

1990 Toyota Land Cruiser

1986-92 AUTOMATIC TRANSMISSIONS Toyota A-440F Overhaul

1986-92 AUTOMATIC TRANSMISSIONS

Toyota A-440F Overhaul

APPLICATION

APPLICATION & LABOR TIMES

Vehicle Application	Labor Times R & I ⁽¹⁾	Labor Times Overhaul ⁽²⁾	Trans. Model
1986-92 Land Cruiser (FJ)	6.3	11.4	A-440F

(1) Removal and installation of transmission from vehicle chassis.

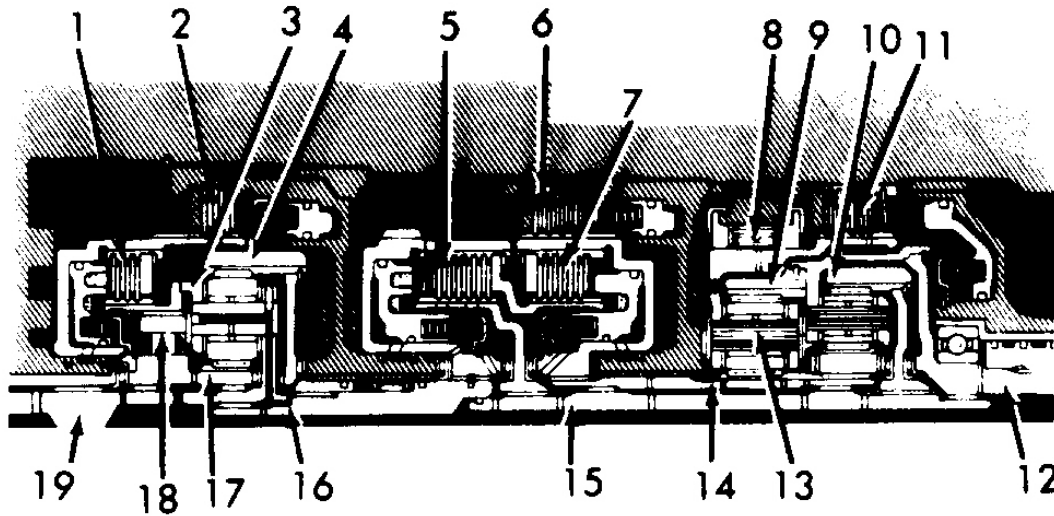
(2) Bench overhaul time for transmission. DOES NOT include removal and installation.

IDENTIFICATION

Vehicle Identification Number (VIN) is used for correct application of component parts and assemblies. VIN locations are top left of instrument panel, driver's door post and stamped on front cowl of engine compartment.

DESCRIPTION

The A-440F is a 4-speed automatic transmission with a 2-speed transfer unit. Torque converter has a lock-up mechanism. Planetary gears are actuated by 3 multi-disc brakes and 2 clutches. See **Fig. 1** . Each clutch and brake operates by hydraulic pressure. Gear shifts are determined by engine load, selector lever position, throttle valve position and output shaft speed. The only external adjustments are throttle cable position, shift linkage adjustment and neutral start switch.



- | | |
|------------------------------|-----------------------------|
| 1. OD Direct Clutch | 11. 1st & Reverse Brake |
| 2. OD Brake | 12. Output Shaft |
| 3. OD Planetary Carrier | 13. Front Planetary Carrier |
| 4. OD Planetary Ring Gear | 14. Sun Gear |
| 5. Front Clutch | 15. Intermediate Shaft |
| 6. 2nd Brake | 16. Input Shaft |
| 7. Rear Clutch | 17. OD Planetary Sun Gear |
| 8. No. 2 One-Way Clutch | 18. OD One-Way Clutch |
| 9. Front Planetary Ring Gear | 19. OD Input Shaft |
| 10. Rear Planetary Ring Gear | |
- 93D25216**

Fig. 1: Identifying Transmission Component Locations
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

LUBRICATION & ADJUSTMENT

See appropriate article in TRANSMISSION SERVICING.

ON-VEHICLE SERVICE

DRIVE AXLE SHAFTS

See appropriate AXLE SHAFTS article in DRIVE AXLES.

THROTTLE CABLE

Removal

Disconnect throttle cable from the throttle linkage. Disconnect throttle cable from cam. Remove control valve assembly. See **CONTROL VALVE ASSEMBLY** . Using a 10 mm socket, remove throttle cable by pushing retainer part of throttle cable. Pull throttle cable from transmission.

Installation

1. Install throttle cable in transmission case. Ensure cable is fully seated. Install control valve assembly. Connect throttle cable to cam. On new throttle cables stopper should have an indicator mark painted on cable.
2. Pull inner cable lightly until a slight resistance is felt. Stake stopper .020-.059" (.50-1.50 mm) from end of outer cable. See **Fig. 2** . Connect throttle cable linkage.
3. Adjust throttle cable. See appropriate article in TRANSMISSION SERVICING.

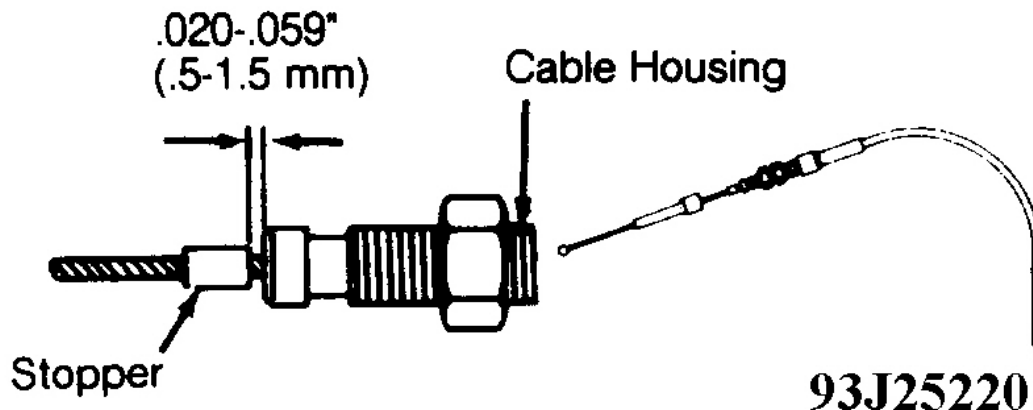


Fig. 2: Locating Throttle Cable Stopper

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

CONTROL VALVE ASSEMBLY

CAUTION: Note bolt length and location. Proper length bolts must be installed to prevent case damage.

Removal

1. Clean exterior of transmission. Drain fluid. Remove oil pan protector. Remove oil pan and gasket. Remove magnets. Remove lock-up relay valve body plate and gasket. **DO NOT** drop lock-up relay valve pins.
2. Using large screwdriver, remove oil tubes. Temporarily install lock-up relay valve body plate with 4 short bolts. Remove oil strainer and gasket. Remove control valve assembly bolts. Note bolt location and length. Disconnect throttle cable from cam and remove control valve assembly.

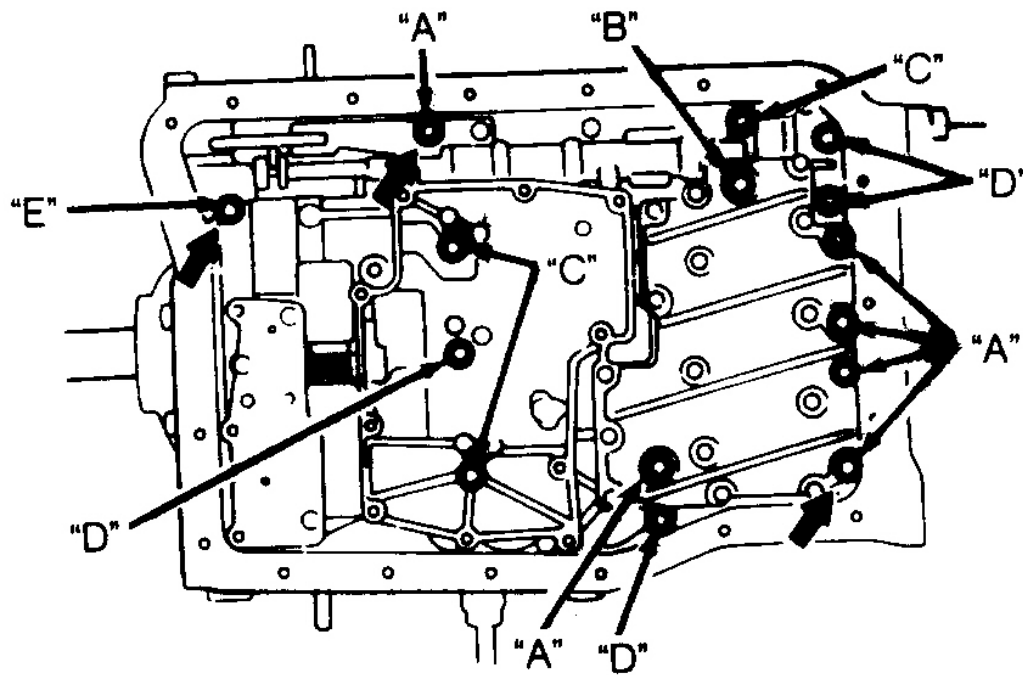
Installation

1. Align groove of manual valve with pin of manual valve lever. Connect throttle cable to cam. Install 3 bolts indicated by bold arrows in illustration. See **Fig. 3** . Install remaining bolts. See the **CONTROL VALVE ASSEMBLY BOLT SPECIFICATIONS** table below. Ensure manual valve lever contacts center of roller at tip of detent spring. Torque bolts to 89 INCH lbs. (10 N.m).

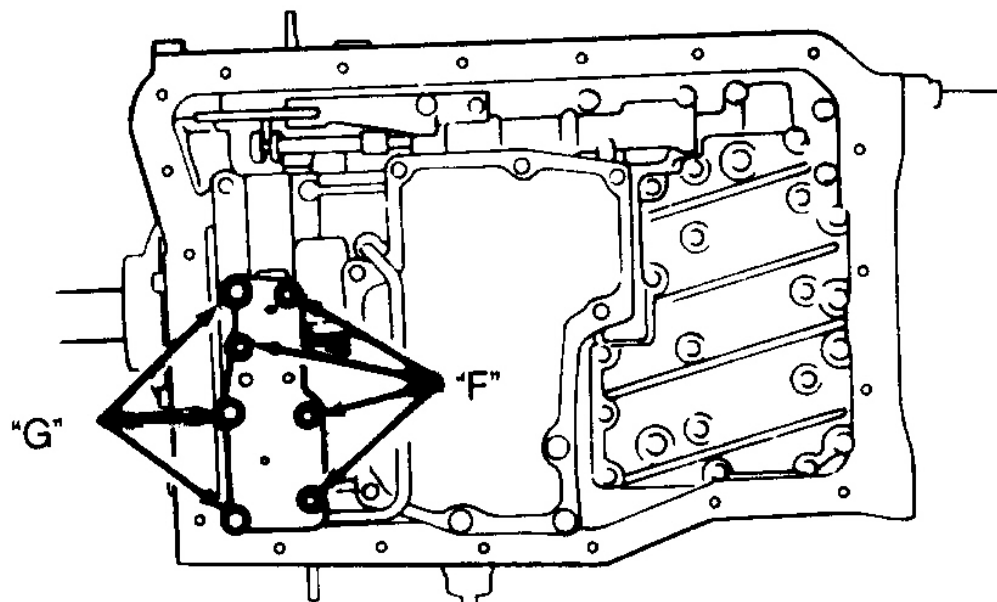
CONTROL VALVE ASSEMBLY BOLT SPECIFICATIONS ⁽¹⁾

Bolt I.D.	In. (mm)
"A"	1.77 (45)
"B"	2.24 (57)
"C"	.87 (22)
"D"	1.26 (32)
"E"	1.61 (41)
"F"	.47 (12)
"G"	2.52 (64)
(1) For bolt identification and locations, see Fig. 3 .	

2. Install new gasket and oil strainer with 7 wave washers and 8 mm head bolts. Install 10 mm head bolts. Torque 8 mm head bolts to 48 INCH lbs. (5.4 N.m) and 10 mm head bolts to 89 INCH lbs. (10 N.m).
3. Remove lock-up relay valve body plate. **DO NOT** drop lock-up relay valve pins. Using plastic hammer, install tube into position. **DO NOT** bend or damage tube. Install new gasket and lock-up relay valve body plate with 4 wave washers (for short bolts) and 7 bolts. Torque 8 mm head bolts to 48 INCH lbs. (5.4 N.m) and 10 mm head bolts to 89 INCH lbs. (10 N.m).
4. Install magnets in oil pan. Install new gasket and oil pan. Torque bolts to 61 INCH lbs. (6.9 N.m). Install oil pan protector. Fill transmission using ATF DEXRON IIE. See appropriate article in TRANSMISSION SERVICING.



CONTROL VALVE ASSEMBLY



LOCK-UP RELAY VALVE BODY PLATE

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Fig. 3: Locating Control Valve Assembly Component Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TRANSFER CASE FRONT & REAR OIL SEALS

Removal

1. Drain gear oil from transfer case. Disconnect propeller shaft flange from companion flange on differential and transfer. Remove propeller shaft.
2. Using hammer and chisel, loosen staked part of companion flange nut. Using Holding Tool (09330-00021) to hold companion flange, remove companion flange lock-nut. Remove plate washer and companion flange.
3. Using Oil Seal Puller (09308-10010), remove output shaft oil seal. Using Transfer Bearing Replacer (09316-60010) and hammer, tap in new oil seal. Apply multipurpose grease to oil seal lip.

Installation

1. Install plate washer, companion flange and new lock nut. Using holding tool to hold companion flange, torque nut to 94 ft. lbs. (127 N.m).
2. Using a punch and hammer, stake lock-nut. Install front and rear propeller shafts. Torque bolts to 65 ft. lbs. (88 N.m). Fill transfer using proper fluid. See appropriate article in TRANSMISSION SERVICING.

TROUBLE SHOOTING

SYMPTOM DIAGNOSIS

Fluid Discolored Or Smells Burnt

Fluid contaminated. Torque converter faulty. Transmission faulty.

No Movement In Any Forward Gear Or Reverse

Manual linkage out of adjustment. Faulty control valve assembly or primary regulator. Park lock pawl faulty. Faulty torque converter. Converter drive plate damaged or broken. Oil pump intake screen blocked. Transmission faulty.

Shift Lever Position Incorrect

Manual linkage out of adjustment. Faulty manual valve and lever. Transmission faulty.

Harsh Engagement Into Any Drive Range

Throttle cable out of adjustment. Faulty control valve assembly, primary regulator or accumulator pistons.

Delayed 1-2, 2-3 Or 3-OD Upshift, Or Downshifts From OD-3

Or 3-2 Then Shifts Back To OD Or 3

Throttle cable out of adjustment. Control valve assembly faulty. Governor faulty. Throttle cable and cam faulty.

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Slips On 1-2, 2-3 Or 3-OD Upshift, Or Slips Or Shudders

On Acceleration

Manual linkage out of adjustment. Throttle cable out of adjustment. Control valve assembly faulty. Transmission faulty.

Drag, Binding Or Tie-Up On 1-2, 2-3 Or 3-OD Upshifts

The manual shifting linkage is out of adjustment. Control valve assembly is faulty. Transmission is faulty. Refer to the **TRANSMISSION COMPONENT APPLICATION** table.

No Lock-Up

Control valve assembly faulty. Torque converter faulty. Transmission faulty.

Harsh Downshift

Throttle cable out of adjustment. Throttle cable and cam faulty. Accumulator pistons faulty. Control valve assembly faulty. Transmission faulty.

No Downshift When Coasting

Faulty governor or control valve assembly.

Downshift Occurs Too Soon Or Too Late While Coasting

Throttle cable out of adjustment. Governor faulty. Control valve assembly faulty. Transmission faulty.

No OD-3, 3-2 Or 2-1 Kickdown

Throttle cable out of adjustment. Governor faulty. Control valve assembly faulty.

No Engine Braking In "2" Or "L" Range

Control valve assembly faulty. Transmission faulty.

Vehicle Does Not Hold In "P" Range

Manual linkage out of adjustment. Parking lock pawl cam and spring faulty.

TRANSMISSION COMPONENT APPLICATION

Selector Lever Position	Elements In Use
"D" (Drive)	
First Gear	OD Direct Clutch, Front Clutch, OD One-Way Clutch & No. 2 One-Way Clutch
Second Gear	Front Clutch, 2nd Brake & OD One-

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	Way Clutch
Third Gear	OD Direct Clutch, Front Clutch, Rear Clutch & OD One-Way Clutch
OD (Overdrive)	Front Clutch, Rear Clutch & OD Brake
"3" (Third)	
First Gear	OD Direct Clutch, Front Clutch OD One-Way Clutch & No. 2 One-Way Clutch
Second Gear	Front Clutch, 2nd Brake & OD One-Way Clutch
Third Gear	OD Direct Clutch, Front Clutch, Rear Clutch & OD One-Way Clutch
"2" (Second)	OD Direct Clutch, Front Clutch, 2nd Brake & OD One-Way Clutch
"L" (First)	OD Direct Clutch, Front Clutch, 1st & Reverse Brake, OD One-Way Clutch & No. 2 One-Way Clutch
"P" (Park)	OD Direct Clutch & OD One-Way Clutch
"R" (Reverse)	OD Direct Clutch, Rear Clutch, 1st & Reverse Brake, & OD One-Way Clutch
"N" (Neutral)	OD Direct Clutch & OD One-Way Clutch

TESTING

PRELIMINARY CHECKS

NOTE: DO NOT overfill transmission. If transmission is inadvertently overfilled, drain excess fluid. Use ATF DEXRON II.

1. Perform following checks before starting test procedures. Check tire inflation. Check idle speed in Neutral. Idle speed should be 650 RPM.
2. Park vehicle on level surface and set parking brake. With engine idling, place shift lever into each shift position from "P" to "L" range. Pull dipstick and check fluid level. Check condition of fluid. If fluid smells burnt or is black in color, drain and replace fluid.
3. Inspect and adjust throttle cable. Adjust shift linkage. Inspect and adjust neutral start switch.

ELECTRICAL TESTING

ATF Temperature Warning Light

Disconnect wiring harness connector from A/T temperature sensor. See **Fig. 11** . Connect a jumper wire between wiring harness connector and ground. Turn ignition switch to ON position. Ensure ATF temperature warning light glows. If light does not glow, test light.

A/T Temperature Sensor

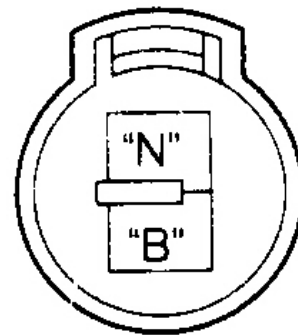
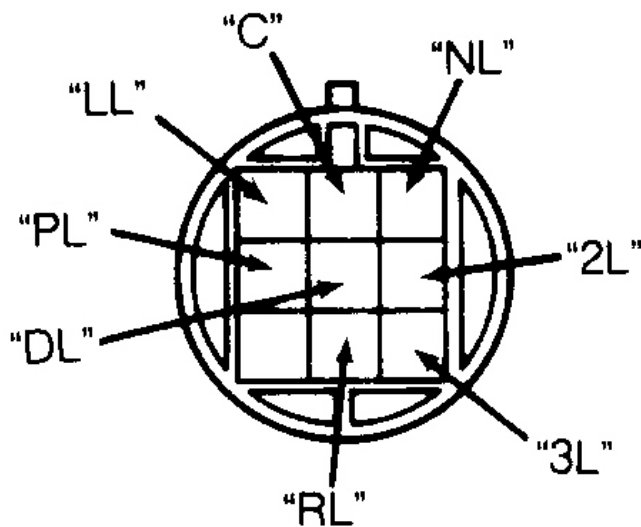
Remove A/T temperature sensor. See **Fig. 11** . Place sensor in clean ATF. Heat ATF to 325-343°F (145-155° C). Using an ohmmeter, check for continuity between sensor terminal and sensor body. If continuity does not exist, replace sensor.

Neutral Start Switch

Using an ohmmeter, check for continuity at specified terminals in appropriate gear position. See **NEUTRAL START SWITCH CONTINUITY** table. See **Fig. 4** .

NEUTRAL START SWITCH CONTINUITY

Gear Shift Position	Terminals
"P" Range	"B" & "N", & "C" & "PL"
"R" Range	"C" & "RL"
"N" Range	"B" & "N", & "C" & "NL"
"D" Range	"C" & "DL"
"3" Range	"C" & "3L"
"2" Range	"C" & "2L"
"L" Range	"C" & "LL"



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Fig. 4: Testing Neutral Start Switch

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

OD Solenoid (With Cruise Control)

Apply compressed air to OD solenoid. See **Fig. 5** . Ensure solenoid valve opens. Apply battery voltage to OD solenoid terminals. See **Fig. 5** . Ensure solenoid does not leak air. If operation is not as specified, replace OD

solenoid.

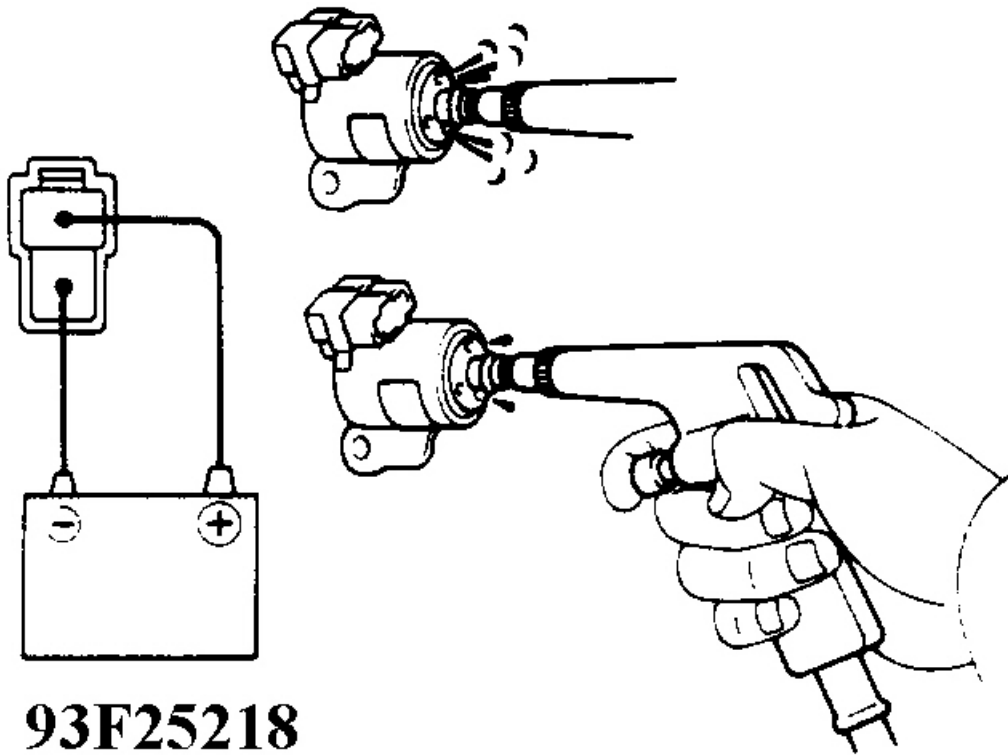


Fig. 5: Testing OD Solenoid

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

ROAD TEST

CAUTION: Perform test at normal operating fluid temperature of 122-176°F (50-80°C).

"D" Range Test

1. Shift into "D" range. Hold accelerator pedal constantly at full throttle position. Check 1-2, 2-3 and 3-OD upshift points. See the **SHIFT SPEED SPECIFICATIONS** table.
 - If no 1-2 upshift occurs, governor valve is defective or 1-2 shift valve is faulty.
 - If no 2-3 upshift occurs, 2-3 shift valve is faulty.
 - If no 3-OD upshift occurs, 3-4 shift valve is faulty.
 - Incorrect shift points indicate that throttle cable requires adjustment or throttle valve, 1-2, 2-3 or 3-

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OD shift valves are defective.

2. Use procedure outlined in step 1 to check shock and slip between 1-2, 2-3 and 3-OD upshifts. Excessive shock can be caused by excessive line pressure, defective accumulator or defective check ball.
3. Run in OD or lock-up of "D" range. Check for abnormal noise and vibration. Noise and vibration may be unbalanced propeller shaft, differential, torque converter or other drive train components.
4. While running in "D" range, 2nd, 3rd and OD gear, confirm correct kickdown vehicle speed limits for 2-1, 3-2 and OD-3 gears.
5. Check for abnormal shock and slip at kickdown.
6. Check lock-up mechanism. See **LOCK-UP SPEEDS** table.

Drive in OD gear of "D" range, at steady speed (lock-up ON) of 53 MPH. Lightly depress accelerator pedal. Ensure engine RPM does not change abruptly. Large increase in engine RPM indicates there is no lock-up.

"3" Range Test

While running in 3rd gear of "3" range, check that there is no upshift to OD gear. Check for abnormal noise at acceleration and deceleration and shock at upshift and downshift.

"2" Range Test

1. While running in 2nd gear, check that there is no upshift to 3rd gear.
2. While running in 2nd gear, check that there is no downshift to 1st gear.
3. While running in 2nd gear, release accelerator pedal. Check engine braking effect.
4. Check for abnormal noise during acceleration and deceleration.

"L" Range Test

1. While running in "L" range, check that there is no upshift to 2nd gear.
2. While running in "L" range, release accelerator pedal. Check engine braking effect. If there is no engine braking effect, 1st and reverse brake is defective.
3. Check for abnormal noise during acceleration and deceleration.

"R" Range Test

Shift into "R" range. While starting at full throttle, check for slipping.

"P" Range Test

Stop vehicle on slight grade. Shift transaxle into "P". Release parking brake. Ensure parking pawl holds vehicle in place.

SHIFT SPEED SPECIFICATIONS

Application	(1) MPH	(2) MPH
"D" Range ⁽³⁾		

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1st-2nd	21-29	22-31
2nd-3rd	47-55	50-59
3rd-OD	68-76	73-82
OD-3rd	63-71	68-76
3rd-2nd	41-48	44-52
2nd-1st	17-25	19-27
"2" Range		
3rd-2nd	48-56	52-60
"L" Range		
2nd-1st	22-30	43-51
(1) Equipped with P235/75R15 tires.		
(2) Equipped with 31 X 10.5R15 tires.		
(3) Throttle valve fully open.		

LOCK-UP SPEEDS

Application	(1) MPH	(2) MPH
"D" Range ⁽³⁾		
Lock-Up ON	44-51	47-55
Lock-Up OFF	40-47	43-51
(1) Equipped with P235/75R15 tires.		
(2) Equipped with 31 X 10.5R15 tires.		
(3) Throttle valve fully closed.		

STALL TEST

CAUTION: Perform test at normal operating fluid temperature 122-176°F (50-80°C). DO NOT continue test longer than 5 seconds.

- Object of test is to check overall performance of transmission and engine by measuring maximum engine speeds in "D" and "R" ranges.
- Block front and rear wheels. Connect engine tachometer. Apply parking and service brakes. Start engine.

NOTE: If stall RPM is more than 600 RPM lower than specifications, torque converter may be faulty.

- Shift into "D" range. Fully depress accelerator pedal. Immediately note highest engine RPM. Specification is 1800-2100 RPM. **DO NOT** perform test longer than 5 seconds.
- Repeat test in "R" range. Check for insufficient engine output or defective stator one-way clutch if stall speed is low but the same for both ranges.

5. If stall speed is higher than specified in "D" range, front clutch may be slipping, one-way No. 2 clutch may not be operating, line pressure may be low, or OD one-way clutch may not be operating.
6. If stall speed in "R" is higher than specified, rear clutch and/or 1st and reverse brake may be slipping, line pressure may be low, or OD one-way clutch may not be operating.
7. If stall speed in "R" and "D" is higher than specified, line pressure may be too low, fluid level may be wrong, or OD one-way clutch is not operating properly.

TIME LAG TEST

CAUTION: Perform this test at normal operating fluid temperature of 122-176°F (50-80°C). Allow a one minute interval between tests. Make 3 measurements and take the average value.

