

2003 Mazda Protege Mazdaspeed

2001-03 MANUAL TRANSMISSIONS Mazda F25M-R, G15M-R & G25M-R 5-Speed Overhaul

2001-03 MANUAL TRANSMISSIONS

Mazda F25M-R, G15M-R & G25M-R 5-Speed Overhaul

APPLICATION

MANUAL TRANSAXLE APPLICATIONS

Application	Transaxle Model
Protege & Protege5	F25M-R/G15M-R
626	G25M-R

LUBRICATION

RECOMMENDED FLUID

Use API SAE 75W/90 (all season) or SAE 80W/90 (above 10°C {50°F}) GL-4 or GL-5 oil.

FLUID CAPACITIES

Oil level should be level with bottom of fill plug opening. Add oil as needed to bring to correct level. For fluid capacity, see **FLUID CAPACITIES** table.

FLUID CAPACITIES ⁽¹⁾

Application	Quantity - Qts. (Liters)
F25M-R/G15M-R	2.83 (2.68)
G25M-R	2.9 (2.7)

(1) Approximate quantity.

ON-VEHICLE SERVICE

ADJUSTMENTS

NOTE: No external adjustments are necessary.

AXLE SHAFTS

NOTE: See appropriate AXLE SHAFTS article in DRIVE AXLES.

TROUBLE SHOOTING

NOTE: See **MANUAL TRANSMISSION** in TROUBLE SHOOTING - BASIC PROCEDURES article.

REMOVAL & INSTALLATION

NOTE: For manual transmission removal procedure, see appropriate **CLUTCHES** article under **TRANSAXLE/TRANSMISSION**.

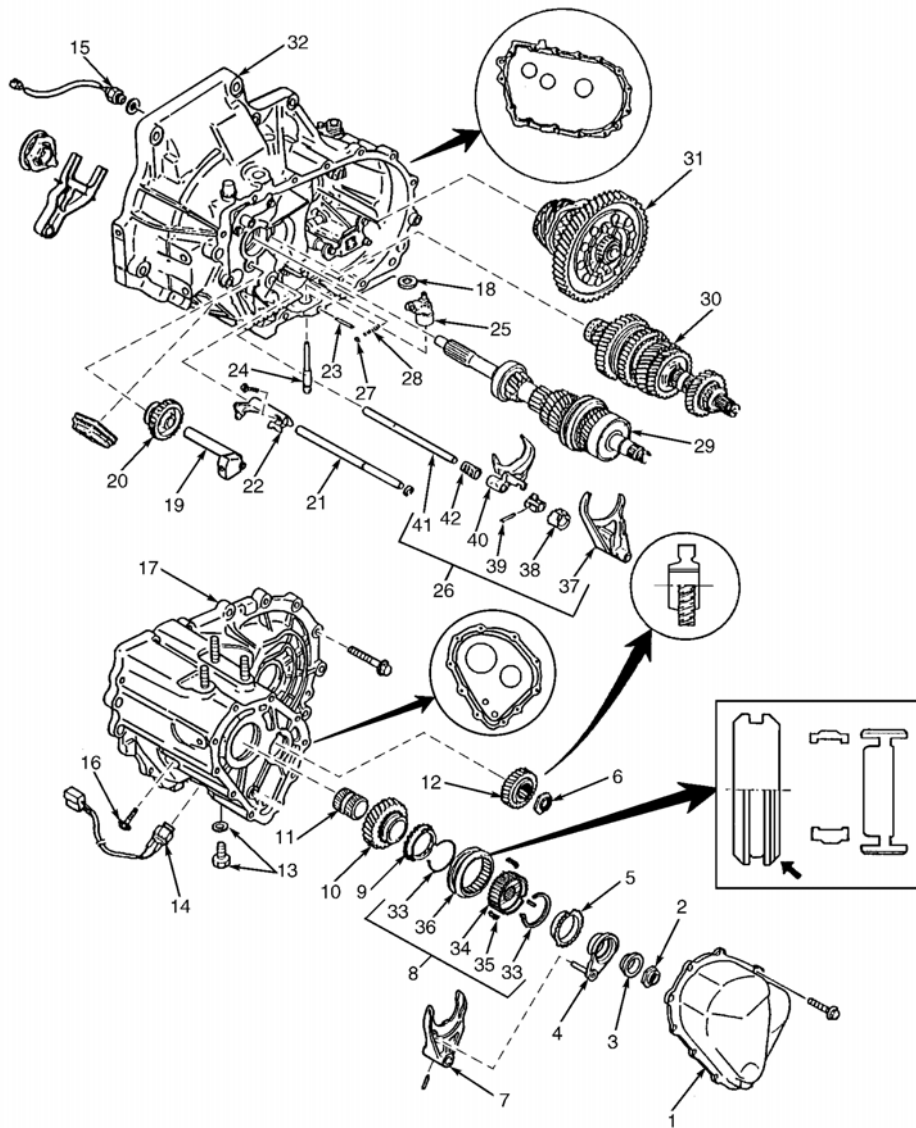
TRANSAXLE DISASSEMBLY

NOTE: Refer to appropriate exploded view for disassembly reference. See **Fig. 1** and **Fig. 2**.

