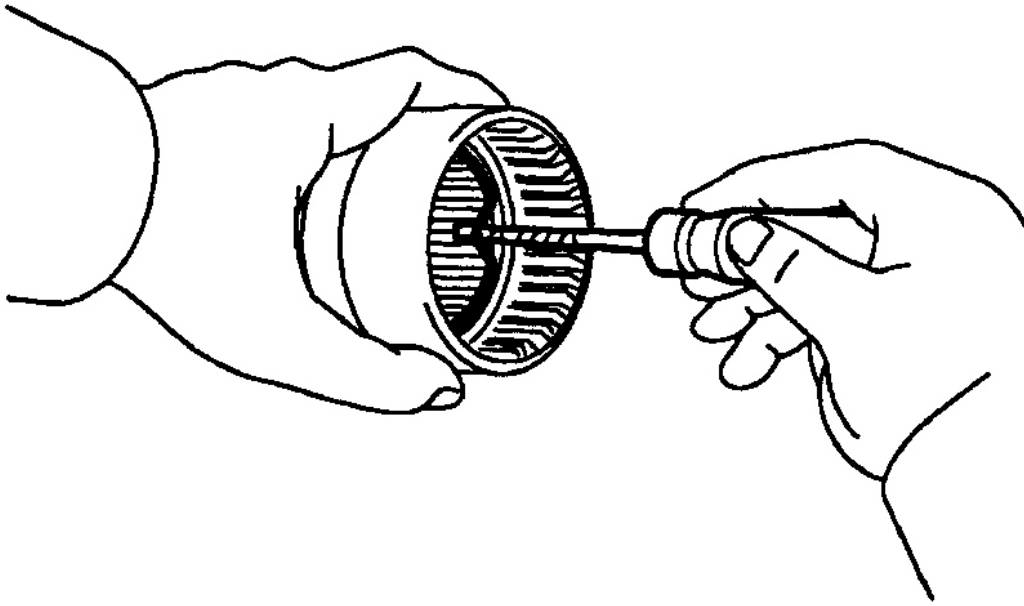
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Fig. 2: Measuring Driven Pinion Starting Preload
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



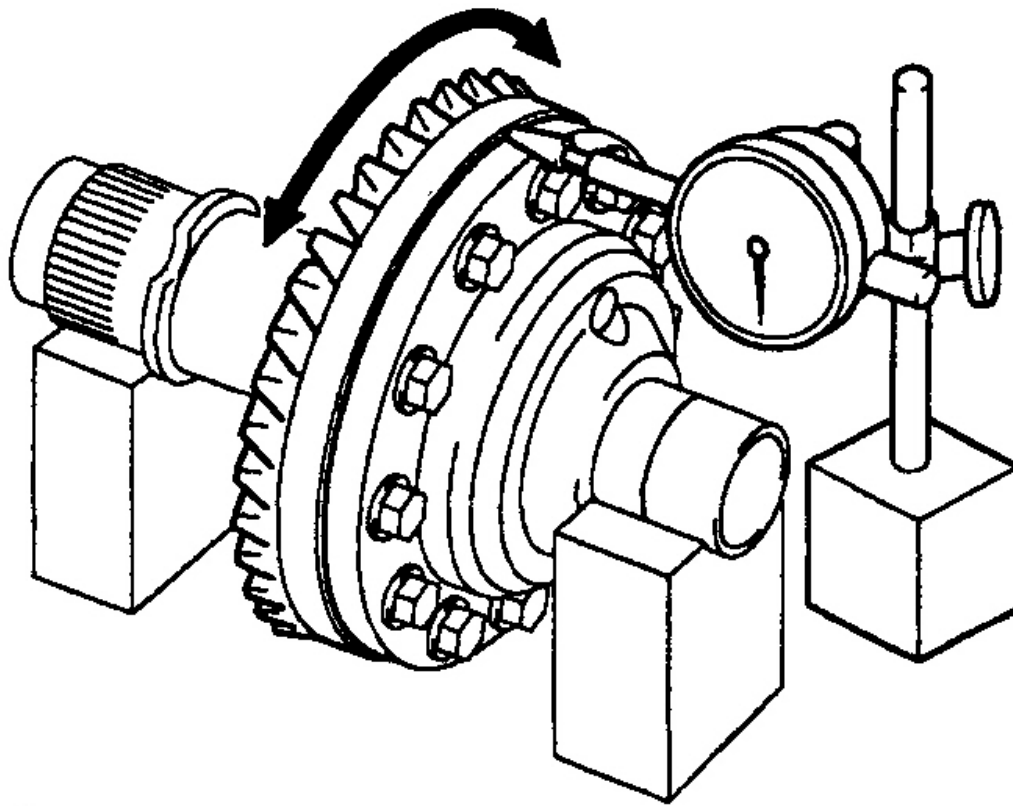
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Fig. 3: Measuring Transfer Gear Backlash
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