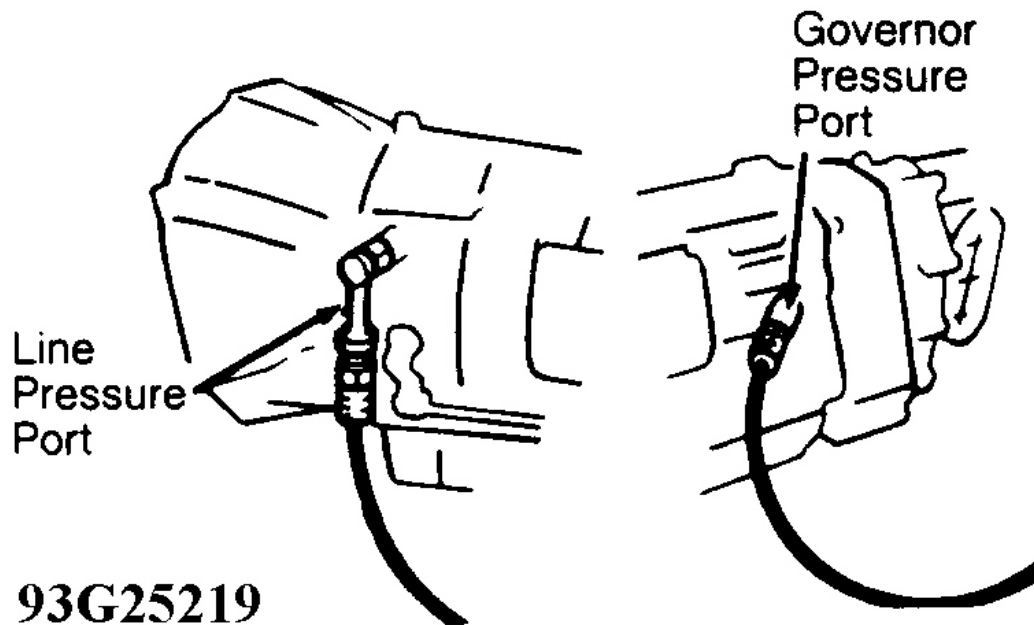
1. If shift lever is actuated with engine idling, a time lag will be noted before shock can be felt. This test is used for checking condition of Overdrive (OD) clutch, forward clutch, direct clutch and 1st reverse brake.
2. Apply parking brake. Start engine. Ensure idle speed is 650 RPM in "N" range. Shift transmission from "N" into "D" range. Use a stop watch to measure elapsed time between shifting of lever until shock is felt.
3. Time lag must be less than 0.7 seconds. Repeat procedure shifting from "N" to "R" range. Time lag must be less than 1.2 seconds.
4. Excessive time lag for "N" to "D" range may be caused by low line pressure, defective forward clutch or defective Overdrive (OD) one-way clutch. Excessive time lag for "N" to "R" range may be caused by low line pressure, defective direct clutch, 1st and reverse brake or defective OD one-way clutch.

HYDRAULIC TEST

CAUTION: Hydraulic pressure test should be performed with transmission fluid temperature of 122-176°F (50-80°C).

Line Pressure Test

1. Remove transmission test plugs and connect pressure gauge. See **Fig. 6** . Block all wheels. Apply parking brake. Start engine and shift into "D" range.

**Fig. 6: Checking Governor & Line Pressure**

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

2. Apply brakes and depress accelerator. Note pressure readings at idle and stall speed. Repeat test in "R" range. Compare pressure readings to those listed in **LINE PRESSURE SPECIFICATIONS** table. If pressure is lower than specified, check throttle cable adjustment.
3. Perform test again after adjustment. High pressure in both ranges indicates that throttle cable may be out of adjustment, defective throttle valve or regulator valve.
4. Low pressure in both ranges indicates throttle cable may be out of adjustment, defective oil pump, throttle valve, regulator valve or Overdrive (OD) direct clutch.
5. Low pressure in "D" range only indicates "D" range circuit leaking pressure or defective forward clutch. Low pressure in "R" range only indicates "R" range circuit leaking pressure, defective direct clutch, 1st and reverse brake.

LINE PRESSURE SPECIFICATIONS

Application	psi (kg./cm ²)
"D" Range	
Idle Speed	53-61 (3.7-4.3)
Stall Speed	158-193 (11.1-13.6)
"R" Range	
Idle Speed	64-78 (4.5-5.5)
Stall Speed	199-242 (14.0-17.0)

Governor Pressure Test

1. Transmission must be at normal operating temperature of 122-176°F (50-80°C). Shift transfer shift lever to "H2" position. Chock wheels. Raise and support rear of vehicle allowing rear wheels to turn freely.
2. Remove transmission case test plugs and connect hydraulic pressure gauge. See **Fig. 6**.
3. Ensure parking brake is not applied. Start engine. Shift into "D" range. Measure governor pressure at speeds specified in the **GOVERNOR PRESSURE SPECIFICATIONS** table.
4. Incorrect governor pressure may be caused by incorrect line pressure leakage at governor pressure circuit or defective governor valve.

GOVERNOR PRESSURE SPECIFICATIONS

Engine RPM	Speed (MPH)	psi (kg./cm ²)
1000	20	11-17 (.8-11.2)
1800	35	27-37 (1.9-2.6)
3500	69	80-90 (5.6-6.3)

COMPONENT TESTS**TORQUE CONVERTER**

NOTE: The torque converter is a sealed unit and must be serviced as complete unit. Perform following tests to ensure converter is defective. Torque converter and transmission cooler must be thoroughly cleaned and flushed if transmission is contaminated.

DRIVE PLATE RUNOUT TEST

Measure drive plate runout. See **Fig. 7**. If runout exceeds .0079" (.200 mm), or if ring gear is damaged, replace drive plate. If installing a new drive plate, note position of spacers. Torque bolts to 64 ft. lbs. (87 N.m).

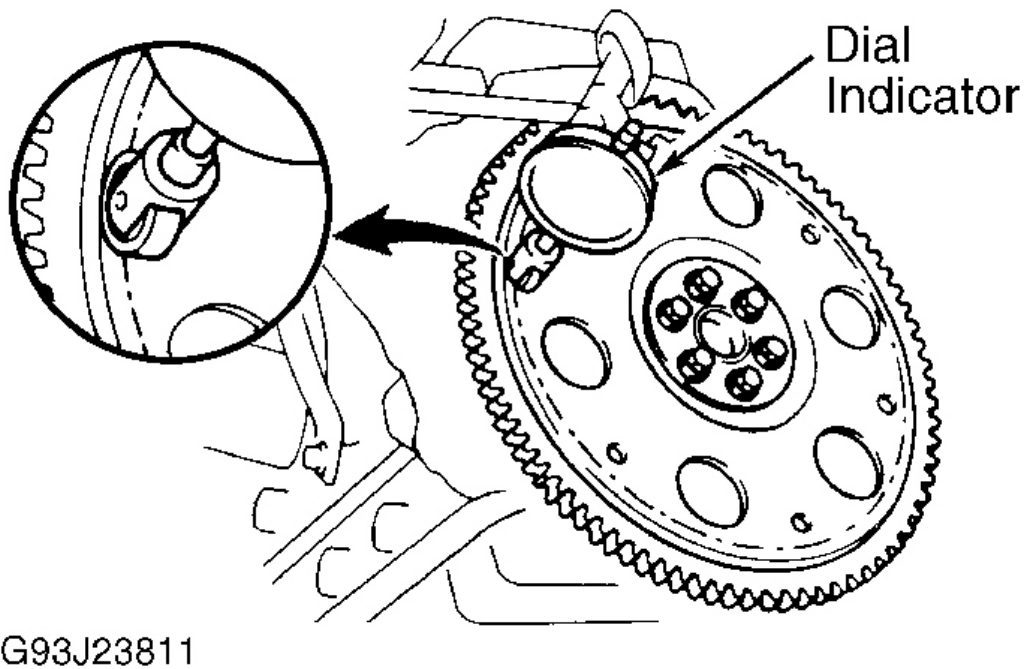


Fig. 7: Measuring Drive Plate Runout

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

CONVERTER SLEEVE RUNOUT TEST

1. Temporarily mount torque converter to drive plate. Mount a dial indicator with needle resting on converter sleeve. See **Fig. 8** . Rotate converter. If runout exceeds .0118" (.300 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.

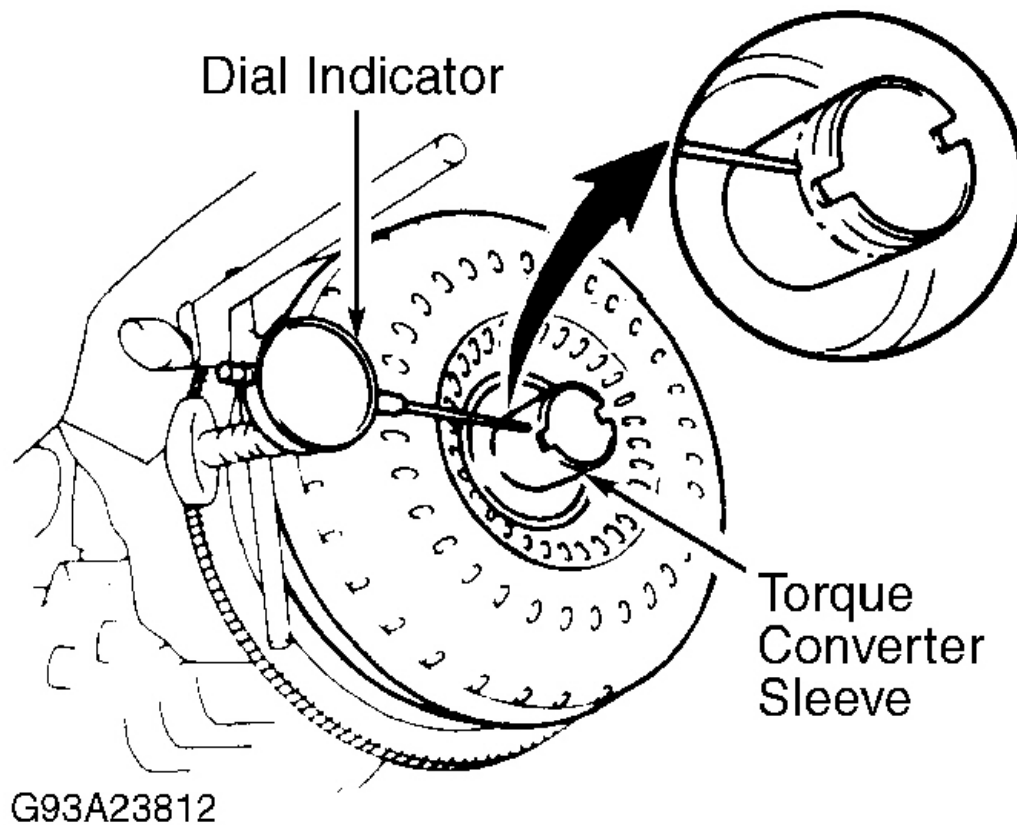


Fig. 8: Measuring Torque Converter Sleeve Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL & INSTALLATION

TRANSMISSION

For transmission removal procedure, see appropriate TRANSMISSION REMOVAL & INSTALLATION article in TRANSMISSION SERVICING.

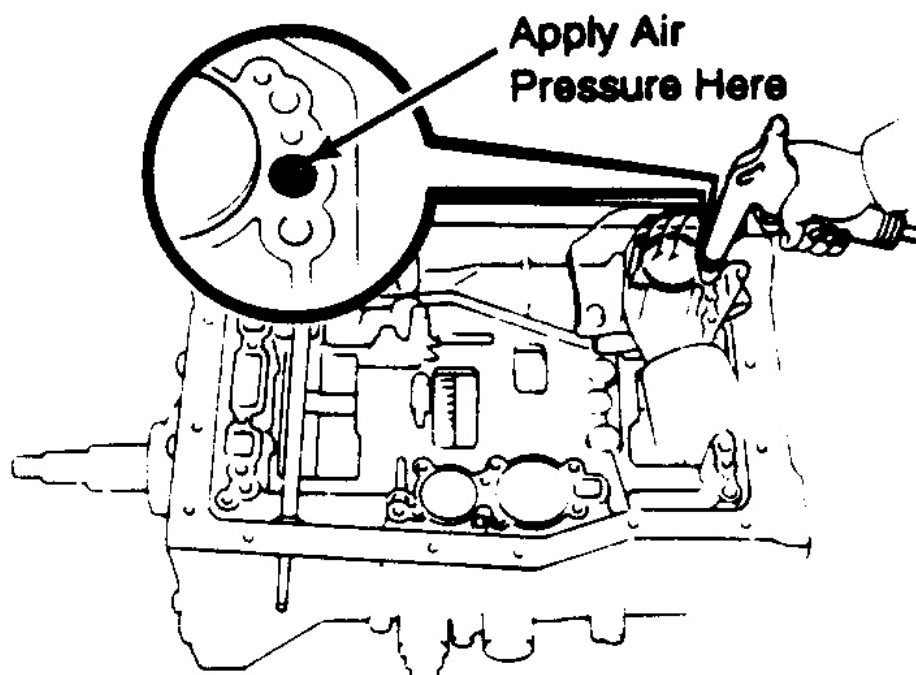
TRANSMISSION DISASSEMBLY

1. Disconnect 4 connectors and remove transmission wire harness. Using 2 screwdrivers, pry out breather plug. Remove control shaft lever. Remove oil cooler pipe assemblies.
2. Remove neutral start switch. Remove oil cooler unions. Remove ATF temperature sensor. Remove throttle cable clamp. Remove transmission housing.
3. Remove oil pan protector. **DO NOT** turn transmission over or control valve assembly will be

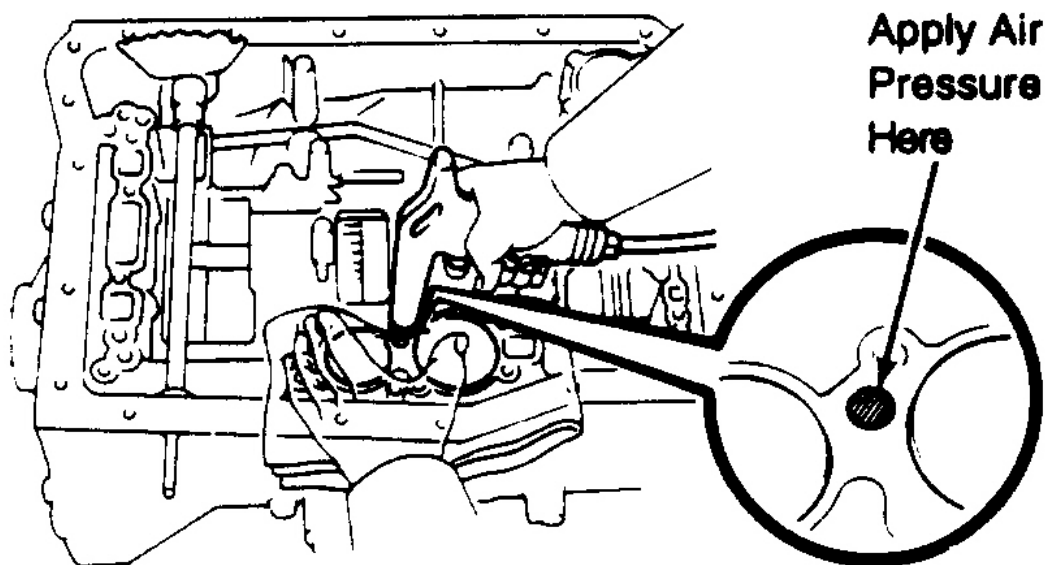
contaminated with any foreign matter at bottom of oil pan. Remove oil pan and gasket. Remove magnets from oil pan.

CAUTION: Note control valve assembly bolts length and location. Proper length bolts must be installed in correct locations to prevent transaxle case damage.

4. Remove lock-up relay valve body plate and gasket. **DO NOT** drop lock-up relay valve pins. Using large screwdriver, remove oil tube. Temporarily install lock-up relay valve body plate with 4 short bolts. Remove oil strainer and gasket. Disconnect throttle cable from cam and remove control valve assembly. See **CONTROL VALVE ASSEMBLY** table under ON-VEHICLE SERVICE.
5. Remove center support apply gaskets. Using 10 mm socket, remove throttle cable by pushing retainer part of throttle cable. Remove rear clutch accumulator piston and spring by applying compressed air to oil hole. See **Fig. 9** . Remove Overdrive (OD) brake accumulator piston together with 2nd brake accumulator piston by applying compressed air to oil hole. See **Fig. 9** . Remove OD brake and 2nd brake accumulator springs. Identify each accumulator piston and spring for reassembly reference.



REAR CLUTCH ACCUMULATOR



**OVERDRIVE BRAKE
& 2ND BRAKE ACCUMULATORS**

93B25222

Fig. 9: Removing Accumulator Pistons & Springs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. Check thrust clearance of OD input shaft OD planetary gear. Push OD input shaft toward rear of transmission by applying a force of 11-22 lbs. (5-10 kg). Measure thrust clearance of input shaft. Standard thrust clearance should be .0157-.0354" (.400-.900 mm). Maximum thrust clearance is .035" (.90 mm).
7. Remove oil pump retaining bolts. Using Puller (09350-06140), remove oil pump and gasket. Remove 2 races and thrust bearing from OD direct clutch drum or oil pump.
8. Place Plate (09350-06090) on installation surface of oil pump. Using calipers, measure distance between top of plate and clutch drum. Record reading for reassembly reference. Remove OD planetary gear, OD direct clutch and one-way clutch assembly. Remove bearing and race from OD planetary gear or ring gear flange.
9. Remove OD planetary ring gear assembly from OD case. Remove thrust bearing and race from OD case or ring gear flange.
10. Remove transfer No. 2 case cover. See the appropriate TRANSFER CASE article in TRANSFER CASES for detailed information.
11. Check thrust clearance of input shaft front clutch drum. Push transmission output shaft toward front of transmission by applying a force of 11-22 lbs. (5-10 kg). Push OD case toward rear of transmission by applying a force of 11-20 lbs. (5-10 kg). Using Extension Bar (09350-06130) and dial indicator, measure thrust clearance of input shaft. Standard thrust clearance should be .0118-.0276" (.300-.700 mm). Maximum thrust clearance is .0276" (.700 mm).
12. Using screwdriver, remove snap ring. Remove OD case set bolts. Using Puller (09350-06140), remove OD case assembly. Remove "O" rings from oil holes in OD case. Remove oil seal ring from input shaft. Remove races, thrust bearing and spacer from front clutch drum or OD case. See **Fig. 13**.
13. Place Plate (09350-06090) on installation surface of oil pump. Measure distance between top of plate and front clutch drum. Record reading for reassembly reference. Remove front clutch. Remove races and thrust bearing from rear clutch drum or front clutch hub. Insert 2 wires into flukes of clutch discs. Remove rear clutch.
14. Check thrust clearance of center support. Push transmission output shaft toward front of transmission by applying a force of 11-22 lbs. (5-10 kg). Push center support toward rear of transmission by applying a force of 11-22 lbs. (5-10 kg), then pull with same amount of force. Place Plate (09350-06090) on center support. Using calipers, measure distance "A" between top of plate and thrust washer on front planetary gear. Using calipers, measure thickness "B" of plate. Record readings for reassembly reference. Remove 3 center support set bolts. Using Puller (09350-06140), remove center support. Remove "O" rings from center support oil holes. See **Fig. 52**.
15. Turn center support over together with thrust washer and place on a flat surface. Insert calipers into thrust washer hole, measure distance "C" between thrust washer hole and flat surface. Center support thrust clearance is "A" - ("B" + "C"). Standard thrust clearance should be .0118-.0276" (.300-.700 mm). Maximum thrust clearance is .0354" (.900 mm). Remove thrust washer from center support.
16. Remove transfer component parts. See appropriate TRANSFER CASE article in TRANSFER CASES. Remove transfer adapter and output shaft rear bearing. Remove transfer adapter bolts. Using Puller (09350-06140), remove transfer adapter with rear bearing. Remove gasket.
17. Remove output shaft spacer. Remove governor body assembly. Remove thrust washer from planetary gear. Remove snap ring. Remove planetary gears, one-way clutch and output shaft.
18. Using Spring Compressor (09350-06130) and dial indicator, measure piston stroke of 1st and reverse brake piston by applying compressed air. See **Fig. 10**. Piston stroke should be .1299-.1496" (3.30-3.80 mm). If piston stroke is not within specification, inspect discs.

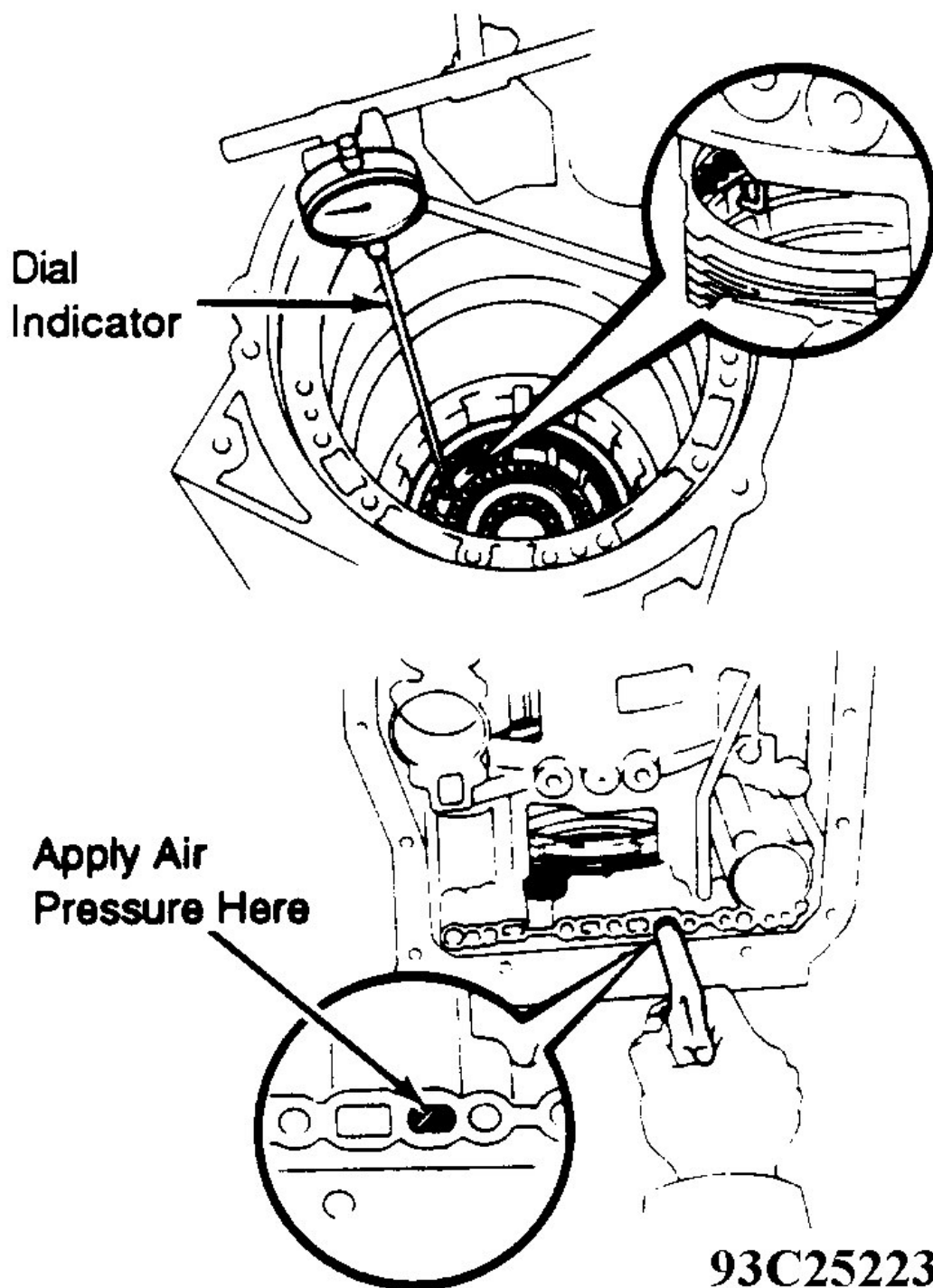


Fig. 10: Checking 1st & Reverse Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. Remove snap ring. Remove flange, 6 discs, 6 plates and cushion plate. Set Spring Compressor (09350-06030) on spring retainer, compress return spring. Remove snap ring. Remove piston return spring. Hold 1st and reverse brake piston with hand, remove 1st and reverse brake piston by applying compressed air into oil hole of transmission case. If piston does not pop out with compressed air, lift piston out with needle-nose pliers. Remove 2 "O" rings from piston.
20. Remove front clutch accumulator cover, gaskets and plate. Remove accumulator piston and spring by applying compressed air to oil hole. Remove "O" rings from accumulator piston.
21. Remove transmission rear cover and gasket. Remove manual valve lever, shaft and oil seals. Using a chisel, cut off spacer and remove from shaft. Tap out pin with a pin punch. Pull manual valve lever shaft out through case. Remove manual valve lever, parking lock rod, 2 plate washers and wave washer. Disconnect parking lock rod from manual valve lever. Using a screwdriver, pry out 2 oil seals. See **Fig. 11** , **Fig. 12** , and **Fig. 13** .

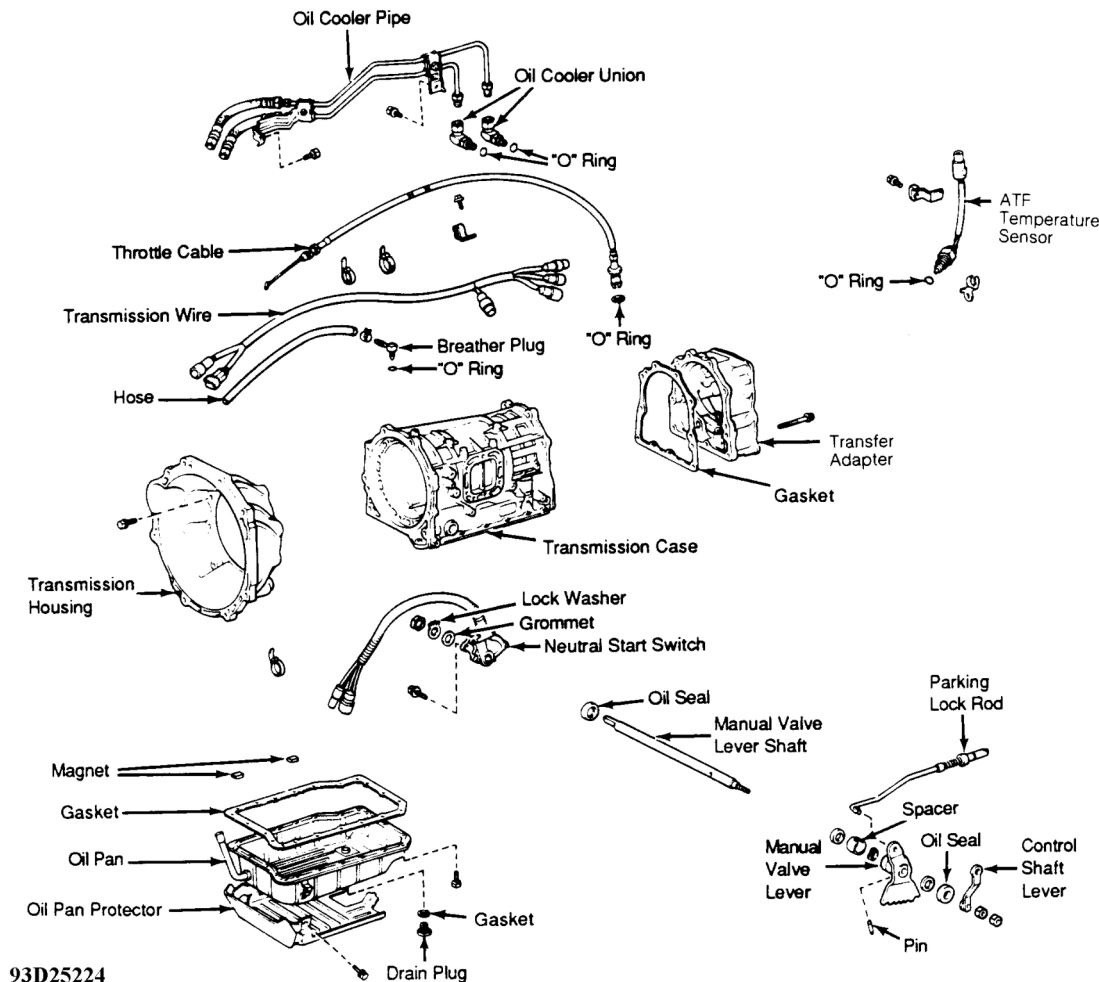


Fig. 11: Exploded View Of External Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