1. Remove clutch release bearing and release fork. See **Fig. 1** or **Fig. 2**. Mount transaxle in holder. Remove rear cover. Secure primary shaft with Holder (49 F401 440). Shift to 1st or 2nd gear to lock rotation of primary shaft. Uncrimp the tabs of the locknuts. Remove and discard lock nuts from primary and secondary shafts. Align ends of interlock sleeve and control lever. Turn shift rod counterclockwise. Remove sleeve, primary reverse synchronizer cone assembly and synchronizer ring.
2. Remove 5th-reverse gear shift fork, 5th-reverse synchronizer hub assembly with synchronizer ring, 5th gear and gear sleeve from secondary shaft.
3. Remove secondary 5th gear. Remove guide bolt from outside of case. Remove back-up light switch, neutral switch and lock bolt. Remove bolts securing transaxle case to converter housing. Using soft-faced hammer, strike case to loosen and remove.
4. Remove reverse idler gear with shaft. Holding primary shaft assembly, secondary shaft assembly and shift forks as an assembly, lift and remove from clutch housing. Separate shift fork assemblies from shaft assemblies.

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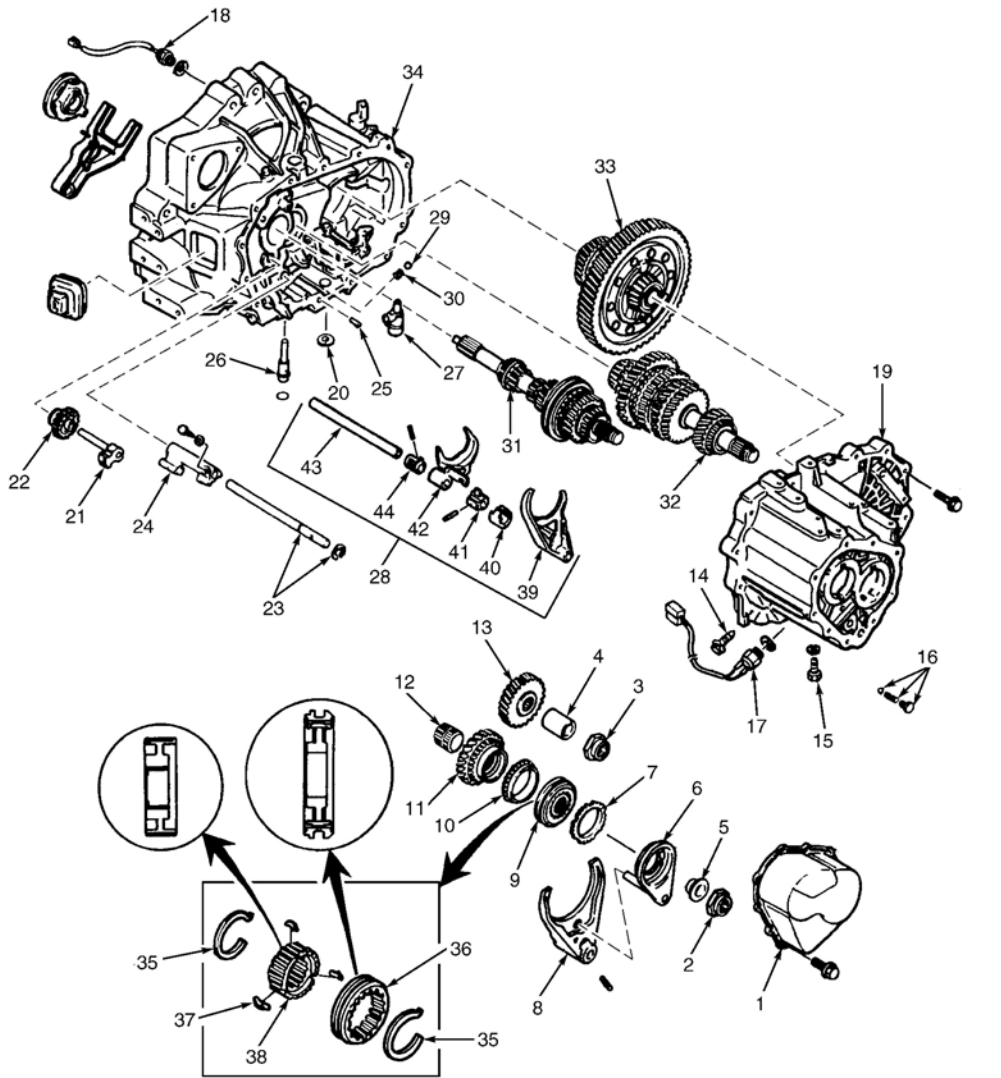
- | | | |
|---------------------------------------|-------------------------------------|-----------------------------------|
| 1. Rear Cover | 15. Neutral Safety Switch | 29. Primary Shaft Gear Assembly |
| 2. Lock Nut (Primary Shaft) | 16. Lock Bolt | 30. Secondary Shaft Gear Assembly |
| 3. Reverse Synchronizer Gear Sleeve | 17. Case Assembly | 31. Differential Assembly |
| 4. Reverse Synchronizer Cone Assembly | 18. Magnet | 32. Clutch Housing |
| 5. Reverse Synchronizer Ring | 19. Reverse Idler Shaft | 33. Synchronizer Key Springs |
| 6. Lock Nut (Secondary Shaft) | 20. Reverse Idler Gear | 34. Clutch Hub |
| 7. 5th/Reverse Shift Fork | 21. 5th/Reverse Shift Rod | 35. Synchronizer Keys |
| 8. 5th/Reverse Clutch Hub Assembly | 22. 5th/Reverse Shift Rod End | 36. Clutch Hub Sleeve |
| 9. 5th Gear Synchronizer Ring | 23. Pin | 37. 3rd/4th Shift Fork |
| 10. 5th Gear | 24. Crank Lever Shaft | 38. Interlock Sleeve |
| 11. Gear Sleeve | 25. Crank Lever Assembly | 39. Control Lever |
| 12. Secondary 5th Gear | 26. Shift Fork & Shift Rod Assembly | 40. 1st/2nd Shift Fork |
| 13. Guide Bolt & Washer | 27. Steel Ball | 41. Control Rod |
| 14. Back-Up Light Switch | 28. Spring | 42. Control End |

