

2005 Toyota RAV4
2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

2001-05 AUTOMATIC TRANSMISSIONS
U140F Overhaul

APPLICATION

CAUTION: Flush oil cooler and oil cooler lines prior to transaxle installation. Oil cooling system contamination may cause premature transaxle failure.

TRANSAXLE APPLICATION

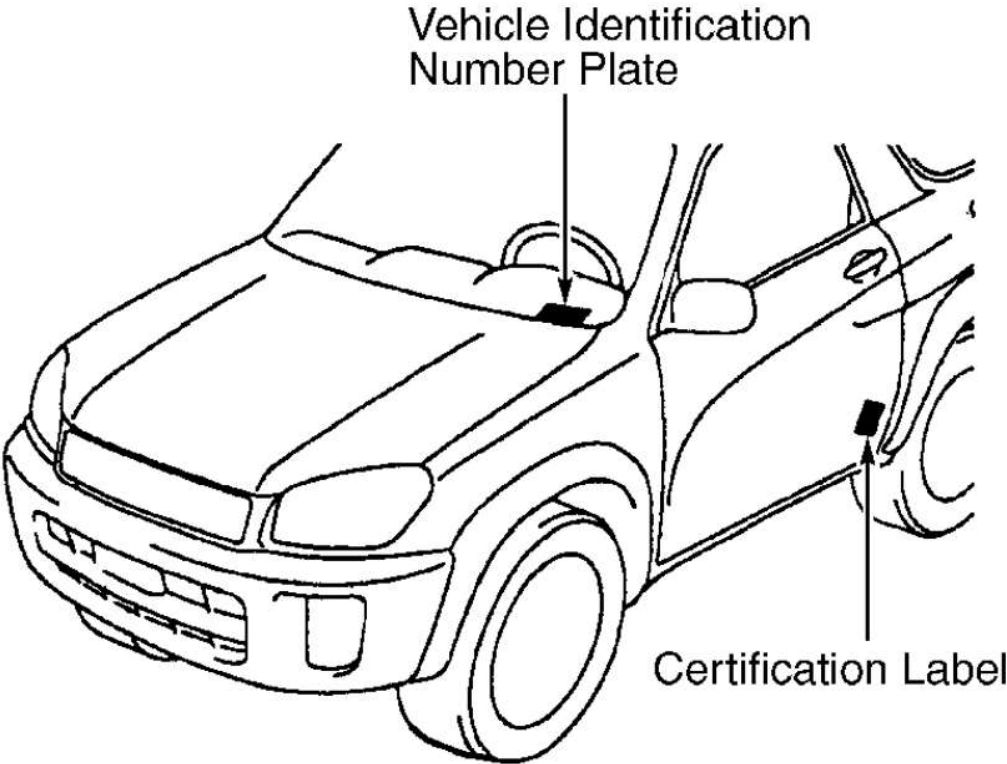
Application	Transaxle Model
RAV4	U140F

IDENTIFICATION

TRANSAXLE

Vehicle Identification Number (VIN) is used for correct identification of component parts and assemblies. VIN is located at top left corner of instrument panel. Vehicle certification label is located at left corner of driver's door. This label also contains the VIN. See **Fig. 1**.

2005 Toyota RAV4
2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00110614

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

GEAR RATIOS

TRANSAXLE GEAR RATIOS

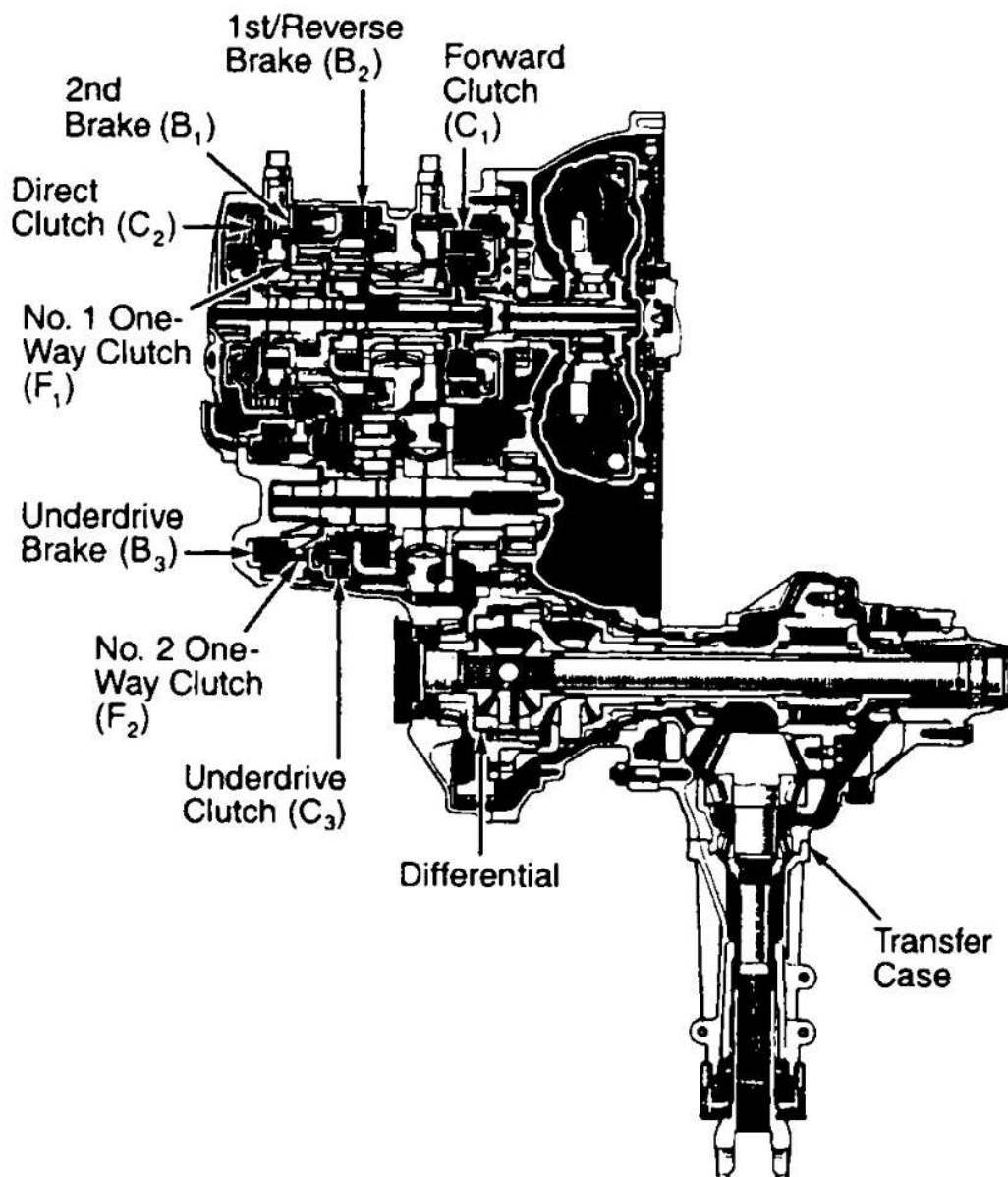
Gear Range	Gear Ratio
1st	3.938:1
2nd	2.194:1
3rd	1.411:1
OD	1.019:1
Reverse	3.141:1

DESCRIPTION & OPERATION

INTRODUCTION

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

The U140F transaxle is a 4-speed electronically controlled transaxle. Transaxle uses a lock-up torque converter, direct clutch, forward clutch, underdrive clutch, underdrive brake, 3 planetary gears, 2nd brake, 2 one-way clutches, 1st/reverse brake, and hydraulic and electronic control systems. Transaxle is equipped with a transfer case. See **Fig. 2**.



G00182309

Fig. 2: Identifying Transaxle Component Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

LUBRICATION

NOTE: See appropriate **SERVICING** article.

TROUBLE SHOOTING

NOTE: Transaxle malfunctions may be caused by poor engine performance, improper adjustments, fluid condition or failure of hydraulic, mechanical or electronic components. Ensure all concerns have been properly checked prior to transaxle overhaul. See appropriate **DIAGNOSIS** article.

COMPONENT TESTS**TORQUE CONVERTER**

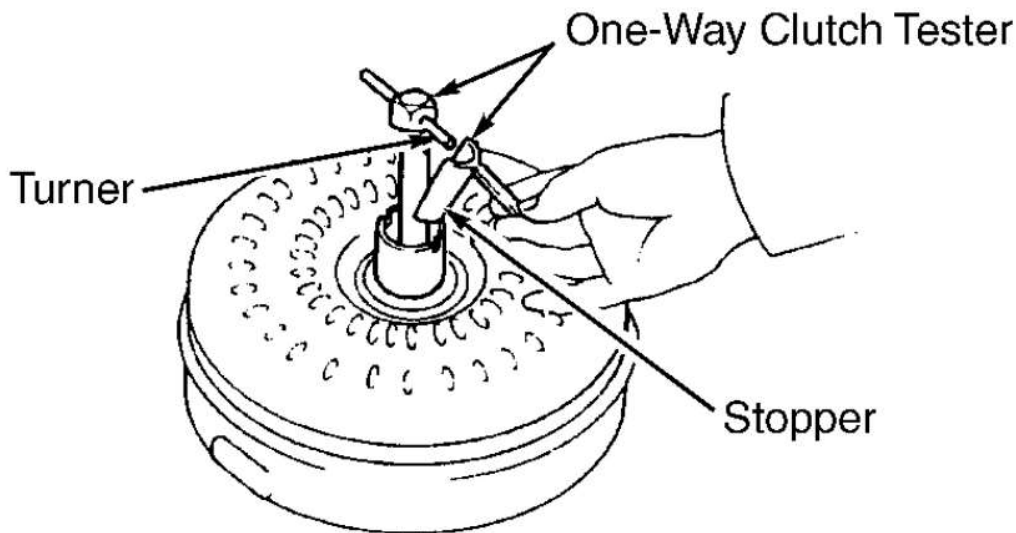
NOTE: Torque converter is a sealed unit and is serviced as a complete assembly. Perform the following tests to check for defective converter. Torque converter and transaxle cooler must be thoroughly cleaned and flushed if transaxle is contaminated.

Torque Converter One-Way Clutch Test

1. Insert a turning tool into inner race of one-way clutch. Install Tester (09351-32010) so it fits in notch of converter hub and outer race of one-way clutch.
2. With converter in normal operating position, clutch should lock-up when turned counterclockwise and should rotate freely and smoothly when turned clockwise. See **Fig. 3**. If one-way clutch fails test in either direction, clean converter. Retest clutch. If clutch fails test, replace torque converter.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G93I23810

Fig. 3: Checking Torque Converter One-Way Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Torque Converter Sleeve Runout Test

1. Temporarily mount torque converter to drive plate. Mount a dial indicator with needle resting on converter sleeve. See **Fig. 4**. Rotate converter. If runout exceeds .012" (.30 mm), ensure converter is properly mounted to drive plate.
2. If converter is properly mounted and runout exceeds specifications, replace torque converter. Mark position of converter to ensure correct installation. Remove converter from drive plate.

Drive Plate (Flexplate) Runout Test

Measure drive plate runout. See **Fig. 5**. If runout exceeds .008" (.20 mm), or if ring gear is damaged, replace drive plate. If installing a NEW drive plate, note position of spacers. Tighten bolts to 72 ft. lbs. (98 N.m).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

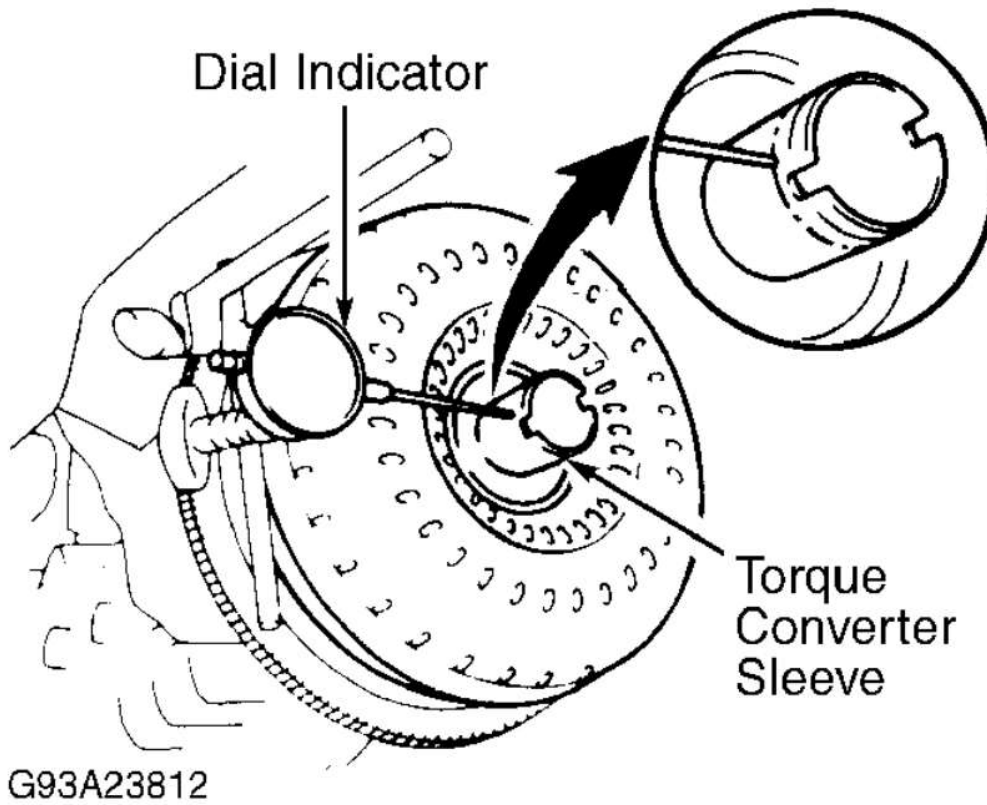
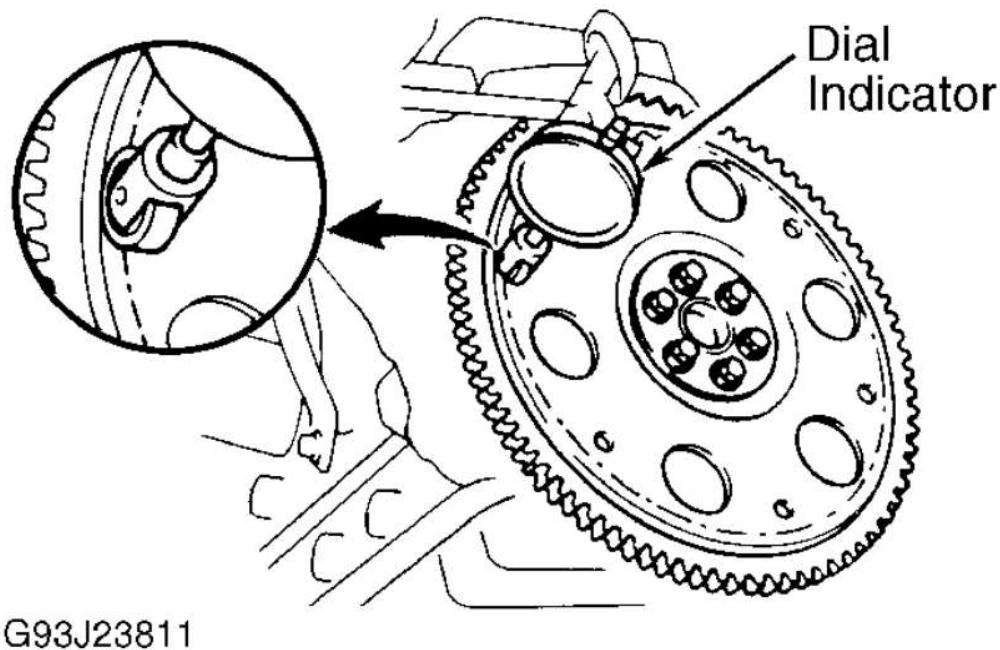


Fig. 4: Checking Torque Converter Sleeve Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

**Fig. 5: Checking Drive Plate Runout**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

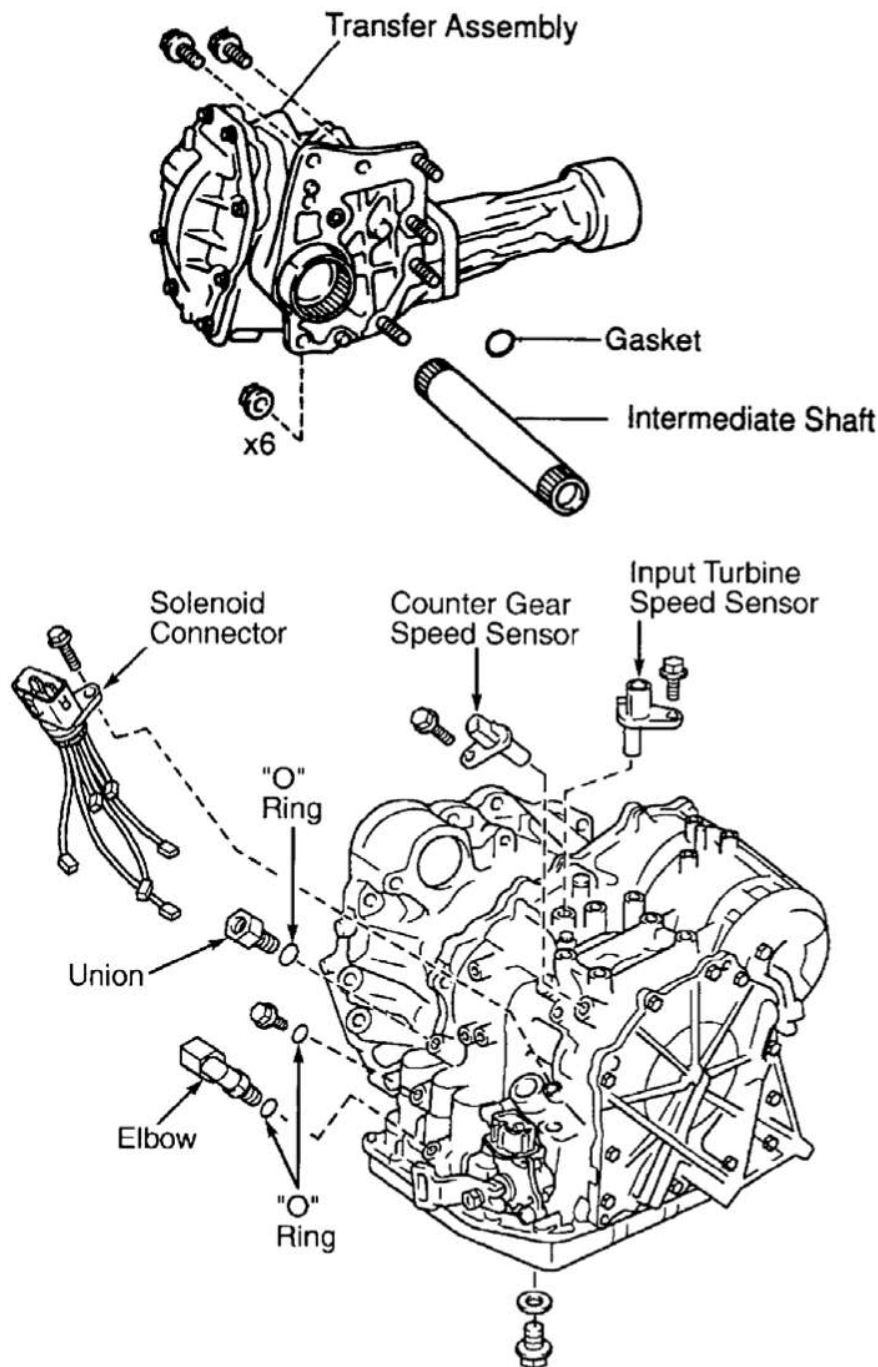
TRANSAXLE DISASSEMBLY

1. Remove transfer case. Remove 2 bolts and 6 nuts. Using plastic hammer, drive transfer case from transaxle. Pull transfer case straight up to remove from transaxle. Remove round gasket and intermediate shaft. Remove nut, washer and control shift lever. Using a screwdriver, unstake lock tab. Remove 2 bolts and nut, and remove park/neutral position switch. See **Fig. 7**.
2. Remove oil line union and elbow. Remove and discard "O" rings from union and elbow. Remove input turbine and counter gear speed sensors from top of transaxle. See **Fig. 6**. Remove and discard speed sensor "O" rings. Remove transaxle test plug from transaxle case. See **Fig. 8**. Remove solenoid connector bolt located above park/neutral position switch. DO NOT try to remove solenoid connector from transaxle case at this time.
3. Place transaxle on wooden blocks. Remove 18 bolts, oil pan and gasket. Disconnect 5 shift solenoid connectors. Remove bolts, clamps and fluid temperature sensor. See **Fig. 9**. Remove transaxle wiring harness with solenoid connector from transaxle case. Remove 3 bolts and oil strainer. Remove and discard gasket from oil strainer.
4. Remove 17 valve body bolts. Note bolt length and location for reassembly reference. See **Fig. 92**. Remove valve body assembly.
5. Remove 3 apply gaskets, check ball body and spring. See **Fig. 10**. Remove brake drum gasket located

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

near 3 apply gaskets. See **Fig. 7**. Remove underdrive clutch accumulator spring. Using 57 psi (4 kg/cm²) of compressed air applied to transaxle case, remove underdrive clutch accumulator piston. See **Fig. 11**. Cover piston with shop towel during removal.

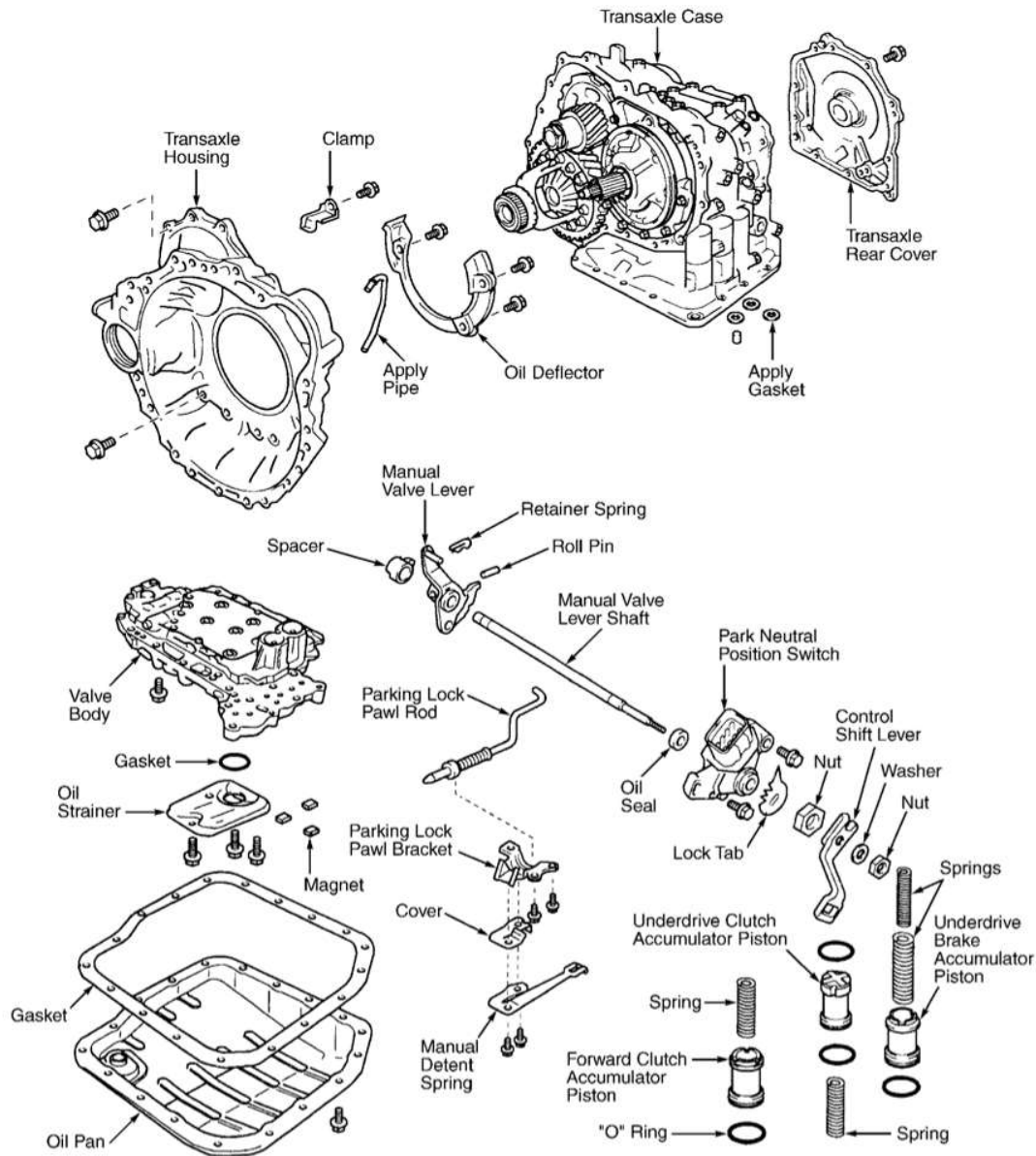


G00182310

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

Fig. 6: Locating Transfer Assembly & Speed Sensors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

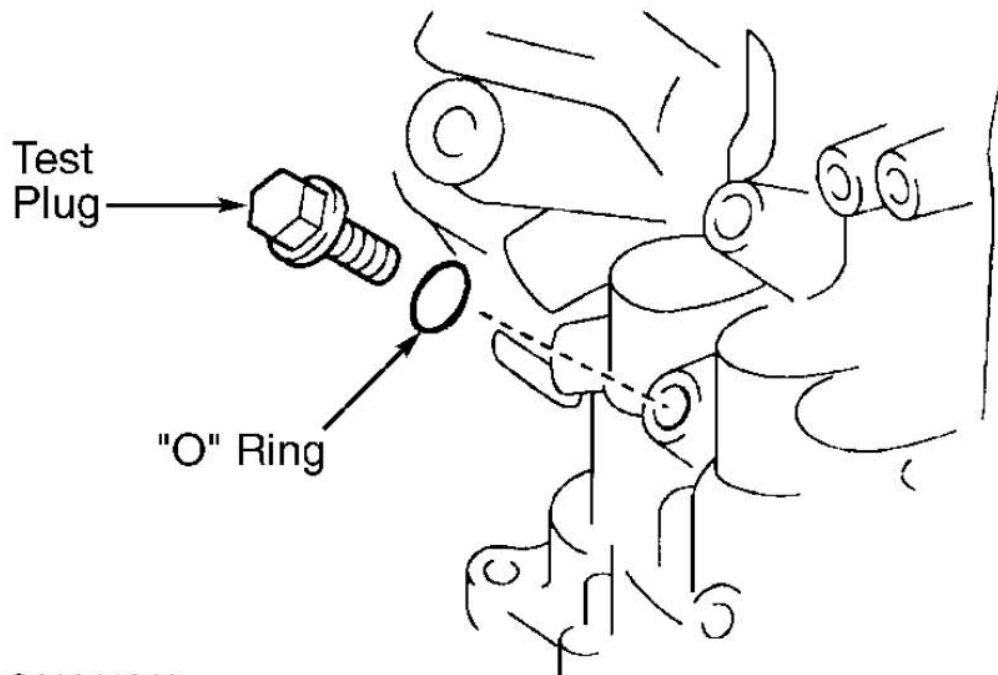


G00011241

Fig. 7: Exploded View Of Transaxle External Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



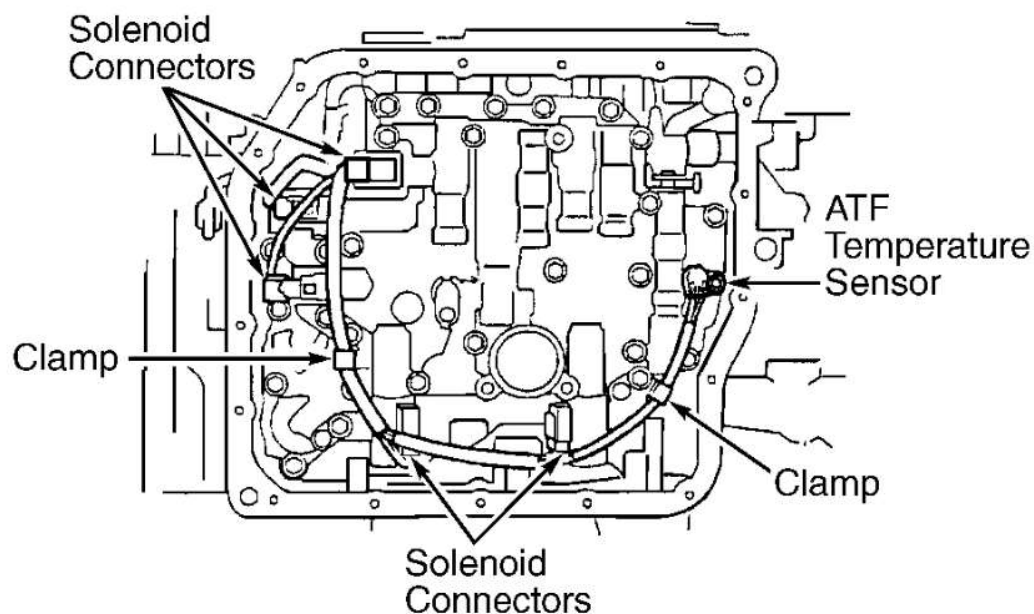
G00011240

Fig. 8: Locating Transaxle Test Plug

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

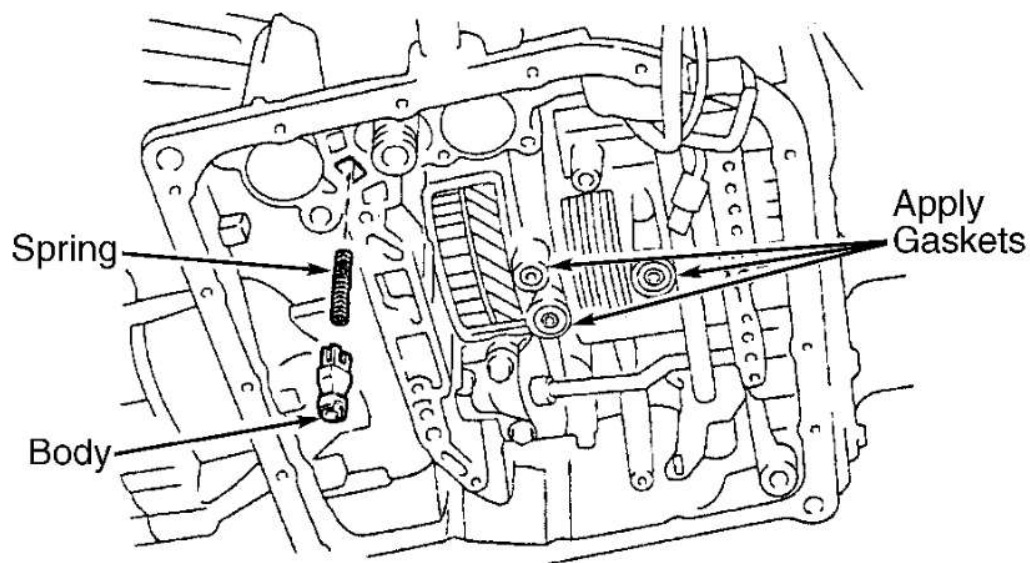
2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011242

Fig. 9: Locating Fluid Temperature Sensor & Solenoid Connectors
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

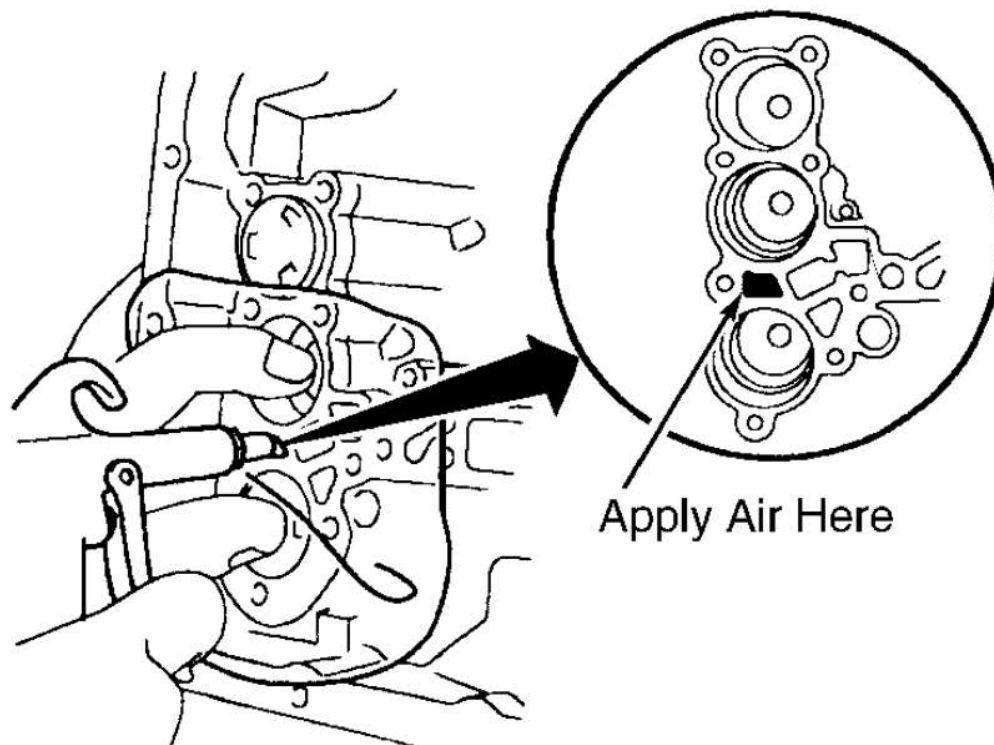


G00011243

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

Fig. 10: Locating Check Ball Body & Spring, & Apply Gaskets (3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G00011244

Fig. 11: Removing Underdrive Clutch Accumulator Piston
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Using 57 psi (4 kg/cm²) of compressed air applied to transaxle case, remove forward clutch accumulator piston and spring, and underdrive brake accumulator piston. Cover pistons with shop towel during removal. See **Fig. 12** and **Fig. 13**.
7. Using needle nose pliers, remove manual valve lever retainer spring. Remove 2 bolts, manual detent spring and cover. See **Fig. 7**. Remove 2 bolts and parking lock pawl bracket. Using a hammer and chisel, unstake and remove spacer. Using a pin punch and hammer, drive out roll pin. Ensure pin does not fall into transaxle case.
8. Remove manual valve lever shaft and manual valve lever. Remove parking lock pawl rod from manual valve lever. Using a screwdriver, remove shaft oil seal. See **Fig. 7**. Position transaxle case with oil pump assembly facing upward.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

CAUTION: Use caution when removing transaxle housing. Differential assembly may attach to transaxle housing during removal.

9. Using a dial indicator, measure input shaft end play. See **Fig. 14**. End play should be .010-.049" (.26-1.25 mm). Remove 16 transaxle housing bolts. Note bolt length and location during removal for reassembly reference. See **Fig. 15**.

