

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

1984-94 AUTOMATIC TRANSMISSIONS

Toyota A-140E & A-140L Overhaul

APPLICATION

TRANSAXLE APPLICATIONS

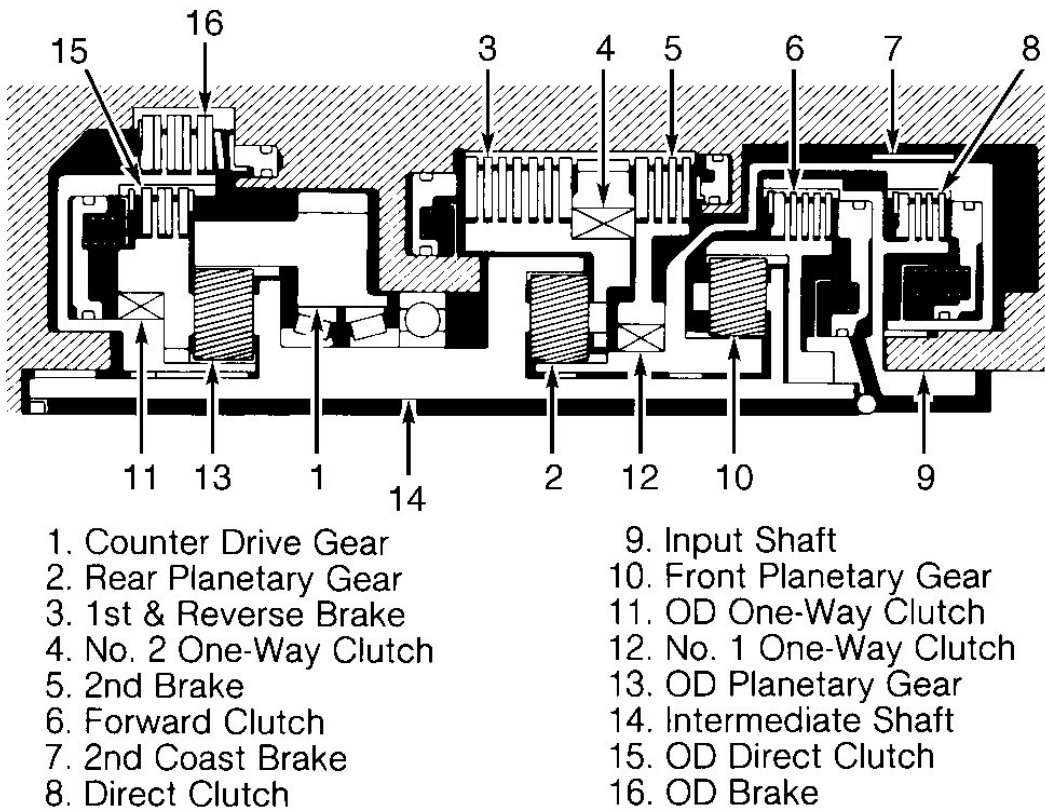
Vehicle Model	Labor Times R & I ⁽¹⁾	Labor Times Overhaul ⁽²⁾	Transaxle Model
1983-87 Camry	N/A	11.5	A-140E
1986 MR2	N/A	N/A	A-141E
1987-89			
Celica DX & LE	N/A	11.5	A-140E
Celica Standard	N/A	12.0	A-140L
1988-90			
Camry DX & LE	N/A	11.5	A-140E
Camry Standard	N/A	12.0	A-140L
1991			
Camry DX & LE	7.1	11.5	A-140E
Camry (All Others)	6.6	12.0	A-140L
1992-93 Camry DX, LE & XLE	6.3	11.5	A-140E
1994 Camry DX, LE & XLE, Celica GT	6.3	11.5	A-140E
(1) Removal and installation of transaxle from vehicle chassis.			
(2) Bench overhaul time for transaxle and differential. DOES NOT include removal and installation.			

IDENTIFICATION

Vehicle Identification Number (VIN) is used for correct identification 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-140E automatic transaxle is a 4-speed Electronic Controlled Transaxle (ECT) which controls shift and lock-up timing. This transaxle features a lock-up type torque converter, planetary gear unit, hydraulic control system and electronic control system.



G93C25116

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

LUBRICATION & ADJUSTMENTS

See the appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING.

ON-VEHICLE SERVICE

DRIVE AXLE SHAFTS

See appropriate AXLE SHAFTS article in DRIVE AXLES.

NO. 2 SPEED SENSOR (1993 MODEL)

Removal

Remove transmission dust cover. Remove 2 bolts securing bracket. Remove bracket. Disconnect speed sensor connector. Remove speed sensor and "O" ring.

Inspection

Connect an ohmmeter to speed sensor. Ensure meter deflects when sensor is repeatedly brought close to a magnet and removed from it.

Installation

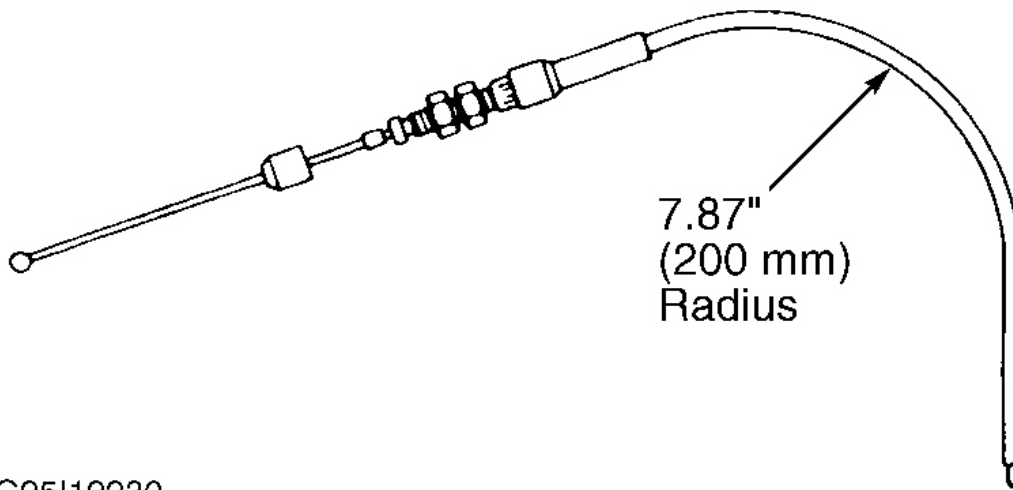
Reverse removal procedure. Replace "O" ring. Tighten bracket bolt to 115 INCH lbs. (13 N.m).

THROTTLE VALVE CABLE**Removal**

1. Disconnect throttle cable from throttle valve linkage. Disconnect housing from bracket. Disconnect transaxle control cable from manual shift lever. Remove manual shift lever. Remove park/neutral position switch at transaxle.
2. Remove valve body. See **VALVE BODY ASSEMBLY**. Remove cable housing retainer bolt. Pull throttle cable out of transaxle.

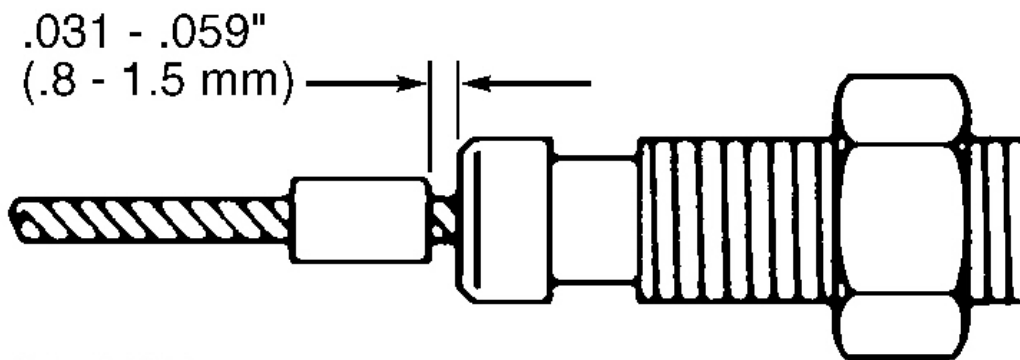
Installation

1. Push cable into transaxle housing and install retainer bolt. Install valve body. See **VALVE BODY ASSEMBLY**. If new cable is being installed, it is necessary to install new cable stopper.
2. Bend cable so there is a radius of approximately 7.87" (200 mm). See **Fig. 2**. Lightly pull cable until a slight resistance is felt. Hold cable in place. Stake stopper within .031-.059" (.8-1.5 mm) of cable housing. See **Fig. 3**.
3. To complete installation, reverse removal procedure. Ensure throttle cable is correctly adjusted. See the appropriate AUTOMATIC TRANSMISSION SERVICING article in TRANSMISSION SERVICING. Also check park/neutral position switch and transaxle control cable adjustment.



G95I19230

Fig. 2: Identifying Throttle Valve Cable Bend
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G95J19231

Fig. 3: Installing Throttle Valve Cable Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

VALVE BODY ASSEMBLY

Removal

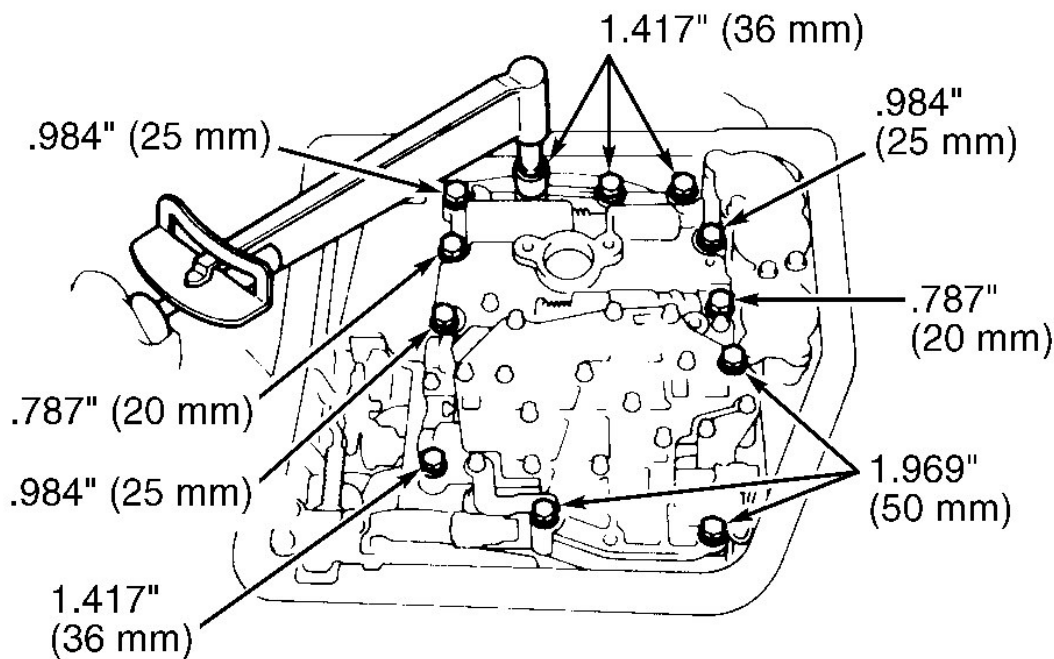
1. Clean exterior of transaxle. Remove oil pan plug. Drain transaxle fluid. Remove oil pan and gasket.

Remove 2 bolts and apply tube bracket. Note bolt length and position during disassembly of valve body for ease of reassembly. Remove 3 bolts and oil strainer.

2. Disconnect solenoid harness connectors. Remove oil tubes. Remove manual detent spring. Remove manual valve and valve body. Remove 12 bolts. Disconnect throttle cable from cam. Remove valve body. Remove 2nd brake apply gasket.

Installation

1. Install 2nd brake apply gasket. While holding cam down, slip cable end into slot. **DO NOT** entangle cable with kickdown switch or solenoid wire. Install valve body. Hand tighten valve body bolts first, then tighten bolts in crisscross pattern to 89 INCH lbs. (10 N.m). See **Fig. 4**. Connect solenoid harness connectors.
2. Align manual valve with pin on manual shift lever. Place lower valve body into position. Initially install 4 bolts hand tight. Tighten bolts in crisscross pattern to 89 INCH lbs. (10 N.m). See **Fig. 5**.
3. Install detent spring. Tighten bolts to 89 INCH lbs. (10 N.m). Ensure manual valve lever is in contact with center of roller at end of detent spring. Tap oil tubes into position. **DO NOT** bend or damage tubes during installation. Install apply tube bracket. Tighten bolts to 89 INCH lbs. (10 N.m).
4. Install oil strainer. Tighten bolts to 89 INCH lbs. (10 N.m). See **Fig. 6**. Install magnets in oil pan. Ensure magnet does not interfere with oil tubes. Install oil pan. Tighten bolts to 43 INCH lbs. (4.9 N.m). Install drain plug with new washer gasket. Tighten plug to 36 ft. lbs. (49 N.m). Fill transmission with oil. See **LUBRICATION & ADJUSTMENTS**.



G93E25118

Fig. 4: Identifying Valve Body Bolt Length & Location

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

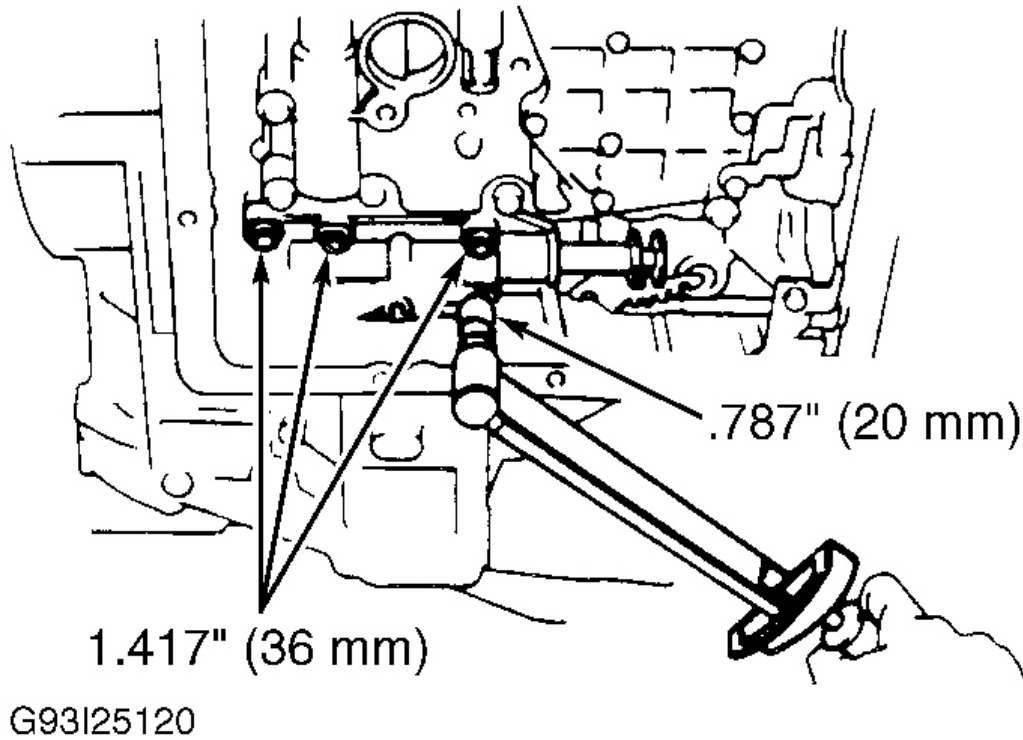


Fig. 5: Manual Valve Body Bolt Length & Location

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

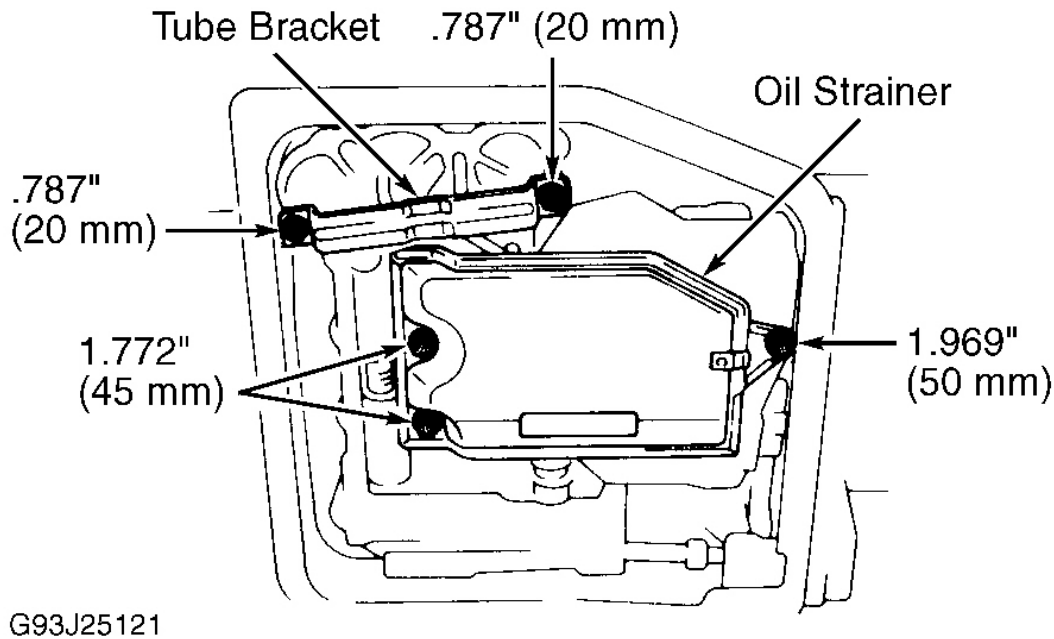


Fig. 6: Tube Bracket I.D. & Oil Strainer Bolt Length & Location
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TROUBLE SHOOTING

SYMPTOM DIAGNOSIS

NOTE: Items listed after symptom are recommended to be checked in order listed.

Vehicle Does Not Move In Any Forward Or Reverse Gear

Check manual valve, primary regulator valve, parking lock pawl, OD one-way clutch, OD direct clutch, OD brake, front planetary gear, rear planetary gear and OD planetary gear.

Vehicle Does Not Move In Any Forward Gear

Check forward clutch, No. 2 one-way clutch, 1st and reverse brake, 2nd coast brake, 2nd brake and direct clutch.

Vehicle Does Not Move In Reverse ("R") Gear

Check 1-2 shift valve, 2-3 shift valve, 2nd coast brake, front planetary gear, rear planetary gear, direct clutch, OD direct clutch and 1st and reverse brake.

No 1-2 And/Or 2-3 Upshift

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

Check Throttle Position Sensor (TPS) circuit, No. 1 and No. 2 shift solenoid circuit, Vehicle Speed Sensor (VSS), Electronic Control Module (ECM), 1-2 shift valve, 2-3 shift valve, second brake, direct clutch and No. 1 one-way clutch.

No 3-OD Upshift

Check OD switch and OD OFF indicator switch circuit, OD cancel signal circuit, No. 1 and No. 2 shift solenoid circuit, VSS, Engine Coolant Temperature (ECT) circuit, ECM, 3-4 shift valve and OD brake.

No OD-3 Downshift

Check No. 1 and No. 2 shift solenoid valve, VSS circuit, OD cancel signal circuit, ECM and 3-4 shift valve.

No 3-2 &/Or 2-1 Downshift

Check No. 1 and No. 2 shift solenoid valve, VSS circuit, TPS circuit, ECM, 2-3 shift valve, 1-2 shift valve and 2nd coast brake.

No Torque Converter Lock-Up

Check shift solenoid valve SL circuit, TPS circuit, VSS circuit, OD cancel circuit, brakelight circuit, ECT circuit, ECM, lock-up relay valve and torque converter clutch.

Torque Converter Lock-Up Will Not Release

Check shift solenoid valve SL circuit, TPS circuit, IDL switch circuit, brakelight circuit, ECT circuit, ECM, lock-up relay valve and torque converter clutch.

Shift Speeds, Too High Or Too Low

Check TPS circuit, VSS circuit, shift solenoid valve SL circuit, OD cancel signal circuit, pattern select switch circuit and ECM.

Harsh Engagement, Neutral To Reverse

Check direct clutch accumulator, direct clutch, throttle valve and, 1st and reverse brake.

Harsh Engagement, Neutral To Drive

Check front clutch accumulator, throttle valve and forward clutch.

No Engine Braking In Low

Check low modulator valve and, 1st and reverse brake.

No Engine Braking In 2nd

Check 2nd modulator valve and 2nd coast brake.

TESTING

PRELIMINARY CHECK

Ensure a thorough explanation of when and how transmission malfunction occurs is received from customer. Check fluid level and condition. Retrieve trouble codes. See **TOYOTA A-140E ELECTRONIC CONTROLS** article. Proceed as necessary. If no codes are present, proceed with symptom diagnosis. See **TROUBLE SHOOTING**. Check throttle cable adjustment. See **LUBRICATION & ADJUSTMENTS**. Perform the following **STALL SPEED TEST**, **TIME LAG TEST** and **HYDRAULIC TEST** as needed. After repairs are completed, perform **ROAD TEST** to confirm repairs.

STALL SPEED TEST

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

1. Testing is done to check overall performance of transmission and engine by measuring maximum engine speeds in "D" and "R" ranges.
2. Block front and rear wheels. Connect engine tachometer. Apply parking and service brakes. Start engine. Shift transmission into "D" range. Fully depress accelerator pedal. Release throttle after 5 SECONDS.
3. Record highest engine RPM. Compare reading obtained to specification. Stall speed should be 2300-2600. Repeat test in "R" range.
4. If engine speed is same for both ranges, but lower than specified RPM, engine output may be insufficient or stator one-way clutch is not operating properly.
5. If stall speed in "D" range is higher than specifications, forward clutch may be slipping, one-way clutch No. 2 and overdrive not operating properly, line pressure too low.
6. If stall speed in "R" range is higher than specifications, direct clutch is slipping, 1st and reverse brake is slipping, line pressure is too low or overdrive one-way clutch not operating properly.
7. If stall speed in "R" and "D" ranges is higher than specifications, line pressure is too low, incorrect fluid level or overdrive one-way clutch not operating properly.

CLUTCH & BAND APPLICATION

Selector Position	Elements In Use
"D" - DRIVE	
1st Gear	OD Direct Clutch, Forward Clutch, OD One-Way Clutch & No. 2 One-Way Clutch
2nd Gear	OD Direct Clutch, Forward Clutch, 2nd Brake, OD One-Way Clutch & No. 1 One-Way Clutch
3rd Gear	OD Direct Clutch, Forward Clutch, Direct Clutch, 2nd Brake & OD One-Way Clutch
Overdrive	Forward Clutch, Direct Clutch, OD

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

	Brake & 2nd Brake
"2" - SECOND	
1st Gear	OD Direct Clutch, Forward Clutch, OD One-Way Clutch & No. 2 One-Way Clutch
2nd Gear	OD Direct Clutch, Forward Clutch, 2nd Coast Brake, 2nd Brake, OD One-Way Clutch & No. 1 One-Way Clutch
3rd Gear ⁽¹⁾	OD Direct Clutch, Forward Clutch, Direct Clutch, 2nd Brake & OD One-Way Clutch
"L" - LOW	
1st Gear	OD Direct Clutch, Forward Clutch, 1st & Reverse Brake, OD One-Way Clutch & No. 2 One-Way Clutch
2nd Gear ⁽¹⁾	OD Direct Clutch, Forward Clutch, 2nd Coast Brake, 2nd Brake, OD One-Way Clutch & No. 1 One-Way Clutch
"P" - PARK	OD Direct Clutch
"R" - REVERSE	OD Direct Clutch, Direct Clutch & 1st & Reverse Brake
"N" - NEUTRAL	OD Direct Clutch
(1) Gear available only during downshifting. No upshifting occurs.	