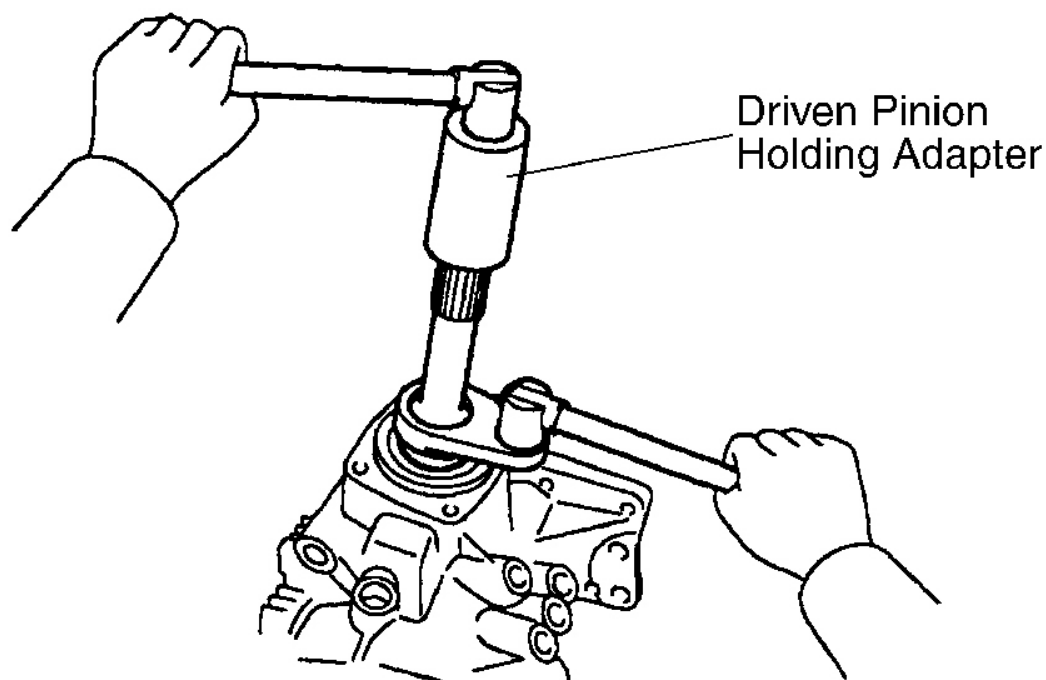
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Fig. 4: Removing Differential Lock Sleeve "O" Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 5: Measuring Ring Gear Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 6: Removing/Installing Driven Pinion Lock Nut
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TRANSFER CASE REASSEMBLY

1. Using appropriate bearing driver, install rear bearing outer race.
2. Install front bearing outer race. Install original washer in transfer case. Using appropriate race installer, install outer race to transfer case. See **Fig. 7**.
3. Install bearing outer race LH. Install original washer in transfer case. Using appropriate adapter and a press, install outer race to the transfer case.
4. Install driven pinion. Using appropriate adapter and press, install the front bearing inner race to the driven pinion. Install the driven pinion in the transfer case.

NOTE: Do not stake lock nut until the final adjustment of the preload, tooth contact and backlash is completed.