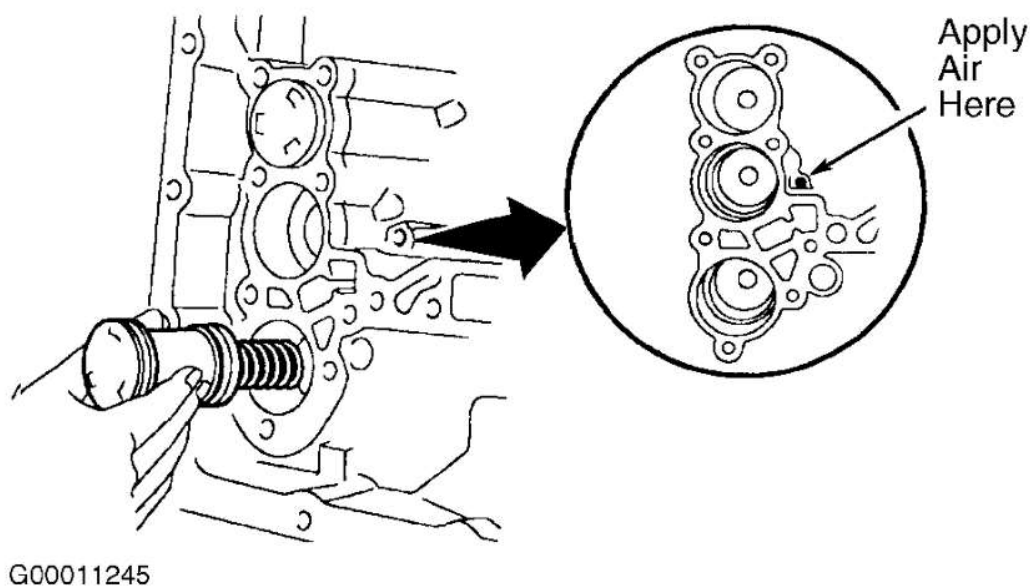
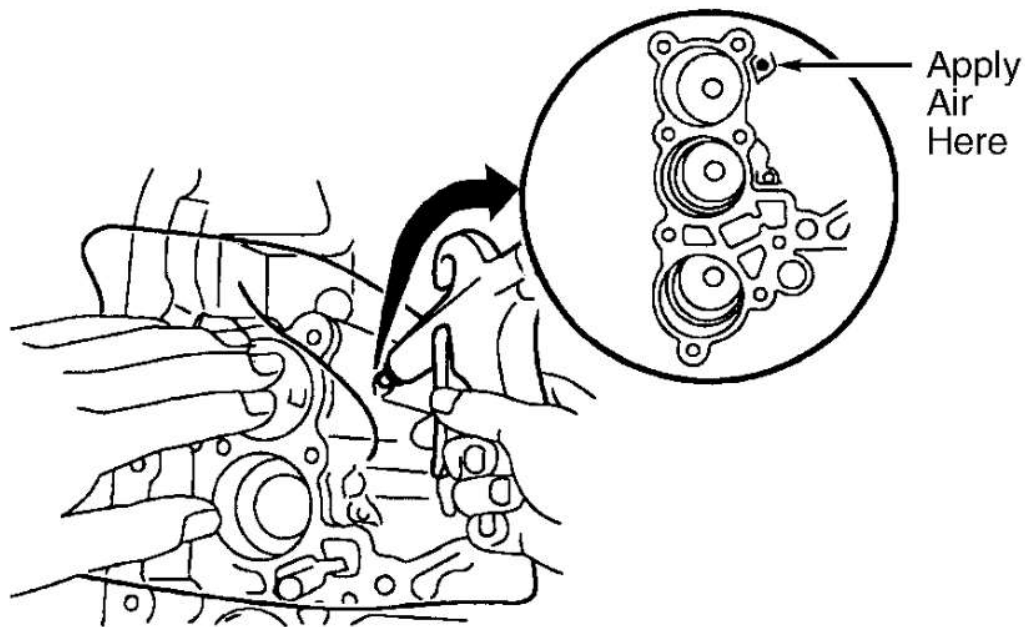


Fig. 12: Removing Forward Clutch Accumulator Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011246

Fig. 13: Removing Underdrive Brake Accumulator Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

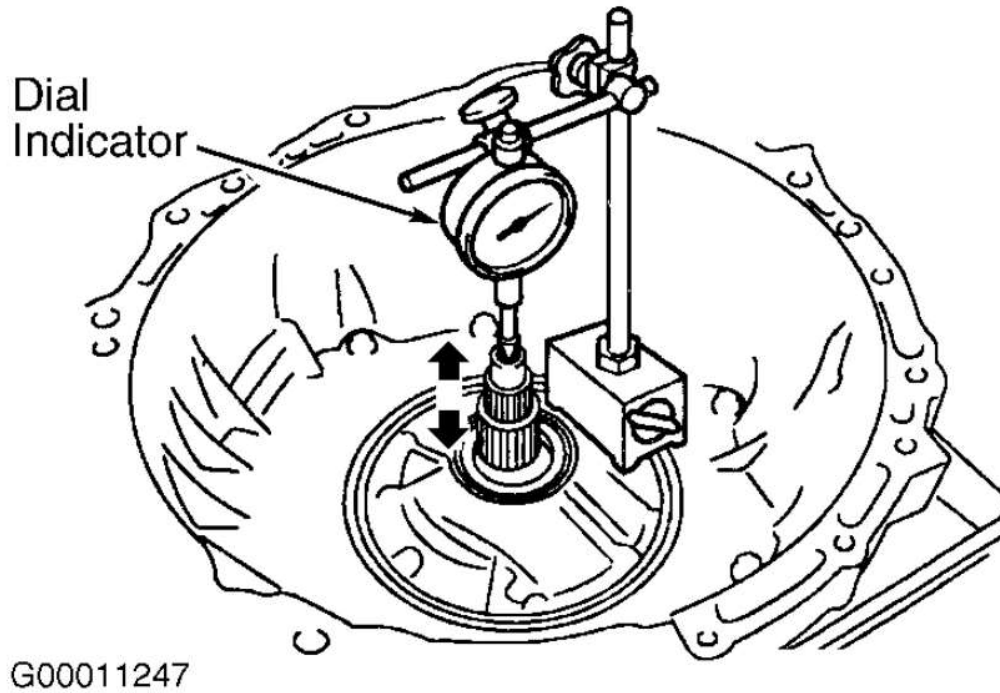
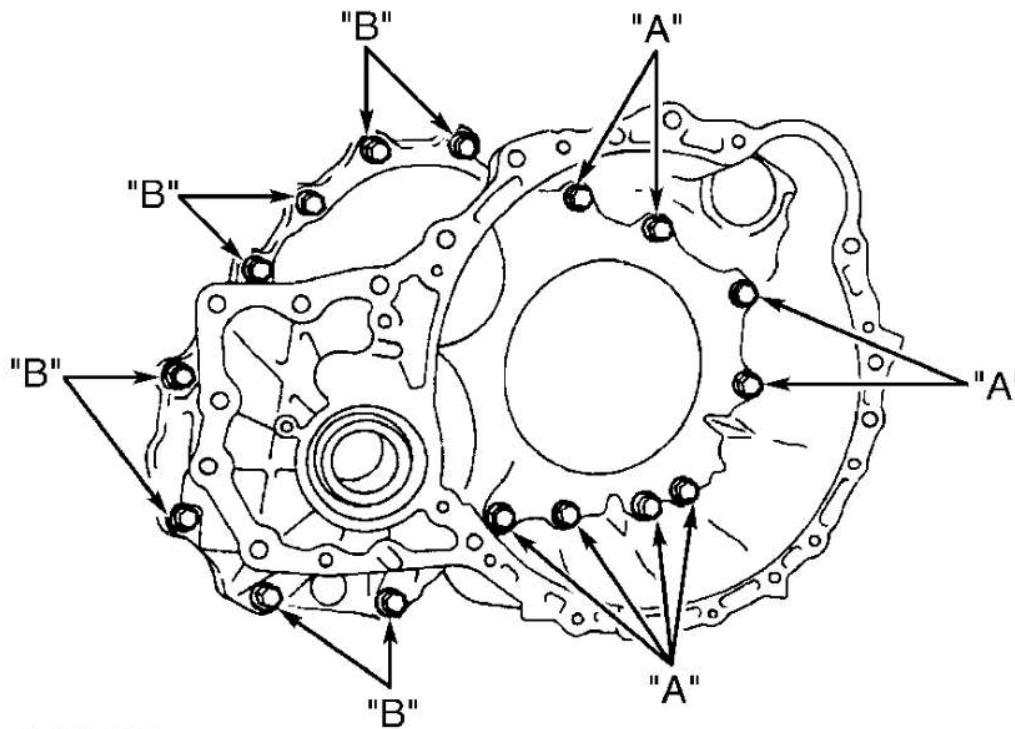


Fig. 14: Measuring Input Shaft End Play
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011248

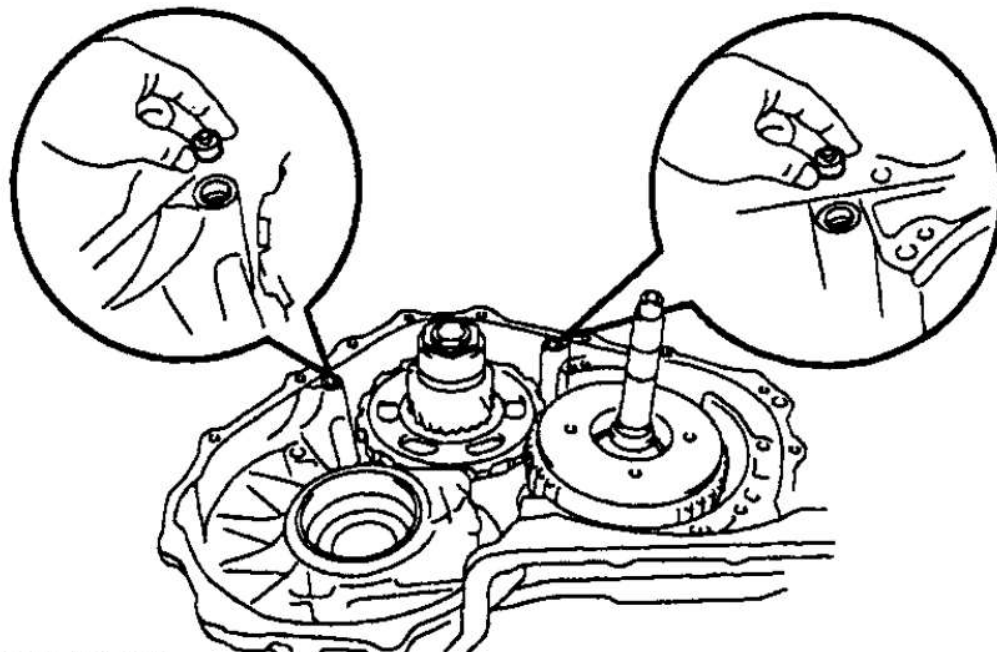
Fig. 15: Removing & Installing Transaxle Housing Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. Remove 7 oil pump bolts and oil pump. Remove thrust bearing and bearing race from underdrive planetary gear assembly. Remove differential assembly. See **Fig. 18**. Remove 2 apply gaskets from front of transaxle case. See **Fig. 16**. Remove forward clutch from transaxle case. Remove multiple clutch hub and needle roller bearing from transaxle case. See **Fig. 17**.
11. Remove one bolt and parking lock pawl clamp. See **Fig. 18**. Remove parking lock pawl shaft. Push parking lock pawl toward transaxle case to prevent interference during underdrive planetary gear assembly removal. See **Fig. 19**. Using both hands, remove underdrive planetary gear assembly. **DO NOT** allow planetary gear assembly to separate.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182268

Fig. 16: Removing 2 Apply Gaskets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. Remove spring, pawl pin and parking lock pawl. Remove underdrive clutch assembly. See **Fig. 18**. Remove thrust bearing and bearing race. Using a screwdriver, remove No. 2 one-way clutch snap ring. Remove No. 2 one-way clutch from transaxle case. Note position of index marks on No. 2 one-way clutch for reassembly reference. See **Fig. 87**. Note position of outer race retainer on No. 2 one-way clutch for reassembly reference. See **Fig. 20**. Remove outer race retainer from No. 2 one-way clutch.
13. Using a screwdriver, remove underdrive brake snap ring. Remove flange, 3 discs and 3 plates from transaxle case. Note location of components during removal for reassembly reference. Using appropriate press, compress underdrive brake piston return spring. Using snap ring expander, remove snap ring from underdrive brake. Remove piston return spring. See **Fig. 18**.
14. Remove 11 bolts and transaxle rear cover. If necessary, tap on circumference of rear cover with plastic hammer to remove cover. Remove 2 oil seal rings from rear cover. Using appropriate puller, remove needle roller bearing, if necessary. See **Fig. 17**. Remove bolt, clamp and 2 brake apply pipes. Using a screwdriver, remove 2 apply gaskets from rear of transaxle case. See **Fig. 18**.
15. Remove direct clutch with thrust bearing from transaxle case. Remove bearing race from direct clutch (shaft side). Remove rear planetary sun gear assembly from transaxle case. Remove thrust bearing from rear planetary sun gear. Remove thrust washer No. 1 from rear planetary sun gear.
16. Remove No. 1 one-way clutch and thrust bearing from transaxle case. Remove inner race from one-way clutch. Remove one-way clutch outer sleeve from transaxle case. Note direction of components for

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

reassembly reference. Using a screwdriver, remove 2nd brake snap ring. Remove flange, 3 discs and 3 plates from transaxle case. Note location of components during removal for reassembly reference. See **Fig. 17**.

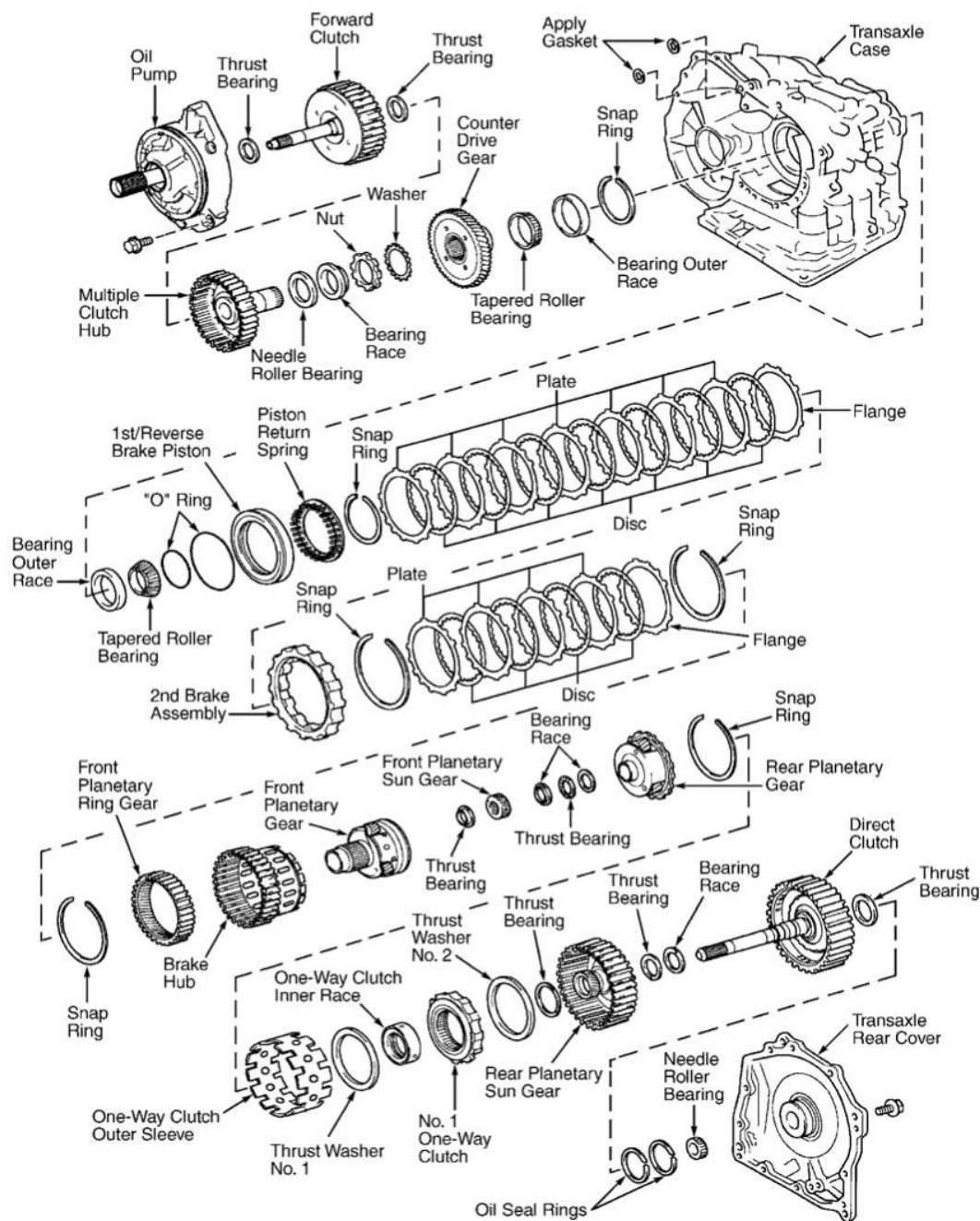
17. Using a screwdriver, remove rear planetary gear snap ring. Remove rear planetary gear from transaxle case. Remove thrust washer No. 2 from rear planetary gear. Remove 2 bearing races, thrust bearings and front planetary sun gear from transaxle case. See **Fig. 17**.
18. Using a hammer and chisel, unstake washer located on counter drive gear. See **Fig. 17**. Ensure all claws on washer are pushed down to allow socket to fit securely on nut. Using holding tool and socket, remove nut. See **Fig. 21**. Using appropriate adapter and press, remove front planetary gear from counter drive gear. See **Fig. 22**.
19. Using a screwdriver, remove 2nd brake assembly snap ring. Remove brake hub with 2nd brake assembly. Remove brake hub from 2nd brake assembly. See **Fig. 17**. Using a screwdriver, remove snap ring and front planetary ring gear from brake hub. Remove 1st/reverse brake flange, 5 discs and 5 plates from transaxle case. Note location of components during removal for reassembly reference.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

20. Using appropriate press, compress 1st/reverse brake piston return spring. Using snap ring expander, remove snap ring from underdrive brake. Remove piston return spring. Using 57 psi (4 kg/cm²) of compressed air applied to transaxle case, remove 1st/reverse brake piston from case. See **Fig. 23**. Cover piston with shop towel during removal.
21. Using appropriate adapter and press, remove counter drive gear from transaxle case. Install and tighten 2 bolts opposite each other evenly on counter drive gear. Ensure clearance between counter drive gear and bearing race is about .79" (20.0 mm). Using bearing puller, remove rear tapered roller bearing from counter drive gear. See **Fig. 17**.
22. Using a brass drift and hammer, remove bearing inner and outer races. Remove snap ring at underdrive brake piston from transaxle case. Using 57 psi (4 kg/cm²) of compressed air applied to transaxle case, remove underdrive brake piston from case. See **Fig. 24**. Cover piston with shop towel during removal.
23. Using appropriate puller, remove needle roller bearing from transaxle case. Remove 2 oil seal rings from transaxle case. See **Fig. 26**. Using appropriate puller, remove cylindrical roller bearing from transaxle case.
24. Remove oil seal ring from transaxle housing. See **Fig. 25**. Remove bolt, clamp and apply pipe from transaxle case. Remove 3 bolts and oil deflector (if equipped) from transaxle case. See **Fig. 7**.

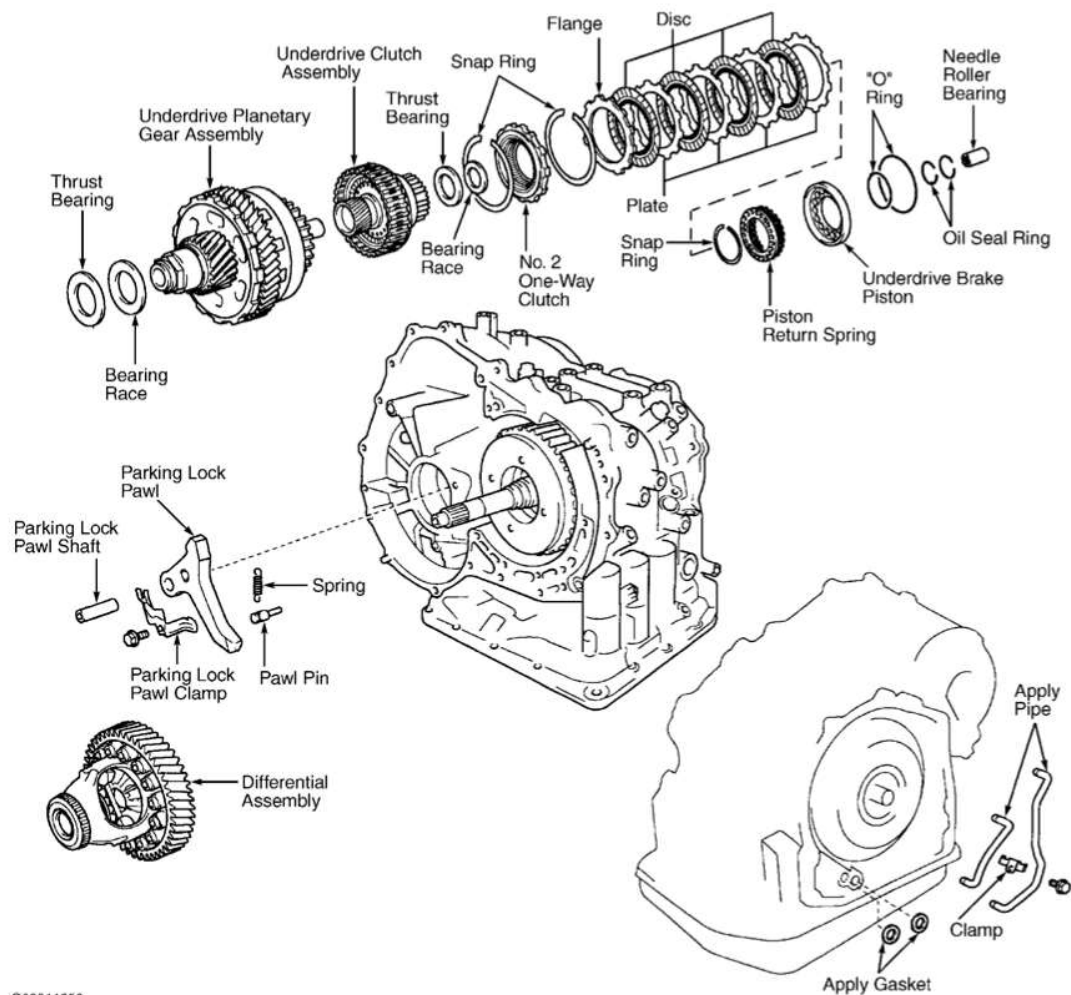
2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011249

Fig. 17: Exploded View Of Transaxle Internal Components (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

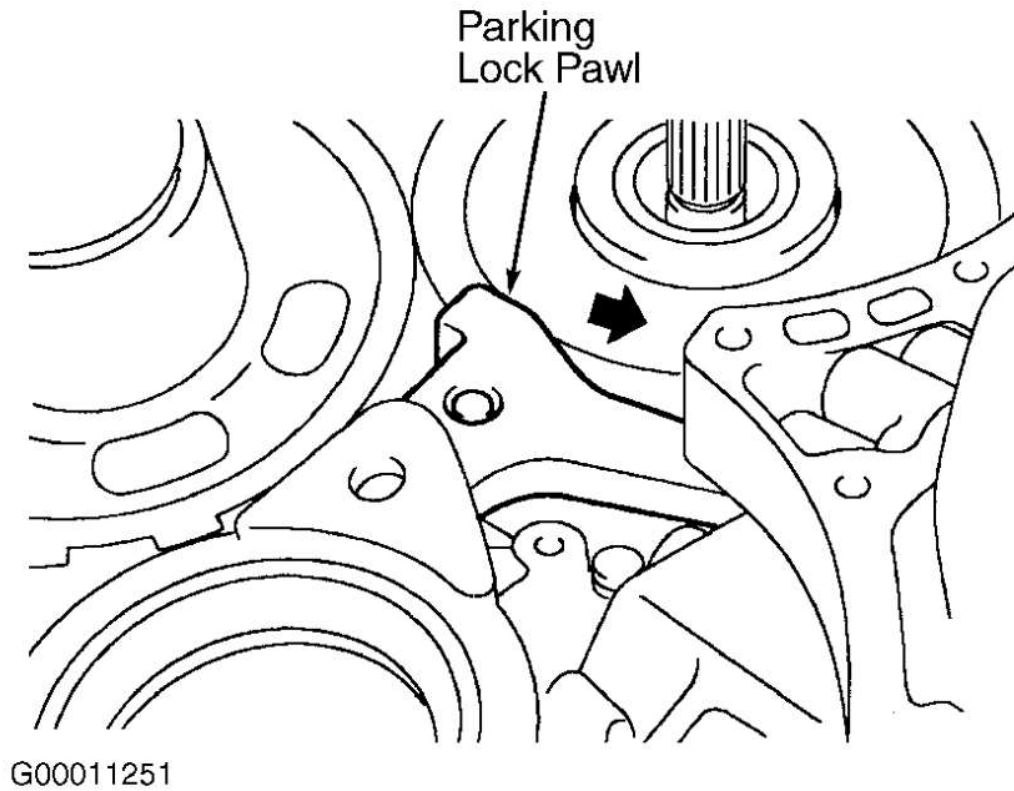
2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

G00011250

Fig. 18: Exploded View Of Transaxle Internal Components (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011251

Fig. 19: Pushing Parking Lock Pawl Toward Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

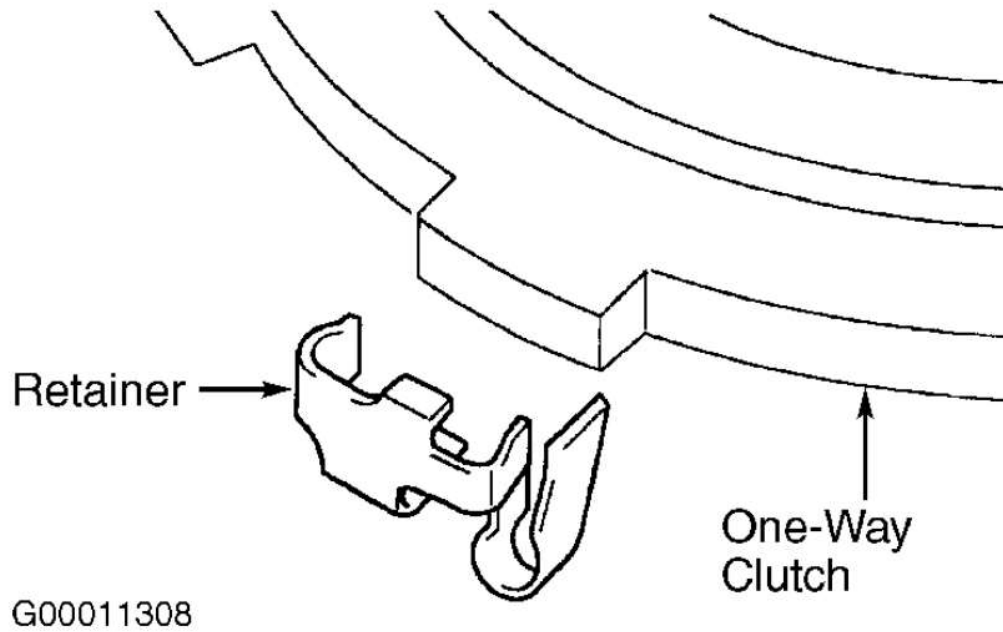
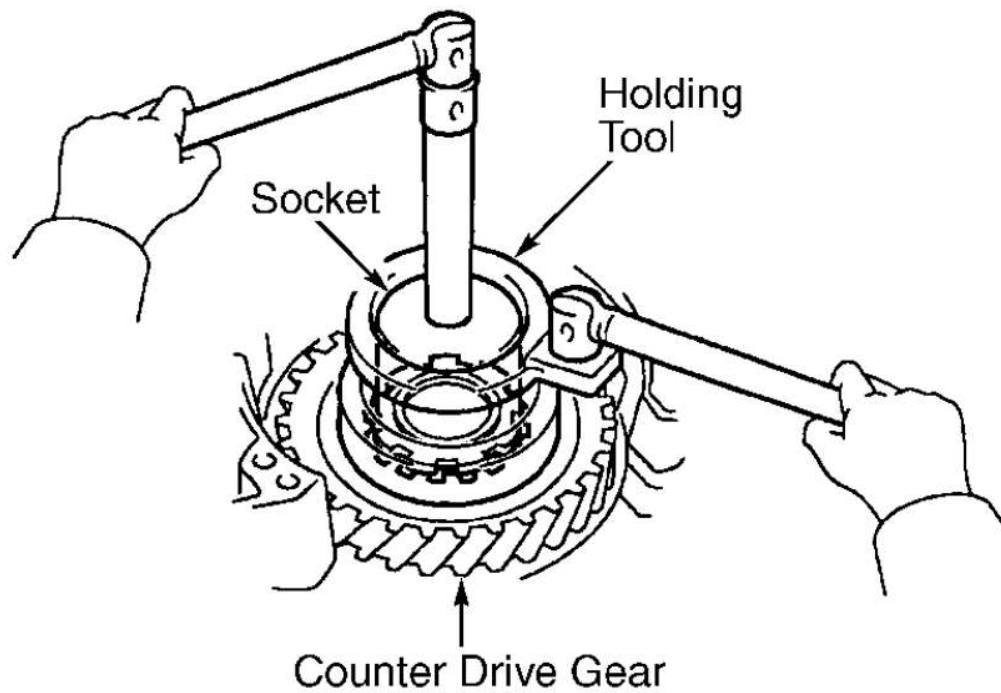


Fig. 20: Removing & Installing Outer Race Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011252

Fig. 21: Removing & Installing Counter Drive Gear Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

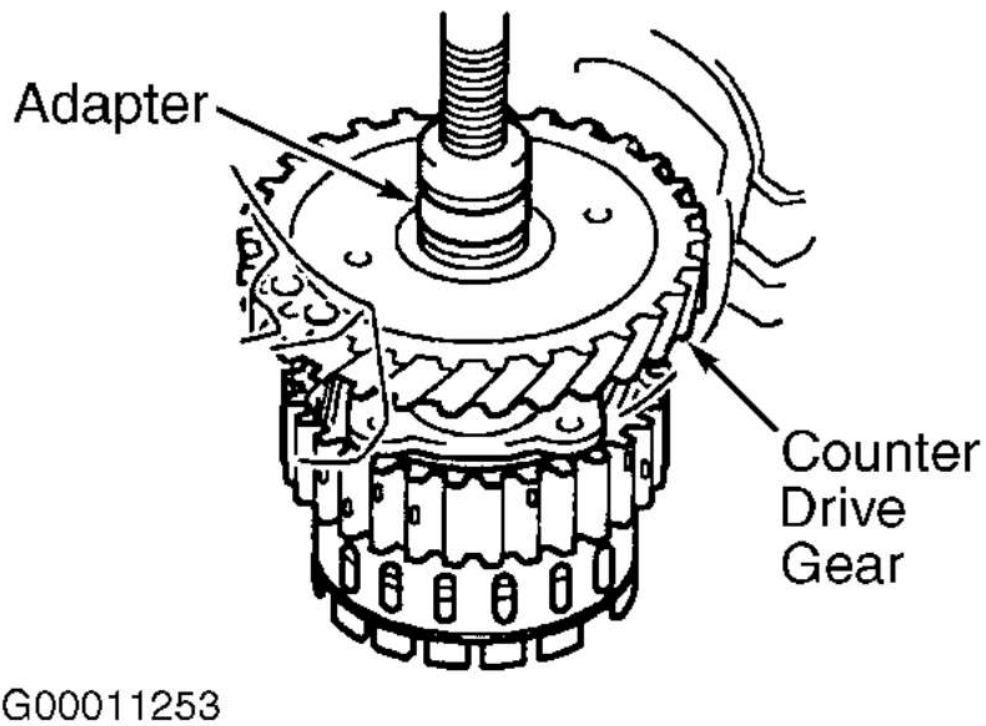
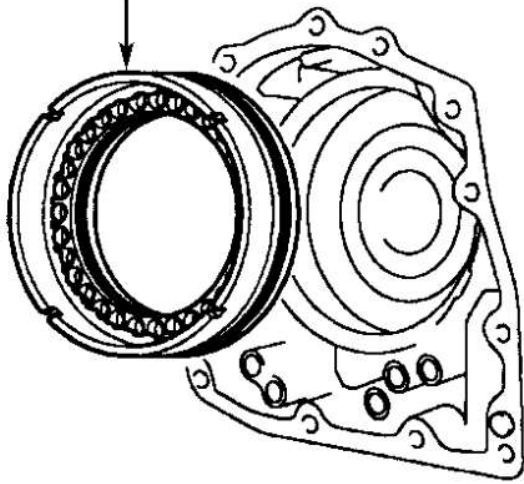


Fig. 22: Removing Front Planetary Gear From Counter Drive Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

1st/Reverse
Brake Piston



G00011254

Apply
Air Here

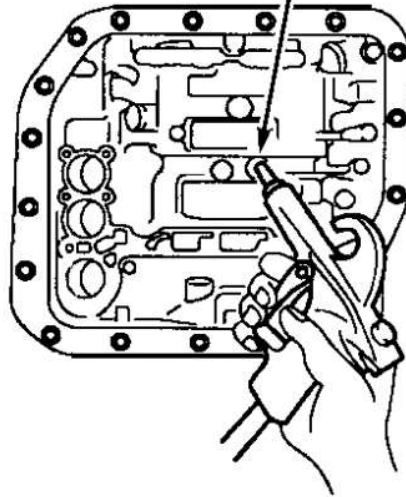


Fig. 23: Removing 1st/Reverse Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

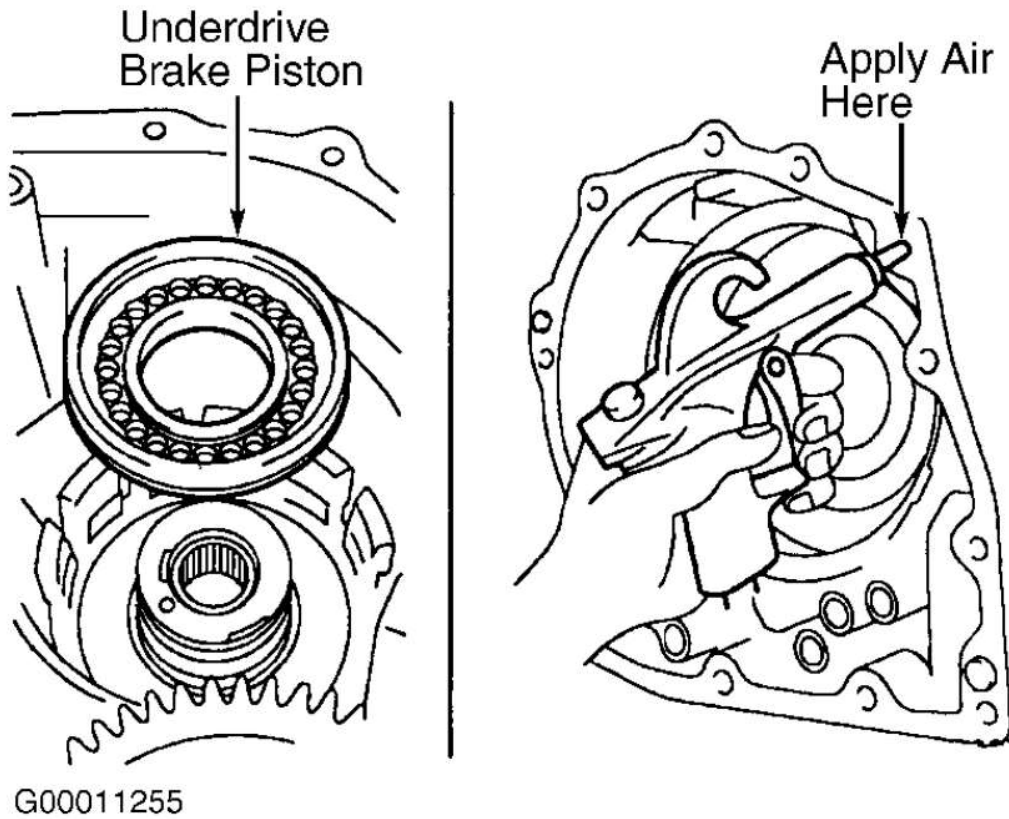


Fig. 24: Removing Underdrive Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

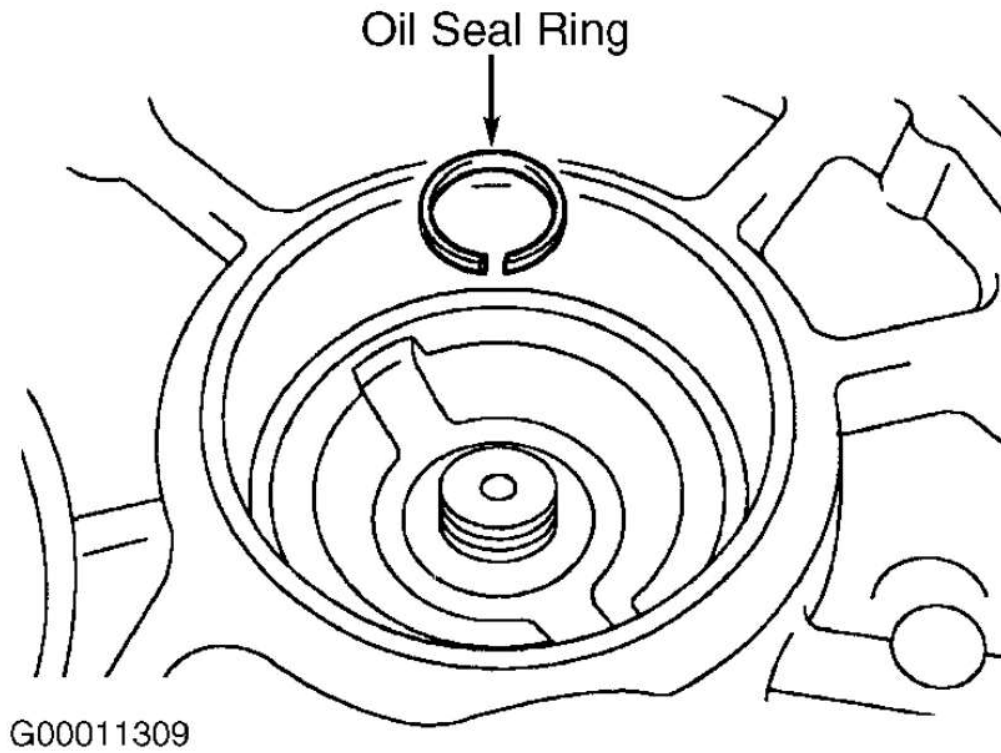
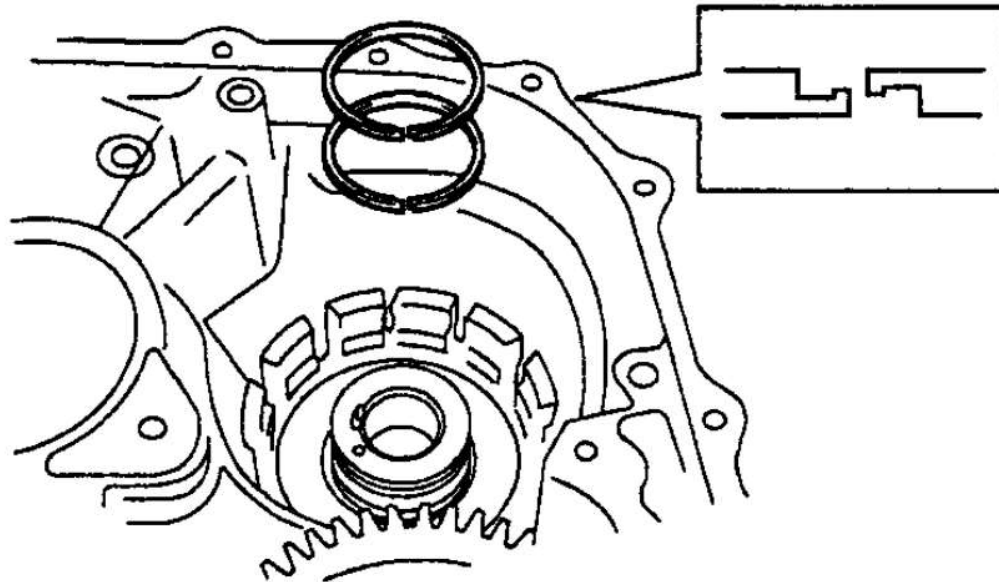


Fig. 25: Removing & Installing Transaxle Housing Oil Seal Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182276

Fig. 26: Removing Underdrive Clutch Oil Seal Rings
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

COMPONENT DISASSEMBLY & REASSEMBLY

OIL PUMP ASSEMBLY

Disassembly

Using 2 screwdrivers, turn drive gear and check for smooth rotation. Remove 2 oil seal rings. Using T30 Torx socket, remove 11 bolts attaching oil pump body and stator shaft. Remove "O" ring from oil pump body. See **Fig. 27**. Note direction and location of drive and driven gears. Leave gears in oil pump body for inspection.