TIME LAG TEST

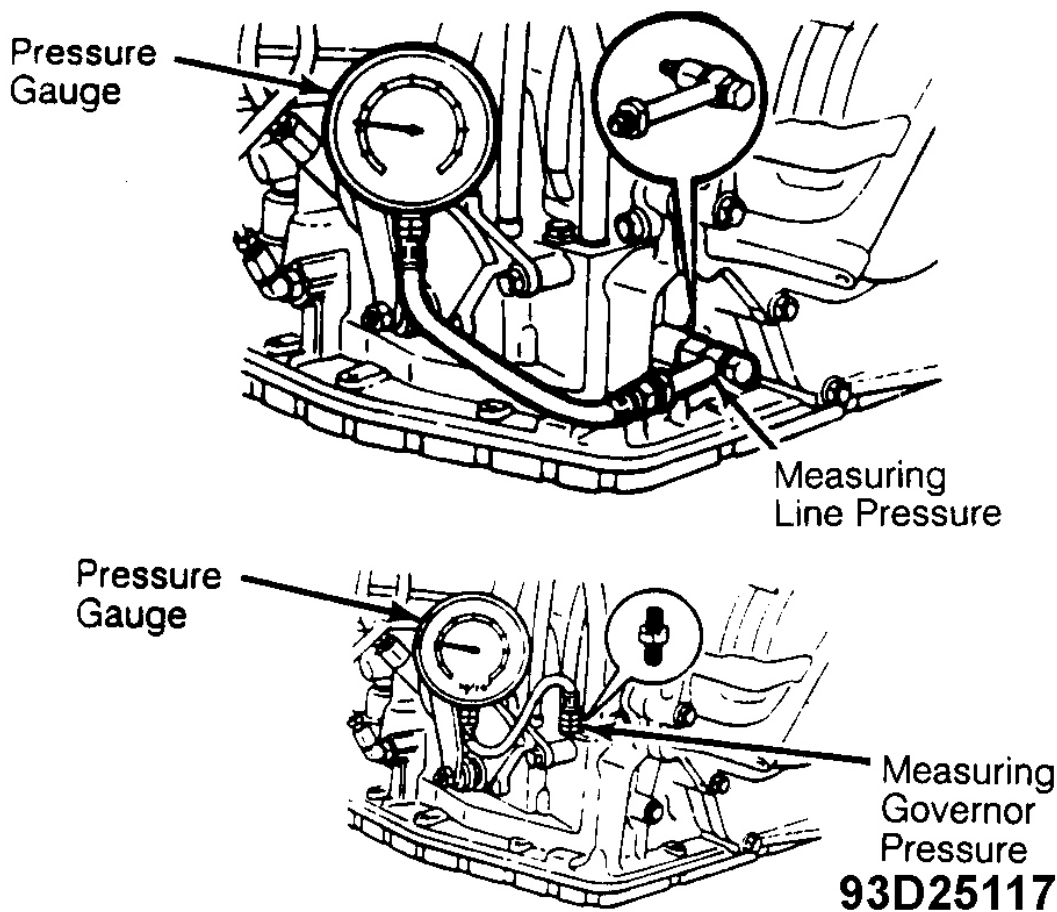
CAUTION: Perform this test at normal operating fluid temperature 122-176°F (50-80°C). Allow 2 minutes between tests. Make 3 measurements and average results.

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 clutch, forward clutch, direct clutch and 1st and reverse brake.
2. Apply parking brake. Start engine. Ensure idle speed is 750RPM. Shift transmission from "N" into "D" range. Use a stop watch to measure elapsed time between shifting lever until shock is felt.
3. Standard time lag is less than 1.2 seconds. Repeat test to measure time lag for "N" to "R". Standard lag is less than 1.5 seconds. If "N" to "D" time lag is longer than specification, line pressure is too low, forward clutch may be worn, overdrive one-way clutch not operating properly.
4. If "N" to "R" time lag is longer than specified, direct clutch may be worn, 1st and reverse brake may be worn, line pressure is too low or overdrive one-way clutch not operating properly.

HYDRAULIC TEST

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

1. Ensure transmission fluid is at operating temperature. Lift and support vehicle. Remove transmission case test plug. Install hydraulic pressure gauge. See **Fig. 7**.
2. Fully apply parking brake. Start engine. Shift into "D" range. Read and record pressure at idle. Fully apply brakes. Depress accelerator pedal to floor. **DO NOT** apply full throttle for more than 5 seconds.
3. Measure highest line pressure. Refer to **LINE PRESSURE SPECIFICATIONS** table. Repeat test in "R" range. If pressures exceed specifications in all ranges, regulator valve or throttle valve is defective or throttle cable out of adjustment.
4. If pressures in all ranges are lower than specifications, oil pump, regulator valve, throttle valve or overdrive clutch is defective or throttle cable is out of adjustment.
5. If pressure is lower than specifications in "D" range only, forward clutch is defective or "D" range circuit has a fluid leak. If pressure is lower than specifications in "R" range only, direct clutch is defective, 1st and reverse brake is defective or "R" range circuit has a fluid leak.



93D25117

Fig. 7: Locating Line Pressure Test Connections
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

LINE PRESSURE SPECIFICATIONS

Engine RPM	"D" Range psi (kg/cm ²)	"R" Range psi (kg/cm ²)
Idle Speed	53-61 (3.7-4.3)	90-115 (6.3-8.1)
Stall Speed	109-130 (7.7-9.2)	199-233 (14.0-16.4)

ROAD TEST

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

"D" Range Test In NORM & PWR Pattern Ranges

1. Shift into "D" range. Hold the accelerator pedal constant at full throttle. Place shift mode button in NORM or PWR position. Check the 1-2, 2-3, and 3-OD lock-up and upshift points. See **SHIFT SPEED SPECIFICATIONS**.

NOTE: There is no overdrive upshift when coolant temperature is below 122°F (50°C). There is no lock-up when vehicle speed is 6 MPH less than the set cruise control speed.

- If no 1-2 upshift occurs, check 1-2 shift valve or solenoid.
 - If no 2-3 upshift occurs, check 2-3 shift valve or solenoid.
 - If no 3-OD upshift occurs, check 3-OD shift valve.
 - If all shift points are incorrect, check throttle valve, 1-2 shift valve, 2-3 shift valve and 3-OD shift valve.
 - If all lock-up points are incorrect, check lock-up relay valve or solenoid.
2. Use procedure outlined in step 1) to check for shock and slip between 1-2, 2-3, and 3-OD upshifts. If shock is harsh, line pressure may be too high. Also check accumulator or check ball.
 3. Run vehicle in "D" range lock-up or overdrive gear. Check for abnormal noise and vibration.

NOTE: Check for cause of abnormal noise and vibration must be made with extreme care as problem could be due to an unbalanced drive shaft, differential, tire, torque converter, etc.

4. While running in "D" range, confirm correct kickdown vehicle speed limits for 2-1, 3-2, OD-3 shift points. Check for abnormal shock and slip at kickdown.
5. Check lock-up function. Drive vehicle in OD gear of "D" range with lock-up on. Hold vehicle speed steady at 47 MPH. Lightly depress accelerator pedal. Ensure engine RPM does not change abruptly. Large increase in engine RPM indicates lock-up function is faulty.

"2" Range Test

1. Shift to "2" range. Drive with accelerator pedal held constantly at full throttle. Ensure 1-2 upshift points at each accelerator opening take place and are operating properly.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

NOTE: In "2" range there will be no lock-up to 2nd gear.

- While driving in "2" range, release accelerator pedal and check engine braking effect. If there is no engine braking effect, 2nd coast brake is defective. Check for abnormal noise and shock at acceleration and deceleration.

"L" Range Test

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

"R" Range Test

Shift into "R" range. Accelerate in reverse from a stop at full throttle. Ensure slipping does not occur.

"P" Range Test

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

SHIFT SPEED SPECIFICATIONS

A-140E SHIFT SPEED SPECIFICATIONS ⁽¹⁾ (CAMRY)

Application	MPH
"D" Range	
NORM	
1st-2nd	36-40
2nd-3rd	68-75
3rd-OD	91-98
3rd-OD ⁽²⁾	24-28
OD-3rd ⁽²⁾	11-15
OD-3rd	86-93
3rd-2nd	61-67
2nd-1st	26-30
PWR	
1st-2nd	36-40
2nd-3rd	68-75
3rd-OD	91-98
3rd-OD ⁽²⁾	24-28
OD-3rd ⁽²⁾	11-15
OD-3rd	86-93
3rd-2nd	63-69

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

2nd-1st	32-36
"2" Range	
NORM or PWR	
1st-2nd	36-40
3rd-2nd	55-62
2nd-1st	26-30
"L" Range	
NORM or PWR	
2nd-1st	31-35
(1) Wide open throttle.	
(2) Fully closed throttle.	

A-140E SHIFT SPEED SPECIFICATIONS ⁽¹⁾ (CELICA)

Application	MPH
"D" Range	
1st-2nd	33-37
2nd-3rd	62-68
3rd-OD	89-95
3rd-OD	33-37
OD-3rd	12-14
OD-3rd	83-89
3rd-2nd	56-61
2nd-1st	26-29
"2" Range	
1st-2nd	33-37
2nd-1st	26-29
"L" Range	
2nd-1st	28-31
(1) Wide open throttle. (2) - Fully closed throttle.	

LOCK-UP SPEEDS ⁽¹⁾ (CAMRY)

Application	MPH
"D" Range ⁽²⁾	
NORM	
Lock-Up ON in 3rd ⁽³⁾	53-57
Lock-Up OFF in 3rd ⁽³⁾	49-53
Lock-Up ON in OD	42-46
Lock-Up OFF in OD	35-38
PWR	

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

Lock-Up ON in 3rd ⁽³⁾	53-57
Lock-Up OFF in 3rd ⁽³⁾	49-53
Lock-Up ON in OD	45-50
Lock-Up OFF in OD	43-48
(1) Throttle valve opening 5 percent.	
(2) There is no lock-up in "L" or "2" range.	
(3) With OD switch off.	

LOCK-UP SPEEDS ⁽¹⁾ (CELICA)

Application	MPH
"D" Range ⁽²⁾	
Lock-Up ON in 3rd ⁽³⁾	41-44
Lock-Up OFF in 3rd ⁽³⁾	38-41
Lock-Up ON in OD	48-51
Lock-Up OFF in OD	44-47
(1) Throttle valve opening 5 percent.	
(2) There is no lock-up in "L" or "2" range.	
(3) With OD switch off.	

REMOVAL & INSTALLATION

TRANSAXLE

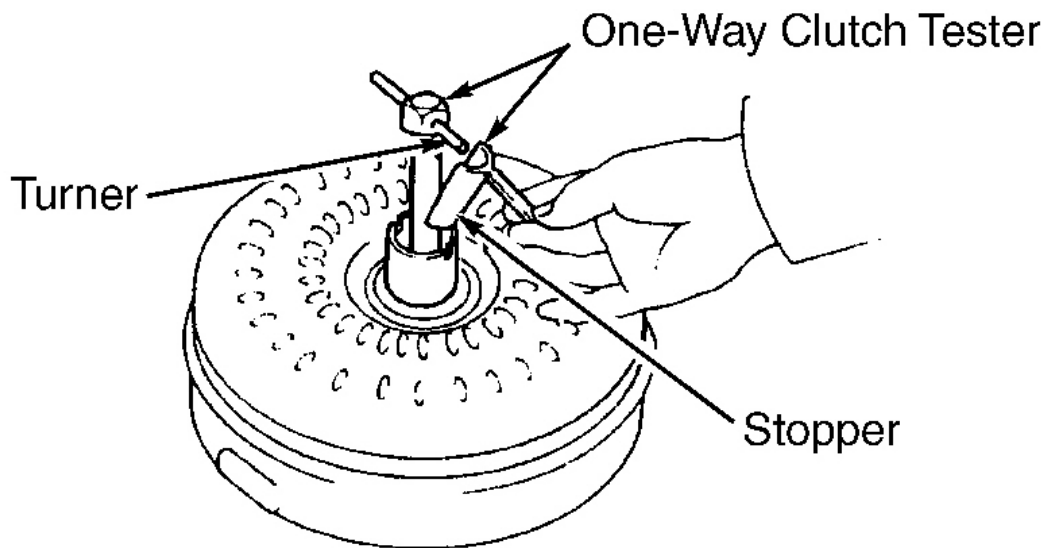
See the appropriate AUTOMATIC TRANSMISSION REMOVAL article in TRANSMISSION SERVICING.

TORQUE CONVERTER

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

ONE-WAY CLUTCH TEST

1. Insert a turning tool into inner race of one-way clutch. Install Tester (09351-32010) so that it fits in notch of converter hub and other 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. 8**.
3. If one-way clutch fails test in either direction, clean converter. Retest clutch. If clutch fails test, replace converter.



G93I23810

Fig. 8: Testing One-Way Clutch

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

CONVERTER SLEEVE RUNOUT TEST

1. Temporarily mount Tighten converter to drive plate. Mount a dial indicator with needle resting on converter sleeve. See **Fig. 9**. 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 Tighten converter. Mark position of converter to ensure correct installation. Remove converter.

DRIVE PLATE (FLYWHEEL) RUNOUT TEST

Measure drive plate runout. See **Fig. 10**. 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 61 ft. lbs. (83 N.m).

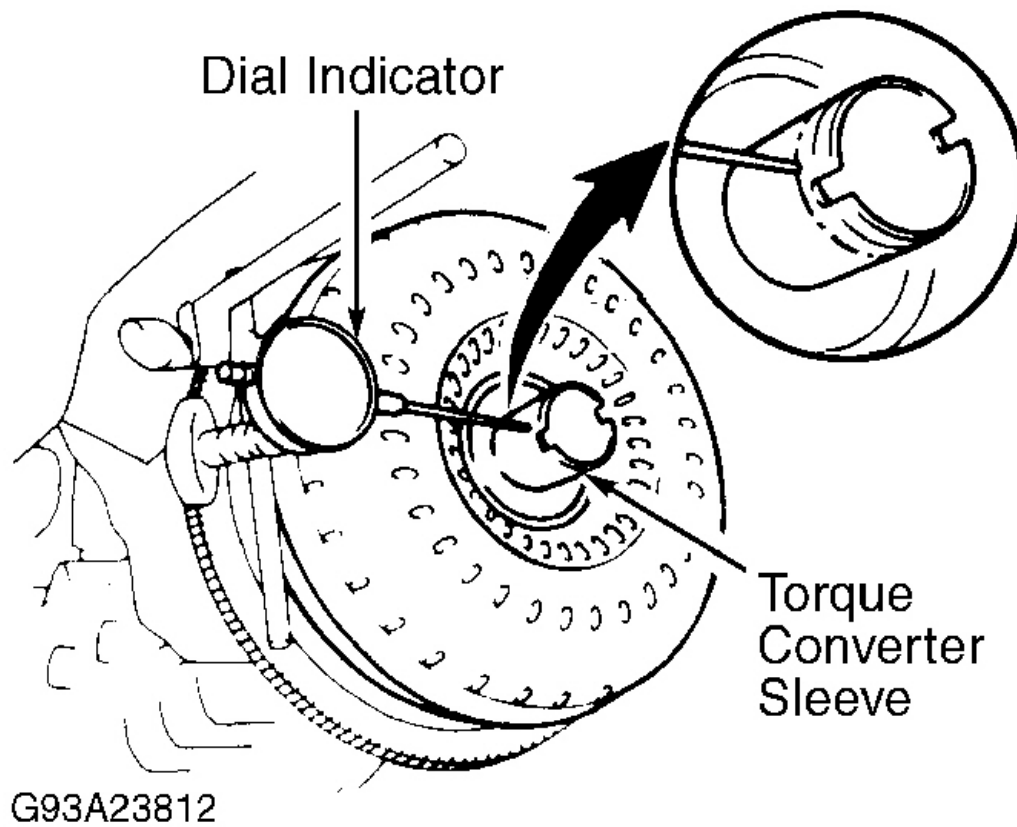


Fig. 9: Measuring Torque Converter Sleeve Runout
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

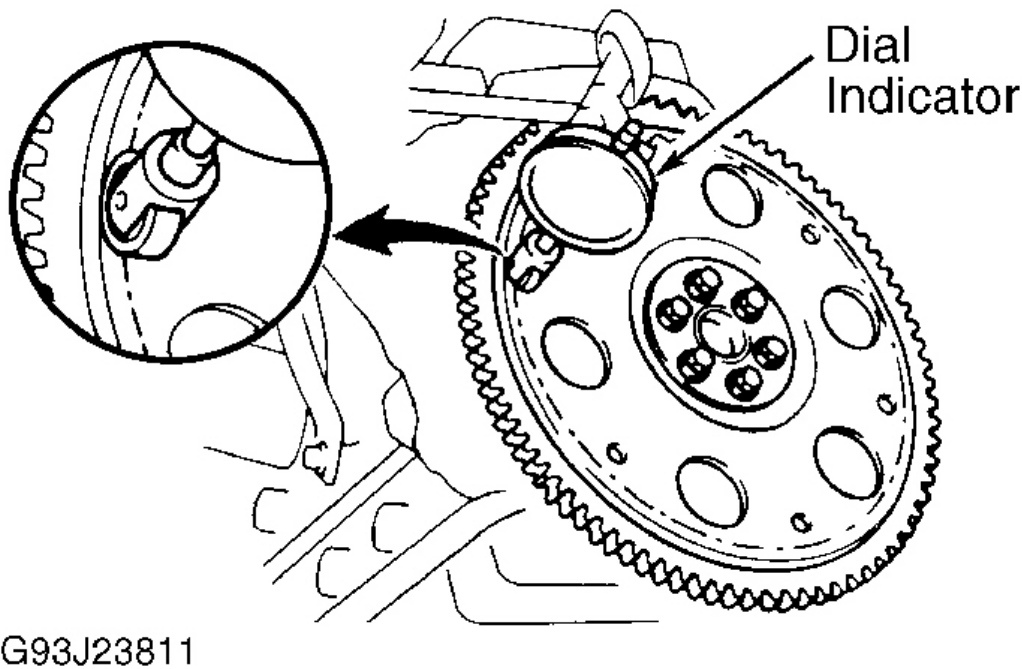


Fig. 10: Checking Drive Plate Runout

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

TRANSAXLE DISASSEMBLY

1. Remove oil cooling tubes. Remove union and elbow. Remove manual shift lever and park/neutral position switch. Remove 2 solenoid attaching bolts and solenoid. Remove oil filler tube. Unbolt throttle valve cable retaining plate. Remove solenoid wire retaining bolt.
2. Unplug speed sensor connector (if equipped). Remove cover bracket, speed sensor and "O" ring. Remove 15 oil pan bolts and remove oil pan. **DO NOT** turn transaxle over. This will contaminate valve body with foreign material.
3. Place transaxle on wooden blocks to prevent damage to pipe bracket. Examine particles found in oil pan. If particles are magnetic (steel), bearing, gear and clutch plate wear are indicated. If particles are brass, bushing wear is indicated.
4. Turn transaxle over. Remove tube bracket, oil strainer and solenoid connectors. Using screwdriver, carefully remove 4 oil tubes. Remove manual detent spring, manual valve and valve body.
5. Remove valve body bolts. Disconnect throttle cable from throttle valve cam. Remove valve body. Remove throttle cable. Remove solenoid wiring from case. Remove 2nd brake apply gasket.
6. Loosen 5 bolts one turn at a time until spring tension is released. Remove cover and gasket. Remove piston and spring for forward clutch and direct clutch. Using 15 psi (1 kg/cm²) of air pressure in apply hole, pop out 2nd brake piston into a shop cloth. Remove piston and spring. See **Fig. 11**.

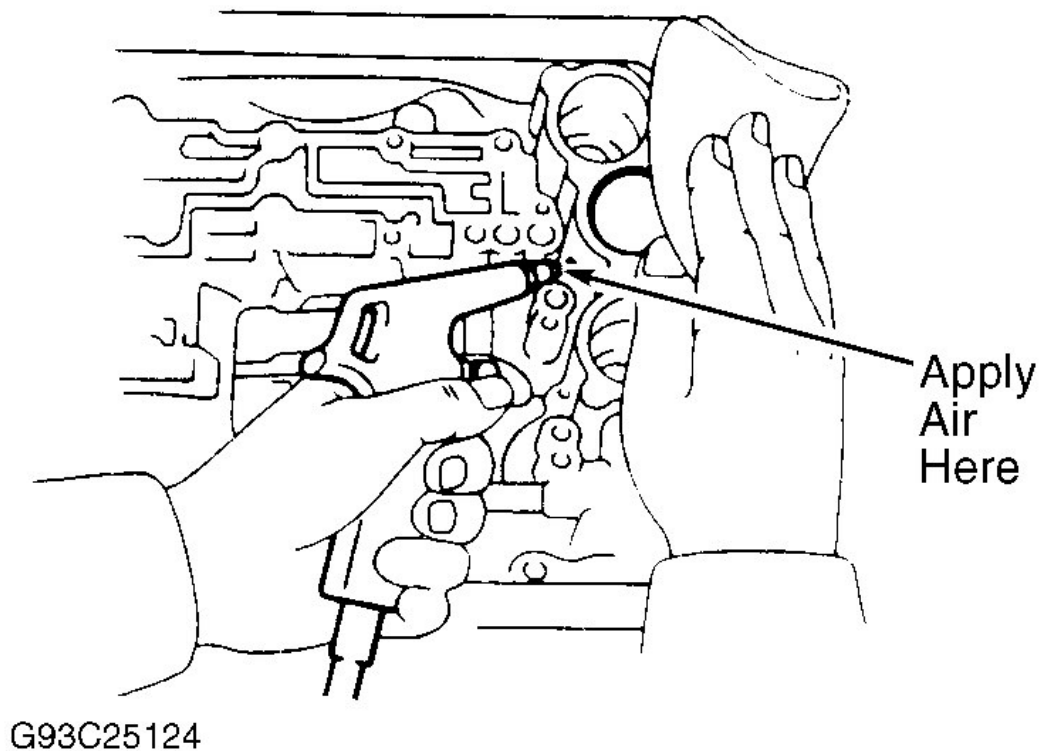


Fig. 11: Removing Accumulator Piston & Spring
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Remove 2nd coast brake piston snap ring and cover. Remove piston and outer return spring. Remove 7 oil pump-to-case bolts. Using appropriate puller, remove oil pump.
8. Direct clutch assembly should be attached to oil pump. Remove direct clutch from oil pump. **DO NOT** lose race located behind oil pump. Remove clutch drum thrust washer.
9. Remove forward clutch with thrust bearing and race. Remove 2nd coast brake band. Push pin with a small screwdriver to remove pin from bolt hole of oil pump mounting. Remove brake band.
10. Remove front planetary ring gear. Remove race and bearing from ring gear. Remove planetary gear. Remove bearing from planetary sun gear. Remove sun gear, sun gear input drum, 2nd brake hub and No. 1 one-way clutch. Stand transmission case up and remove 2nd coast brake band guide.
11. Remove snap ring holding 2nd brake drum to case. Remove 2nd brake drum. If brake drum is difficult to remove, lightly tap drum with a wooden block. Remove 2nd brake drum gasket from bottom of case. Remove 2nd brake piston return spring.
12. Remove clutch plates, discs and flange. Remove snap ring holding No. 2 one-way clutch outer race to case. Remove No. 2 one-way clutch and rear planetary gear. Retain planetary carrier thrust washers, located on both sides.
13. Remove rear planetary ring gear, bearing and race. Remove snap ring holding 1st and reverse brake

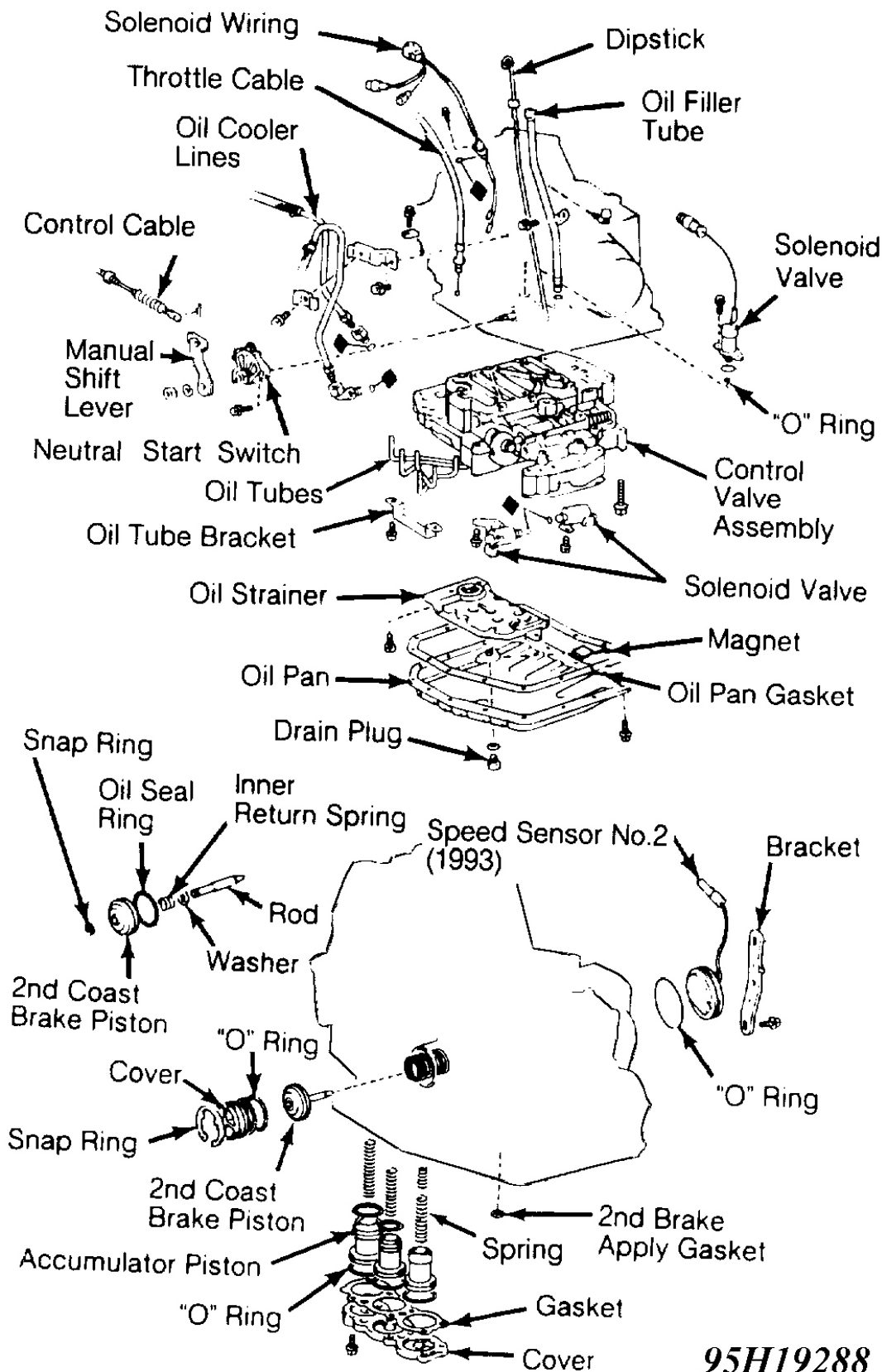
flange to case. Remove flanges, plates and discs. Turn transmission around. Remove 11 bolts attaching overdrive unit to transmission case. Remove overdrive unit. Tap on outside of overdrive case with a plastic hammer. Remove overdrive planetary gear and countergear.