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Fig. 1: Exploded View Of Transaxle (F25M-R/G15M-R)
 Courtesy of MAZDA MOTORS CORP.

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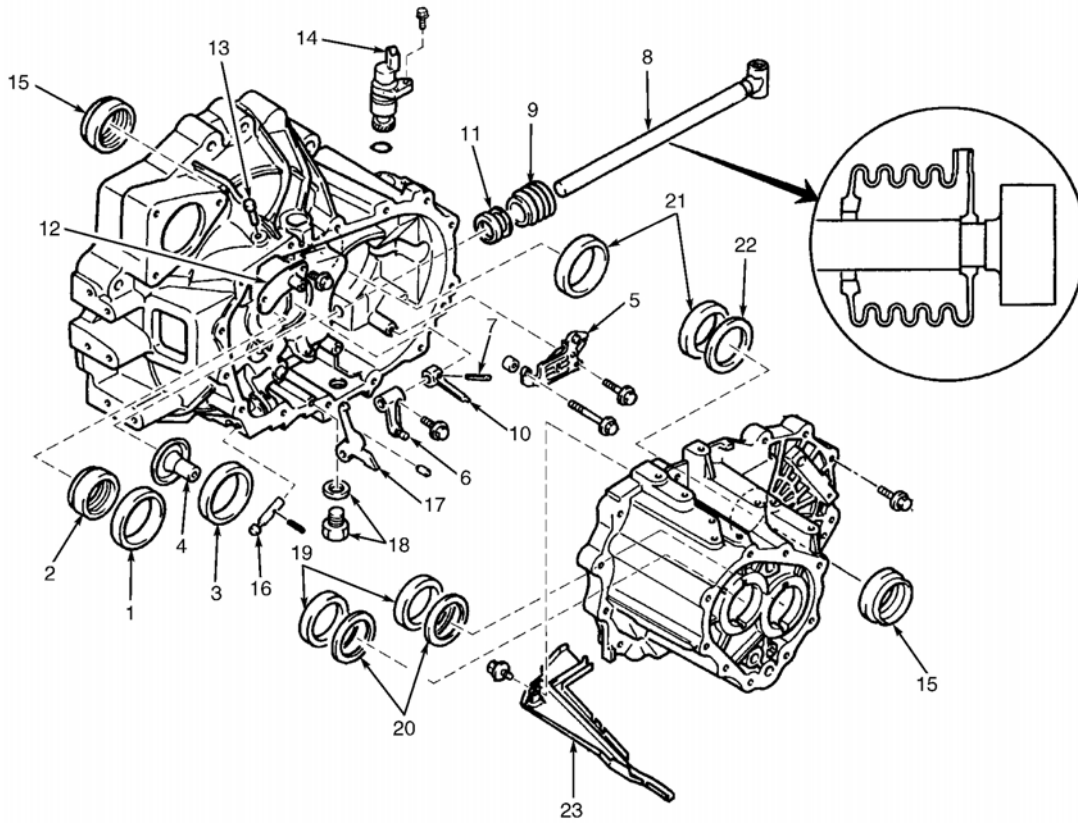
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- | | | |
|---------------------------------------|-------------------------------------|-----------------------------------|
| 1. Rear Cover | 16. Lock Bolt, Ball & Spring | 31. Primary Gear Shaft Assembly |
| 2. Lock Nut (Primary Shaft) | 17. Back-Up Light Switch | 32. Secondary Gear Shaft Assembly |
| 3. Lock Nut (Secondary Shaft) | 18. Neutral Safety Switch | 33. Differential Assembly |
| 4. Spacer | 19. Transaxle Case | 34. Clutch Housing |
| 5. Reverse Synchronizer Gear Sleeve | 20. Magnet | 35. Synchronizer Key Springs |
| 6. Reverse Synchronizer Cone Assembly | 21. Reverse Idler Shaft | 36. Clutch Hub Sleeve |
| 7. Reverse Synchronizer Ring | 22. Reverse Idler Gear | 37. Synchronizer Keys |
| 8. 5th/Reverse Shift Fork | 23. 5th/Reverse Shift Rod | 38. Clutch Hub |
| 9. 5th/Reverse Clutch Hub Assembly | 24. 5th/Reverse Shift Rod End | 39. 3rd/4th Shift Fork |
| 10. 5th Gear Synchronizer Ring | 25. Pin | 40. Interlock Sleeve |
| 11. 5th Gear | 26. Crank Lever Shaft | 41. Control Lever |
| 12. Gear Sleeve | 27. Crank Lever Assembly | 42. 1st/2nd Shift Fork |
| 13. Secondary 5th Gear | 28. Shift Fork & Shift Rod Assembly | 43. Control Rod |
| 14. Lock Bolt | 29. Steel Ball | 44. Control End |
| 15. Guide Bolt & Washer | 30. Spring | |

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Fig. 2: Exploded View Of Transaxle (G25M-R)
 Courtesy of MAZDA MOTORS CORP.



