

## 1999 Toyota RAV4

1999 MANUAL TRANSMISSIONS Toyota E250 & E250F 5-Speed Overhaul

### 1999 MANUAL TRANSMISSIONS

#### Toyota E250 & E250F 5-Speed Overhaul

## APPLICATION

### TRANSAXLE APPLICATIONS

Vehicle Application	Transaxle Model
RAV4	
2WD	E250
4WD	E250F

## IDENTIFICATION

Transmission type is identified by ID label located on driver-side door post.

## DESCRIPTION

Transaxle design incorporates transmission, center differential, front differential and transfer case (4WD models). Transmission is shifted by a pair of push-pull cables. These cables provide positive shift feel and absorb transmission and engine vibrations. The E250F utilizes a full-time transfer case with a limited slip viscous coupling. Both the E250 and E250F have a center differential, which compensates for difference between the rotational speed of the front and rear wheels.

## ADJUSTMENTS

**NOTE:** No adjustments are necessary.

## LUBRICATION

Remove filler plug from side of transmission. Fluid should be level with bottom of filler opening. If fluid is low, fill until level is correct. Use SAE 75W/90 API GL-4 or GL-5 gear oil for 2WD models, or SAE 75W/90 API GL-5 gear oil for 4WD models. Capacity is 4.1 qts. (3.9L) for 2WD models, or 5.3 qts. (5.0L) for 4WD models.

## ON-VEHICLE SERVICE

### AXLE SHAFTS

See appropriate AXLE SHAFTS article in AXLE SHAFTS & TRANSFER CASES.

## TROUBLE SHOOTING

See GENERAL TROUBLE SHOOTING article.

## REMOVAL & INSTALLATION

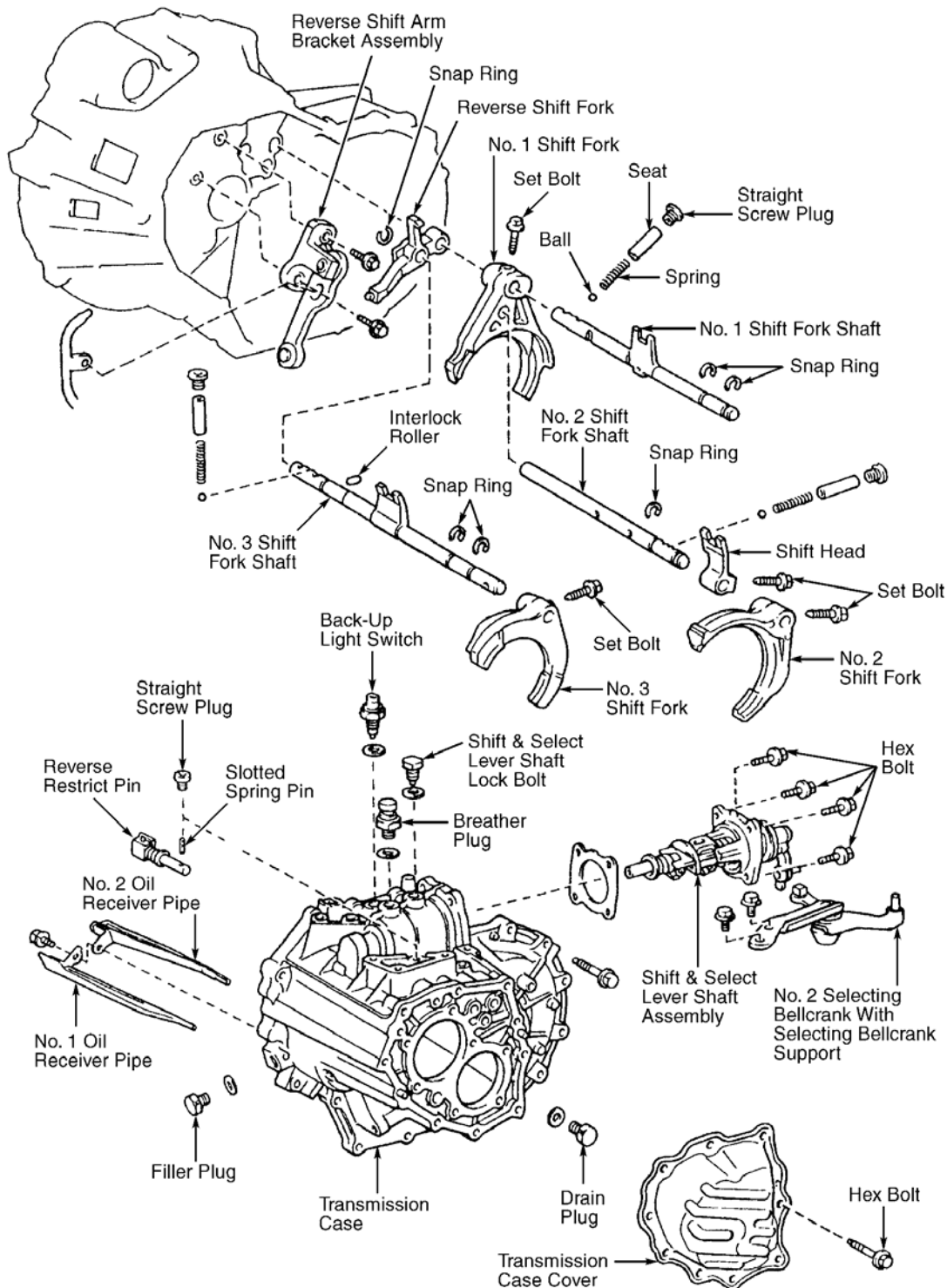
See appropriate MANUAL TRANSMISSION REMOVAL article in TRANSMISSION SERVICING.

## TRANSAXLE DISASSEMBLY

1. Unbolt transfer case from transaxle housing. Using a plastic hammer, remove transfer case from transaxle. Screw appropriate bolt and washer into differential side gear intermediate shaft. Using slide hammer type puller, remove shaft. Remove snap ring from shaft.
2. Remove clutch release fork and bearing. Remove back-up light switch. Remove speedometer adapter. Remove speedometer driven gear or speed sensor, if equipped. Remove gear selecting bellcrank. Remove shift and select lever lock bolt. Remove control shaft cover. Remove shift and select lever shaft assembly. See **Fig. 1**.
3. Remove case cover. Unstake output shaft lock nut. Lock transmission in 2 gears. Remove output shaft lock nut. Unlock transmission. See **Fig. 2**.
4. Remove No. 3 shift fork set bolt. Remove No. 3 hub sleeve and No. 3 shift fork. Using puller, remove 5th driven gear. See **Fig. 2**. Measure 5th gear clearances. Record for reassembly reference. Using dial indicator, measure 5th gear thrust clearance. See **Fig. 3** and **Fig. 4**. Standard clearance should be .004-.022" (.10-.57 mm). Service limit is .026" (.65 mm). Remount dial indicator to measure lateral movement (oil clearance) of 5th gear. Standard clearance should be .0004-.002" (.009-.05 mm). Service limit is .0028" (.070 mm).
5. Remove input shaft snap ring. Using puller, remove No. 3 clutch hub with synchronizer ring and 5th gear. Remove needle bearing and spacer. Remove 7 Torx (T45) screws and rear bearing retainer. Remove adjusting shim.
6. Remove input shaft rear bearing snap ring. Remove shift fork shaft snap rings. Remove plug. Remove seat, spring and detent ball with a magnet. Remove reverse idler gear shaft retaining bolt.
7. Remove transmission housing. Remove output shaft rear bearing outer race. Remove No. 2 oil pipe. Remove reverse shift arm bracket. Remove reverse idler gear, thrust washer and shaft. Remove all remaining plugs, seats, springs and detent balls with magnet.
8. To remove No. 1 shift fork shaft, pull up No. 3 shift fork shaft. Using magnetic finger, remove interlock roller. Remove No. 2 shift fork shaft, shift head and No. 1 shift fork. Pull out No. 3 shift fork shaft along with the reverse shift fork. Remove No. 2 shift fork. Remove snap rings from shift fork shafts.
9. Remove output and input shaft assemblies. Remove oil pump drive gear. Remove differential case assembly. Remove oil pipe and oil pump. See **Fig. 1**.

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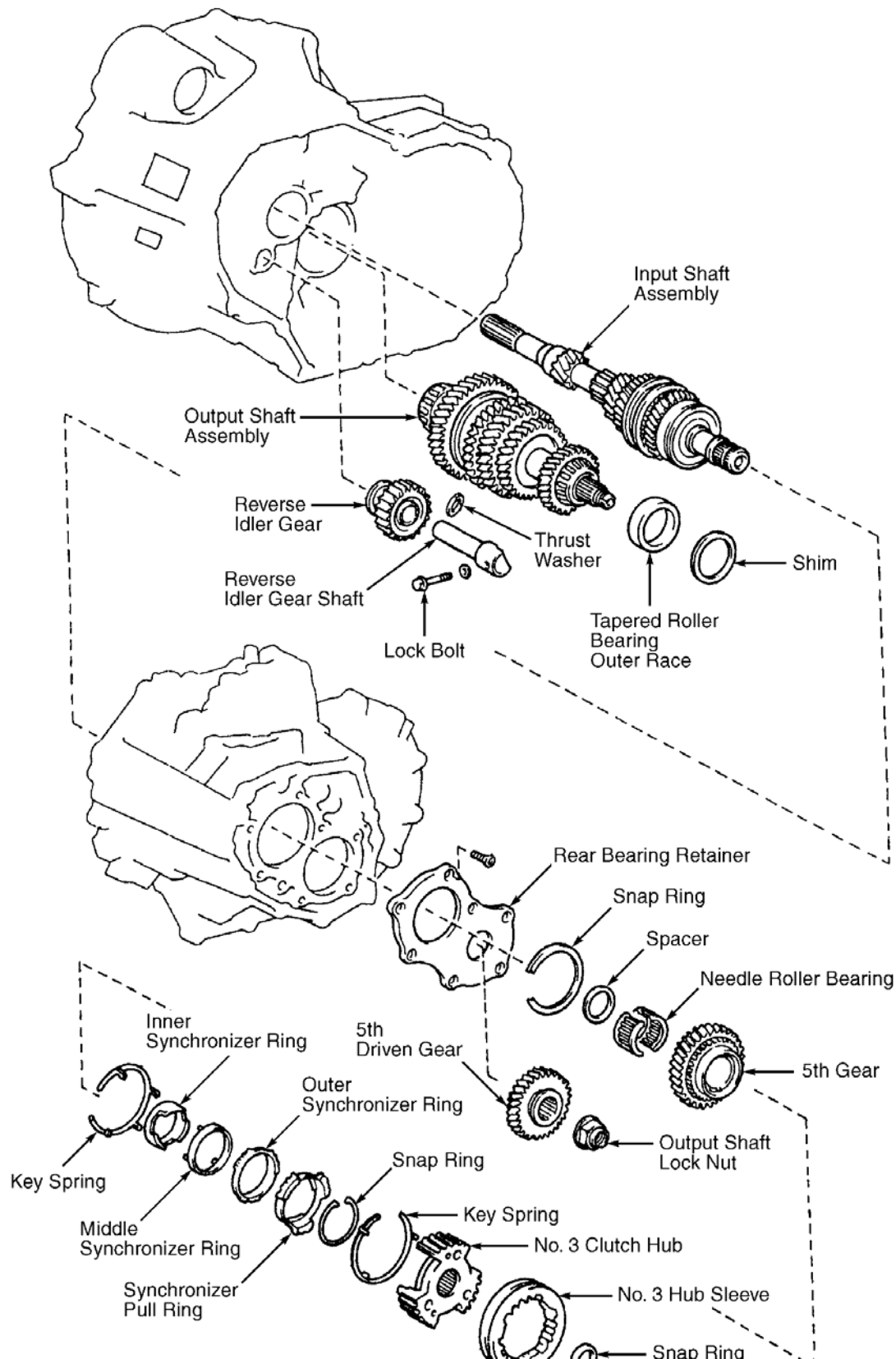