14. Remove overdrive brake drum from transmission case. Remove case gasket. Remove overdrive clutch apply gasket and overdrive brake apply gasket. Using Spring Compressor (09351-32040), compress 1st and reverse piston return springs.
15. Remove snap ring. Remove return spring from case. Remove 1st and reverse brake piston with compressed air. See **Fig. 14**. Remove "O" rings from piston.
16. Remove parking lock pawl bracket and lock rod. Remove pin, spring and parking lock pawl. Remove manual valve shaft. Remove retaining spring. Using a hammer and chisel, pry and turn collar. Using a hammer and punch, drive out pin. Slide shaft out and remove manual valve lever from case. Remove manual shaft oil seal with a screwdriver.

NOTE: For differential and drive pinion assembly removal and installation procedures, see **COMPONENT DISASSEMBLY & REASSEMBLY**.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul



95H19288

Fig. 12: Locating Transaxle External Components

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

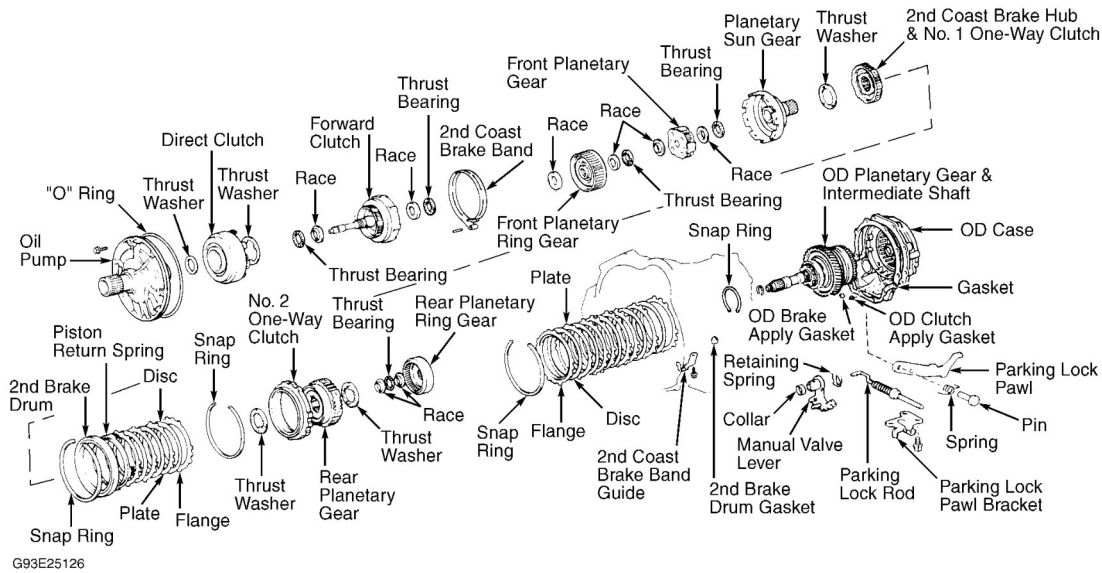


Fig. 13: Exploded View Of Transaxle Internal Components

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

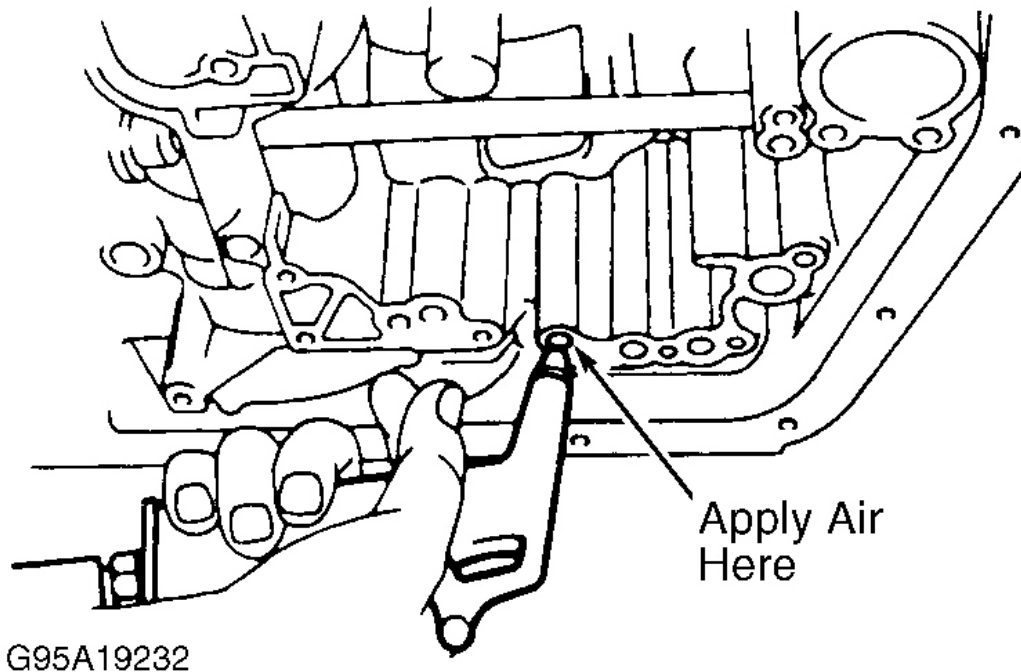


Fig. 14: Removing 1st & Reverse Piston

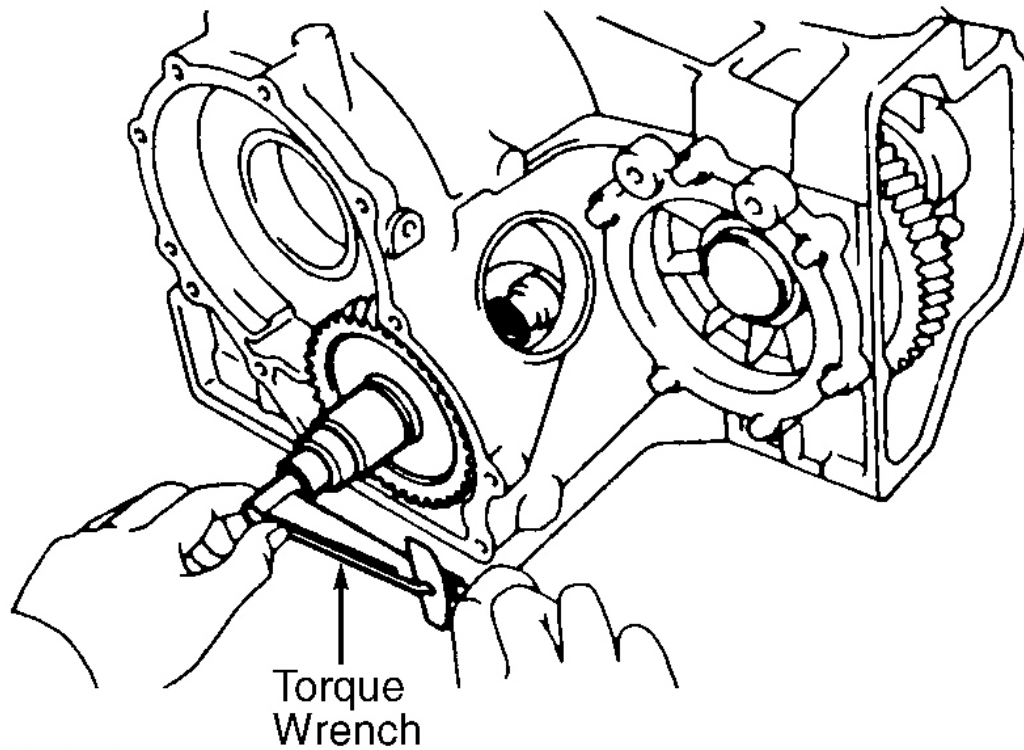
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

COMPONENT DISASSEMBLY & REASSEMBLY

DIFFERENTIAL ASSEMBLY

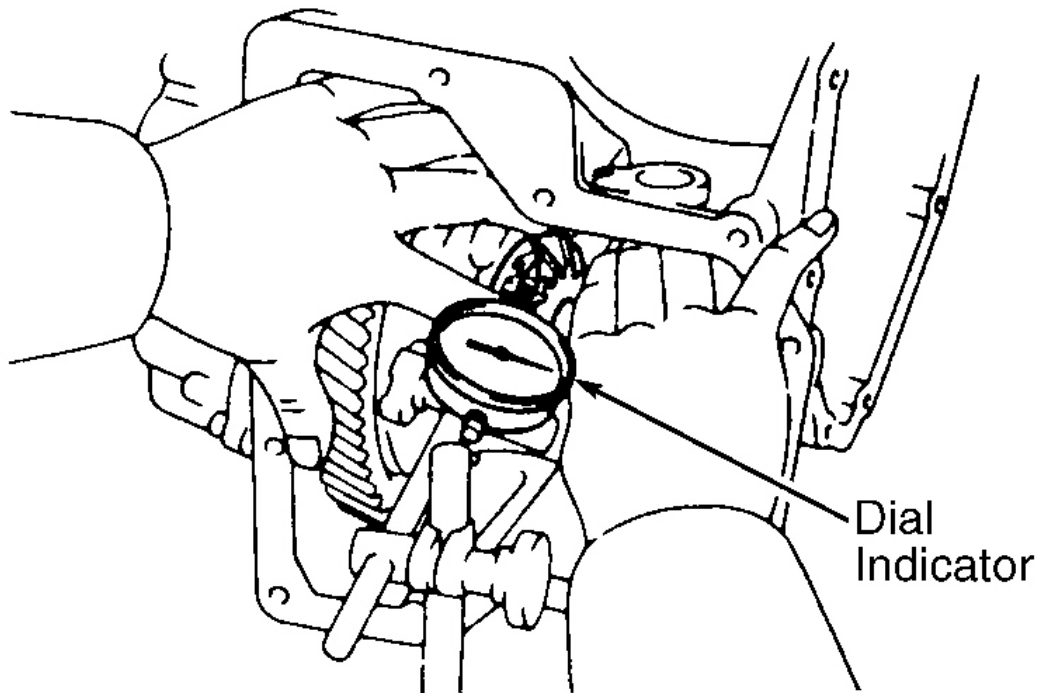
Disassembly

1. Remove carrier cover. Perform pre-disassembly inspection. Attach an INCH-lb. torque wrench to end of pinion shaft. Measure total preload required to rotate pinion. See **Fig. 15**. Note and record reading. Position dial indicator assembly on transaxle case. Position dial indicator tip against side gear. See **Fig. 16**. Measure side gear backlash while holding one pinion toward case. Backlash should be .002-.008" (.05-.20 mm). Note and record reading.



G95B19233

Fig. 15: Measuring Drive Pinion Total Preload
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G95C19234

Fig. 16: Measuring Differential Side Gear Backlash
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Remove left side bearing retainer bolts. Remove bearing retainer. Remove "O" ring from retainer. Remove right side bearing cap. Remove differential, outer race and adjustment shim from transaxle case.
3. Attach an INCH-lb. torque wrench to end of pinion shaft. Measure drive pinion preload. Note and record reading. Starting preload should be 4-7 INCH lbs. (.5-.8 N.m) for a used bearing, 9-14 INCH lbs. (1-1.6 N.m) for new bearing. Total preload reading minus drive pinion preload should equal 1-2 INCH lbs. (.1-.2 N.m). If measurement is not within specification, side bearing preload requires adjustment or bearing replacement. See **DRIVE PINION ASSEMBLY**.
4. Remove side bearings from differential case using appropriate puller. Remove speedometer drive gear. Mark ring gear and case for reassembly reference. Spread ring gear bolt locking plates. Remove ring gear bolts and locking plates. Using brass hammer, tap ring gear from differential case.
5. Mount differential case in vise. Using a dial indicator, check side gear backlash. Hold one pinion against case. Measure side gear backlash. Backlash must be .002-.008" (.05-.20 mm). If backlash is not within specification, side gear thrust washers must be replaced.
6. Drive out pinion shaft lock pin from ring gear side. Remove pinion shaft, pinion gears, side gears and thrust washers. See **Fig. 17**. Remove left oil seal from bearing retainer. Using a press, remove bearing outer race and shim from bearing retainer. Using a long screwdriver, remove right oil seal from transaxle case.

Cleaning & Inspection

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

Reassembly

1. Using appropriate seal installer and handle, install right oil seal until oil seal surface is flush with surface of transaxle case. Install original shim onto retainer. Using appropriate race installer and press, install outer race. Install left oil seal to a depth of .106" (2.7 mm). Lubricate oil seal lip.
2. Select thrust washers that will ensure correct side gear backlash. Thrust washers are available in thicknesses of .037-.047" (.95-1.20 mm) in .20" (5.0 mm) increments. Install thrust washers and side gears in differential case. See **Fig. 14**. If possible, install same size thrust washers on both sides. Install pinion gears and pinion shaft. Check side gear backlash to ensure proper thrust washers are used.
3. Drive lock pin through differential case and into pinion shaft. Stake differential case to retain lock pin. Install speedometer drive gear onto differential case. Using Adapters (09351-32090 and 09351-32180) and press, install side bearings onto differential case.
4. Clean ring gear contact surface of differential case. Clean contact surface of ring gear using cleaning solvent. Heat ring gear to 212°F (100°C) in an oil bath. **DO NOT** heat ring gear above 230°F (110°C). Align ring gear with differential case. Install ring gear on differential case.
5. Install NEW locking plates and bolts. Tighten bolts in crisscross pattern to 72 ft. lbs. (97 N.m). Stake lock plates. Stake one tab flush with flat surface of bolt. Stake 2nd tab against corner of bolt.
6. Install outer race and original adjusting shim on right side bearing. Remove drive pinion. See **DRIVE PINION ASSEMBLY**. Install differential in transaxle case. Install left bearing outer race, shim and retainer without "O" ring. Tighten bolts evenly to 14 ft. lbs. (19 N.m). Install right side bearing cap. Snug bolts evenly in crisscross pattern while turning ring gear. Tighten bolts to 53 ft. lbs. (72 N.m).
7. Using Differential Preload Adapter (09564-32011) and an INCH-lb. torque wrench, measure differential bearing preload with drive pinion removed. See the **DIFFERENTIAL PRELOAD SPECIFICATIONS** table. Also, see **Fig. 18**. If preload is not within specifications, remove differential from transaxle case and replace adjustment shim at right side bearing with appropriate shim.
8. Adjustment shims are available in thicknesses from .075-.110" (1.90-2.80 mm) in .20" (5.0 mm) increments. Preload will increase approximately 2.6-3.5 INCH lbs. (.3-.4 N.m) with each .20" (5.0 mm) shim thickness increase.

DIFFERENTIAL PRELOAD SPECIFICATIONS

Application	INCH Lbs. (N.m)
New Bearings	9-14 (1.0-1.6)
Used Bearings	4-7 (.5-.8)

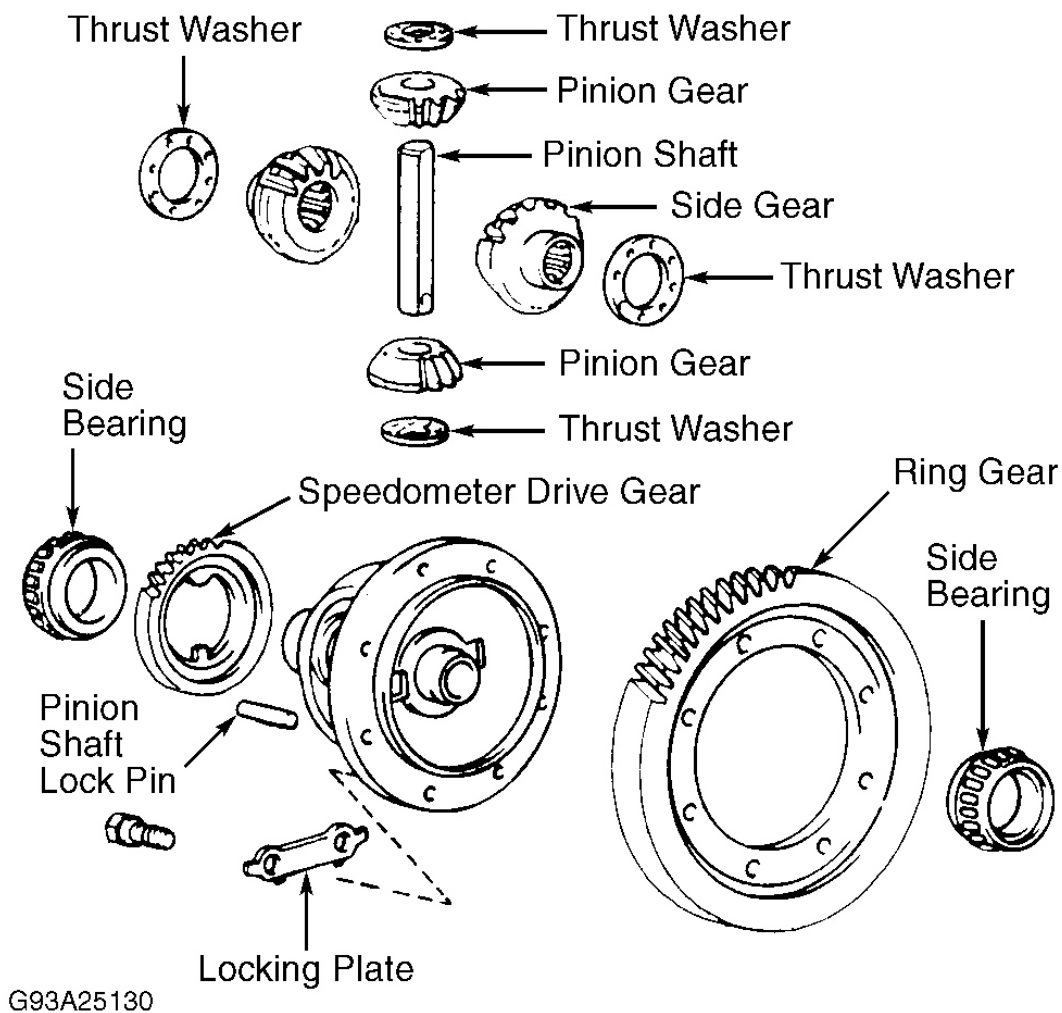
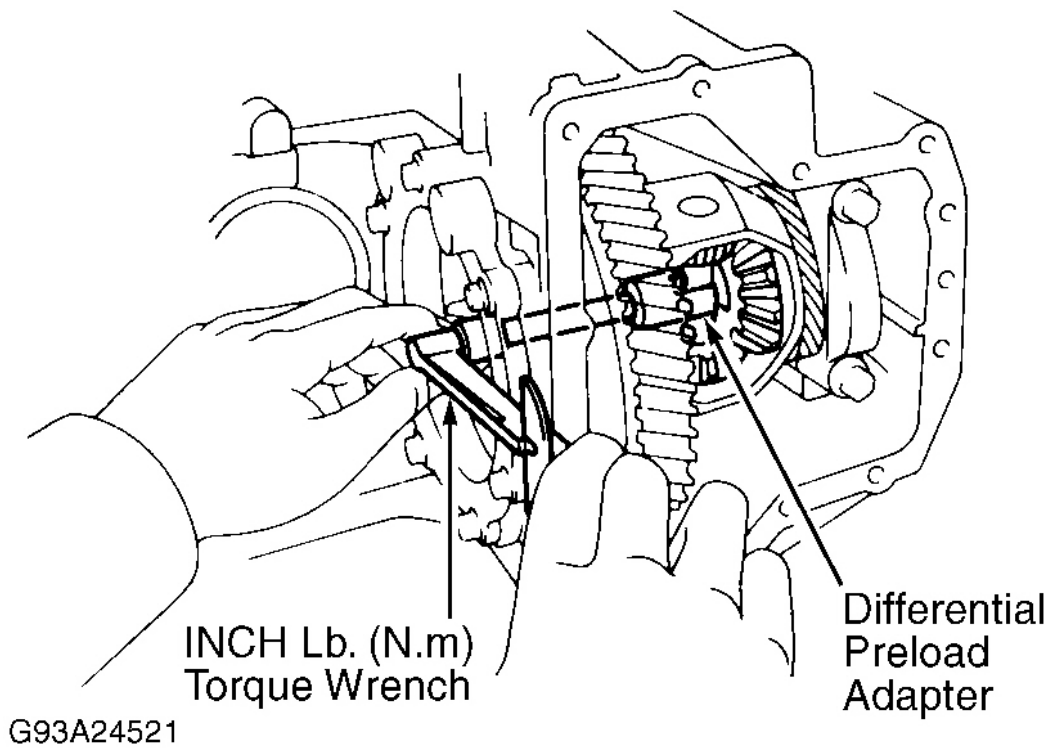


Fig. 17: Exploded View Of Differential Unit
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**Fig. 18: Measuring Differential Bearing Preload**

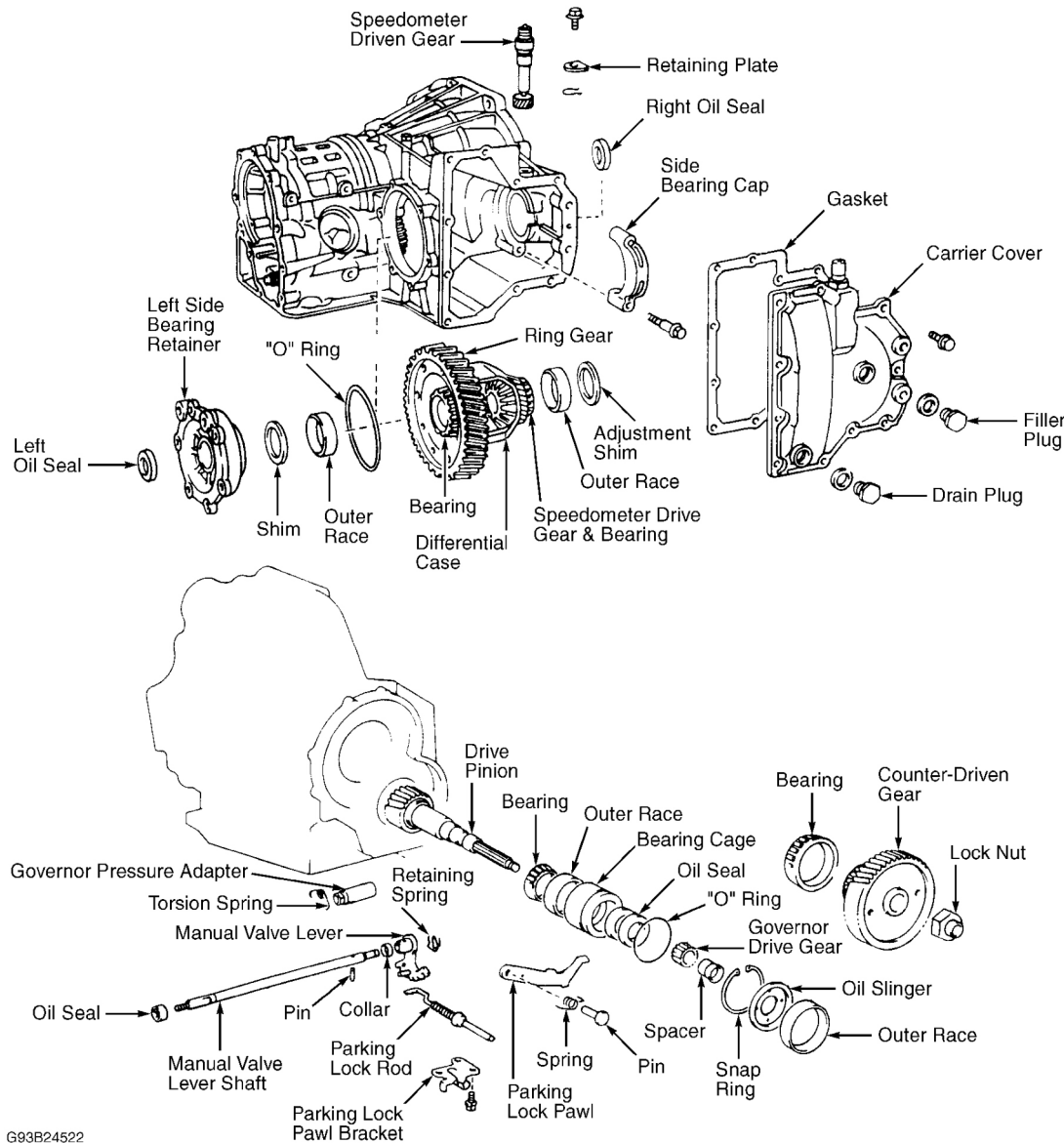
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Proceed with steps 9-11 once drive pinion has been removed, inspected and reassembled. See **DRIVE PINION ASSEMBLY**. It is necessary to measure bearing preload of each individual component without the other component installed in transaxle case.