- | | | |
|---------------------------------|-----------------------------|---------------------------------|
| 1. Primary Shaft Bearing Race | 9. Boot | 17. Reverse Lever |
| 2. Primary Shaft Oil Seal | 10. Selector | 18. Drain Plug |
| 3. Secondary Shaft Bearing Race | 11. Change Rod Oil Seal | 19. Case Bearing Race |
| 4. Funnel | 12. Breather Cover | 20. Case Adjustment Shim |
| 5. Guide Plate Assembly | 13. Breather | 21. Differential Bearing Race |
| 6. Change Arm | 14. Speedometer Driven Gear | 22. Differential Adjusting Shim |
| 7. Roll Pin | 15. Differential Oil Seal | 23. Oil Passage |
| 8. Change Rod | 16. Reverse Lever Shaft | |

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Fig. 4: Exploded View Of Transaxle Case & Components (G25M-R)
 Courtesy of MAZDA MOTORS CORP.

COMPONENT DISASSEMBLY & REASSEMBLY

TRANSAXLE CASE

Disassembly

1. Lift mainshaft oil funnel from clutch housing and remove funnel and outer race bearing as a unit. Remove 3 bolts retaining shifter guide plate. Remove shifter guide plate, reverse gate and spring. See **Fig. 4**.
2. Drive out spring pin retaining selector arm to change rod and withdraw change rod from clutch housing. Remove boot from change rod and oil seal from rod bore. Remove vent cover and vent from top of clutch housing.
3. Remove speedometer driven gear assembly. Remove differential and input shaft oil seals. Drive out

reverse lever shaft roll pin. Remove spring and ball (if equipped).

4. Remove reverse lever set spring and reverse lever. Drive out differential bearing races. Remove 5th gear outer bearing races from transaxle.
5. Remove diaphragm spring and adjusting shims from transaxle case. Remove differential oil seal from transaxle case.

NOTE: Check and adjust bearing preload before reassembling case. See **BEARING PRELOAD** under **ADJUSTMENTS**.

Reassembly

To reassemble, reverse disassembly procedure. Smaller diameter of diaphragm spring (located behind bearing race) should face toward inside of transaxle case.

PRIMARY SHAFT

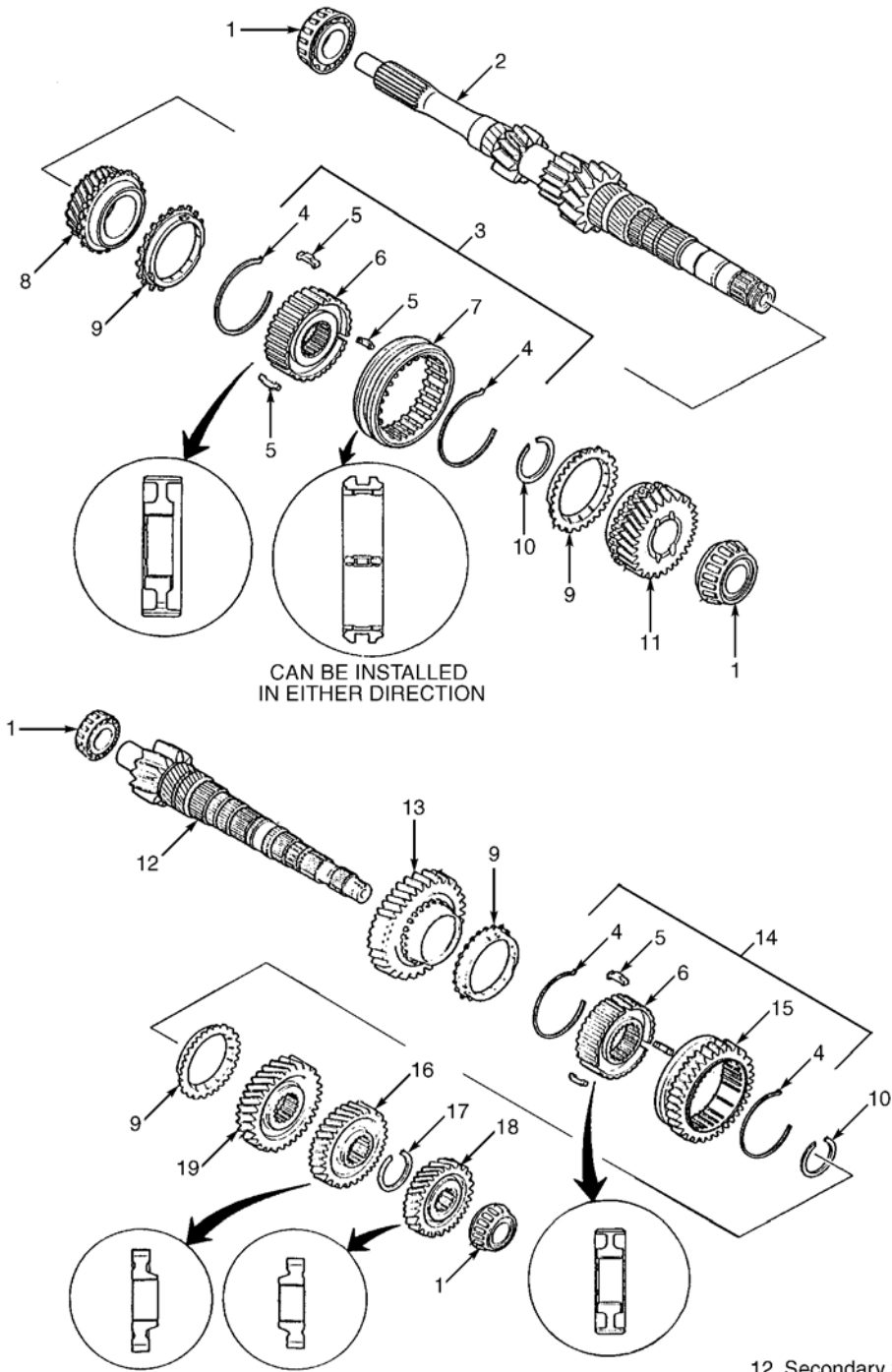
NOTE: When disassembling synchronizer assemblies, note cut-outs in some blocking rings for reassembly reference. Cut-out rings must be installed in original position.