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**Fig. 1: Exploded View Of Transmission Assembly (1 Of 2)**  
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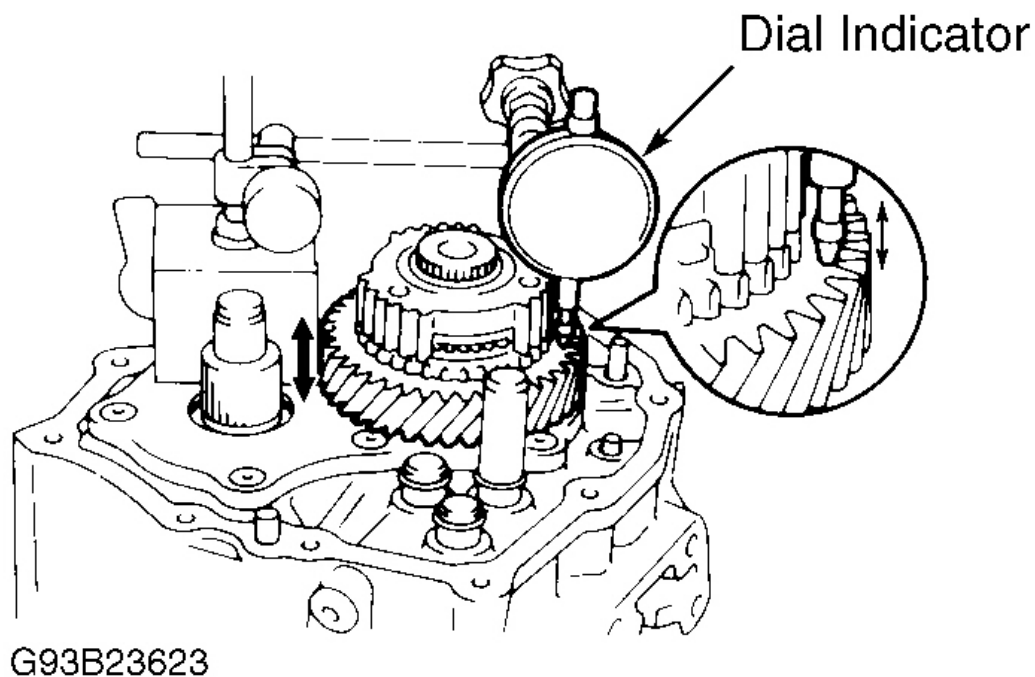
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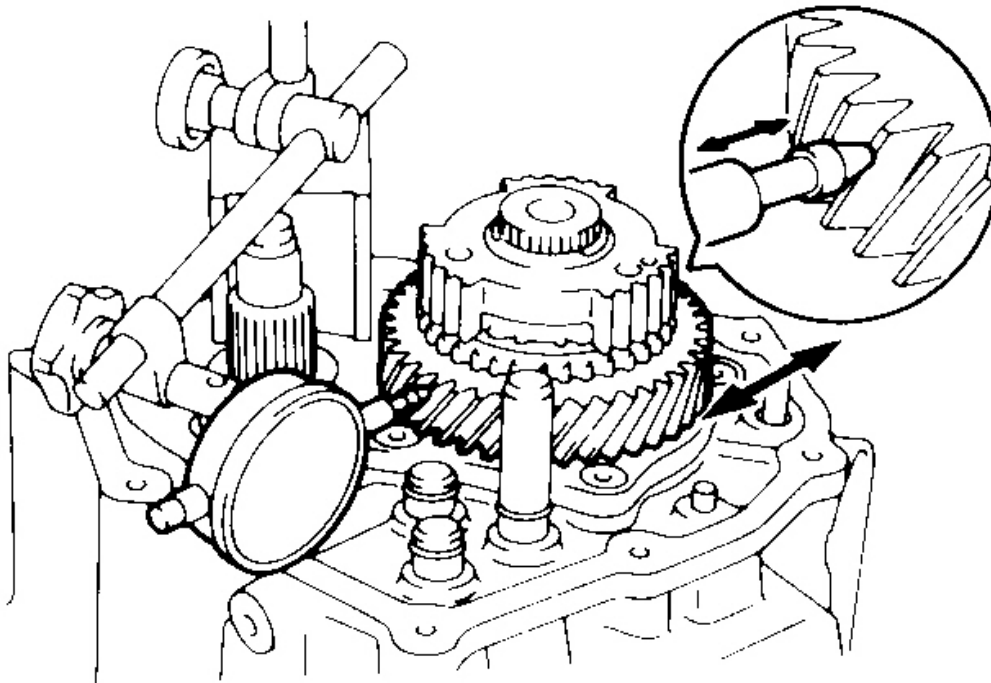
**Fig. 2: Exploded View Of Transmission Assembly (2 Of 2)**

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



**Fig. 3: Measuring 5th Gear Thrust Clearance**

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



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**Fig. 4: Measuring 5th Gear Lateral Movement**  
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## COMPONENT DISASSEMBLY & REASSEMBLY

### INPUT SHAFT (MAINSHAFT)

#### Disassembly

1. For all input shaft clearance measurements, see **INPUT SHAFT CLEARANCE SPECIFICATIONS** table. Using feeler gauge, measure 3rd and 4th gear thrust clearances. Secure input shaft in soft-jaw vise. Using dial indicator, measure 3rd and 4th gear lateral movement (gear oil clearance). If clearance exceeds maximum specification, replace gear, needle bearing and/or shaft.

#### INPUT SHAFT CLEARANCE SPECIFICATIONS

Application	In. (mm)
3rd Gear Thrust Clearance	
Standard	.004-.014 (.10-.35)

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Service Limit	.016 (.40)
4th Gear Thrust Clearance	
Standard	.004-.022 (.10-.55)
Service Limit	.024 (.60)
3rd & 4th Gear Lateral Movement	
Standard	.0004-.002 (.009-.05)
Service Limit	.003 (.07)

2. Remove snap ring from input shaft. Using bearing splitter or appropriate blocks, support 4th gear, and press input shaft out of rear bearing and 4th gear. Remove needle bearings, spacer and synchronizer ring. Remove snap ring. Supporting 3rd gear, press input shaft out of No. 2 hub sleeve. Remove synchronizer ring, needle bearing and 3rd gear. Remove needle bearing. Press input shaft out of front bearing inner race. See **Fig. 5**.

**NOTE:** Input shaft inner bearing race is non-reusable and should be replaced whenever removed..

#### Inspection

1. Inspect all parts for damage and wear. Replace if necessary. Clean all parts in clean solvent and dry. Lubricate all parts, and ensure oil passages are free of contamination.
2. Measure input shaft at points "A", "B" and "C". See **Fig. 6**. Support input shaft on "V" blocks. Using dial indicator to measure runout, rotate input shaft 2 complete revolutions. Replace input shaft if runout or any part of shaft is not within service limit. See **INPUT SHAFT JOURNAL DIAMETERS** table.

#### INPUT SHAFT JOURNAL DIAMETERS

Application <sup>(1)</sup>	Minimum Diameter - In. (mm)
"A" Shaft Journal Diameter	1.100 (27.95)
"B" Shaft Journal Diameter	1.415 (35.95)
"C" Shaft Journal Diameter	1.415 (35.95)
Runout Limits	.002 (.05)
(1) "A", "B", and "C" refer to measuring points indicated in illustration. See <b>Fig. 6</b> .	

**NOTE:** Input shaft front inner bearing race is non-reusable and should be replaced whenever removed.

#### Reassembly

1. Install clutch hub and shifting keys to No. 2 hub sleeve. Ensure key spring end-gaps are not in-line.
2. Apply multipurpose grease to needle bearings. Install bearing in 3rd gear. Place synchronizer ring on 3rd

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gear, and align ring slots with shifting keys. Using press, install 3rd gear and No. 2 hub sleeve. See **Fig. 5**.

3. Select snap ring that will allow minimum axial play on shaft. See **SNAP RING APPLICATION CHART NO. 1**.

#### SNAP RING APPLICATION CHART NO. 1

Stamped Letter	Thickness - In. (mm)
H	.090 (2.30)
J	.092 (2.35)
K	.094 (2.40)
L	.096 (2.45)
M	.098 (2.50)
N	.100 (2.55)
P	.102 (2.60)

4. Install selected snap ring. Recheck 3rd gear thrust clearance. Clearance should be .004-.014" (.10-.35 mm). Install spacer. Place synchronizer ring on 4th gear, and align ring slots with shifting keys. Install 4th gear. Press on ball bearing. See **Fig. 5**.
5. Select 4th gear snap ring that will allow minimum axial play on shaft. See **SNAP RING APPLICATION CHART NO. 2**.