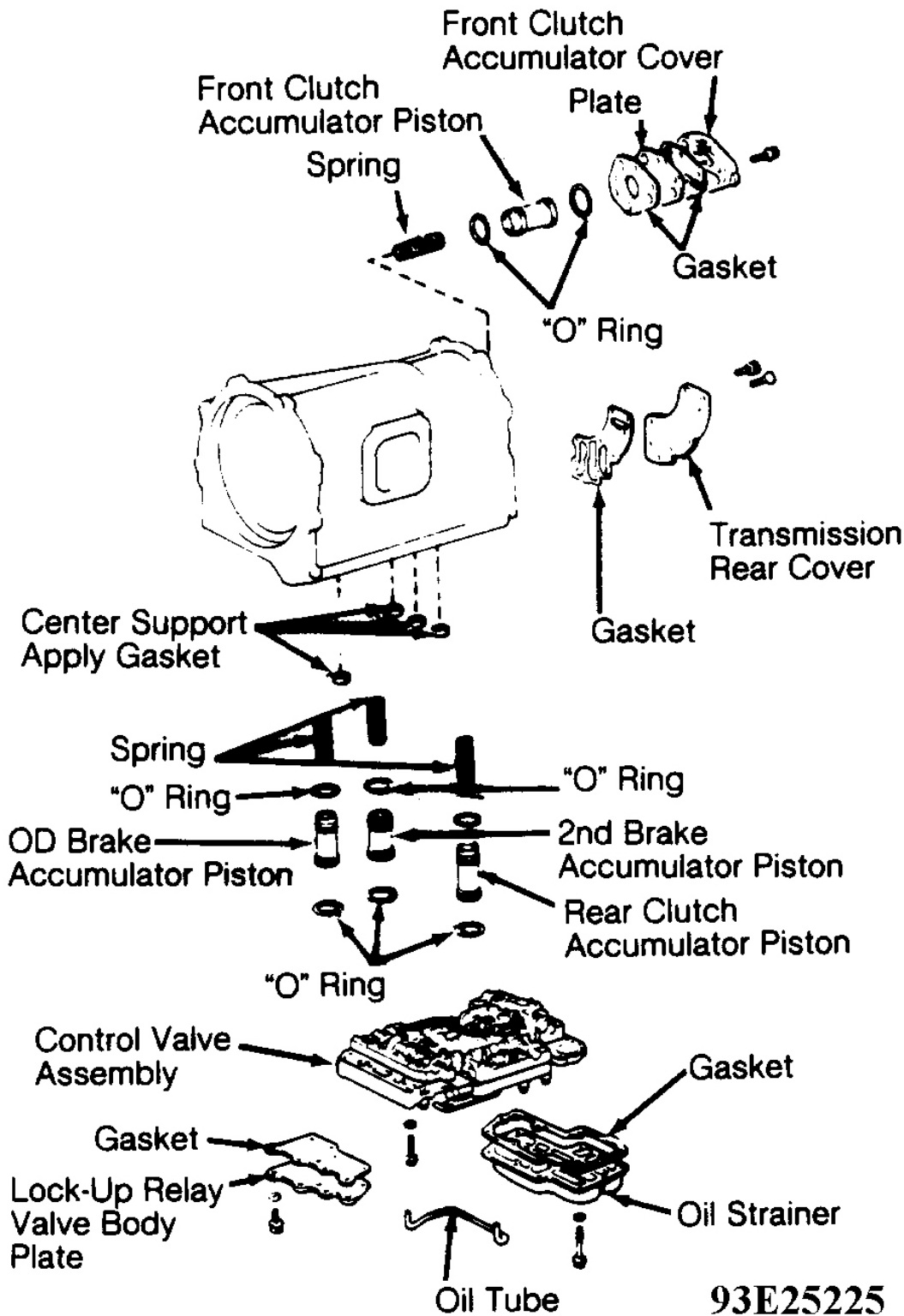


Fig. 12: Exploded View Of Center Components

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

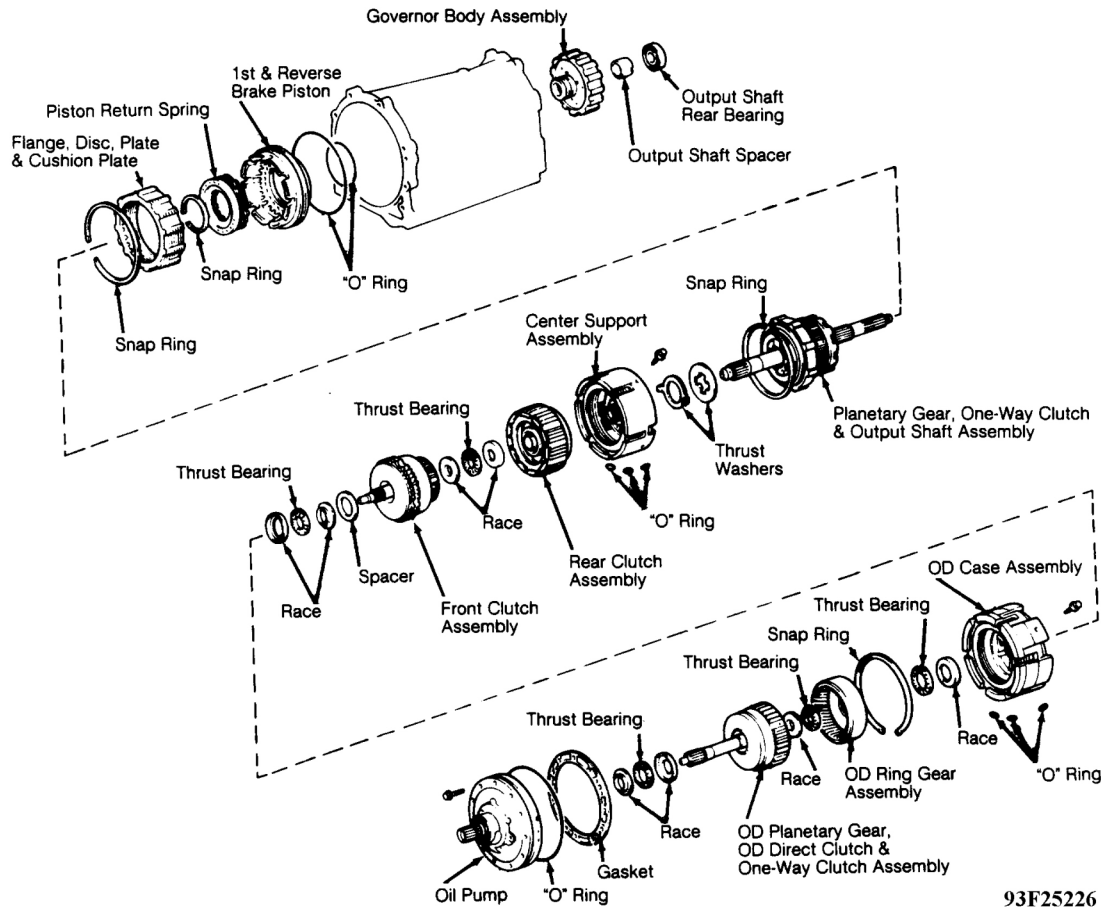


Fig. 13: Exploded View Of Internal Components

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

COMPONENT DISASSEMBLY & REASSEMBLY

OIL PUMP

Disassembly

1. Set oil pump shaft in torque converter while working on pump. Remove 2 oil seal rings from pump cover.
2. Using Spring Compressor (09350-06100), compress spring and remove spring seat. See **Fig. 14** . Remove spring and check ball.
3. Remove oil pump cover. Mark oil pump drive and driven gears for reassembly reference and remove from pump body.

Inspection

1. Note position of oil pump gears. Clean all parts with solvent. Use compressed air to ensure that passages are free.
2. Check driven gear-to-body clearance. Push driven gear against one side of pump. Using a feeler gauge, measure clearance between the driven gear and the pump body. See **Fig. 15** . Replace drive, driven gear and pump housing if not within specification. Refer to the **OIL PUMP CLEARANCE SPECIFICATIONS** table.
3. Using feeler gauge, measure tip clearance between both gears and crescent-shaped part of pump body. See **Fig. 16** . Replace drive gear, driven gear and pump housing if not within specification. See **OIL PUMP CLEARANCE SPECIFICATIONS** table.
4. Using feeler gauge and straightedge, measure side clearance of both gears. See **Fig. 17** . Replace driven gear and pump housing if not within specification. See **OIL PUMP CLEARANCE SPECIFICATIONS** table. If side clearance is excessive, select and replace gears as a set. There are different thicknesses for drive and driven gears: .7258-.7264" (18.435-18.450 mm) and .7264-.7278" (18.451-18.486 mm). If necessary, replace pump body.

OIL PUMP CLEARANCE SPECIFICATIONS

Application	In. (mm)
Driven Gear-To-Pump Body	
Standard	.0028-.0059 (.070-.150)
Maximum	.012 (.30)
Gear-To-Crescent	
Standard	.0055-.0094 (.14-.24)
Maximum	.012 (.30)
Gear Side Clearance	
Standard	.0008-.0020 (.020-.050)
Maximum	.004 (.10)

5. Measure inside diameter of oil pump body bushing. Standard inside diameter should be 1.6555-1.6565" (42.050-42.075 mm). Maximum inside diameter is 1.6587" (42.130 mm). If inside diameter is excessive, replace pump body.
6. Measure inside diameter of oil pump cover bushings. Standard inside diameter for front bushing is .9449-.9457" (24.000-24.021 mm). Standard inside diameter for rear bushing is 1.0433-1.0441" (26.500-26.521 mm). Maximum inside diameter for front bushing is .9476" (24.07 mm). Maximum inside diameter for rear bushing is 1.0461" (26.57 mm). If inside diameter is excessive, replace pump cover. Replace oil seal if necessary.

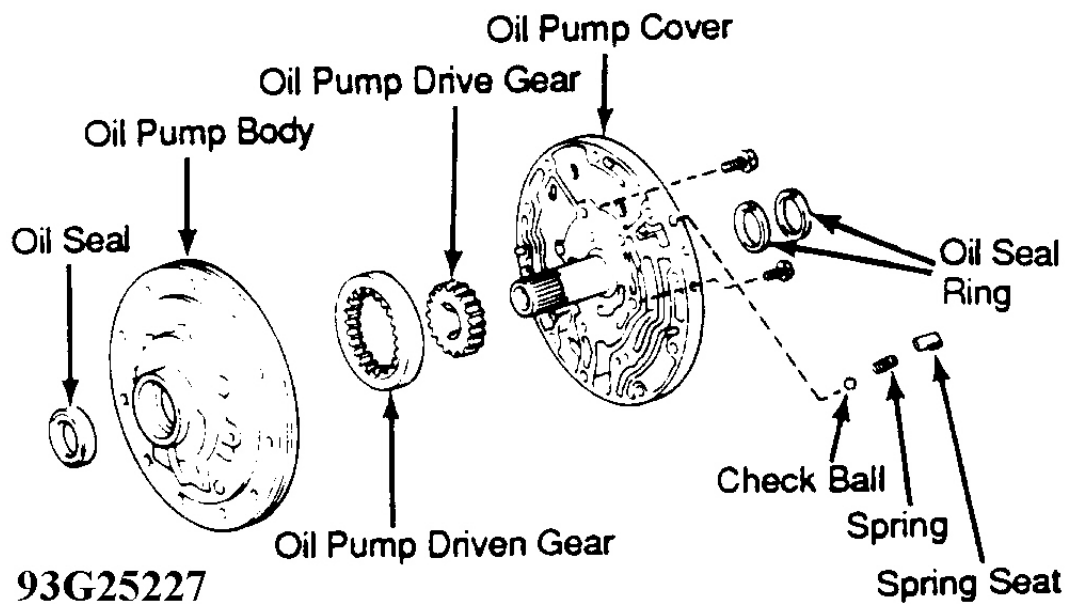


Fig. 14: Exploded View Of Oil Pump

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

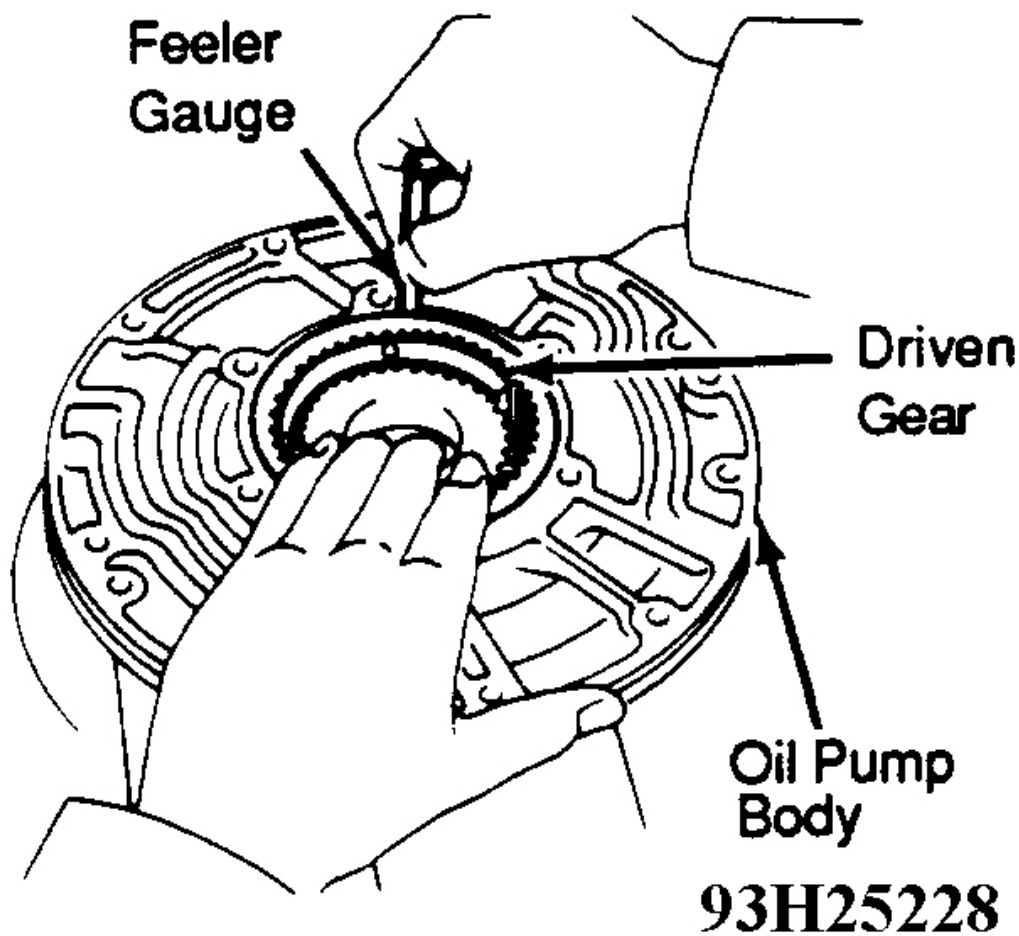


Fig. 15: Checking Driven Gear Clearance

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

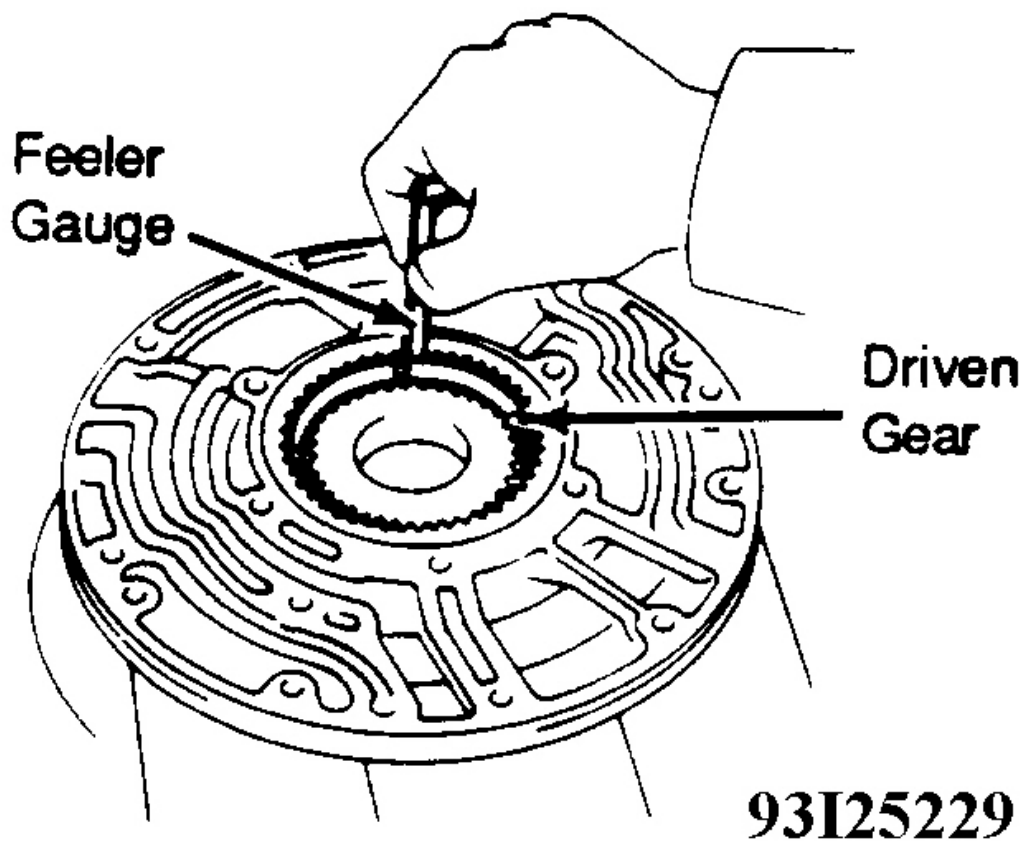


Fig. 16: Checking Driven Gear Tip Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

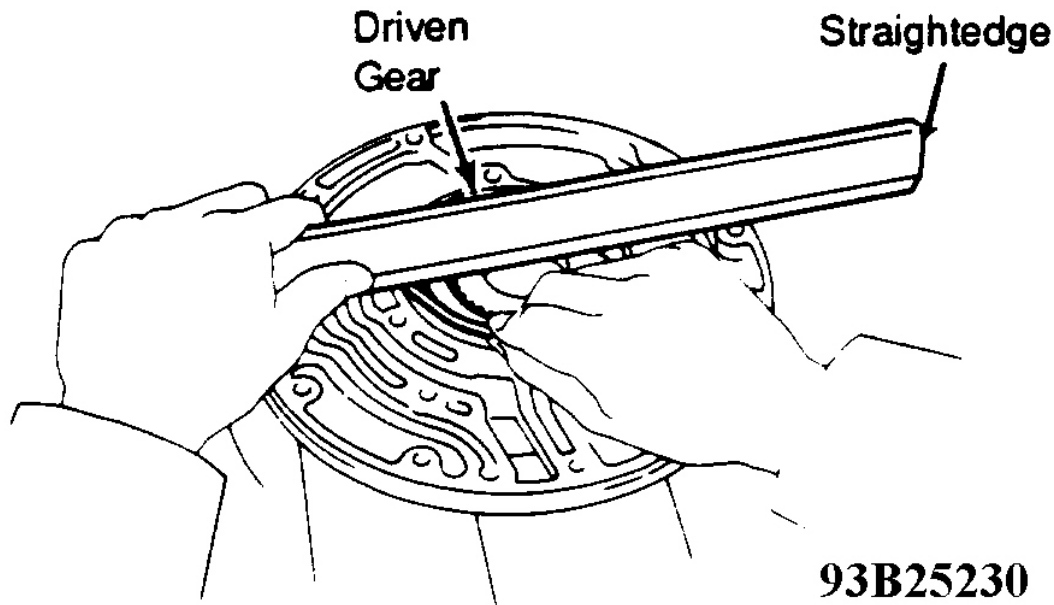


Fig. 17: Checking Gear Side Clearance

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

Reassembly

1. Place oil pump on torque converter. Coat driven and drive gears with ATF. Install driven and drive gears.
2. Align bolt holes of pump body and cover. Install pump cover bolts. Torque 10 mm head bolts to 78 INCH lbs. (8.8 N.m). Torque 12 mm head bolts to 15 ft. lbs. (21 N.m).
3. Install check ball and spring. Using Spring Compressor (09350-06100), compress spring and install spring seat. Coat 2 oil seal rings with ATF. Install oil seal rings on stator shaft. **DO NOT** spread ring ends more than required for installation. Ensure oil seal rings rotate smoothly. Ensure drive gear rotates smoothly when installed to torque converter.

OVERDRIVE (OD) & OD PLANETARY GEAR, DIRECT CLUTCH & OD ONE-WAY CLUTCH

Disassembly

1. Hold the OD direct clutch drum and turn the input shaft. The input shaft should turn freely clockwise and lock when turned counterclockwise. See **Fig. 18**.
2. Remove OD direct clutch assembly from OD planetary gear. Place oil pump on torque converter. Place OD direct clutch assembly on oil pump. Using Measure Terminal (09350-06110) and dial indicator, measure piston stroke by applying compressed air. See **Fig. 19**. Piston stroke should be .0433-.0669" (1.100-1.700 mm). If piston stroke is not within specification, inspect discs for proper assembly.
3. Using screwdriver, remove snap ring. Remove flange, 3 discs and 3 plates. Place Spring Compressor (09350-06010) on spring seat, compress return spring with an arbor press. Remove snap ring with snap

ring pliers. Remove spring seat and 24 return springs.

4. Place oil pump on torque converter. Place OD direct clutch on oil pump. Hold clutch piston with hand, apply compressed air to oil hole of oil pump to remove direct clutch piston. See **Fig. 20** . Remove 2 "O" rings from clutch piston.
5. Remove oil seal ring from ring gear flange. Remove snap ring. Remove ring gear flange. Remove snap ring. Remove No. 4 thrust washer. Remove one-way clutch and outer race. Remove No. 3 thrust washer. Remove 2 retainers and one-way clutch from outer race.

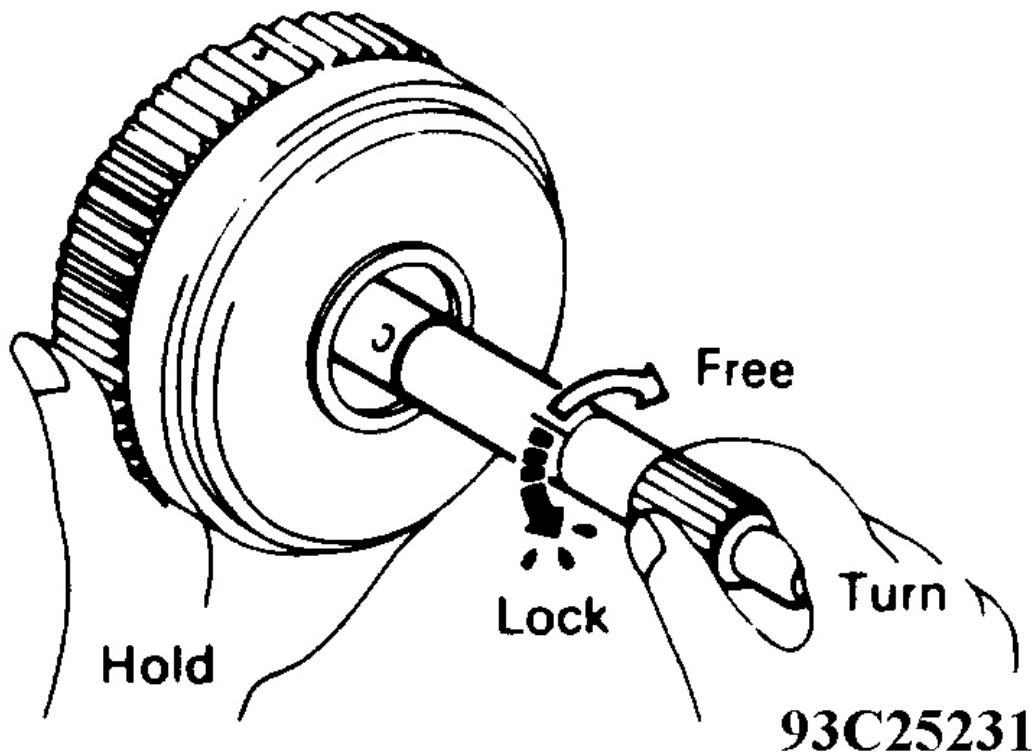


Fig. 18: Checking OD One-Way Clutch Operation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

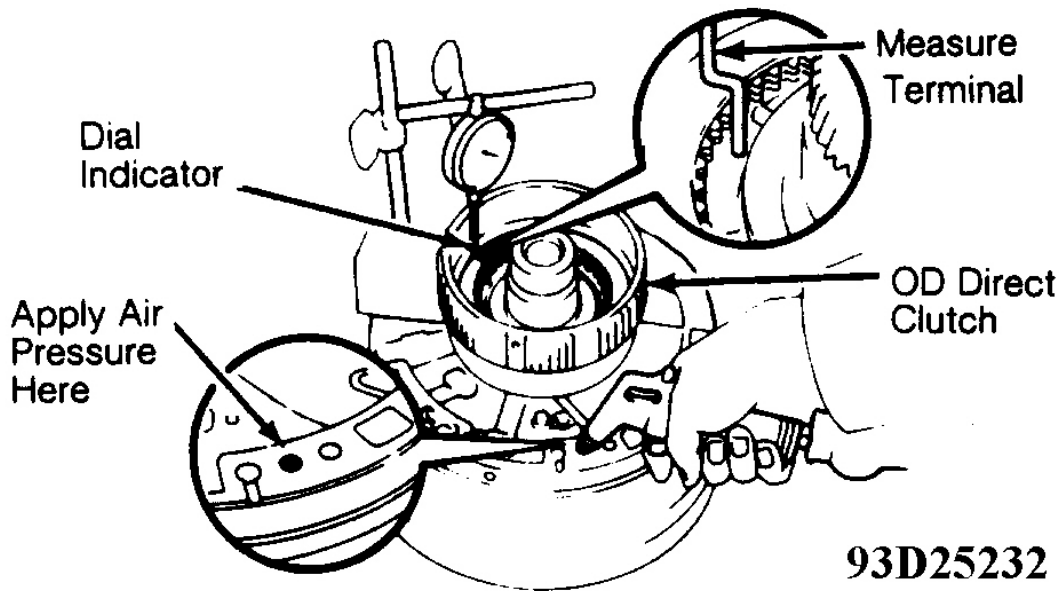


Fig. 19: Checking OD Direct Clutch Piston Stroke
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

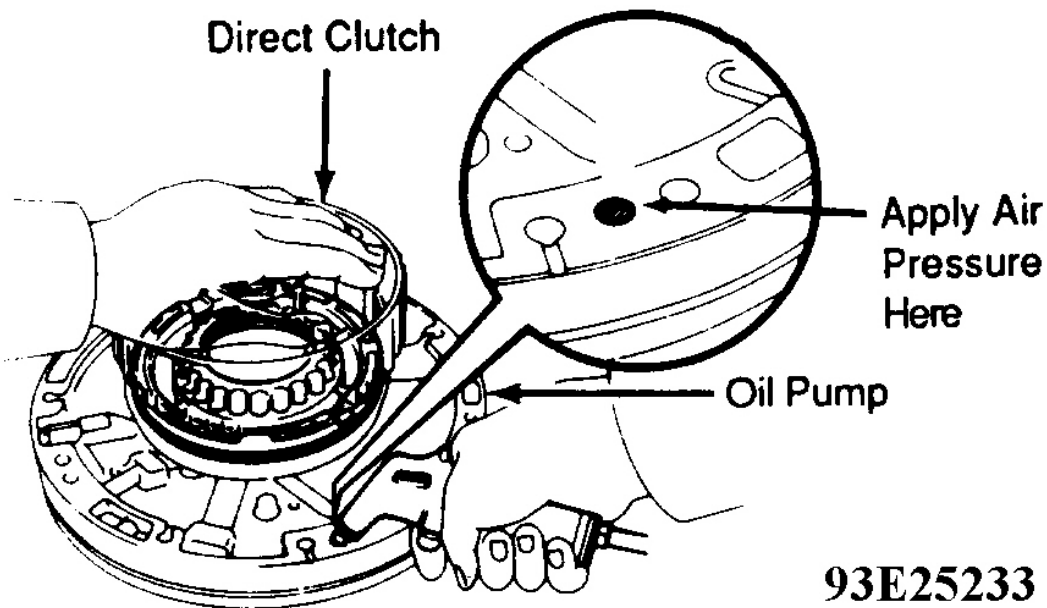


Fig. 20: Removing OD Direct Clutch Piston

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

Inspection

1. Inspect discs, plates and flange. Clean all parts thoroughly in clean solvent. Air dry parts with compressed air. Soak new discs in ATF for at least 15 minutes before installation.
2. Inspect OD direct clutch piston. Shake piston to ensure check ball is free. Check that valve does not leak by applying low pressure compressed air. Replace parts as necessary.
3. Inspect bushings of OD direct clutch drum. Measure inside diameter. Standard inside diameter is 1.0433-1.0441" (26.500-26.521 mm). Maximum inside diameter is 1.0461" (26.570 mm). If inside diameter is excessive, replace clutch drum.
4. Inspect bushing of OD planetary gear. Measure inside diameter. Standard inside diameter is .4724-.4731" (12.000-12.018 mm). Maximum inside diameter is .4752" (12.070 mm). If inside diameter is excessive, replace planetary gear.
5. Inspect planetary pinion gear thrust clearance. Measure thrust clearance between pinions and carriers. See **Fig. 21**. Standard clearance is .0079-.0232" (.200-.590 mm). Maximum clearance is .0315" (.800 mm). If thrust clearance is excessive, replace planetary gear.