9. If preload is within specification, remove left bearing retainer. **DO NOT** misplace selected adjustment shim. Install "O" ring on left bearing retainer. Remove right side bearing cap bolts and coat threads with sealant. Tighten bolts evenly and gradually in crisscross pattern to 53 ft. lbs. (73 N.m), while turning ring gear. Recheck preload.
10. With drive pinion installed in case, measure total preload using procedure in step 1 under **DISASSEMBLY**. Starting preload should be the drive pinion preload of 4-7 INCH lbs. (.5-.8 N.m), plus 3-4 INCH lbs. (.3-.4 N.m) for new bearings or 1-2 INCH lbs. (.1-.2 N.m) for used bearings.
11. If total preload is not within specification, disassemble differential and readjust. If total preload is correct, stake counterdriven gear lock nut. Install drive pinion cap. Coat carrier cover bolt threads with sealant. Install carrier cover and gasket. Install bolts and tighten in crisscross pattern to 18 ft. lbs. (25 N.m). To complete reassembly, reverse disassembly procedure. Tighten all bolts to specification. See **Fig. 19**.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul



G93B24522

Fig. 19: Exploded View Of Differential & Drive Pinion Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A. INC.

DRIVE PINION ASSEMBLY

NOTE: To set total preload, refer to steps 10 and 11 under DIFFERENTIAL ASSEMBLY.

Disassembly

1. Using an INCH-lb. torque wrench, measure drive pinion preload with differential assembly removed. Starting preload should be 4-7 INCH lbs. (.5-.8 N.m) for used bearings. Remove drive pinion cap from converter housing side of case. Loosen staked area of counterdriven gear lock nut. Install Holder (09351-

32032) on gear. Remove lock nut. Using Puller (09351-32061), remove counterdriven gear and bearing from shaft.

2. Using appropriate 2-jaw puller, remove outer bearing race from transaxle case. Remove oil slinger, bearing spacer and rotor sensor. Remove drive pinion snap ring from transaxle case. Drive pinion and bearing cage from bore. Remove bearing cage from drive pinion. Remove "O" ring from bearing cage. See **Fig. 19**.
3. Press bearing from counterdriven gear. Remove pinion shaft bearing. Drive out drive bearing outer race from cage. Note position of oil seal lips. Remove seals from cage.

Cleaning & Inspection

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

Reassembly

1. Lubricate lips of oil seals. Install inner seal with lip facing downward. Oil seal must be installed to proper depth of .374" (9.50 mm).
2. Install outer seal with lip facing upward. Position oil seal flush with cage surface. Install outer bearing race in bearing cage.
3. Install drive pinion shaft bearing. Install bearing on counterdriven gear. Install "O" ring on bearing cage. Install cage on drive pinion shaft. Use care not to damage oil seals. Install rotor sensor. Install shaft assembly into transaxle case.
4. Tap bearing cage into transaxle case. Ensure cage is past snap ring groove. Install snap ring. Insert brass bar into hole and tap drive pinion shaft against snap ring. Ensure snap ring is fully seated. Install oil slinger with lip facing outward. Install outer race in transaxle case with narrow end facing out. Install new bearing spacer, small end first.
5. Drive counterdriven gear onto shaft until lock nut can be installed. **DO NOT** tap on transaxle case. Lubricate lock nut threads and install lock nut on shaft. Install holder on gear. Tighten counterdriven gear lock nut to 127 ft. lbs. (172 N.m). Rotate counterdriven gear both directions several times.
6. Using an INCH-lb. torque wrench, measure drive pinion preload. Starting preload should be 9-14 INCH lbs. (1.0-1.6 N.m) for new bearings and 4-7 INCH lbs. (.5-.8 N.m) for used bearings. Replace bearing spacer (crush sleeve) if preload exceeds specifications. Recheck preload procedure (if necessary).
7. If preload is less than specification, tighten lock nut in additional increments of 9.5 ft. lbs. (13 N.m). Tighten lock nut until specified preload is obtained. If maximum torque of 213 ft. lbs. (289 N.m) is exceeded while tightening nut, replace bearing spacer and repeat procedure. **DO NOT** back off (loosen) nut to reduce preload.

OIL PUMP

Disassembly

Remove race from stator shaft. Remove "O" ring from pump body. Remove 2 oil seal rings from back of stator shaft (pump support). Remove thrust washer from stator shaft. Remove 11 bolts attaching oil pump body and stator shaft. See **Fig. 20**.

Inspection

1. Check body clearance of driven gear. Push gear to one side of body. Using a feeler gauge, measure clearance. See **Fig. 21**. Body clearance should be .0028-.0059" (.07-.15 mm). Maximum body clearance is .012" (.30 mm). If body clearance exceeds specification, replace pump body.
2. Check tip clearance of both gears. Measure between gear teeth and crescent-shaped part of pump body. Tip clearance is .0043-.0055" (.110-.140 mm). Maximum tip clearance is .012" (.30 mm). If tip clearance exceeds specification, replace pump body.
3. Check side clearance of both gears. Use a steel straightedge and feeler gauge to measure side clearance of both gears. Clearance is .0008-.0020" (.020-.050 mm). Maximum side clearance is .004" (.10 mm). Drive and driven gears are available in 3 different thicknesses. See **DRIVE & DRIVEN GEAR THICKNESS SPECIFICATIONS** table. If thickest gear does not bring side clearance within specification, replace pump body.

DRIVE & DRIVEN GEAR THICKNESS SPECIFICATIONS

I.D. Mark	Thickness In. (mm)
A	.3717-.3723 (9.440-9.456)
B	.3723-.3730 (9.456-9.474)
C	.3730-.3736 (9.474-9.490)

4. Using a dial indicator, measure inside diameter of oil pump body bushing. 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 bushings. Maximum front side bushing inside diameter is .849" (21.57 mm). Maximum rear side bushing inside diameter is 1.066" (27.07 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 screwdriver. 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 pump body. Align bolt holes. Install 11 stator shaft-to-oil pump body bolts. Tighten bolts in crisscross pattern to 89 INCH lbs. (10 N.m).
2. Coat thrust bearing with petroleum jelly. Align tab of washer with hollow of pump body. Install thrust washer. Install 2 oil seal rings on oil pump. **DO NOT** spread ring ends too much.
3. Turn drive gear with screwdrivers to ensure a smooth rotation. **DO NOT** damage oil seal lip. Install race on stator shaft.

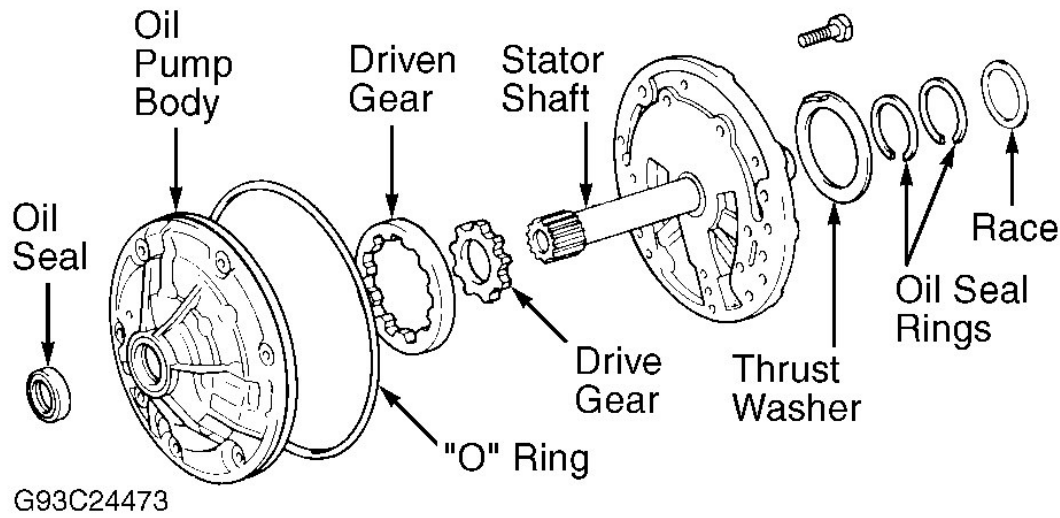
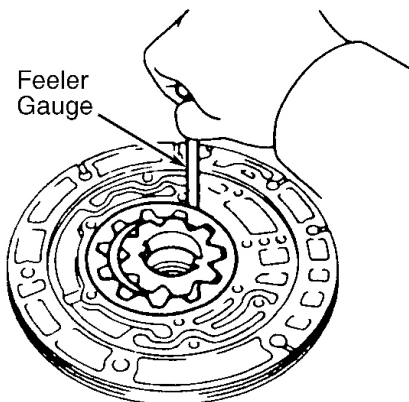
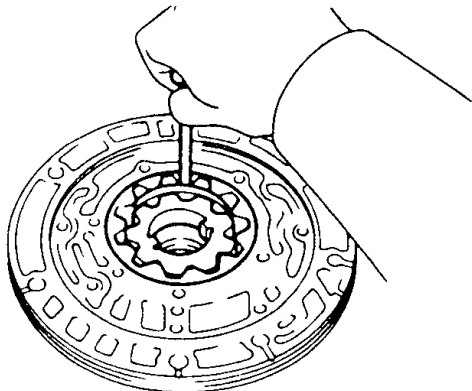


Fig. 20: Exploded View Of Oil Pump

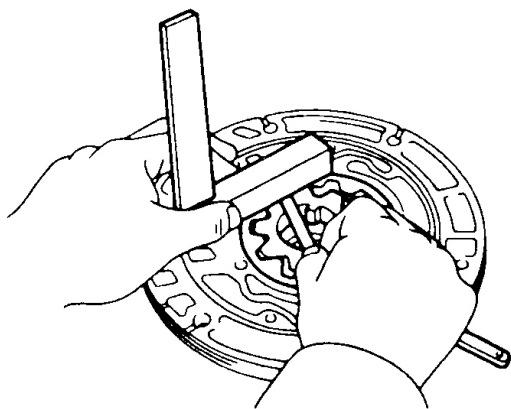
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



CHECKING BODY CLEARANCE



CHECKING TIP CLEARANCE



CHECKING SIDE CLEARANCE

G95D19235

Fig. 21: Measuring Oil Pump Clearances
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIRECT CLUTCH

Disassembly

1. Prior to disassembly, measure piston stroke of direct clutch. Measure direct clutch piston stroke by applying compressed air. See **Fig. 22**. Piston stroke should be .0437-.0567" (1.110-1.440 mm). If piston stroke exceeds specification, inspect each component.
2. Remove snap ring from clutch drum. Remove flange, discs and plates. Compress piston return springs and remove snap ring See **Fig. 23**.
3. Remove piston return spring. See **Fig. 24**. Slide direct clutch on oil pump. Remove piston by applying low pressure compressed air. If piston does not completely come out, remove with needle-nose pliers. Remove direct clutch from oil pump. Remove 2 "O" rings from clutch piston.

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.
2. If disc lining is peeled or discolored, replace discs as necessary. Replace all damaged components. Using a dial indicator, measure inside diameter of direct clutch bushing. Maximum inside diameter is 1.853" (47.07 mm). If inside diameter exceeds specification, replace direct clutch.

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

Reassembly

1. Install NEW "O" rings on piston. Coat rings with ATF. Press piston in drum with cup side up. Ensure "O" rings are not damaged. Install piston return springs. Set retainer and snap ring in position.
2. Using arbor press, compress return springs. See **Fig. 23**. Using a screwdriver, install snap ring in groove. Ensure end gap of spring is not aligned with spring retainer claw.
3. Install in order: plate, disc, plate, disc, plate, disc and flange. See **Fig. 24**. Install flange with flat end facing inward. Install outer snap ring. Ensure end gap of snap ring is not aligned with cut-outs of drum.
4. If disc, plate or flange have been replaced, check piston stroke. Using a dial indicator, measure piston stroke by applying and releasing 57-114 psi (4-8 kg/cm²) compressed air. See **Fig. 22**.
5. Piston stroke should be .0437-.0587" (1.110-1.440 mm). If piston stroke is less than specification, disassemble and reassemble direct clutch parts.
6. Measure piston stroke again. If measurement is still not to specification, replace flange. Flange is available in 2 thicknesses, .102" (2.60 mm) or .118" (3.00 mm).
7. Check operation of direct clutch. Install direct clutch on oil pump. Apply compressed air into passage with oil pump body. Ensure movement of piston. If piston does not move, disassemble and inspect unit.

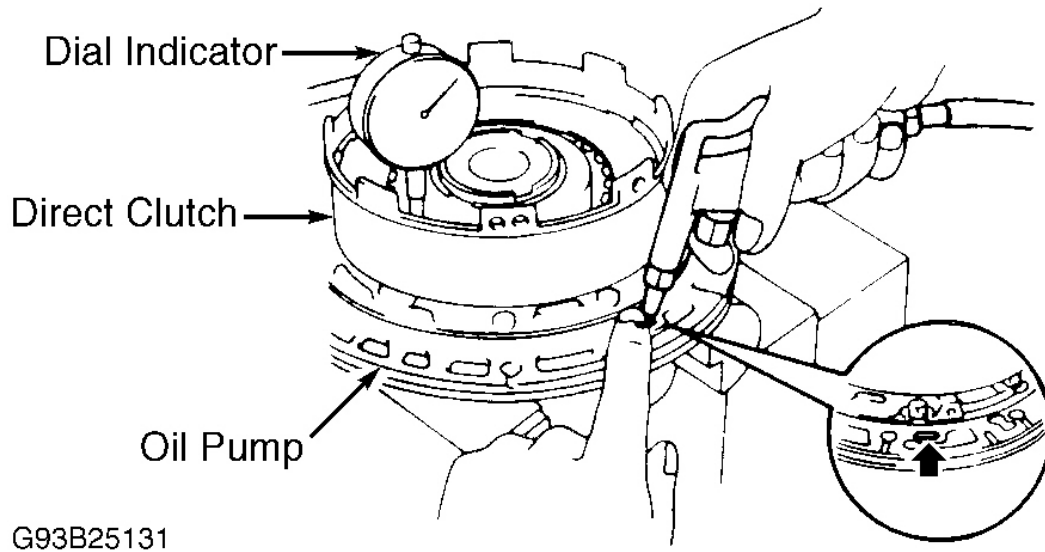
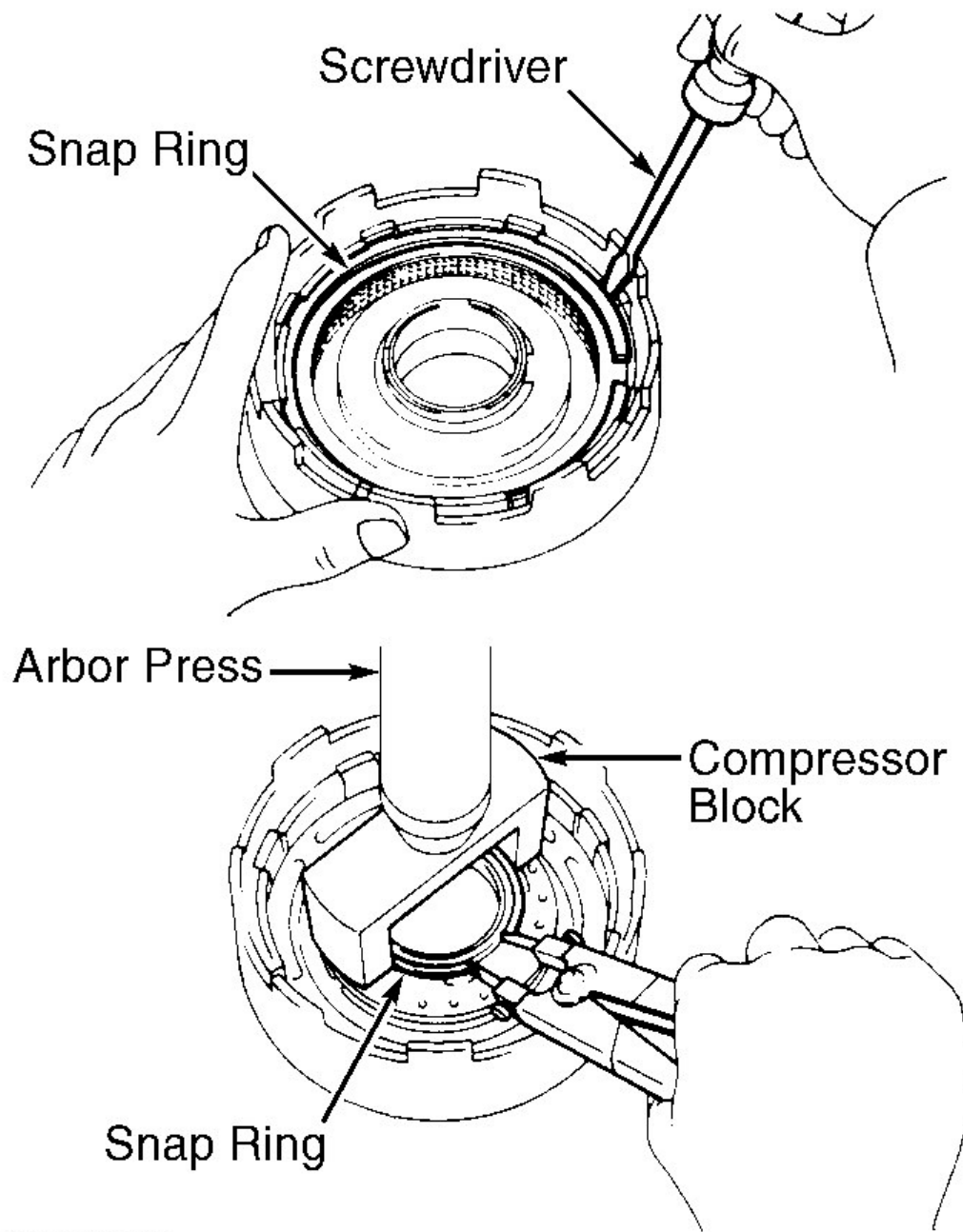
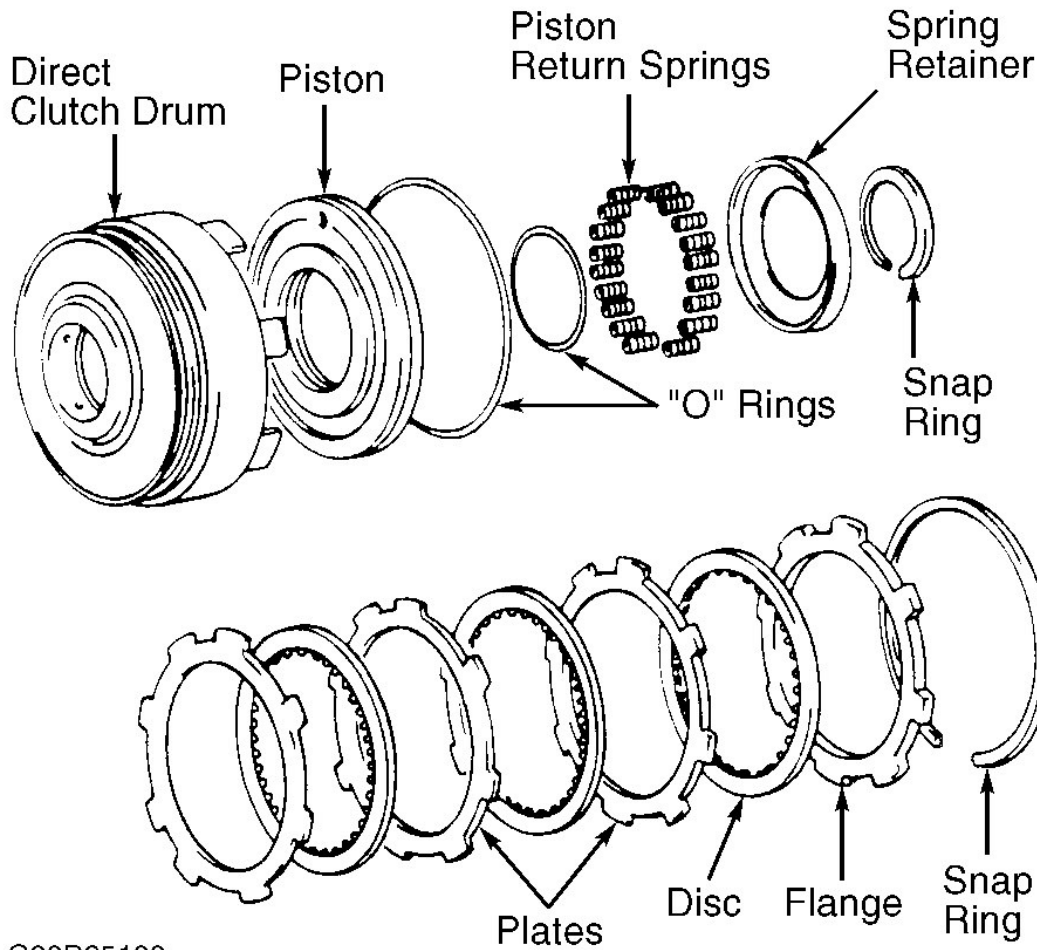


Fig. 22: Checking Direct Clutch Piston Stroke
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G95I19255

Fig. 23: Removing/Installing Direct Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G93D25133

Fig. 24: Exploded View Of Direct Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FORWARD CLUTCH

Disassembly

1. Remove thrust bearings and races from both sides of clutch. Remove snap ring from clutch drum. Remove flange, discs and plates. See **Fig. 25**.
2. Using an arbor press, compress return springs. Remove retainer and 18 springs. Apply compressed air to oil passage to remove piston. If piston does not come out, remove piston with needle-nose pliers. Remove 2 "O" rings from piston.

Inspection

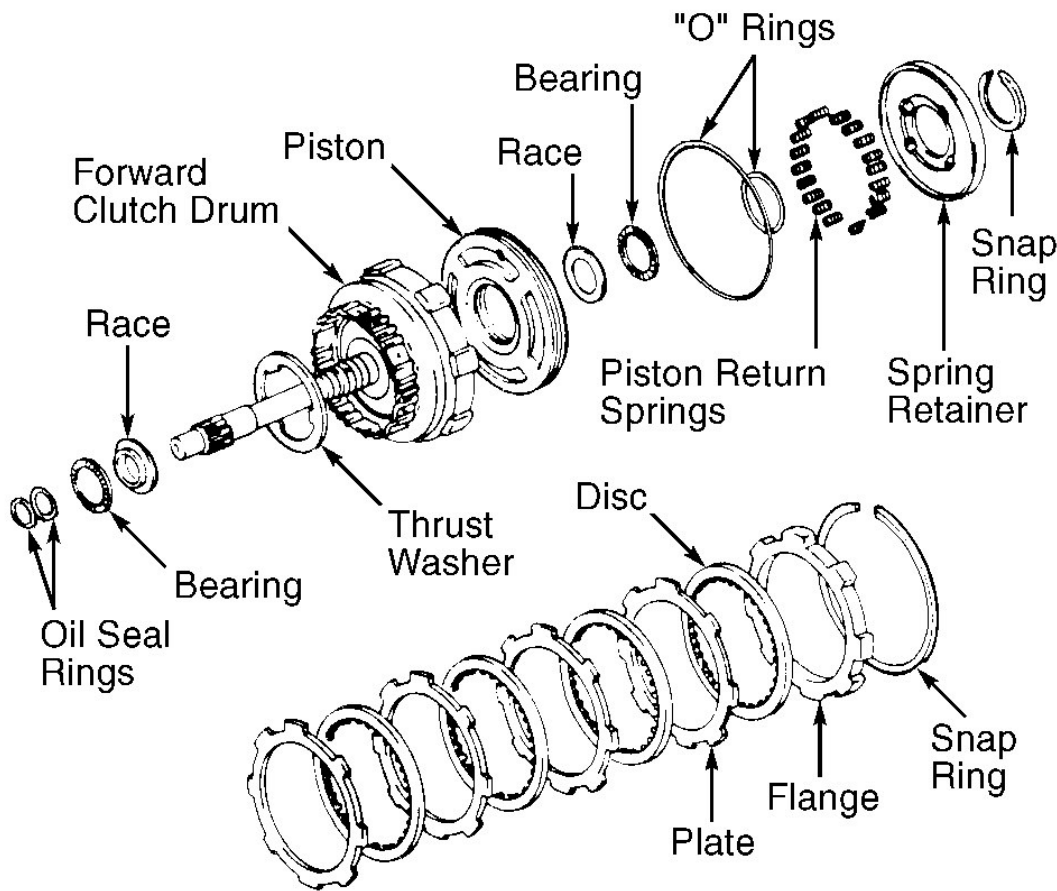
Clean all parts (except discs) with solvent. Dry parts using compressed air. Ensure check ball is free in piston.