#### SNAP RING APPLICATION CHART NO. 2

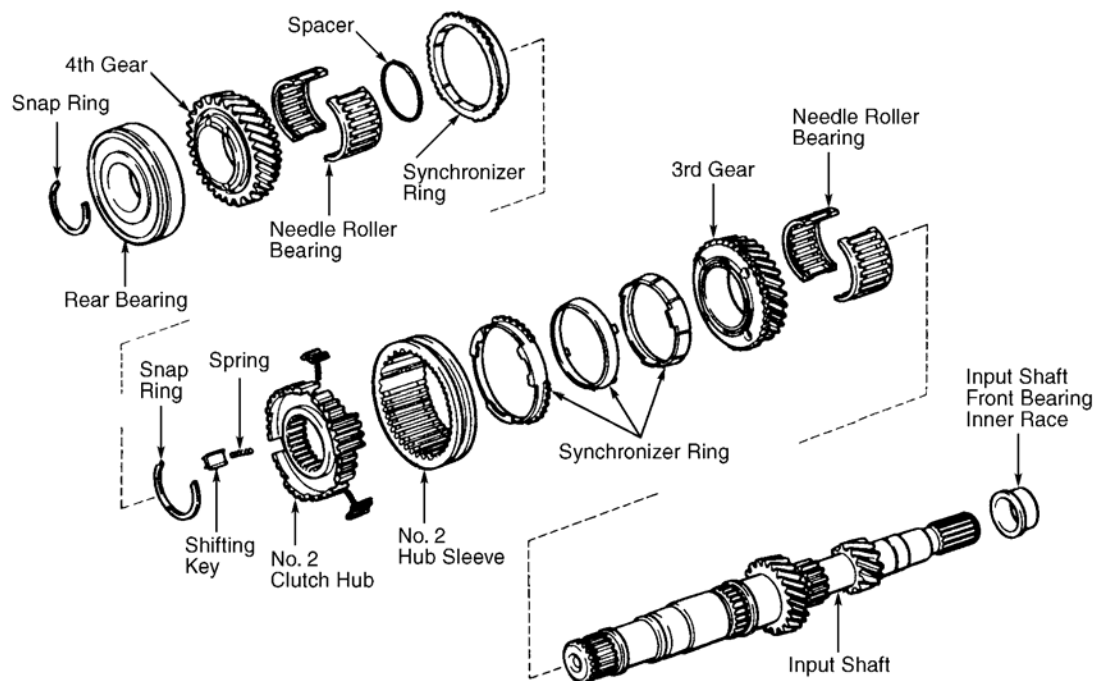
Stamped Number	Thickness - In. (mm)
1	.092 (2.35)
2	.094 (2.40)
3	.096 (2.45)
4	.098 (2.50)
5	.100 (2.55)
6	.102 (2.60)
7	.104 (2.65)
8	.106 (2.70)

6. Install snap ring. Recheck 4th gear thrust clearance. Clearance should be .004-.022" (.10-.55 mm). Using press, install input shaft front bearing inner race.



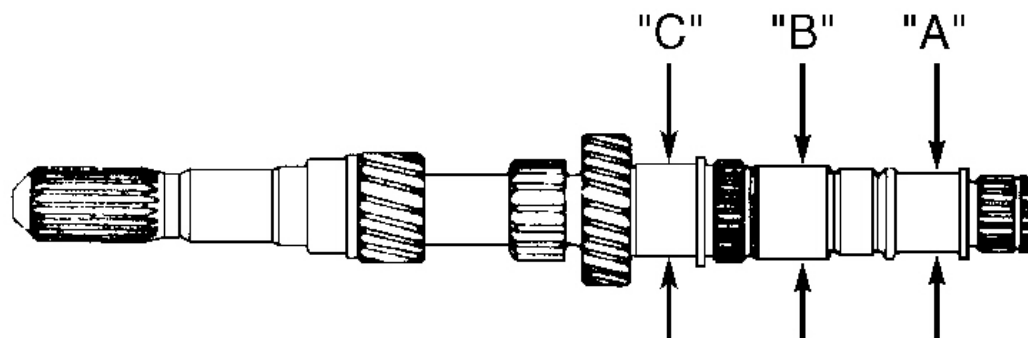
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**Fig. 5: Identifying Input Shaft Components**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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**Fig. 6: Measuring Input Shaft Journals**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OUTPUT SHAFT

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#### Disassembly

1. For all output shaft clearance specifications, refer to **OUTPUT SHAFT CLEARANCE SPECIFICATIONS** table. Using feeler gauge, measure 1st and 2nd gear thrust clearances. Secure output shaft in soft-jaw vise. Using dial indicator, measure 1st and 2nd gear lateral movement (gear oil clearance). If clearance exceeds maximum, replace gear, needle bearing and/or shaft.

#### OUTPUT SHAFT CLEARANCE SPECIFICATIONS

Application	In. (mm)
1st Gear Thrust Clearance	
Standard	.004-.014 (.10-.35)
Service Limit	.016 (.40)
2nd Gear Thrust Clearance	
Standard	.004-.018 (.10-.45)
Service Limit	.020 (.50)
1st & 2nd Gear Lateral Movement	
Standard	.0004-.002 (.009-.05)
Service Limit	.003 (.07)

2. Using bearing splitter or blocks, support 4th driven gear, and press output shaft out of rear bearing and 4th driven gear. Remove spacer. Support 2nd gear, and press output shaft out of 3rd driven gear and 2nd gear. Remove needle bearing, spacer and synchro ring. Remove snap ring. Support 1st gear, and press output shaft out of No. 1 hub sleeve and 1st gear. Remove synchro ring and needle bearing. See **Fig. 7**.

#### Inspection

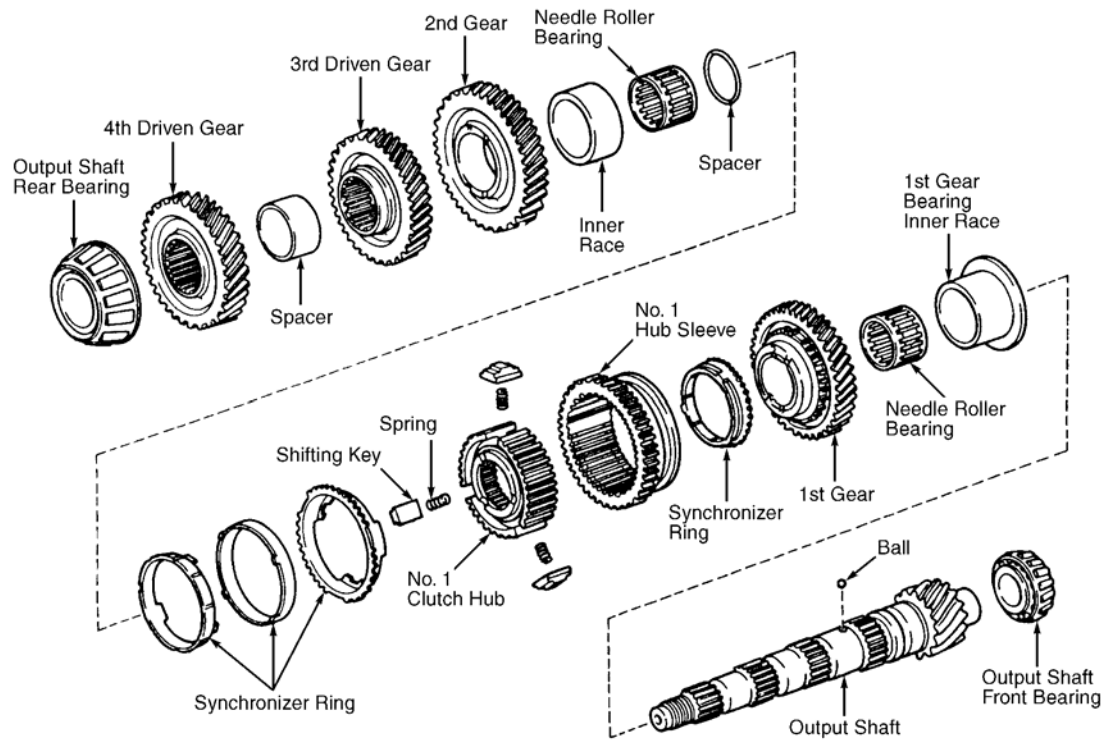
1. Inspect all parts for damage and wear. Replace if necessary. Thoroughly clean all parts in clean solvent, and dry. Lubricate all parts, and ensure oil passages are free of contamination.
2. Measure output shaft diameter at points "A" and "B". See **Fig. 8**. Support output shaft on "V" blocks. Using a dial indicator to measure runout, rotate output shaft 2 complete revolutions. Replace output shaft if runout or any part of shaft is not within service limit. See **OUTPUT SHAFT JOURNAL DIAMETERS** table.

#### OUTPUT SHAFT JOURNAL DIAMETERS

Application <sup>(1)</sup>	Minimum Diameter - In. (mm)
"A" Shaft Journal Diameters	1.48 (37.53)
"B" Shaft Journal Diameter	1.36 (34.51)
Runout Limits	.002 (.06)
(1) "A" and "B" refer to measuring points indicated in illustration. See <b>Fig. 8</b> .	