Inspection

1. Check body clearance of driven gear. Push driven gear to one side of body. Using a feeler gauge, measure clearance. See **Fig. 28**. Body clearance should be .0039-.0067" (.100-.170 mm). Maximum body clearance is .0067" (.170 mm). If body clearance exceeds specification, replace oil pump body.
2. Using a feeler gauge, check tip clearance of driven gear. Measure between gear teeth and crescent-shaped part of oil pump body. See **Fig. 29**. Tip clearance is .0028-.0059" (.070-.150 mm). Maximum tip clearance is .0059" (.150 mm). If tip clearance exceeds specification, replace oil pump body.
3. Check side clearance of both gears. Use a steel straightedge and feeler gauge to measure side clearance of both gears. See **Fig. 30**. Clearance is .0008-.0020" (.020-.050 mm). Maximum side clearance

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

is .0020" (.050 mm). Replace gears as necessary. If side clearance is not within specification after gear replacement, replace oil pump body.

4. Using a dial indicator, measure inside diameter of oil pump body bushing. See **Fig. 31**. Maximum inside diameter is 1.503" (38.18 mm). If inside diameter exceeds specification, replace oil pump body.
5. Using a dial indicator, measure inside diameter of stator shaft bushing. See **Fig. 32**. Maximum inside diameter is .849" (21.57 mm). If inside diameter exceeds specification, replace stator shaft.
6. Inspect front oil seal for cracks, damage or wear. Replace oil seal (if necessary). Remove oil seal with slide hammer. Install a NEW oil seal. Seal is properly installed when it is flush with outer edge of pump body.

Reassembly

1. Install front oil seal. Install driven gear and drive gear. Ensure top of gears are facing upward. Install stator shaft on oil pump body. Align bolt holes. Install 11 stator shaft-to-oil pump body bolts. Tighten bolts in crisscross pattern to 87 INCH lbs. (9.8 N.m).
2. Install 2 oil seal rings on oil pump. DO NOT expand ring ends excessively. Turn drive gear with screwdrivers to ensure a smooth rotation. DO NOT damage oil seal lip.

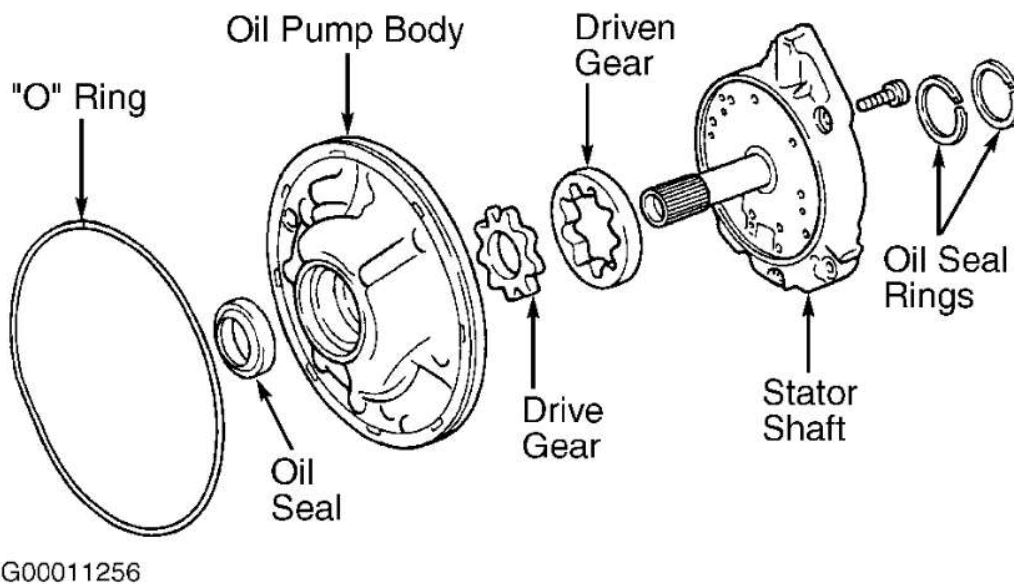


Fig. 27: Exploded View Of Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

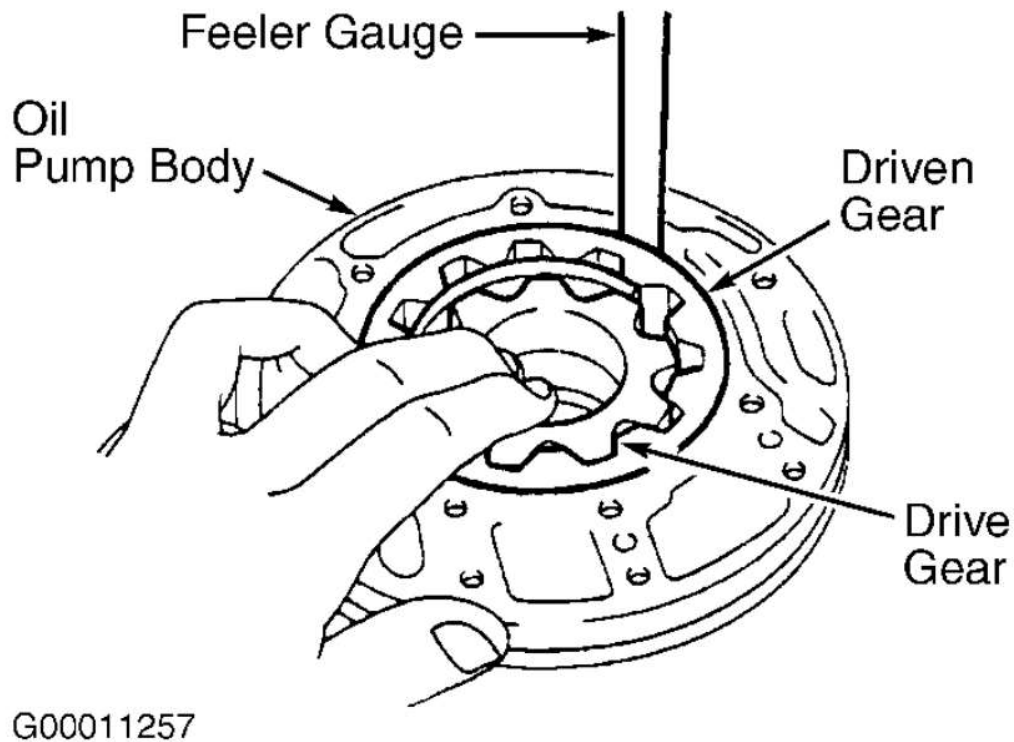


Fig. 28: Checking Oil Pump Driven Gear Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

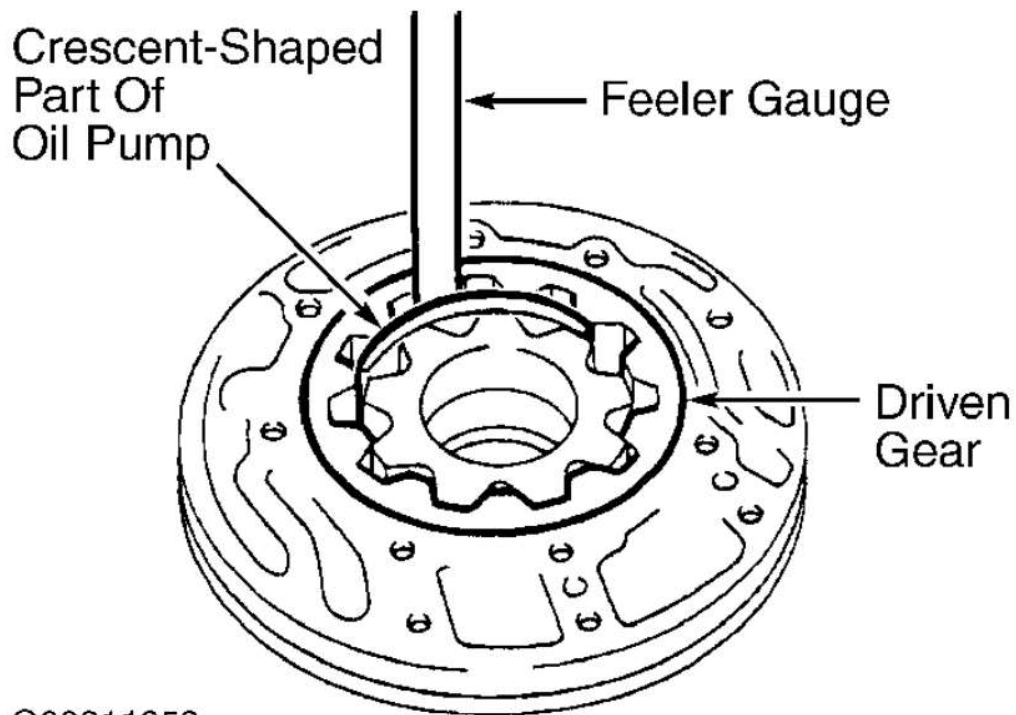


Fig. 29: Checking Oil Pump Driven Gear Tip Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

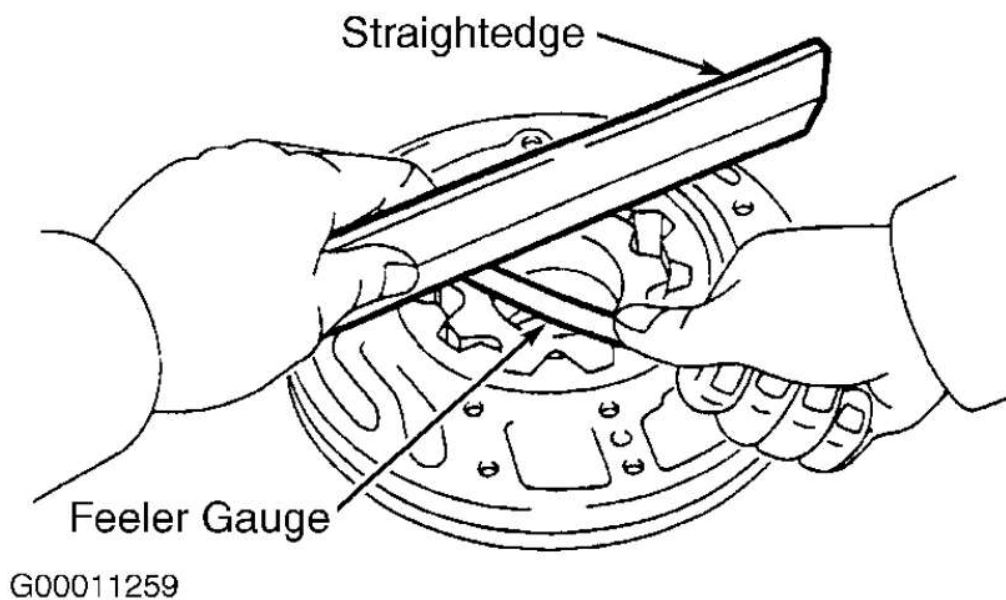
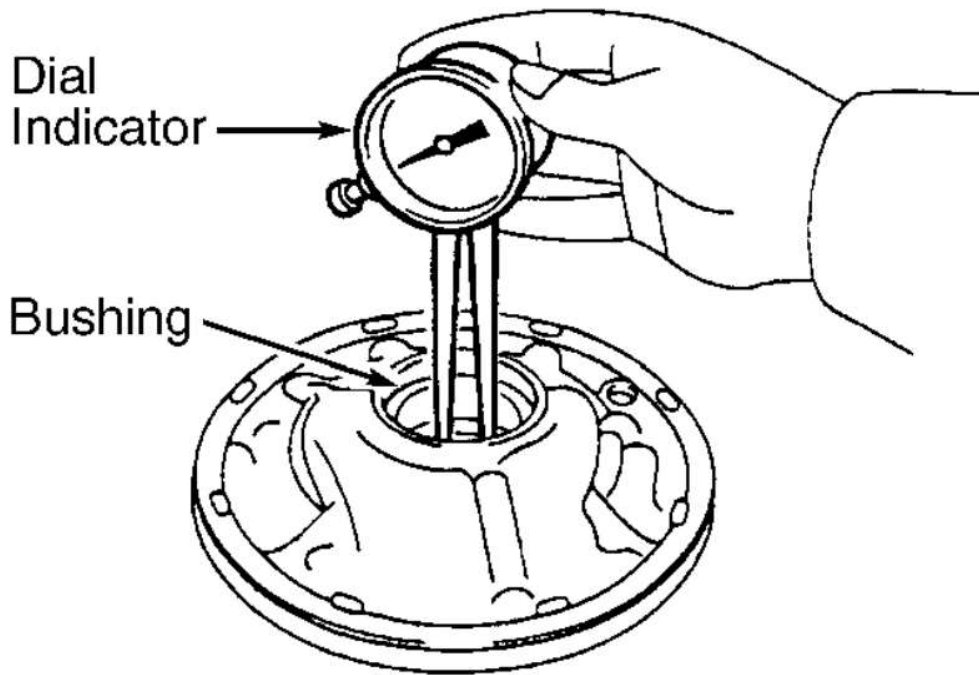


Fig. 30: Checking Oil Pump Gear Side Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

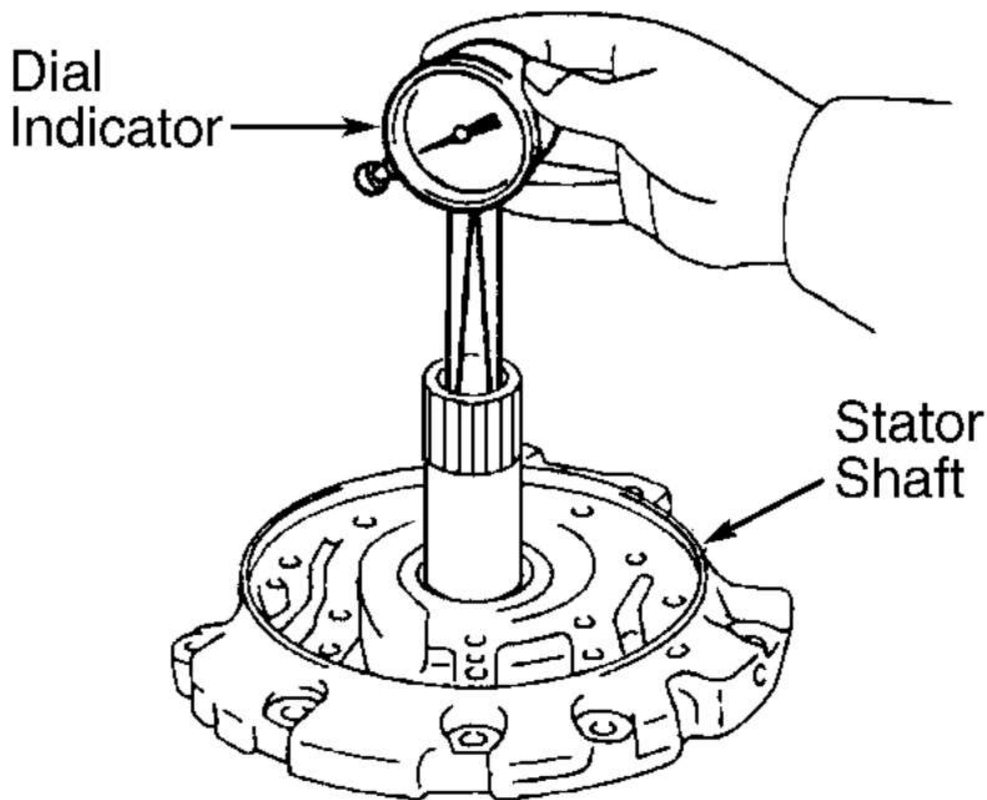


G00011260

Fig. 31: Checking Oil Pump Body Bushing Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011261

Fig. 32: Checking Stator Shaft Bushing Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIRECT CLUTCH

Disassembly

1. Prior to disassembly, measure piston stroke of direct clutch. Install direct clutch and needle roller bearing on transaxle rear cover. Using a dial indicator, measure direct clutch piston stroke by applying and releasing 57 psi (4 kg/cm²) of compressed air to transaxle rear cover. See **Fig. 33**. Piston stroke should be .024-.033" (.61-.83 mm). If piston stroke is not within specification, inspect each component during disassembly.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

spring seat from becoming deformed. DO NOT expand snap ring excessively.

2. Remove direct clutch from transaxle rear cover. Using a screwdriver, remove snap ring from direct clutch drum. Remove flange, 3 discs and 3 plates. Note location of components during removal for reassembly reference. Position clutch balancer on a press. Compress piston return springs and remove snap ring. See **Fig. 34**.
3. Remove clutch balancer and piston return springs from clutch drum. Install direct clutch on transaxle rear cover. While holding direct clutch piston, apply 57 psi (4 kg/cm²) of compressed air to transaxle rear cover to remove direct clutch piston. See **Fig. 33**.

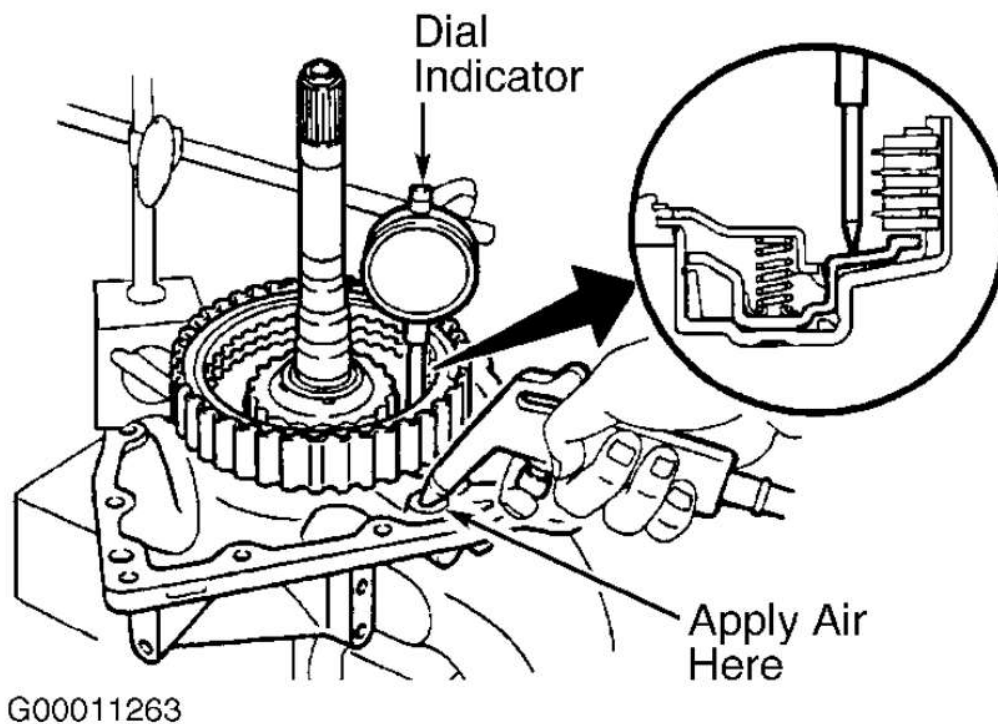


Fig. 33: Measuring Direct Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

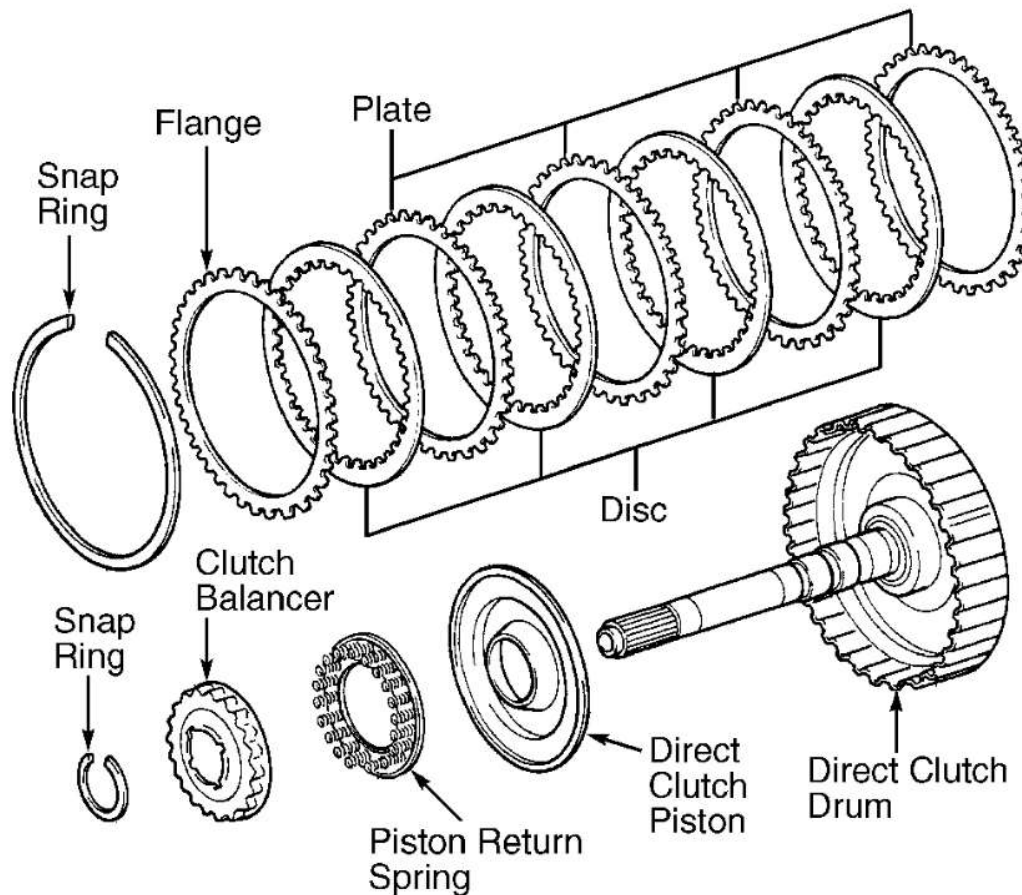


Fig. 34: Exploded View Of Direct Clutch Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection

1. Clean all parts (except discs) with solvent. Dry parts using compressed air. Inspect discs and plates for wear or burnt areas. If disc lining is peeled or discolored, replace discs as necessary. Replace all damaged components.
2. Using vernier calipers, measure direct clutch piston return spring free length with spring mounted to spring seat. Free length should be .889" (22.58 mm). Replace springs as necessary.

NOTE: New discs must be soaked in ATF at least 15 minutes prior to reassembly.

Reassembly

1. Coat piston with ATF. Using hand pressure, press piston into direct clutch drum. Ensure piston lip seal is

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

not damaged. Install piston return springs and clutch balancer onto direct clutch drum. Set snap ring in position.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

2. Using appropriate press positioned on clutch balancer, compress piston return springs. Using snap ring expander, install snap ring in direct clutch drum groove. Ensure end gap of spring is not aligned with gaps in clutch balancer hub.
3. Install 3 plates and 3 discs, starting with plate and alternating with disc. Install flange on top of disc. See **Fig. 34**. Install snap ring. Ensure end gap of snap ring is not aligned with cutouts of direct clutch drum.
4. If disc, plate or flange have been replaced, check piston stroke. Install direct clutch and needle roller bearing on transaxle rear cover. Using a dial indicator, measure direct clutch piston stroke by applying and releasing 57 psi (4 kg/cm²) of compressed air to transaxle rear cover. See **Fig. 33**.
5. Piston stroke should be .024-.033" (.61-.83 mm). If piston stroke is not within specification, disassemble and reassemble direct clutch components.
6. Measure piston stroke again. If measurement is still not within specification, replace flange. Flange is available in 6 thicknesses, from .118" (3.00 mm) to .138" (3.50 mm) in increments of .004" (.10 mm).
7. Check direct clutch operation. Insert rear planetary sun gear into direct clutch. Ensure rear planetary sun gear rotates in both directions. See **Fig. 35**. If sun gear does not rotate as described, disassemble and inspect direct clutch.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

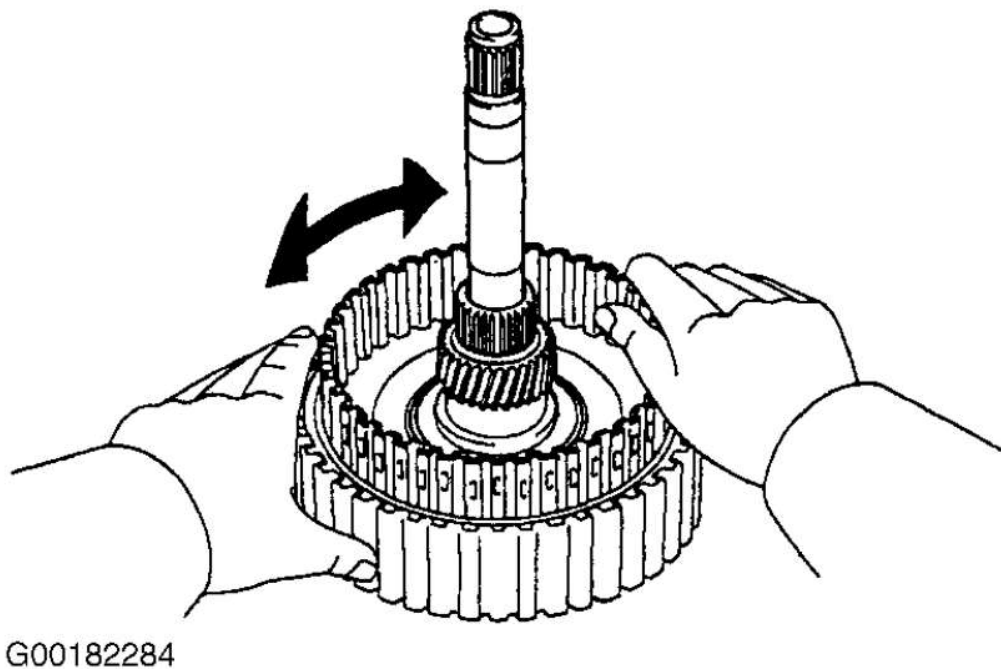


Fig. 35: Checking Direct Clutch Operation
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FORWARD CLUTCH

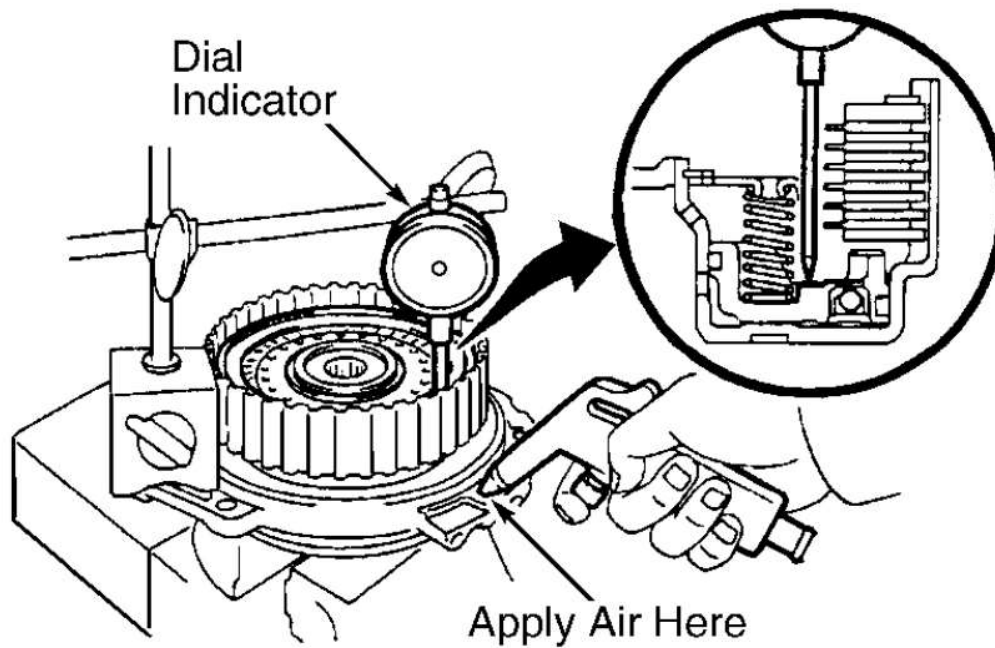
Disassembly

1. Prior to disassembly, measure piston stroke of forward clutch. Install forward clutch on oil pump assembly. Using a dial indicator, measure forward clutch piston stroke by applying and releasing 57 psi (4 kg/cm²) of compressed air to oil pump. See **Fig. 36**. Opening in oil pump is large. To prevent air from discharging, surround air nozzle with shop towel. Piston stroke should be .056-.069" (1.41-1.75 mm). If piston stroke is not within specification, inspect each component during disassembly.
2. Remove forward clutch from oil pump assembly. Using a screwdriver, remove snap ring from forward clutch drum. Remove flange, 4 discs and 4 plates. Note location of components during removal for reassembly reference. Using appropriate press, compress piston return springs. Using snap ring expander, remove snap ring. See **Fig. 37**.
3. Remove press and piston return springs. Install forward clutch on oil pump assembly. While holding forward clutch piston, apply 57 psi (4 kg/cm²) of compressed air to oil pump to remove forward clutch piston. See **Fig. 36**. Opening in oil pump is large. To prevent air from discharging, surround air nozzle with shop towel.
4. If piston cannot be removed using compressed air, wrap needle nose pliers tips with vinyl tape and

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

remove piston using pliers. Remove 2 "O" rings from piston.

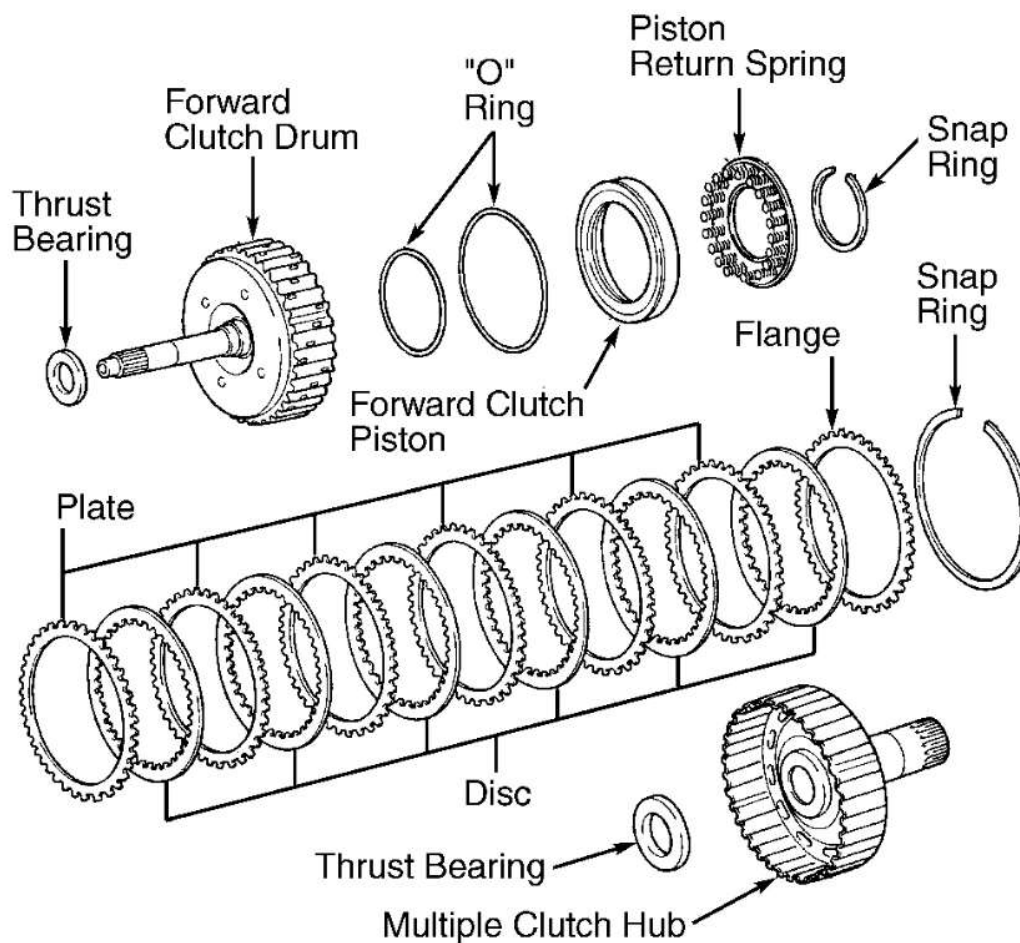


G00011265

Fig. 36: Measuring Forward Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011264

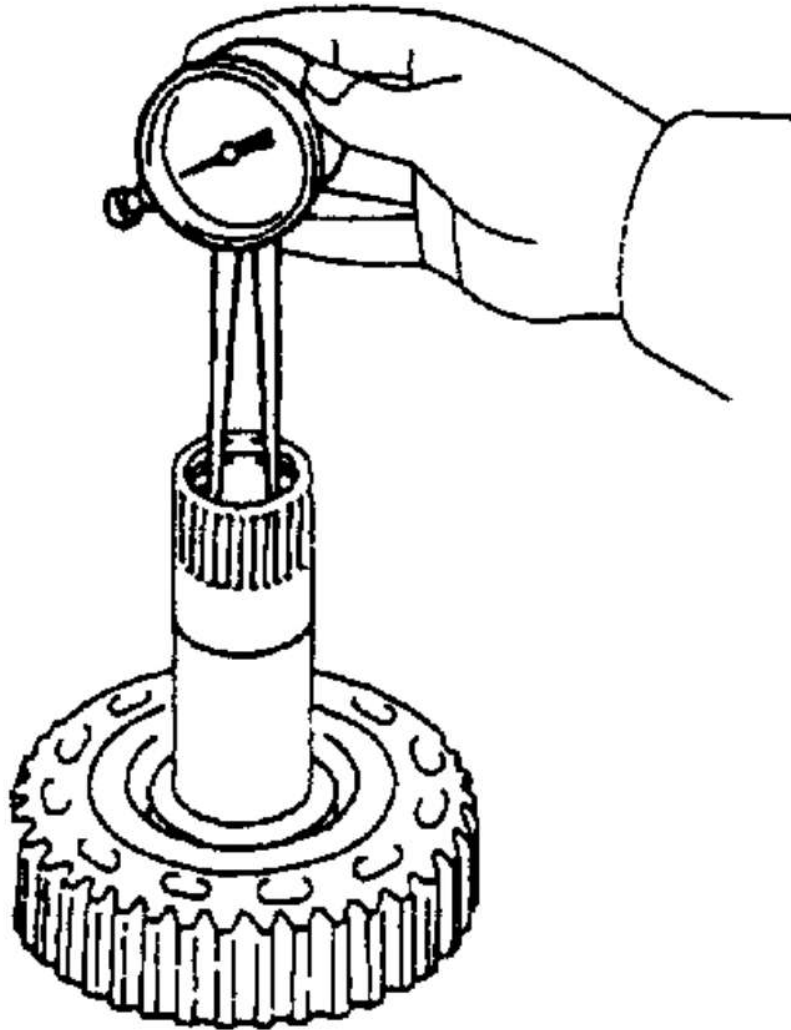
Fig. 37: Exploded View Of Forward Clutch Assembly With Multiple Clutch Hub
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection

1. Clean all parts (except discs) with solvent. Dry parts using compressed air. Ensure check ball is free in piston. Apply low air pressure to small hole in piston to check for air leakage around piston valve. Inspect discs and plates for wear or burnt areas. If disc lining is peeled or discolored, replace discs as necessary. Replace all damaged components.
2. Using vernier calipers, measure forward clutch piston return spring free length with spring mounted to spring seat. Free length should be 1.111" (28.23 mm). Replace springs as necessary.
3. Using a dial indicator, measure inside diameter of multiple clutch hub bushing. See **Fig. 38**. Maximum inside diameter is .909" (23.09 mm). If inside diameter exceeds specification, replace multiple clutch hub.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182269

Fig. 38: Measuring Multiple Clutch Hub Bushing Inside Diameter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: New discs must be soaked in ATF for 15 minutes prior to reassembly.

Reassembly

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

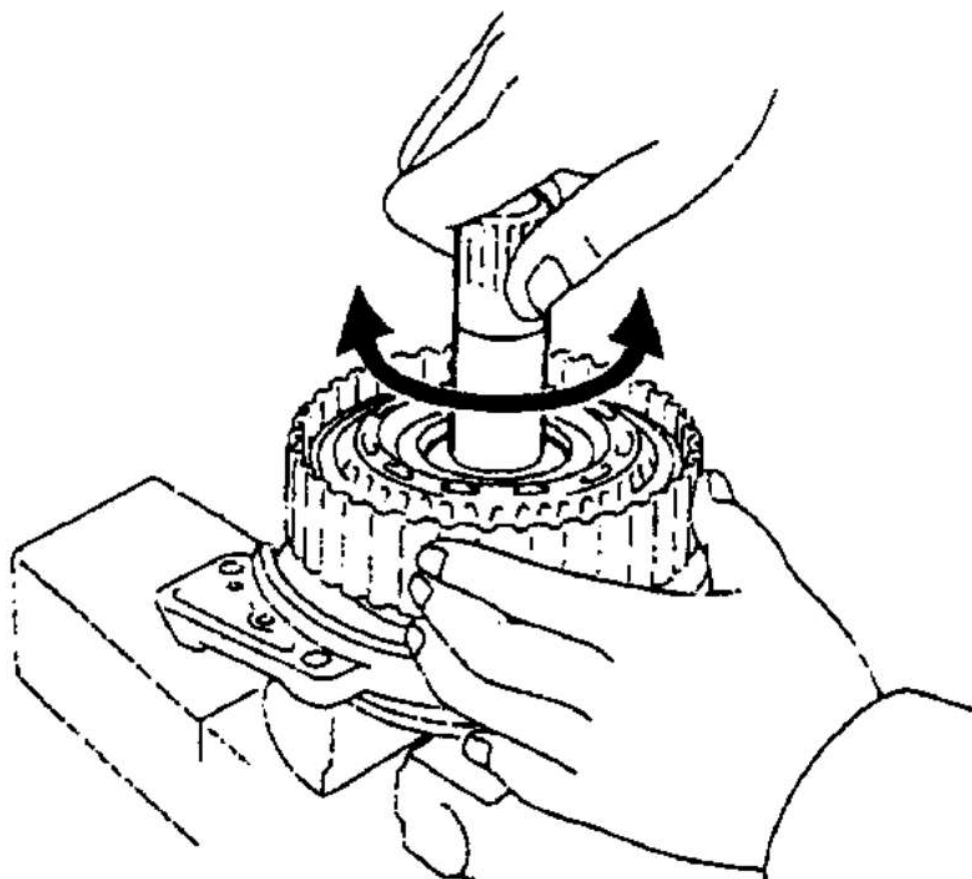
1. Coat NEW piston "O" rings with ATF. Install "O" rings on forward clutch piston. Using hand pressure, press piston into forward clutch drum. Ensure "O" rings are not damaged. Set piston return springs in position.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

2. Position spring seat on a press. Compress piston return springs. Using snap ring expander, install snap ring in forward clutch drum groove. Ensure end gap of spring is not aligned with gap in spring retainer hub.
3. Install 4 plates and 4 discs, starting with plate and alternating with disc. Install flange on top of disc. See **Fig. 37**. Install snap ring. Ensure end gap of snap ring is not aligned with cutouts of forward clutch drum.
4. If disc, plate or flange have been replaced, check piston stroke. Install forward clutch on oil pump assembly. Using a dial indicator, measure forward clutch piston stroke by applying and releasing 57 psi (4 kg/cm²) of compressed air to oil pump. See **Fig. 36**. Opening in oil pump is large. To prevent air from discharging, surround air nozzle with shop towel. Piston stroke should be .056-.069" (1.41-1.75 mm). If piston stroke is not within specification, disassemble and reassemble forward clutch components.
5. Measure piston stroke again. If measurement is still not within specification, replace flange. Flange is available in 5 thicknesses from .118" (3.00 mm) to .142" (3.60 mm) in increments of .006" (.15 mm). Coat thrust bearings with ATF and install.
6. Check forward clutch operation. Insert multiple clutch hub into forward clutch. Ensure forward clutch rotates in both directions. See **Fig. 39**. If forward clutch does not rotate as described, disassemble and inspect forward clutch.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182288

Fig. 39: Checking Forward Clutch Operation
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2ND BRAKE

Disassembly & Reassembly

1. Using appropriate press, position press on piston return springs and compress springs. Using a screwdriver, remove snap ring. Remove press and piston return springs. See **Fig. 40**. While holding 2nd brake piston, apply 57 psi (4 kg/cm²) of compressed air to 2nd brake cylinder to remove piston. See **Fig. 41**. Remove 2 "O" rings from piston.
2. Using vernier calipers, measure 2nd brake piston return spring free length with spring mounted to spring seat. Free length should be .654" (16.61 mm). Replace springs as necessary. Coat NEW "O" rings with

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

ATF and install on piston.