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.

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

Reassembly

1. Install NEW seal rings on shaft (if necessary). Use care not to over expand seal rings. Coat NEW piston "O" rings with ATF. Install "O" rings on piston. Press piston into drum with cup side up. Ensure "O" rings are not damaged.
2. Set return springs, retainer and snap ring in drum. Compress retainer using an arbor press. Install snap ring in groove with pliers. Ensure end gap of snap ring is not aligned with spring retainer claw.
3. Install in order: plate, disc, plate, disc, plate, disc, plate, disc and flange. Install flange with flat end facing downward. Install outer snap ring. Ensure end gap of ring is not aligned with cut-outs of drum.
4. Mount drum shaft in soft-jawed vise. Measure piston stroke by applying compressed air to oil passage hole (nearest piston) on rear of forward clutch shaft and note reading. Clutch piston stroke should be .056-.072" (1.41-1.82 mm).
5. If piston stroke is not as specified, select appropriate flange to obtain correct piston stroke. Flanges range in thickness from .110" (2.8 mm) to .142" (3.6 mm) in .2 mm increments. Coat thrust washer, races and bearing with petroleum jelly and install.



G93F25135

Fig. 25: Exploded View Of Forward Clutch

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

NO. 1 ONE-WAY CLUTCH, SUN GEAR & FRONT PLANETARY GEAR

Disassembly

1. Check operation of one-way clutch. Holding sun gear, turn hub. Hub should turn freely clockwise and should lock when turned counterclockwise.
2. Turning hub clockwise, remove one-way clutch from sun gear. Remove thrust washer from sun gear input drum. Remove snap ring. Remove sun gear input drum. See **Fig. 26**. Remove shaft snap ring from sun gear.

Inspection

1. Inspect ring gear flange bushing. Measure inside diameter of flange bushing. Standard inside diameter is .7490-.7500" (19.025-19.050 mm). If inside diameter exceeds specification, replace flange.

2. Measure planetary pinion gear thrust clearance with a feeler gauge. Standard clearance should be .0079-.0197" (.200-.500 mm).

Reassembly

Install shaft snap ring on sun gear. Install sun gear input drum on sun gear. Install shaft snap ring. Install thrust washer on sun gear input drum. See **Fig. 26**. While turning hub clockwise, slide one-way clutch on sun gear. Recheck operation of No. 1 one-way clutch. Ensure hub turns clockwise while holding outer hub.

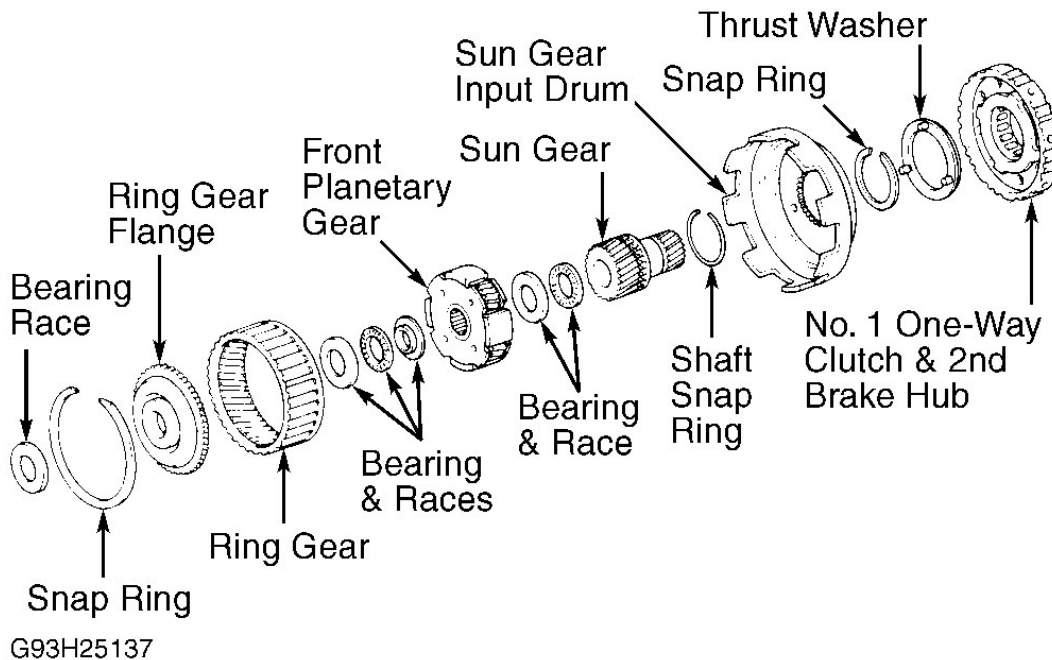


Fig. 26: Exploded View Of No. 1 One-Way Clutch, Sun Gear & Front Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NO. 2 ONE-WAY CLUTCH & REAR PLANETARY GEAR

Disassembly

1. Check operation of one-way clutch. Hold outer race and turn hub. Hub should turn freely counterclockwise and should lock when turned clockwise.
2. Separate No. 2 one-way clutch and rear planetary gear. Remove thrust washers from each side of planetary gear. Remove both side snap rings and 2 side retainers. Remove one-way clutch from outer race. See **Fig. 27**.

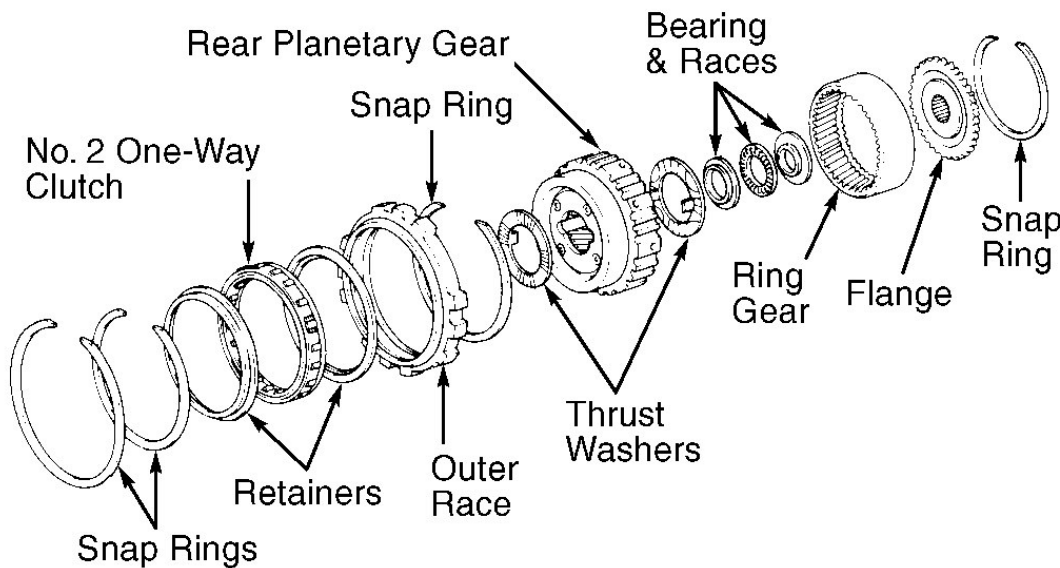
Inspection

Measure planetary pinion gear thrust clearance with a feeler gauge. Standard clearance should be .0079-

.0197" (.200-.500 mm).

Reassembly

1. Install one-way clutch in outer race. Face flanged side of one-way clutch inward from shiny side of outer race. Install 2 side retainers and 2 snap rings.
2. Install rear planetary gear into one-way clutch facing inner race of planetary gear inward from **Black** side of outer race. Check operation of one-way clutch. Coat thrust washers with petroleum jelly. Install thrust washer on each side of carrier. Align tab of washers with hollow of rear planetary gear.



G93I25138

Fig. 27: Exploded View Of No. 2 One-Way Clutch & Rear Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1ST & REVERSE BRAKE PISTON

Disassembly

Using appropriate spring compressor, gradually and evenly tighten tool bolt to compress springs. Using snap ring pliers, remove snap ring. Remove piston return spring assembly. Apply compressed air into oil passage of case to remove piston. See **Fig. 14**. Hold air gun away from hole. Ensure piston does not tilt during removal. Remove "O" rings from piston.

Reassembly

1. Install NEW "O" rings on piston. Coat rings with ATF. Install piston in bore of case facing spring seats upward. Place base of spring compressor under case. Install piston return springs and retainer. Set snap

ring in place.

2. Compress piston return springs slowly and evenly to allow installation of snap ring. **DO NOT** overtighten bolt as it will cause spring retainer to bend.
3. Push snap ring in place with fingers. Ensure snap ring is fully seated and centered on 3 lugs of spring retainer. Ensure end gap of ring is not aligned with spring retainer claw. Remove compressor tool. See **Fig. 28**.

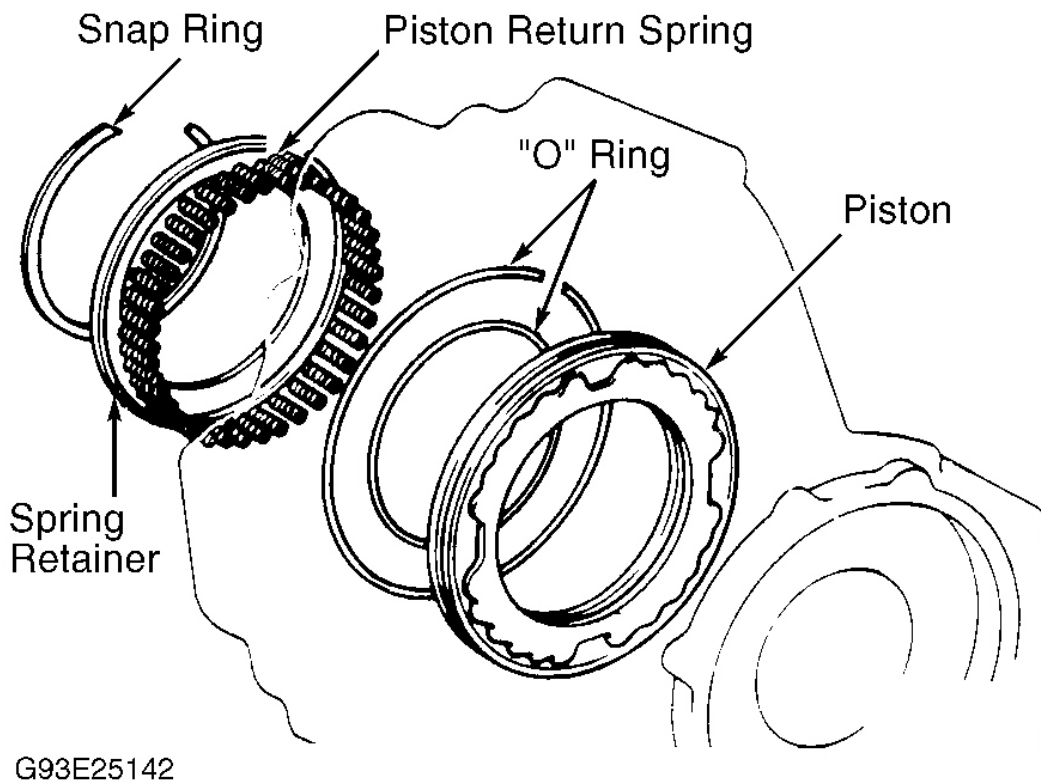


Fig. 28: Exploded View Of 1st & Reverse Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2ND COAST BRAKE

Disassembly

Remove oil seal ring from piston. Remove "E" ring while pushing piston with needle nose pliers. Remove spring, washer and piston rod.

Inspection

1. Replace brake band if lining is peeled off or discolored or printed numbers are defaced. Before assembling NEW band, soak in ATF for at least 2 hours.

2. If brake band is serviceable but piston rod stroke is not within specification, select a NEW piston. Piston stroke should be .059-.118" (1.50-3.00 mm). There are 2 lengths of piston rods, 2.811" (71.40 mm) and 2.870" (72.90 mm).

Reassembly

Install washer and spring to piston rod. Install "E" ring. Install oil seal ring. **DO NOT** spread oil seal ring ends more than necessary for installation. See **Fig. 29**.

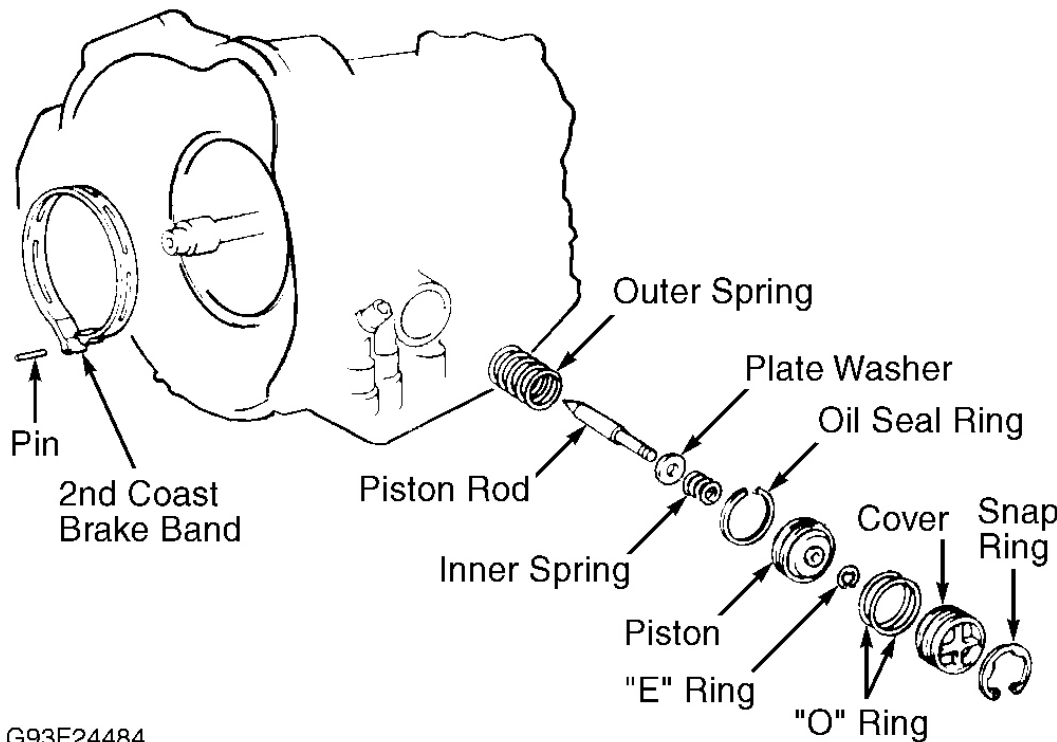


Fig. 29: Exploded View Of 2nd Coast Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2ND BRAKE PISTON

Disassembly & Reassembly

Apply compressed air to oil hole and remove 2nd brake piston. Remove 2 "O" rings from piston. Coat NEW "O" rings with ATF and install. Carefully press 2nd brake piston into 2nd brake drum. See **Fig. 30**.

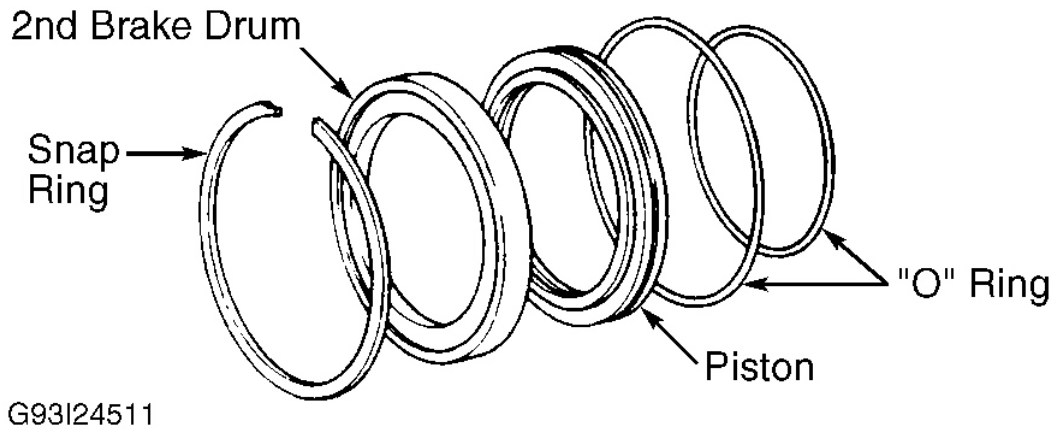


Fig. 30: Exploded View Of 2nd Brake Piston
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

VALVE BODY ASSEMBLY

NOTE: All valve body components must be installed in original location. Lay all components in sequence during removal for reassembly reference. Throttle pressure is changed according to number of adjusting rings. When assembling valve body, install same number of adjusting rings as were removed. Some valve bodies do not have adjusting rings.

Disassembly

1. Remove 9 bolts and upper valve body cover. Remove strainer, 2 gaskets and plate. Remove sleeve stopper. Remove 3 bolts and upper valve body. Remove 14 bolts, lower valve body cover and gasket. Remove 3 lower valve body bolts.
2. Hold plate against lower valve body and carefully remove lower valve body. **DO NOT** lose check balls. Note location of check balls, retainers and pins in valve body. Remove plate and gasket. See **Fig. 31**.

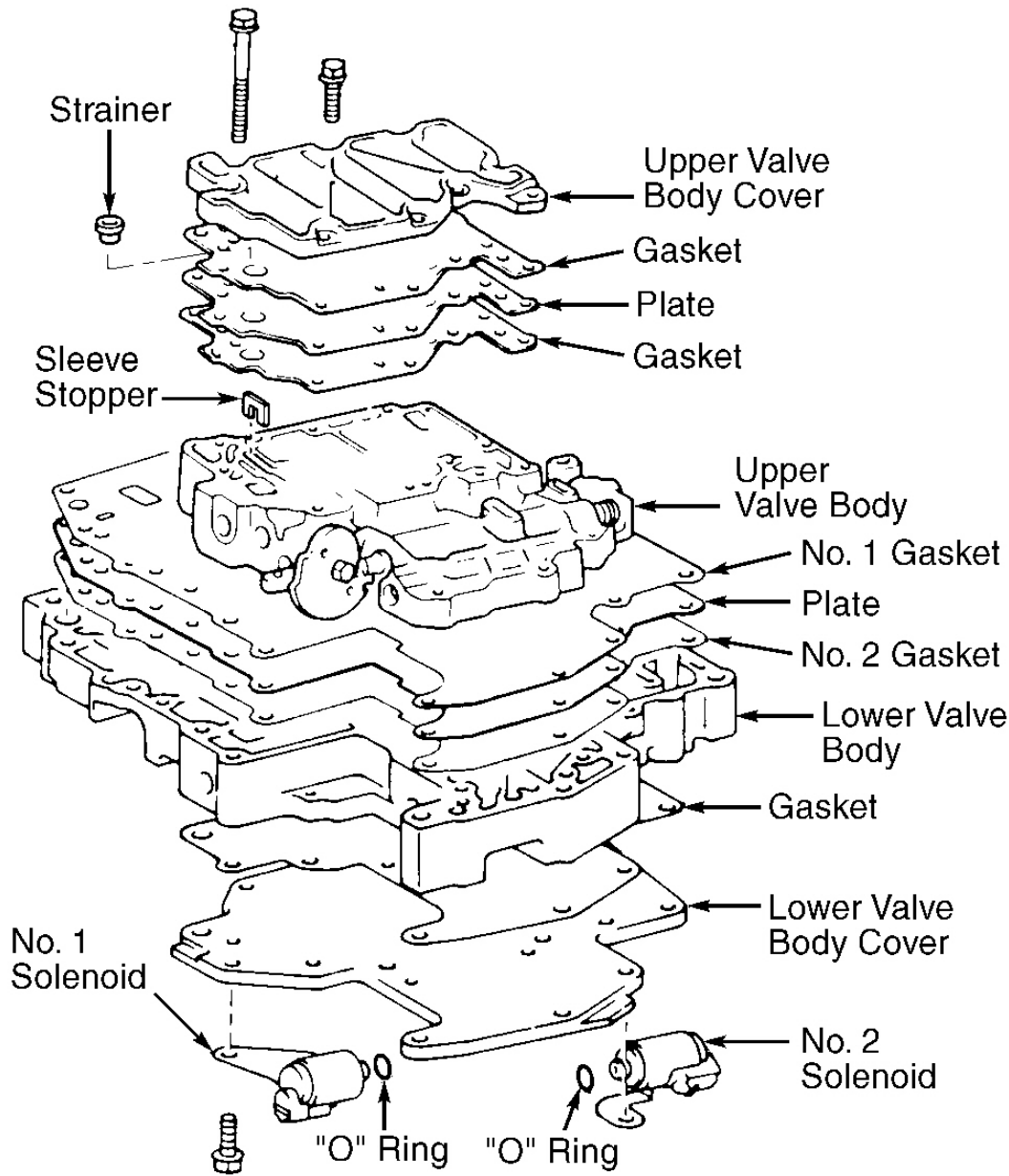


Fig. 31: Exploded View Of Valve Body Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A. INC.

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. Inspect valve springs for damage, squareness, rust and collapsed coils. Measure spring free length and outer diameter.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

2. Replace spring if not within specification. See **VALVE BODY SPRING SPECIFICATIONS**. Ensure valve body springs correspond with appropriate valve. Make sure the retainers are installed in their appropriate locations. See **VALVE BODY RETAINER SPECIFICATIONS**.

VALVE BODY SPRING SPECIFICATIONS

UPPER VALVE BODY SPRING SPECIFICATIONS ⁽¹⁾

Spring No.	Diameter: In. (mm)	Free Length: In. (mm)
1	.374 (9.50)	.854 (21.70)
2	.417 (10.60)	1.105 (28.06)
3	.311 (7.90)	.850 (21.60)
4	.344 (8.73)	1.173 (29.80)
5	.362 (9.20)	1.209 (30.70)
6	.335 (8.50)	.824 (20.93)
7	.236 (6.00)	.858 (21.80)
8	.402 (10.20)	1.046 (26.56)

(1) For spring locations, see **Fig. 32**.

LOWER VALVE BODY SPRING SPECIFICATIONS ⁽¹⁾

Spring No.	Diameter: In. (mm)	Free Length: In. (mm)
1	.429 (10.90)	1.717 (43.60)
2	.323 (8.20)	1.181 (30.00)
3	.382 (9.70)	1.152 (29.27)
4	.382 (9.70)	1.152 (29.27)
5	.382 (9.70)	1.152 (29.27)
6	.732 (18.60)	2.624 (66.65)
7	.252 (6.40)	.441 (11.20)
8	.433 (11.00)	.783 (19.90)

(1) For spring locations, see **Fig. 34**.

VALVE BODY RETAINER SPECIFICATIONS

UPPER VALVE BODY RETAINER SPECIFICATIONS ⁽¹⁾

Application (Letter I.D.) ⁽²⁾	Height: In. (mm)
Accumulator Control Valve ("B")	.453 (11.50)
Lock-Up Relay Valve ("D") & 2nd Coast Modulator Valve ("C")	.591 (15.00)
Throttle Modulator ("A") & Cut-Back Valve ("C")	.362 (9.20)

(1) Width is .197" (5.00 mm) for all retainers. Thickness is .126" (3.20 mm) for all retainers.

(2) For retainer locations, see **Fig. 33**.