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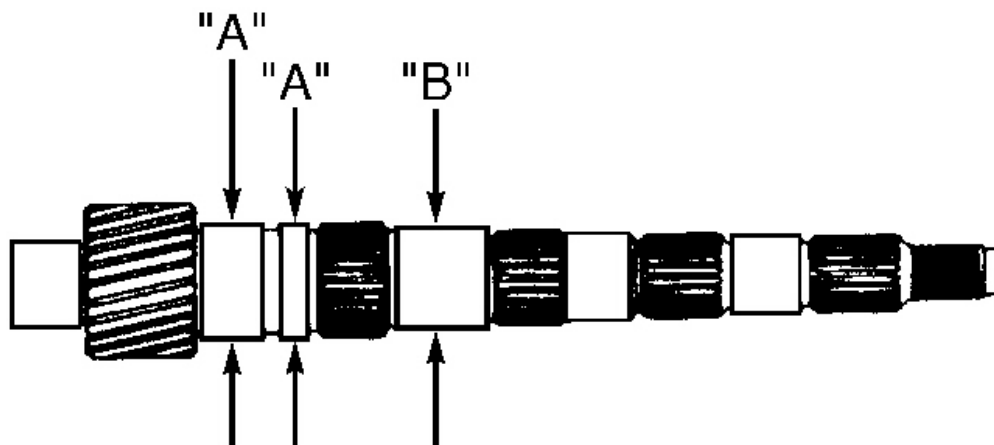
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**Fig. 7: Identifying Output Shaft Components**

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



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**Fig. 8: Measuring Output Shaft Journals**

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

**NOTE:** Output shaft inner bearing race is non-reusable and should be replaced.

**Reassembly**

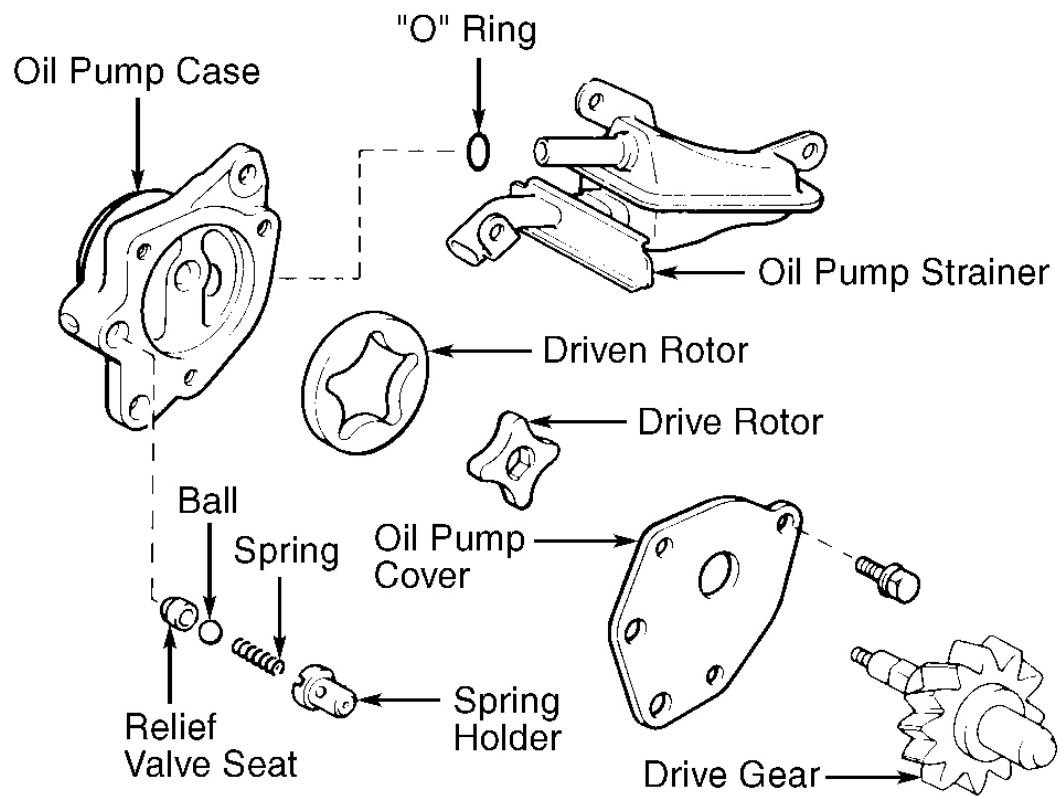
1. If output shaft rear bearing replacement is necessary, support bearing with bearing splitter or blocks. Press output shaft out of bearing. To replace, support bearing with Adapter (09316-60010), press shaft onto bearing. Use 2-jaw puller to remove bearing race from clutch housing. To replace, use driver.
2. Install components in reverse order of disassembly. Install ball, and 1st gear bearing inner race, and align hole in bearing to shaft. Install No. 1 clutch hub and shifting keys to No. 1 hub sleeve. Install shifting key springs under shifting keys. Ensure key spring end gaps are not in-line. Apply multipurpose grease to needle bearings. Install bearing in 1st gear. Place synchronizer ring on gear, and align ring slots with shifting keys. Press 1st gear and No. 1 hub sleeve onto output shaft. See **Fig. 7** . Install 1st gear snap ring.
3. Recheck 1st gear thrust clearance. Clearance should be .004-.014" (.10-.35 mm). Install spacer. Apply multipurpose grease to needle bearing. Place synchronizer ring on 2nd gear, and align ring slots with shifting keys. Install 2nd gear. Using press, install 3rd driven gear onto output shaft. Recheck 2nd gear thrust clearance. Standard clearance should be .004-.018" (.10-.45 mm). Install spacer. Using press, install 4th driven gear on output shaft. Press onto output shaft rear bearing.

**OIL PUMP****Disassembly & Inspection**

1. Install oil pump drive gear onto drive rotor. Ensure drive rotor turns smoothly. Remove gasket from oil pump case. Remove bolt, and pull out oil strainer. Hold oil pump cover. Unbolt and remove cover. Remove spring holder, spring, ball and relief valve seat. See **Fig. 9** .
2. Install oil pump drive gear onto drive rotor. Measure clearance between driven rotor and oil pump case. See **Fig. 10** and **Fig. 11** . Clearance should be .004-.006" (.10-.16 mm). Service limit is .012" (.30 mm). Measure tip clearance between drive rotor and driven rotor. See **Fig. 10** and **Fig. 11** . Standard clearance should be .003-.006" (.08-.15 mm). Service limit is .012" (.30 mm).
3. Remove oil pump drive gear. Using straightedge and feeler gauge, measure side clearance of both rotors. Standard clearance should be .001-.003" (.03-.08 mm). Maximum clearance is .006" (.16 mm). Remove oil pump drive rotor and driven rotor.

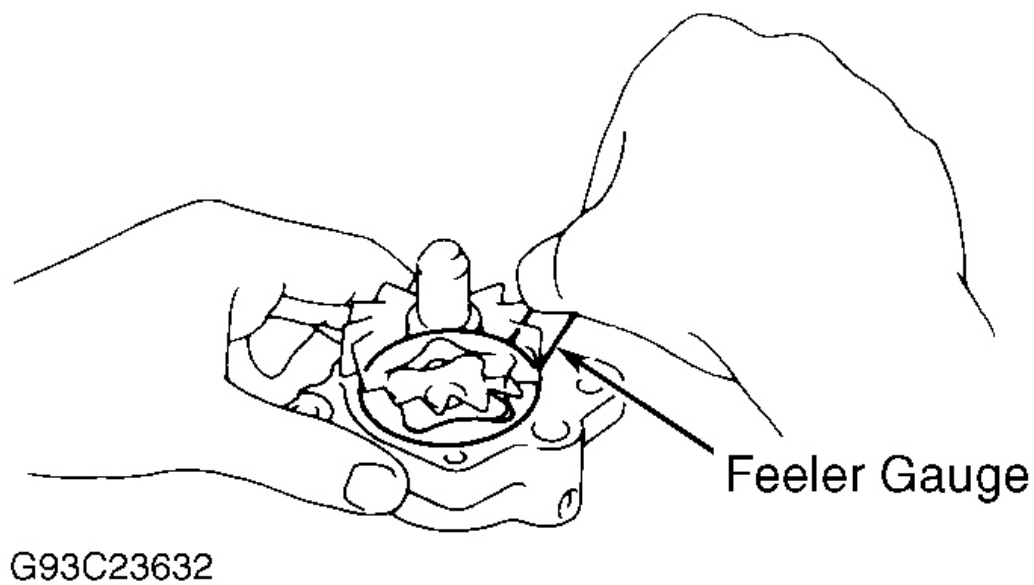
**Reassembly**

Replace "O" ring in oil pump case. Install driven rotor and drive rotor. Install relief valve, ball, spring and spring holder into oil pump case. Install oil strainer to oil pump case. Tighten oil pump cover bolts to 89 INCH lbs. (10 N.m). Insert oil pump drive gear onto drive rotor. Ensure drive rotor turns smoothly. Install NEW gasket onto oil pump case.

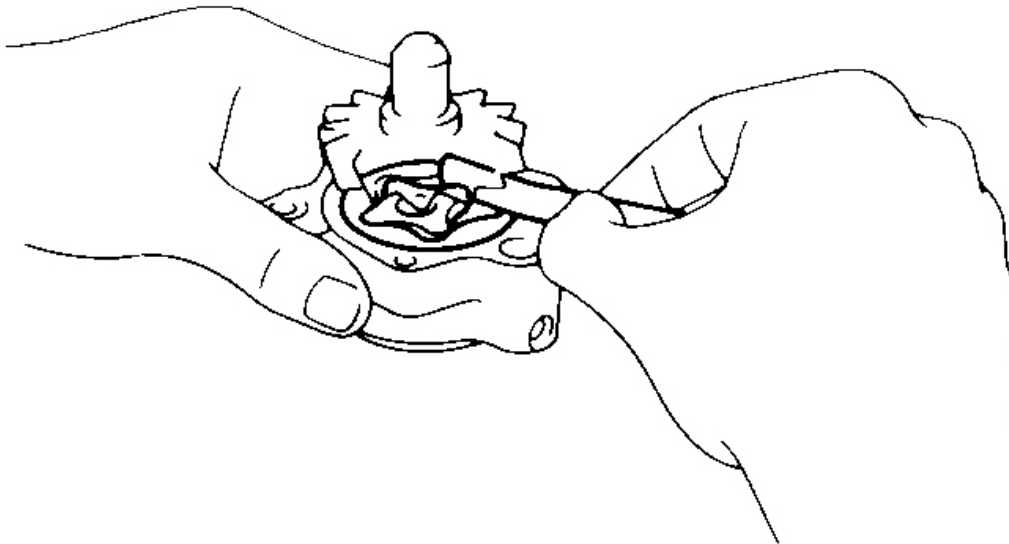


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**Fig. 9: Exploded View Of Oil Pump Assembly**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