3. Carefully press 2nd brake piston by hand into 2nd brake cylinder. See **Fig. 40**. Using appropriate press, compress piston return springs and install snap ring. Ensure end gap of snap ring is not aligned with gap in piston return spring hub.

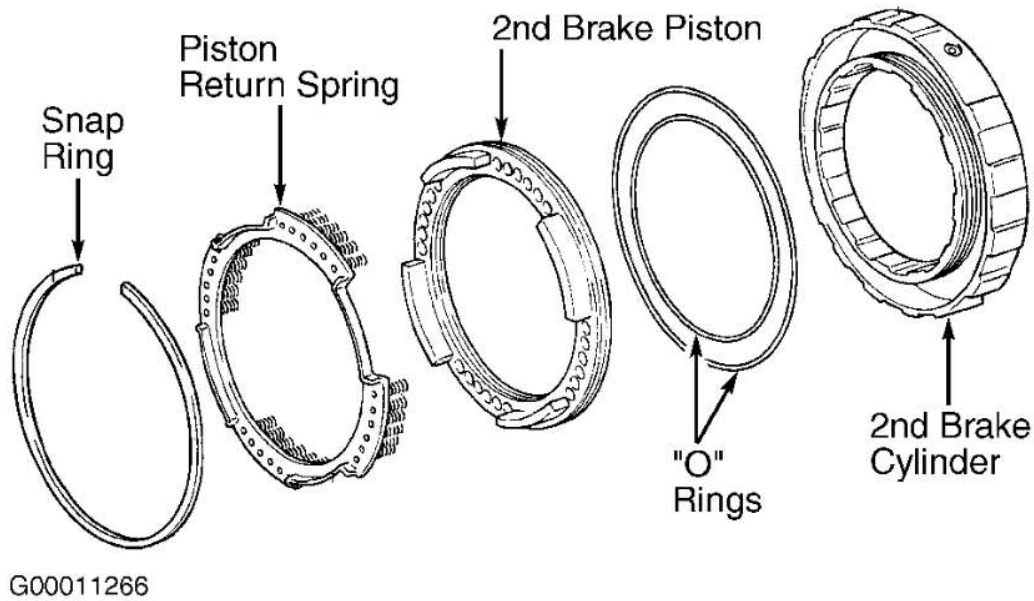
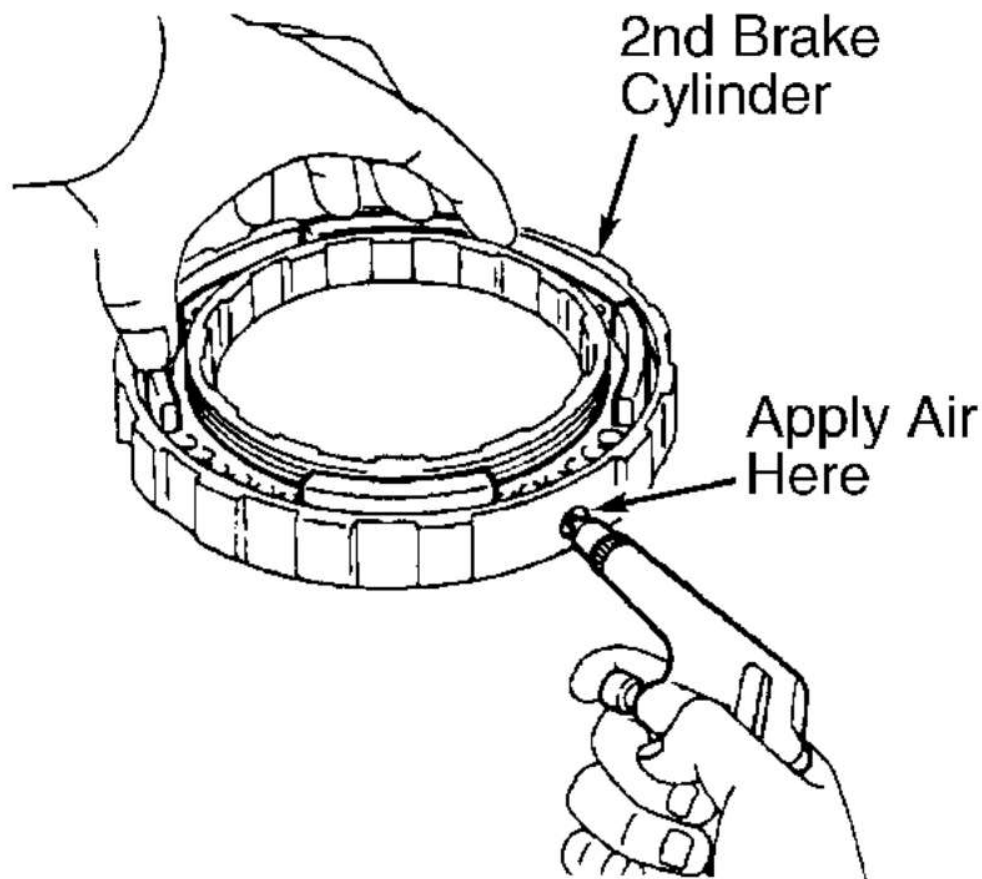


Fig. 40: Exploded View Of 2nd Brake Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011267

Fig. 41: Removing 2nd Brake Piston

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

UNDERDRIVE PLANETARY GEAR**Disassembly**

1. Using gear stand, lock nut socket, adapter and INCH-lb. torque wrench with a fulcrum length of 6.30" (160.0 mm), measure underdrive input shaft starting torque for reference. See **Fig. 42**. Starting torque should be 7.0-51.3 INCH lbs. (.8-5.8 N.m).
2. Using pin punch and hammer, loosen staked part of lock nut. Clamp underdrive planetary gear in a soft-jawed vise. Use care not to damage differential drive pinion. Using appropriate socket, remove lock nut. Remove gear from vise. Using appropriate puller, remove cylindrical roller bearing inner race. See **Fig.**

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

43.

3. Using gear stand and appropriate press, remove differential drive pinion, parking lock gear, counter driven gear with underdrive planetary ring gear and front tapered roller bearing. See **Fig. 43**.
4. Clamp underdrive planetary gear in soft-jawed vise. Using appropriate puller, remove rear tapered roller bearing from underdrive planetary gear. Using snap ring pliers, remove snap ring. Remove underdrive planetary ring gear from counter driven gear.

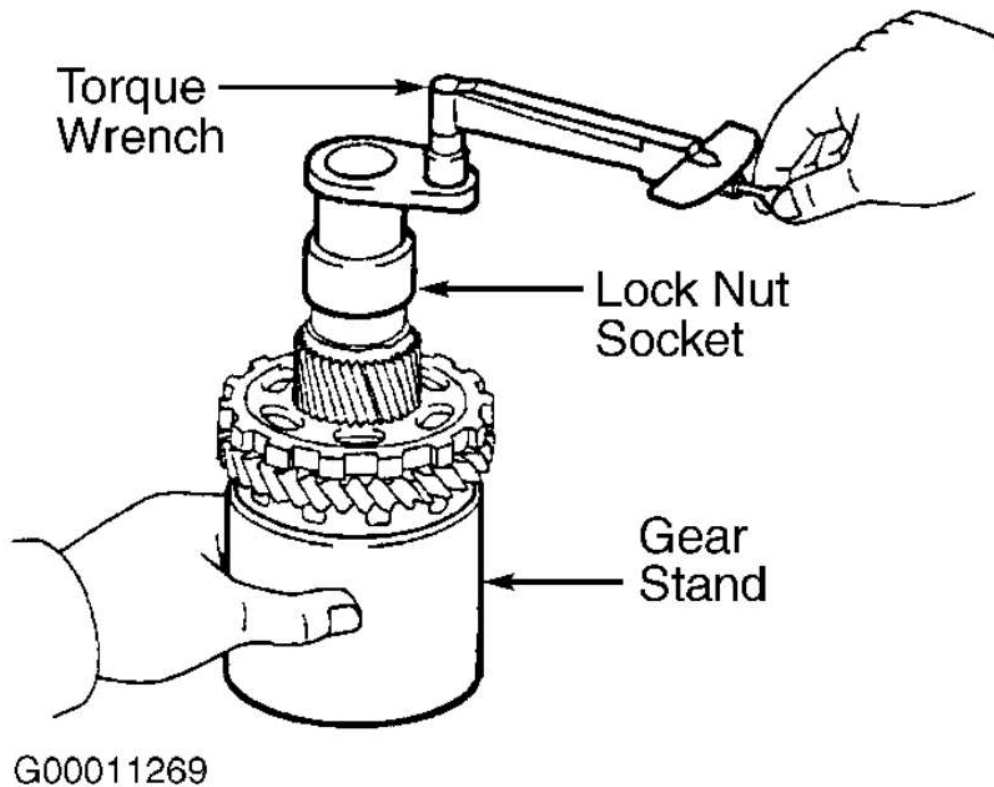
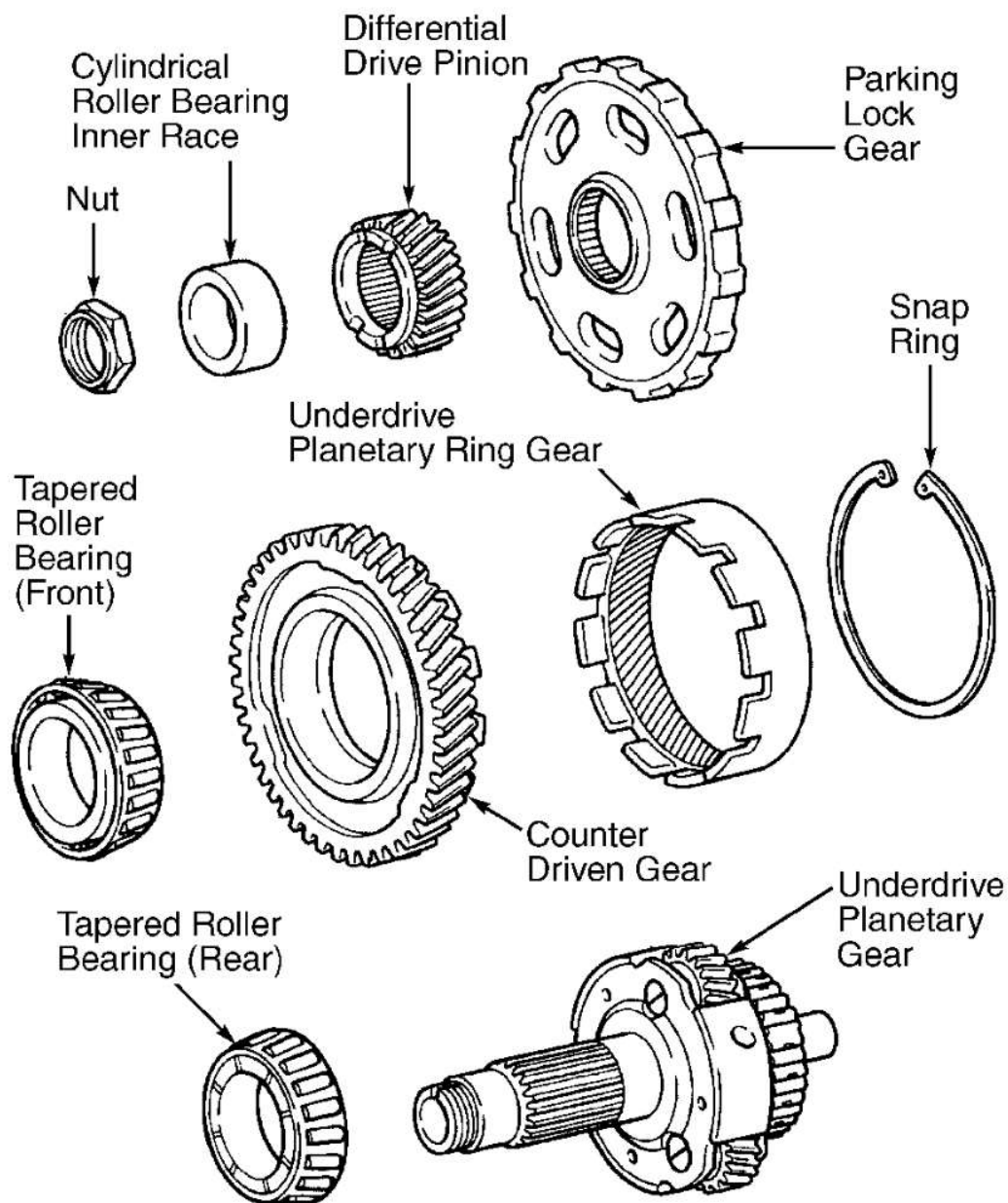


Fig. 42: Measuring Underdrive Planetary Gear Input Shaft Starting Torque
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011268

Fig. 43: Exploded View Of Underdrive Planetary Gear Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reassembly

1. Install underdrive planetary ring gear into counter driven gear. Install snap ring. Using appropriate press,

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

install rear tapered roller bearing onto underdrive planetary gear. Press bearing until it becomes flat at the bottom.

2. Install counter driven gear with underdrive planetary ring gear onto underdrive planetary gear. Using appropriate press, install front tapered roller bearing onto underdrive planetary gear while rotating counter driven gear.
3. Using appropriate press, install parking lock gear while rotating counter driven gear. Using press, install differential drive pinion, then install cylindrical roller bearing inner race while rotating counter driven gear.
4. Clamp underdrive planetary gear in a soft-jawed vise. Use care not to damage differential drive pinion. Using appropriate socket, install NEW lock nut and tighten to 207 ft. lbs. (280 N.m). Remove gear from vise. Using gear stand, lock nut socket, adapter and INCH-lb. torque wrench with a fulcrum length of 6.30" (160.0 mm), ensure underdrive input shaft starting torque is 7.0-51.3 INCH lbs. (.8-5.8 N.m). See **Fig. 42**. Using pin punch and hammer, stake lock nut. Ensure lock nut is not cracked.

UNDERDRIVE CLUTCH

Disassembly

1. Prior to disassembly, check piston stroke of underdrive clutch. Install underdrive clutch into transaxle case. DO NOT damage oil seal rings. Install dial indicator onto underdrive clutch flange. See **Fig. 44**. Apply and release 57 psi (4 kg/cm²) of compressed air to transaxle case. See **Fig. 45**.
2. Piston stroke should be .059-.075" (1.51-1.90 mm). If piston stroke is not within specification, inspect discs and plates during disassembly. Using a screwdriver, remove drum snap ring. Remove flange, 3 discs and 3 plates from underdrive clutch drum. Note location of components during removal for reassembly reference. See **Fig. 47**.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

3. Using appropriate press placed on clutch balancer, compress piston return springs. Using snap ring expander, remove snap ring. Remove press, clutch balancer and piston return springs.
4. Install underdrive clutch into transaxle case. DO NOT damage oil seal rings. While holding underdrive clutch piston, apply 57 psi (4 kg/cm²) of compressed air to transaxle case to remove underdrive clutch piston. See **Fig. 45**. Remove "O" ring from underdrive clutch drum.

Inspection

1. Clean all parts (except discs) with solvent. Dry parts using compressed air. Inspect discs and plates for wear or burnt areas. If disc lining is peeled or discolored, replace discs as necessary. Replace all damaged components.
2. Using vernier calipers, measure underdrive clutch piston return spring free length with spring mounted to spring seat. Free length should be .675" (17.14 mm). Replace springs as necessary.
3. Using a dial indicator, measure inside diameter of underdrive clutch drum bushing. See **Fig. 46**.

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

Maximum inside diameter is 1.462" (37.13 mm). If inside diameter exceeds specification, replace underdrive clutch drum.

Reassembly

1. Coat NEW "O" ring with ATF and install on underdrive clutch drum. Coat underdrive clutch piston with ATF. Using hand pressure, install piston into underdrive clutch drum. Use care not to damage "O" ring. Install piston return springs and clutch balancer to underdrive clutch drum. Set snap ring in position.

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

2. Using appropriate press positioned on clutch balancer, compress piston return springs. Using snap ring expander, install snap ring in underdrive clutch drum groove. Ensure end gap of spring is not aligned with gap in clutch balancer hub.
3. Install 3 plates and 3 discs, starting with plate and alternating with disc. Install flange on top of disc. See **Fig. 47**. Install snap ring. Ensure end gap of snap ring is not aligned with cutouts of underdrive clutch drum.
4. Check piston stroke of underdrive clutch. Install underdrive clutch into transaxle case. DO NOT damage oil seal rings. Install dial indicator onto underdrive clutch flange. See **Fig. 44**. Apply and release 57 psi (4 kg/cm²) of compressed air to transaxle case. See **Fig. 45**.
5. Piston stroke should be .059-.075" (1.51-1.90 mm). If piston stroke is not within specification, replace flange. Flange is available in thicknesses of .118" (3.00 mm), .126" (3.20 mm) and .134" (3.40 mm).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

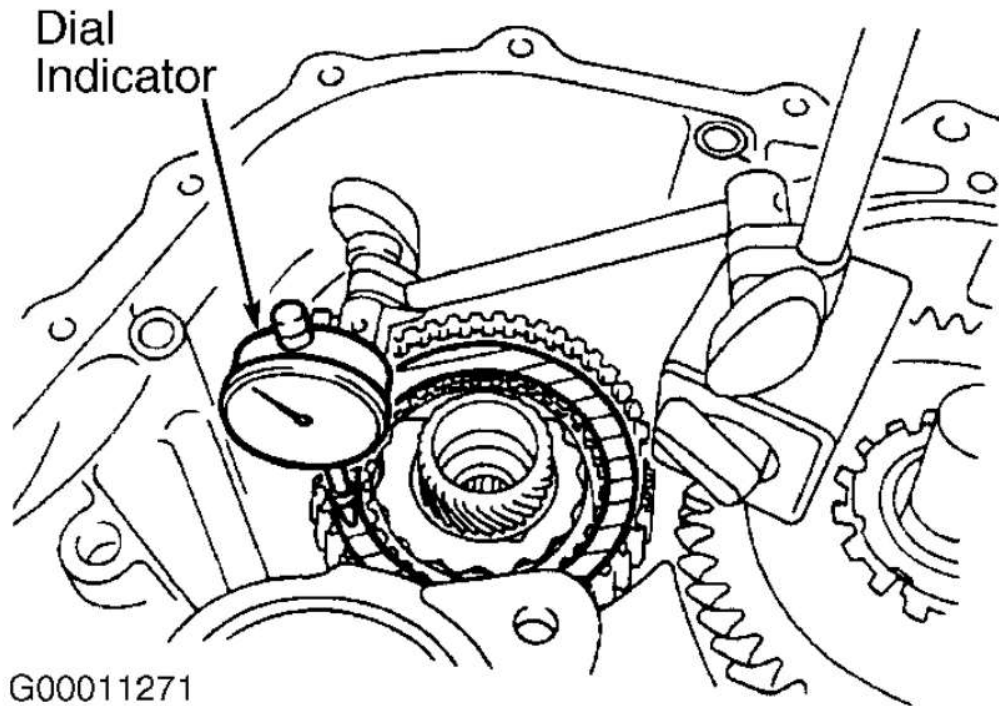


Fig. 44: Installing Dial Indicator Onto Underdrive Clutch Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

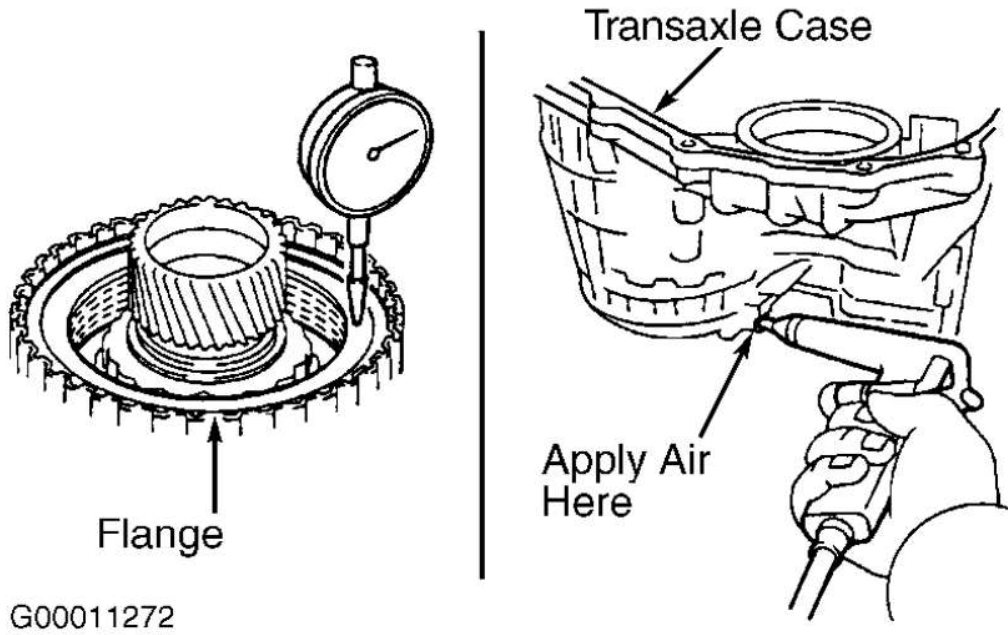


Fig. 45: Measuring Underdrive Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

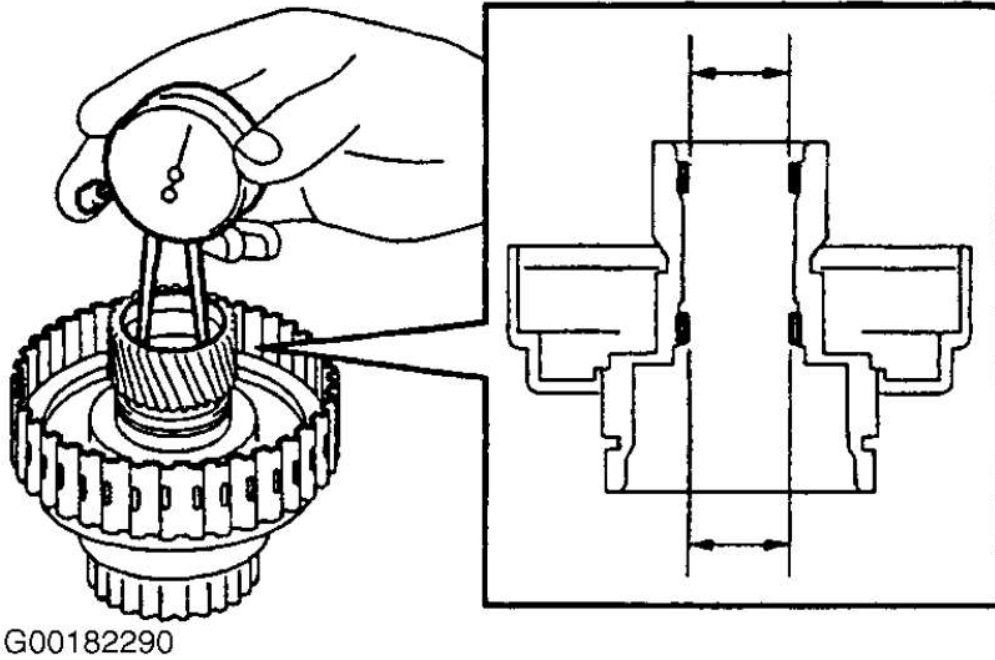
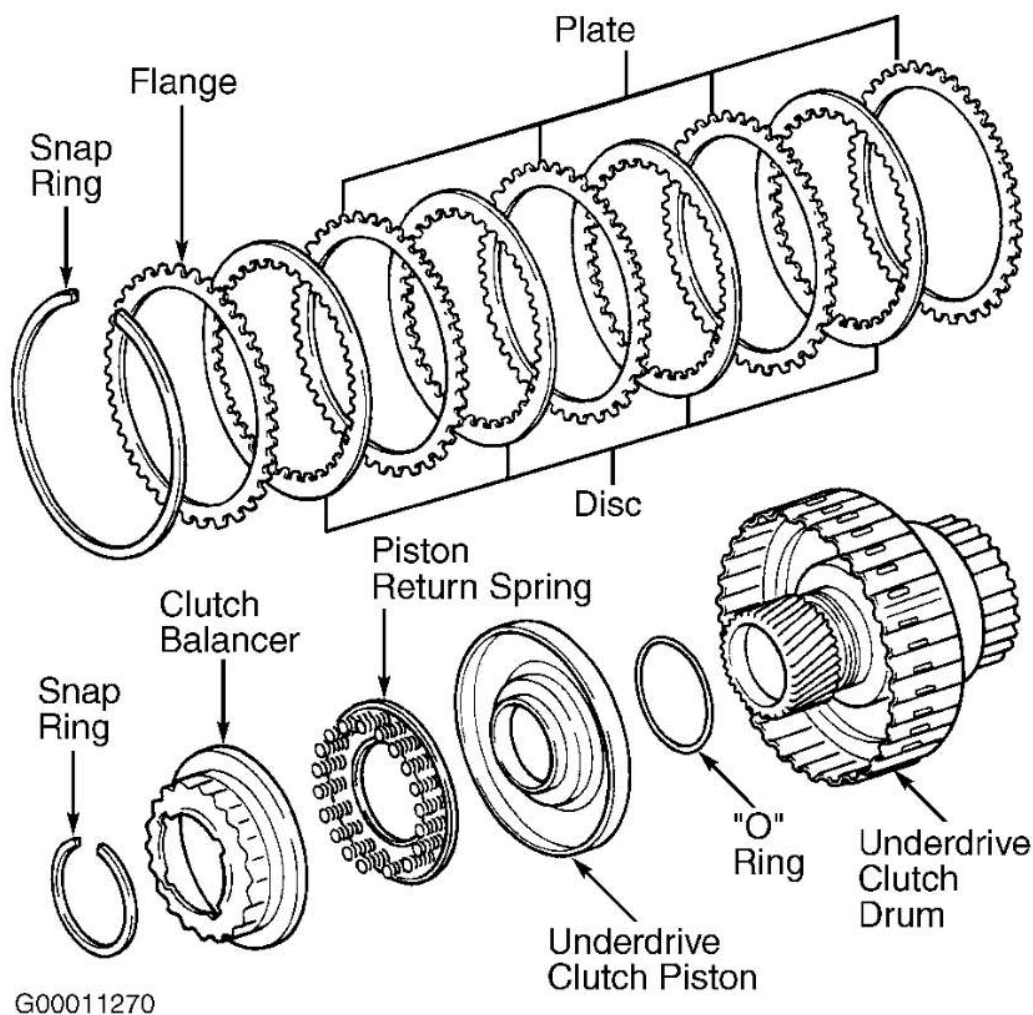


Fig. 46: Checking Underdrive Clutch Drum Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

**Fig. 47: Exploded View Of Underdrive Clutch Assembly**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

VALVE BODY ASSEMBLY

NOTE: All valve body components must be installed in original location. Lay all components in sequence during removal for reassembly reference. Primary regulator valve position controls line pressure. Note location of primary regulator valve sleeve, plug and pin prior to disassembly. See [Fig. 50](#).

Disassembly

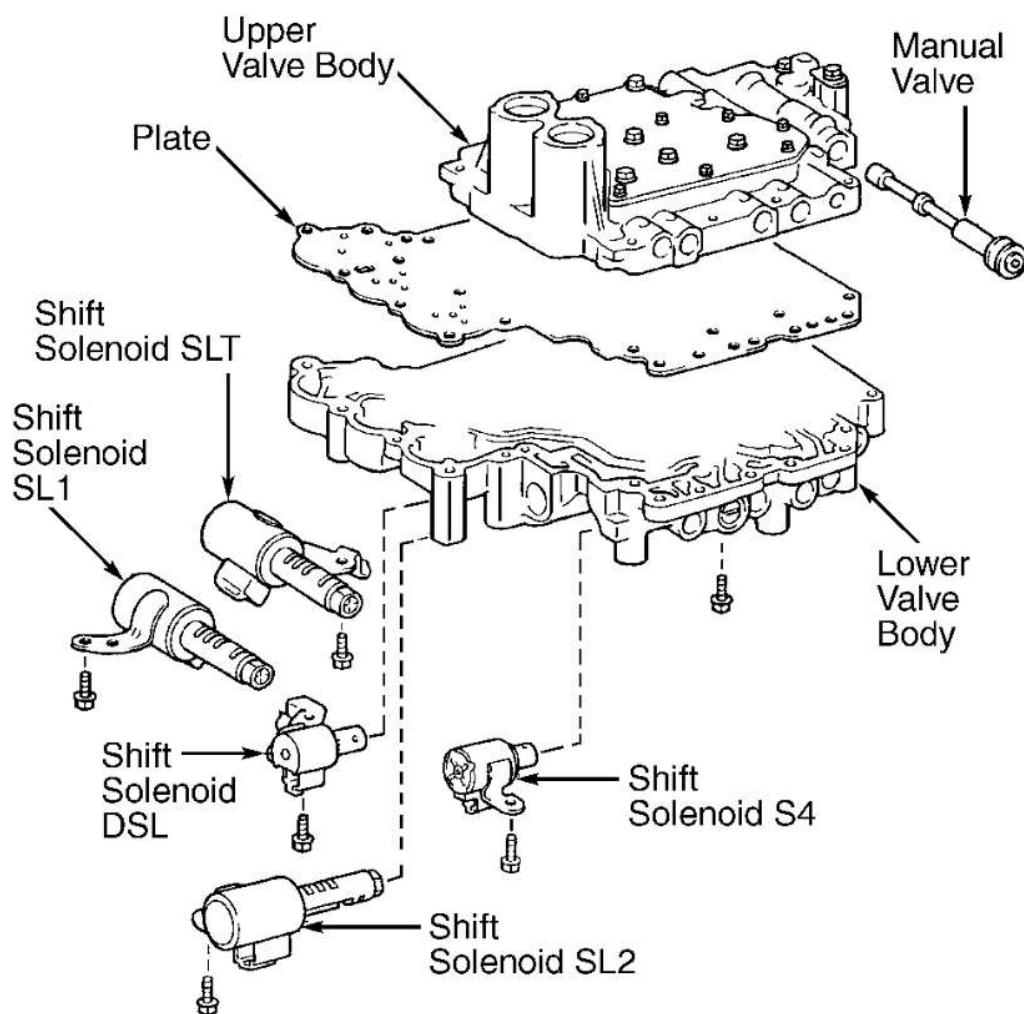
1. Remove 5 bolts and 5 shift solenoids. See [Fig. 48](#) and [Fig. 51](#) . Using snap ring pliers, remove 2 snap

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

rings securing accumulator assemblies. Remove 2 washers, 4 springs and 2 pistons from upper valve body. See **Fig. 49**.

2. Remove 8 upper valve body bolts. See **Fig. 52**. Remove 7 upper valve body cover bolts. See **Fig. 53**. Remove bolt, cover and 2 pressure relief check balls. See **Fig. 54**.
3. Remove 7 lower valve body bolts. See **Fig. 55**. Hold plate against lower valve body and carefully remove lower valve body from upper valve body. Remove plate from lower valve body. DO NOT lose check balls. Note location of check balls, keys, plugs and pins in valve body. See **Fig. 56-Fig. 59**.