Disassembly

Remove snap rings as necessary. See **Fig. 5**. On G25M-R, press off bearing next to 4th gear. On F25M-R, press off 4th gear and bearing together. Press off 4th gear. Press off 3rd gear with clutch hub assembly. Press off bearing on clutch end.

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CAN BE INSTALLED
IN EITHER DIRECTION

- 1. Taper Roller Bearing
(Ball Bearing On F25M-R)
- 2. Primary Shaft
- 3. 3rd/4th Clutch Hub
- 4. Synchro Key Ring
- 5. Key

- 6. Hub
- 7. Sleeve
- 8. 3rd Gear
- 9. Synchronizer Ring
- 10. Retaining Ring
- 11. 4th Gear

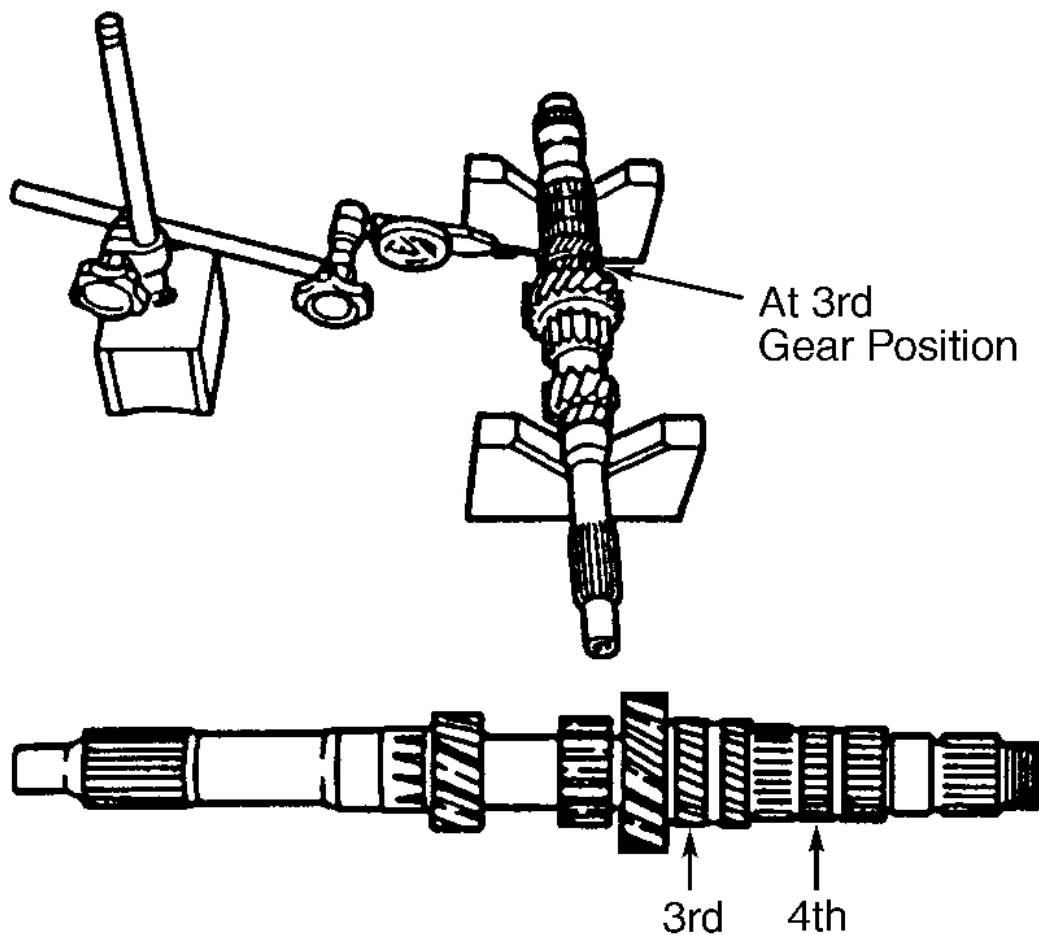
- 12. Secondary Shaft
- 13. 1st Gear
- 14. 1st/2nd Clutch Hub
- 15. Reverse Gear
- 16. 3rd Gear
- 17. Retaining Ring
- 18. 4th Gear
- 19. 2nd Gear

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Fig. 5: Exploded View Of Primary & Secondary Shafts (G15M-R/G25M-R Shown; F25M-R Is Similar)
 Courtesy of MAZDA MOTORS CORP.