**Fig. 10: Measuring Oil Pump Driven Rotor To Case Clearance**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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**Fig. 11: Measuring Oil Pump Drive Rotor Tip To Driven Rotor Clearance**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

## **SHIFT & SELECT LEVER SHAFT**

### **Disassembly**

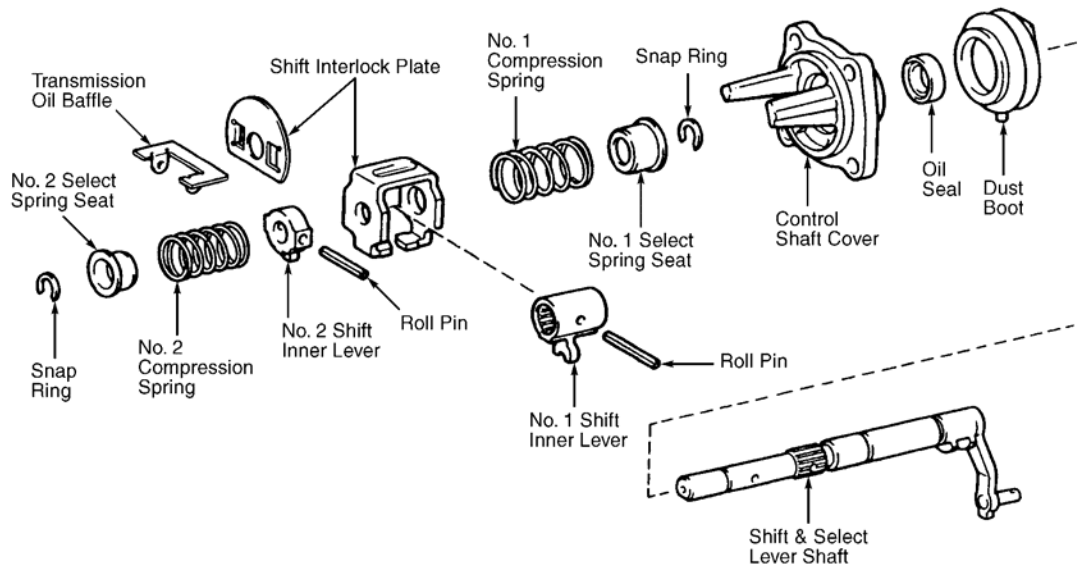
1. Using pin punch and a hammer, drive out roll pin from No. 2 shift inner lever. Remove snap ring. Remove No. 2 select spring seat, No. 2 spring and No. 2 shift inner lever. Drive out roll pin from No. 1 shift inner lever. Remove shift interlock plate and No. 1 shift inner lever from shaft. See **Fig. 12** .
2. Remove No. 1 compression spring and No. 1 select spring seat. Remove snap ring. Remove control shaft cover and dust boot. If necessary, replace control shaft cover oil seal. Drive in NEW oil seal to a depth of 0-.020" (0-.51 mm). Apply multipurpose grease to oil seal. See **Fig. 12** .

### **Reassembly**

1. Check shift and select lever shaft and components for wear or damage. Replace as needed. Apply multipurpose grease to shift and select lever shaft. Install boot to control shaft cover. Install shift and select lever or control shaft to control shaft cover. Install snap ring.
2. Install No. 1 spring seat, No. 1 spring and select inner lever. Drive roll pin into select inner lever. Ensure No. 1 select spring seat slides smoothly. Install shift interlock plate and No. 1 shift inner lever. Drive roll pin into shift inner lever. Ensure shift interlock plate turns smoothly. See **Fig. 12** .
3. Install No. 2 shift inner lever, No. 2 spring and No. 2 select spring seat. Install snap ring. Drive roll pin into No. 2 shift inner lever. Ensure No. 2 select spring seat slides smoothly.

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**Fig. 12: Exploded View Of Shift & Select Lever Assembly**

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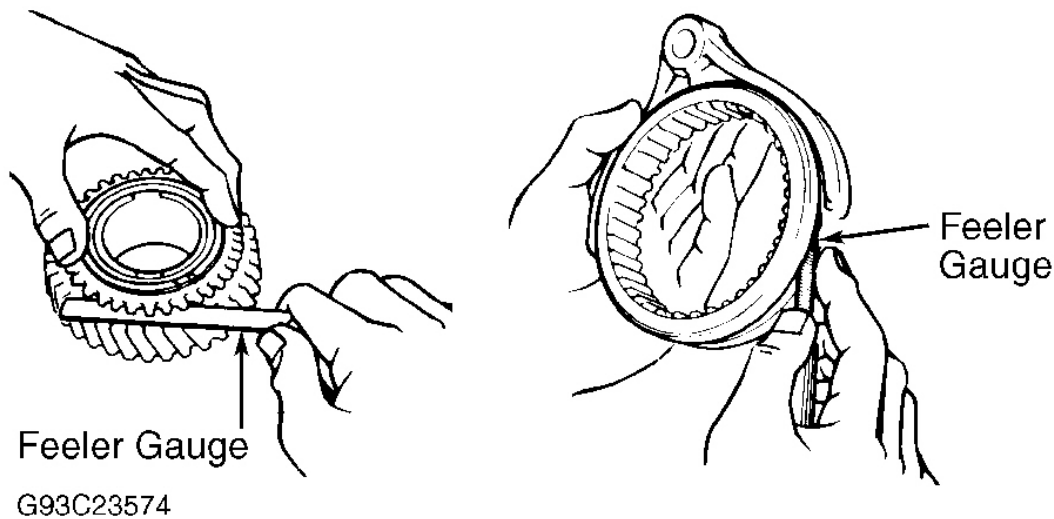
### SHIFT FORK ASSEMBLY

Measure clearance between hub sleeve and shift fork. Maximum clearance is .039" (1.00 mm). If clearance exceeds specification, replace shift fork or hub sleeve. See **Fig. 13** .

### SYNCHRO RING & GEAR

Check synchronizer rings for wear or damage. Turn and push ring to check braking action. Measure clearance between synchronizer ring back and gear spline end. First and 4th gear synchronizer minimum clearance is .03" (.8 mm). Second and 3rd gear synchronizer minimum clearance is .028" (.7 mm). If clearance is less than specification, replace synchronizer ring. See **Fig. 13** .





**Fig. 13: Measuring Synchronizer Ring & Shift Fork Clearances**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

## **DIFFERENTIAL**

**NOTE:** Measure differential bearing preload prior to transmission disassembly.

### **Disassembly (2WD Models)**

1. Separate differential housings. Press tapered roller bearings from both cases. Match mark differential case and ring gear. Remove ring gear. Match mark differential case halves. Separate case halves. Remove speed sensor drive gear from right case.
2. Remove 2 differential side gears, side gear thrust washers, 4 pinions and pinion thrust washers from left case. On transmission side of housing, remove oil seal and baffle. Drive out bearing race. Remove existing shim. Install NEW shim of lesser thickness. Press in NEW bearing race. Install oil baffle. Drive in NEW oil seal.
3. On transaxle side of housing, remove 4 bolts and 3 nuts, and tap case cover loose. Drive oil seal from cover. Remove bearing outer race. Using press and driver, install NEW bearing race. Drive in NEW oil seal. Coat seal lips with multipurpose grease. Coat case cover with Three Bond (1281) sealant. Apply sealant to bolt threads, and install and tighten bolts.

### **Reassembly (2WD Models)**

1. Coat all sliding and rotating surfaces with gear oil before reassembly. Install thrust washer to side gear. Install 4 pinions and thrust washers to spider. Install side gear and spider with 4 pinions onto differential left case. Install dial indicator to pinion gear and measure backlash while pushing pinions and spider to left side. Standard backlash should be .002-.008" (.05-.20 mm).

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2. Push side gear and pinions to right side of case. Measure side gear backlash. Select thrust washer which will ensure backlash is within limits. Thrust washers are available in thicknesses of .031" (.80 mm) to .055" (1.40 mm), in .004" (.10 mm) increments.
3. Install vehicle speed sensor drive gear. Align match marks on differential cases and carefully tap together. Install and tighten attaching screws. Clean contact surface of differential case and threads of ring gear. Heat ring gear in water to 212°F (100°C). Quickly clean ring gear contact surface with solvent, then install on differential case.
4. Allow ring gear to cool. Tighten ring gear bolts to 91 ft. lbs. (124 N.m). Press NEW bearings onto differential cases. Adjust output shaft bearing preload. See **OUTPUT SHAFT BEARING PRELOAD** under TRANSAXLE REASSEMBLY. Install differential case assembly into transaxle case half. Install output shaft assembly. Install transmission case half. Tighten bolts.
5. Install output shaft bearing outer race. Install shim. Install rear bearing retainer, and tighten bolts. Install NEW lock nut onto output shaft. Rotate output shaft 2-3 times to set bearings. Install torque wrench, and measure side bearing preload. If preload is not 1.6-3.0 INCH lbs. (1.8-3.5 kg) for NEW bearings, or 1.0-.9 INCH lbs. (1.1-2.2 kg) for used bearings, select appropriate adjusting shim. Adjusting shims are available in thicknesses of .079" (2.0 mm) to .112" (2.85 mm) in .002" (.05 mm) increments. Shims are stamped "1"-"9", and "A"-"H".

**NOTE:** Total preload will change approximately 1.7 lbs. (1 kg) for every .002" (.05 mm) change in adjusting shim thickness.

#### Disassembly (4WD Models)

1. Remove No. 2 differential case. Match mark differential case and ring gear. Remove ring gear. Remove No. 2 differential side gear thrust washer and conical spring washer. See **Fig. 14**.
2. Remove front differential case assembly. Remove front differential side gear and thrust washer. Remove snap ring and spacer.