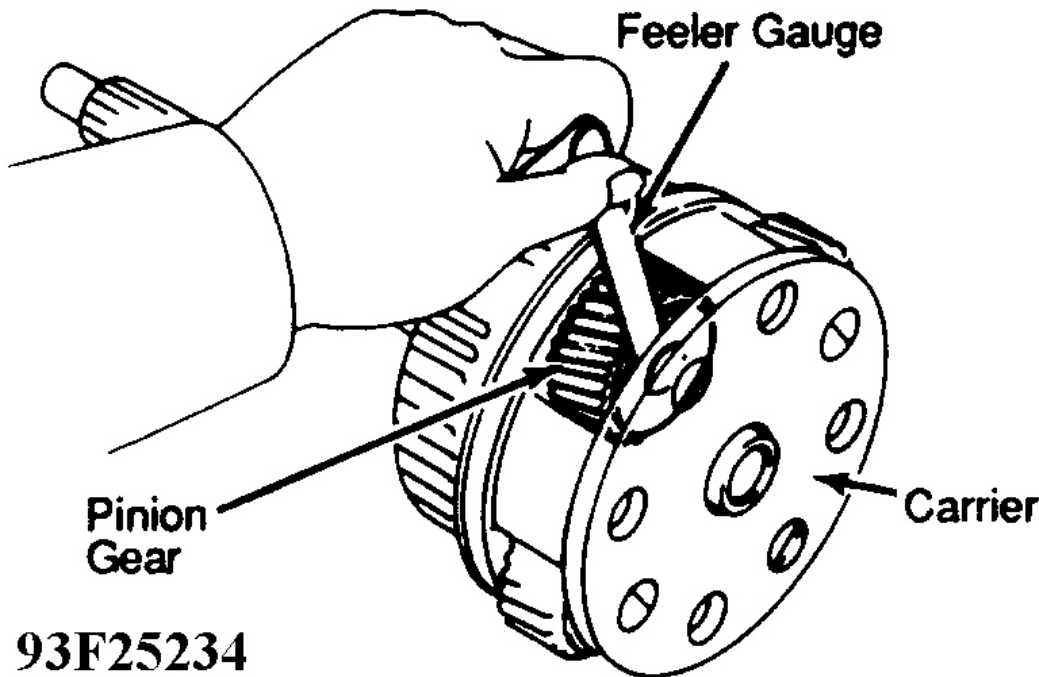


Fig. 21: Measuring Planetary Pinion Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reassembly

OVERDRIVE (OD) BRAKE**Disassembly**

1. Using needle nose pliers, remove 3 ring retainers from oil holes on OD case. Place OD case on rear clutch. Using Measure Terminal (09350-06120) and dial indicator, measure piston stroke by applying compressed air. Piston stroke should be .0492-.0728" (1.250-1.850 mm). If piston stroke is greater than specified, inspect the discs. See **Fig. 23** .
2. Using screwdriver, remove snap ring. Remove flange, 3 discs and 3 plates. Place Spring Compressor (09350-06020) on spring seat, compress return spring with an arbor press. Remove snap ring. Remove return spring.
3. Place return spring on brake piston. Place Spring Compressor (09350-06020) on return spring. Hold spring compressor so it does not slant. Apply compressed air into oil hole of OD case to remove brake piston. See **Fig. 23** . Remove 2 "O" rings from OD case. Remove 2 oil seal rings from OD case.

Inspection

1. Clean all parts thoroughly in clean solvent. Air dry parts with compressed air. Inspect all parts for wear or damage. Replace as necessary. Check piston return springs for wear, damage and collapsed coils. Inspect clutch plates, discs and flange for signs of burning.
2. Inspect bushing of OD case. Measure inside diameter. Standard inside diameter should be 1.3031-1.3051" (33.100-33.150 mm). Maximum inside diameter is 1.3071" (33.200 mm). If inside diameter is excessive, replace OD case.

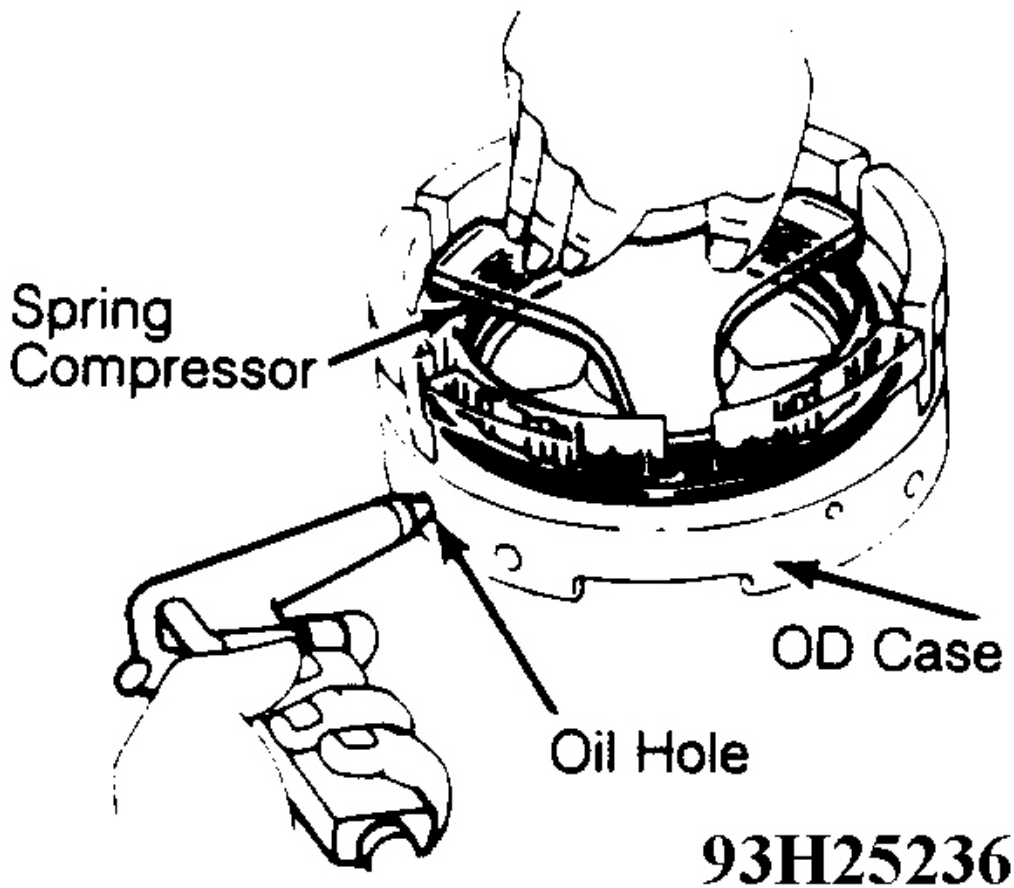


Fig. 23: Removing OD Brake Piston

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

Reassembly

1. Coat oil seal rings with ATF. Install oil seal rings on OD case. **DO NOT** spread ring ends more than necessary. Ensure oil seal rings rotate smoothly after installation.
2. Install new "O" rings on OD brake piston. Align protrusions of brake piston with grooves of OD case. Push brake piston into OD case with both hands. **DO NOT** damage "O" rings.
3. Place return spring on brake piston. Place spring compressor on spring seat. Compress return spring with an arbor press. Install snap ring. Ensure end-gap of snap ring is not aligned with cutout portion of OD case.
4. Install 3 plates and 3 discs in order: plate, disc, plate, disc, plate, disc. Install flange with rounded edge facing upward. Install snap ring. Ensure end gap of snap ring is not aligned with cutout portion of OD case.

5. Place OD case on rear clutch. Using Measure Terminal (09350-06120) and dial indicator, measure piston stroke by applying compressed air. Piston stroke should be .0492-.0728" (1.25-1.850 mm). If piston stroke is less than specified, parts may have been assembled incorrectly. Check and reassemble again. Using needle nose pliers, install 3 ring retainers into oil holes of OD case. See **Fig. 24**.

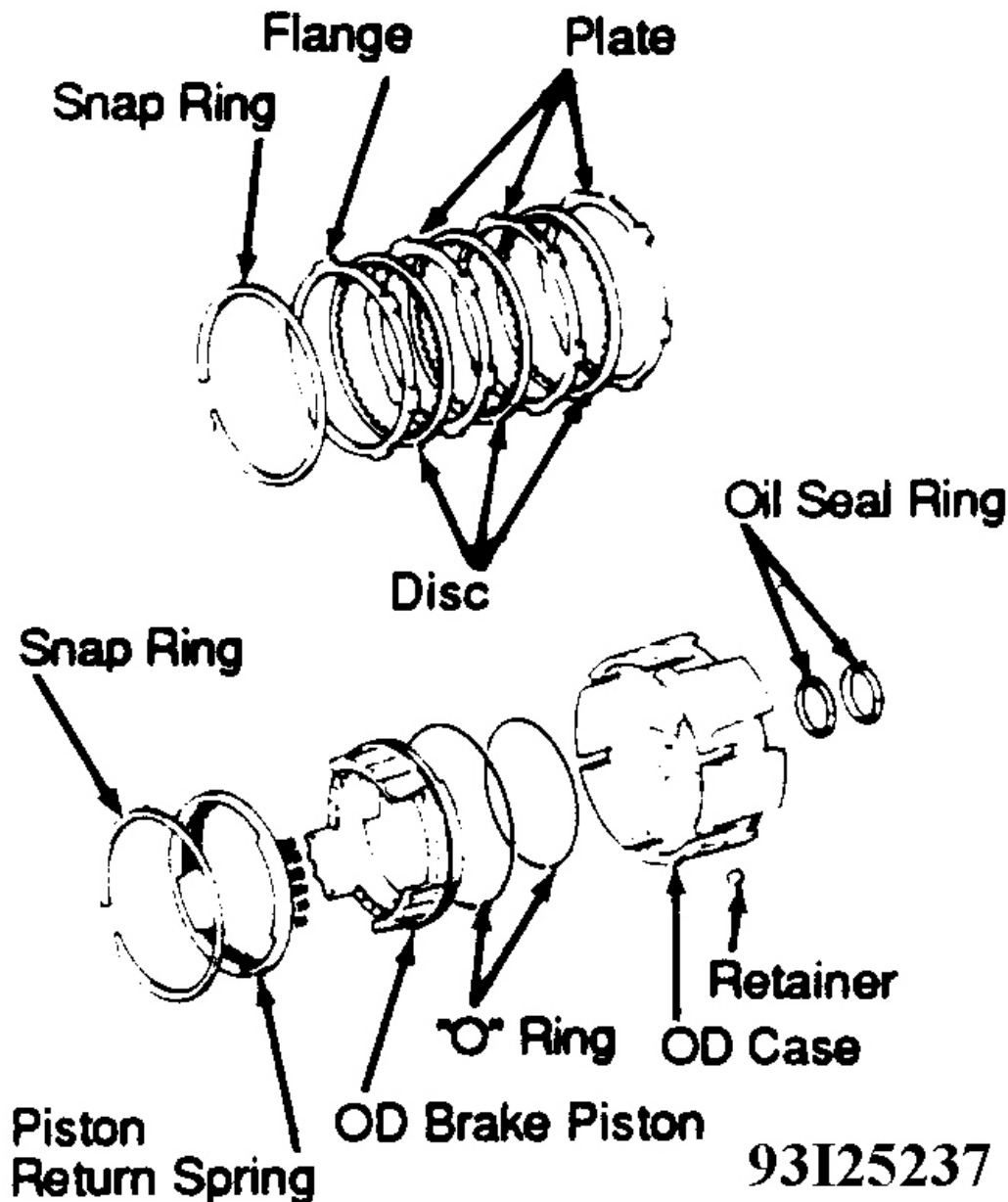


Fig. 24: Exploded View Of OD Brake

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

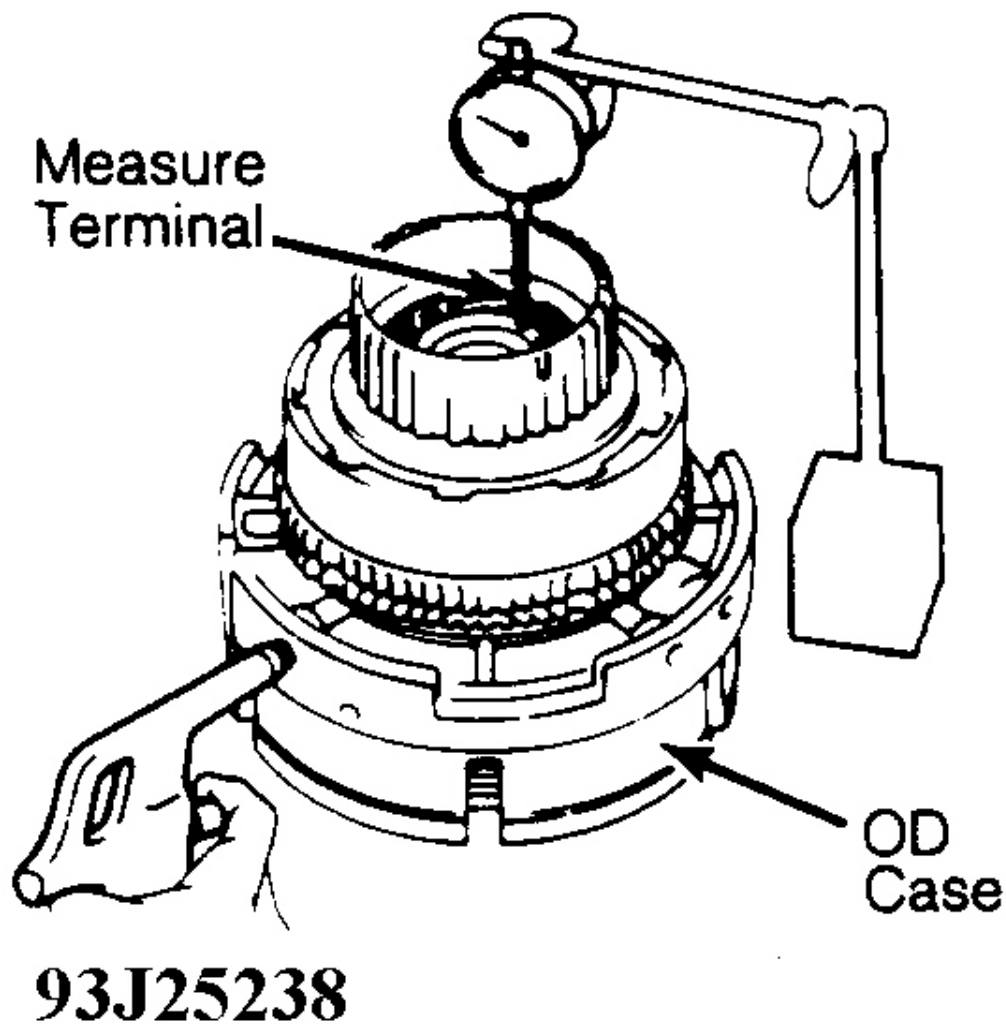


Fig. 25: Checking Front Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

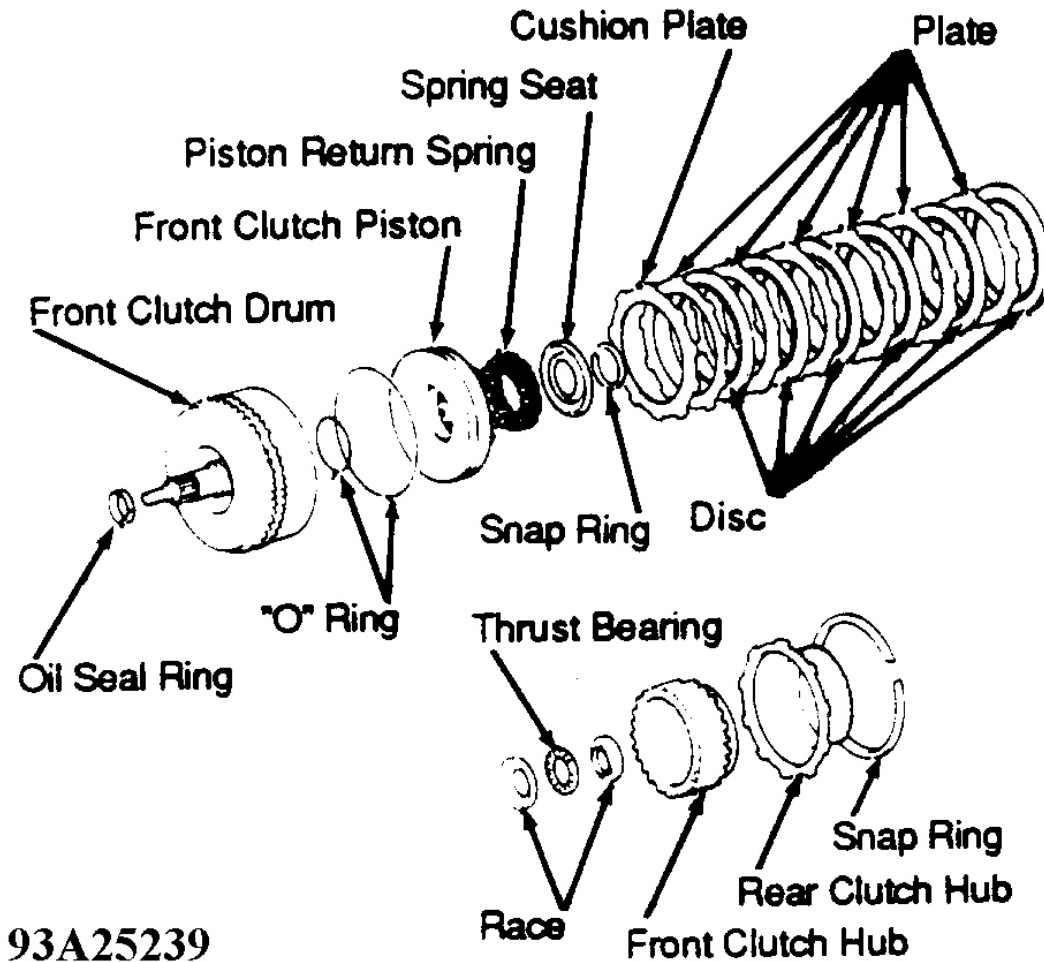


Fig. 26: Exploded View Of Front Clutch
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REAR CLUTCH

Disassembly

1. Remove snap ring. Remove flange, 5 discs and 5 plates from rear clutch drum. Place Spring Compressor (09350-06010) on spring seat, compress return spring with an arbor press. Remove snap ring. Remove spring seat and 22 return springs.
2. Place center support on wooden blocks. Position clutch drum on center support. Hold piston with hand. Apply compressed air to oil hole in center support. Remove clutch piston. See **Fig. 27**. Remove 2 "O" rings from clutch piston.

Inspection

Thoroughly clean all parts and inspect for wear and damage. Inspect clutch plates and discs for signs of burning. Soak new clutch discs in ATF for at least 15 minutes before installation. Inspect rear clutch piston. Shake piston and ensure check ball is free. Ensure valve does not leak by applying low pressure compressed air.

Reassembly

1. Lubricate and install "O" rings on clutch drum. Insert piston carefully into clutch drum, being careful not to damage "O" rings.
2. Place 22 return springs and spring seat on clutch piston. Compress return springs and install snap ring. Ensure end-gap of snap ring is not aligned with spring retainer claw.
3. Install plates and discs in order: plate, disc, plate, disc, plate, disc, plate, disc, plate, disc. Install flange with rounded edge facing upward. Install snap ring. Ensure end-gap of snap ring is not aligned with cutout portion of rear clutch drum.
4. Position center support on wooden block. Provide clearance so that sun gear does not touch rear clutch drum. Place rear clutch on center support. Using measure terminal and dial indicator, measure piston stroke by applying compressed air. See **Fig. 28** . Piston stroke should be .0669-.0748" (1.700-1.900 mm).
5. If piston stroke is less than specified, components may have been assembled incorrectly. Check and reassemble. If piston stroke exceeds limit, clutch pack may be worn. Select different thickness flange. There are 4 different flange thicknesses: .197" (5.00 mm), .205" (5.20 mm), .213" (5.40 mm) and .220" (5.60 mm). See **Fig. 29** .

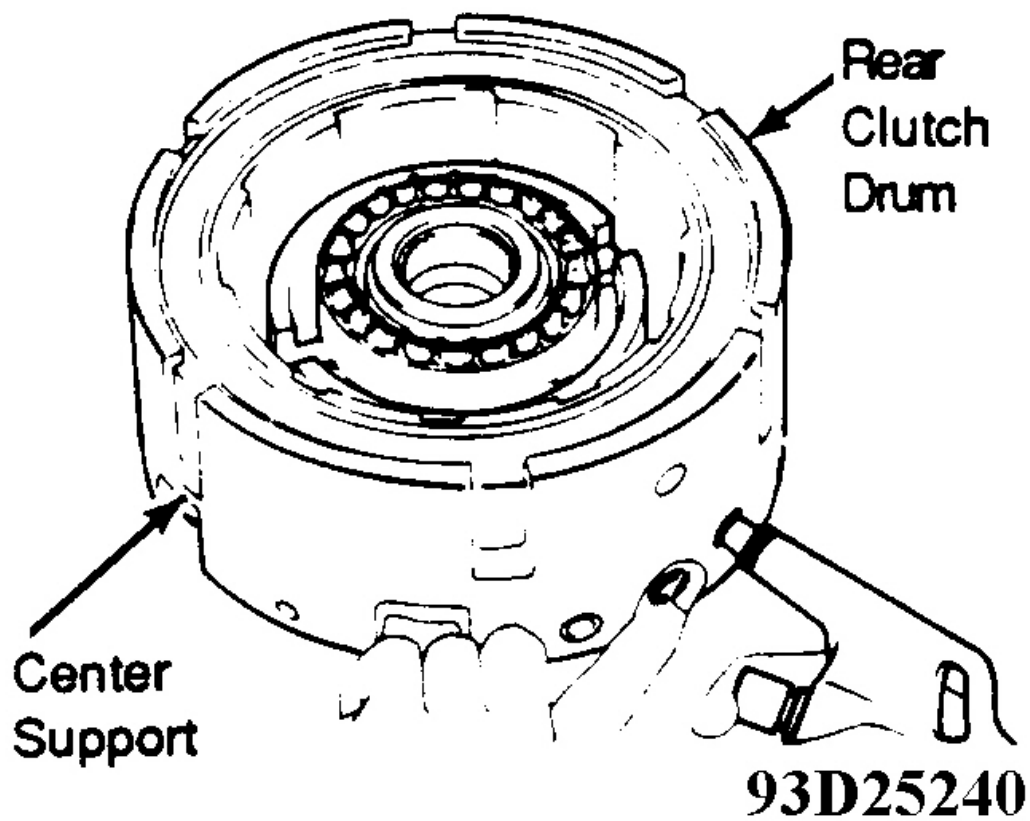


Fig. 27: Removing Rear Clutch Piston

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

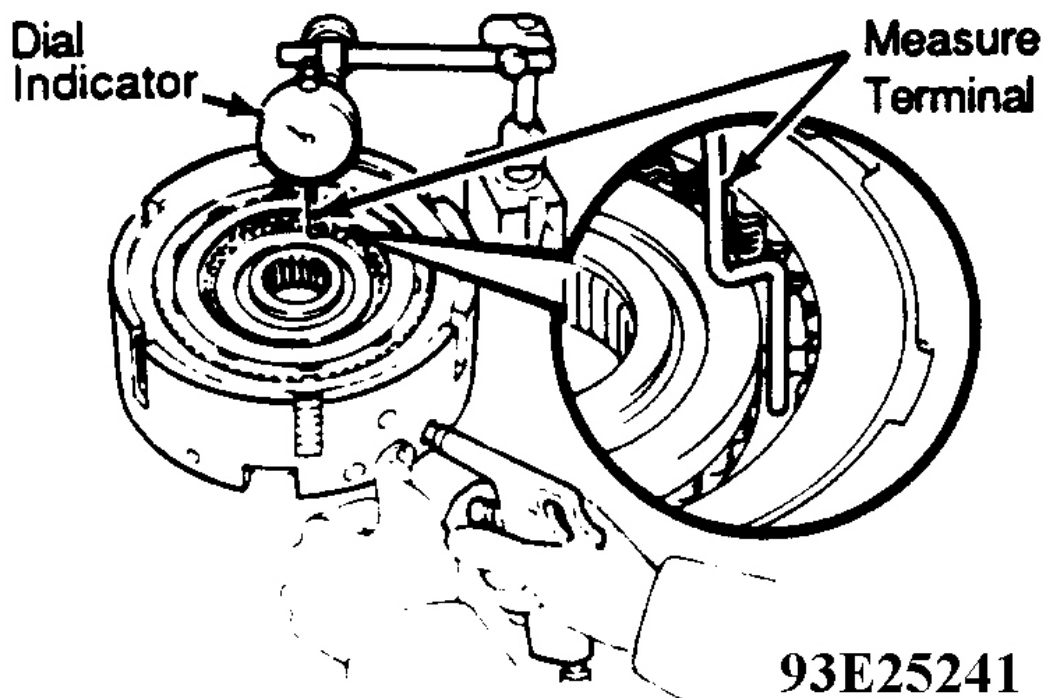
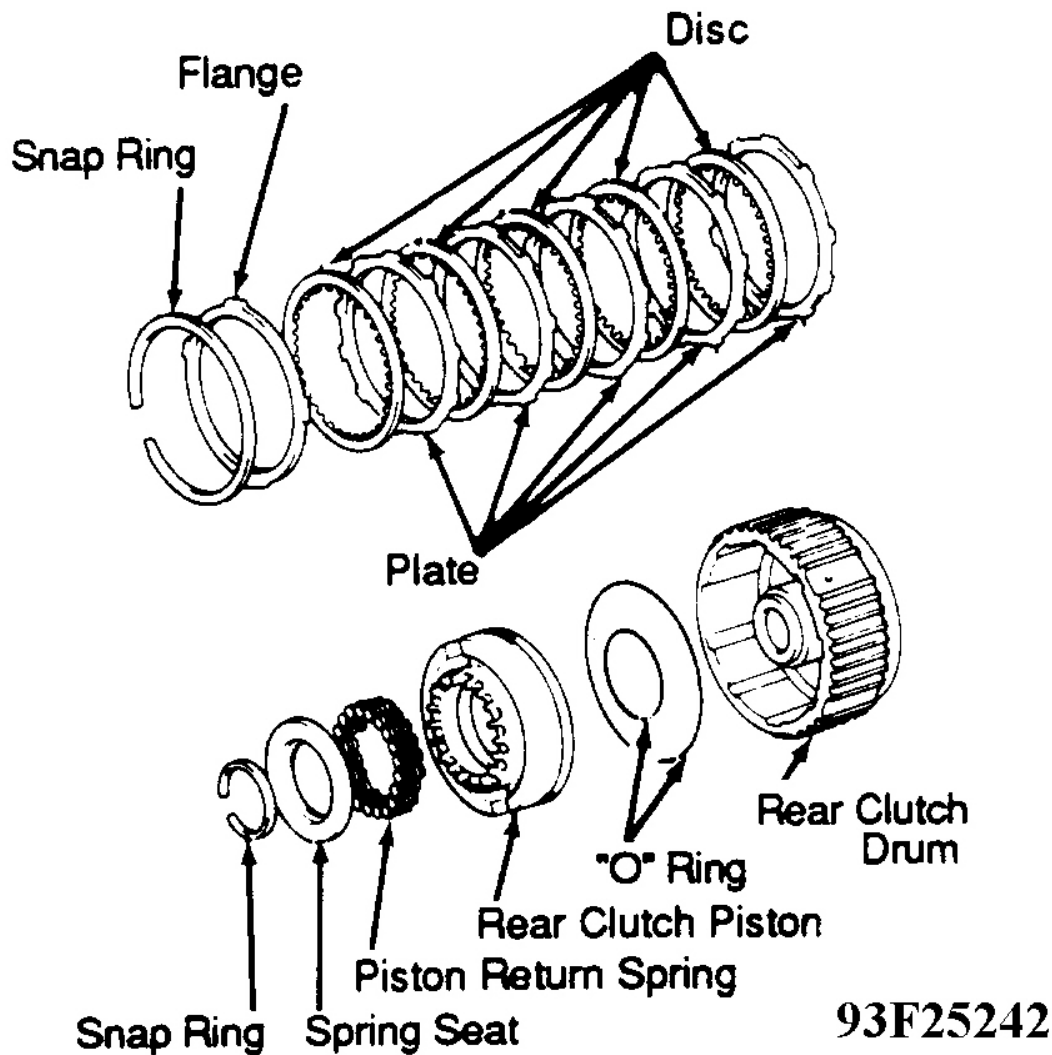


Fig. 28: Checking Rear Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**Fig. 29: Exploded View Of Rear Clutch**

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

2ND BRAKE**Disassembly**

1. Using needle-nose pliers, remove 3 ring retainers from oil holes of center support. Remove snap ring. Remove front planetary sun gear.
2. Using screwdriver, remove snap ring. Remove flange, 4 discs and 4 plates. Position Spring Compressor (09350-06020) on spring seat, compress return spring with an arbor press. Remove snap ring and return spring.
3. Position return spring on brake piston. Place Spring Compressor (09350-06020) on return spring. Hold

spring compressor so it does not slant. Apply compressed air into oil hole of center support to remove brake piston. Remove 2 "O" rings from center support.