5. Install a new spacer and rear bearing inner race to the driven pinion. See **Fig. 1**. Using driven pinion holding adapter, install the lock nut. See **Fig. 6**. Tighten lock nut to 227-257 ft. lbs. (308-349 N.m).
6. Check driven pinion preload. Using INCH lb. torque wrench, measure the driven pinion preload (at starting). See **Fig. 2**. Starting preload should be 7.8-12.4 INCH lbs. (.9-1.4 N.m) for new bearing or 7.1-9.7 INCH lbs. (.8-1.1 N.m) for used bearing.

- If the preload is not sufficient, adjust the driven pinion by tightening the lock nut by 5-10 degrees and measuring the preload until the preload is within the standard value. If the preload is more than the standard value, replace the spacer with a new one.
 - If the tightening torque for a driven pinion nut is more than the standard value, and the preload is not sufficient, loosen the lock nut, apply gear oil on the thread and bearing surface and adjust it as described above. When the tightening torque is less than the standard value, replace the spacer with a new one.
7. Assemble center differential control coupling. Clean the contact surface of the ring gear and center differential control coupling. Heat the ring gear in water and boil for 10 minutes. Carefully remove the ring gear from the water.
 8. After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the center differential control coupling. Install the 12 bolts. Tighten bolts to specification in crisscross pattern. See **TORQUE SPECIFICATIONS** .
 9. Using appropriate adapter and a press, install the center differential case tapered roller bearing inner race LH and RH.
 10. Install center differential control coupling.
 11. Install center differential case tapered roller bearing outer race RH. Install original washer to the bearing retainer RH. Using appropriate bearing race installer and a press, install the outer race to the bearing retainer RH.
 12. Install Bearing Retainer RH. Put the installation surface for the bearing retainer RH of the transfer case upward. Install the center differential control coupling onto the transfer case and make the center meet each other. See **Fig. 8** .

NOTE: **Do not make the transfer case, bearing retainer RH and centering tool interfere forcibly with the center differential control coupling. Pay attention for the damage and peeling off of the "O" ring in the retainer.**

13. Insert Centering tool (09387-00090) to the bearing retainer RH. See **Fig. 9** . Install the bearing retainer RH with the centering tool to the transfer center differential control coupling. See **Fig. 10** .
14. When the bearing retainer cannot be inserted, hit it soft with the plastic hammer and insert it.
15. After having inserted the bearing retainer to the transfer case, remove centering tool. Install 7 bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
16. Inspect backlash. Using dial indicator, measure and record the ring gear backlash at 3 positions. See **Fig. 3** . Backlash should be .004-.006" (.10-.15 mm).
17. If the backlash is not within the specification replace the washer on the ring gear side with one of a different thickness. See **Fig. 11** . Washers available range in thickness of .082-.118" (2.07-3.00 mm) in increments of .0012" (.030 mm).
18. Inspect gear tooth contact pattern. Coat 3 or 4 teeth at four different positions on ring gear using Prussian Blue. Rotate the ring gear, inspect the contact pattern on teeth. See GEAR TOOTH CONTACT PATTERNS article in GENERAL INFORMATION.
19. If the teeth are not contacting properly, select and install the proper washer. See **Fig. 12** . Washers available range in thickness of .047-.065" (1.20-1.65 mm) in increments of .0004" (.01 mm).
20. Check and adjust total preload. Using INCH lb. torque wrench, measure the total preload. See **Fig. 2** .

Total preload should be 9.7-15.9 INCH lbs. (1.1-1.8 N.m) for new bearing or 8.0-12.4 INCH lbs. (.9-1.4 N.m) for used bearing.

21. If total preload is not within standard, select and install the proper washer. See **Fig. 13** . Washers available range in thickness of .058-.102" (1.47-2.58 mm) in increments of .0012" (.03 mm).
22. Remove bearing retainer RH. Remove 7 retaining bolts.
23. Using a screwdriver and hammer, make clearance by hitting gap between the bearing retainer RH and transfer case.
24. Using appropriate puller and slide hammer, remove the bearing retainer RH from the transfer case.
25. Using appropriate puller and slide hammer, remove the outer race and washer.
26. Assemble bearing retainer RH. Install the side gear shaft holder bearing to the bearing retainer RH. Using snap ring pliers, install the snap ring. See **Fig. 1** . Coat new oil seal lip with multi-purpose grease.
27. Using appropriate bearing race driver and press, install the oil seal to the bearing retainer RH. Install the washer.
28. Using appropriate bearing race driver and press, install the bearing race into the bearing retainer RH.
29. Coat 2 new "O" rings with gear oil, then install them on the bearing retainer RH.
30. Install bearing retainer RH. Put the installation surface for the bearing retainer RH of the transfer case upward. Install the center differential control coupling onto the transfer case and make the center meet each other. See **Fig. 8** .