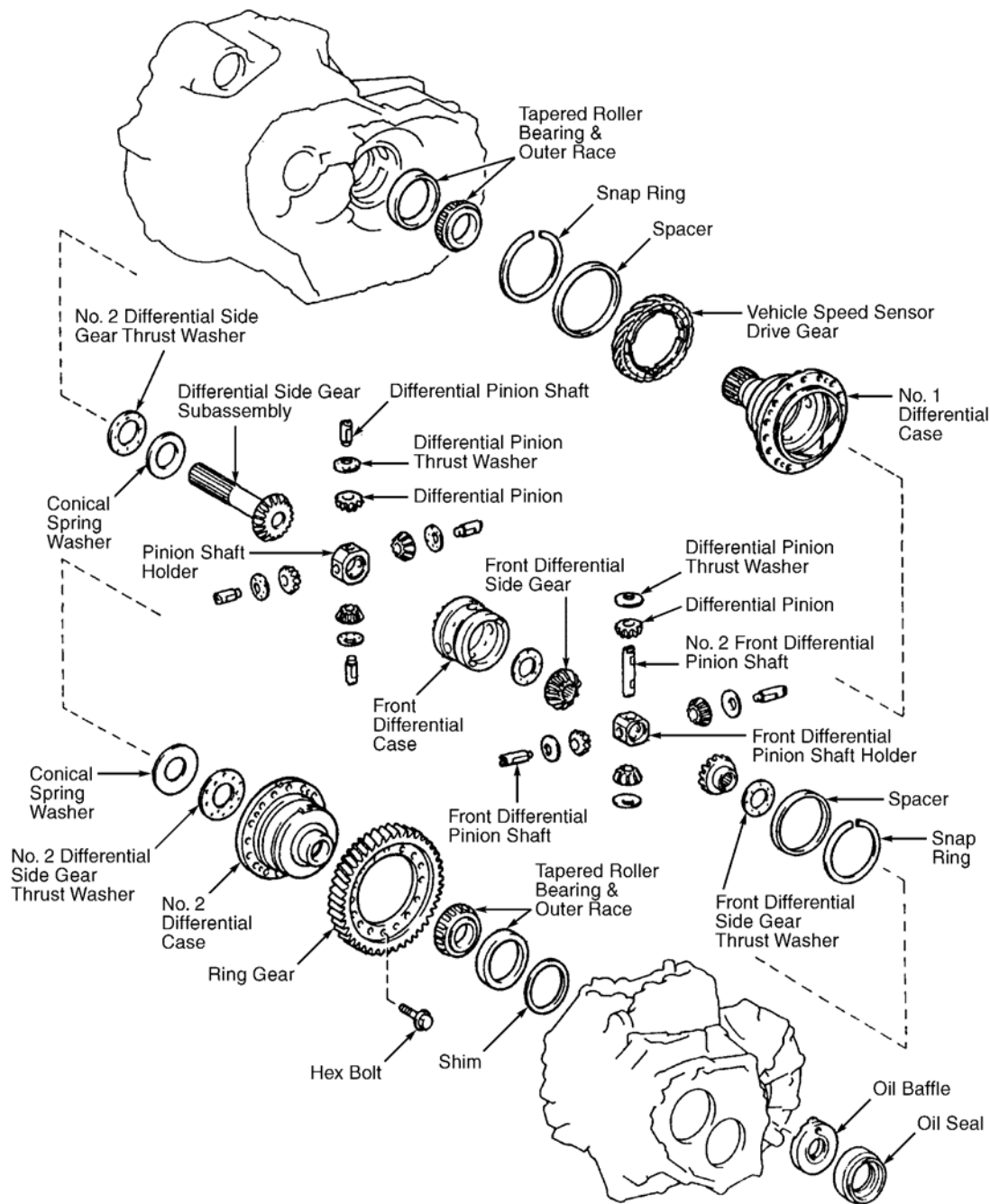
**NOTE:** Wrap vinyl tape around case to prevent damage.

Remove front differential pinion shafts, No. 2 front pinion shaft, shaft holder, pinions, pinion thrust washers, front differential side gear and front differential thrust washer. Remove snap ring, spacer and vehicle speed sensor drive gear. Remove tapered roller bearing.

3. From No. 1 differential case, remove pinion shafts, shaft holder, pinions and thrust washers, differential side gear subassembly, conical spring washer and side gear thrust washer. Remove tapered roller bearing. See **Fig. 14**.

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**Fig. 14: Exploded View Of Differential Assemblies (4WD Shown; 2WD Is Similar)**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

#### Measurements (4WD Models)

For differential measurement specifications, see **DIFFERENTIAL CASE SPECIFICATIONS** table. Using a dial bore gauge, measure inner diameters of No. 1 differential case and No. 2 differential case. Measure outer

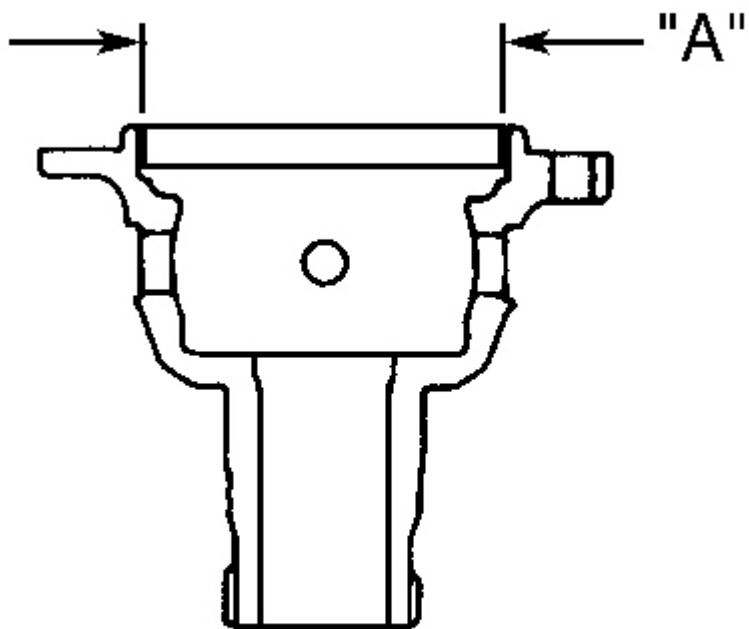
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diameters of No. 2 differential case. Measure height of conical spring washer. See **Fig. 15 -Fig. 18** .

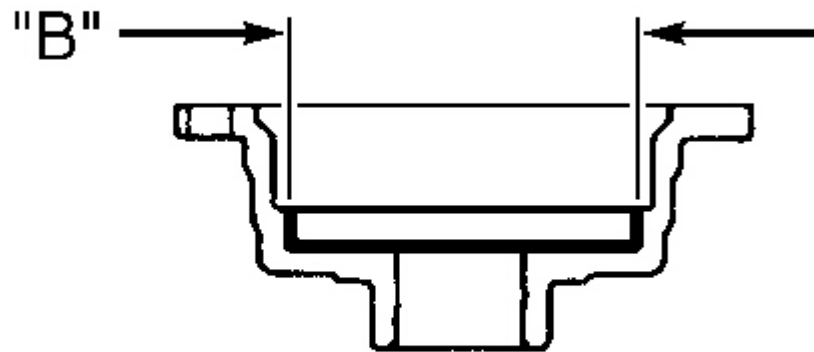
#### DIFFERENTIAL CASE SPECIFICATIONS

Application	In. (mm)
No. 1 Differential Case <sup>(1)</sup>	
"A" Standard Diameter	4.095-4.096 (104.0-104.03)
"A" Maximum Diameter	4.097 (104.06)
No. 2 Differential Case <sup>(1)</sup>	
"B" Standard Diameter	3.819-3.820 (97.00-97.04)
"B" Maximum Diameter	3.821 (97.06)
Front Differential Case <sup>(1)</sup>	
"C" Standard Diameter	4.092-4.093 (103.93-103.96)
"C" Minimum Diameter	4.089 (103.85)
"D" Standard Diameter	3.816-3.818 (96.93-96.96)
"D" Minimum Diameter	3.813 (96.85)
Conical Spring Washer	
No. 1 Case Washer	
Standard Height	.067-.075 (1.70-1.90)
Minimum Height	.063 (1.60)
No. 2 Case Washer	
Standard Height	.102-.110 (2.60-2.80)
Minimum Height	.098 (2.50)
(1) "A", "B", "C" and "D" refer to measuring points indicated in illustration. See <b>Fig. 18</b> .	



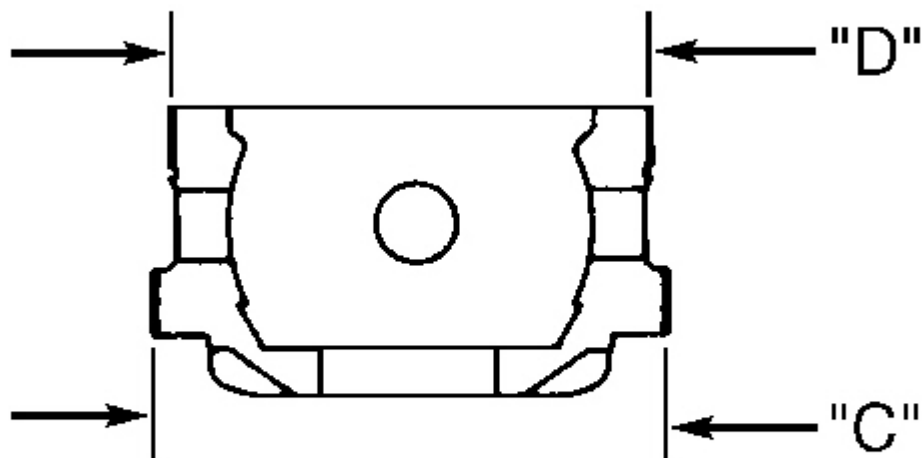
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**Fig. 15: Identifying No. 1 Differential Case Measuring Point**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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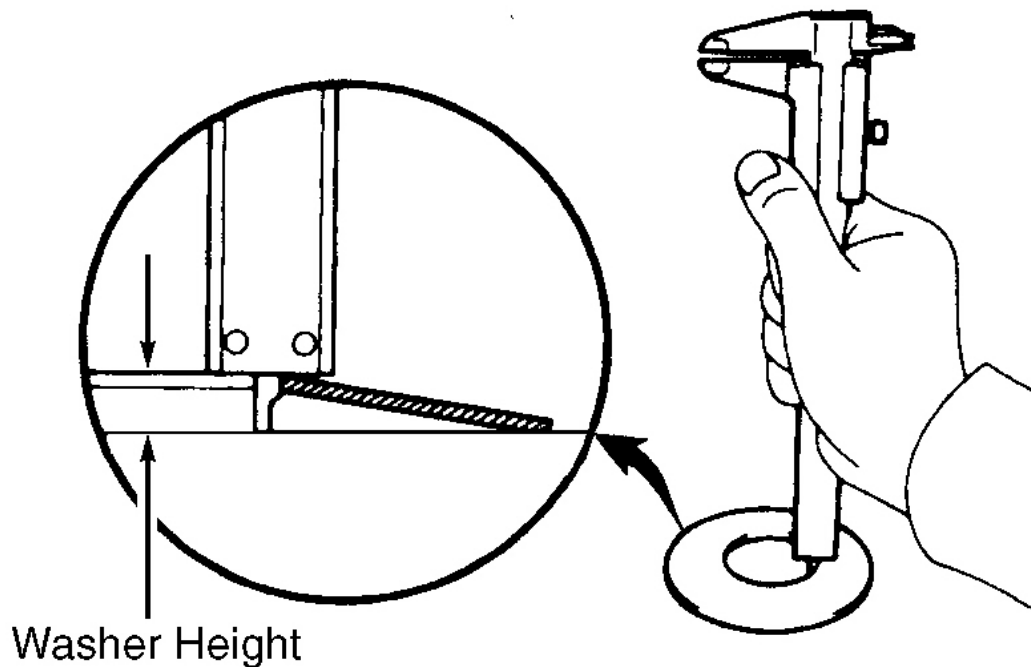
**Fig. 16: Identifying No. 2 Differential Case Measuring Point**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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**Fig. 17: Identifying Front Differential Case Measuring Point**