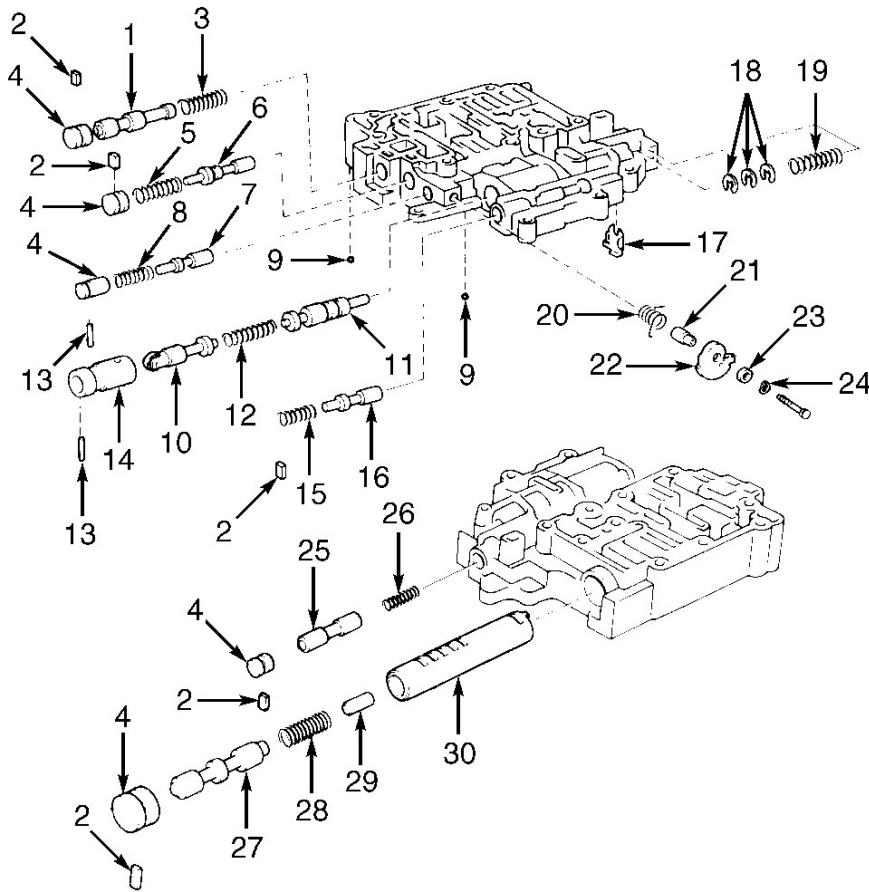
LOWER VALVE BODY RETAINER SPECIFICATIONS

Application (Letter I.D.) ⁽¹⁾	Height: In. (mm)
Lock-Up Signal Valve ("F")	⁽²⁾ .591 (15.00)
Primary Regulator ("A") & 1-2 Shift Valves ("C")	⁽²⁾ .362 (9.20)
Secondary Regulator ("E")	⁽³⁾ .512 (13.00)
2-3 Shift ("B") & 3-4 Shift Valves ("D")	⁽³⁾ .315 (8.00)
<p>(1) For retainer locations, see Fig. 33.</p> <p>(2) Retainer width is .197" (5.00 mm).</p> <p>(3) Retainer width is .236 (6.00).</p>	

NOTE: Valves may be held in with pins or retainers and plugs. Remove components and note locations. Arrange parts in order for reassembly reference.

Reassembly

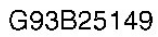
1. Coat all components with ATF. To reassemble, reverse disassembly procedure. Ensure check balls, pins and strainer on upper side of lower valve body are installed correctly. See **Fig. 35**. Ensure check ball, pins, retainers and vibrating stopper on lower side of upper valve body are installed correctly. See **Fig. 33**.
2. Position new No. 2 gasket, plate and new No. 1 gasket on lower valve body. Ensure gaskets are installed in correct locations. See **Fig. 37**. Place lower valve body with plate and gaskets on upper valve body. **DO NOT** let components separate. Align each bolt hole in valve bodies with gaskets and plate.
3. Install and finger-tighten bolts in lower valve body to secure upper valve body. Use proper length bolt. See **Fig. 36**. Install lower valve body cover over new gasket. Install and finger-tighten 10 cover bolts. Install and finger-tighten three 1.102" (28.00 mm) bolts in upper valve body.
4. Ensure retainers are installed correctly on upper side of upper valve body. See **Fig. 33**. Install sleeve stopper. Position new gasket, plate and strainer. Install strainer onto plate. Position and install upper valve body cover, and finger-tighten 9 bolts. See **Fig. 36**. Place and install new "O" rings on solenoids. Check alignment of gaskets and plates. Tighten upper and lower valve body bolts to 48 INCH lbs. (5.4 N.m).



- | | |
|------------------------------|--------------------------------|
| 1. Throttle Modulator Valve | 16. 2nd Coast Modulator Valve |
| 2. Retainer | 17. Vibration Stopper |
| 3. Spring No. 1 | 18. Adjusting Ring |
| 4. Plug | 19. Spring No. 5 |
| 5. Spring No. 2 | 20. Spring |
| 6. Accumulator Control Valve | 21. Cam Pin |
| 7. Low Coast Modulator Valve | 22. Cam |
| 8. Spring No. 3 | 23. Plate Washer |
| 9. Steel Check Ball | 24. Wave Washer |
| 10. Downshift Plug | 25. Cut Back Valve |
| 11. Throttle Valve | 26. Spring No. 7 |
| 12. Spring No. 4 | 27. Lock-Up Relay Valve |
| 13. Pin | 28. Spring No. 8 |
| 14. Throttle Valve Sleeve | 29. Control Valve |
| 15. Spring No. 6 | 30. Lock-Up Relay Valve Sleeve |

G95D19276

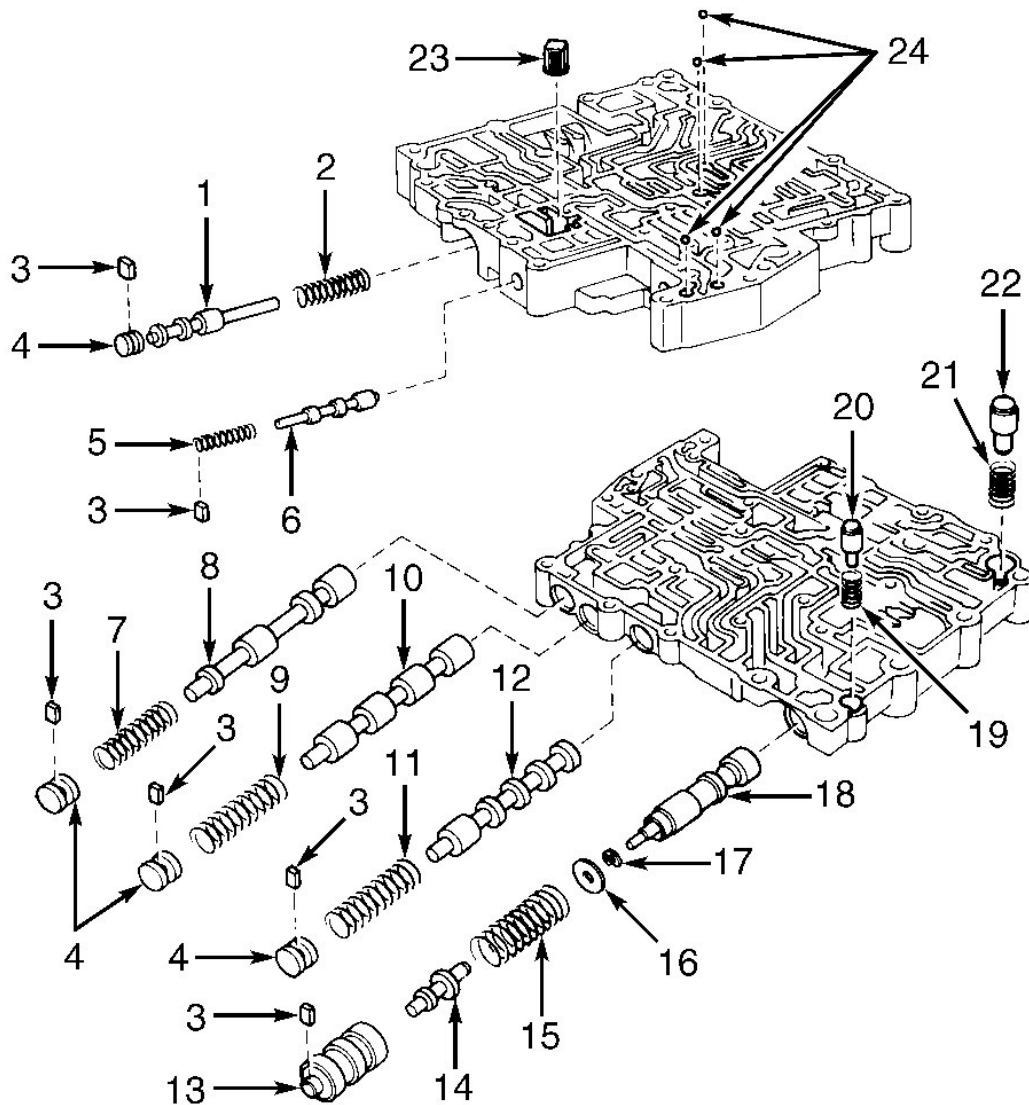
Fig. 32: Exploded View Of Upper Valve Body
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



miércoles, 8 de febrero de 2023 06:25:30 p. m.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

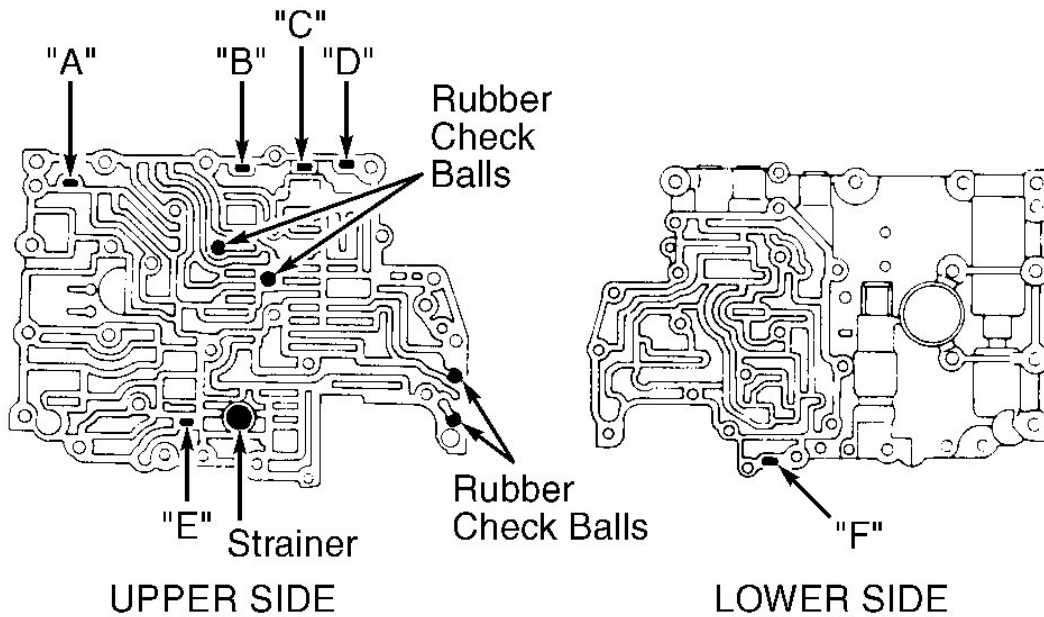


- | | |
|------------------------------|-----------------------------|
| 1. Secondary Regulator Valve | 13. Sleeve |
| 2. Spring No. 1 | 14. Plunger |
| 3. Retainer | 15. Spring No. 6 |
| 4. Plug | 16. Plate Washer |
| 5. Spring No. 2 | 17. Adjusting Ring |
| 6. Lock-Up Signal Valve | 18. Primary Regulator Valve |
| 7. Spring No. 3 | 19. Spring No. 7 |
| 8. 3-4 Shift Valve | 20. Pressure Relief Valve |
| 9. Spring No. 4 | 21. Spring No. 8 |
| 10. 1-2 Shift Valve | 22. Cooler By-Pass Valve |
| 11. Spring No. 5 | 23. Strainer |
| 12. 2-3 Shift Valve | 24. Rubber Check Ball |

G93G25151

Fig. 34: Exploded View Of Lower Valve Body

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



G93I25153

Fig. 35: Identifying Lower Valve Body Check Ball, Pin & Retainer Locations

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

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

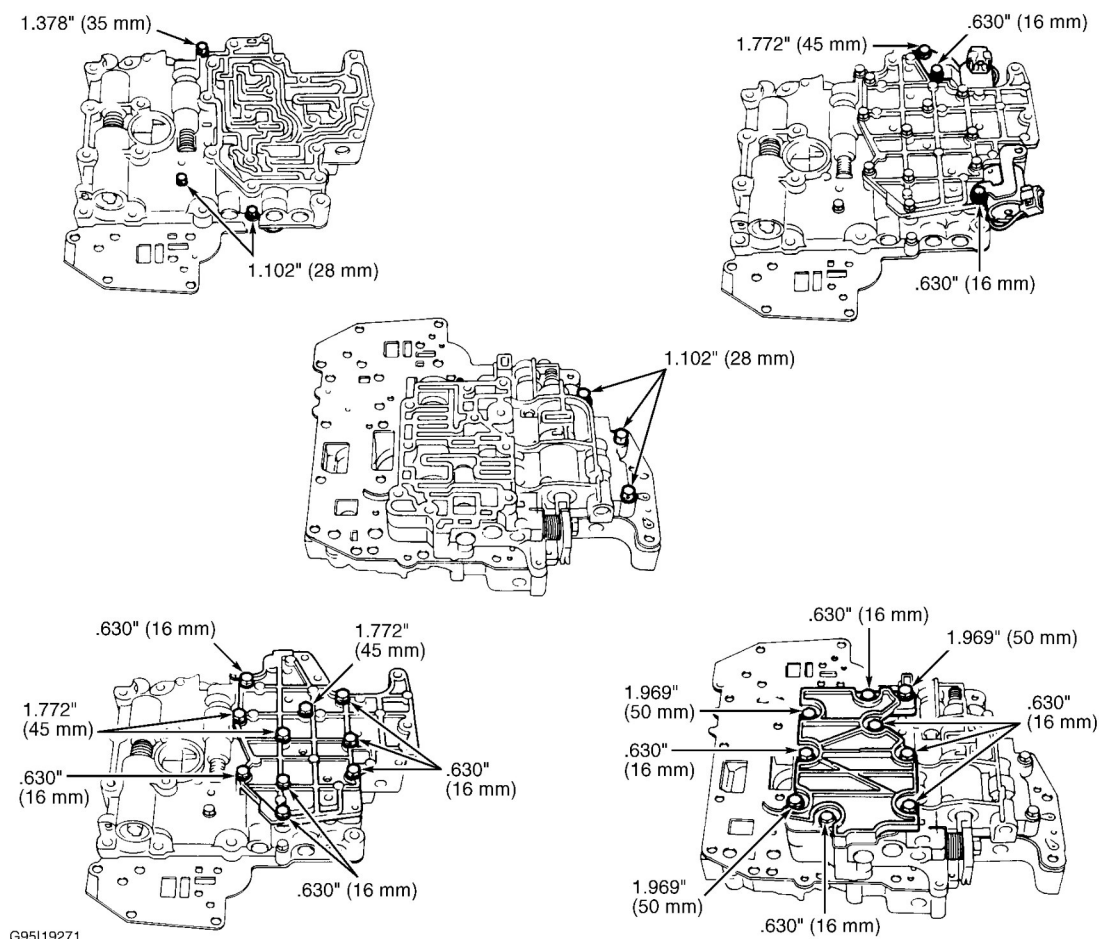
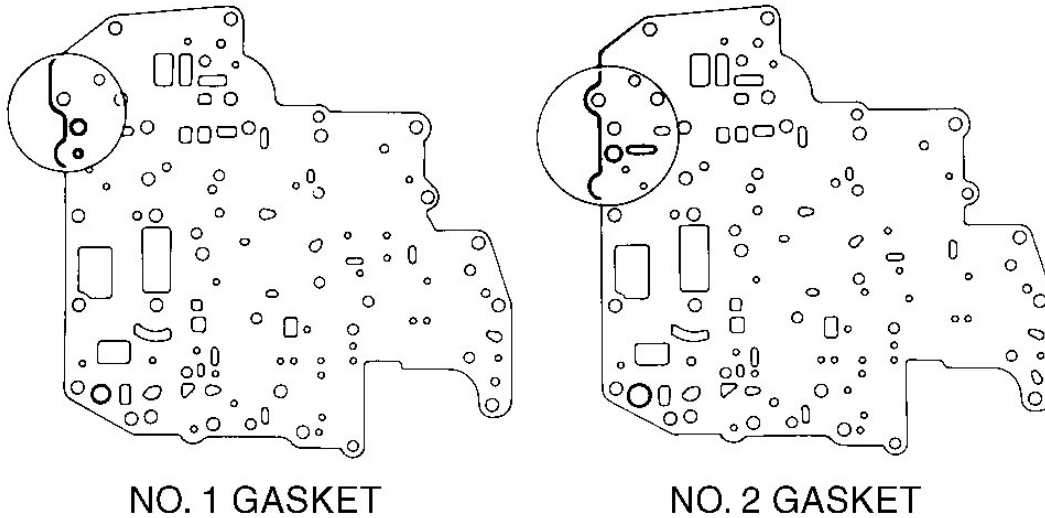


Fig. 36: Identifying Upper & Lower Valve Body Cover Bolt Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



G93A25155

Fig. 37: Identifying Valve Body Gaskets

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

OVERDRIVE BRAKE

Disassembly

1. Remove overdrive brake drum. Push in return spring and using a screwdriver, remove snap ring. Remove cushion plate. Remove plates, discs and flange. See **Fig. 41**.
2. Remove piston from drum by applying compressed air to oil hole and remove piston. Ensure piston does not tilt. Remove "O" ring from piston.

Inspection

Inspect disc, plate and flange. If disc lining is peeled or discolored, replace discs as necessary. If discs are replaced, allow discs to soak at least 15 minutes in ATF.

Reassembly

1. Install "O" rings on piston. Coat "O" rings with ATF. Install piston in drum. Ensure "O" ring is not damaged. Install flange facing flat end upward.
2. Install following parts in order: disc, plate, plate, disc, plate. Install cushion plate with rounded end upward. Install piston return spring assembly. Install snap ring in case. Ensure end gap of snap ring is not aligned with cutouts. While turning the overdrive gear clockwise, install overdrive gear to case. If overdrive gear is properly installed to case, height will be .94" (24.0 mm). See **Fig. 38**.

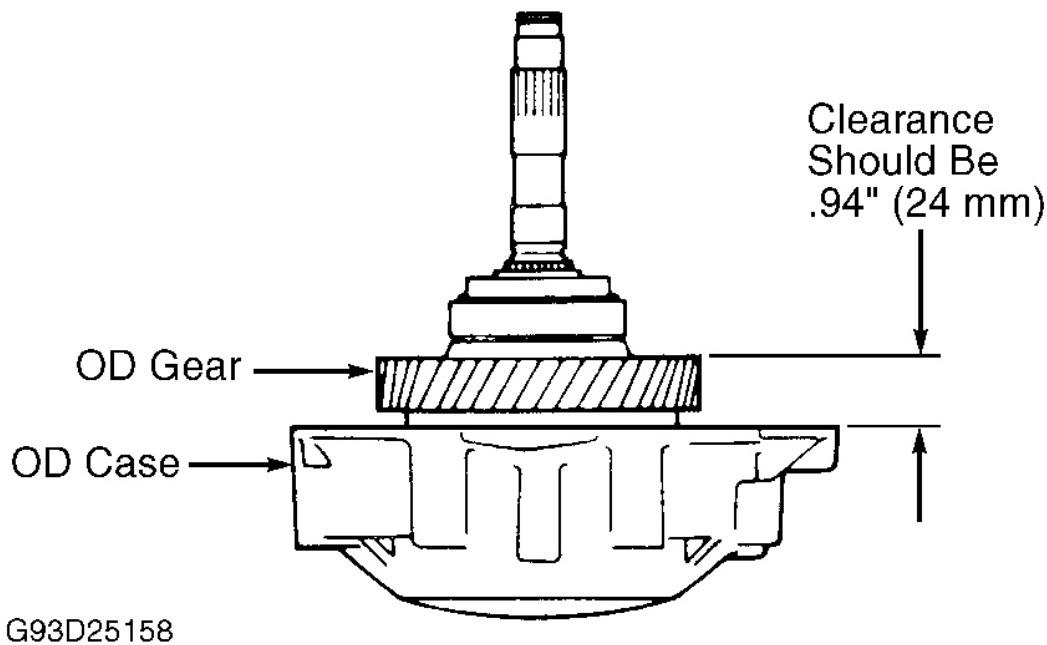


Fig. 38: Checking Installed Height Between OD Gear & Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OVERDRIVE DIRECT CLUTCH

Disassembly

1. Remove OD direct clutch from case. Remove bearing and race from clutch drum and case. Using a screwdriver, remove snap ring. Remove flanges, discs and plates.
2. Using appropriate spring compressor, compress piston return spring. Remove snap ring and piston return spring. Install clutch drum on case.
3. Apply compressed air to pressure apply hole. Remove OD direct clutch drum from case. See **Fig. 39**. If piston does not completely come out, use needle-nose pliers to remove piston. Remove "O" rings from piston.

Inspection

1. Inspect check ball of piston for free movement by shaking piston. Ensure valve does not leak by applying low pressure compressed air. If disc lining is peeled or discolored, replace discs as necessary. If discs are replaced, allow discs to soak at least 15 minutes in ATF.
2. Measure inside diameter of both OD direct clutch drum bushings. Maximum inside diameter is .870" (22.09 mm). If inside diameter exceeds specification, replace OD direct clutch drum.

Reassembly

1. Coat NEW "O" rings with ATF. Install "O" rings on piston. Press piston in drum with cup side up. **DO NOT** damage "O" rings. Install return spring. Set retainer and snap ring in place.
2. Compress spring retainer. Install snap ring with a screwdriver. Ensure end gap of ring is aligned with groove of clutch drum.
3. Install following parts in order: flange, disc, plate, disc and flange. Using a screwdriver, install snap ring. Ensure snap ring end gap is aligned with groove of clutch drum.
4. Coat race with petroleum jelly and install race to case. Coat assembled bearing and race with petroleum jelly and install with race side facing downward to clutch drum.
5. Install OD clutch drum to case. Measure OD direct clutch piston stroke by applying compressed air into case passage. Piston stroke should be .048-.075" (1.21-1.91 mm). See **Fig. 40**. If piston does not move, disassemble and inspect.

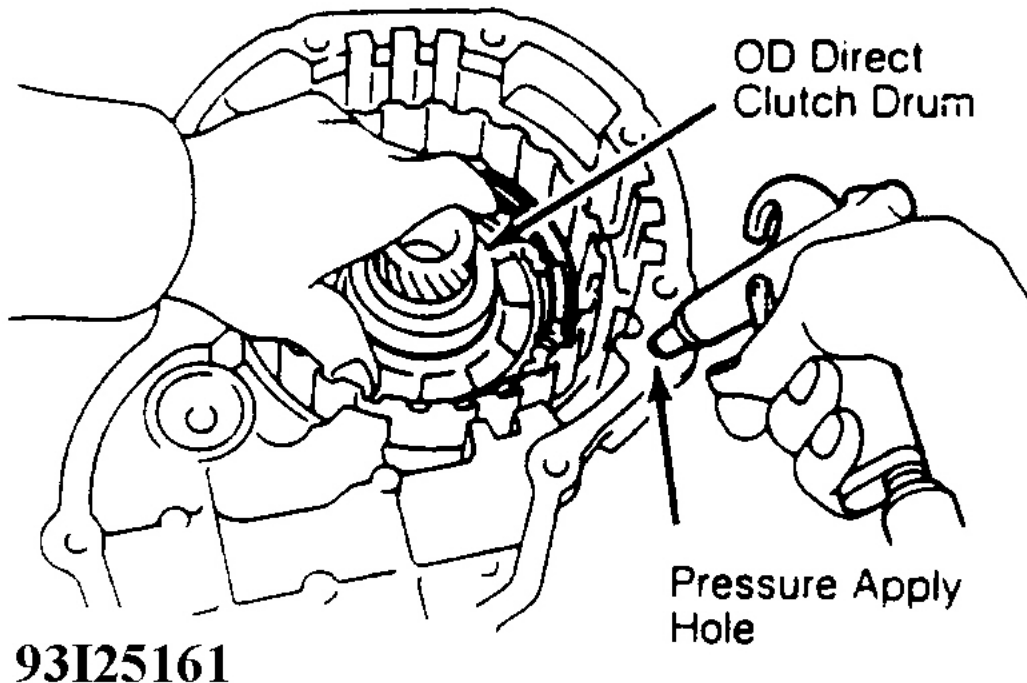


Fig. 39: Removing OD Direct Clutch From Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

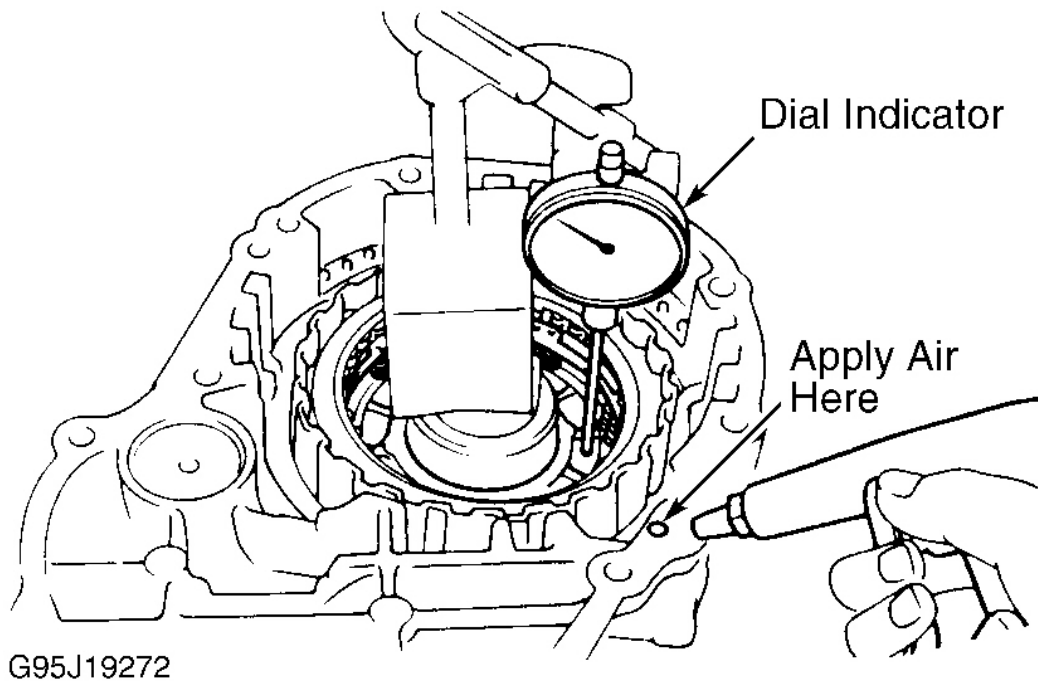


Fig. 40: Measure OD Direct Clutch Piston Stroke
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OVERDRIVE ONE-WAY CLUTCH

Disassembly

1. Install OD clutch in OD planetary gear while turning OD clutch clockwise. Hold OD clutch and turn intermediate shaft. Shaft should turn freely clockwise and lock counterclockwise. If not, proceed to next step.
2. Remove snap ring and retaining plate. Remove one-way clutch and outer race as an assembly. Remove No. 3 overdrive planetary thrust washer. See **Fig. 41**.
3. Remove one-way clutch from outer race, noting direction of one-way clutch. Using magnet, carefully remove 4 plugs from planetary gear.