Inspection

1. Check all parts for wear and damage. Check plates and discs for signs of burning. Soak new discs in ATF for at least 15 minutes before installation.
2. Inspect center support bushing. Measure inside diameter. Standard inside diameter should be 1.3780-1.3789" (35.000-35.025 mm). Maximum inside diameter is 1.3811" (35.080 mm). If inside diameter is excessive, replace center support.
3. Inspect front planetary sun gear bushings. Measure inside diameter. Standard inside diameter should be .9449-.9457" (24.000-24.021 mm). Maximum inside diameter is .9476" (24.070 mm).

Reassembly

1. Install 2 oil seal rings on center support. **DO NOT** spread ring ends more than necessary. Ensure oil seal rings rotate smoothly.
2. Install new "O" rings on 2nd brake piston. Align protrusions of brake piston with grooves of center support. Push brake piston into center support with both hands. **DO NOT** damage "O" rings.
3. Position return spring on brake piston. Compress return springs and install snap-ring. Ensure snap ring end-gap is not aligned with cutout portion of center support.
4. Install plates and discs in order: plate, disc, plate, disc, plate, disc, plate, disc. Install flange with rounded edge facing inward. If flange is step edged, install flange with step edge facing inward. Install snap ring. Ensure snap ring end-gap is not aligned with cutout portion of center support.
5. Using Measure Terminal (09350-06120) and dial indicator, measure piston stroke by applying compressed air. See **Fig. 30** . Piston stroke should be .063-.071" (1.60-1.80 mm).
6. If piston stroke is less than specified, parts may have been assembled incorrectly. Check and reassemble. If piston stroke exceeds limit, clutch pack may be worn. Select different thickness flange. There are 4 different flange thicknesses .197" (5.00 mm), .205" (5.20 mm), .213" (5.40 mm) and .220" (5.60 mm).
7. Install front planetary sun gear. Install snap ring. Using needle nose pliers, install 3 ring retainers into center support oil holes. See **Fig. 31** .

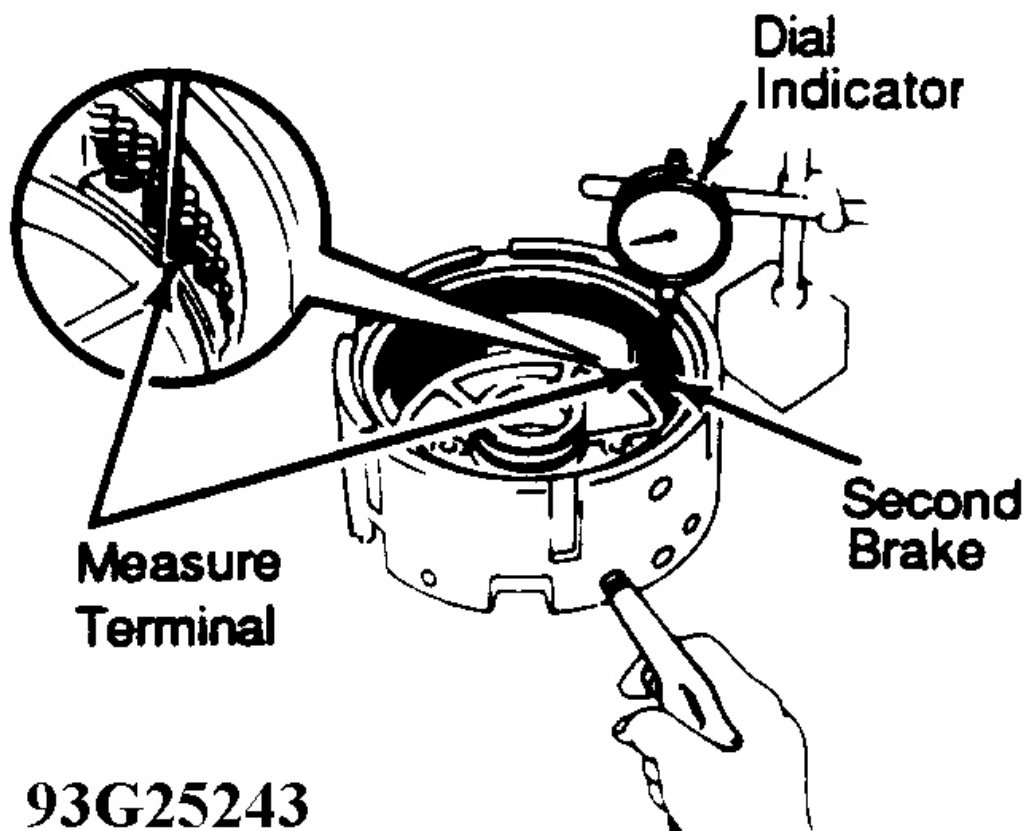
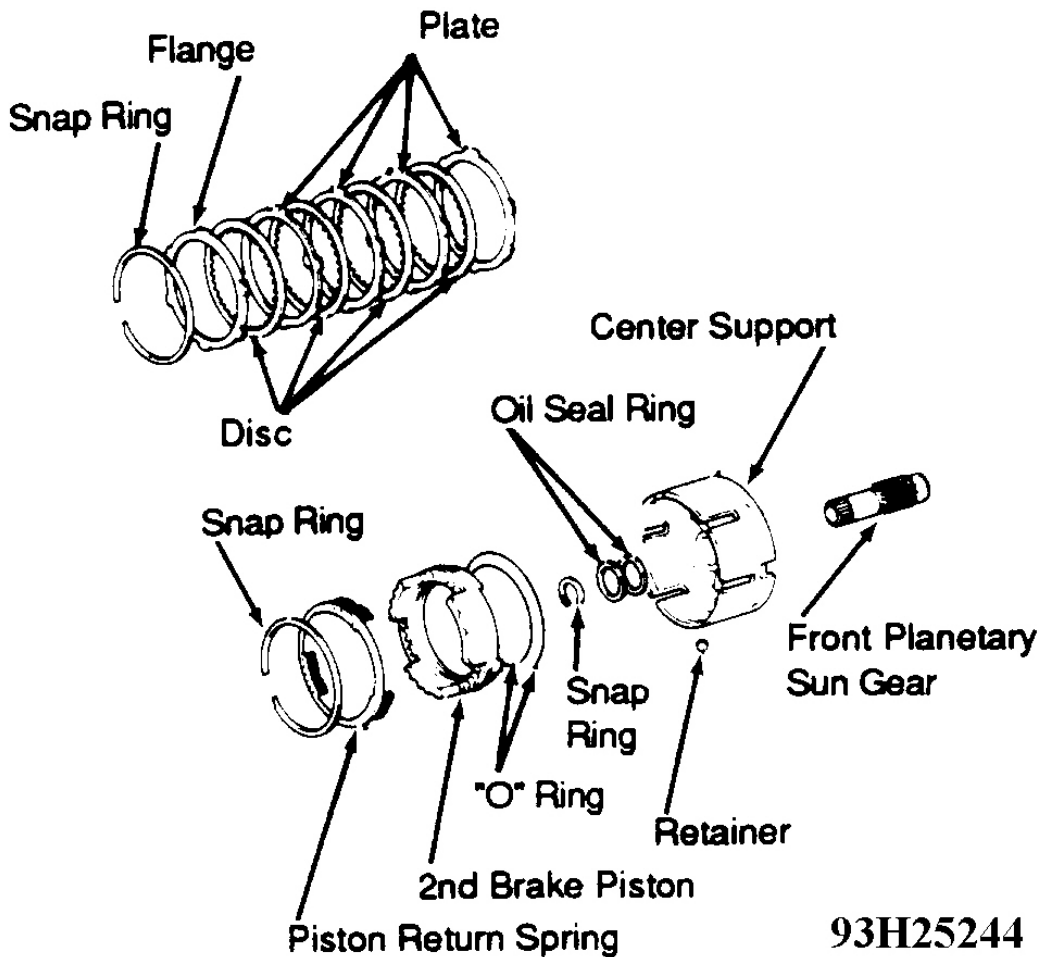


Fig. 30: Checking 2nd Brake Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 31: Exploded View Of 2nd Brake

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

PLANETARY GEARS, ONE-WAY CLUTCH & OUTPUT SHAFT**Disassembly**

1. Remove rear planetary gear and output shaft from front planetary gear. Remove No. 1 rear thrust washer from front planetary gear. See **Fig. 33**.
2. Remove one-way clutch from front planetary gear. Using snap ring pliers and screwdriver, pry out front planetary ring gear while compressing snap ring.
3. Remove No. 2 thrust washer from rear planetary gear. Remove snap ring. Remove output shaft from rear planetary gear. Remove thrust bearing and race from rear side of ring gear flange.
4. Remove ring gear and intermediate shaft from rear planetary gear. Remove thrust bearing and race from front side of ring gear flange. Remove sun gear from rear planetary gear. Using small screwdriver, remove oil seal ring.

5. Remove snap ring from rear side of intermediate shaft. Remove ring gear and flange from intermediate shaft. Remove snap ring from front side of intermediate shaft. Remove snap ring and ring gear flange from rear planetary ring gear.

Inspection

1. Inspect output shaft bushing. Measure inside diameter. Standard diameter is .6693-.6700" (17.000-17.018 mm). Maximum inside diameter is .6720" (17.070 mm). If inside diameter is excessive, replace output shaft.
2. Inspect planetary pinion gear thrust clearance. Measure thrust clearance between pinions and carrier. See **Fig. 32** . Standard clearance should be .008-.020" (.20-.50 mm). Maximum clearance is .030" (.75 mm). If thrust clearance is excessive, replace planetary gear.

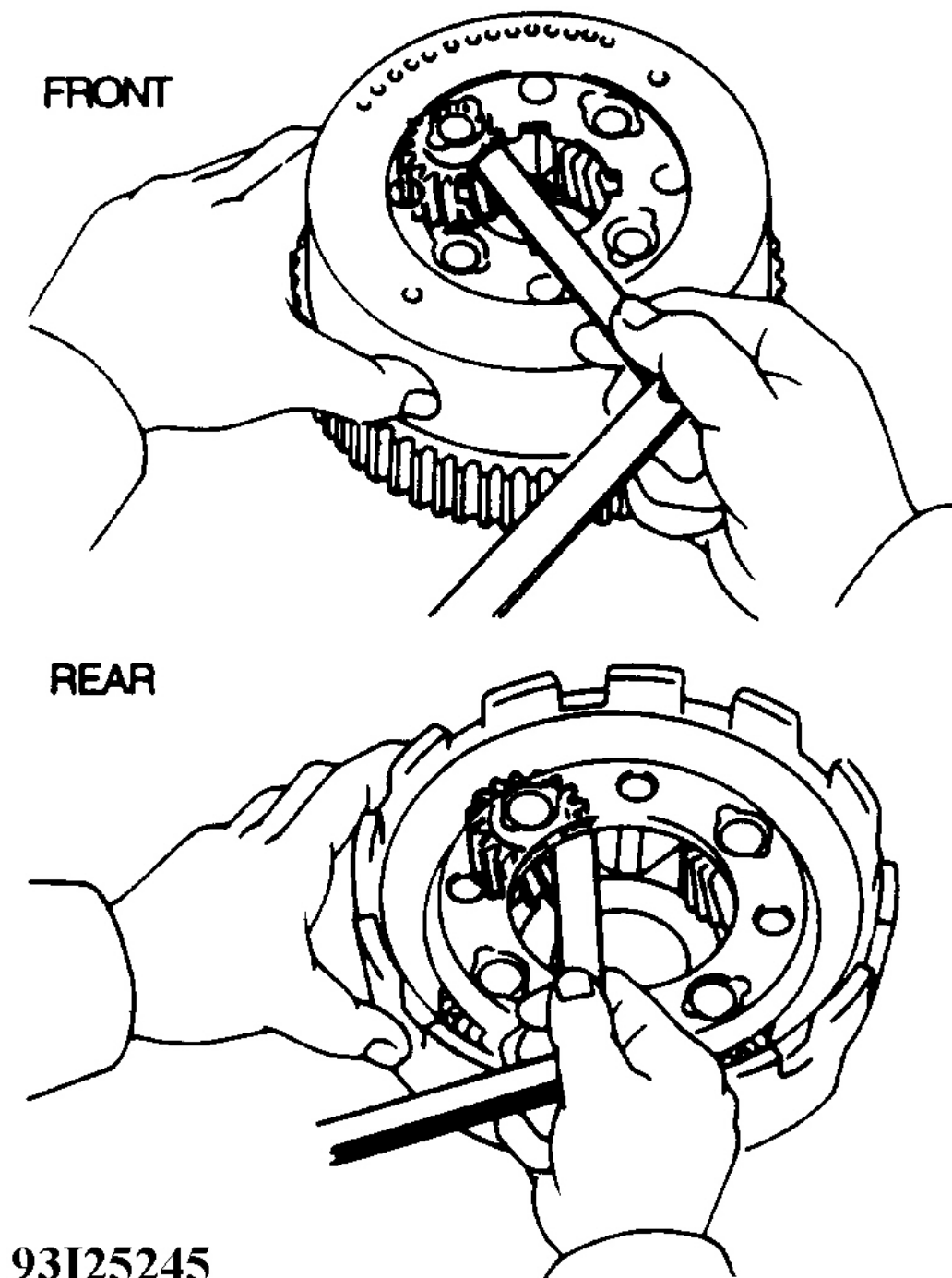


Fig. 32: Measuring Planetary Pinion Gear Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

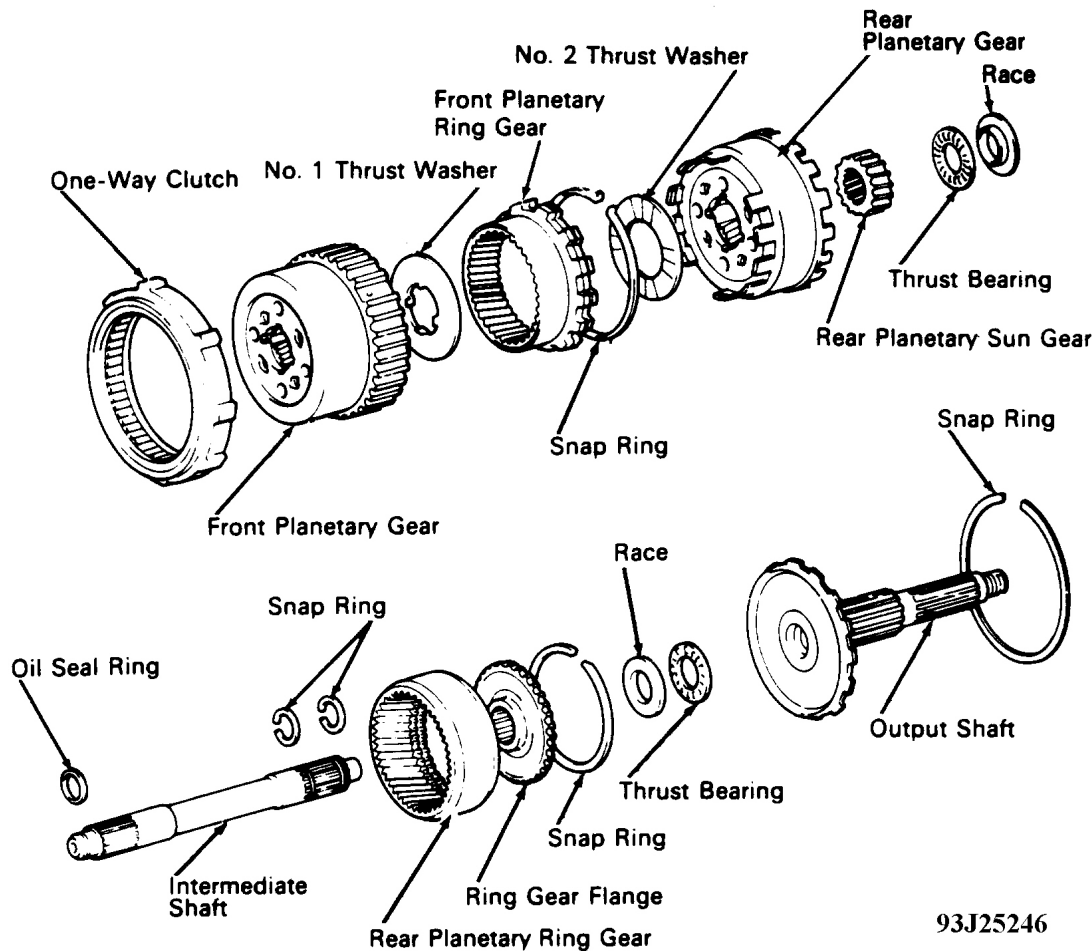


Fig. 33: Exploded View Of Planetary Gears, One-Way Clutch & Output Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Reassembly

1. Install ring gear flange on rear planetary ring gear. Install snap ring. Install snap ring on front side of intermediate shaft. Install ring gear and flange. Install snap ring on rear side of intermediate shaft.
2. Install new oil seal ring on intermediate shaft. Install sun gear to rear planetary gear. Install race and thrust bearing on front side of ring gear flange. Install ring gear and intermediate shaft to rear planetary gear.
3. Install race and thrust bearing on rear side of ring gear flange. Install output shaft to rear planetary gear. Install snap ring. Ensure snap ring end-gap is not aligned with cutout portion of rear planetary gear.
4. Install No. 2 thrust washer on rear planetary gear. Securely fit lips of thrust washer into holes of rear planetary gear.
5. Install front planetary ring gear. Align snap ring end with wide cutout portion of rear planetary gear. Using snap ring pliers and plastic hammer, tap in ring gear while compressing snap ring. Ensure snap ring is installed in rear planetary groove.

6. Position one-way clutch on front planetary gear, with flanged side of one-way clutch facing inward. Install one-way clutch on front planetary gear by rotating one-way clutch counterclockwise.
7. Hold one-way clutch outer race and turn front planetary gear. Front planetary gear should turn freely counterclockwise and lock clockwise. If operation is not as specified, replace one-way clutch.
8. Install No. 1 rear thrust washer on rear side of front planetary gear. Securely fit claws of thrust washer into grooves of front planetary gear. See **Fig. 33**.

1ST & REVERSE BRAKE

Disassembly

1. Remove snap ring. Remove flange, 6 discs, 6 plates and cushion plate. Set Spring Compressor (09350-06030) on spring retainer. Compress return spring. Remove snap ring.
2. Remove piston return spring. Hold 1st and reverse brake piston with hand, remove piston by applying compressed air into oil hole of transmission case. If piston does not pop out with compressed air, lift piston out with needle-nose pliers. Remove 2 "O" rings from piston.

Inspection

Clean all parts in solvent and blow dry with compressed air. Inspect piston for scoring, wear or damage. Check discs, plates and flange for wear or burning. Soak new discs in ATF for at least 15 minutes before installation.

Reassembly

1. Install new "O" rings on piston and coat with ATF. Using Handle (09350-06050) and Plate (09350-06090), push in brake piston.
2. Position return spring on brake piston. Using spring compressor, compress return spring. Using screwdriver, install snap ring.
3. Install cushion plate with rounded edge facing inward. Install in order: plate, disc, plate, disc, plate, disc, plate, disc, plate, disc, plate, disc. Install flange with rounded edge facing outward. If flange is step edged, install flange with step edge facing inward. Install snap ring. Ensure end of snap ring is not aligned with cutout portion of transmission case. See **Fig. 34**.

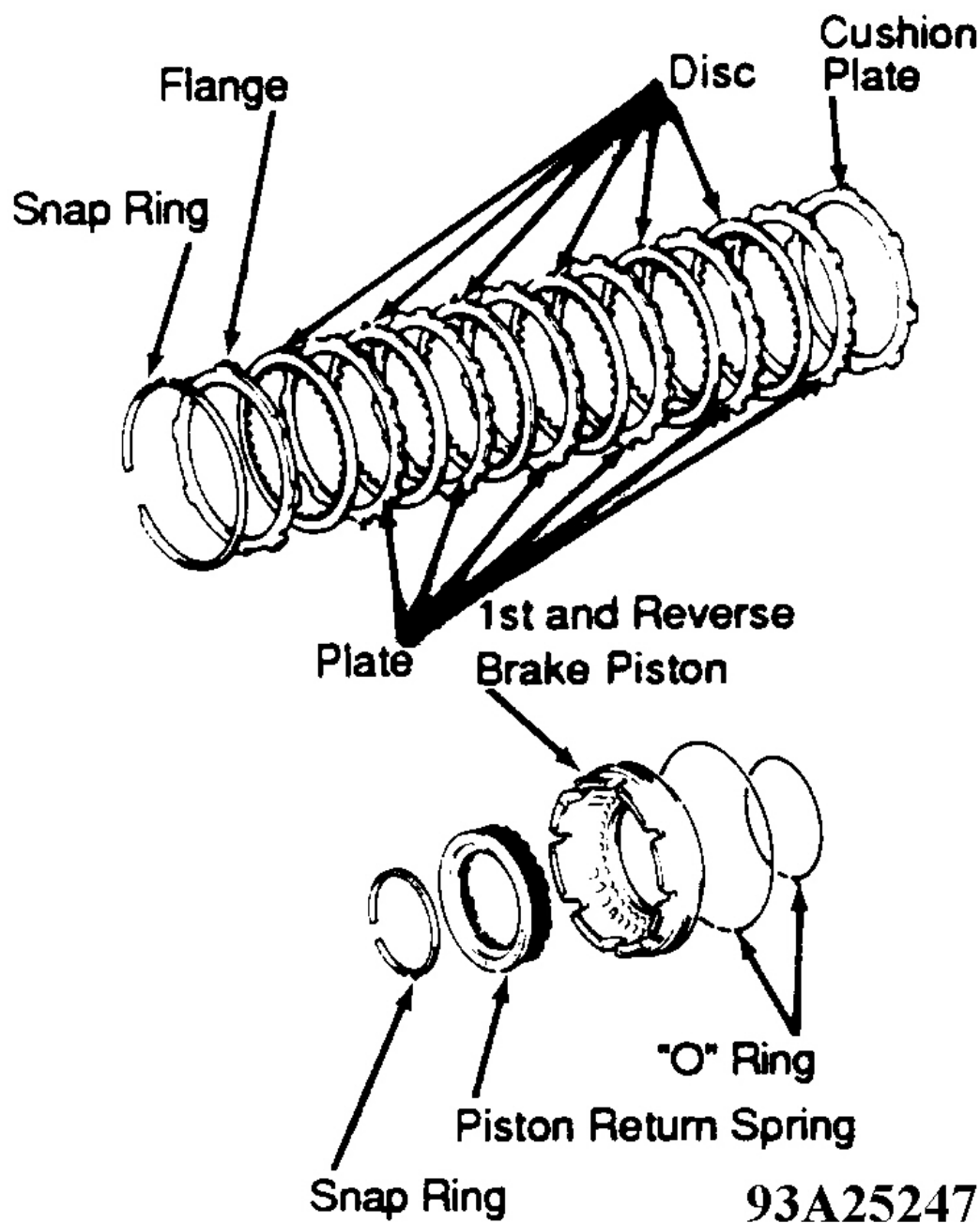


Fig. 34: Exploded View Of 1st & Reverse Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

GOVERNOR BODY

Disassembly & Inspection

1. Remove oil seal rings. Remove governor body and gasket. Remove oil strainer. See **Fig. 35** .
2. Remove "E" ring. Remove governor weight from governor body. Remove valve shaft, spring and No. 1 governor valve from governor body.
3. Remove "E" ring. Remove spacer. Remove snap ring. Remove valve shaft, spring and governor valve from governor body.
4. Inspect all parts for wear and damage. Insert valve shaft into body and ensure that it slides smoothly. Check oil passage for clogging.

Reassembly

1. Coat No. 2 governor valve and shaft with ATF. Install the No. 2 governor valve, spring and valve shaft into governor body. Free length of spring is 1.5421" (39.170 mm). Install snap ring. Using needle nose pliers, install "E" ring.
2. Coat No. 1 governor valve and shaft with ATF. Install the No. 1 governor valve, spring and valve shaft into governor body. Free length of spring is 1.0858" (27.58 mm). Install governor weight. Install "E" ring.
3. Install oil strainer. Coat new gasket with ATF and install on body support. Temporarily install governor body. **DO NOT** torque bolts yet. Tighten bolts after adjusting clearance between output shaft and governor body. See **TRANSMISSION REASSEMBLY** procedure for clearance and torque information.

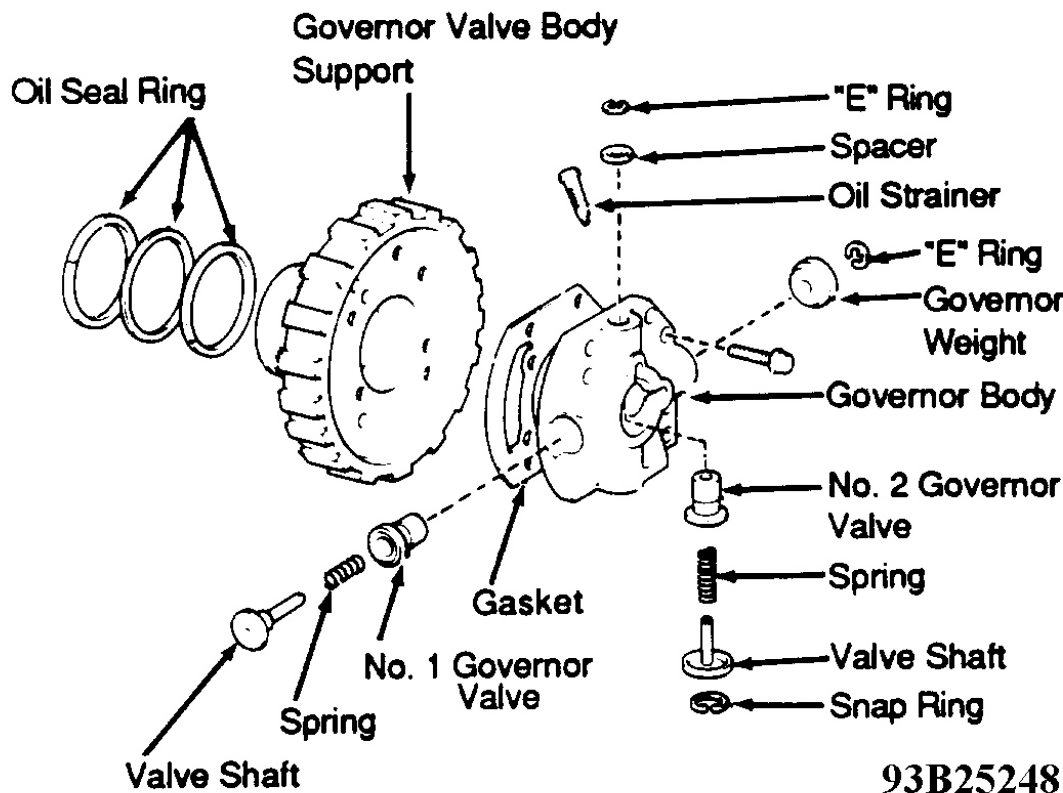


Fig. 35: Exploded View Of Governor Body

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

PARKING LOCK PAWL

Disassembly

Remove pawl shaft, 2 plate washers and spring. Remove snap ring. Remove parking lock pawl. Remove parking lock pawl bracket.

Reassembly

1. Temporarily install pawl bracket with 2 bolts. Using Plate (09350-06090) and calipers, set pawl bracket so that distance between transfer adapter surface and top of bracket tab is specified distance. Standard distance = total distance minus plate thickness. Standard distance should be 1.870-1.874" (47.50-47.60 mm). Torque bolts to 14 ft. lbs. (19 N.m).
2. Install parking lock pawl. Install snap ring. Install plate washer, spring and plate washer. Insert spring end in hole of transfer adapter. Install pawl shaft. Hold pawl shaft, hook other spring end to pawl with screwdriver. Ensure pawl moves smoothly. See **Fig. 36**.