Inspection

1. Using dial indicator, measure shaft gear runout. See **Fig. 6** . See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G25M-R)** table.
2. Inspect synchronizer cones for wear. Inspect gear teeth for damage, wear and cracks. Inspect synchronizer ring matching teeth for damage and wear. Inspect synchronizer ring teeth for damage, wear and cracks. Measure clearance between synchronizer ring and teeth on matching gear. See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G25M-R)** table. Inspect clutch hub sleeve and hub operation. Inspect gear teeth for damage, wear and cracks. Inspect synchronizer keys for damage, wear and cracks.



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Fig. 6: Measuring Primary Shaft Gear Runout At 3rd & 4th Gear
 Courtesy of MAZDA MOTORS CORP.

Reassembly

1. To reassemble, reverse disassembly procedure. Measure clearance after each component is installed. See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G25M-R)** table. See **Fig. 5**.
2. Select correct synchronizer keys. See **Fig. 7**. For F25M-R, see **SYNCHRONIZER KEY DIMENSIONS** table. For G25M-R, see **TRANSAXLE COMPONENT SPECIFICATIONS (G25M-R)** table. Install keys and spring in synchronizer hub. Install synchronizer assembly with bevel facing away from input end of primary shaft. Locate synchronizer rings on correct clutch assembly.

TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)

Application	Standard - In. (mm)	Maximum - In. (mm)
Primary Shaft		
3rd Gear Thrust (3rd-To-2nd Gear)	0.002-0.008 (0.06-0.21)	0.010 (0.26)
4th Gear Thrust (4th Gear-To-Bearing)	0.002-0.008 (0.06-0.21)	0.066 (0.26)
Shaft End Thrust Clearance	0.0002-0.0039 (0.005-0.10)	N/A
Secondary Shaft		
1st Gear Thrust (1st Gear-To-Differential Drive Gear)	0.002-0.011 (0.05-0.28)	0.013 (0.33)
2nd Gear Thrust (2nd-To-3rd Gear)	0.007-0.020 (0.18-0.51)	0.22 (0.56)
1st-2nd Hub Sleeve-To-Shift Fork	0.004-0.014 (0.10-0.36)	0.034 (0.86)
3rd-4th Hub Sleeve-To-Shift Fork	0.008-0.020 (0.20-0.50)	.039 (1.0)
5th-Reverse Hub Sleeve-To-Shift Fork	0.016-0.030 (0.40-0.75)	0.049 (1.24)
5th Gear Thrust Clearance	0.0024-0.0102 (0.06-0.26)	0.0122 (0.31)
Synchronizer-To-Gear	0.044-0.074 (1.12-1.88)	0.031 (0.80)
Reverse Idler		
Gear-To-Shift Lever	0.004-0.013 (0.10-0.32)	0.015 (0.37)
Primary Shaft Runout	N/A	0.002 (0.05)
Secondary Shaft Runout	N/A	0.0006 (0.015)
Oil Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)		
All	0.001-0.003 (0.003-0.07)	N/A
Differential Backlash	0.0-0.004 (0.0-0.10)	N/A

TRANSAXLE COMPONENT SPECIFICATIONS (G15M-R/G25M-R)