NOTE: **Do not make the transfer case, bearing retainer RH and centering tool interfere forcibly with the center differential control coupling. Pay attention for the damage and peeling off of the "O" ring on the retainer.**

31. Insert Centering tool (09387-00090) to the bearing retainer RH. See **Fig. 9** . Install the bearing retainer RH with the centering tool to the transfer center differential control coupling. See **Fig. 10** .
32. Install 7 bolts and tighten to specification. See **TORQUE SPECIFICATIONS** . Check total preload. Go to step 20 .
33. Install oil seal. Coat a new oil seal lip with multi-purpose grease. Using appropriate driver, install oil seal to the bearing retainer RH.
34. Coat new oil seal lip with multi-purpose grease. Using appropriate driver, install oil seal to the transfer case.
35. Install center differential lock sleeve. Coat a new "O" ring with multi-purpose grease and install it to the center differential lock sleeve.
36. Using appropriate driver, install the center differential lock sleeve to the transfer case. Using snap ring pliers, install the snap ring.
37. Using a chisel and a hammer, stake the lock nut.
38. Install extension housing. Coat oil seal lip with multi-purpose grease. Using appropriate seal driver, install the oil seal to the extension housing. Using appropriate adapter and a press, install the dust deflector to the extension housing.
39. Ensure contacting surface of extension housing and transfer case are clean. Apply appropriate gasket sealant to extension housing. Install the extension housing with 4 bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .

NOTE: The shorter threaded portion of stud bolt should be installed in transfer case.

40. Install 4 stud bolts to the transfer case.
41. Using a plastic hammer, install 4 pins. Remove transfer case from holding fixture.

NOTE: Ensure angle bend of deflector faces inward.

42. Install No. 1 case cover. Install the oil deflector with the bolt to the No. 1 case cover. Tighten bolt to 58 INCH lbs. (6.5 N.m).
43. Ensure contacting surface of case cover and transfer case are clean. Apply appropriate gasket sealant to case cover. Install the case cover with 2 new bolts at 2 and 3 o'clock positions. Install remaining 6 bolts. Tighten bolts to specification.
44. Install No. 2 intermediate side gear. Install gasket. Coat new gasket with A/T fluid and install it to the transfer case.