Reassembly

1. Install 4 plugs through planetary gear. Install No. 3 thrust washer with groove facing overdrive case. Install one-way clutch into outer race.
2. Install retainers on both sides of one-way clutch. Place overdrive one-way clutch assembly into hub. Ensure one-way clutch is installed in correct direction and is the correct part. Install retaining plate and snap ring.
3. Hold OD clutch and turn intermediate shaft. Shaft should turn freely clockwise and lock

counterclockwise. Remove OD clutch from planetary gear.

OVERDRIVE CASE

Disassembly

Remove OD direct clutch accumulator piston snap ring. Remove retaining plate and 2 springs. Remove accumulator piston. Remove oil seal rings from case. Push one end of ring into groove and unhook both ends of ring by hand. Spread rings and remove.

Reassembly

Spread rings and install in groove. Push one end of ring in groove and hook both ends by hand. Coat NEW "O" ring with ATF and install on OD direct clutch accumulator piston. Install accumulator piston, spring, retainer plate and snap ring.

COUNTERDRIVE GEAR & BEARING

Disassembly

1. Pry back tabs of lock washer with chisel. Hold shaft in soft-jawed vise. Loosen adjusting nut. Remove nut and washer. Use a bearing puller and arbor press to remove intermediate shaft bearing.
2. Use a press to remove counterdrive gear and front bearing together. Remove rear bearing using bearing puller and arbor press. To remove OD planetary ring gear from counterdrive gear, pull up ring gear. Compress snap ring with needle-nose pliers. Remove snap ring from groove.
3. Remove ring gear from counterdrive gear. Use a brass bar and hammer to drive outer races from counterdrive gear. Using a screwdriver, remove snap ring from counterdrive gear.

Inspection

Using a feeler gauge, measure overdrive planetary pinion gear thrust clearance. Standard clearance is .008-.020" (.20-.50 mm).

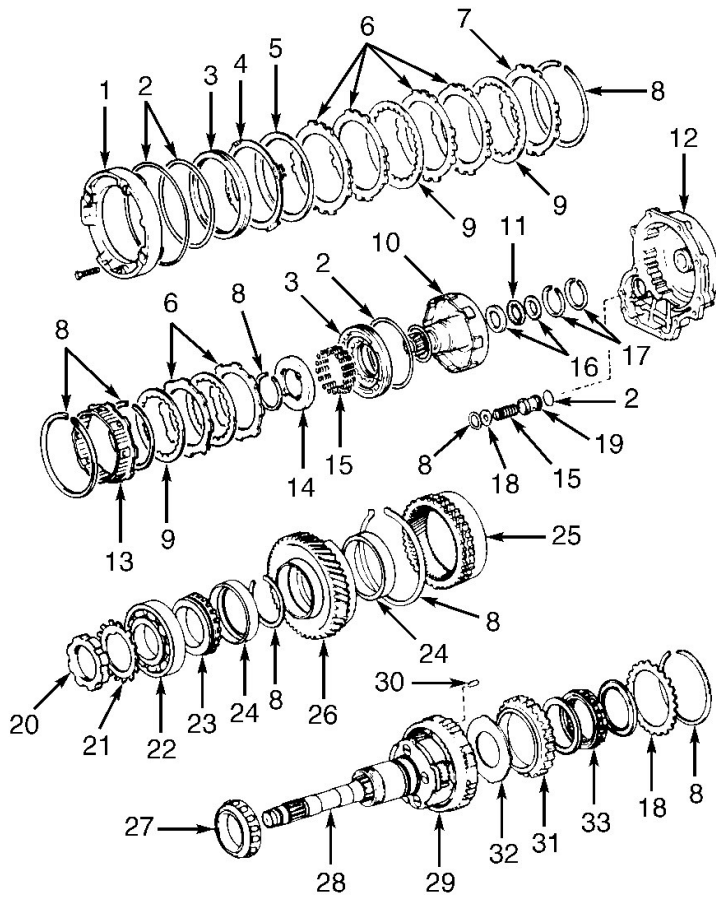
Reassembly

1. Install snap ring in counterdrive gear. Use a bearing race installer and arbor press to install 2 outer races in counterdrive gear. Press in outer races until races touch snap ring.
2. While pushing down on ring gear, squeeze snap ring end with needle-nose pliers. Install OD planetary ring gear in counterdrive gear. When snap ring is fully seated, end is free.
3. Use a plate and arbor press to install rear bearing on shaft. Press in bearing until side surface of inner race touches shaft. Install counterdrive gear on shaft. Mesh ring gear with planetary pinions. Place front bearing on shaft. Hold ring gear to prevent shaft from falling.
4. Press in bearing until axial play between bearings is .020" (.50 mm). Press bearing on intermediate shaft. Press bearing until bearing race touches front bearing of counterdrive gear.
5. Place locking washer and adjusting nut on intermediate shaft. Adjust preload of counterdrive gear. Holding shaft in a soft-jawed vise. Using a spring gauge and wrench on adjusting nut, tighten adjusting nut.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

6. Rotate counterdrive gear right and left several times before measuring preload. Torque adjusting nut until preload is 2.0-3.4 INCH lbs. (9-15 N). See **Fig. 42**. Bend lock washer tab until even with adjusting nut groove.
7. Install snap ring. Ensure snap ring end gap is not aligned with cutouts. Turn OD gear clockwise and install OD gear in case. If OD gear is properly installed, clearance between OD gear and case will be .94" (24.0 mm). See **Fig. 38**. Align pin of OD brake drum in hole of case and install OD brake drum.



- | | |
|---------------------------|---|
| 1. OD Brake Drum | 18. Retaining Plate |
| 2. "O" Ring | 19. OD Direct Clutch Accumulator Piston |
| 3. Piston | 20. Adjusting Nut |
| 4. Piston Return Spring | 21. Lock Washer |
| 5. Cushion Plate | 22. Intermediate Shaft Bearing |
| 6. Plate | 23. Front Bearing |
| 7. Flange | 24. Outer Race |
| 8. Snap Ring | 25. Ring Gear |
| 9. Disc | 26. Counter Drive Gear |
| 10. OD Direct Clutch Drum | 27. Rear Bearing |
| 11. Thrust Bearing | 28. Intermediate Shaft |
| 12. OD Case | 29. OD Planetary Gear |
| 13. OD Brake Hub | 30. Plug |
| 14. Spring Retainer | 31. One-Way Clutch Outer Race |
| 15. Spring | 32. No. 3 Thrust Washer |
| 16. Races | 33. OD One-Way Clutch |
| 17. Oil Seal Rings | |

G93J25162

Fig. 41: Exploded View Of Overdrive Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

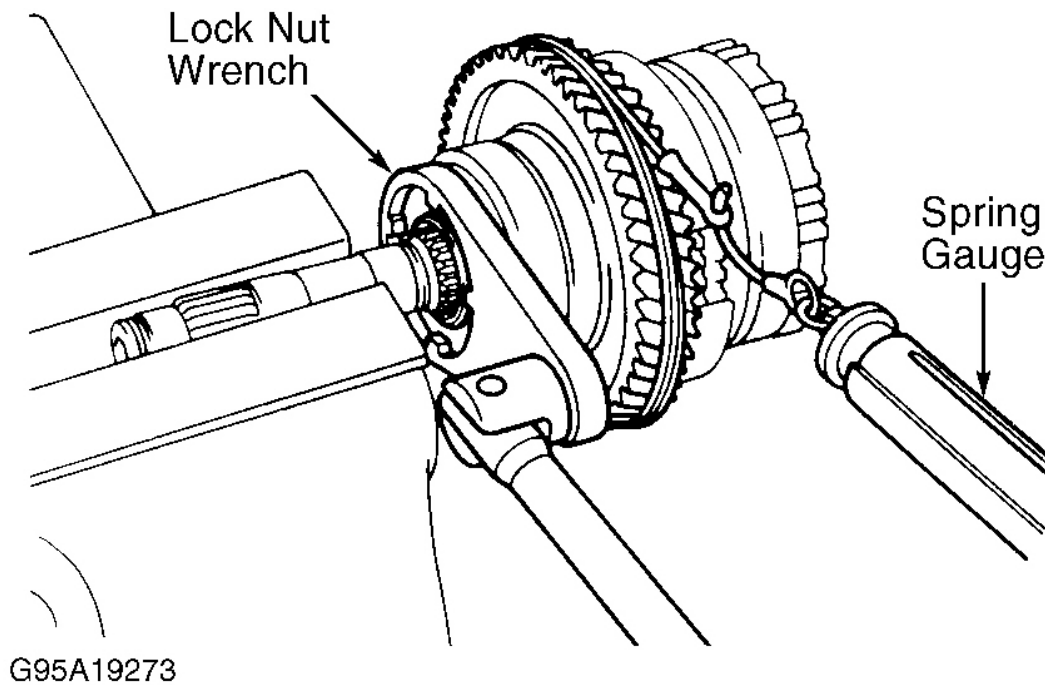


Fig. 42: Adjusting Preload Of Counterdrive Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

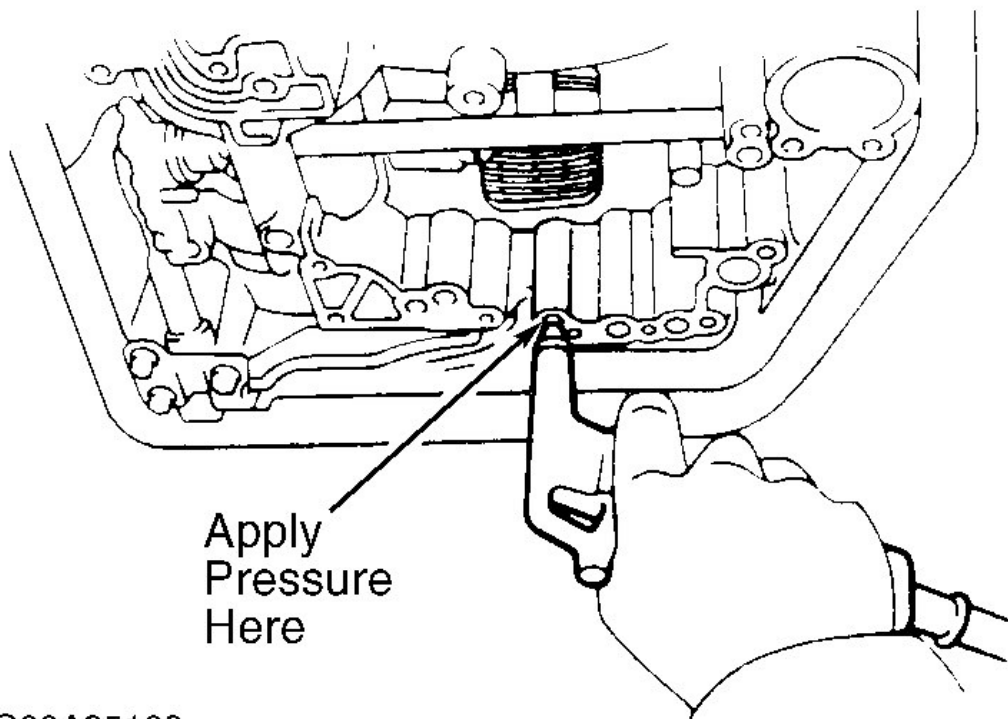
TRANSAXLE REASSEMBLY

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 cut-outs 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: For thrust bearing and race location, see [Fig. 53](#).

1. Install drive pinion. Refer to [DRIVE PINION ASSEMBLY](#) under COMPONENT DISASSEMBLY & REASSEMBLY. Install differential assembly. Refer to [DIFFERENTIAL ASSEMBLY](#) under COMPONENT DISASSEMBLY & REASSEMBLY.
2. Install manual valve shaft. Install shaft oil seal to case. Assemble a new collar to manual valve lever. Install manual valve lever shaft to case through lever. Drive in roll pin until flush with lever surface. Align collar hole with notch in lever and stake in position using a hammer and punch. Install retaining spring. Ensure lever moves smoothly.
3. Install parking pawl. Hook spring ends to case and pawl. Install pin in hole of case through spring and

- pawl. Install parking lock rod. Install parking lock pawl bracket. Tighten bolts to 65 INCH lbs. (7.4 N.m). Check operation of parking pawl. Ensure counterdriven gear is locked when manual lever is in "P" range.
4. Coat 1st and reverse brake piston "O" rings with ATF and install on piston. Install 1st and reverse brake piston to case with spring seat upward. Place piston return spring and snap ring on piston. Compress return spring until snap ring can be installed.
5. Coat OD apply gaskets with petroleum jelly to hold in place. Install gaskets on transmission case. Install both overdrive brake and governor apply gaskets over appropriate case opening.
6. Align each bolt hole in gasket and case. Install overdrive unit over gasket. Tighten bolts to 18 ft. lbs. (25 N.m). Check intermediate shaft end play. Ensure shaft has thrust play in axial (in and out) direction. Thrust clearance should be .019-.059" (.49-1.51 mm). Ensure shaft turns smoothly.
7. Install 1st and reverse brake in case. Install brake inner flange facing flat end toward oil pump side. Install following parts in order: disc, plate, disc, plate, disc, plate, disc, plate, disc, plate and disc. Install outer flange flat side facing toward piston side.
8. Install snap ring. Ensure snap ring end gap is not aligned with cutouts. Check operation of 1st and reverse brake. Apply compressed air at oil passage of transmission case to confirm piston movement. See **Fig. 43**.



G93A25163

Fig. 43: Checking Operation Of 1st & Reverse Brake
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. Coat rear ring gear thrust washers with petroleum jelly. Install washers on ring gear. Ensure that different

lug shapes match openings on ring gear. Coat races and bearing with petroleum jelly. Install planetary gear on ring gear. Install ring gear into case.

10. Install rear planetary gear in case by aligning lugs of discs in 1st and reverse brake. Align spline of carrier with lugs of discs. Install planetary gear in 1st and reverse brake discs.
11. Install No. 2 one-way clutch in case. Install one-way clutch on inner race while turning planetary pinion counterclockwise with snap ring pliers. Check operation of No. 2 one-way clutch by turning planetary carrier. Carrier should turn freely clockwise and lock counterclockwise. Install snap ring. Ensure end gap is not aligned with cutouts.
12. Install 2nd coast brake band guide and 2nd brake drum guide. Install band guide so tip touches case. Install 2nd brake in case. Install brake flange facing flat end toward 2nd brake piston.
13. Install following parts in order: flange, disc, plate, disc, plate, disc, plate. Install piston return spring assembly with each spring end installed in protrusion of case.
14. Install 2nd brake drum in case. Align groove of drum with bolt. Place drum in case. Place snap ring in case so end gap is installed in groove. While compressing piston return springs over drum with 2 hammer handles, install snap ring in groove. Ensure snap ring end gap is not aligned with cutouts. Install 2nd brake drum gasket.
15. Check operation of 2nd brake by applying compressed air into case oil passage. Ensure piston moves freely. See **Fig. 44**. Install new drum gasket until contact is made with 2nd brake drum.
16. Install No. 1 one-way clutch and 2nd brake hub by aligning flukes of discs in 2nd brake. Align spline of hub with flukes of discs. Install hub in 2nd brake discs. Check distance between surfaces of 2nd brake hub and rear planetary gear. See **Fig. 45**. Distance should be approximately .20" (5.0 mm).

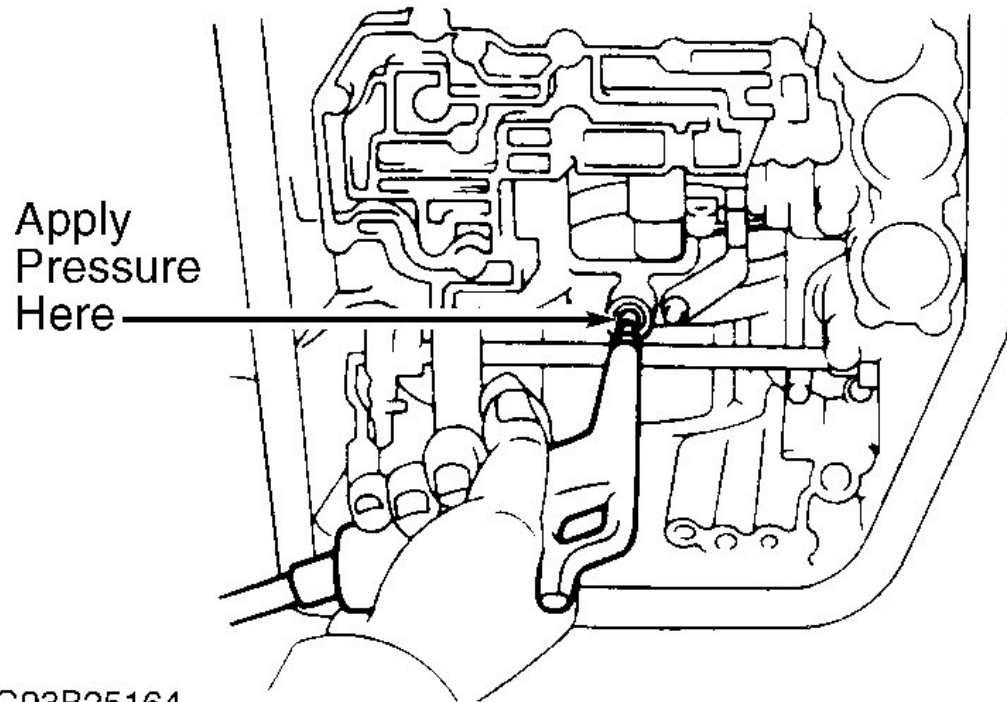


Fig. 44: Checking Operation Of 2nd Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

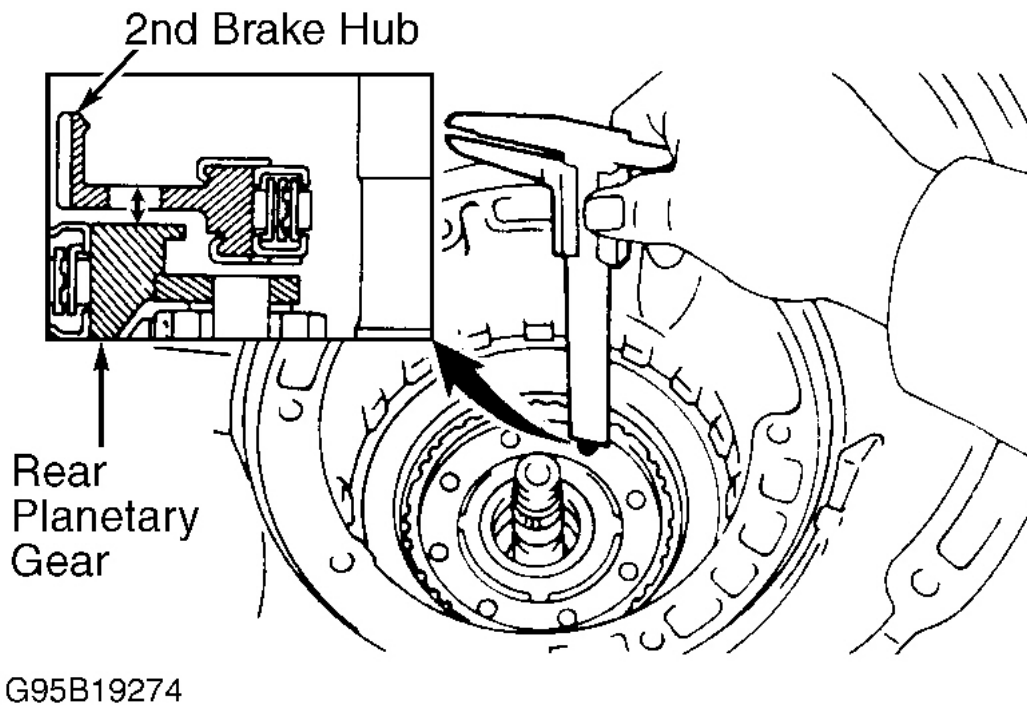


Fig. 45: Checking Clearance Between 2nd Brake Hub & Rear Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. Install sun gear and sun gear input drum by turning sun gear clockwise and installing in one-way clutch. Ensure sun gear is placed in center of intermediate shaft to protect bushing from damage.
18. To install front planetary gear on ring gear, coat races and bearings with petroleum jelly. Install races and bearings onto ring gear. Install planetary gear on ring gear.

NOTE: For thrust bearing and race location, see **Fig. 53**.

19. Install front planetary gear assembly on sun gear. If planetary gear and other parts are installed correctly in case, end of bushing with ring gear flange will be flush with shoulder of intermediate shaft.
20. Coat race with petroleum jelly. Install race onto tip of ring gear flange. Install intermediate shaft oil seal ring. Install 2nd coast brake band in case. Install pin through oil pump mounting bolt hole. See **Fig. 46**.

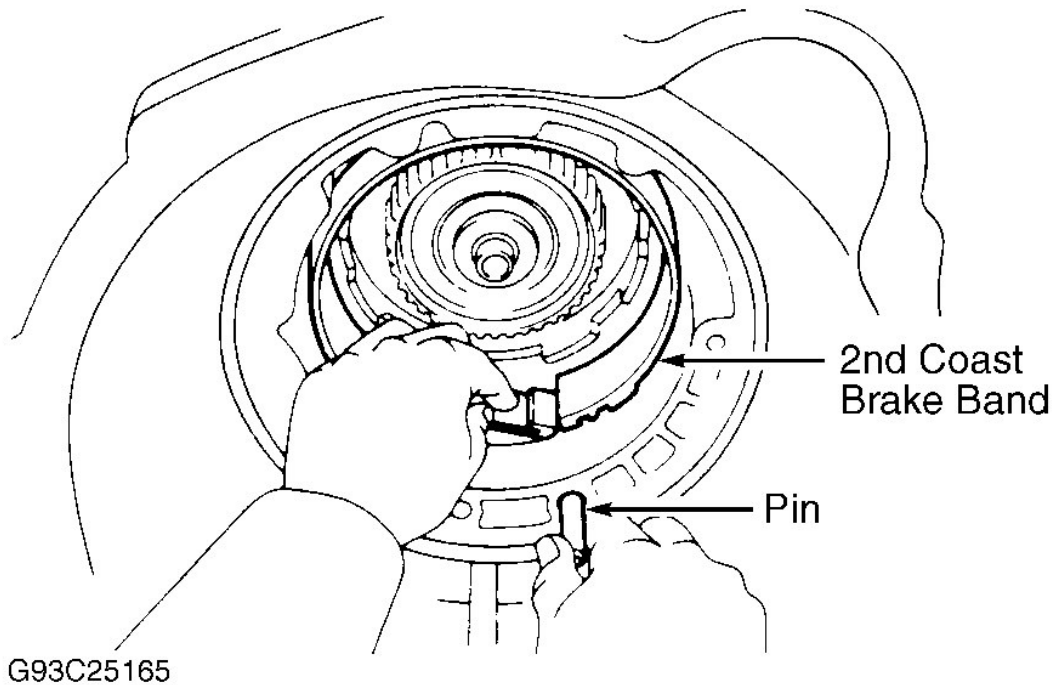


Fig. 46: Installing 2nd Coast Brake Band

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

21. Install forward clutch in case by coating races and bearings with petroleum jelly. Install races and bearings on both sides of clutch drum. Coat clutch drum thrust washer with petroleum jelly.
22. Install thrust washer with oil groove facing upward onto direct clutch drum. Align lugs of disc in direct clutch. Mesh hub with lugs of direct clutch while turning clutch drum or forward clutch.
23. If lugs of discs are meshed with hub correctly, end of bushing with direct clutch drum will be flush with surface of forward clutch. Place direct and forward clutch into case.
24. Rotate forward clutch to mesh front planetary ring gear and discs. Check distance between direct clutch and forward clutch. See **Fig. 47**. Distance should be .118" (3.00 mm).