Application	Standard - In. (mm)	Limit - In. (mm)
Gear		

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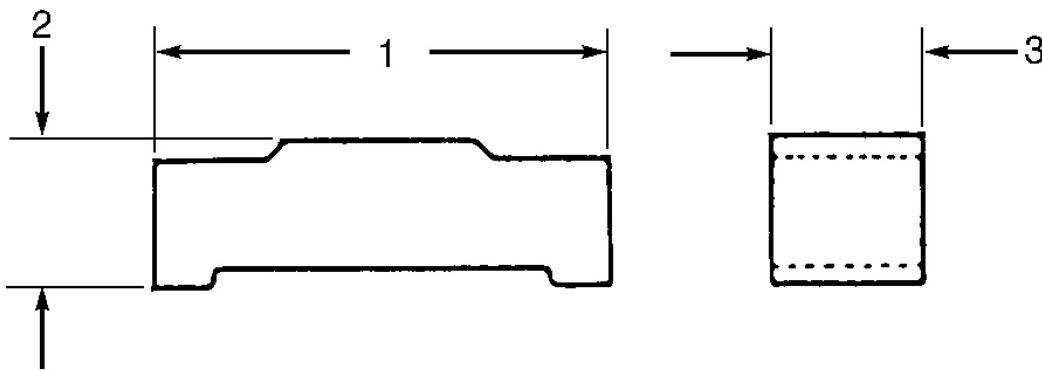
1st Gear Thrust Clearance	0.002-0.011 (0.05-0.29)	0.013 (0.34)
2nd Gear Thrust Clearance	0.007-0.018 (0.17-0.37)	0.018 (0.46)
3rd Gear Thrust Clearance	0.002-0.011 (0.05-0.29)	0.013 (0.34)
4th Gear Thrust Clearance	0.007-0.015 (0.17-0.37)	0.011 (0.27)
5th Gear Thrust Clearance	0.004-0.008 (0.10-0.22)	0.037 (0.95)
1st Gear Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)	0.0012-0.0031 (0.030-0.080)	N/A
2nd Gear Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)	0.0020-0.0035 (0.050-0.090)	N/A
3rd Gear Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)	0.0012-0.0031 (0.030-0.080)	N/A
4th Gear Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)	0.0012-0.0031 (0.030-0.080)	N/A
5th Gear Clearance (Gear Inner Diameter-To-Shaft Outer Diameter)	0.0012-0.0031 (0.030-0.080)	N/A
Synchronizer Ring & Key		
Synchronizer Ring & Gear Clearance	0.059 (1.50)	0.031 (0.80)
Synchronizer Key Dimension ⁽¹⁾		
Dimension No. 1 (1st & 2nd)	0.744-0.751 (18.9-19.1)	N/A
Dimension No. 2 (1st & 2nd)	0.188-0.194 (4.78-4.93)	N/A
Dimension No. 3 (1st & 2nd)	0.1670-0.1677 (4.24-4.26)	N/A
Dimension No. 1 (3rd, 4th, 5th & Reverse)	0.666-0.673 (16.9-17.1)	N/A
Dimension No. 2 (3rd, 4th, 5th & Reverse)	0.188-0.194 (4.78-4.93)	N/A
Dimension No. 3 (3rd, 4th, 5th & Reverse)	0.1670-0.1677 (4.24-4.26)	N/A
Clutch Hub & Shift Fork		
1-2 Shift Fork & Reverse Gear Clearance	0.004-0.018 (0.10-0.45)	0.037 (0.95)
3-4 Shift Fork & Clutch Hub Sleeve Clearance	0.004-0.016 (0.10-0.40)	0.035 (0.90)
5-Rev. Shift Fork & Hub Sleeve Clearance	0.004-0.014 (0.10-0.36)	0.033 (0.85)
Reverse Idler Gear & Reverse Gear Clearance	0.004-0.014 (0.10-0.35)	0.033 (0.84)
Primary Shaft		
Runout	N/A	0.002 (0.05)
Bearing Preload	(2)	N/A
Secondary Shaft		
Runout	N/A	0.0006 (0.015)
Bearing Preload	(3)	N/A
Differential		
Bearing Preload	(4)	N/A
Backlash	0.0020-0.0059 (0.05-	N/A

0.15)

- (1) See **Fig. 7** .
- (2) 0.9-2.1 INCH Lbs. (0.1-0.2 N.m)
- (3) 2.0-7.5 INCH Lbs. (0.2-0.7 N.m)
- (4) 13-17 INCH Lbs. (1.4-1.9 N.m)

SYNCHRONIZER KEY DIMENSIONS (F25M-R)

Synchro	Dimension No. 1 - In. (mm)	Dimension No. 2 - In. (mm)	Dimension No. 3 - In. (mm)
1st-2nd	0.748 (19.00)	0.167 (4.25)	0.197 (5.00)
3rd-4th	0.669 (17.00)	0.167 (4.25)	0.197 (5.00)
5th-Reverse	0.669 (17.00)	0.219 (5.55)	0.197 (5.00)



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Fig. 7: Measuring Synchronizer Key
 Courtesy of MAZDA MOTORS CORP.

SECONDARY SHAFT

Disassembly

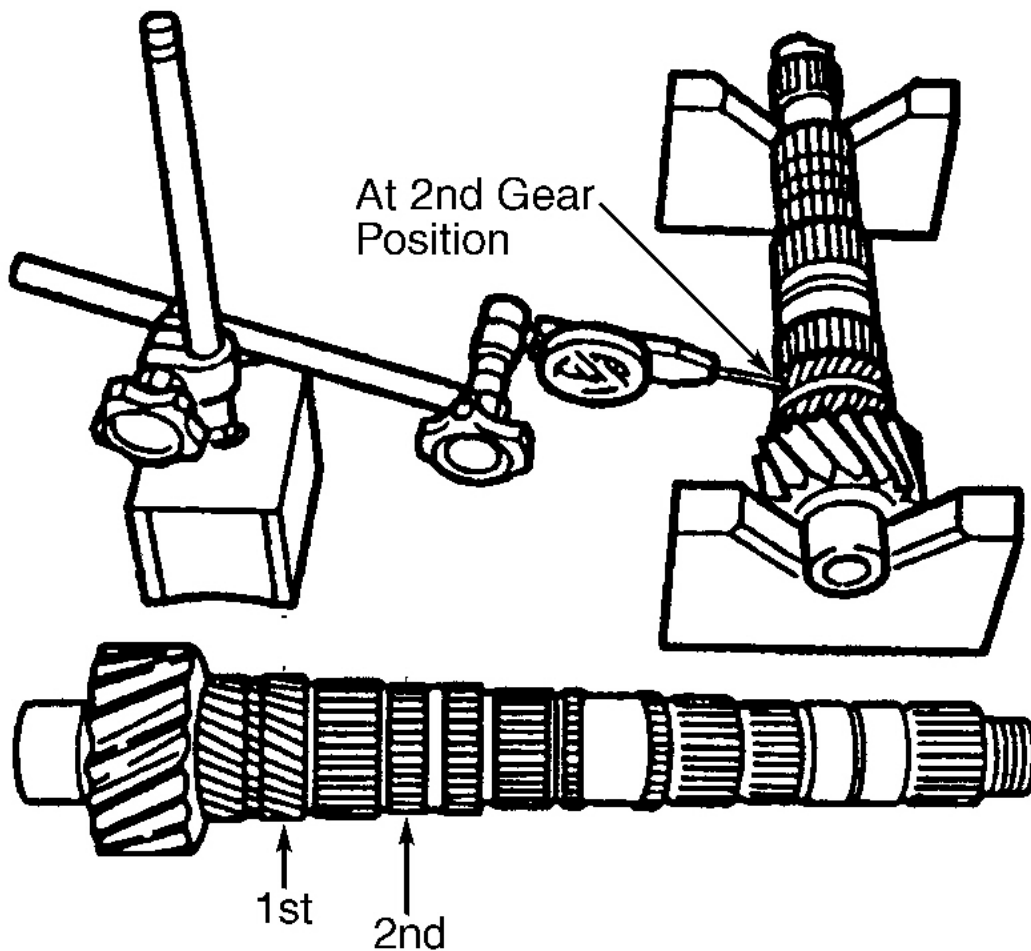
Press off 4th gear with bearing. Remove retaining ring. Shift clutch hub sleeve to 1st gear. Press off 3rd and 2nd gears. Remove retaining ring. Press off 1st gear with 1-2 clutch hub assembly. Press off bearing on differential drive gear end of shaft. See **Fig. 10** or **Fig. 11** .