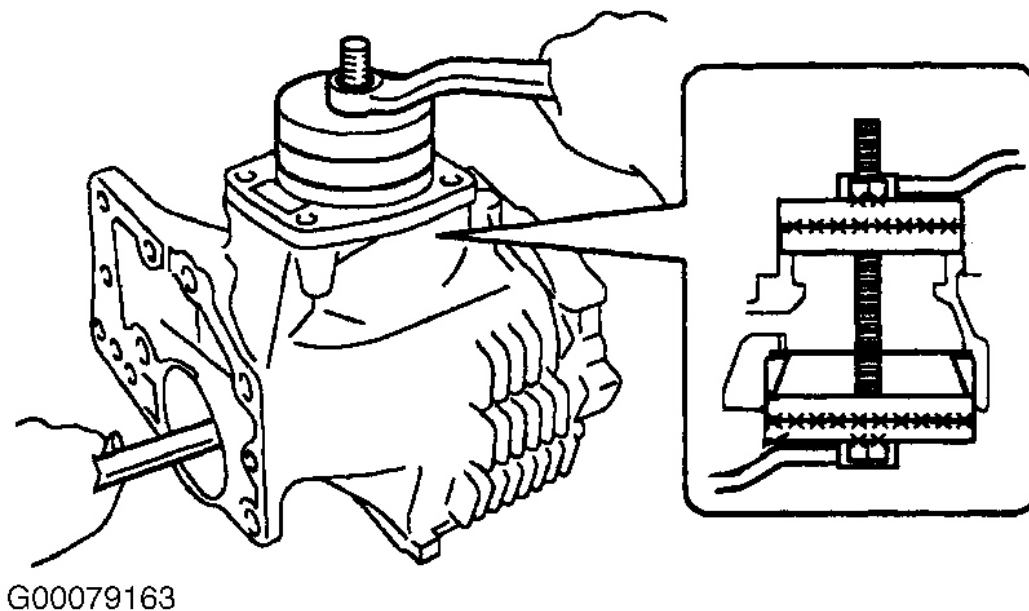
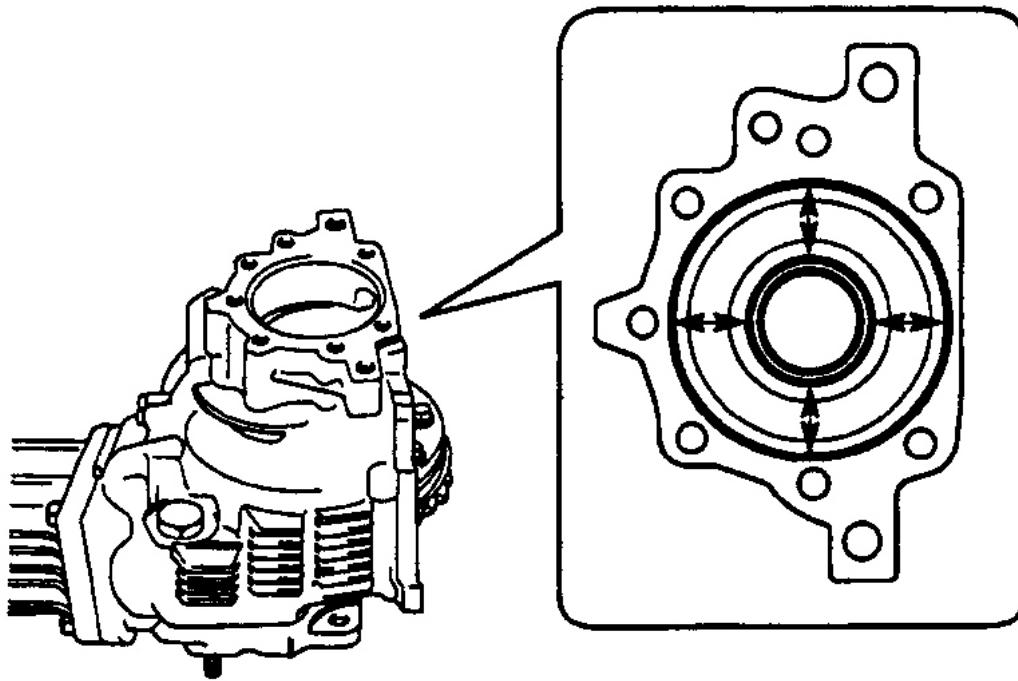