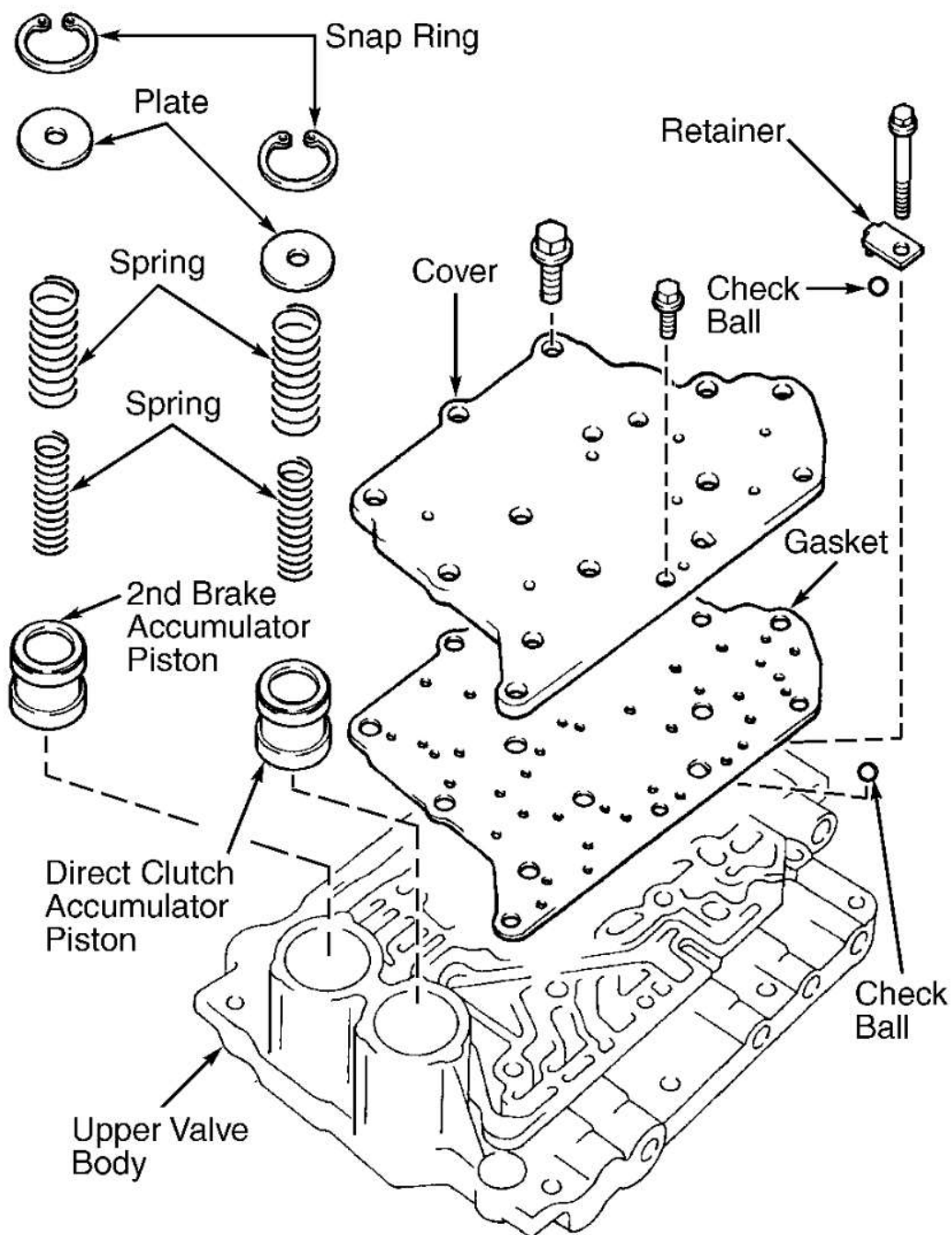


G00011273

Fig. 48: Exploded View Of Valve Body Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

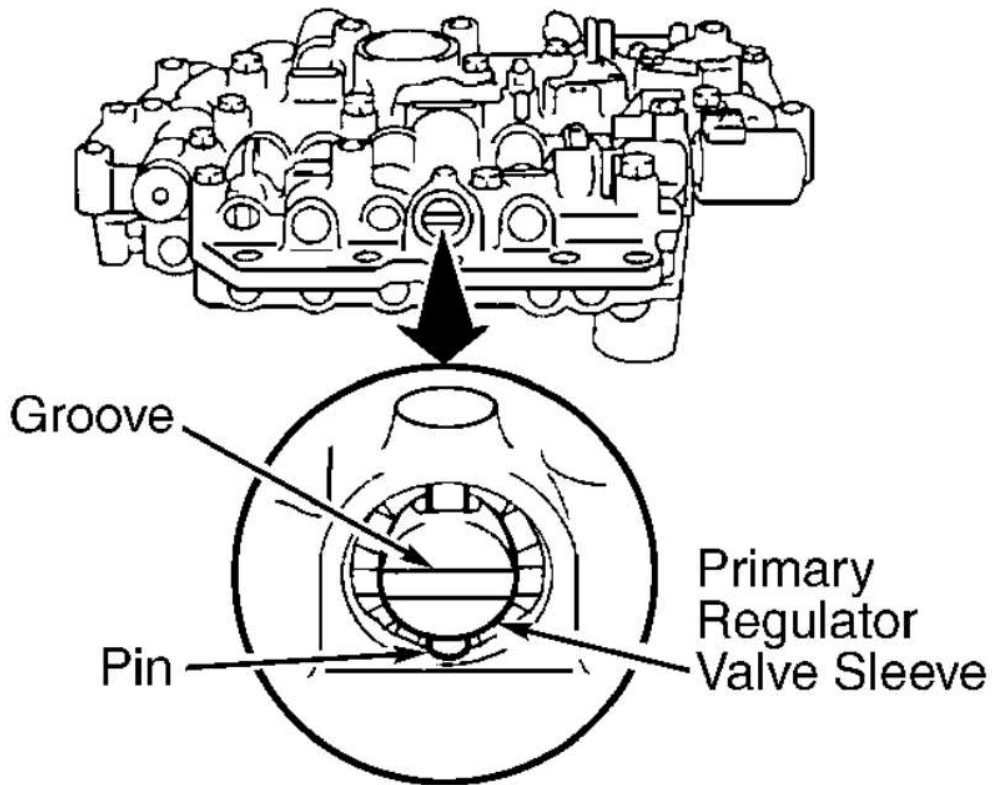


G00011274

Fig. 49: Locating Upper Valve Body Accumulator Pistons, Check Balls & Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

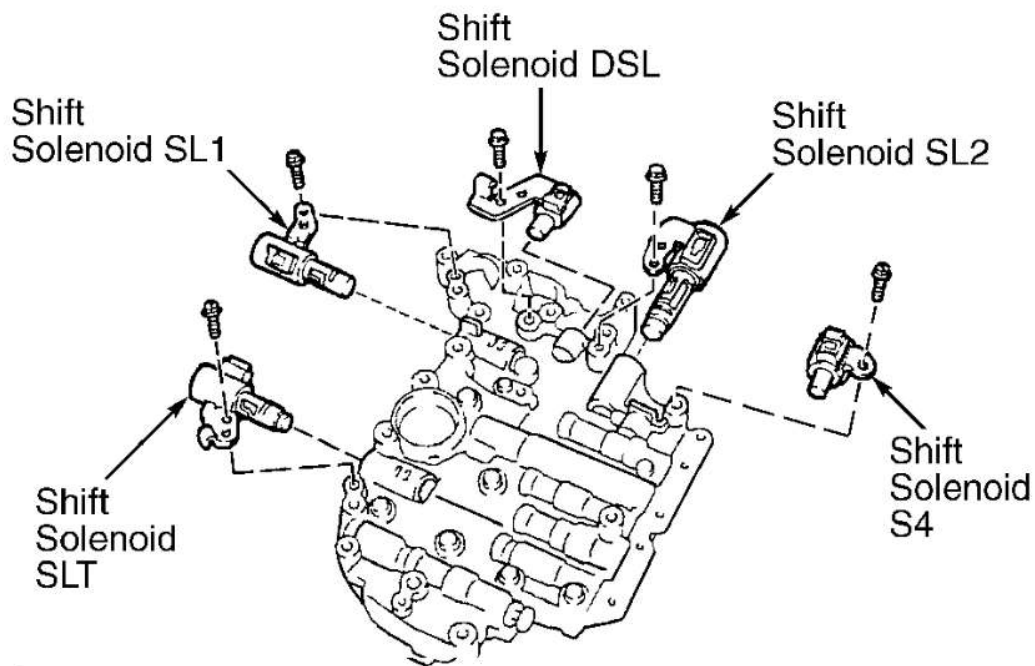


G00011275

Fig. 50: Identifying Primary Regulator Valve Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



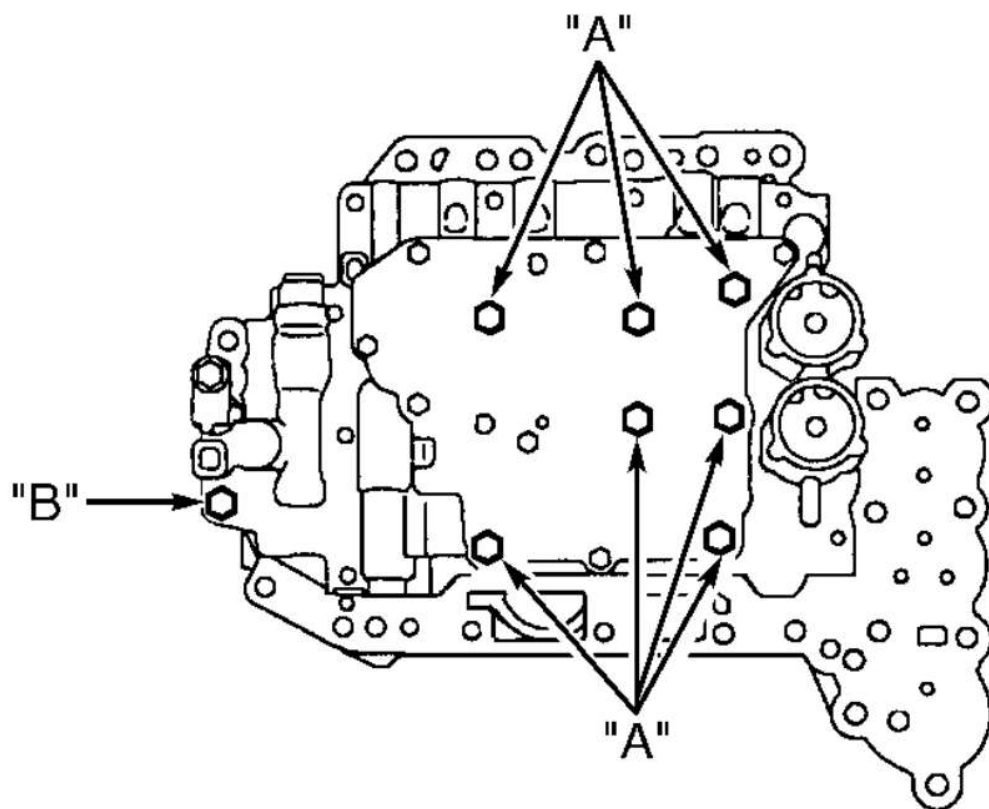
G00011276

Fig. 51: Identifying Shift Solenoid Locations

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

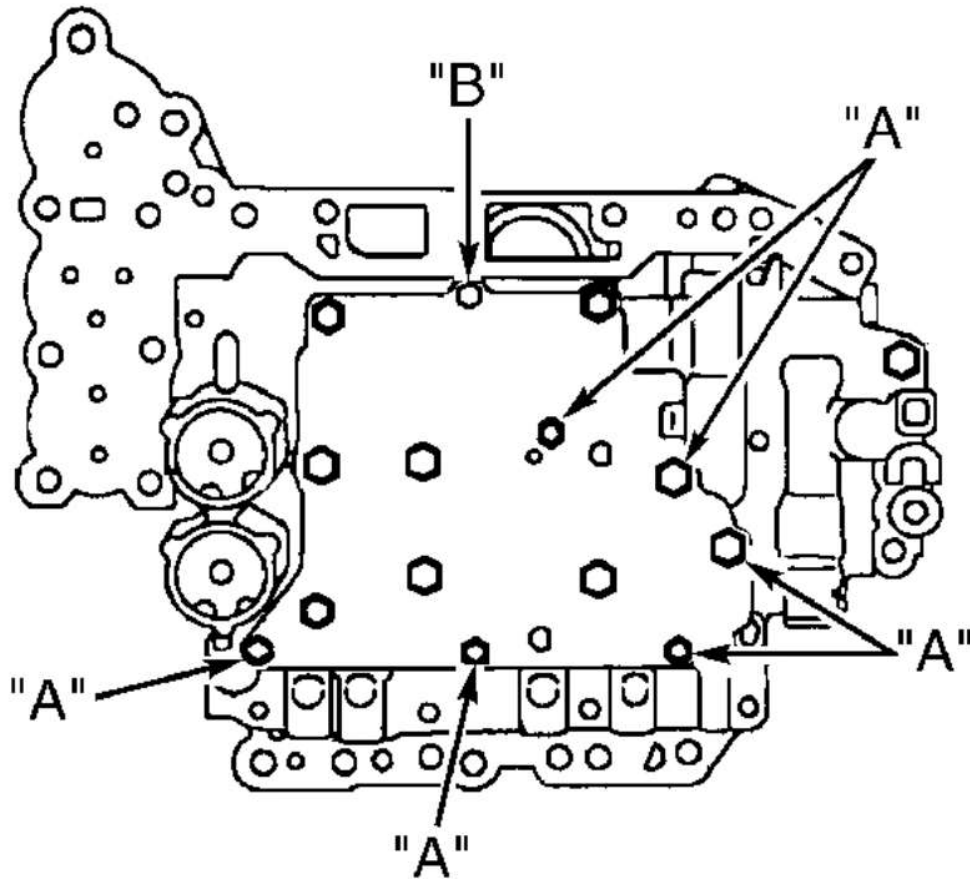


G00011277

Fig. 52: Removing & Installing 8 Upper Valve Body Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

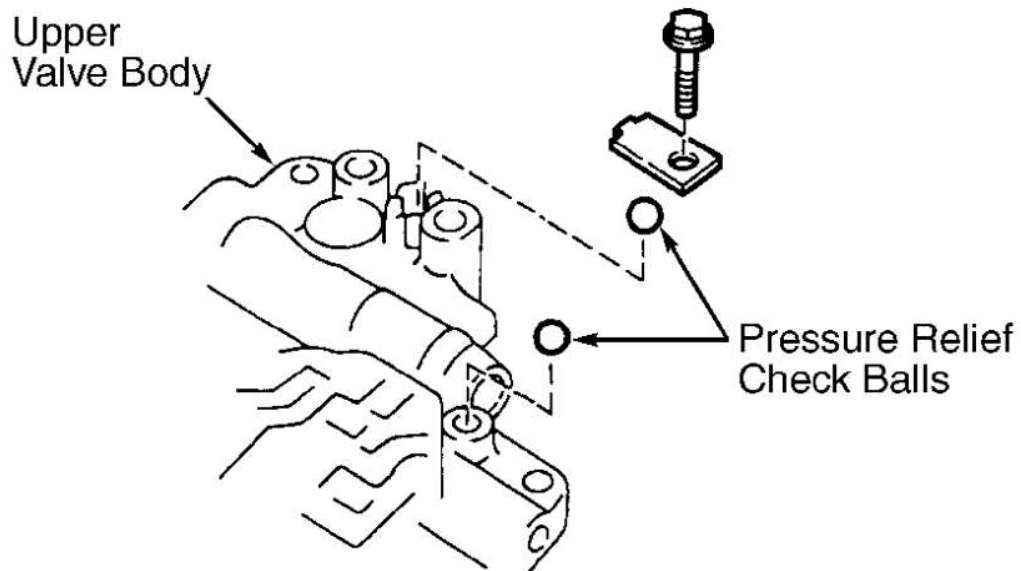


G00011278

Fig. 53: Removing & Installing Upper Valve Body Cover Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

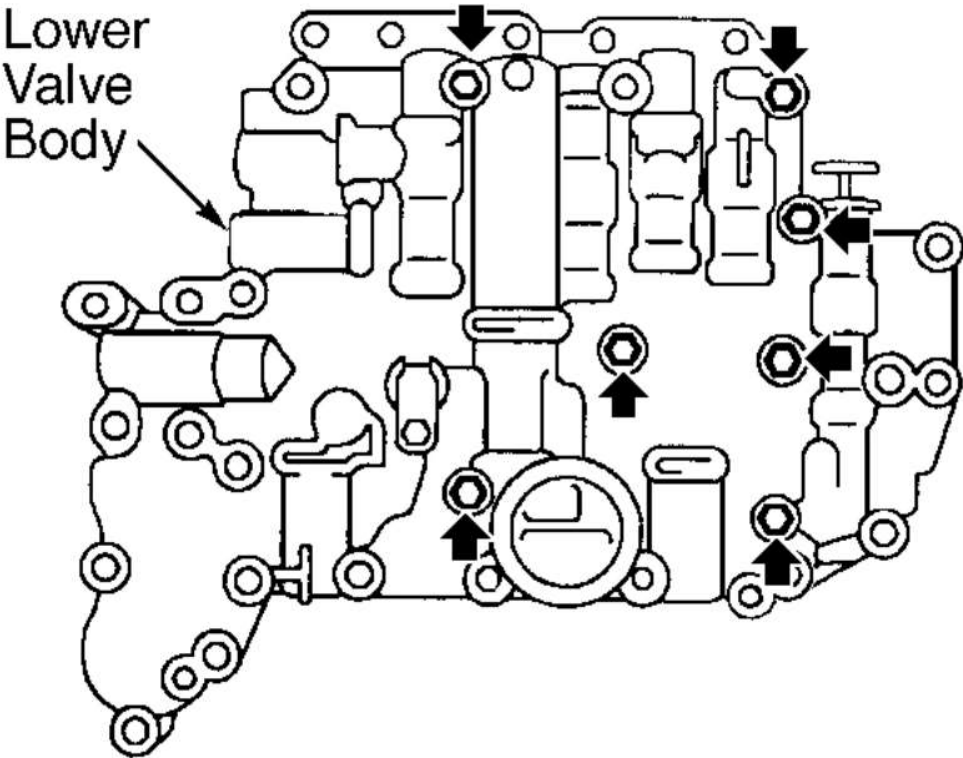


G00011279

Fig. 54: Locating Pressure Relief Check Balls
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011280

Fig. 55: Removing & Installing 7 Lower Valve Body Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Inspection

1. Clean all parts with solvent. Dry parts with compressed air. Ensure all valve body oil passages are clear. Inspect valves for scoring or roughness. See **Fig. 56** and **Fig. 57** . Inspect valve springs for damage, squareness, rust and collapsed coils. Measure spring free length and outer diameter.
2. Replace spring if not within specification. See appropriate VALVE BODY SPRING SPECIFICATIONS table. Ensure valve body springs correspond with appropriate valve. Ensure keys are installed in appropriate locations. See appropriate VALVE BODY KEY SPECIFICATIONS table.

UPPER VALVE BODY SPRING SPECIFICATIONS

Application (Color) ⁽¹⁾	Outer Diameter - In. (mm)	Free Length - In. (mm)
Clutch Apply Control Valve	.354 (9.00)	1.586 (40.29)

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

(Purple)		
Direct Clutch Exhaust Valve (Orange)	.291 (7.40)	1.585 (40.27)
Direct Clutch Lock Valve (Yellow)	.291 (7.40)	1.325 (33.65)
Lock-Up Control Valve (None)	.213 (5.40)	.944 (23.98)
Lock-Up Relay Valve (None)	.382 (9.70)	1.152 (29.27)
Secondary Regulator Valve (Blue)	.343 (8.70)	2.297 (58.35)
Solenoid Modulator Valve (Red)	.386 (9.80)	2.457 (62.40)
Underdrive Brake Orifice Control Valve (Gray)	.307 (7.80)	2.467 (62.65)
2nd Brake Lock Valve (White)	.386 (9.80)	1.472 (37.40)

(1) Refer to illustration for spring locations. See **Fig. 56**.

LOWER VALVE BODY SPRING SPECIFICATIONS

Application (Color) ⁽¹⁾	Outer Diameter - In. (mm)	Free Length - In. (mm)
Direct Clutch Control Valve (Brown)	.390 (9.90)	1.346 (34.20)
Primary Regulator Valve (Orange)	.783 (19.90)	2.266 (57.55)
1st/Reverse Brake Control Valve (Pink)	.386 (9.80)	2.246 (57.05)
2nd Brake Control Valve (Light Green)	.386 (9.80)	1.911 (48.55)
3-4 Shift Valve (None)	.382 (9.70)	1.152 (29.25)

(1) Refer to illustration for spring locations. See **Fig. 57**.

UPPER VALVE BODY KEY SPECIFICATIONS

Key I. D. Letter ⁽¹⁾	⁽²⁾ Height - In. (mm)
A, B & D	.394 (10.00)
F	.728 (18.50)
All Other Keys	.315 (8.00)

(1) Refer to illustration for key locations. See **Fig. 58**.

(2) Thickness for key "F" is .091" (2.30 mm). Width is not available. For all other keys, width is .197" (5.00 mm). Thickness is .126" (3.20 mm).

LOWER VALVE BODY KEY SPECIFICATIONS

Key I. D. Letter ⁽¹⁾	⁽²⁾ Height - In. (mm)
A	1.004 (25.50)
B, C & D	.571 (14.50)

Refer to illustration for key locations. See **Fig. 59**.

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

- (1)
- (2) Thickness for key "A" is .091" (2.30 mm). Width is not available. For keys "B", "C" and "D", key width is .197" (5.00 mm). Thickness is .126" (3.20 mm).

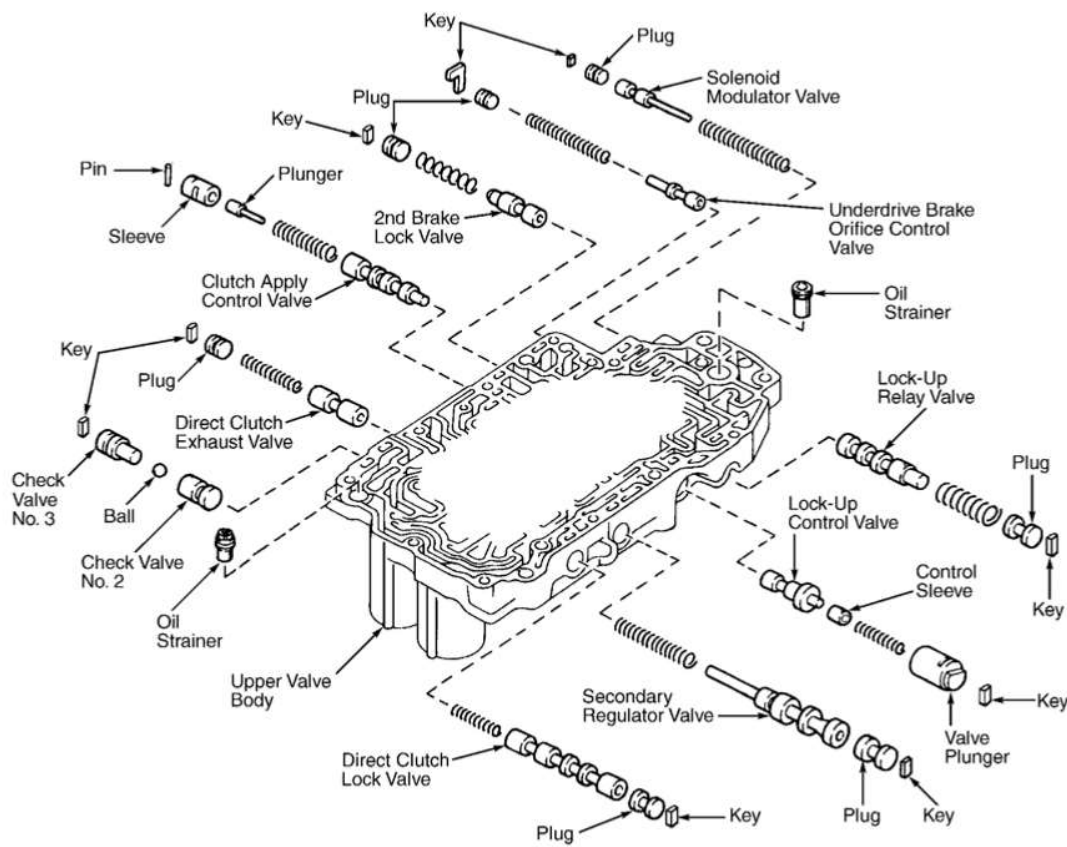
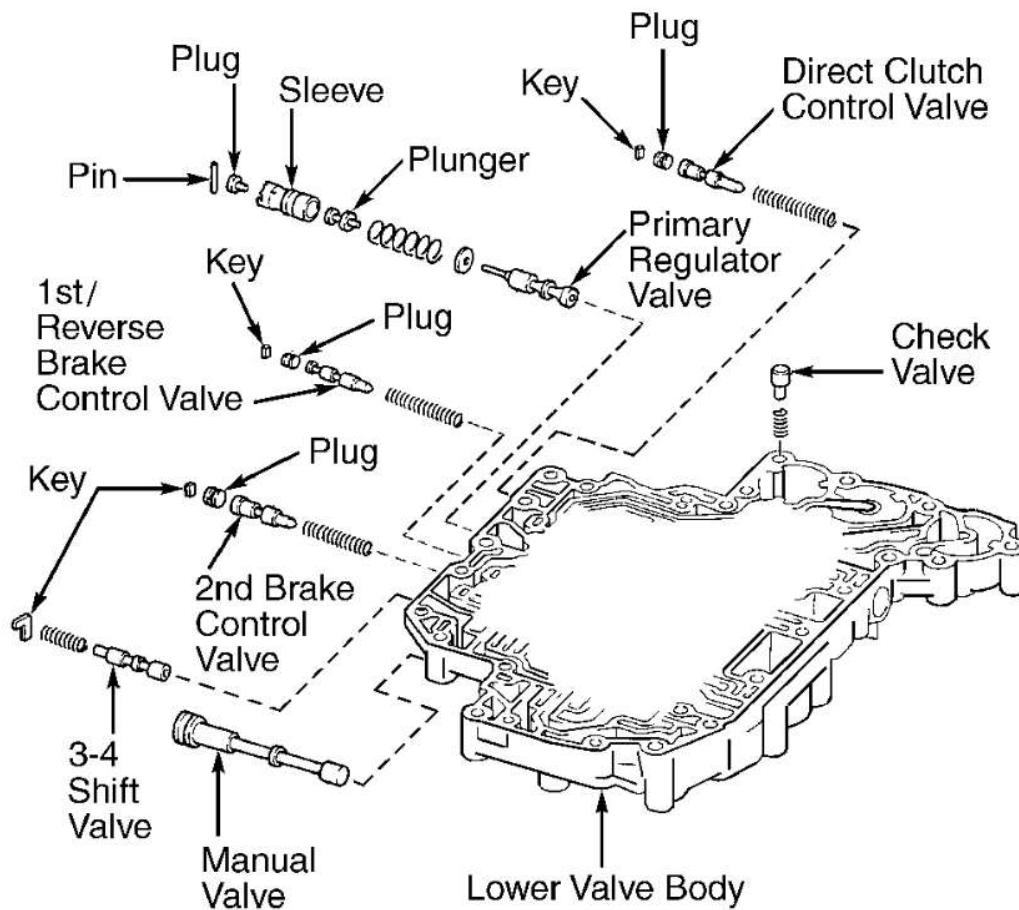


Fig. 56: Exploded View Of Upper Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

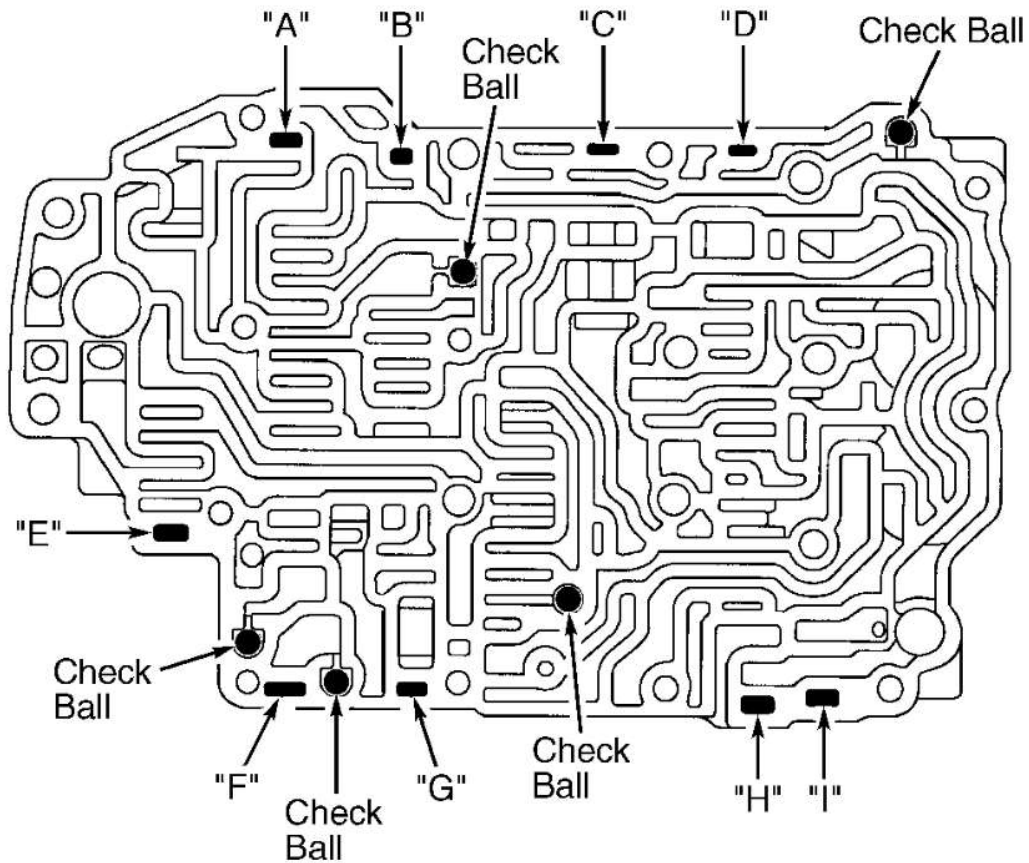


G00011282

Fig. 57: Exploded View Of Lower Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



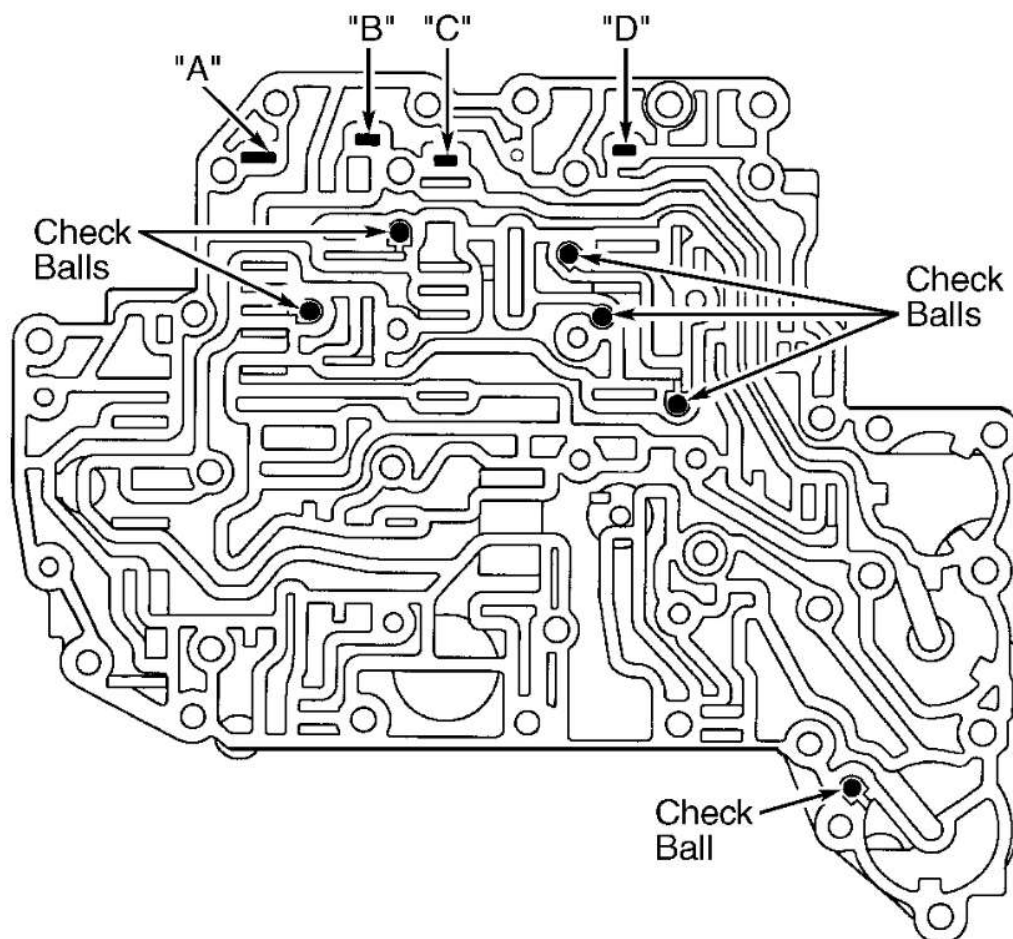
G00011283

Fig. 58: Identifying Upper Valve Body Check Ball & Key Locations

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011284

Fig. 59: Identifying Lower Valve Body Check Ball & Key Locations

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reassembly

1. Install check balls in upper and lower valve bodies. Ensure check balls are installed in correct locations. See **Fig. 58** and **Fig. 59**. Install plate to lower valve body. Install lower valve body with plate to upper valve body. Install 7 lower valve body bolts and tighten to 97 INCH lbs. (11 N.m). Bolts are 1.614" (41.00 mm) in length.
2. Install accumulator pistons, springs, washers and snap rings. Ensure spring free length and outer diameter are within specification. For spring specifications, see **ACCUMULATOR VALVE SPRING SPECIFICATIONS** table. Ensure components are installed in correct locations. Install pressure relief check balls, retainer and bolt. Tighten bolt to 97 INCH lbs. (11 N.m). See **Fig. 54**.
3. Turn valve body over. Install 7 upper valve body cover bolts. Tighten bolts to 58 INCH lbs. (6.6 N.m). Install 8 upper valve body bolts. Tighten bolts to 97 INCH lbs. (11 N.m). Ensure bolts are installed in

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

correct locations. For bolt identification, see **UPPER VALVE BODY BOLT IDENTIFICATION** table.

4. Install 5 shift solenoids and bolts. Tighten shift solenoid SLT and SL1 bolts to 58 INCH lbs. (6.6 N.m). Bolt length is .47" (12.0 mm). Tighten all other shift solenoid bolts to 97 INCH lbs. (11 N.m). Bolt length is 1.77" (45.0 mm). See **Fig. 51**. Ensure primary regulator valve is installed in correct position. See **Fig. 50**.

ACCUMULATOR VALVE SPRING SPECIFICATIONS

Application (Color)	Free Length - In. (mm)	Outer Diameter - In. (mm)
Direct Clutch Accumulator		
Inner Spring (Brown)	1.873 (47.58)	.441 (11.20)
Outer Spring (Brown)	1.874 (47.61)	.472 (12.00)
2nd Brake Accumulator		
Inner Spring (Purple)	1.728 (43.88)	.433 (11.00)
Outer Spring (White)	1.776 (45.12)	.465 (11.80)

UPPER VALVE BODY BOLT IDENTIFICATION

Application	In. (mm)
Cover Bolt ⁽¹⁾	
Bolt A	.551 (14.00)
Bolt B	.394 (10.00)
Upper Valve Body Bolt ⁽²⁾	
Bolt A	1.614 (41.00)
Bolt B	1.181 (30.00)
(1) Refer to illustration for cover bolt locations. See Fig. 53 .	
(2) Refer to illustration for upper valve body bolt locations. See Fig. 52 .	

DIFFERENTIAL ASSEMBLY

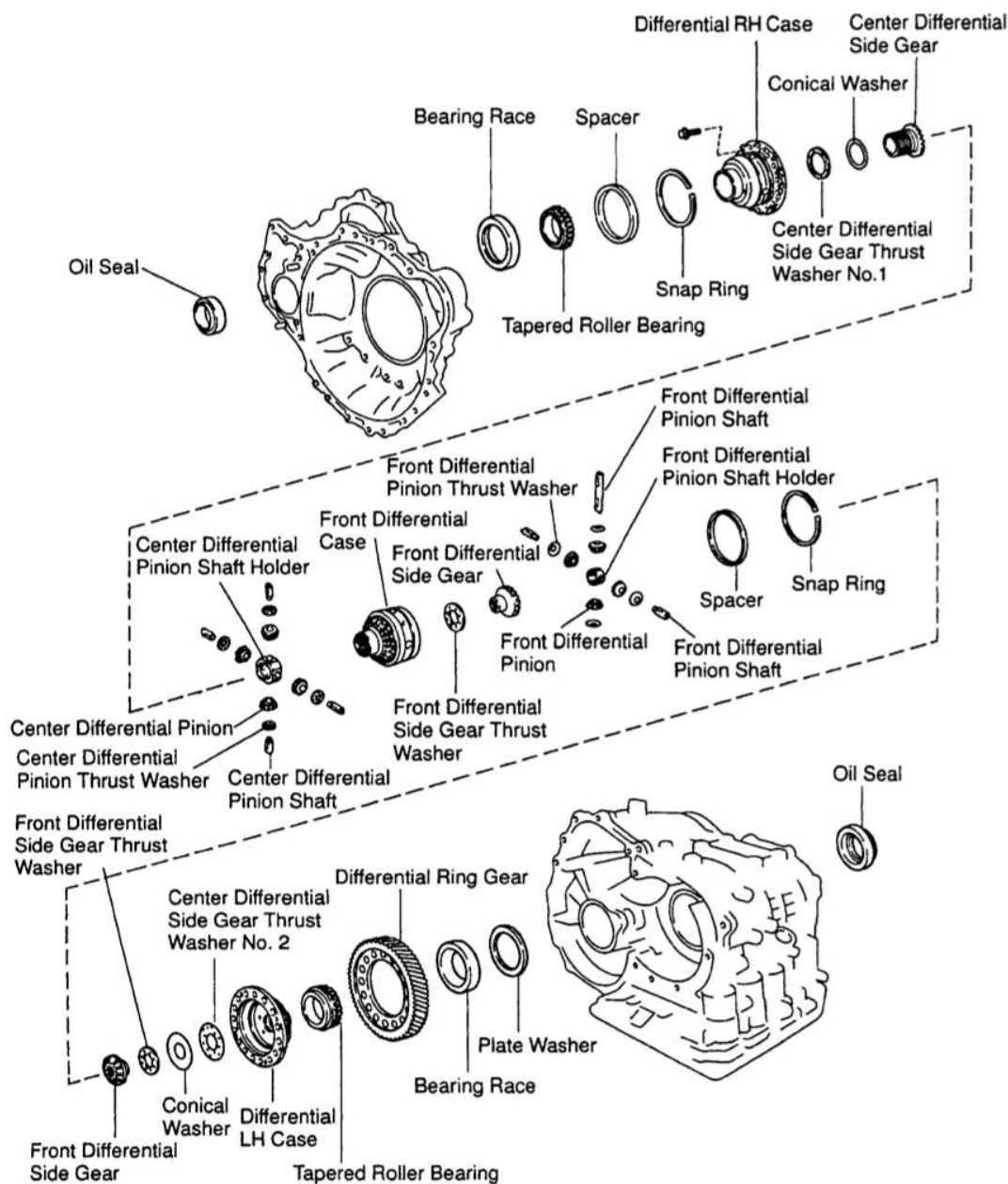
Disassembly

1. Mark ring gear and differential case for reassembly reference. Remove 16 bolts. Using a plastic hammer, tap on ring gear to remove it from differential case. Remove left side differential case from differential right side case. Remove front differential case from left side differential case. See **Fig. 60**.
2. Remove front differential side gear, front differential side gear thrust washer, conical washer and center differential side gear thrust washer No. 2 from left side differential case. Using snap ring expander, remove snap ring from front differential case. See **Fig. 61**. Remove spacer from front differential case. Remove 3 pinion shafts from front differential case. See **Fig. 60**.
3. Remove 4 front differential pinion gears, thrust washers, pinion shaft holder, side gear and thrust washer from front differential case. Using appropriate puller, remove tapered roller bearing from left side differential case. See **Fig. 60**.
4. Using snap ring expander, remove snap ring from right side differential case. See **Fig. 62**. Slide spacer

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

down to remove 4 center differential pinion shafts. Remove 4 center differential pinion shafts, differential pinions, thrust washers, pinion shaft holder, side gear, conical washer and center differential side gear thrust washer No. 1 from right side differential case. See **Fig. 63**. Remove the spacer. See **Fig. 60**.

5. Using appropriate puller, remove tapered roller bearing from right side differential case. Remove transaxle housing bearing race. Remove transaxle housing oil seal. Remove transaxle case bearing race and plate washer. Remove transaxle case oil seal. See **Fig. 60**.