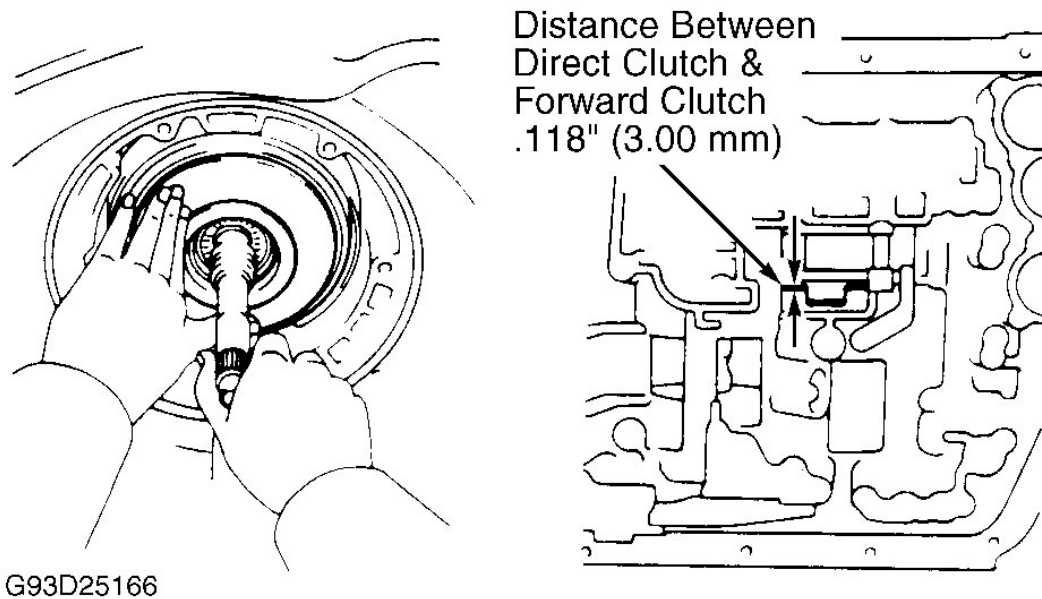


Fig. 47: Checking Distance Between Direct & Forward Clutch

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

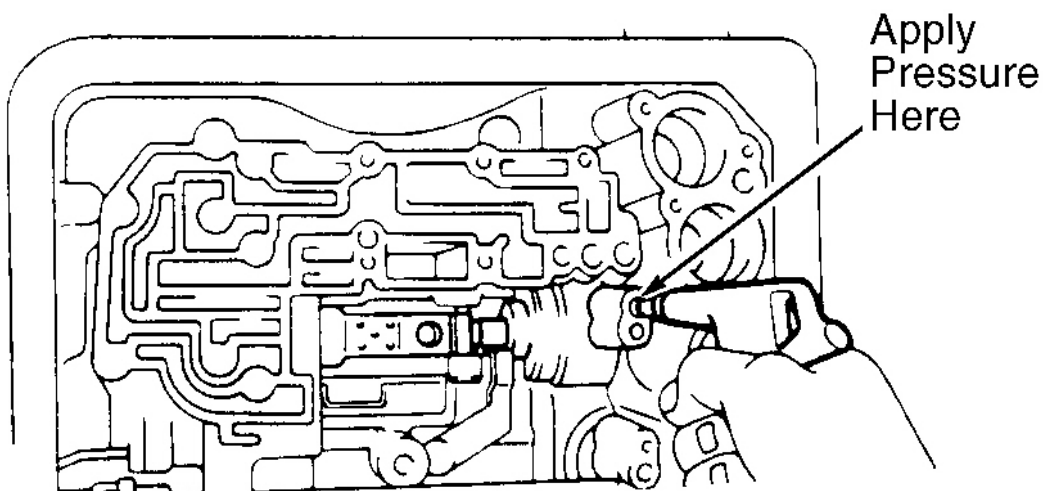
25. Coat oil pump race with petroleum jelly. Install oil pump on stator shaft. Place oil pump through input shaft. Align bolt holes of pump body at transmission case. Hold input shaft. Lightly press oil pump body to slide oil seal rings on stator shaft through direct clutch drum.
26. **DO NOT** push on oil pump hard or oil seal ring will stick to direct clutch drum. Install and tighten oil pump mounting bolts to 16 ft. lbs. (22 N.m). Measure end play of input shaft in axial direction.
27. End play should be .012-.035" (.30-.90 mm). If end play is not within specification, chose alternate bearing race. There are 2 different thicknesses of races for end of stator shaft, .031" (.80 mm) and .055" (1.40 mm). If end play is still not within specification, recheck all sub-component assemblies. Check input shaft rotation. Ensure shaft turns smoothly.
28. Install 2nd coast brake piston. Remove all parts from bore. Install outer spring with piston. Place cover in bore. Install snap ring while pressing in on cover. Ensure front end of piston rod contacts center of 2nd brake band depression.
29. Check 2nd coast brake piston stroke. Apply a small amount of paint to piston rod at point were piston rod contacts case. Measure 2nd coast piston stroke by applying and releasing 57-114 psi (4-8 kg/cm²) of compressed air. See **Fig. 48**. Piston stroke should be .059-.118" (1.50-3.00 mm).
30. If stroke exceeds specification, replace piston rod with longer rod. Piston rods are available in 2 sizes, 2.870" (72.90 mm) or 2.811" (71.40 mm). After installation of new rod, remeasure stroke. If stroke exceeds specification, replace brake band.
31. Install the accumulator pistons and springs into the bore. See **Fig. 49**. Verify correct spring installation. Refer to the **SPRING FREE LENGTH SPECIFICATIONS** table. Install cover with gasket. Tighten 5 bolts gradually to 89 INCH lbs. (10 N.m). Ensure proper length bolts are used. See **Fig. 50**.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

SPRING FREE LENGTH SPECIFICATIONS

Application	Free Height: In. (mm)	Color
Front Clutch	2.269 (57.64)	Red & Purple
Direct Clutch	2.764 (70.21)	Purple
2nd Brake	2.732 (69.39)	Green & White



G93E25167

Fig. 48: Checking Operation Of 2nd Coast Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

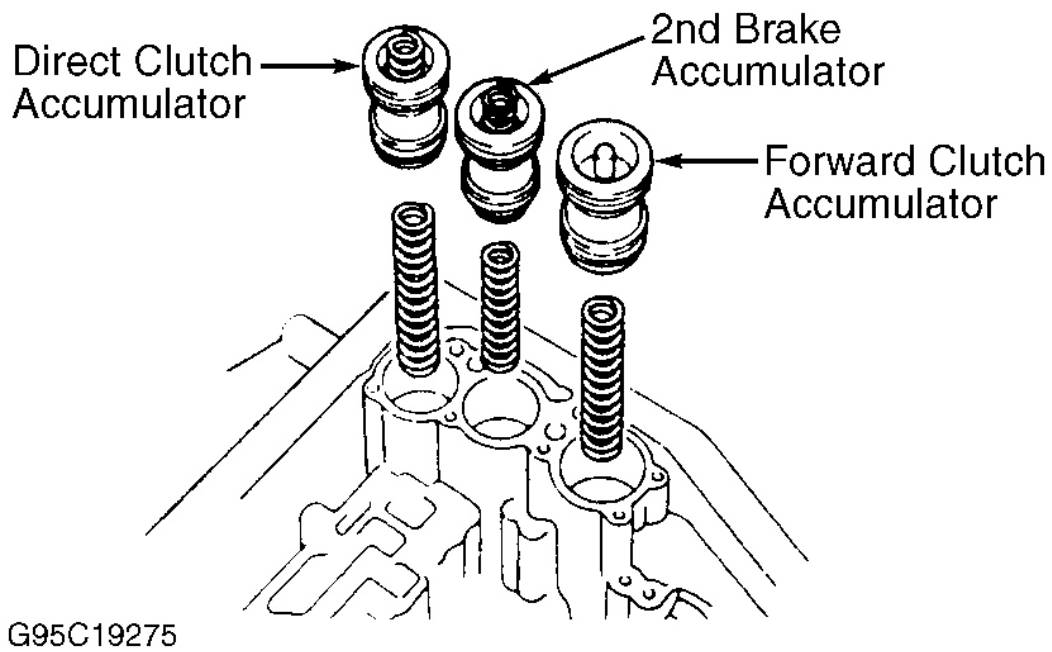


Fig. 49: Identifying Accumulator Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

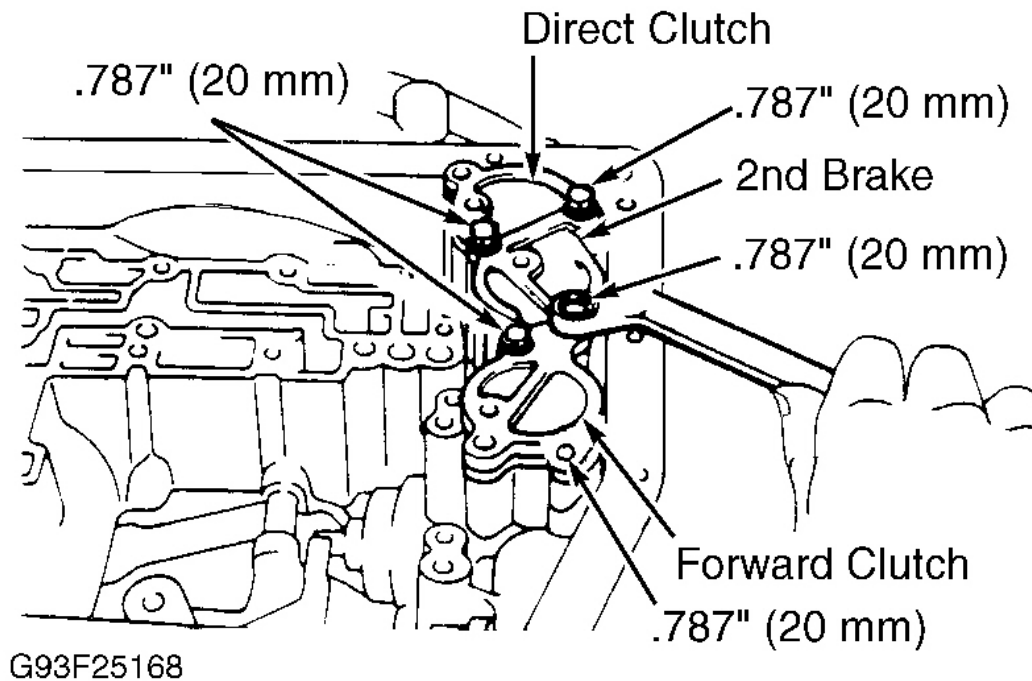


Fig. 50: Identifying Length & Location Of Accumulator Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION: DO NOT roll case over cable. Cable fitting will be damaged.

32. Install throttle cable and solenoid wiring through case. Ensure "O" ring is not damaged. Ensure all components are fully seated. Place valve body on transmission. While holding cam down with hand, slip cable end in slot. Lower valve body in position. **DO NOT** entangle throttle cable, solenoid or kickdown wiring.
33. Install valve body bolts. Ensure proper length and location of bolts. See **Fig. 4**. Finger tighten all bolts. Tighten bolts in crisscross pattern to 89 INCH lbs. (10 N.m). Connect solenoid wire connectors.
34. Place manual valve and body on transmission. Align manual lever with pin of manual shaft lever. Lower valve body into position. Finger tighten bolts. Evenly torque bolts to 89 INCH lbs. (10 N.m).
35. Install detent spring. Ensure proper length and location of each bolt. Finger tighten bolts. Tighten to 89 INCH lbs. (10 N.m). Check for correct operation of manual valve lever. Ensure lever is touching center of detent spring tip roller.
36. Install oil tubes using plastic hammer. See **Fig. 51**. **DO NOT** bend or damage tubes. Install tube bracket. Tighten bolts to 89 INCH lbs. (10 N.m). Install oil strainer. Tighten bolts to 89 INCH lbs. (10 N.m). Install magnet on oil pan.
37. Ensure magnet does not interfere with oil tubes. Install oil pan with gasket. Tighten pan bolts to 43 INCH

lbs. (4.9 N.m). On 1993 models, install speed sensor with "O" ring. On all other models, install plug. Install cover/plug bracket with 2 bolts.

38. On all models, install throttle and solenoid wiring retainer plates. Install filler tube and gauge (dipstick). Install solenoid by coating "O" rings with ATF and pushing tip of solenoid into hole. Tighten 2 bolts.
39. Install park/neutral position switch. Install seal gasket, facing lip inward. Tighten nut to 61 INCH lbs. (6.9 N.m) and stake with lock washer. Install manual shift lever. Adjust park/neutral position switch by aligning groove and neutral basic line. Lock switch with 2 bolts. Tighten bolts to 48 INCH lbs. (5.4 N.m).
40. Install cooler lines. Install bracket on case. Connect lines to union. Clamp pipes on bracket and union nuts. Tighten union nuts to 20 ft. lbs. (27 N.m). Install torque converter in transaxle while turning. Ensure converter is properly installed by measuring distance from edge of housing. See **Fig. 52**. Setback should be more than .898" (22.8 mm).

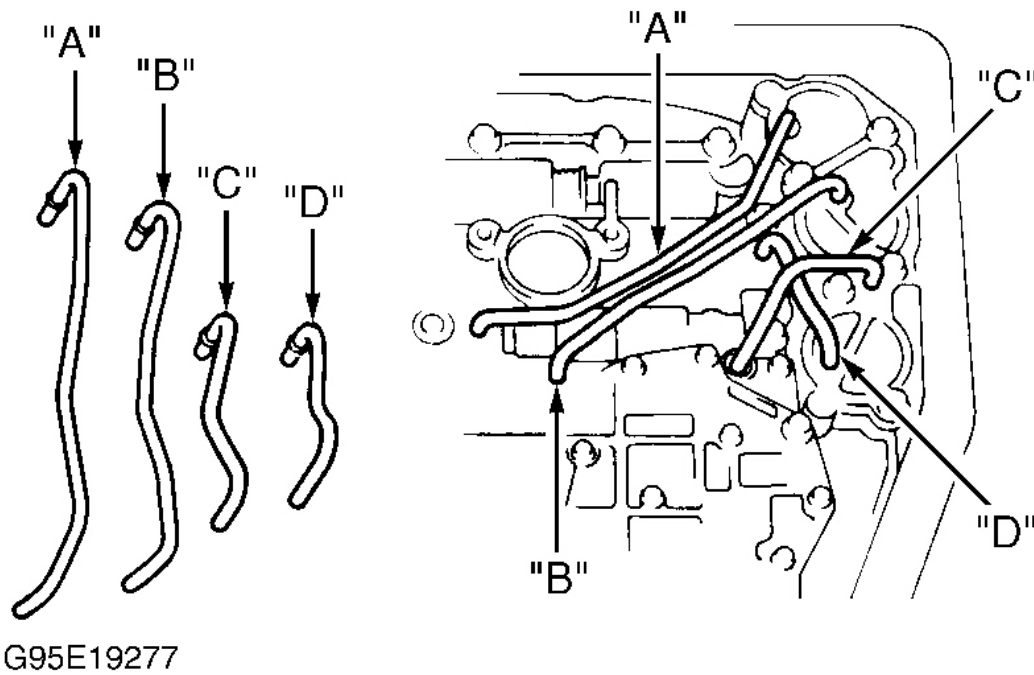
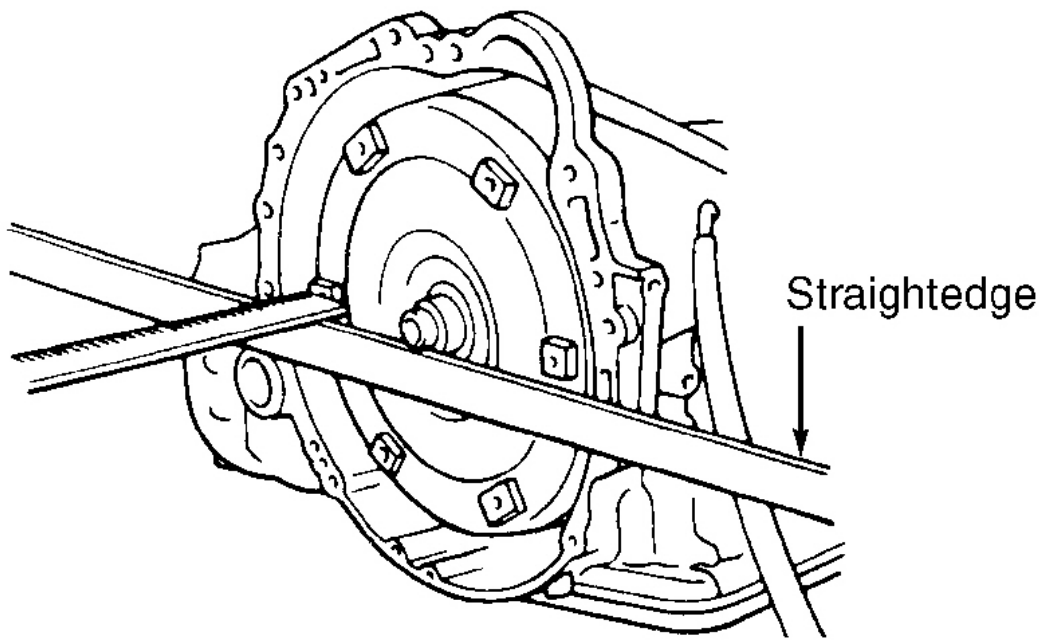


Fig. 51: Identifying Oil Tubes

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

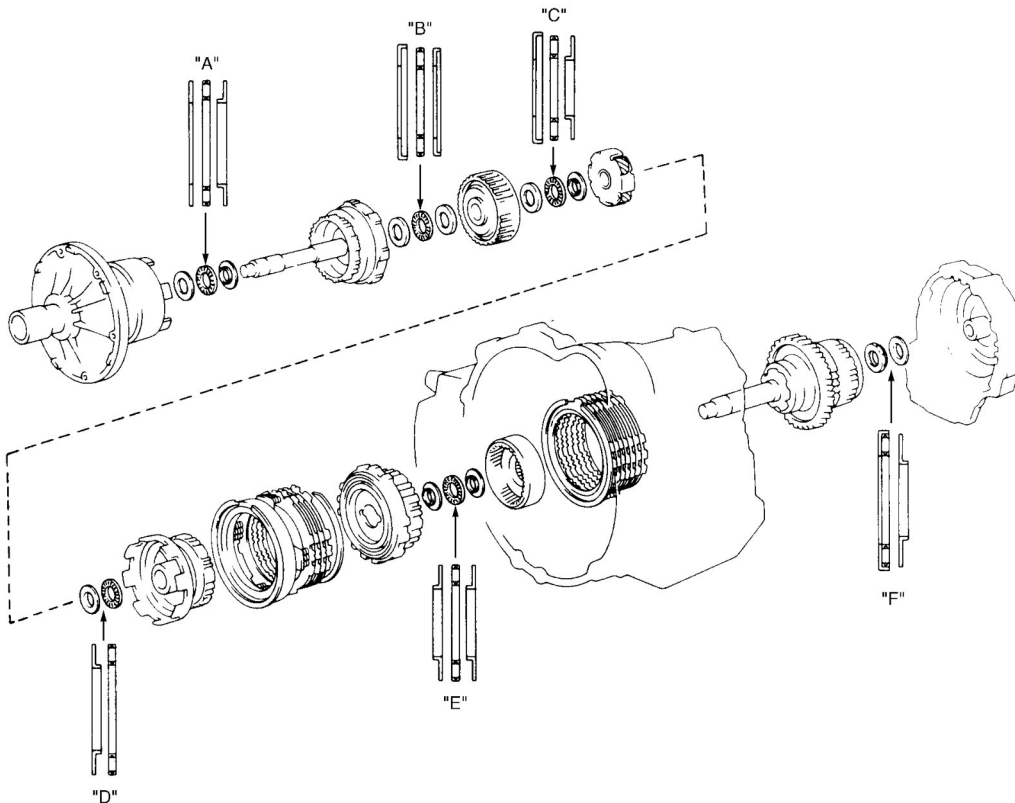


G95J19280

Fig. 52: Measuring Torque Converter Depth
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul



THRUST BEARING & RACE SPECIFICATIONS

Application	Outer Diameter In. (mm)	Inner Diameter In. (mm)
"A"		
Front Race	1.693 (43)	1.201 (30.5)
Rear Race	1.654 (42)	1.067 (27.1)
Bearing	1.654 (42)	1.138 (28.9)
"B"		
Front Race	1.492 (37.9)	.866 (22)
Rear Race	1.406 (35.7)	.906 (23)
Bearing	1.421 (36.1)	.874 (22.2)
"C"		
Front Race	1.492 (37.9)	.866 (22)
Rear Race	1.378 (35)	.748 (19)
Bearing	1.421 (36.1)	.874 (22.2)

THRUST BEARING & RACE SPECIFICATIONS (Cont.)

Application	Outer Diameter In. (mm)	Inner Diameter In. (mm)
"D"		
Front Race	1.772 (45)	1.102 (28)
Bearing	1.772 (45)	1.181 (30)
"E"		
Front Race	1.469 (37.3)	.949 (24.1)
Rear Race	1.480 (37.6)	.874 (22.2)
Bearing	1.480 (37.6)	.945 (24.0)
"F"		
Rear Race	1.693 (43)	.965 (24.5)
Bearing	1.823 (46.3)	1.031 (26.2)

G95A19281

Fig. 53: Identifying Thrust Bearing & Thrust Washer Locations
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TRANSMISSION SPECIFICATIONS

TRANSMISSION SPECIFICATIONS

Application	In. (mm)
Bushing Inside Diameter (Maximum)	
Direct Clutch	1.853 (47.07)
Oil Pump Body	1.503 (38.18)
Oil Pump Stator	
Front Bushing	.849 (21.57)

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

Rear Bushing	1.066 (27.07)
OD Direct Clutch	.870 (22.09)
Planetary Ring Gear Flange	.749-.750 (19.03-19.05)
Stator Shaft	.849 (21.57)
Input Shaft End Play	.012-.035 (.30-.90)
Intermediate Shaft End Play	.019-.059 (.49-1.51)
Planetary Pinion Gear Clearance (All)	.008-.020 (.20-.50)
Oil Pump	
Driven Gear-To-Body Clearance	.003-.006 (.07-.15)
Driven Gear Tip-To- Crescent Clearance	.004-.006 (.11-.15)
Gears Side Clearance	.0008-.0020 (.02-.05)
Piston Stroke	
Direct Clutch	.044-.057 (1.11-1.44)
Forward Clutch	.056-.071 (1.41-1.82)
2nd Coast Brake	.059-.118 (1.5-3.0)
OD Direct Clutch	.048-.075 (1.21-1.91)
Side Gear Backlash	.002-.008 (.05-.20)
Torque Converter Runout (Maximum)	
Drive Plate	.008 (.20)
Sleeve	.012 (.30)

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Application	Ft. Lbs. (N.m)
Converter-To-Drive Plate Bolts	20 (27)
Differential	
Carrier Bearing Cap Bolts	53 (72)
Carrier Cover Bolts	18 (25)
Counterdriven Gear Mounting Nut	127 (172)
Maximum Torque (Preload Adj.)	213 (289)
Ring Gear Mounting Bolts	72 (97)
Side Bearing Retainer	14 (19)
Drive Plate Mounting Bolts	61 (83)
Oil Pan Drain Plug	36 (49)
Oil Pump Mounting Bolts	16 (22)
Overdrive Unit-To-Transmission Case Mounting Bolts	18 (25)

1990 Toyota Camry

1984-94 AUTOMATIC TRANSMISSIONS Toyota A-140E & A-140L Overhaul

	INCH Lbs. (N.m)
Accumulator Cover Bolts	89 (10)
Lower-To-Upper Valve Body Attaching Bolts	48 (5.4)
Manual Valve & Body Attaching Bolts	89 (10)
Neutral Start Switch Nut	61 (6.9)
Neutral Start Switch Bolts	48 (5.4)
Oil Pan Attaching Bolts	43 (4.9)
Oil Strainer Attaching Bolts	89 (10)
Parking Pawl Mounting Bolt	65 (7.4)
Speed Sensor Bracket Bolt	115 (13)
Stator Shaft-To-Oil Pump Attaching Bolts	89 (10)
Tube Bracket Attaching Bolts	89 (10)
Upper-To-Lower Valve Body Attaching Bolts	48 (5.4)
Valve Body Mounting Bolts	89 (10)