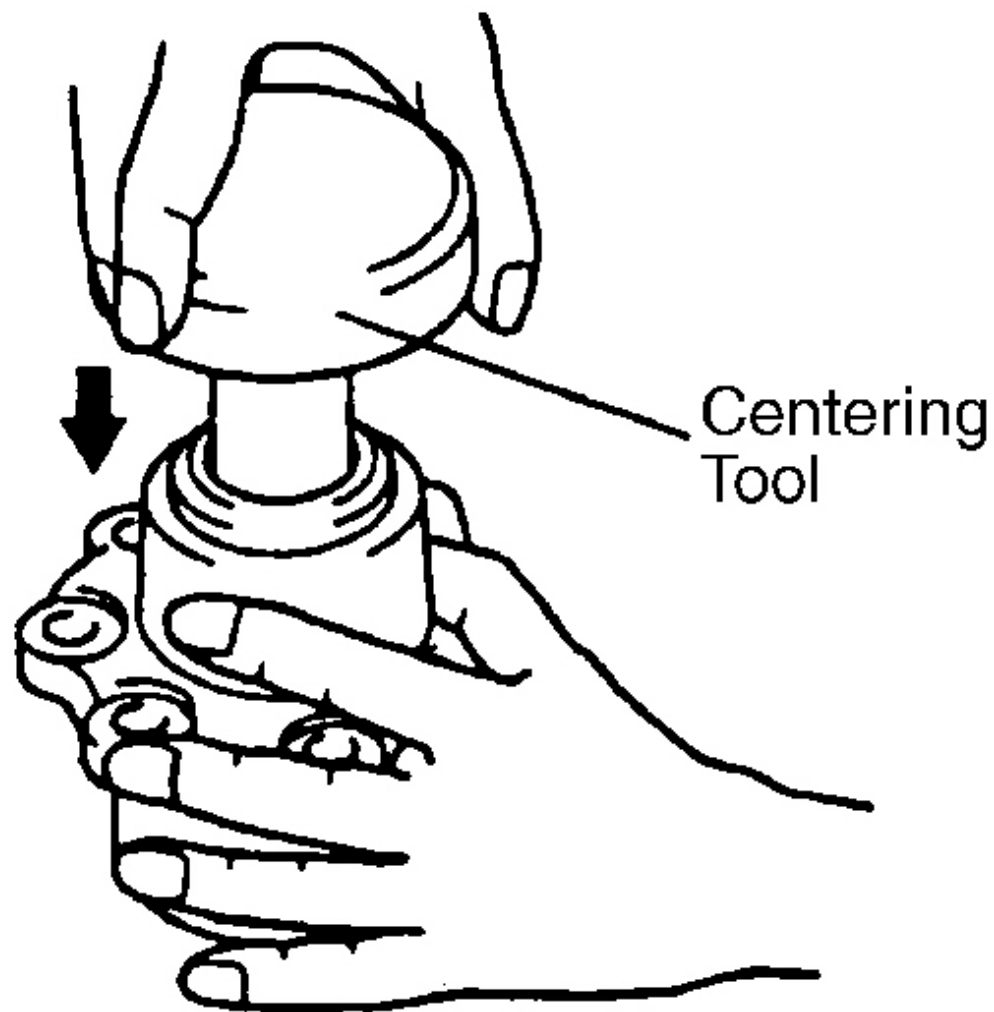