G00182311

Fig. 60: Exploded View Of Differential Assembly

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

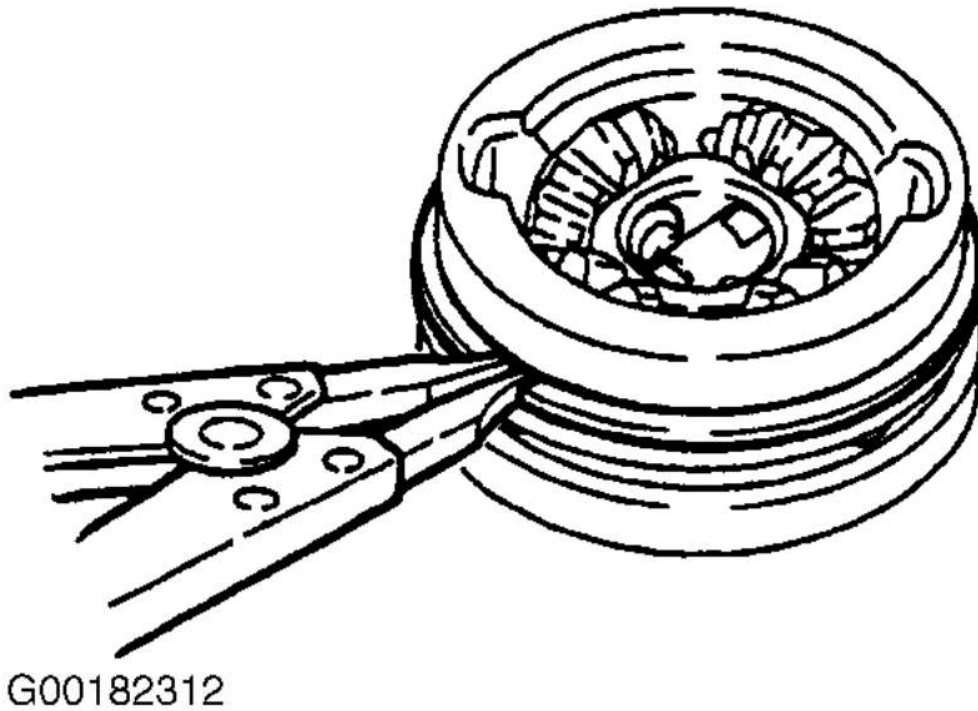


Fig. 61: Removing Snap Ring From Front Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

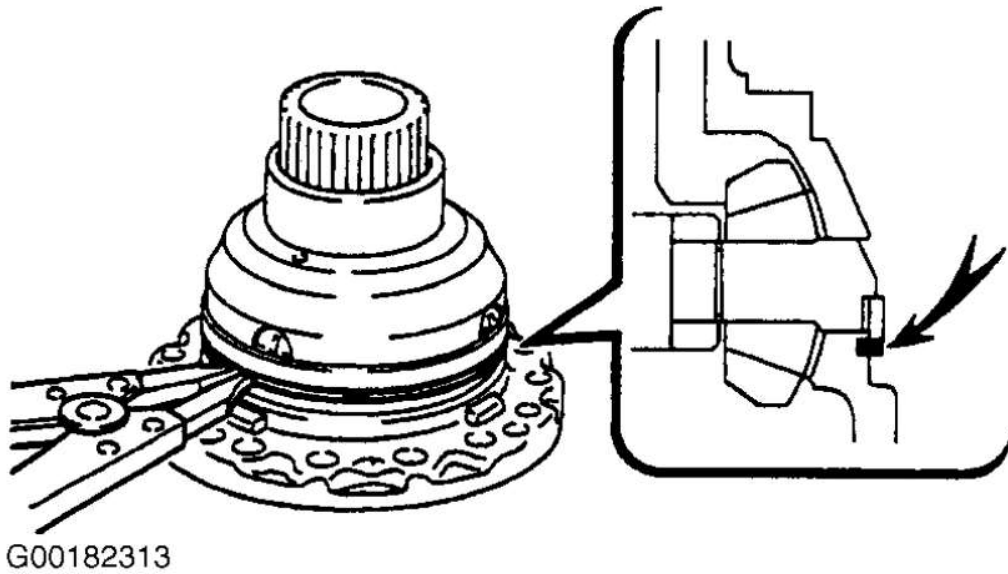
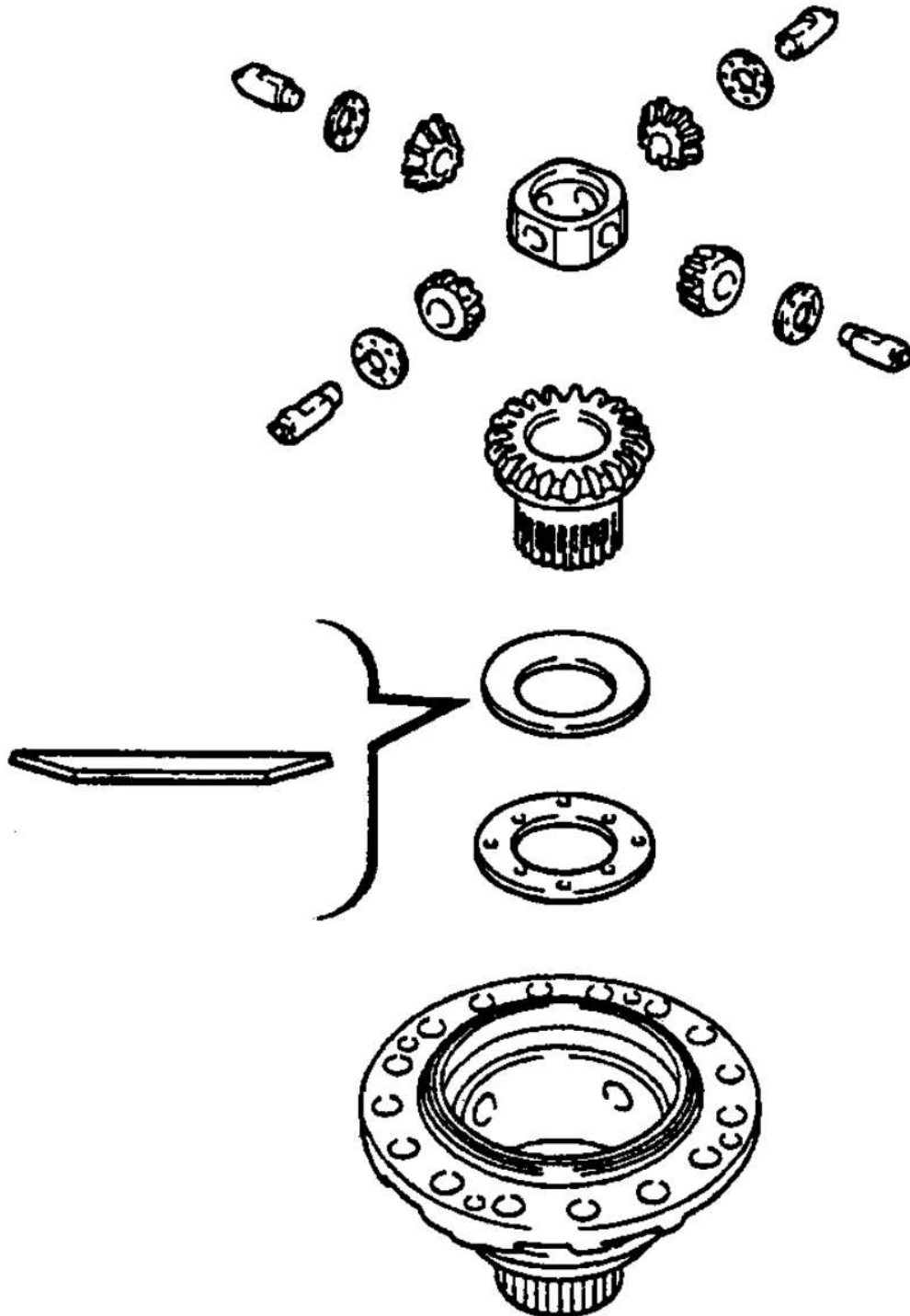


Fig. 62: Removing Snap Ring From Right Side Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182314

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

Fig. 63: Removing Right Side Differential Case Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Cleaning & Inspection

Clean all parts with solvent. Dry with compressed air. Check bearings, races and gears for wear or damage. Replace as necessary.

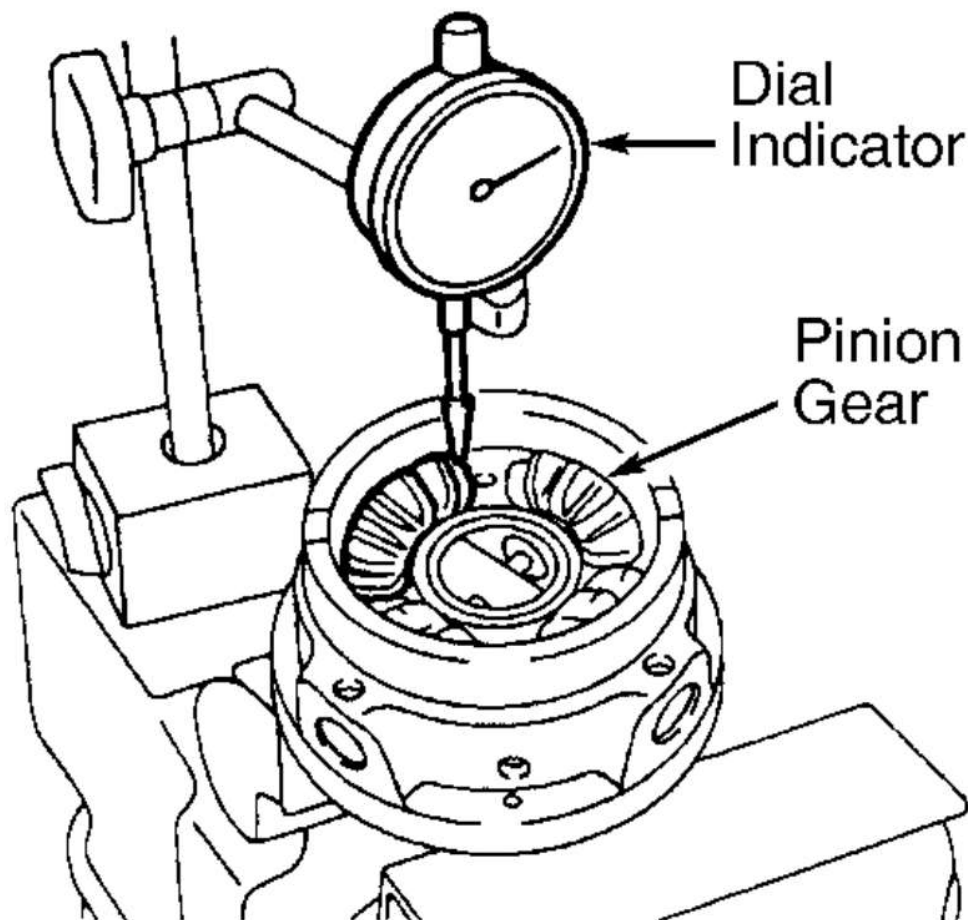
Reassembly

NOTE: Coat all sliding and rotating surfaces with ATF prior to reassembly.

1. Using appropriate race installer and a hammer, install transaxle housing bearing race. Install plate washer of lesser thickness than washer removed during disassembly into transaxle case. Using appropriate race installer and a hammer, install transaxle case bearing race. See **Fig. 60**.
2. Coat front differential side gear thrust washer, front differential side gear, front differential pinion shaft holder, 4 front differential pinion thrust washers and 4 front differential pinion gears with ATF, and install components into front differential case. Install 3 pinion shafts into front differential case. See **Fig. 60**.
3. Mount front differential case in soft-jawed vise. DO NOT damage surface of front differential case which contacts vise. Using a dial indicator, measure front differential pinion gear backlash while holding front differential side gear toward front differential case. See **Fig. 64**.
4. Backlash should be .002-.008" (.05-.20 mm). If backlash is not within specification, select appropriate thrust washer to ensure backlash is within specification. Thrust washers are marked in alphabetical order from "B" to "G", and are available in thicknesses from .039" (1.00 mm) to .049" (1.25 mm) in increments of .002"(.05 mm).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011289

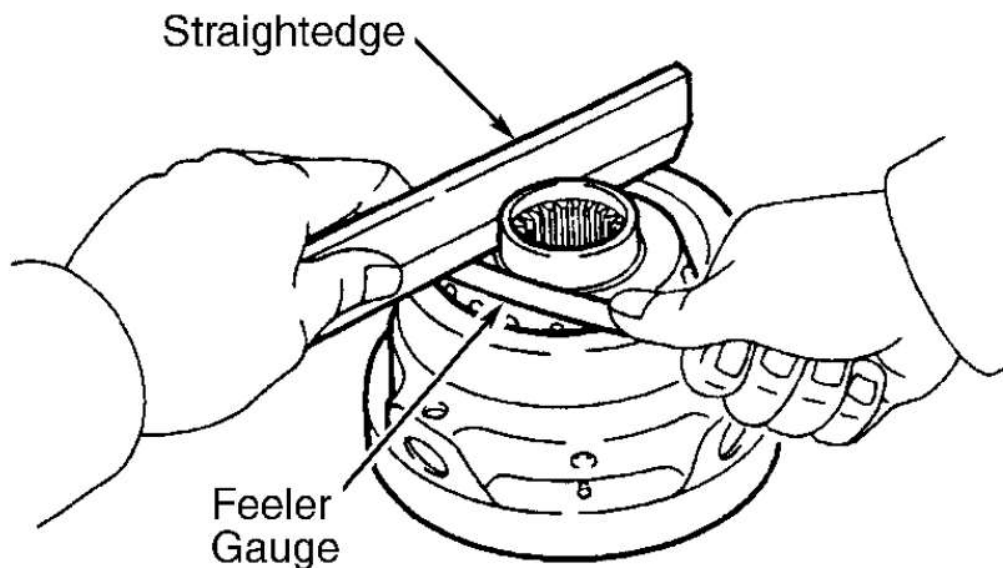
Fig. 64: Measuring Front Differential Pinion Gear Backlash
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Engage side gear to front differential case. Install left side differential case to front differential case. Ensure side gear is centered. Once side gear is centered, remove left side differential case.
6. Using a straightedge and feeler gauge, measure clearance between front differential case and side gear. See **Fig. 65**. Use the following formula to determine correct thrust washer thickness for specified clearance: thrust washer thickness equals clearance (feeler gauge thickness) minus .006-.011" (.16-.27 mm).
7. Thrust washers are marked in alphabetical order from "A" to "K" (except "I"), and are available in

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

thicknesses from .037" (.95 mm) to .055" (1.40 mm) in increments of .002" (.05 mm). If clearance is not as specified, ensure components were assembled correctly.



G00011290

Fig. 65: Measuring Front Differential Case-To-Side Gear Clearance

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. Install spacer to front differential case. Wrap vinyl tape around case prior to snap ring installation to avoid damaging front differential case. Install snap ring on front differential case as shown. See **Fig. 66**. Install spacer to right side differential case. Slide down spacer to install 4 center differential pinion shafts.
9. Install center differential side gear thrust washer No. 1, conical washer, center differential side gear, pinion shaft holder, differential pinion gears, thrust washers and pinion shafts to right side differential case. Ensure conical washer is installed correctly into right side differential case. See **Fig. 63**. Mount right side differential case in soft-jawed vise. Using dial indicator, measure center differential pinion gear backlash, while holding center differential side gear toward case. See **Fig. 67**.
10. Backlash should be .002-.008" (.05-.20 mm). If backlash is not within specification, select appropriate thrust washer to ensure backlash is within specification. Thrust washers are marked in alphabetical order from "MA" to "MN" (except "MI"), and are available in thicknesses from .032" (.80 mm) to .055" (1.40 mm) in increments of .002" (.05 mm).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

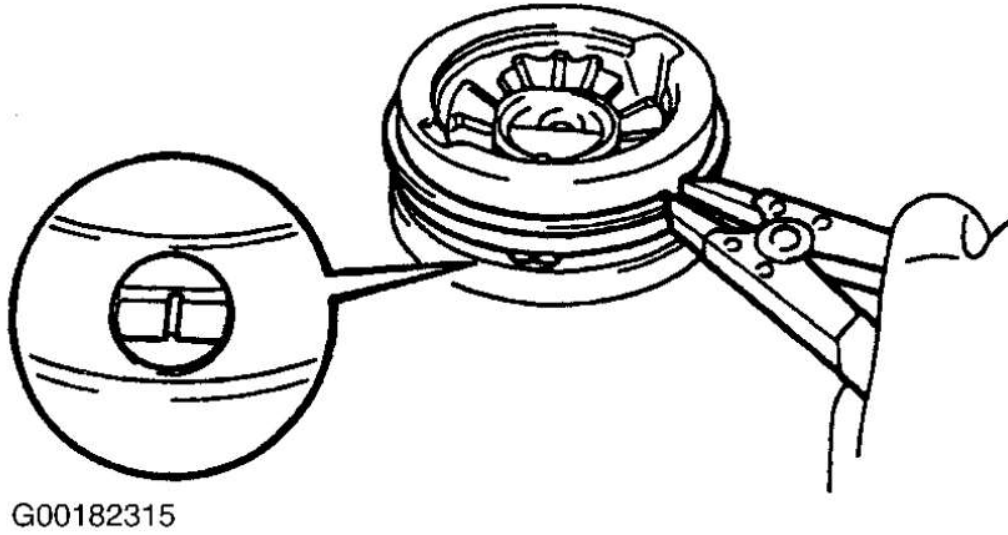
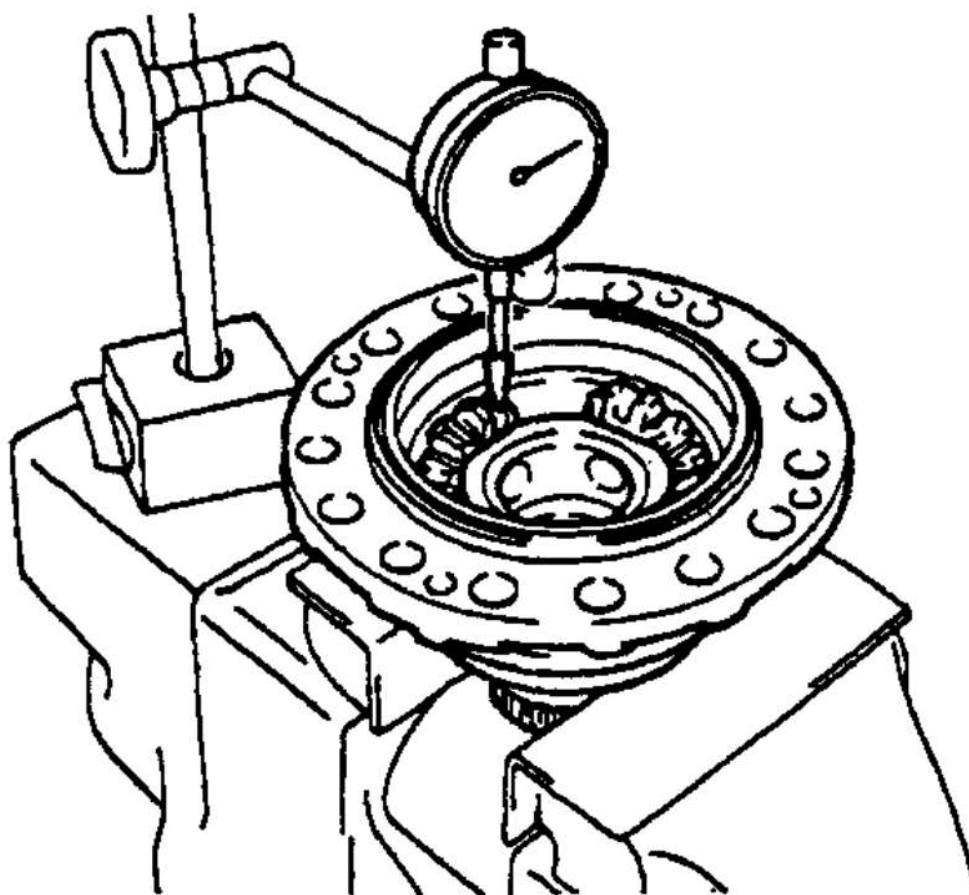


Fig. 66: Installing Snap Ring To Front Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



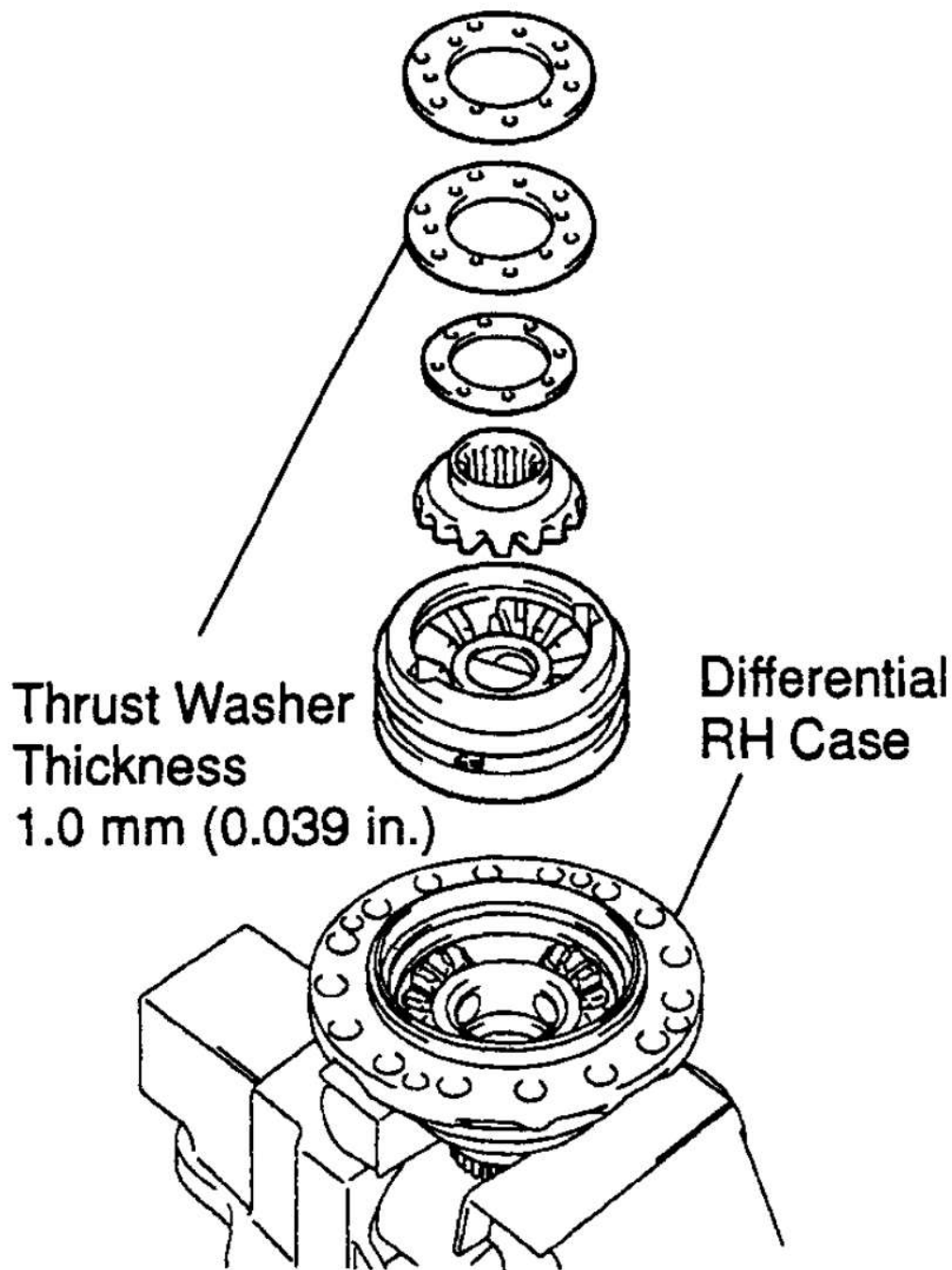
G00182316

Fig. 67: Measuring Center Differential Pinion Gear Backlash
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: In the following step, the .039" (1.00 mm) thick center differential side gear thrust washer No. 2 is used for reference when checking backlash.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00182317

Fig. 68: Installing Components Into Right Side Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

11. Temporarily install front differential case, front differential side gear, front differential side gear thrust washer, a .039" (1.00 mm) thick center differential side gear thrust washer No. 2 (temporarily) and center differential side gear thrust washer No. 2 to right side differential case. See **Fig. 68**. Engage front differential side gear and pinion gear of right side differential case.
12. Clean contact surface of center differential side gear thrust washer No. 2 and left side differential case. Apply Plastigage on center differential side gear thrust washer No. 2 as shown in **Fig. 69**, in 4 positions directly above pinion shafts in right side differential case.
13. Install left side differential case downward. Align match marks on right side differential case and left side differential case. See **Fig. 70**. Temporarily install right side differential case and 4 service bolts to left side differential case. See **Fig. 71**. Tighten bolts to 24 ft. lbs. (33 N.m). Remove 4 bolts and left side differential case.
14. Measure Plastigage at its widest point. See **Fig. 72**. Standard clearance should be .006-.010" (.16-.25 mm). If standard clearance is not as specified, select appropriate thrust washer No. 2 to ensure backlash is within specification. Try to select a thrust washer of the same size. Thrust washers are marked in numeric and alphabetic order and are available in thicknesses from .032" (.80 mm), marked with a zero, to .049" (1.25 mm), marked with the number "9", and from .051" (1.30 mm), marked with the letter "A", to .055" (1.40 mm), marked with the letter "C". Thrust washers increase in increments of .002" (.05 mm).

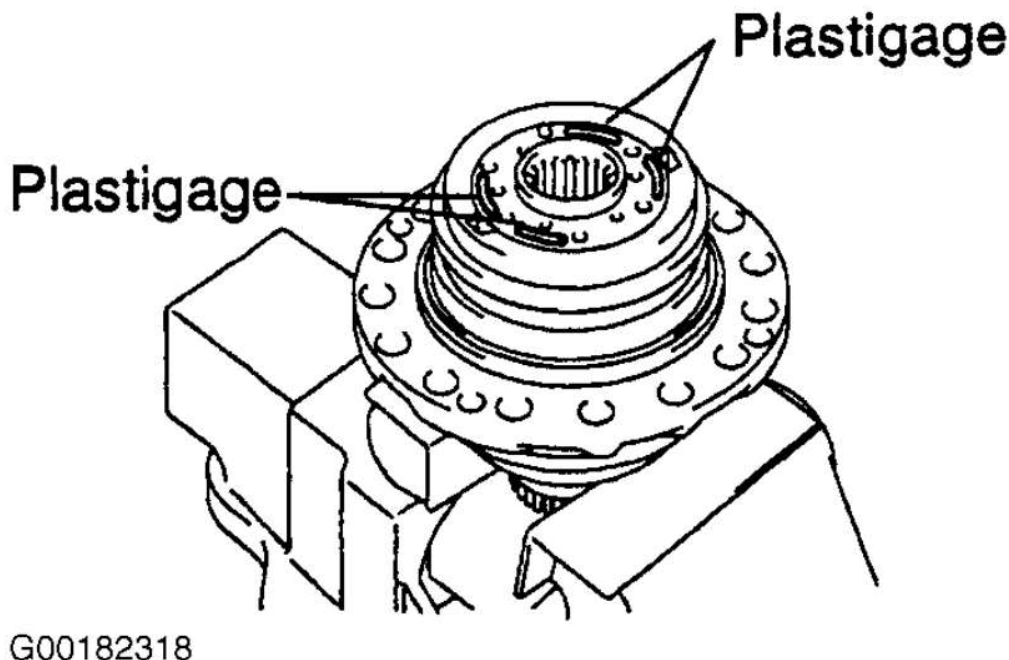
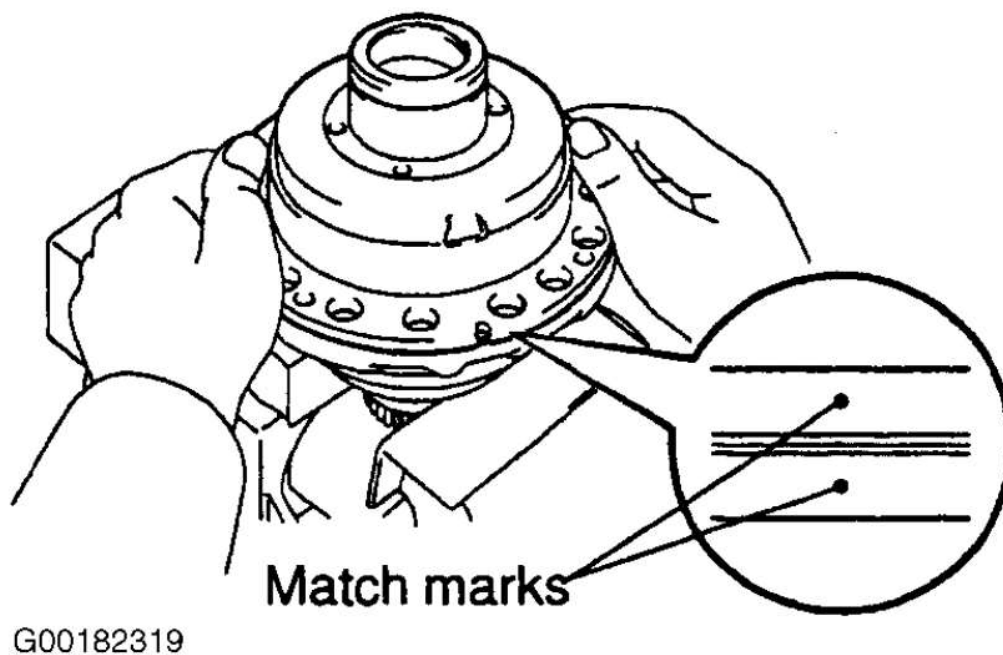


Fig. 69: Installing Plastigage On Center Differential Side Gear Thrust Washer No. 2
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

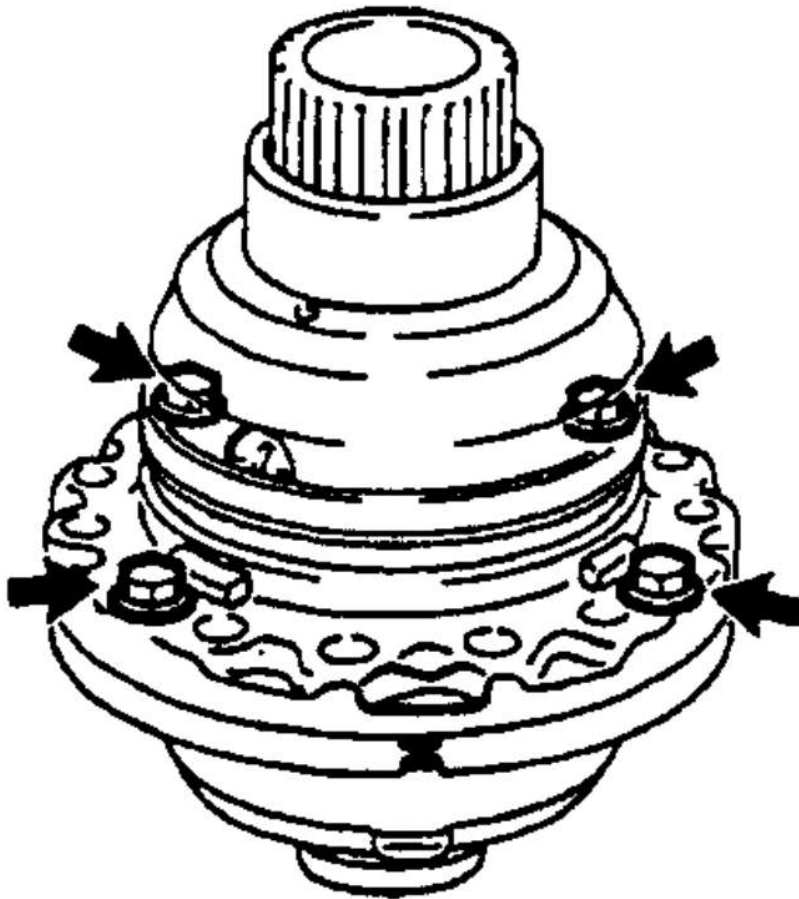
2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

**Fig. 70: Aligning Differential Cases**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

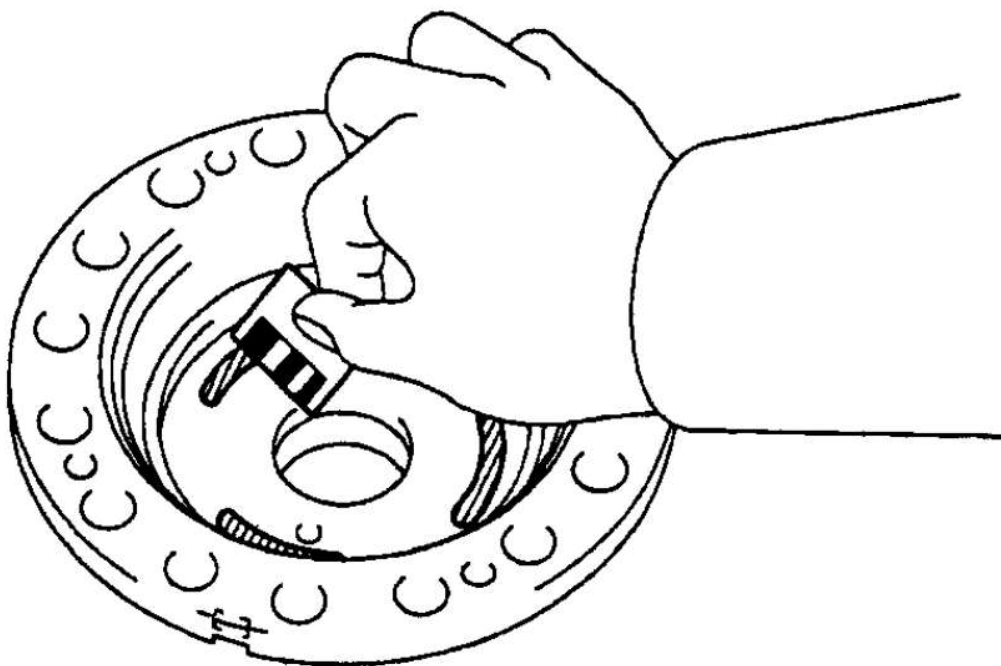


G00182320

Fig. 71: Installing 4 Service Bolts To Differential Cases
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



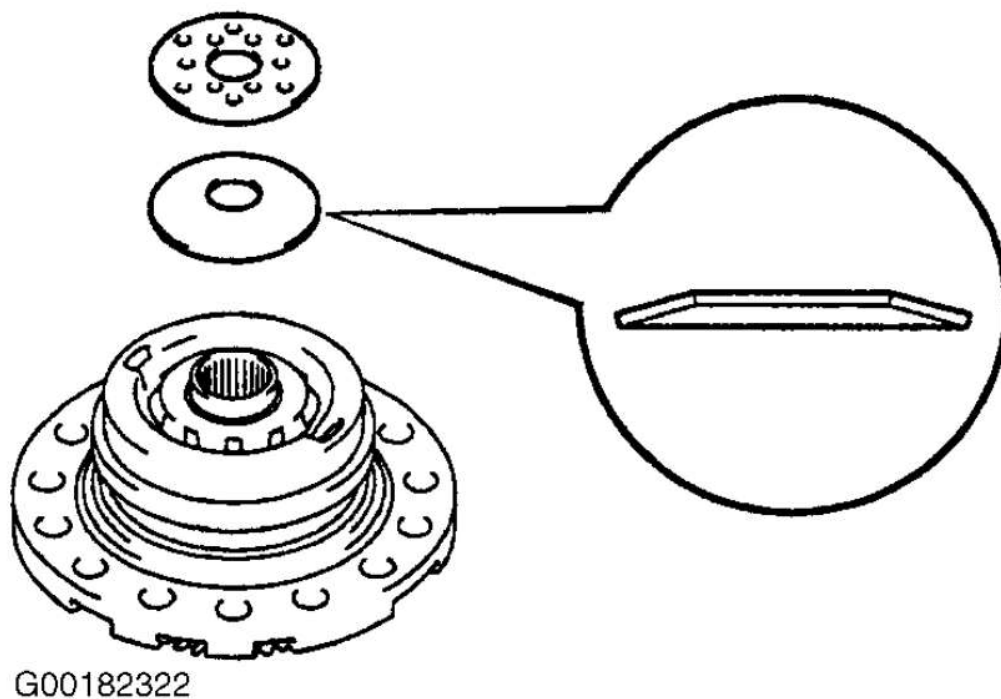
G00182321

Fig. 72: Measuring Plastigage At Its Widest Point
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. Remove left side differential case, center differential side gear thrust washer No. 2 and temporary .039" (1.00 mm) thick center differential side gear thrust washer No. 2. Install conical washer and center differential side gear thrust washer No. 2 (previously selected) from differential case. Ensure conical washer is installed correctly. See **Fig. 73**.
16. Install left side differential case onto right side differential case and align match marks. See **Fig. 70**. Temporarily install right side differential case and 4 service bolts to left side differential case. See **Fig. 71**. Tighten service bolts to 24 ft. lbs. (33 N.m).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

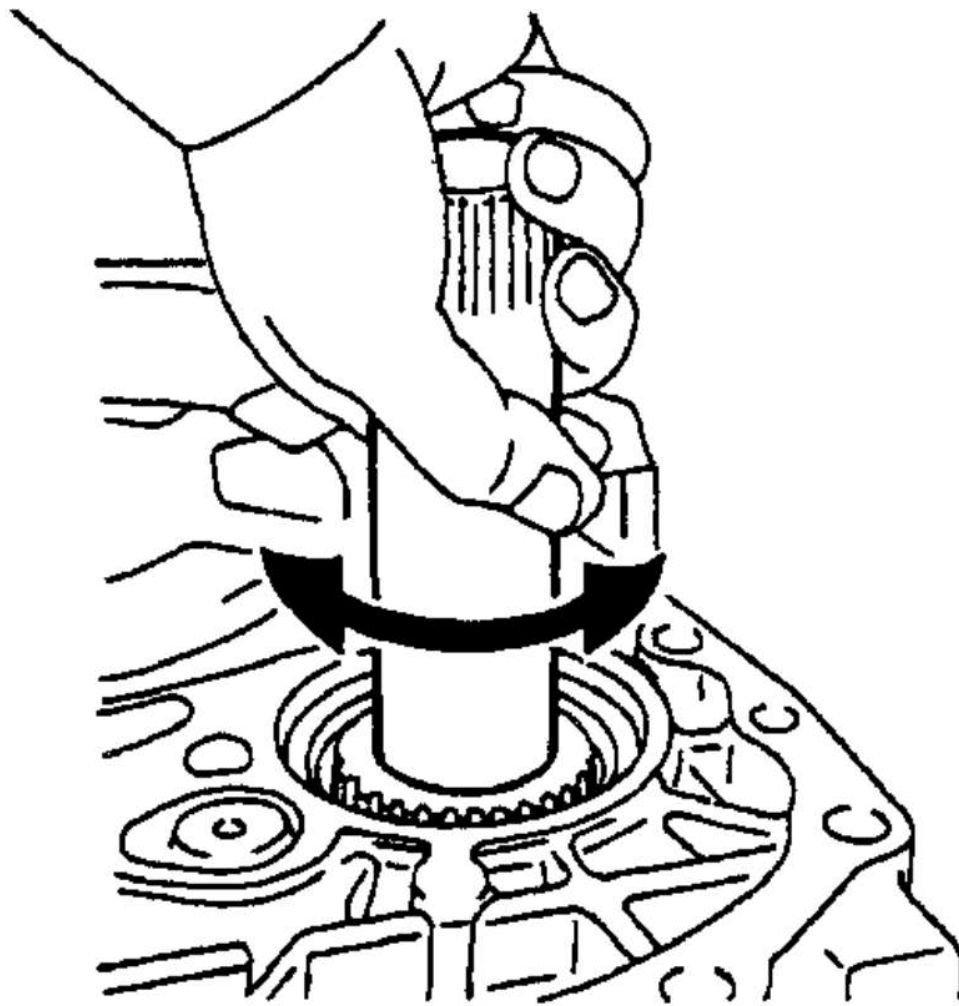
**Fig. 73: Installing Conical Washer**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. Using appropriate adapter and press, install differential case tapered roller bearings. Remove any material from transaxle housing and transaxle case mating surfaces. DO NOT allow oil to contact surfaces. Install differential assembly into transaxle case. Install transaxle housing onto transaxle case. Install 5 lower bolts inside transaxle housing and tighten to 16 ft. lbs. (22 N.m). Install all other bolts and tighten to 21 ft. lbs. (29 N.m). Ensure bolts are in correct locations. Longest bolts go inside transaxle housing. See **Fig. 15**.
18. Temporarily install transfer assembly intermediate shaft. See **Fig. 74**. Turn intermediate shaft right and left several times to allow bearings to seat. Remove intermediate shaft. Using appropriate adapter and INCH-lb. torque wrench, measure differential preload. See **Fig. 75**. Preload should be 1.8-6.1 INCH lbs. (.20-.69 N.m) for NEW bearings and .9-3.1 INCH lbs. (.10-.35 N.m) for used bearings.
19. If preload is not within specification, remove 16 transaxle housing bolts. Using a plastic hammer, remove transaxle housing from transaxle case. Remove differential assembly from transaxle case and replace plate washer behind transaxle case bearing race. See **Fig. 60**.
20. Plate washers are marked in numeric and alphabetic order and are available in thicknesses from .079" (2.00 mm), marked with a zero, to .096" (2.45 mm), marked with the number "9", and from .098" (2.50 mm), marked with the letter "A", to .112" (2.85 mm), marked with the letter "H". Washers increase in increments of .002" (.05 mm). Recheck preload after washer replacement.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

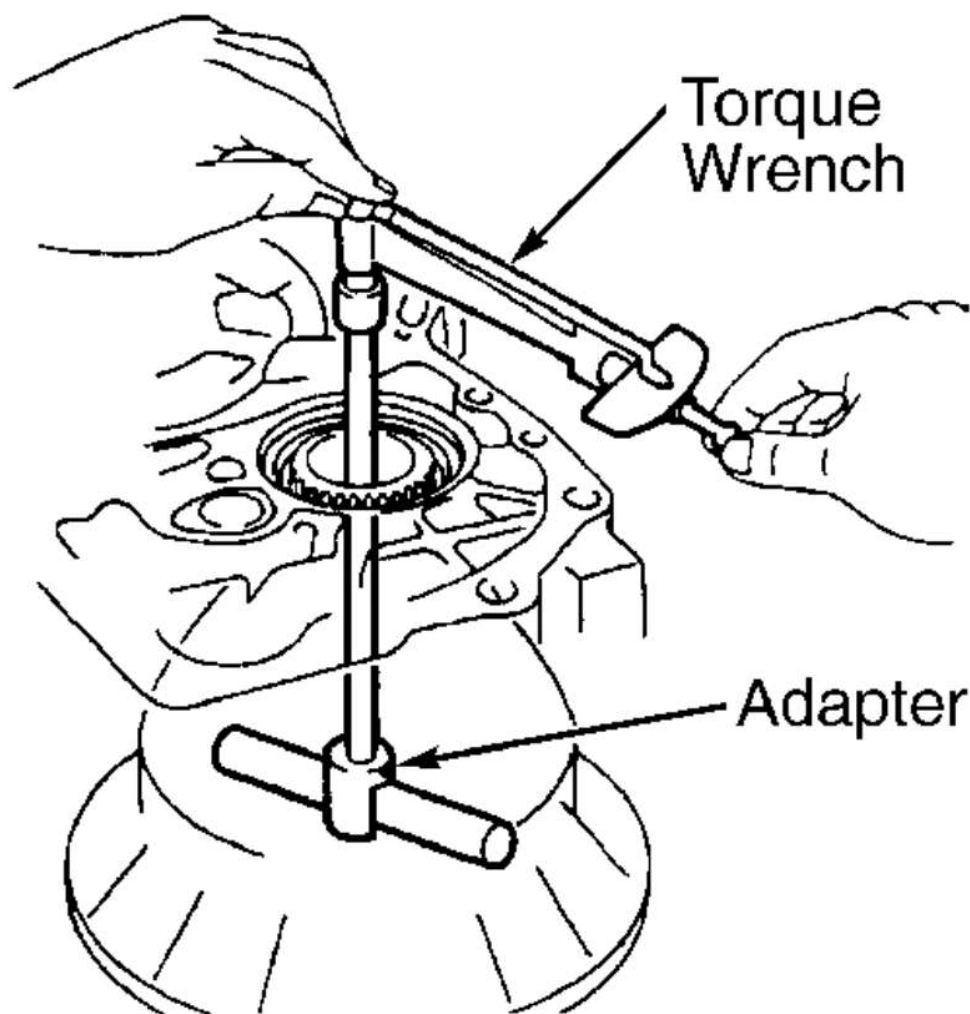


G00182323

Fig. 74: Installing Transfer Assembly Intermediate Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011293

Fig. 75: Measuring Differential Preload

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. Clean contact surface of differential case and ring gear using cleaning solvent. Heat ring gear to 212°F (100°C) in water. DO NOT heat ring gear above 230°F (110 °C).
22. Carefully remove ring gear from water and quickly align match marks made during disassembly. Install ring gear on differential case. Install but DO NOT tighten 8 ring gear bolts, in pairs of 2, in a crisscross

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

pattern. Ensure ring gear is properly seated and aligned. Remove 4 service bolts previously installed. See **Fig. 71**. Install remaining 8 ring gear bolts and tighten all bolts to 70 ft. lbs. (95 N.m). Install NEW oil seal in transaxle case. Coat oil seal lip with lubricant.