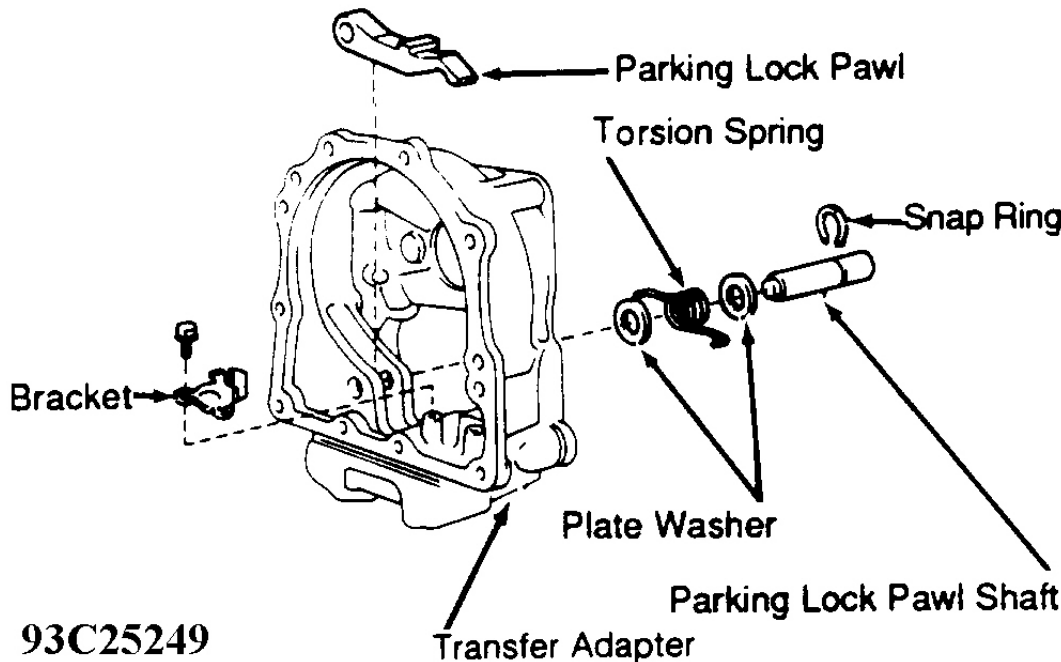


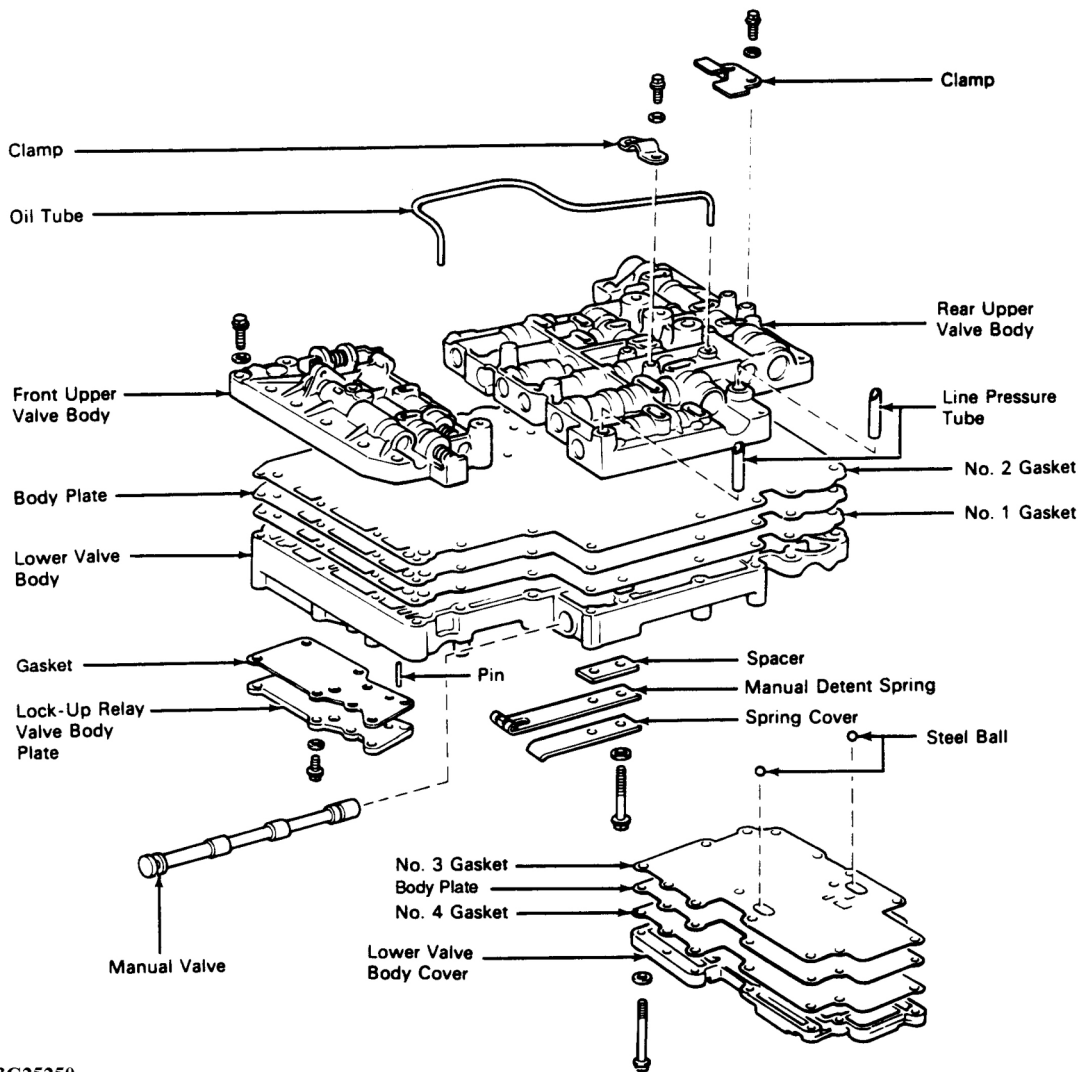
Fig. 36: Exploded View Of Parking Lock Pawl
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CONTROL VALVE ASSEMBLY

CAUTION: All control valve assembly components must be installed in original location. Lay all components in sequence during removal for reassembly reference. Note diameter and ball location. Note control valve assembly bolts length and location. Proper length bolts must be installed in correct locations to prevent transaxle case damage.

Disassembly (Control Valve Assembly)

1. Remove 2 line pressure tubes. Remove 2 bolts, wave washers and tube clamp. Using large screwdriver, remove oil tube. See **Fig. 37**.
2. Remove manual valve. Remove 2 bolts, wave washers and clamp. Turn control valve assembly over. Remove bolt, wave washer, spring cover, manual detent spring and spacer.
3. Remove wave washers, lock-up relay valve body plate and gasket. Using magnet, remove lock-up relay valve sleeve pin.
4. Remove 15 bolts, wave washers, lower valve body cover, 2 gaskets and body plate. Remove 2 check balls from lower valve body.
5. Turn control valve assembly over. Remove 7 bolts and wave washers. Turn control valve assembly over. Remove 3 bolts and wave washers. Remove front upper valve body by lifting up lower valve body.
6. Remove 6 bolts and wave washers. Hold valve body plate to lower valve plate. Remove rear upper valve body by lifting up lower valve body. Ensure that check balls and springs **DO NOT** fall out. Turn control valve assembly over. Remove 2 gaskets and body plate.



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Fig. 37: Exploded View Of Control Valve Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Disassembly (Front Upper Valve Body)

1. Remove throttle valve cam and spring assembly. Remove pin, sleeve, primary downshift plug and spring, primary throttle valve, valve stopper, adjusting ring(s) and primary throttle valve spring. See **Fig. 38**.
2. Remove pin, sleeve, secondary downshift plug and spring, secondary throttle valve, valve stopper, adjusting ring(s) and secondary throttle valve spring.
3. Remove retainer, plug, secondary regulator valve and spring. Remove check ball and spring. Remove oil strainer.

Disassembly (Rear Upper Valve Body)

1. Remove pin, plug, spring, intermediate coast shift valve and 2-3 shift valve. From opposite side of bore

remove 2-3 shift pin, plug and 2-3 shift valve plug. See **Fig. 39** .

2. Remove pin, sleeve, 2-3 shift timing plug, 2-3 shift timing valve and spring.
3. Remove pin, plug and 3-4 shift valve. From opposite side of bore remove retainer, plug 3rd coast valve, 3-4 coast shift valve and spring. Remove 7 check balls.
4. Remove retainer, plug, detent regulator valve and spring. Remove pin, sleeve, spring, seat and lock-up signal valve. Remove retainer, plug and cut-back valve.
5. Remove retainer, plug, spring and OD clutch exhaust valve. Remove retainer, plug and manual down timing valve. Remove retainer, plug intermediate modulator valve and spring.

Disassembly (Lower Valve Body)

1. Remove retainer, plug and low coast shift valve. Remove retainer, plug, spring and low coast modulator valve. Remove pin, plug, spring and 1-2 relay valve. Remove check ball and spring. Remove check valve and spring. See **Fig. 40** .
2. Remove pin, valve plunger, No. 1 sleeve, lock-up relay valve, lock-up relay control valve, spring, No. 2 sleeve and pin.
3. Remove retainer, sleeve, spring, primary regulator washer, adjusting ring(s) and primary regulator valve. Remove retainer, plug, spring and accumulator control valve. Remove retainer, plug, 3-2 kickdown orifice control valve and spring.
4. Remove retainer, plug, 2nd lock valve and spring. Remove pin, plug, 1-2 shift valve low plug, 1-2 shift valve and spring.

1990 Toyota Land Cruiser

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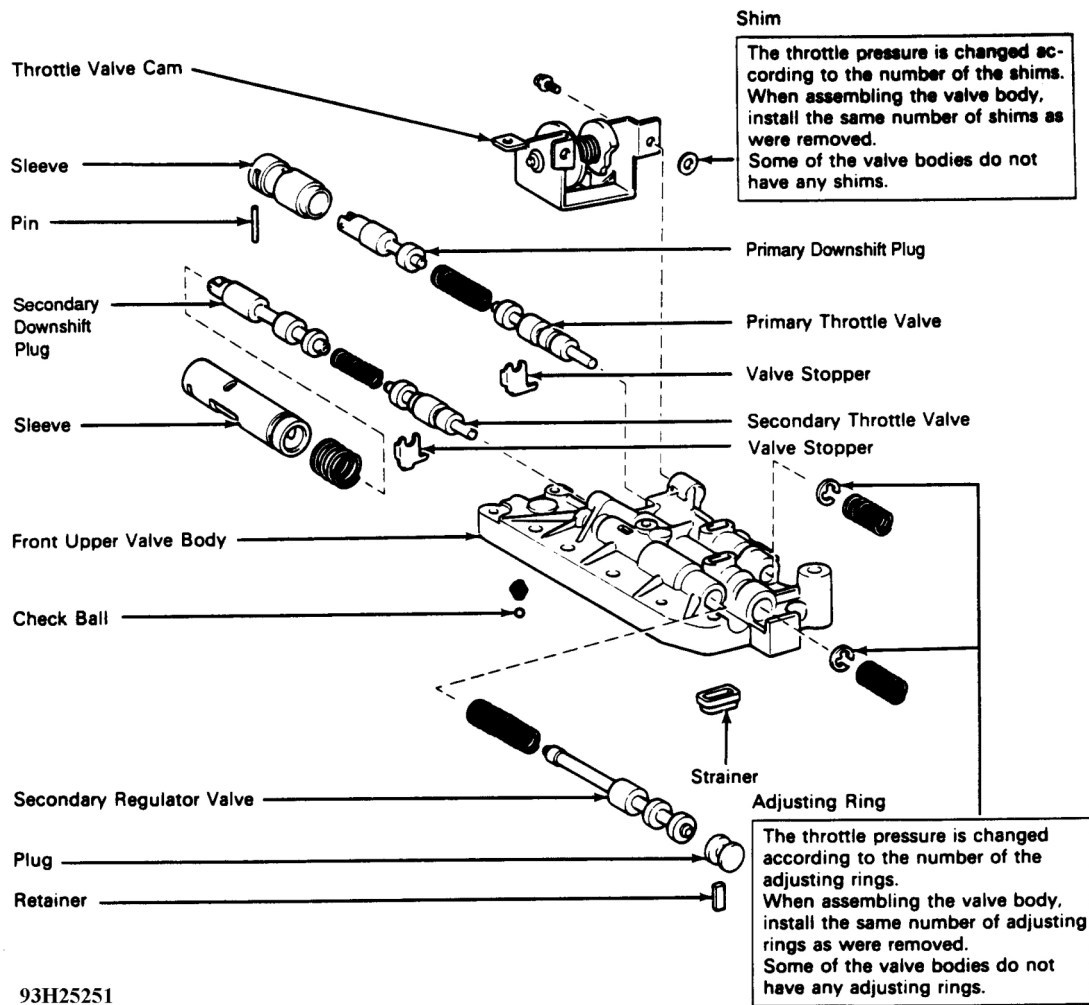


Fig. 38: Exploded View Of Front Upper Valve Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

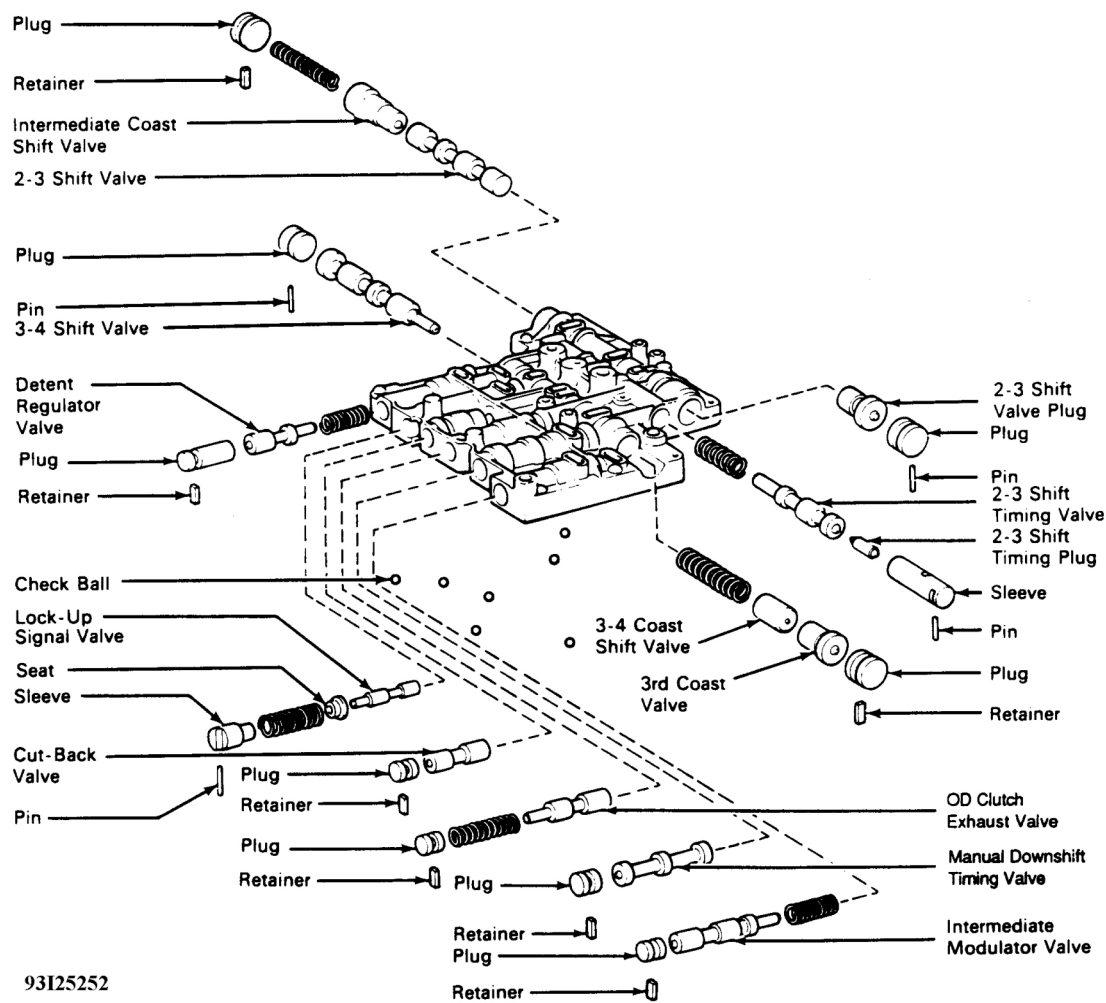


Fig. 39: Exploded View Of Rear Upper Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

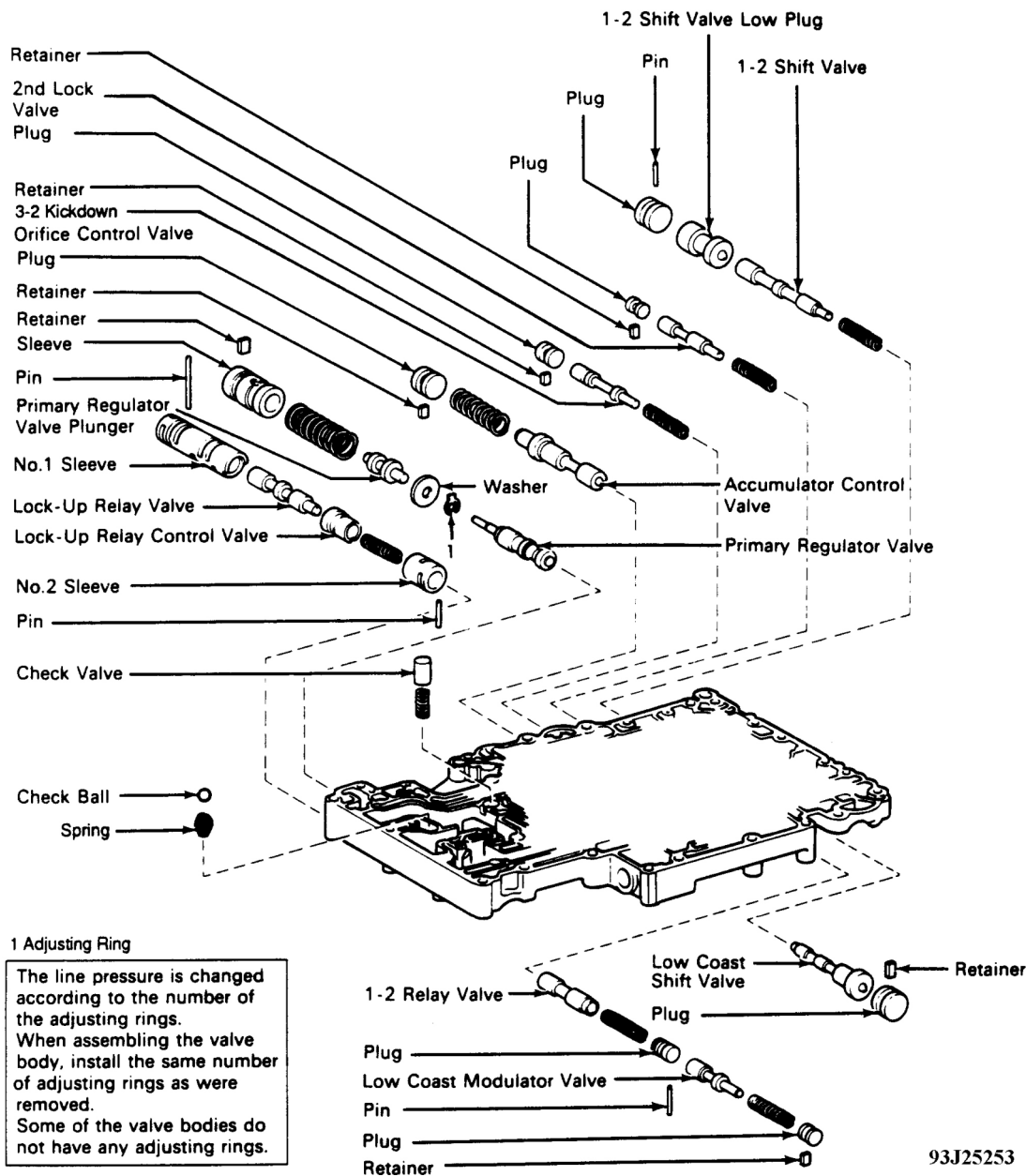


Fig. 40: Exploded View Of Lower Valve Body

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

Inspection (Control Valve Assembly)

1. Clean all parts in clean solvent. Clean all fluid passages and holes. Dry with compressed air. Ensure strainer is not damaged or clogged. Inspect valves for scoring or roughness.
2. Ensure valves slide freely in bores. Inspect valve springs for damage, squareness, corrosion and collapsed coils. Measure spring free length. Replace spring if not within specification. See appropriate VALVE BODY SPRING SPECIFICATIONS table.

1990 Toyota Land Cruiser

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FRONT UPPER VALVE BODY SPRING SPECIFICATIONS

Spring Application	Color Code	Free Length In. (mm)
Check Ball	None	.512 (13.00)
Primary Throttle Valve	White	.996 (25.30)
Primary Downshift Plug	Blue	1.059 (26.90)
Secondary Regulator Valve	None	1.811 (46.00)
Secondary Throttle Valve	White	.996 (25.30)
Secondary Downshift Plug	White	1.283 (32.60)
Throttle Valve Spring	None	.425 (10.80)

REAR UPPER VALVE BODY SPRING SPECIFICATIONS

Spring Application	Color Code	Free Length In. (mm)
2-3 Shift Valve	Brown	1.705 (43.30)
2-3 Shift Timing Valve	Pink	1.543 (39.20)
3-4 Shift Valve	None	1.508 (38.30)
Detent Regulator Valve	White	1.197 (30.40)
Lock-Up Signal Valve	Green	2.102 (53.40)
OD Clutch Exhaust Valve	Yellow	1.311 (33.30)
Intermediate Modulator Valve	Pink	.886 (22.50)

LOWER VALVE BODY SPRING SPECIFICATIONS

Spring Application	Color Code	Free Length In. (mm)
Check Valve	None	1.091 (27.70)
Check Ball	None	.512 (13.00)
1-2 Shift Valve	None	1.047 (26.60)
3-2 Kickdown Orifice Control Valve	Blue	1.280 (32.50)
2nd Lock Valve	Brown	1.158 (29.40)
Lock-Up Relay Valve	Pink	1.276 (32.40)
Primary Regulator Valve	None	2.291 (58.20)
Accumulator Control Valve	Red	.988 (25.10)
Low Coast Modulator Valve	Yellow	1.181 (30.00)
1-2 Relay Valve	None	.902 (22.90)

Reassembly (Front Upper Valve Body)

1. Coat all components with ATF. To reassemble, reverse disassembly procedure. Check that all valves slide freely in bores. Ensure retainers, valve stopper, check ball, and pin are installed in correct location. See **Fig. 41**.
2. Install primary throttle valve. Install same number of adjusting rings on throttle valve as were removed during disassembly. See **Fig. 38**.
3. Install secondary throttle valve. Install adjusting rings. Install throttle valve cam and spring assembly. Torque bolts to 89 INCH lbs. (10 N.m).

4. Install secondary regulator valve. Install check ball and spring. See **Fig. 41** . Install strainer.

Reassembly (Rear Upper Valve Body)

1. Coat all components with ATF. To reassemble, reverse disassembly procedure. Ensure all valves slide freely in bores. Ensure retainers, valve stopper, check ball, and pins are installed in correct location. See **Fig. 42** and **Fig. 43** .
2. Install 2-3 shift valve and intermediate coast shift valve. Install 2-3 coast shift valve plug in opposite end of bore. See **Fig. 39** .
3. Install 2-3 shift timing valve. Install 3-4 shift valve (small end first) in opposite end of bore.
4. Install detent regulator valve. Install lock-up signal valve. Install cut-back valve with small end first.
5. Install OD clutch exhaust valve. Install manual downshift timing valve with small end first. Install intermediate modulator valve. Install 7 check balls. See **Fig. 42** .

Reassembly (Lower Valve Body)

1. Coat all components with ATF. To reassemble, reverse disassembly procedure. Ensure all valves slide freely in bores. Ensure retainers, pins and check ball are installed in correct location. See **Fig. 44** and **Fig. 45** .
2. Install low-coast shaft valve with small end first. Install 1-2 relay valve and low coast modulator valve. See **Fig. 40** . Install check valve and spring.
3. Assemble spring, lock-up relay control valve, lock-up relay valve into No. 2 sleeve and insert into bore. Install No. 1 sleeve and pin.
4. Install primary regulator valve, adjusting ring(s) and washer. Install primary regulator valve plunger and spring. Install sleeve and retainer.
5. Install accumulator control valve. Install 3-2 kickdown orifice control valve. Install 2nd lock valve. Install 1-2 shift with small end first. Install 1-2 shift valve low plug.

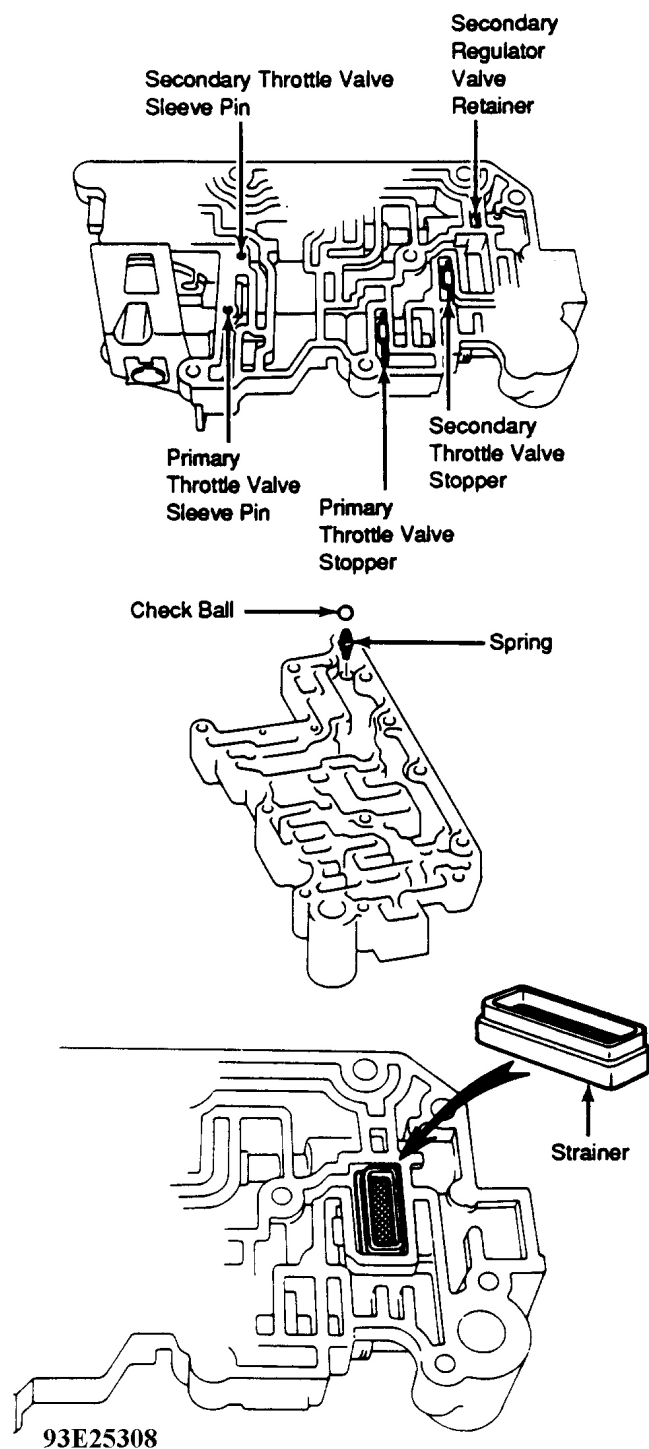


Fig. 41: Front Upper Valve Body Pin, Retainer, Check Ball & Strainer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