Fig. 7: Installing Transfer Case Outer Bearing Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



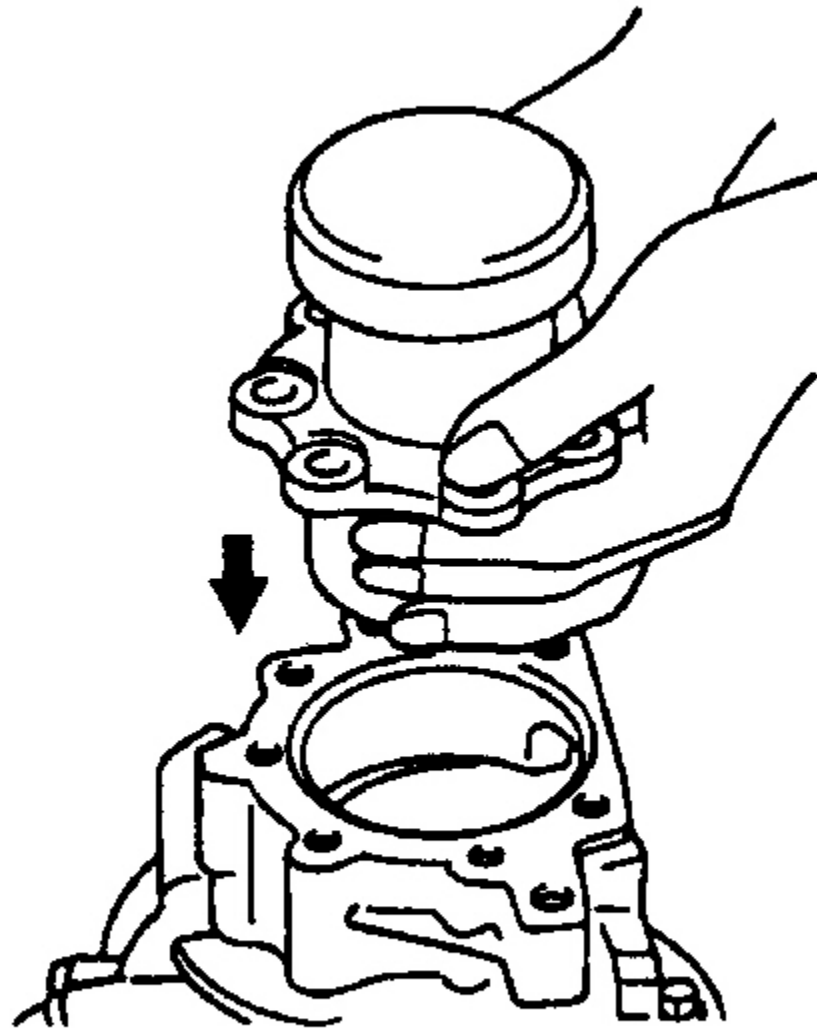
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Fig. 8: Installing Bearing Retainer RH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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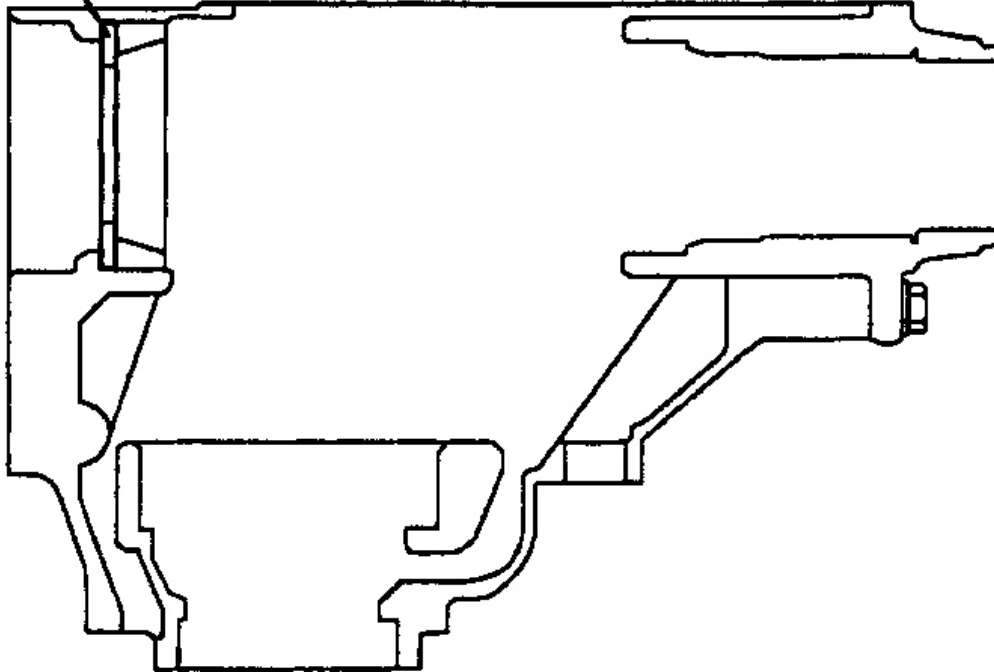
Fig. 9: Identifying Centering Tool Installation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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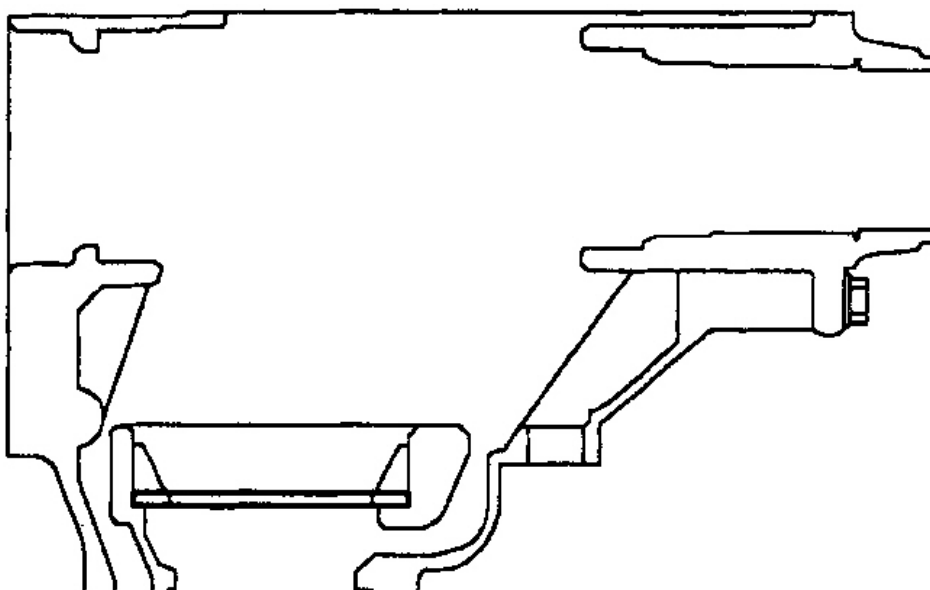
Fig. 10: Installing Bearing Retainer RH With Centering Tool
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Washer: Backlash adjust