23. For transaxle housing oil seal, wrap vinyl tape around seal installer at a position .236" (6.00 mm) above bottom end of installer, until thickness of tape is about .197" (5.00 mm). Coat NEW oil seal lip with lubricant. Install oil seal until wound vinyl tape contacts transaxle housing. Oil seal installed depth should be .22-.26" (5.5-6.5 mm).

TRANSAXLE REASSEMBLY

NOTE: Coat all oil seal rings, clutch discs, clutch plates, rotating parts and sliding surfaces with ATF prior to reassembly. All gaskets and rubber "O" rings should be replaced. Ensure ends of snap rings are not aligned with cutouts of drum. Check thrust bearings and races for wear or damage. Use petroleum jelly to secure parts in place. Clutch discs should be soaked in ATF for at least 15 minutes before installation.

NOTE: Refer to illustration for thrust bearing and race locations. See **Fig. 94**. For component dimensions, see **THRUST BEARING & RACE SPECIFICATIONS table**.

1. Install oil deflector (if equipped) with 3 bolts to transaxle housing. Install apply pipe and clamp. See **Fig. 7**. Install bolt and tighten to 87 INCH lbs. (9.8 N.m). Ensure pipe is installed to stopper. Install oil seal ring to transaxle housing. See **Fig. 25**. Using appropriate adapter and press, install underdrive cylindrical roller bearing into transaxle housing. DO NOT apply excessive pressure to bearing.
2. Using vernier calipers, measure underdrive brake piston return spring free length with spring mounted to spring seat. Free length should be .553" (14.04 mm). Replace springs as necessary. Install 2 oil seal rings to transaxle case. See **Fig. 26**.
3. For needle roller bearing installation, wrap vinyl tape around bearing installer at a position .157" (4.00 mm) above bottom end of installer, until thickness of tape is about .197" (5.00 mm). Using bearing installer and press, install needle roller bearing to transaxle case until wound vinyl tape contacts transaxle case.
4. Coat 2 NEW "O" rings with ATF and install on underdrive brake piston. See **Fig. 18**. Using hand pressure, install piston into transaxle case. Using appropriate adapter and press, compress underdrive brake piston return springs into transaxle case and install snap ring. DO NOT apply excessive force.
5. Install snap ring into transaxle case. Using appropriate bearing race adapter and press, install 2 bearing outer races into transaxle case. Press each outer race into transaxle case until race contacts snap ring. See **Fig. 17**. Using appropriate adapter and press, install tapered roller bearing to counter drive gear until bearing contacts gear. DO NOT apply excessive force.
6. Using appropriate adapter and press, install counter drive gear and bearing into transaxle case. DO NOT apply excessive pressure. Using vernier calipers, measure 1st/reverse brake piston return spring free length with spring mounted to spring seat. Free length should be .611" (15.51 mm). Replace springs as necessary.

2005 Toyota RAV4

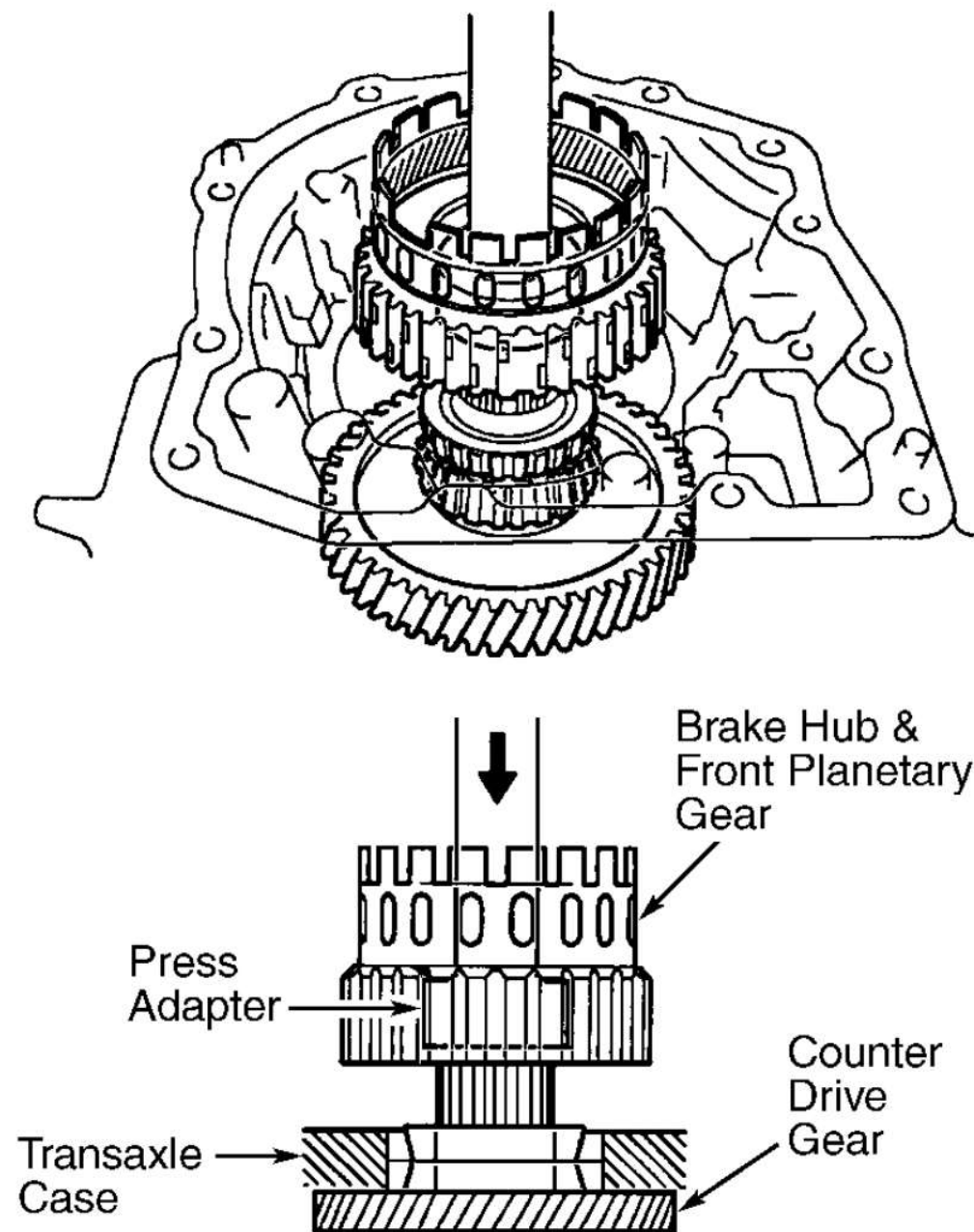
2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

NOTE: In the following step, stop press when piston return spring seat is lowered .039-.079" (1.00-2.00 mm) from snap ring groove. This prevents spring seat from becoming deformed. DO NOT expand snap ring excessively.

7. Coat 2 NEW "O" rings with ATF and install on 1st/reverse brake piston. Using hand pressure, install piston into transaxle case. See **Fig. 17**. Using appropriate adapter and press, compress 1st/reverse brake piston return springs into transaxle case and install snap ring. DO NOT apply excessive force.
8. Install front planetary ring gear and snap ring to brake hub. Install front planetary gear to brake hub. Using appropriate adapter and press, install brake hub with front planetary gear into transaxle case. See **Fig. 76**. Install washer on counter drive gear in correct direction. See **Fig. 77**.
9. Using holding tool, socket and torque wrench, install nut and tighten to 207 ft. lbs. (280 N.m). Using socket, adapter and INCH-lb. torque wrench, measure counter drive gear tapered roller bearing starting torque. Starting torque should be 4.4-8.8 INCH lbs. (.5-1.0 N.m). See **Fig. 78**. If starting torque is not within specification, gradually tighten nut until starting torque is within specification.
10. Install 2 thrust bearings, bearing race and front planetary sun gear to front planetary gear. Coat bearing race with ATF and install race to rear planetary gear. Install thrust washer No. 2. Install rear planetary gear into transaxle case. Install snap ring.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011294

Fig. 76: Installing Front Planetary Gear With Brake Hub Into Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

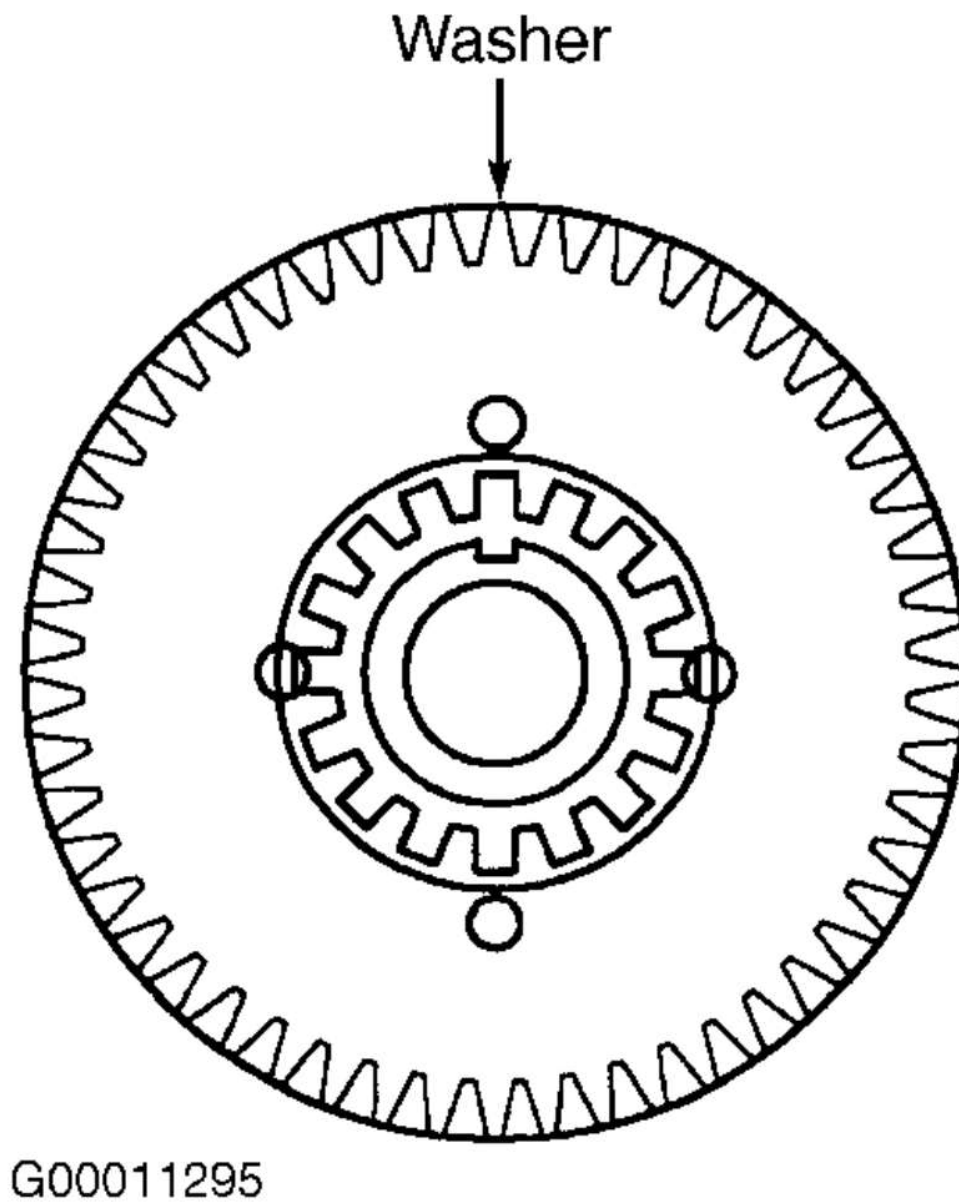
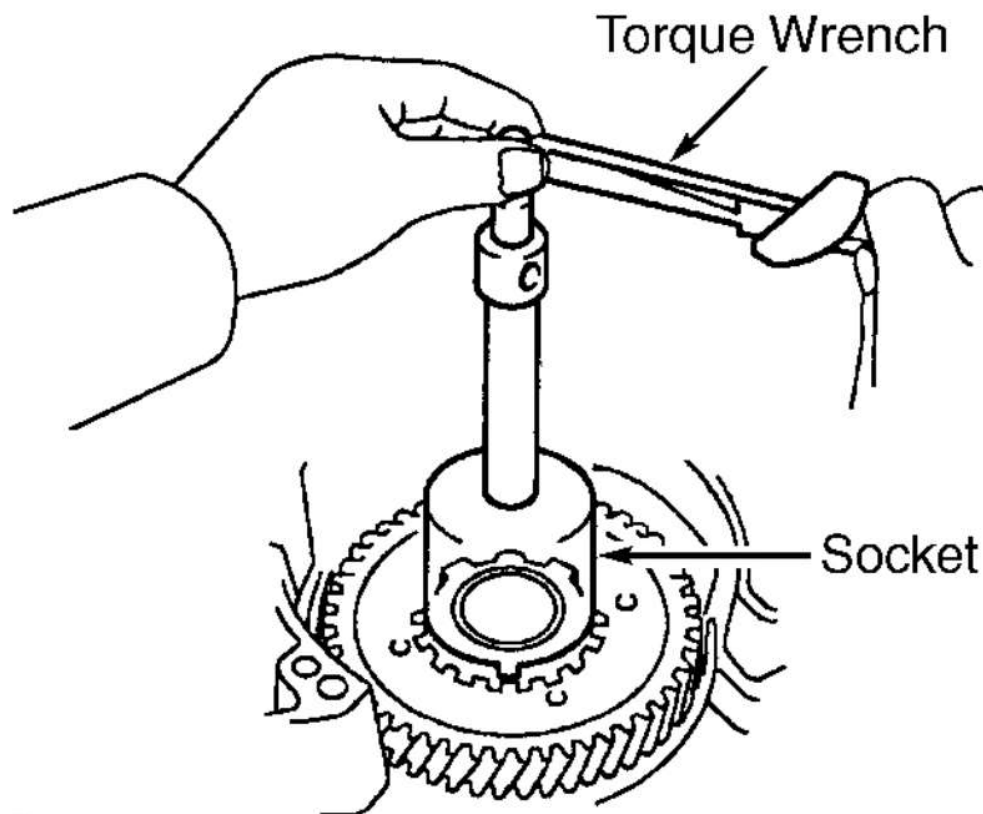


Fig. 77: Installing Counter Drive Gear Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



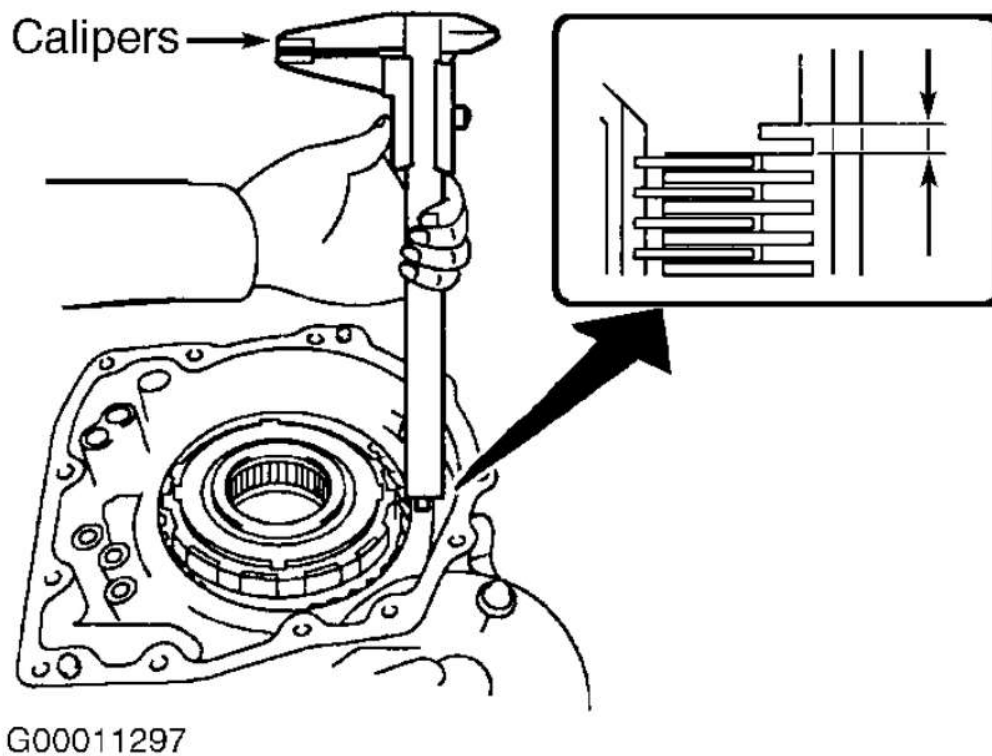
G00011296

Fig. 78: Measuring Counter Drive Gear Bearing Starting Torque
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. Install 1st/reverse brake. Install 5 plates and 5 discs, starting with a plate and alternating with a disc. DO NOT install flange. Measure 1st/reverse brake piston stroke. Using vernier calipers, measure distance between disc surface and contact surface of 2nd brake assembly at transaxle case. See **Fig. 79**.
12. Piston stroke should be .040-.048" (1.02-1.21 mm). Select appropriate flange to ensure piston stroke is within specification. Flanges are marked in numeric order and are available in thicknesses from .071" (1.80 mm), marked with the number "1", to .098" (2.50 mm), marked with the number "8", in increments of .004" (.10 mm). Recheck piston stroke after flange is installed.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

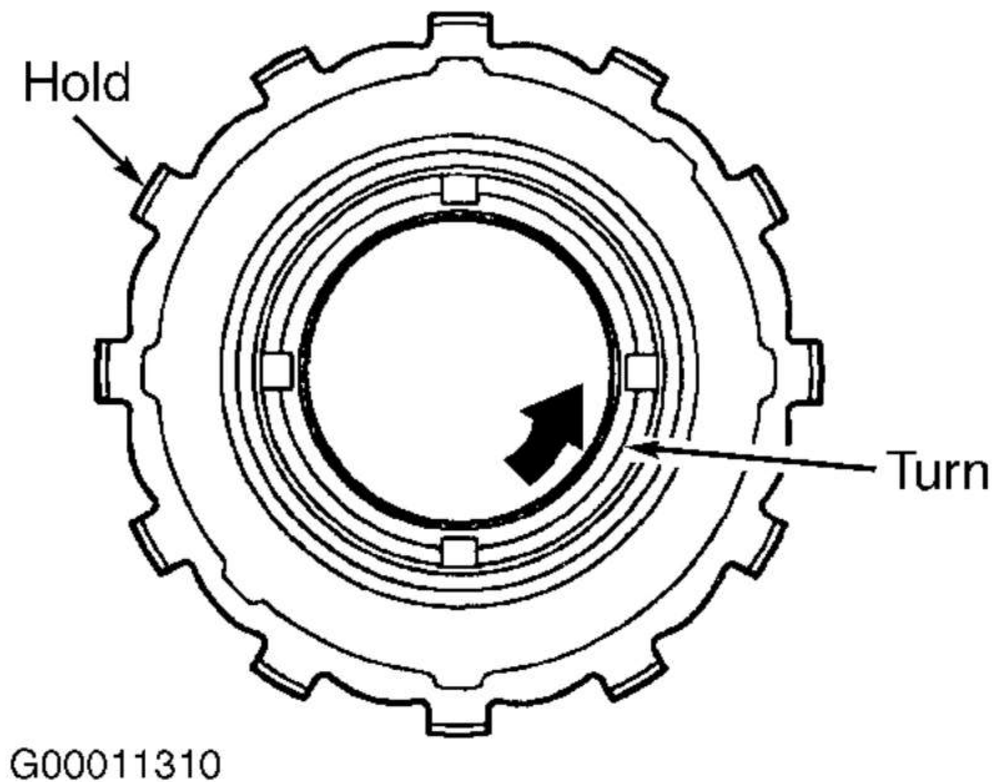


G00011297

Fig. 79: Measuring 1st/Reverse Brake Piston Stroke
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. Install 2nd brake assembly into transaxle case. Install snap ring and measure inside diameter. Snap ring inside diameter should be more than 6.57" (167.0 mm). Snap ring has a specific tapered installation direction. If inside diameter is not within specification, ensure snap ring is installed in correct direction. If snap ring is installed correctly, replace snap ring.
14. Install one-way clutch outer sleeve to 2nd brake assembly. Ensure sleeve is positioned correctly. Install one-way clutch inner race to No. 1 one-way clutch. Ensure inner race is installed correctly. Check No. 1 one-way clutch operating direction. One-way clutch should rotate in counterclockwise direction and lock in clockwise direction. See **Fig. 80**.

2005 Toyota RAV4
2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011310

Fig. 80: Checking No. 1 One-Way Clutch Rotation

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. Install No. 1 one-way clutch and thrust bearing into outer sleeve. See **Fig. 81**. Ensure Black race on thrust bearing is visible upon installation. Coat thrust washer No. 1 with petroleum jelly and install on rear planetary sun gear. Coat thrust bearing with petroleum jelly and install on rear planetary sun gear. Install rear planetary sun gear onto rear planetary gear.
16. Install 2nd brake. Install 3 discs and 3 plates, starting with a plate and alternating with a disc. DO NOT install flange at this time. Temporarily install snap ring. Using vernier calipers, measure 2nd brake piston stroke between disc surface and snap ring surface. See **Fig. 82**. Piston stroke should be .024-.036" (.62-.91 mm).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

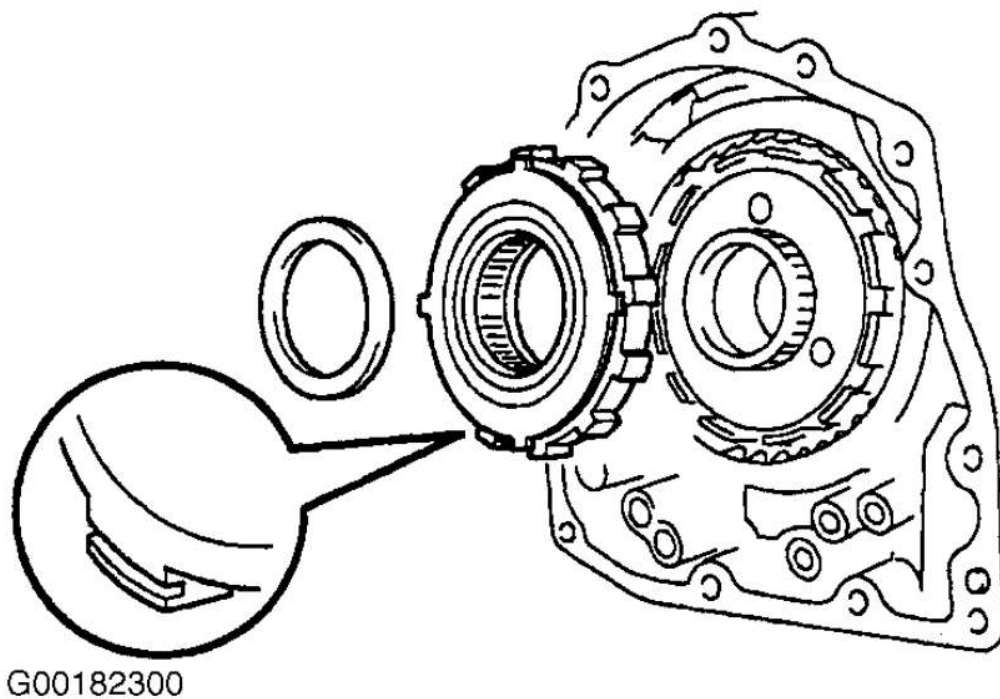
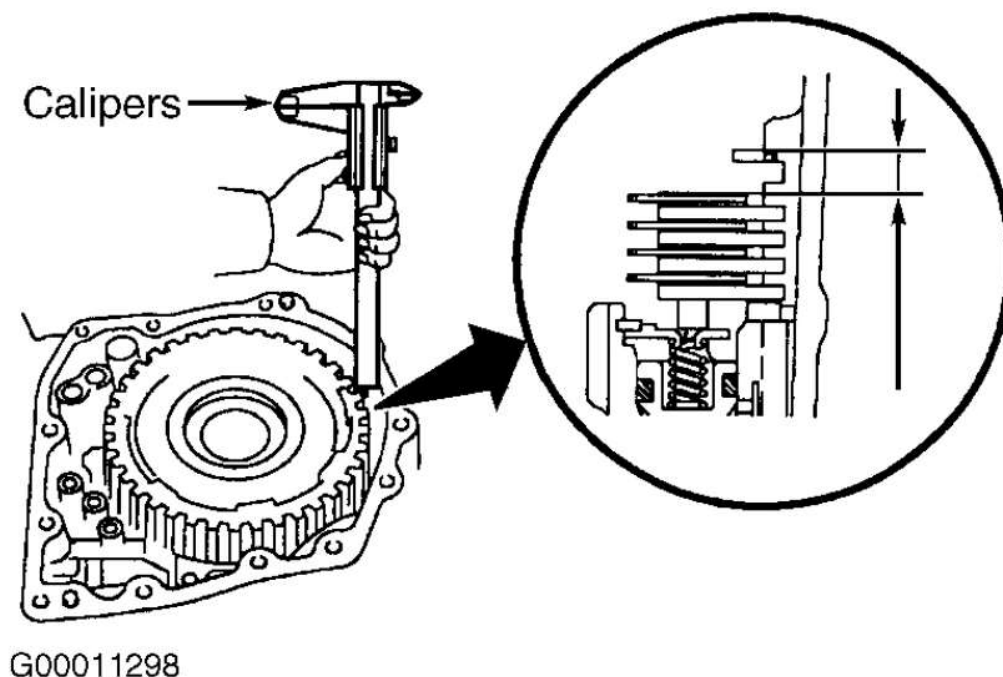


Fig. 81: Installing No. 1 One-Way Clutch & Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

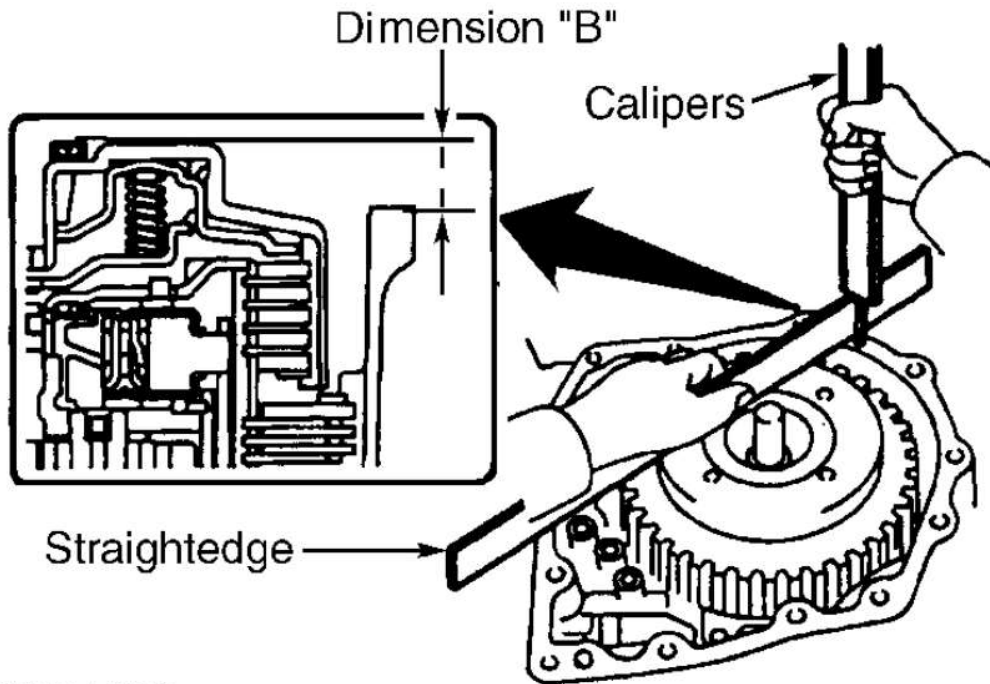
**Fig. 82: Measuring 2nd Brake Piston Stroke**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. Select appropriate flange to ensure piston stroke is within specification. Use the following formula to determine flange thickness: measured distance, minus flange thickness, minus snap ring thickness of .063" (1.60 mm). Flanges are available in thicknesses from .118" (3.00 mm) to .142" (3.60 mm) in increments of .004" (.10 mm), and are marked in numeric order from "1" to "7". Remove snap ring, install appropriate flange and reinstall snap ring. Ensure snap ring end gap is visible through groove in transaxle case.
18. Install bearing race over shaft and onto direct clutch. Install direct clutch assembly and thrust bearing onto rear planetary sun gear assembly. See **Fig. 17**. Ensure discs in direct clutch completely mate with rear planetary sun gear to ensure rear cover can be installed correctly.
19. Ensure transaxle case and rear cover mating surfaces are clean. Place a straightedge onto direct clutch drum. Using vernier calipers, measure distance between bottom of straightedge and transaxle case (dimension "B"). See **Fig. 83**.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011299

Fig. 83: Measuring Direct Clutch End Play (Dimension "B")
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. Measure dimension No. 1 and dimension No. 2 of rear cover in 2 places. See **Fig. 84**. Subtract dimension No. 2 from dimension No. 1. This total equals dimension "C". Calculate direct clutch end play by subtracting dimension "B" from dimension "C". End play should be .008-.037" (.20-.94 mm).
21. Select a thrust bearing to ensure end play is within specification. Thrust bearings are available in 2 thicknesses of .140" (3.55 mm) with an outside diameter of 2.74" (69.6 mm), and .152" (3.85 mm) with an outside diameter of 2.76" (70.18 mm). Inside diameter of both thrust bearings is 2.11" (53.6 mm). During installation, ensure Black race side of thrust bearing is facing transaxle rear cover.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

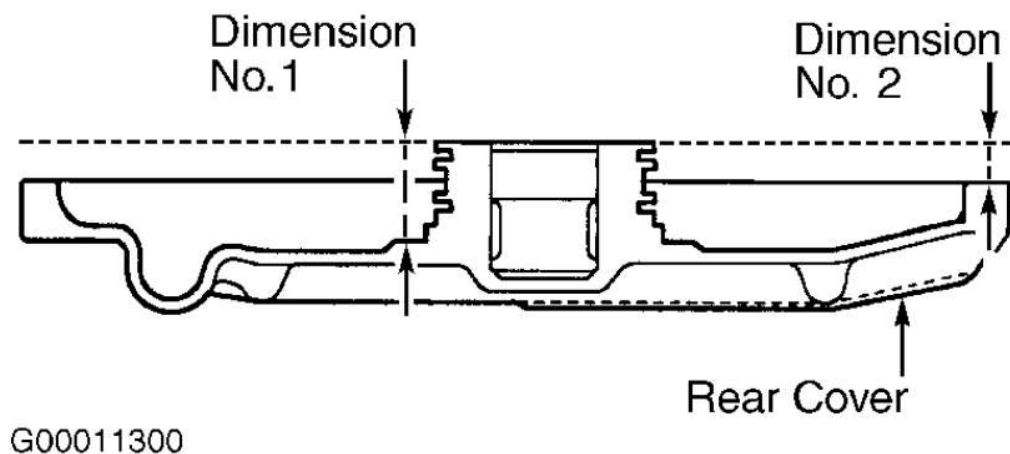
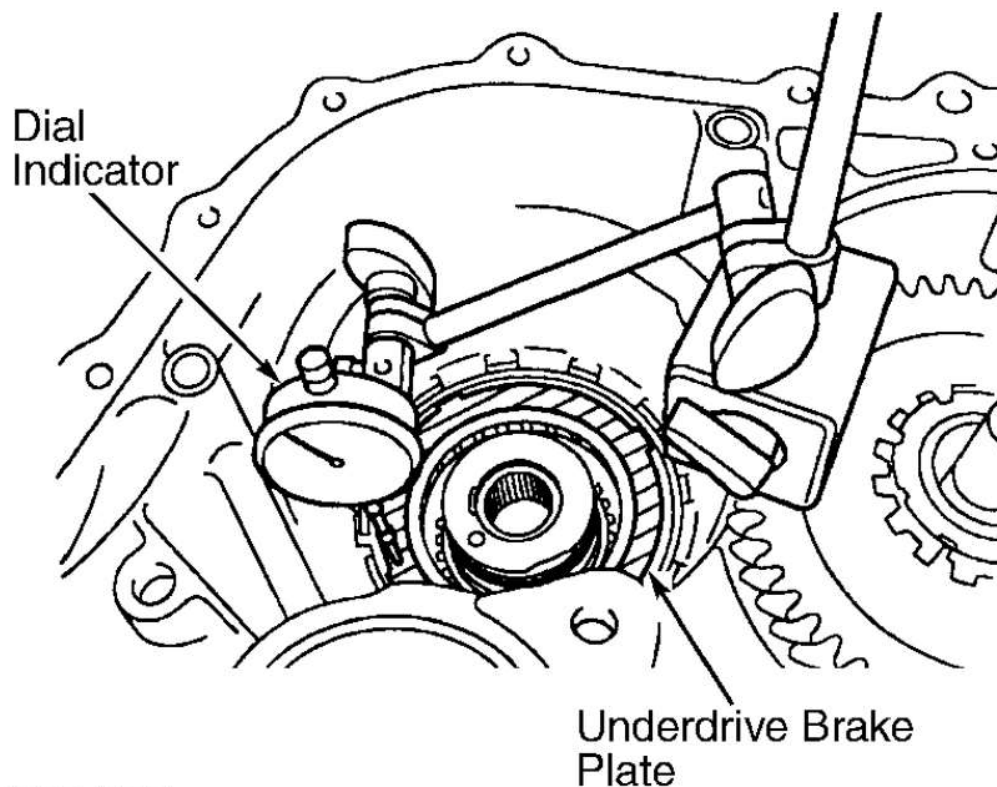


Fig. 84: Measuring Distance Between Rear Cover Surfaces (Dimensions No. 1 & 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. Install 2 NEW apply gaskets to transaxle case. Install clamp to apply pipes prior to installing pipes to transaxle case. This will prevent apply pipes from being deformed or damaged. Install 2 apply pipes, clamp and bolt. See **Fig. 18**. Ensure pipes are securely inserted into transaxle case until they reach the pipe stopper on pipe. Tighten bolt to 48 INCH lbs. (5.4 N.m).
23. Install needle roller bearing onto transaxle rear cover with inscribed mark on bearing facing up. Using appropriate adapter and press, install needle roller bearing to transaxle rear cover. Press bearing in to a depth of .474-.502" (12.05-12.75 mm). Install transaxle rear cover plate and 2 screws. Apply thread sealant to screw threads and tighten screws to 66 INCH lbs. (7.5 N.m). Coat 2 oil seal rings with ATF and install on transaxle rear cover. See **Fig. 17**.
24. Install underdrive brake. Install 3 discs and 3 plates, starting with a plate and alternating with a disc. DO NOT install flange at this time. Temporarily install snap ring. Using a dial indicator, measure underdrive brake piston stroke by applying and releasing 57 psi (4 kg/cm²) of compressed air to transaxle case. See **Fig. 24** and **Fig. 85**.
25. Piston stroke should be .071-.087" (1.81-2.20 mm). Select appropriate flange to ensure piston stroke is within specification. Flanges are available in 3 thicknesses of .118" (3.00 mm), .126" (3.20 mm) and .134" (3.40 mm), and are marked in numeric order from "1" to "3". Remove snap ring, install appropriate flange and reinstall snap ring.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



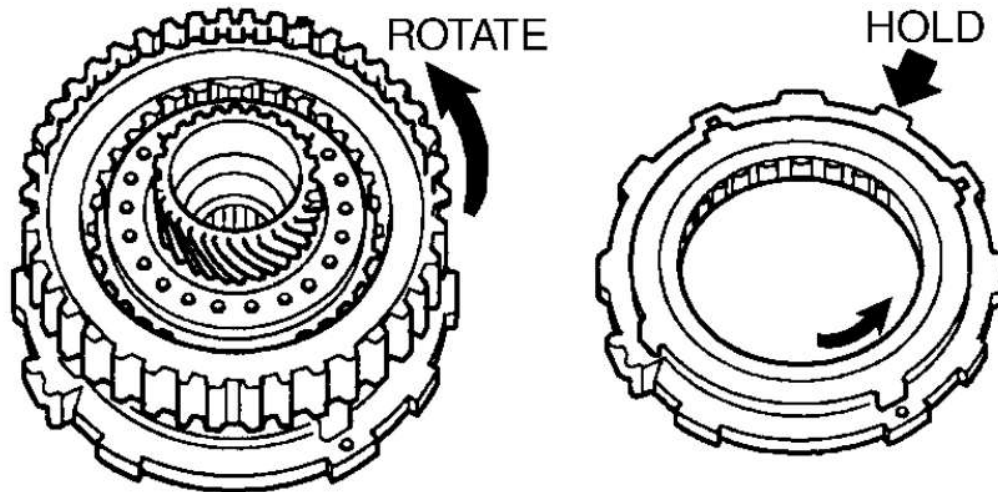
G00011301

Fig. 85: Measuring Underdrive Brake Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. Ensure transaxle case and rear cover surfaces are clean. DO NOT allow oil to contact surfaces. Coat needle roller bearing with ATF. Apply Three Bond (1281) or equivalent gasket sealant to rear cover around inside edges of bolt holes. Install rear cover onto transaxle case. Install 11 rear cover bolts. Install thread sealant to 3 bolts at bottom of rear cover and tighten bolts to 14 ft. lbs. (18 N.m). Tighten all other bolts to 18 ft. lbs. (24 N.m).
27. Install outer race retainer to No. 2 one-way clutch, ensuring long finger of retainer is facing up. See [Fig. 20](#). Install underdrive clutch to No. 2 one-way clutch. Rotate underdrive clutch to ensure correct installation. Underdrive clutch should rotate in a counterclockwise direction, and lock in a clockwise direction. See [Fig. 86](#).