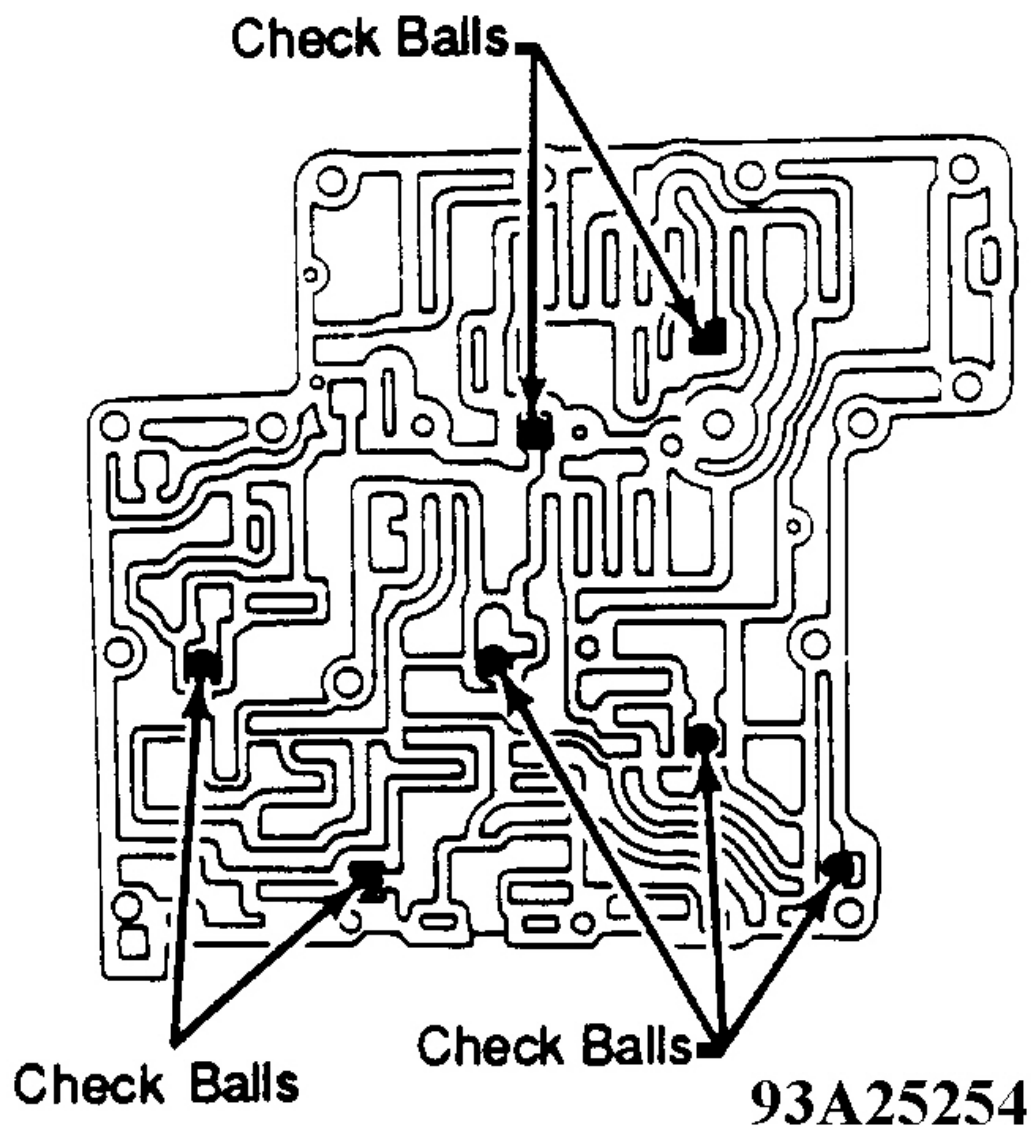
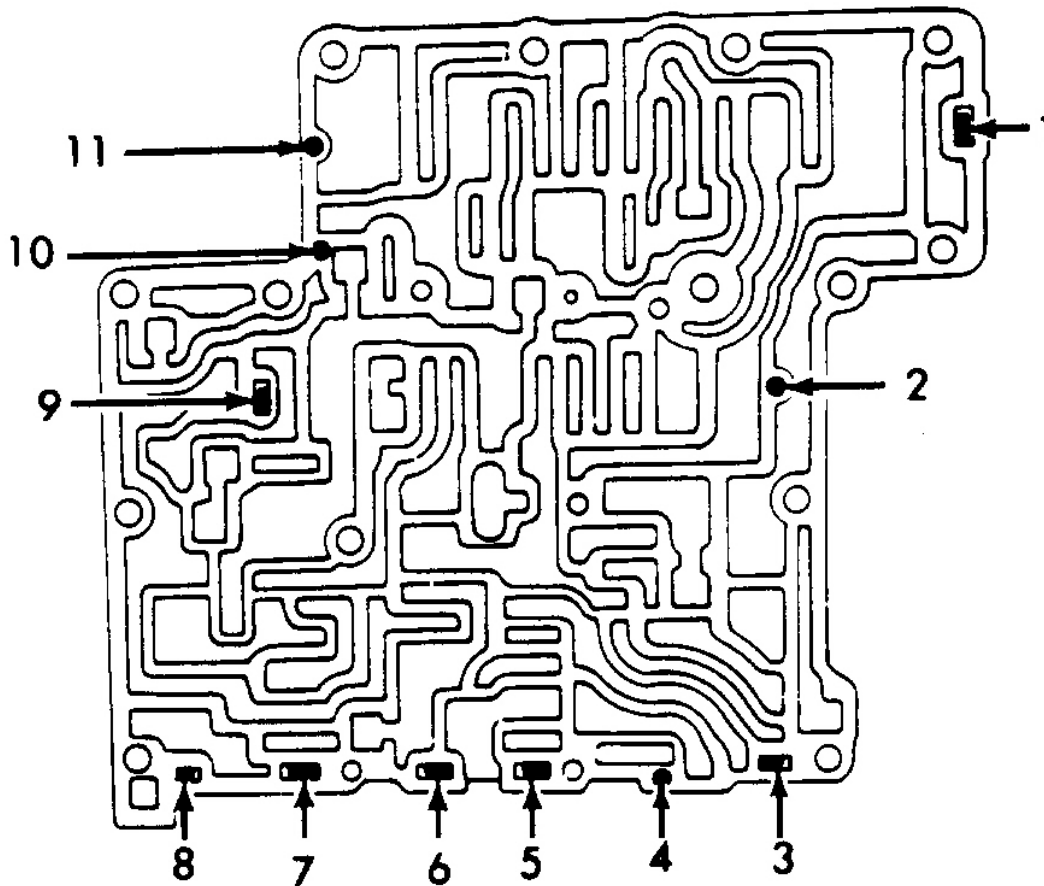


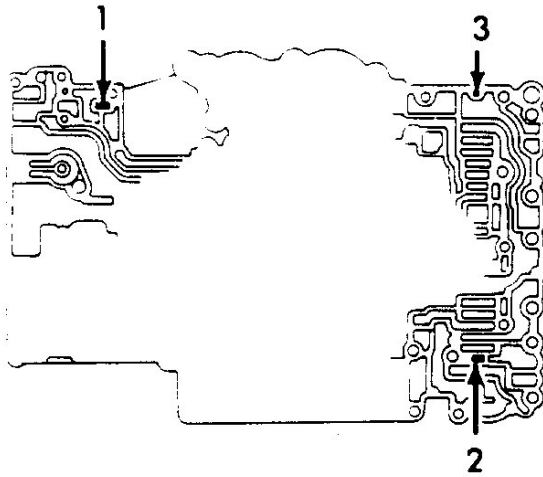
Fig. 42: Locating Rear Upper Valve Body Check Balls
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



1. Retainer For 2-3 Shift Valve Plug
2. Pin For 3-4 Shift Valve Plug
3. Retainer For Detent Regulator Valve Plug
4. Pin For Lock-Up Signal Valve Plug
5. Retainer For Cut-Back Valve Plug
6. Retainer For OD Clutch Exhaust Valve Plug
7. Retainer For Manual Down Timing Valve Plug
8. Retainer For Intermediate Modulator Valve Plug
9. Retainer For 3rd Coast Valve Plug
10. Pin For 2-3 Shift Timing Valve Sleeve
11. Pin For 2-3 Shift Valve Plug

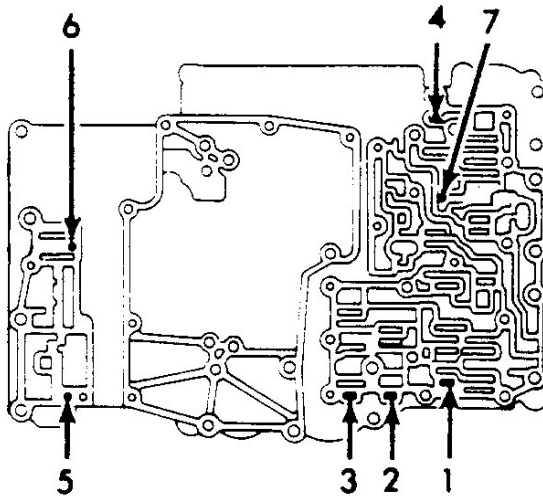
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Fig. 43: Locating Rear Upper Valve Body Retainers & Pins
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



1. Retainer For Primary Regulator Valve Sleeve
2. Retainer For Low Coast Shift Valve Plug
3. Pin For 1-2 Shift Valve Low Plug

UPPER SIDE



1. Retainer For 2nd Lock Valve Plug
2. Retainer For 2-3 Kickdown Orifice Control Valve Plug
3. Retainer For Accumulator Control Valve Plug
4. Retainer For Low Coast Modulator Valve Plug
5. Pin For Lock-Up Relay Valve No. 1 Sleeve
6. Pin For Lock-Up Relay Valve No. 2 Sleeve
7. Pin For 1-2 Relay Valve Plug

LOWER SIDE

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Fig. 44: Locating Lower Valve Body Pin & Retainer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

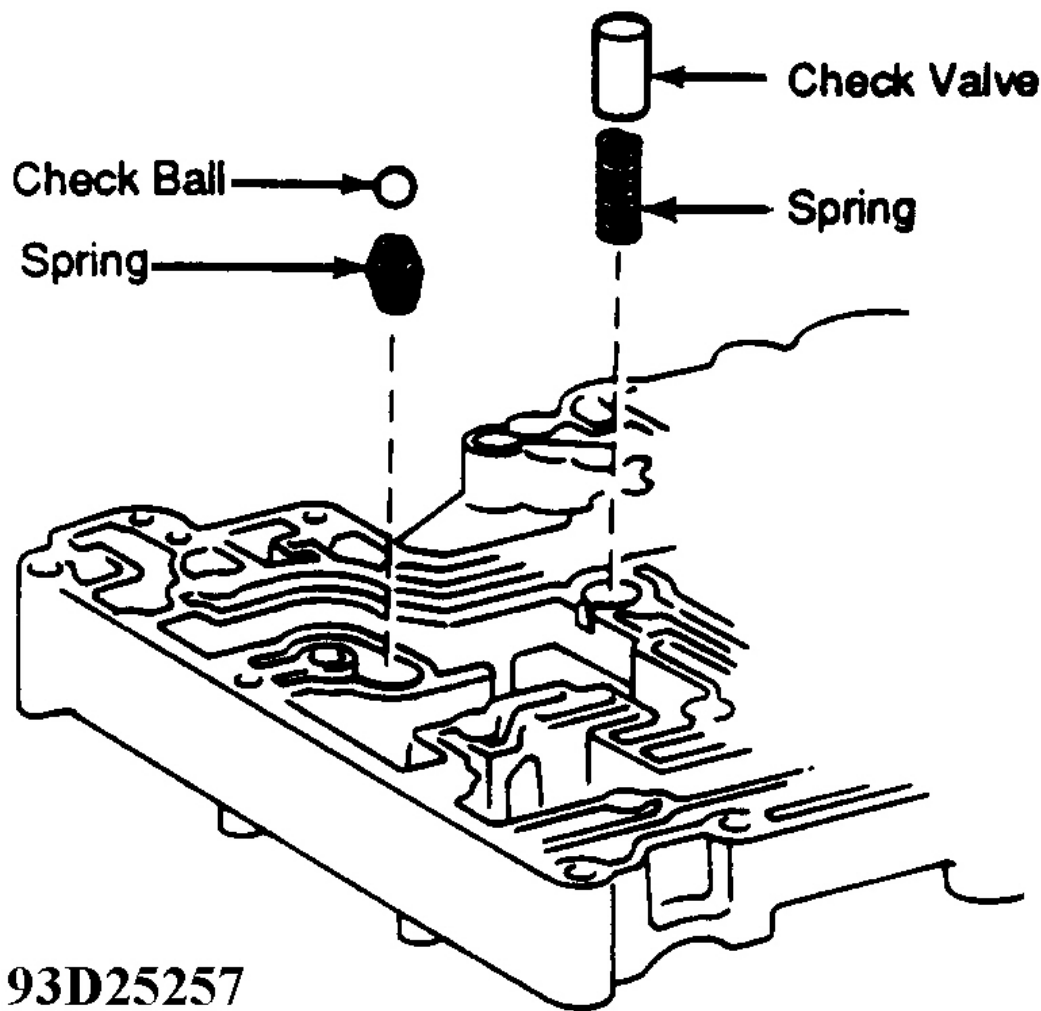


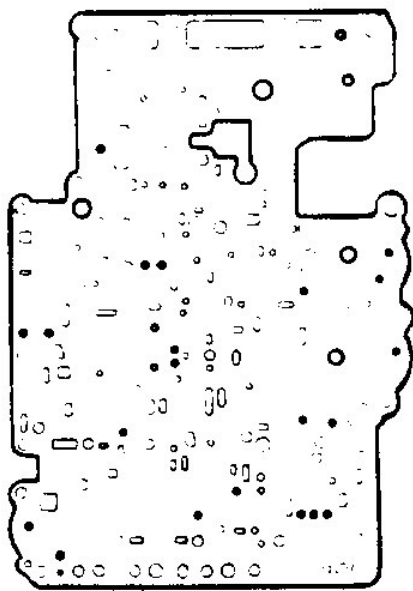
Fig. 45: Locating Lower Valve Body Check Ball

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

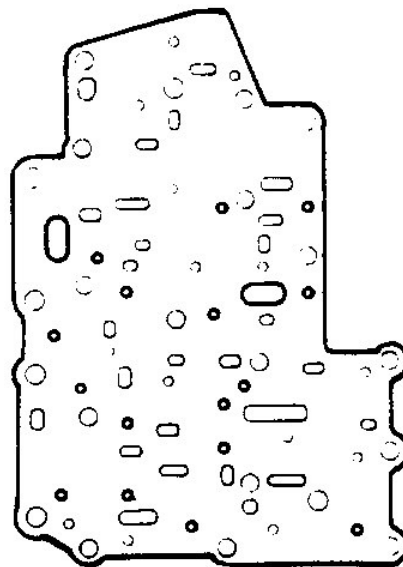
Reassembly (Control Valve Assembly)

1. Position NEW No. 1 gasket and body plate on lower valve body. See **Fig. 46** . Temporarily secure body plate with 2 bolts. Use 2 oil tube clamp bolts. Position NEW No. 2 gasket on body plate.
2. Position lower valve body on rear upper valve body. Temporarily install 6 wave washers and bolts. See **Fig. 47** .
3. Remove 2 temporary installed bolts. Position lower valve body on front upper valve body. Temporarily install 3 wave washers and bolts. See **Fig. 48** .
4. Turn valve body over. Temporarily install 7 wave washers and bolts. See **Fig. 49** .
5. Turn valve body over. Install 2 check balls into lower valve. See **Fig. 50** .

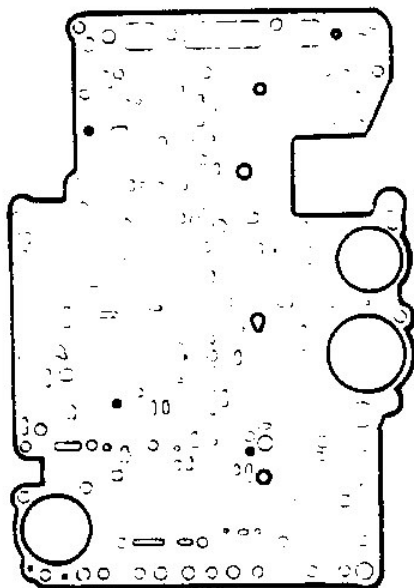
6. Position NEW No. 3 gasket, body plate and new No. 4 gasket on lower valve body. Install body cover with 15 wave washers and bolts. See **Fig. 51** . Torque bolts to 48 INCH lbs. (5.4 N.m).
7. Torque upper and lower valve body bolts to 48 INCH lbs. (5.4 N.m). Install lock-up relay valve sleeve pin. Temporarily install lock-up relay valve body plate. Permanently install lock-up relay valve body plate when valve body is installed in transmission case.
8. Install spacer, detent spring and cover with wave washer and bolt. Torque bolt to 48 INCH lbs. (5.4 N.m). Install manual valve.
9. Install clamp with 2 bolts and wave washers. Using plastic hammer, tap in oil tube. **DO NOT** bend or damage tube. Install tube clamp with 2 wave washers and bolts. Install 2 line pressure tubes.



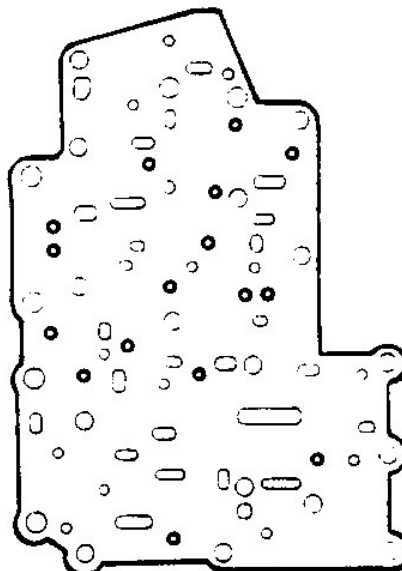
No. 1 Gasket



No. 3 Gasket



No. 2 Gasket



No. 4 Gasket

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Fig. 46: Identifying Valve Body Gasket

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

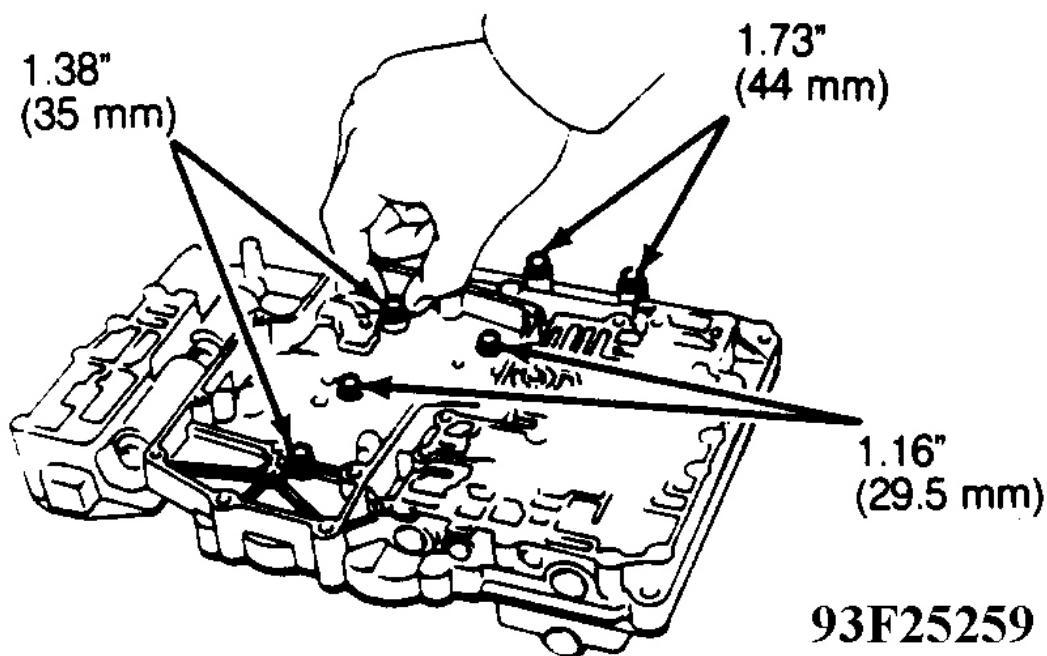


Fig. 47: Locating Valve Body Bolts (1 Of 3)

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

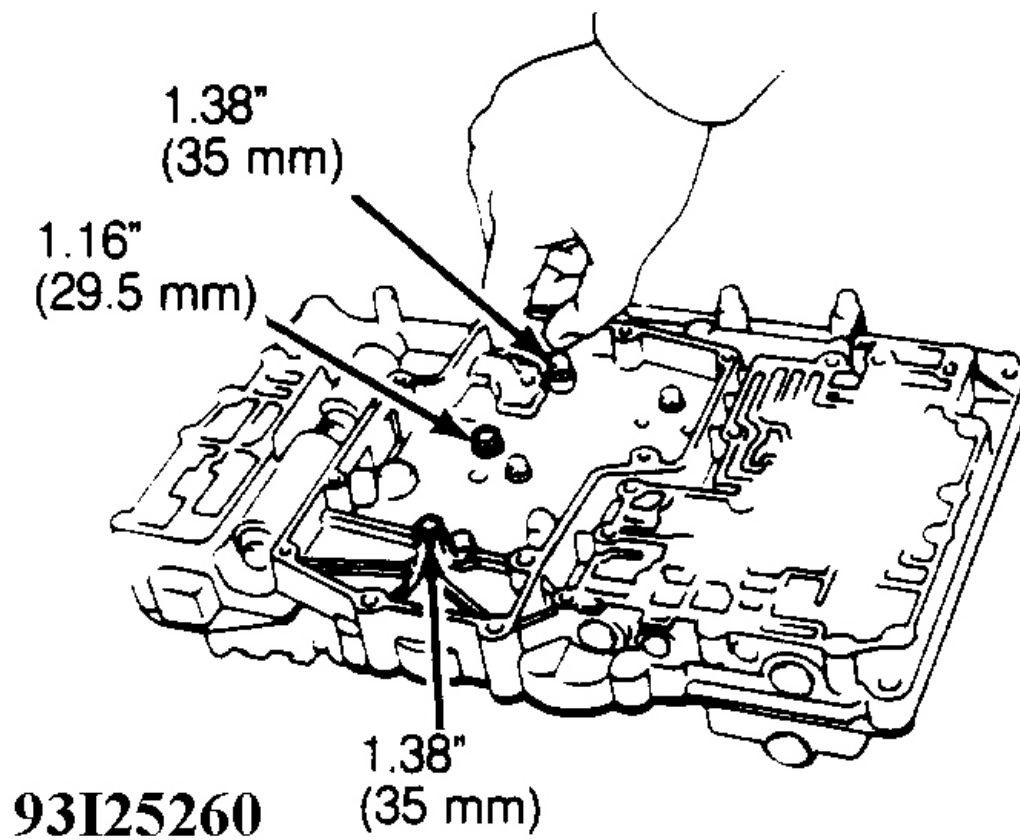


Fig. 48: Locating Valve Body Bolts (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

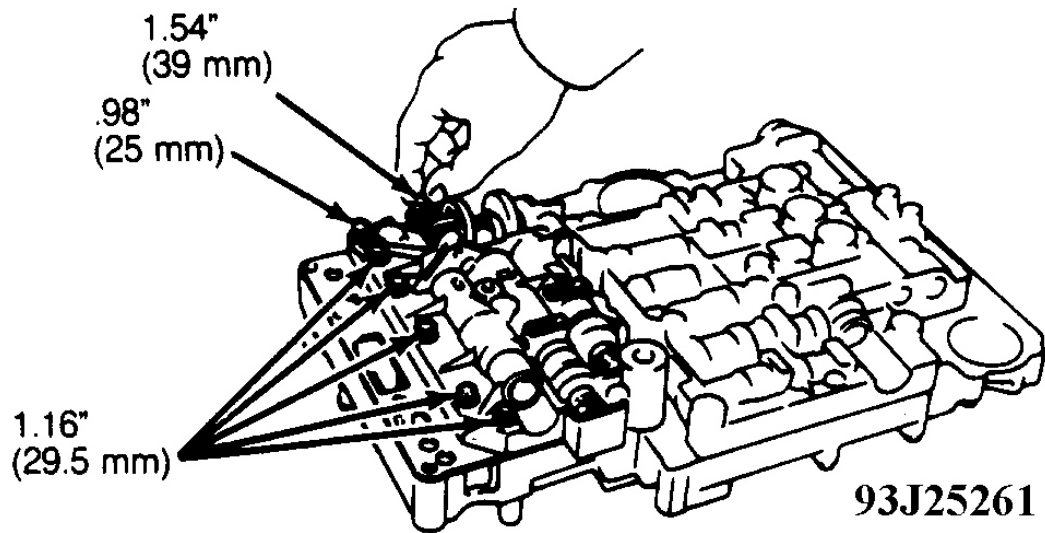


Fig. 49: Locating Valve Body Bolts (3 Of 3)

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

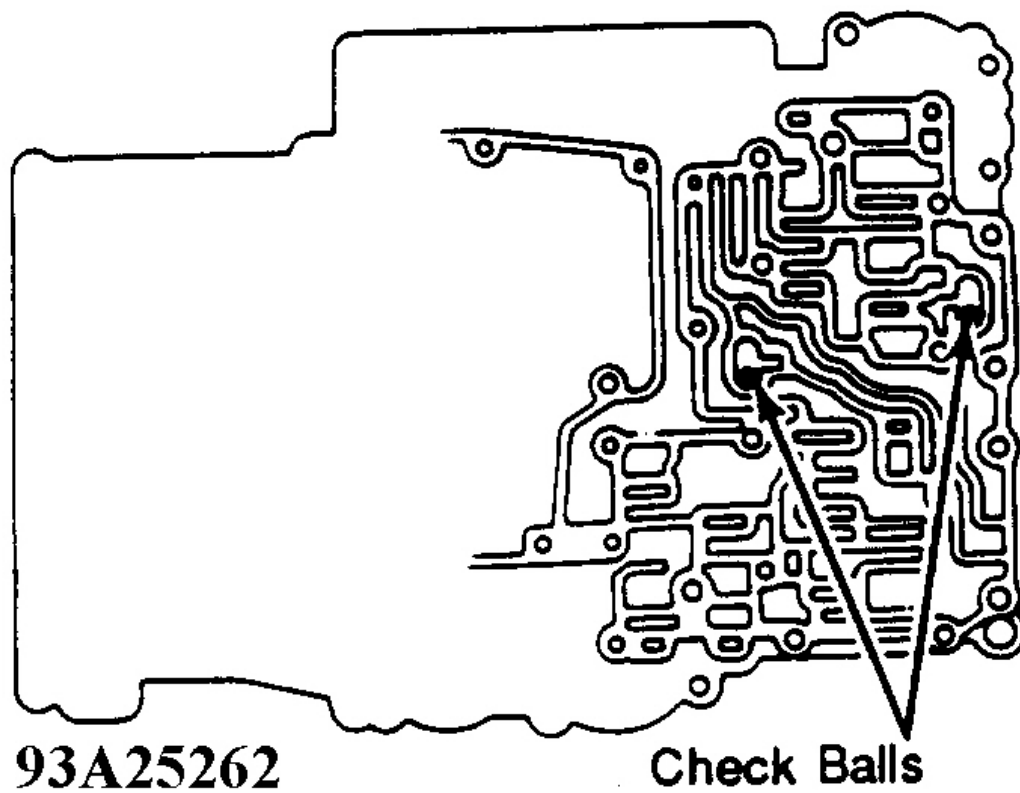


Fig. 50: Locating Valve Body Check Balls
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

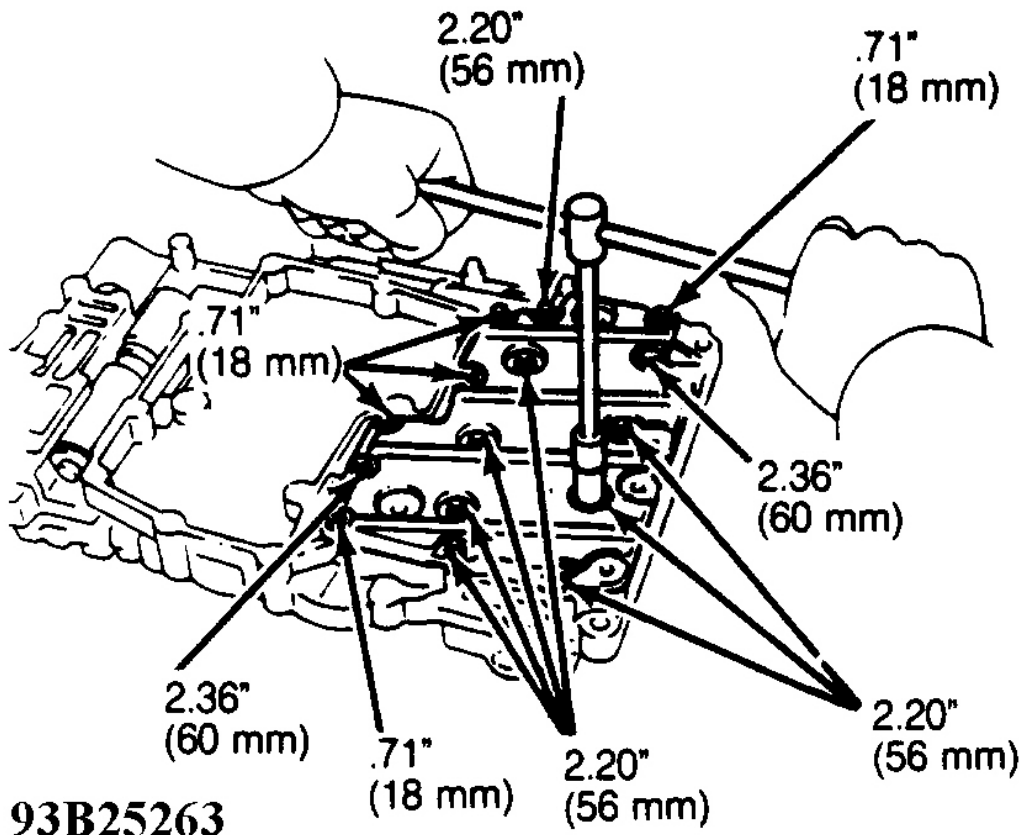


Fig. 51: Locating Valve Body Bolts

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

TRANSMISSION 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 cut-outs and are installed correctly in groove. If a worn bushing is to be replaced, replacement must be made with the subassembly containing that bushing. Check thrust bearings and races for wear or damage. Use petroleum jelly to hold parts in place. Replace parts as necessary. Soak clutch plates in ATF for at least 15 minutes prior to installation.

1. Using Seal Replacer (09350-06150), tap in NEW oil seals. Apply multipurpose grease to oil seal lip. Assemble NEW spacer to manual valve lever. Connect parking lock rod to manual valve lever.
2. Install manual valve lever shaft to transmission case through plate, wave washer, manual valve lever and plate. Using hammer, tap in pin with slot at right angle to shaft. Align spacer hole with notch in lever and

stake in position using a hammer and punch. Ensure manual valve lever shaft turns smoothly.