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Fig. 11: Identifying Backlash Adjustment Washer Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

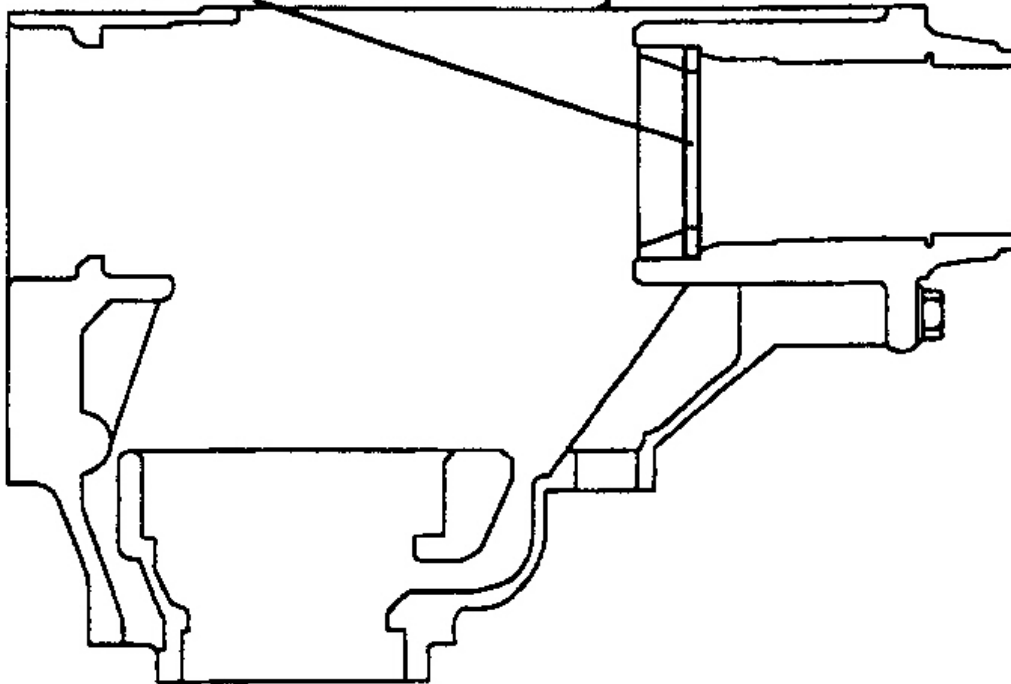


Washer: Tooth contact adjust

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Fig. 12: Identifying Gear Tooth Contact Pattern Adjustment Washer Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Washer: Preload adjust



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Fig. 13: Identifying Total Preload Adjustment Washer Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Bearing Retainer RH Bolt	21 (28)
Case Cover Bolt	14 (19)
Extension Housing Bolt	19 (26)
Ring Gear Bolt	57 (78)
Stud Bolt	29 (40)