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011302

Fig. 86: Checking Underdrive Clutch Assembly Rotation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. Install No. 2 one-way clutch into transaxle case. Note position of index marks on No. 2 one-way clutch. Ensure marks are facing up. See **Fig. 87**. Install snap ring into transaxle case. Coat thrust bearing and bearing race with petroleum jelly and install onto underdrive clutch. Install underdrive clutch into transaxle case.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

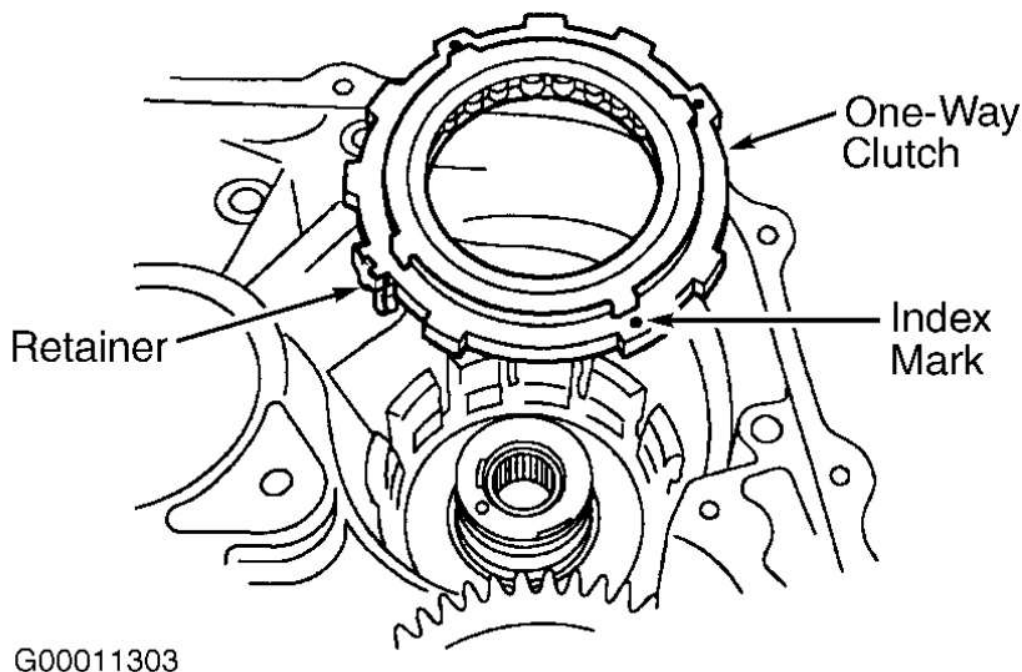
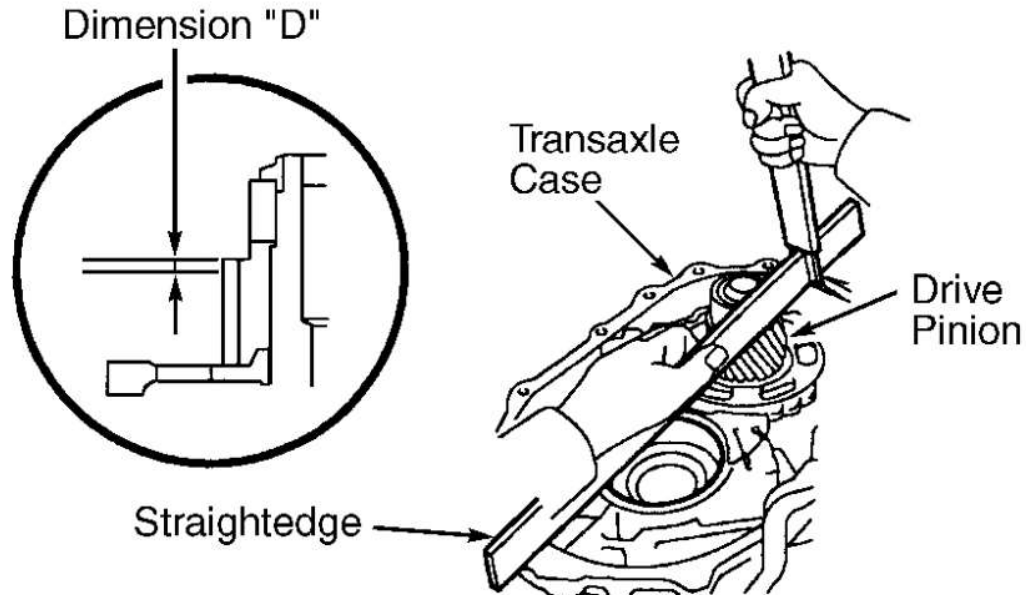


Fig. 87: Installing No. 2 One-Way Clutch & Retainer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. Install pawl pin and spring to parking lock pawl. Temporarily install parking lock pawl, shaft and spring to transaxle case. See **Fig. 18**. Install underdrive planetary gear assembly into transaxle case. Engage all clutch discs and hub spline of planetary gear assembly firmly and securely. Install parking lock pawl shaft. Install lock pawl clamp and bolt. Tighten bolt to 87 INCH lbs. (9.8 N.m).
30. Using vernier calipers and a straightedge, measure gap between top of differential drive pinion in underdrive planetary gear, and contact surface of transaxle case. See **Fig. 88**. Record measurement as dimension "D".
31. Measure dimension No. 1 and dimension No. 2 of transaxle housing in 2 places. See **Fig. 89**. Subtract dimension No. 2 from dimension No. 1. Record measurement as dimension "E". Install bearing race onto counter drive gear in correct direction. See **Fig. 17**.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011304

Fig. 88: Measuring Gap Between Top Of Differential Drive Pinion & Transaxle Case (Dimension "D")

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

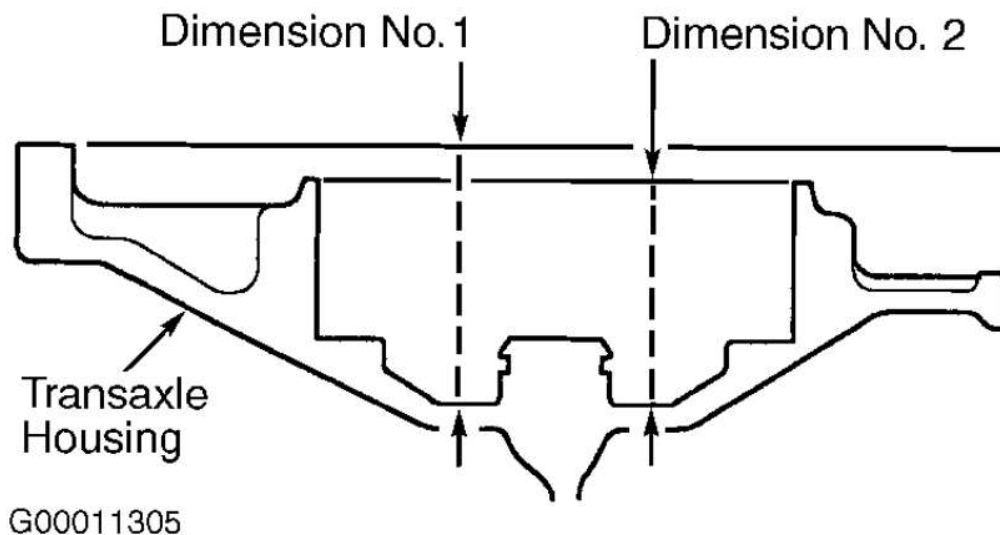


Fig. 89: Measuring Distance Between Transaxle Housing Surfaces (Dimensions No. 1 & 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. Coat needle roller bearing with petroleum jelly and install onto multiple clutch hub (shaft side). Install multiple clutch hub into transaxle case. Install thrust bearing onto multiple clutch hub (forward clutch side). Install forward clutch onto multiple clutch hub. See **Fig. 17**. Align splines of all discs of forward clutch with multiple clutch hub. Install thrust bearing onto forward clutch. Ensure Black side of thrust bearing is visible.
33. Install 2 NEW apply gaskets to front of transaxle case. See **Fig. 17**. Install differential assembly. Calculate transaxle housing-to-underdrive planetary gear assembly end play using the following formula: subtract dimension "D" from dimension "E", performed in steps 30 and 31, minus thrust bearing thickness of .129" (3.28 mm), equals bearing race thickness. End play should be .020-.039" (.50-.99 mm).
34. Select a bearing race to ensure end play is within specification. If dimension "E" minus dimension "D" is less than .292" (7.42 mm), bearing race thickness should be .138" (3.50 mm). If dimension "E" minus dimension "D" is .292" (7.42 mm) or more, bearing race thickness should be .150" (3.80 mm).
35. Install appropriate bearing race onto underdrive planetary gear assembly to ensure end play is within specification. Bearing race outside diameter is 3.268" (83.00 mm). Bearing race inside diameter is 2.220" (56.40 mm). Install appropriate thrust bearing onto bearing race. Thrust bearing outside diameter is 3.345" (84.96 mm). Thrust bearing inside diameter is 2.252" (57.20 mm).
36. Coat oil pump "O" ring with ATF. Install oil pump and 7 bolts. Tighten bolts to 16 ft. lbs. (22 N.m). Ensure transaxle case and transaxle housing surfaces are clean. DO NOT allow oil to contact surfaces. Apply Three Bond (1281) or equivalent gasket sealant about .047" (1.20 mm) wide, to transaxle case around inside edges of bolt holes. Install transaxle housing to transaxle case.
37. Install 16 transaxle housing bolts. Apply thread sealant to 5 lower bolts inside transaxle housing, and tighten these bolts to 16 ft. lbs. (22 N.m) within 10 minutes of installation. Tighten all other bolts to 21 ft.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

- lbs. (29 N.m). Ensure bolts are in correct locations. Longest bolts go inside transaxle housing. See **Fig. 15**.
38. Inspect input shaft end play. Using a dial indicator, measure input shaft end play. See **Fig. 14**. End play should be .010-.049" (.26-1.25 mm). Recheck differential preload. Using appropriate adapter and INCH-lb. torque wrench, measure differential preload. See **Fig. 75**. Preload should be 1.8-6.1 INCH lbs. (.20-.69 N.m) for new bearings and .9-3.1 INCH lbs. (.10-.35 N.m) for used bearings.
 39. If preload is not within specification, remove differential assembly from transaxle case and replace shim or plate washer behind transaxle case bearing race. See **Fig. 60**.
 40. Place transaxle on 2 blocks of wood, with oil pan surface facing outward. Coat NEW manual valve lever shaft oil seal with ATF. Install oil seal into transaxle case. Install parking lock pawl rod to manual valve lever. Install NEW spacer and manual valve lever shaft into transaxle case. See **Fig. 7**.
 41. Using a pin punch and hammer, drive in NEW roll pin. Turn spacer and lever shaft to align small hole for locating staking position in spacer with position mark on lever shaft. See **Fig. 90**. Using a pin punch and hammer, stake spacer through small hole. Ensure spacer does not turn.

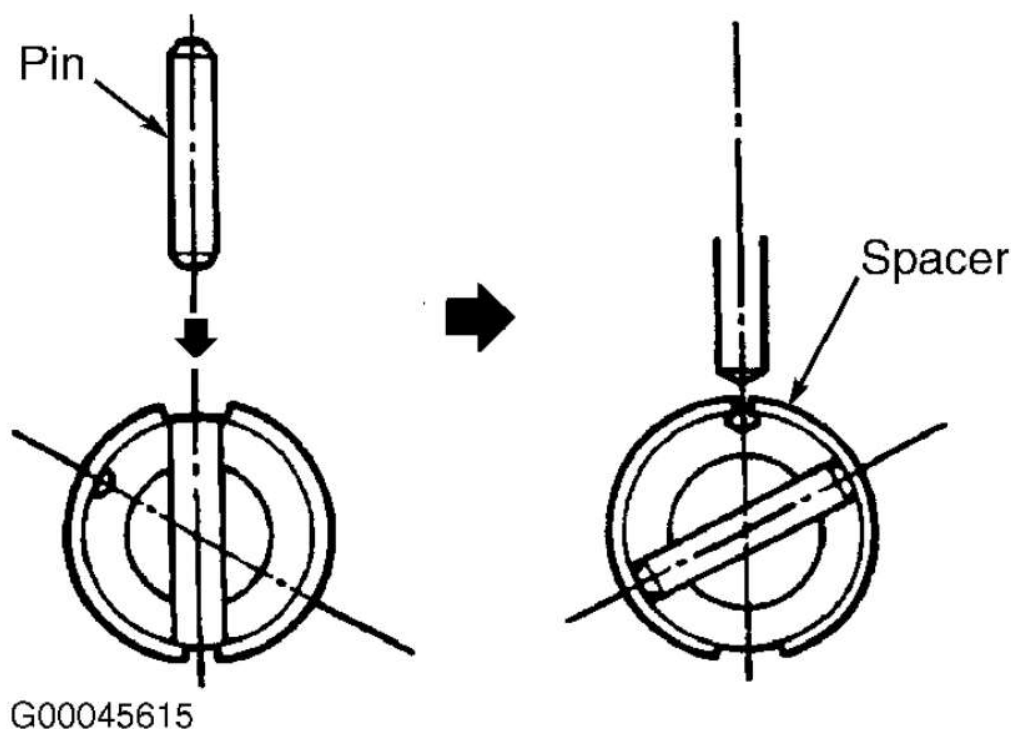


Fig. 90: Staking Spacer To Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

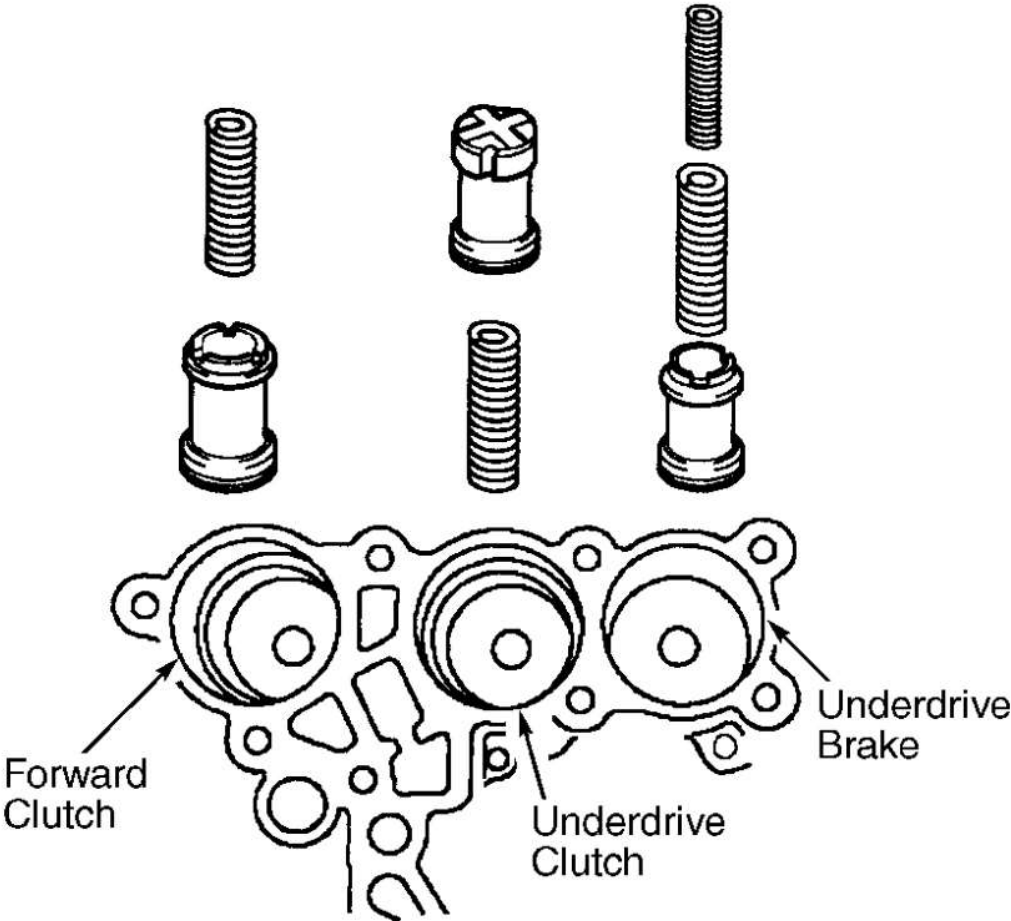
42. Using needle nose pliers, install retainer spring. Install parking lock pawl bracket. Install bolts and tighten to 15 ft. lbs. (20 N.m). Install cover, manual detent spring and 2 bolts. Ensure cover and detent spring are

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

installed correctly. See **Fig. 7**.

43. Tighten 1.063" (27.00 mm) bottom bolt to 15 ft. lbs. (20 N.m). Tighten .630" (16.00 mm) top bolt to 106 INCH lbs. (12 N.m). Coat NEW "O" rings with ATF and install them onto accumulator pistons. Coat 4 springs and 3 accumulator pistons with ATF, and install components into transaxle case holes. See **Fig. 91**. See **ACCUMULATOR SPRING FREE LENGTH SPECIFICATIONS** table for spring specifications and identification.



G00011306

Fig. 91: Identifying Accumulator Piston & Spring Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ACCUMULATOR SPRING FREE LENGTH SPECIFICATIONS

Application (Color)	Free Length - In. (mm)	Outer Diameter - In. (mm)
Forward	3.210 (81.53)	.728 (18.50)

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul

Clutch (Pink)		
Underdrive Brake		
Inner (Green)	2.372 (60.24)	.626 (15.90)
Outer (Blue)	2.859 (72.61)	.657 (16.70)
Underdrive Clutch (White)	3.563 (90.49)	.756 (19.20)

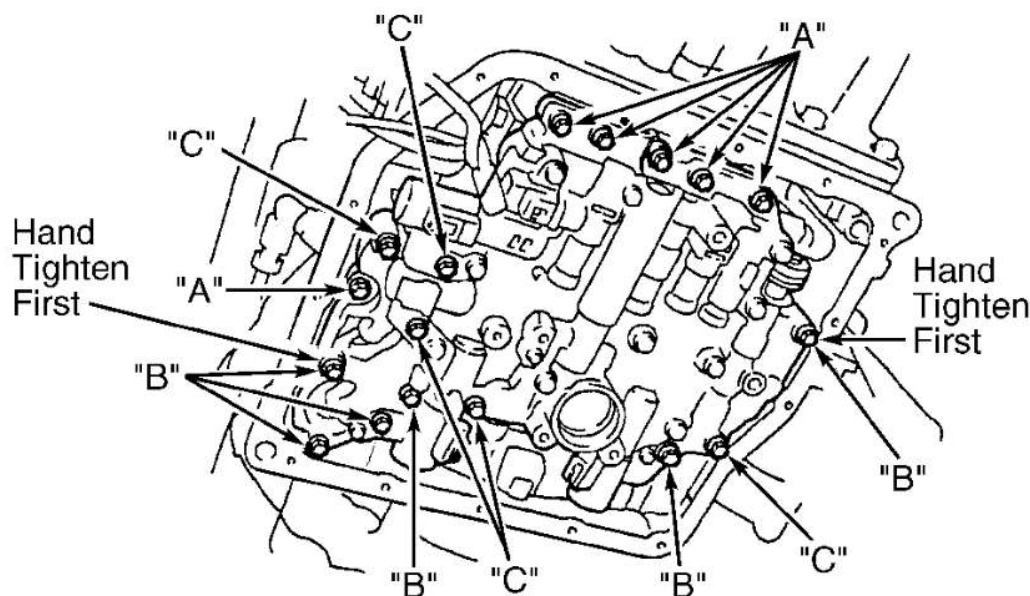
44. Install check ball body and spring. See **Fig. 10**. Coat NEW "O" ring with ATF and install on transaxle solenoid connector. Install connector into transaxle case, above park/neutral position switch, and tighten bolt to 48 INCH lbs. (5.4 N.m). Coat NEW apply gaskets with ATF and install them into transaxle case, below valve body assembly. See **Fig. 10**. Install brake drum gasket, located near 3 apply gaskets. See **Fig. 7**.
45. Align groove in manual valve with pin in manual valve lever. Push valve body assembly against accumulator piston springs and check ball body to assist in installation. Install valve body bolts. Hand tighten 2 bolts temporarily. See **Fig. 92**. These bolts are positioning bolts.
46. Ensure valve body is aligned. Ensure bolts are installed in correct locations. For bolt length, see **VALVE BODY BOLT IDENTIFICATION** table. Tighten bolts to 97 INCH lbs. (11 N.m). Install NEW gasket on oil strainer. Install oil strainer and tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

VALVE BODY BOLT IDENTIFICATION

Bolt Identification	Length - In. (mm)
A	.98 (25)
B	1.61 (41)
C	1.77 (45)

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011239

Fig. 92: Identifying Valve Body Bolt Locations

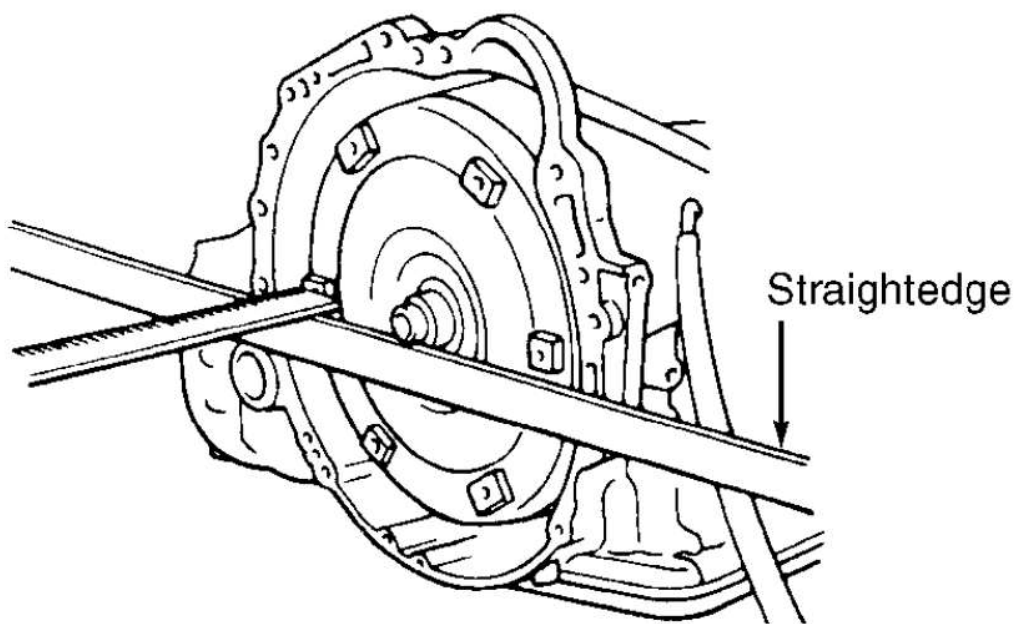
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. Connect 5 shift solenoid connectors. Install fluid temperature sensor, clamps and bolt. Tighten bolt to 58 INCH lbs. (6.6 N.m). See **Fig. 9**. Install 3 magnets into oil pan in original locations. Apply Three Bond (2430) or equivalent to 18 oil pan bolt threads. Install NEW oil pan gasket, oil pan and bolts. Tighten bolts to 67 INCH lbs. (7.6 N.m) within 10 minutes of installation.
48. Coat NEW "O" rings with ATF and install on speed sensors. Install input turbine and counter gear speed sensors into top of transaxle case. Tighten bolts to 97 INCH lbs. (11 N.m). Install NEW "O" rings on oil line union and elbow. Install oil line union and elbow into transaxle case. Tighten to 20 ft. lbs. (27 N.m). See **Fig. 6**.
49. Coat NEW "O" ring with ATF and install on transaxle test plug. Install transaxle test plug into transaxle case. See **Fig. 8**. Install park/neutral position switch onto manual valve lever shaft and temporarily install 2 adjusting bolts. See **Fig. 7**.
50. Install NEW lock tab and nut. Tighten nut to 61 INCH lbs. (6.9 N.m). Temporarily install control shift lever. Turn lever counterclockwise until it stops, then turn it clockwise 2 notches. Remove control shift lever. Align groove in park/neutral position switch to neutral basic line. Tighten 2 adjusting bolts to 48 INCH lbs. (5.4 N.m). Stake lock tab onto nut. Install control shift lever, washer and nut. Tighten nut to 10 ft. lbs. (13 N.m).
51. Remove any debris between transfer case and transaxle case contact surfaces. DO NOT allow oil to contact surfaces. Coat NEW round gasket with petroleum jelly and install onto transfer case.
52. Install intermediate shaft into transfer case assembly. Apply Three Bond (1281) or equivalent gasket sealant about .047" (1.20 mm) wide, to transfer case contact surface. Install transfer case by pushing

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

straight up and into transaxle. Use care not to damage oil seal lip when installing transfer case. Install 2 bolts and 6 nuts and tighten to 51 ft. lbs. (69 N.m).

53. Install torque converter into transaxle housing while rotating. Ensure converter is properly installed by measuring distance from edge of transaxle housing. See **Fig. 93**. Distance should be .510" (12.95 mm) for all models.

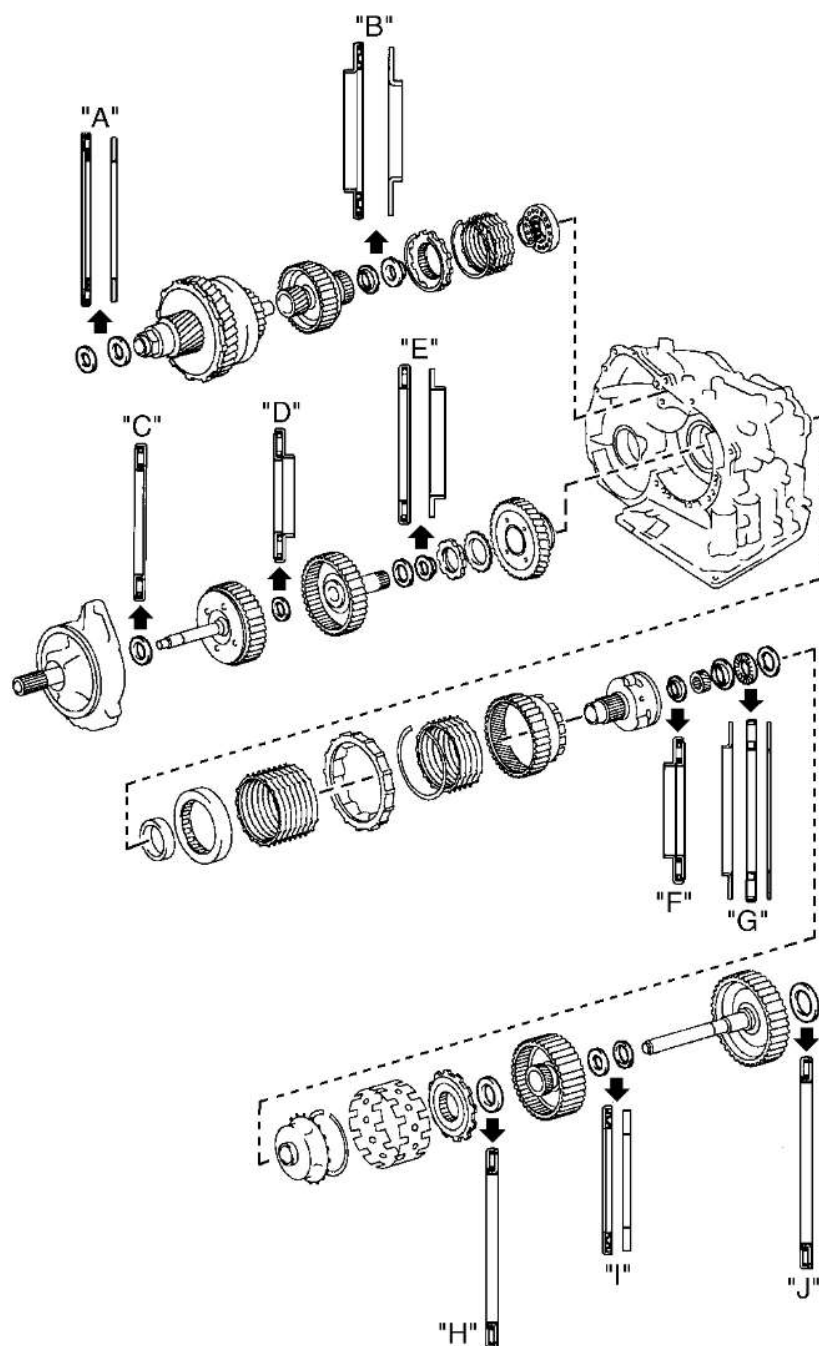


G95J19280

Fig. 93: Measuring Torque Converter Depth
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2005 Toyota RAV4

2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul



G00011307

Fig. 94: Identifying Thrust Bearing & Race Locations
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

THRUST BEARING & RACE SPECIFICATIONS (1)

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

Application	Inner Diameter - In. (mm)	Outer Diameter - In. (mm)
A		
Bearing	2.252 (57.20)	3.345 (84.96)
Rear Race	2.220 (56.40)	3.268 (83.00)
B		
Bearing	1.485 (37.73)	2.283 (58.00)
Rear Race	1.177 (29.90)	2.185 (55.50)
C		
Bearing	1.333 (33.85)	2.055 (52.20)
D		
Bearing	.925 (23.50)	1.732 (44.00)
E		
Bearing	1.429 (36.30)	2.055 (52.20)
Rear Race	1.358 (34.50)	1.909 (48.50)
F		
Bearing	1.362 (34.60)	2.055 (52.20)
G		
Front Race	1.587 (40.30)	2.283 (58.00)
Bearing	1.520 (38.60)	2.362 (60.00)
Rear Race	1.520 (38.60)	2.283 (58.00)
H		
Bearing	2.110 (53.60)	2.740 (69.60)
I		
Bearing	1.327 (33.70)	1.898 (48.20)
Rear Race	1.193 (30.30)	1.811 (46.00)
J		
Bearing	2.110 (53.60)	2.740 (69.60) Or 2.763 (70.18)
(1) Refer to illustration for component locations. See Fig. 94 .		

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Application	Ft. Lbs. (N.m)
--------------------	-----------------------

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

Control Shift Lever Lock Tab Nut	10 (13)
Converter-To-Drive Plate Bolt	30 (41)
Counter Drive Gear Nut	207 (280)
Differential Ring Gear Bolt	70 (95)
Drive Plate Bolt	72 (98)
Elbow	20 (27)
Manual Detent Spring Bottom Bolt	15 (20)
Oil Pan Drain Plug	35 (47)
Oil Pump Bolt	16 (22)
Parking Lock Pawl Bracket Bolt	15 (20)
Transaxle Housing-To-Transaxle Case Bolt	
Lower Bolts (5)	16 (22)
All Other Bolts	21 (29)
Transaxle Rear Cover Bolt	
Lower Bolts (3)	14 (19)
All Other Bolts	18 (24)
Transfer Case-To-Transaxle Bolt/Nut	51 (69)
Underdrive Planetary Gear Lock Nut	207 (280)
Union	18 (25)
INCH Lbs. (N.m)	
Apply Pipe Clamp Bolt	
Transaxle Case	48 (5.4)
Transaxle Housing	87 (9.8)
Manual Detent Spring Top Bolt	89 (10)
Oil Deflector Bolt	87 (9.8)
Oil Pan Bolt	67 (7.6)
Oil Strainer Bolt	97 (11)
Parking Lock Pawl Clamp Bolt	87 (9.8)
Park/Neutral Position Switch	
Nut	61 (6.9)
Bolt	48 (5.4)
Pressure Relief Check Ball Retainer Bolt	97 (11)
Rear Cover Plate Screws	66 (7.5)
Shift Solenoids	
SLT & SL1 Solenoid Bolt	58 (6.6)
All Other Solenoid Bolts	97 (11)
Solenoid Connector Bolt	48 (5.4)
Speed Sensor Bolt	97 (11)
Stator Shaft-To-Oil Pump Bolt	87 (9.8)
Temperature Sensor Clamp Bolt	58 (6.6)
Transaxle Case Plug	65 (7.4)

2005 Toyota RAV4**2001-05 AUTOMATIC TRANSMISSIONS U140F Overhaul**

	58 (6.6)
Upper & Lower Valve Body Bolt	97 (11)
Valve Body Bolt	97 (11)

TRANSAXLE SPECIFICATIONS**TRANSAXLE SPECIFICATIONS**

Application	In. (mm)
Bushing Inside Diameter (Maximum)	
Multiple Clutch Hub	.909 (23.09)
Oil Pump Body	1.503 (38.18)
Oil Pump Stator Shaft	.849 (21.57)
Underdrive Clutch Drum	1.462 (37.13)
Direct Clutch End Play	.008-.037 (.20-.94)
Input Shaft End Play	.010-.049 (.26-1.25)
Underdrive Planetary Gear Assembly End Play	.020-.039 (.50-.99)
Oil Pump	
Driven Gear-To-Body Clearance	.0039-.0067 (.100-.170)
Driven Gear Tip-To-Crescent Clearance	.0028-.0059 (.070-.150)
Gear Side Clearance	.0008-.0020 (.020-.050)
Piston Stroke	
Direct Clutch	.024-.033 (.61-.83)
Forward Clutch	.056-.069 (1.41-1.75)
Underdrive Brake	.071-.087 (1.81-2.20)
Underdrive Clutch	.059-.075 (1.51-1.90)
1st/Reverse Brake	.040-.048 (1.02-1.21)
2nd Brake	.024-.036 (.62-.91)
Side Gear Backlash	.002-.008 (.05-.20)
Torque Converter Runout (Maximum)	
Drive Plate	.008 (.20)
Sleeve	.012 (.30)
Torque Converter Installed Depth	.510 (12.95)

CLUTCH DISC & PLATE QUANTITY

Component	Discs	Plates
Direct Clutch	3	3
Forward Clutch	4	4
Underdrive Brake	3	3
Underdrive Clutch	3	3
1st/Reverse Brake	5	5
2nd Brake	3	3