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



Washer Height

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**Fig. 18: Measuring Conical Spring Washer Height**

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

#### Reassembly (4WD Models)

1. Replace transmission case oil seal and outer bearing race. Adjust bearing race with shims as necessary. Install adjust shim, tapered outer bearing race, oil baffle and oil seal. On transaxle case side, replace tapered roller bearing outer race if needed. Install tapered roller bearing to No. 1 differential case side. Reassemble differential side gear subassembly. Measure backlash of one pinion gear while holding differential side gear subassembly toward case. Using dial indicator, measure backlash. Ensure backlash is .002-.008" (.05-.20 mm). See **Fig. 19**. If backlash is out of specification, select a thrust washer to adjust. Thrust washers are available in thicknesses of .031" (.80 mm) to .055" (1.40 mm) in .002" (.05 mm) increments.
2. Reassemble No. 1 differential case. Install No. 2 side gear thrust washer, conical spring washer and differential side gear subassembly. Install pinions, pinion thrust washers and pinion shafts. Install spacer, vehicle speed sensor drive gear and snap ring, to front differential case side. Install front differential side gear thrust washer, and front differential side gear. Install pinion shaft holder, pinions, pinion thrust washers, No. 2 differential pinion shaft and 2 front differential pinion shafts. Using dial indicator,

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measure backlash. Ensure backlash is .002-.008" (.05-.20 mm). See **Fig. 19** . Front differential side gear thrust washers are available in thicknesses of .039" (1.0 mm) to .049" (1.25 mm) in .002" (.05 mm) increments. Washers are stamped "B"-"G".

**NOTE:**        **DO NOT mount surface of front differential case, which contacts with bushing, in vise.**

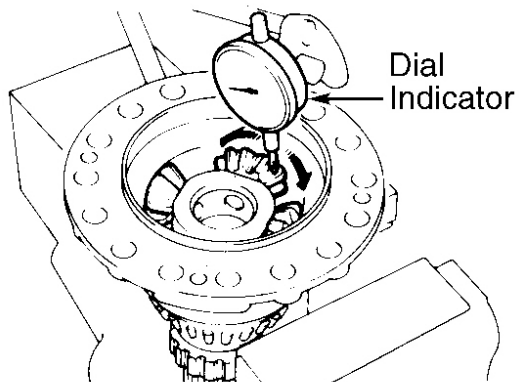
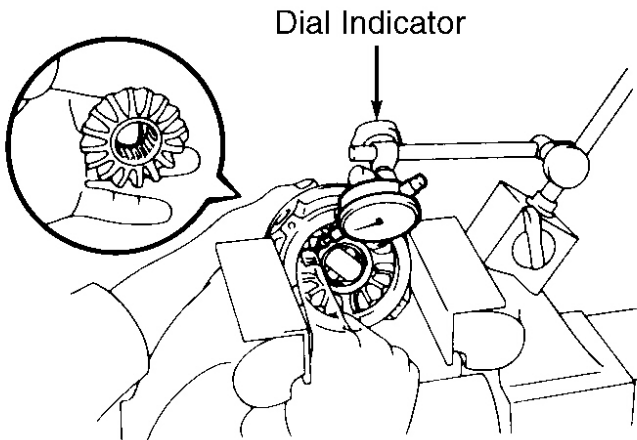
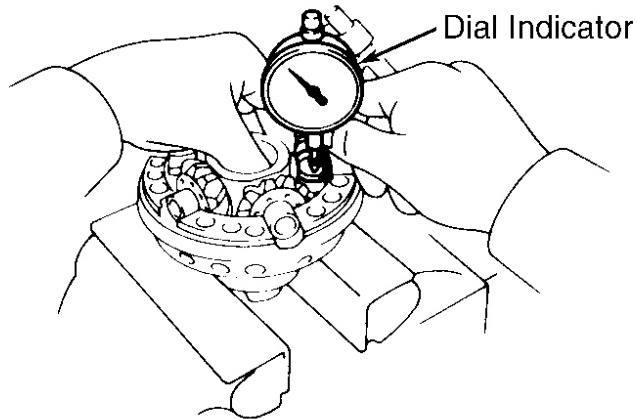
3. Install to No. 2 differential case, No. 2 side gear thrust washer, front differential side gear thrust washer, front differential side gear and front differential case assembly. Using dial indicator, measure thrust clearance of front differential side gear. Standard clearance is .007-.010" (.17-.26 mm). See **Fig. 20** . If backlash is out of specification, select appropriate thrust washer to ensure backlash is within specification. Thrust washers are available in thicknesses of .037" (.95 mm) to .056" (1.40 mm) in .002" (.05 mm) increments. Washers are stamped "A"-"K". Disassemble No. 2 differential case.
4. Clean contact surface of differential left case. Heat ring gear to approximately 212°F (100°C) in boiling water. Carefully remove ring gear from water, clean contact surface of ring gear with cleaning solvent. Quickly install ring gear on differential case, aligning match marks.
5. Check and adjust center differential side gear thrust clearance. Install to front differential case side, front differential case assembly, front differential side gear, and front differential side gear thrust washer. Install (temporarily, for reference when checking back lash) a No.2 .039" (1.0 mm) differential side gear thrust washer. Clean contact surface of No. 2 side gear thrust washer and No. 2 differential case. Apply plastigage to No. 2 thrust washer. See **Fig. 21** . Install No. 2 differential case, and aligning match marks. Install bolts and tighten to 91 ft. lbs. (124 N.m). Remove bolts and No. 2 differential case. Measure plastigage at widest point. Standard clearance is .006-.010" (.16-.25 mm). Select No. 2 thrust washer which will ensure correct backlash specification. Thrust washers are available in thicknesses of .031" (.80 mm) to .055" (1.40 mm) in .002" (.05 mm) increments. Remove No. 2 differential case, No. 2 side gear thrust washer and temporarily install .039 " (1.0 mm) No. 2 side gear thrust washer.
6. Assemble No. 2 differential case. Install previously selected No. 2 side gear thrust washer, and conical spring washer to front differential case. Install No. 2 differential case to No. 1 differential case, aligning match marks. Install and tighten bolt to 91 ft. lbs. (124 N.m).
7. Adjust differential case side bearing preload. Install differential case assembly to transaxle case. Install transmission case. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** . Rotate differential case assembly right and left 2 or 3 times to allow bearings to settle. Using spring tension gauge, measure preload. See **Fig. 22** . For preload specifications, see **PRELOAD SPECIFICATIONS** table. If preload is not within specification, select appropriate adjusting shim. Adjusting shims are available in thicknesses of .079" (2.0 mm) to .096" (2.45 mm) in .002" (.05 mm) increments. Washers are stamped "1"-"9", and "A"-"H" measuring from .098" (2.50 mm) to .112" (2.85 mm) in .002" (.05 mm) increments.

#### PRELOAD SPECIFICATIONS

Application	Lbs. (kg)
Starting Preload <sup>(1)</sup>	
New Bearing	7-14 (3.2-6.3)
Used Bearing	4-9 (2.0-4.0)
(1) Plus output shaft preload.	



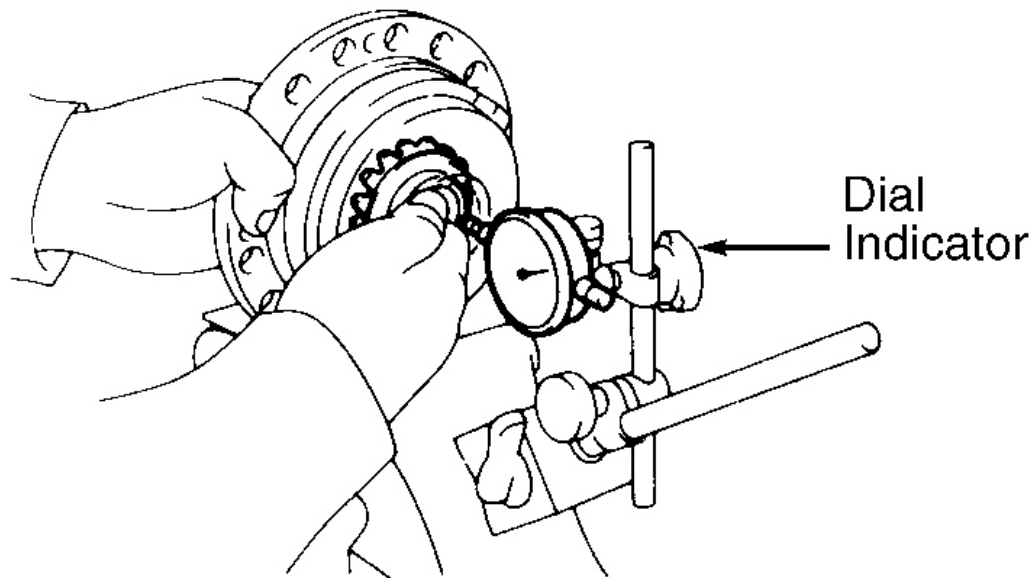
**NOTE:** Total preload will change approximately 1.1 lbs. (.5 kg) for every .002" (.05 mm) change in adjusting shim thickness.