3. Install NEW gasket and rear cover with 3 bolts and 6 screws. Torque bolts to 69 INCH lbs. (7.8 N.m). Install NEW "O" rings on C1 accumulator piston. Install spring and accumulator piston into bore of case. Install 2 NEW gaskets with plate in between. Install front clutch accumulator cover. Torque bolts to 69 INCH lbs. (7.8 N.m).
4. Place transmission case on a cylinder. **DO NOT** damage case. Tape top of cylinder. Install NEW "O" rings on piston and coat with ATF. Using Handle (09350-06050) and Plate (09350-06090), push in brake piston.
5. Position return spring on brake piston. Using spring compressor, compress return spring. Using screwdriver, install snap ring.
6. Install cushion plate with rounded edge facing inward. Install in order: plate, disc, plate, disc, plate, disc, plate, disc, plate, disc, plate, disc. Install flange with rounded edge facing outward. If flange is step edged, install flange with step edge facing inward. Install snap ring. Ensure end of snap ring is not aligned with cutout portion of transmission case.
7. Using Spring Compressor (09350-06130) and dial indicator, measure piston stroke of 1st and reverse brake piston by applying compressed air. See **Fig. 10** . Piston stroke should be .059-.118" (1.50-3.00 mm). If piston stroke is less than specified, parts may have been assembled incorrectly. Check and reassemble. If piston stroke is greater than specified, select different thickness flange. See **1ST & REVERSE BRAKE FLANGE SPECIFICATIONS** table.

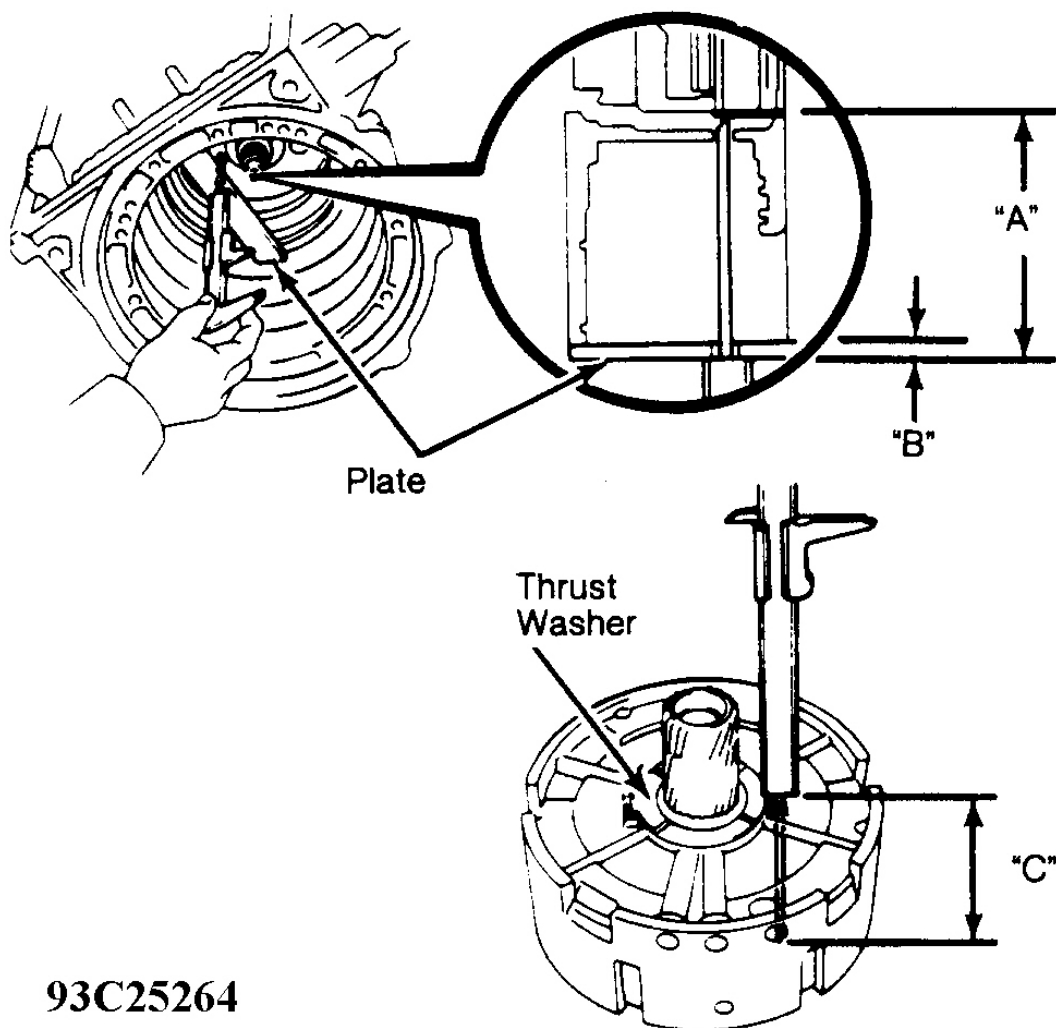
1ST & REVERSE BRAKE FLANGE SPECIFICATIONS

Identifying Mark	Thickness In. (mm)
None	.2618 (6.650)
1	.2776 (7.050)
2	.2933 (7.450)

8. Install planetary gears, one-way clutch and output shaft assembly. Place case on a cylinder per step 4 . Install rear planetary carrier and output shaft assembly to case.
9. Install 2 bolts to front planetary carrier. Use 6 mm bolts. **DO NOT** screw in over 5 revolutions. Align spline of one-way clutch with spline groove of case.
10. Install front planetary carrier and one-way clutch assembly into case. Mesh front planetary carrier spline with disc tabs by rotating and pushing front planetary carrier clockwise. If front planetary carrier will not rotate clockwise, check installation of one-way clutch.
11. Using a screwdriver, install snap ring. Ensure end of snap ring is not aligned with cutout portion of case. Coat thrust washer with petroleum jelly and install on front planetary carrier. Securely fit claws of thrust washer into grooves of front planetary gear.
12. Install governor body on output shaft. Insert a .004" (.10 mm) feeler gauge between output shaft and governor body. Temporarily tighten bolts. Ensure clearance between output shaft and governor body is even all way around. Torque bolts to 89 INCH lbs. (10 N.m).
13. Place NEW gasket on transmission case. Insert parking lock rod between parking lock pawl and bracket. Attach transfer adapter on case. Apply Three Bond (1324) sealant to bolt threads. Install NEW gasket and transfer adapter. Torque bolts to 27 ft. lbs. (37 N.m).
14. Slide spacer on output shaft with cut-out part facing outward. Using Bearing Replacer (09309-36033), install output shaft rear bearing. Install transfer component parts without No. 2 transfer case cover. See

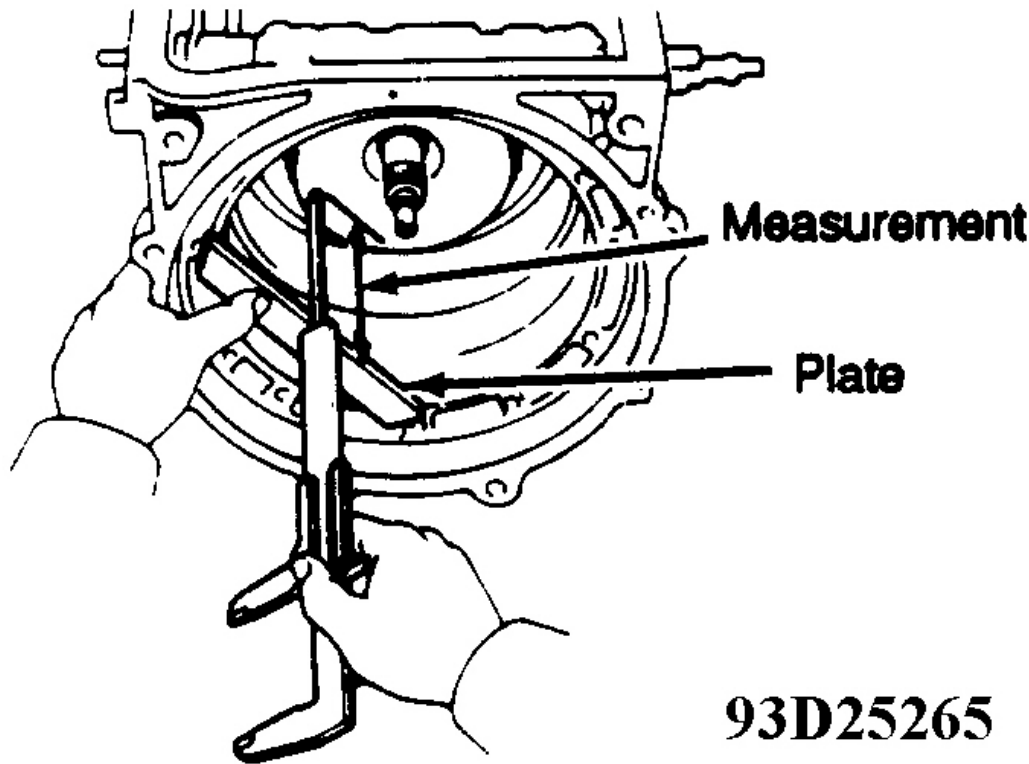
appropriate TRANSFER CASE article in TRANSFER CASES for detailed information.

15. Temporarily install center support assembly. Install thrust washer on rear side of center support. Securely fit thrust washer claws into center support grooves. Install Puller (09350-06140) to center support. Align center support and case oil and bolt holes. Install center support into case.
16. Adjust thrust clearance of center support. Push transmission output shaft toward front of transmission by applying a force of 11-22 lbs. (5-10 kg). Push center support toward rear of transmission by applying a force of 11-22 lbs. (5-10 kg), then pull with same amount of force.
17. Position Plate (09350-06090) on center support. Using calipers, measure distance "A" between top of plate and thrust washer on front planetary gear. Using calipers, measure thickness "B" of Plate (09350-06090). See **Fig. 52**.
18. Remove 3 center support set bolts. Using Puller (09350-06140), remove center support from case. Turn center support and thrust washer over. Place assembly on flat surface. Inserting calipers into thrust washer hole, measure distance "C" between thrust washer hole and flat surface. See **Fig. 52**.
19. Center support thrust clearance is "A" - ("B"+"C"). Standard thrust clearance should be .0118-.0276" (.300-.700 mm). Maximum thrust clearance is .0354" (.900 mm). If thrust clearance is excessive, select and install thrust washer. There are 4 different thicknesses for thrust washers: .071" (1.80 mm), .083" (2.10 mm), .094" (2.40 mm) and .102" (2.60 mm).
20. Install 3 new "O" rings in center support oil holes. Install Puller (09350-06140) to center support. Align center support and case oil and bolt holes. Install center support into case. Apply Three Bond (1344) sealant to center support set bolt threads. Install 3 center support set bolts and torque to 18 ft. lbs. (25 N.m).
21. Install rear clutch into case. Mesh rear clutch drum splines and disc tabs by rotating and pushing rear clutch drum clockwise or counterclockwise.
22. Install races on rear clutch drum and front clutch hub. Install front clutch into case. Mesh front clutch hub splines and disc tabs by rotating and pushing front clutch drum clockwise or counterclockwise.
23. Position Plate (09350-06090) on installation surface of oil pump. Using calipers, measure distance between top of plate and front clutch drum. See **Fig. 53**. If distance corresponds to measurement taken during disassembly, front clutch assembly is installed correctly.



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Fig. 52: Checking Center Support Thrust Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



93D25265

Fig. 53: Checking Front Clutch Installation

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

24. Temporarily install Overdrive (OD) case. Remove oil seal ring from input shaft. Install races, bearing and spacer on front clutch drum. Install Puller (09350-06140) on OD case. Align OD and transmission case oil and bolt holes. Install 3 OD case set bolts. Torque to 18 ft. lbs. (25 N.m).
25. Adjust front clutch drum input shaft thrust clearance. Push transmission output shaft toward front of case by applying a force of 11-22 lbs. (5-10 kg). Push OD case toward rear of transmission by applying a force of 11-22 lbs. (5-10 kg).
26. Using Extension Bar (09350-06130) and dial indicator, measure thrust clearance of input shaft. Standard thrust clearance should be .0118-.0276" (.300-.700 mm). Maximum thrust clearance is .0276" (.700 mm). If thrust clearance is greater than maximum, adjust with spacer.
27. Remove 3 OD case set bolts. Using Puller (09350-06140), remove OD case. Remove races, thrust bearing and spacer from front clutch drum or OD case. Select a spacer. There are 5 different thicknesses of spacers: .035" (.90 mm), .047" (1.20 mm), .059" (1.50 mm), .071" (1.80 mm) and .083" (2.10 mm). Install spacer, races and bearing on front clutch drum. Reinstall oil seal to input shaft.
28. Install OD case. Install new "O" rings on OD case oil holes. Install Puller (09350-06140) to OD case. Align transmission and OD case oil and bolt holes. Apply Three Bond (1344) sealant to OD case set bolt threads. Install 3 OD case set bolts and torque to 18 ft. lbs. (25 N.m). Install snap ring. Install transfer No.

2 case cover.

29. Install race on OD case. Install bearing on ring gear flange. Install OD ring gear assembly.
30. Install bearing and race on OD planetary gear. Install OD planetary gear, OD direct clutch and one-way clutch assembly into transmission case. Mesh OD direct clutch drum splines with disc tabs by rotating and pushing OD direct clutch drum clockwise or counterclockwise.
31. Position Plate (09350-06090) on installation surface of oil pump. Using calipers, measure distance between top of plate and OD clutch drum. See **Fig. 54** . If distance corresponds to measurement taken during disassembly, OD planetary gear, OD direct clutch and one-way clutch assembly is installed properly.
32. Temporarily install oil pump. Install races and bearing on clutch drum. Position gasket on transmission case. Align pump body and case bolt holes. Install and torque bolts to 15 ft. lbs. (21 N.m).
33. Adjust OD planetary gear input shaft clearance. Push OD input shaft toward rear of transmission by applying a force of 11-20 lbs. (5-9 kg). Measure thrust clearance of input shaft. Standard thrust clearance should be .0157-.0354" (.400-.900 mm). If maximum thrust clearance is excessive, adjust with race.
34. Remove 11 oil pump set bolts. Using Puller (09350-06140), remove oil pump and gasket. Remove race from oil pump cover. Select a race. There are 3 different thicknesses of races: .031" (.80 mm), .039" (1.00 mm) and .055" (1.40 mm). Coat race with petroleum jelly and install on oil pump cover.
35. Install oil pump. Position NEW gasket on case. Install "O" ring on pump body. Align pump body and case bolt holes. Using plastic hammer, lightly tap in oil pump to case. Apply Three Bond (1344) sealant to oil pump set bolt threads. Install and torque bolts to 15 ft. lbs. (21 N.m).
36. Install rear clutch, OD brake and 2nd brake accumulator pistons and springs. See **Fig. 55** . Install NEW "O" rings on pistons. Install pistons and springs into the transmission case bores. Refer to the specifications in the **ACCUMULATOR PISTON SPECIFICATIONS** table and **ACCUMULATOR SPRING SPECIFICATIONS** table.

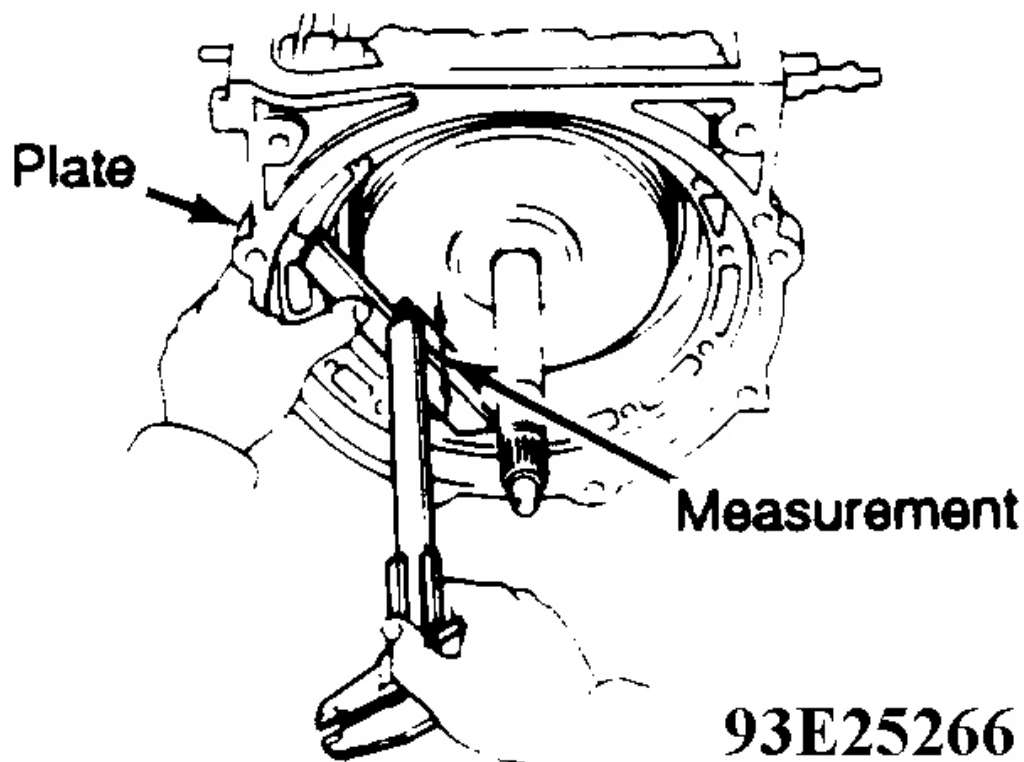


Fig. 54: OD Planetary Gear, Direct & One-Way Clutch Installation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

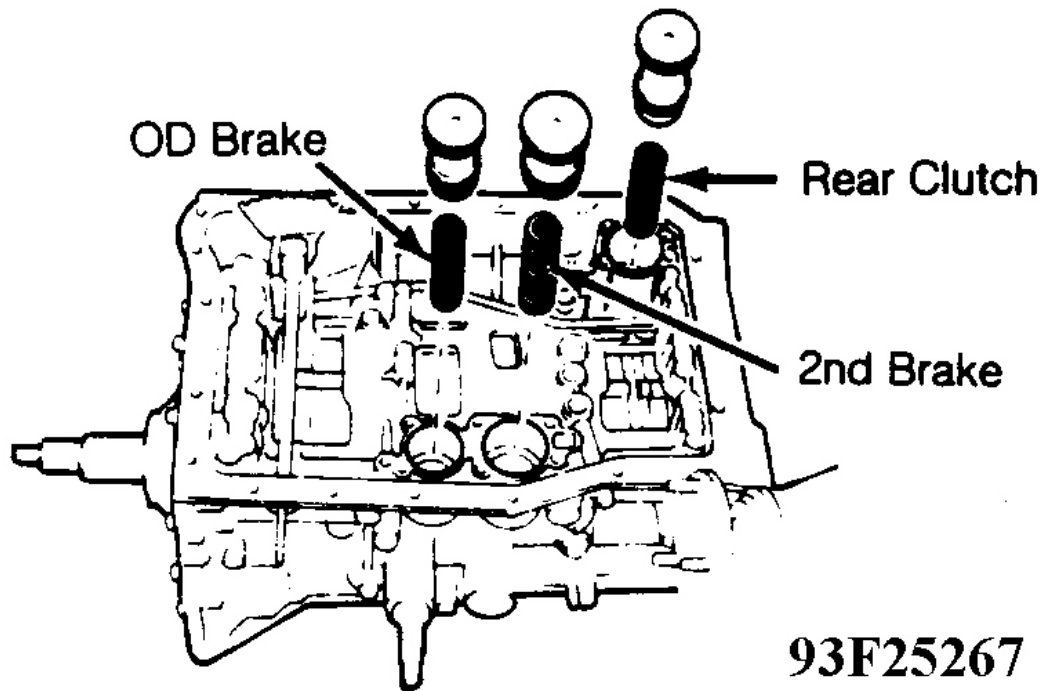


Fig. 55: Exploded View Of Accumulators & Springs
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ACCUMULATOR PISTON SPECIFICATIONS

Application	Diameter In. (mm)
OD Brake	1.413 (35.90)
2nd Brake	1.728 (43.90)
Front Clutch ⁽¹⁾	1.176 (29.90)
Rear Clutch	1.571 (39.90)

(1) For front clutch accumulator piston location, see **Fig. 12** .

ACCUMULATOR SPRING SPECIFICATIONS

Application	Color Code	Free Length In. (mm)	Diameter In. (mm)
OD Brake	None	2.52 (64.1)	.831 (21.10)
2nd Brake			
1991	Yellow	2.56 (65.0)	.988 (25.10)
1992	Yellow	2.48 (63.0)	.854 (21.70)
Front Clutch ⁽¹⁾	None	3.63 (92.3)	.708 (17.90)

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Rear Clutch	Red	3.44 (87.3)	.858 (21.80)
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(1) For front clutch accumulator spring location, see **Fig. 12** .

37. Install NEW "O" ring on throttle cable. Install throttle cable to case. Install 4 NEW center support apply gaskets with pitted side facing toward case.
38. Install the control valve assembly. See **CONTROL VALVE ASSEMBLY** under ON-VEHICLE SERVICE. Ensure proper length bolt is installed in proper location.
39. Install NEW gasket and oil strainer with 7 wave washers and 8 mm head bolts. Install 10 mm head bolts. Torque 8 mm head bolts to 48 INCH lbs. (5.4 N.m) and 10 mm head bolts to 89 INCH lbs. (10 N.m). See **Fig. 3** .
40. Remove lock-up relay valve body plate. **DO NOT** drop lock-up relay valve pins. Install NEW gasket and lock-up relay valve body plate with 4 wave washers (for short bolts) and 7 bolts. Torque 8 mm head bolts to 48 INCH lbs. (10 N.m). See **Fig. 3** .
41. Install magnets in oil pan. Install NEW gasket and oil pan. Torque bolts to 61 INCH lbs. (6.9 N.m). Install oil pan protector.
42. Install transmission housing. Torque bolts to 47 ft. lbs. (64 N.m). Install throttle cable to case. Install new "O" ring on ATF temperature sensor. Install sensor. Torque to 25 ft. lbs. (34 N.m). Install wire clamp. Install oil cooler unions. Torque to 21 ft. lbs. (29 N.m).
43. Install the control shaft lever. Tighten to 115 INCH lbs. (13 N.m). Temporarily install neutral start switch with 2 bolts. Install grommet, NEW lock washer and nut. Torque to 61 INCH lbs. (6.9 N.m). Fully turn control shaft lever back and return 2 notches. Lever is now in Neutral position. Align neutral basic line with switch groove. Torque bolts to 115 INCH lbs. (13 N.m). Bend tabs of lock washer. Bend at least 2 tabs.
44. Install oil cooler pipes with 2 unions and bolt. Torque to 25 ft. lbs. (34 N.m). Install NEW "O" ring on breather plug. Install breather plug and hose. Connect 4 connectors and install transmission wire harness.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
ATF Temperature Sensor-To-Transmission Case Bolt	25 (34)
Center Support Set Bolt	18 (25)
OD Case Set Bolt	18 (25)
Oil Cooler Pipe-To-Oil Cooler Union Bolt	25 (34)
Oil Cooler Pipe Union Nut	25 (34)
Oil Cooler Union-To-Transmission Case Bolt	21 (29)
Oil Pump Cover-To-Oil Pump Body 12 mm Head Bolt	15 (21)
Oil Pump-To-Transmission Case Bolt	15 (21)
Parking Lock Pawl-To-Transfer Adapter Bolt	14 (19)
Propeller Shaft-To-Transfer Bolt	65 (88)
Transfer Adapter-To-Transmission Case Bolt	27 (37)
Transmission Housing-To-Transmission Case Bolt	47 (64)

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Torque Converter-To-Drive Plate Bolt	21 (28)
INCH Lbs. (N.m)	
Control Shaft-To-Transmission Case Bolt	115 (13)
Control Valve Assembly-To-Transmission Case Bolt	89 (10)
Front Accumulator Cover-To-Transmission Case Bolt	69 (7.8)
Front Upper Valve Body-To-Lower Valve Body Bolt	48 (5.4)
Governor Cover-To-Governor Valve Body Support Bolt	89 (10)
Lock-Up Relay Valve Body Plate-To-Valve Body	
8 mm Head Bolt	48 (5.4)
10 mm Head Bolt	89 (10)
Lower Valve Body Cover-To-Lower Valve Body Bolt	48 (5.4)
Manual Detent Spring-To-Lower Valve Body Bolt	48 (5.4)
Neutral Start Switch-To-Manual Valve Shaft Bolt	61 (6.9)
Neutral Start Switch-To-Transmission Case Bolt	115 (13)
Oil Pan-To-Transmission Case Bolt	61 (6.9)
Oil Pump Cover-To-Oil Pump Body 10 mm Head Bolt	78 (8.8)
Oil Strainer-To-Valve Body	
8 mm Head Bolt	48 (5.4)
10 mm Head Bolt	89 (10)
Rear Upper Valve Body-To-Lower Valve Body Bolt	48 (5.4)
Transmission Rear Cover-To-Transmission Case Bolt	69 (7.8)
Valve Body-To-Transmission Case Bolt	89 (10)

WIRING DIAGRAM

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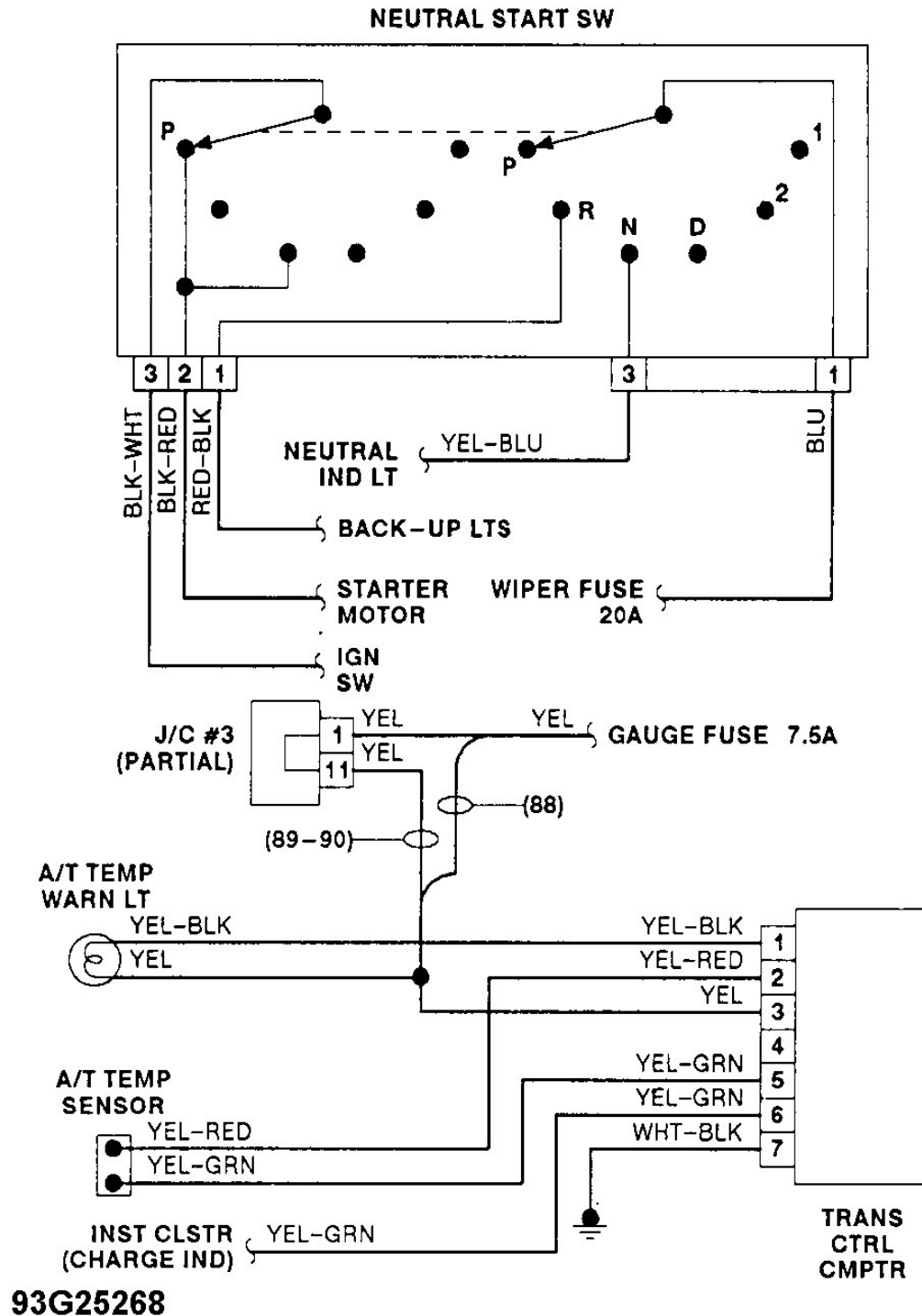


Fig. 56: System Wiring Diagram (A-440F)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.