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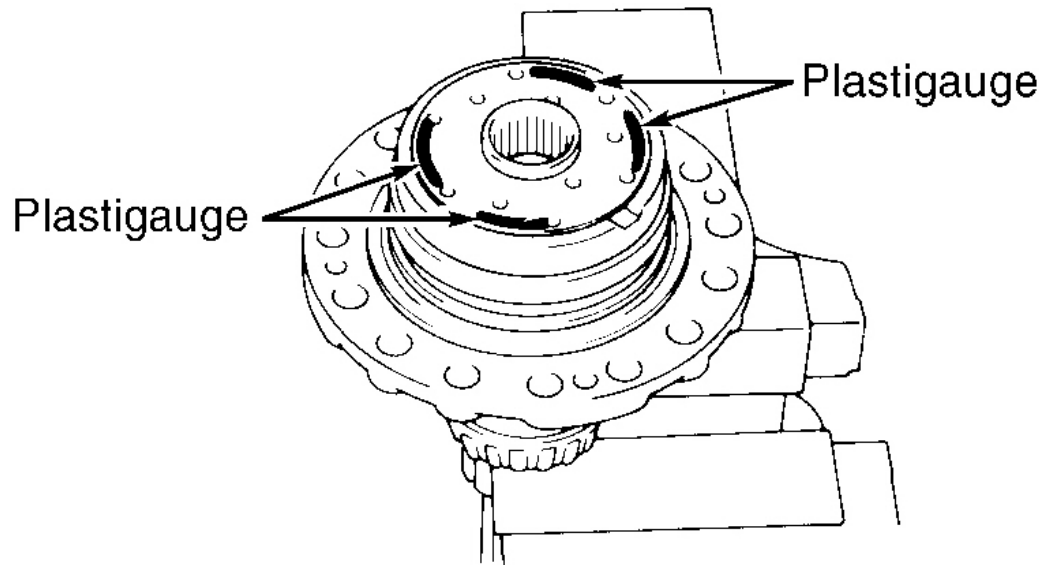
**Fig. 19: Measuring Backlash**

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



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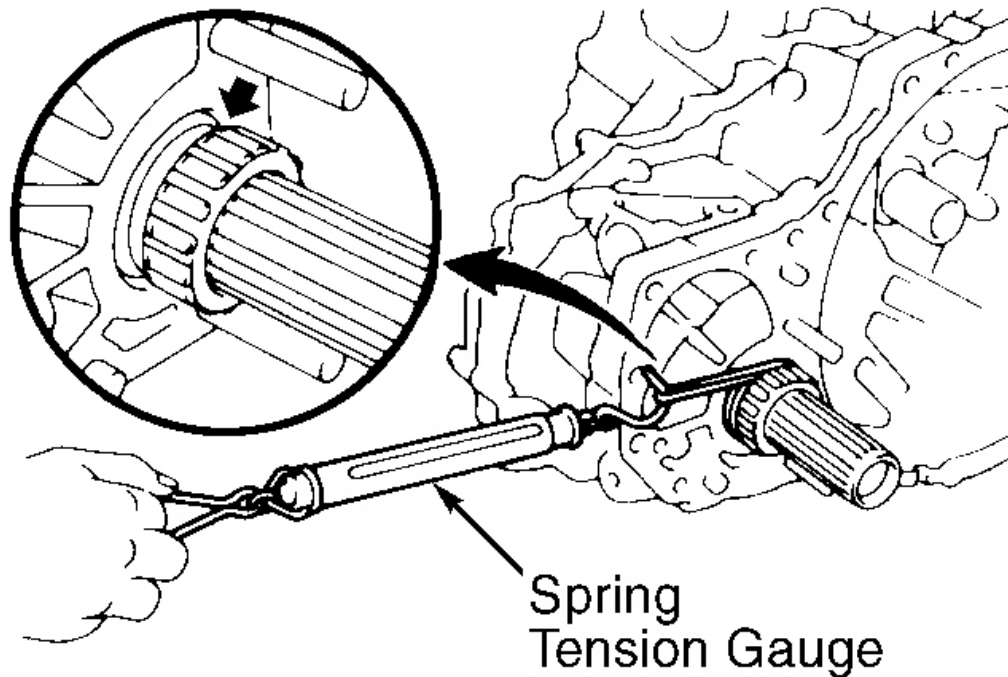
**Fig. 20: Measuring Side Gear Thrust Clearance**  
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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**Fig. 21: Location Of Plastigage**

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



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**Fig. 22: Measuring Differential Side Bearing Preload**  
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

## TRANSAXLE REASSEMBLY

### OUTPUT SHAFT BEARING PRELOAD

1. Install oil pump and gasket. Install oil pipe. Install output shaft into clutch housing. Install transmission housing. Install and tighten bolts to 22 ft. lbs. (29 N.m). Install output shaft rear taper roller bearing outer race. Install original adjusting shim if output shaft bearing has not been replaced. If new bearing has been installed, install .002" (.05 mm) thinner adjusting shim. Install bearing retainer. Install rear bearing retainer, tighten to 31 ft. lbs. (42 N.m).
2. Install lock nut onto output shaft. Rotate output shaft both directions to ensure bearings are seated. Using torque wrench, measure output shaft starting preload. Starting preload should be 6.9-13.9 INCH lbs. (8-16 N.m) for a new bearing. If bearing has not been replaced, starting preload should be 4.3-8.7 INCH lbs. (5-10 N.m). If starting preload is not within specification, select alternate adjusting shim. Starting preload changes about 3.5-4.3 lbs. (4-5 kg) with each increase of shim thickness. Shims are available in .002" (.05 mm) increments. Shims range in thickness from .051" (1.30 mm) to .098" (2.50 mm). Shims are stamped "0"- "9" and "A"- "Q". Install correct shim. Disassemble transmission.

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### REASSEMBLY

1. Assembly is reverse order of disassembly. Remove output shaft. Install oil pump drive gear. Install input and output shaft assemblies, and shift fork assemblies as single unit. Install shift fork shaft locking balls, springs, seats and plugs. Install reverse idler gear and shaft. Align referencing marks on idler gear and clutch housing. Place reverse shift fork pivot into reverse shift arm, and install reverse shift arm bracket to clutch housing. Install No. 2 oil pipe. Install NEW gasket to oil pipe. See **Fig. 1**.

**NOTE:** This transmission does not use gaskets between major housings, use **Three Bond (1281) sealant. Assemble housing within 20 minutes after applying liquid gasket. Allow 30 minutes curing time before filling with oil.**

2. Apply Three Bond (1281) sealant to transmission housing. Install transmission housing to clutch housing. Install reverse idler gear shaft retaining bolt. Install shift shaft locking ball, spring, seat and plug. Install snap rings onto shift fork shafts.
3. Install output shaft rear bearing outer race. Install correct adjusting shim. Install snap ring onto input shaft rear bearing. Install rear bearing retainer. Install spacer, needle bearing and 5th gear. Install synchro ring and key spring to No. 3 clutch hub. Using Installer (09310-17010), install No. 3 clutch hub with synchronizer ring and key spring. See **Fig. 2**.
4. Select a snap ring that will allow minimum axial play and install snap ring onto shaft. Snap rings are available in thicknesses of .068" (1.75 mm) to .084" (2.15 mm) in .002" (.05 mm) increments. Shims are stamped "A"- "J". See **Fig. 2**.
5. Recheck 5th gear thrust clearance. Standard clearance is .004-.022" (.10-.57 mm). Install 5th driven gear. Install No. 3 hub sleeve and No. 3 shift fork. Lock transmission in 2 gears. Install and tighten NEW lock nut to 90 ft. lbs. (123 N.m). Stake lock nut. Unlock transmission.
6. Apply Three Bond (1281) sealant to transmission case cover. Install cover. Install shift and select lever shaft. Install control shaft cover. Install lock bolt. Install boot onto control shaft oil seal. Ensure boot is installed in correct direction. Position air bleed of boot downward. Install selecting bellcrank. Install back-up light switch and speedometer driven gear. Install side gear intermediate shaft. Distance from end of shaft to clutch housing should be 10.06" (255.5 mm).

### TORQUE SPECIFICATIONS

#### TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Back-Up Light Switch	30 (40)
Bellcrank Bolt	14 (20)
Clutch Release Fork Bolt	35 (47)
Differential Case Bolt	46 (63)
Differential Ring Gear Bolt	91 (123)
Drain & Filler Plug	36 (49)
Elbow-To-Transaxle Bolt	20 (27)
Oil Cooler Tube-To-Elbow Bolt	25 (34)
Oil Pipe Clamp	13 (17)

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Output Shaft Lock Nut	90 (123)
Rear Bearing Retainer Bolt	31 (42)
Reverse Idler Shaft Lock Bolt	22 (29)
Reverse Shaft Arm Bracket Bolt	13 (17)
Selecting Bellcrank Support Set Bolt	14 (20)
Selector Shaft Lock Bolt	36 (49)
Shift Forks & Head Set Bolts	17 (24)
Stiffener Plate-To-Transaxle Bolt	27 (37)
Straight Screw Plug	18 (25)
Transaxle Case Cover Bolt	22 (29)
Transmission Case Cover Bolt	22 (29)
Vehicle Speed Sensor Bolt	13 (17)
<b>INCH Lbs. (N.m)</b>	
Oil Pump-To-Cover Bolt	89 (10)
Oil Tube	108 (12)
Reverse Restrict Pin Holder	115 (13)