Inspection

1. Using dial indicator, measure shaft gear runout. See **Fig. 8** . Maximum runout is .0006" (.015 mm). See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT**

SPECIFICATIONS (G15M-R/G25M-R) table.

2. Inspect synchronizer cones for wear. Inspect gear teeth for damage, wear and cracks. Inspect synchronizer ring matching teeth for damage and wear. Inspect synchronizer ring teeth for damage, wear and cracks. Measure clearance between synchronizer ring and teeth on matching gear. See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G15M-R/G25M-R)** table. Inspect clutch hub sleeve and hub operation. Inspect gear teeth for damage, wear and cracks. Inspect synchronizer keys for damage, wear and cracks.



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Fig. 8: Measuring Secondary Shaft Gear Runout At 1st & 2nd Gear
 Courtesy of MAZDA MOTORS CORP.

Reassembly

To reassemble, reverse disassembly procedure. Measure clearance after pressing on each component. See

TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R) or **TRANSAXLE COMPONENT SPECIFICATIONS (G15M-R/G25M-R)** table. See **Fig. 5** .

DIFFERENTIAL

Pre-Disassembly Backlash Inspection

Install left and right axle shafts into differential. Support axle shafts on V-blocks. See **Fig. 9** . Measure backlash of both pinion gears. Backlash should be as specified. See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G15M-R/G25M-R)** table. Rebuild or replace differential assembly if backlash is not as specified.

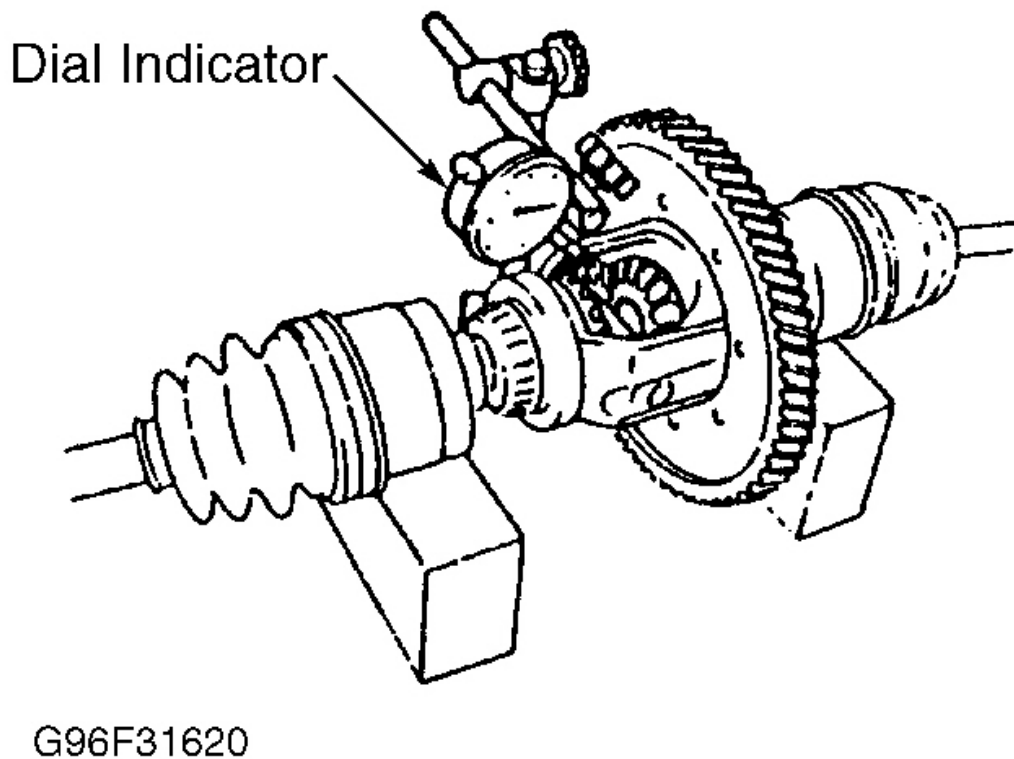


Fig. 9: Checking Pinion Gear Backlash
Courtesy of MAZDA MOTORS CORP.

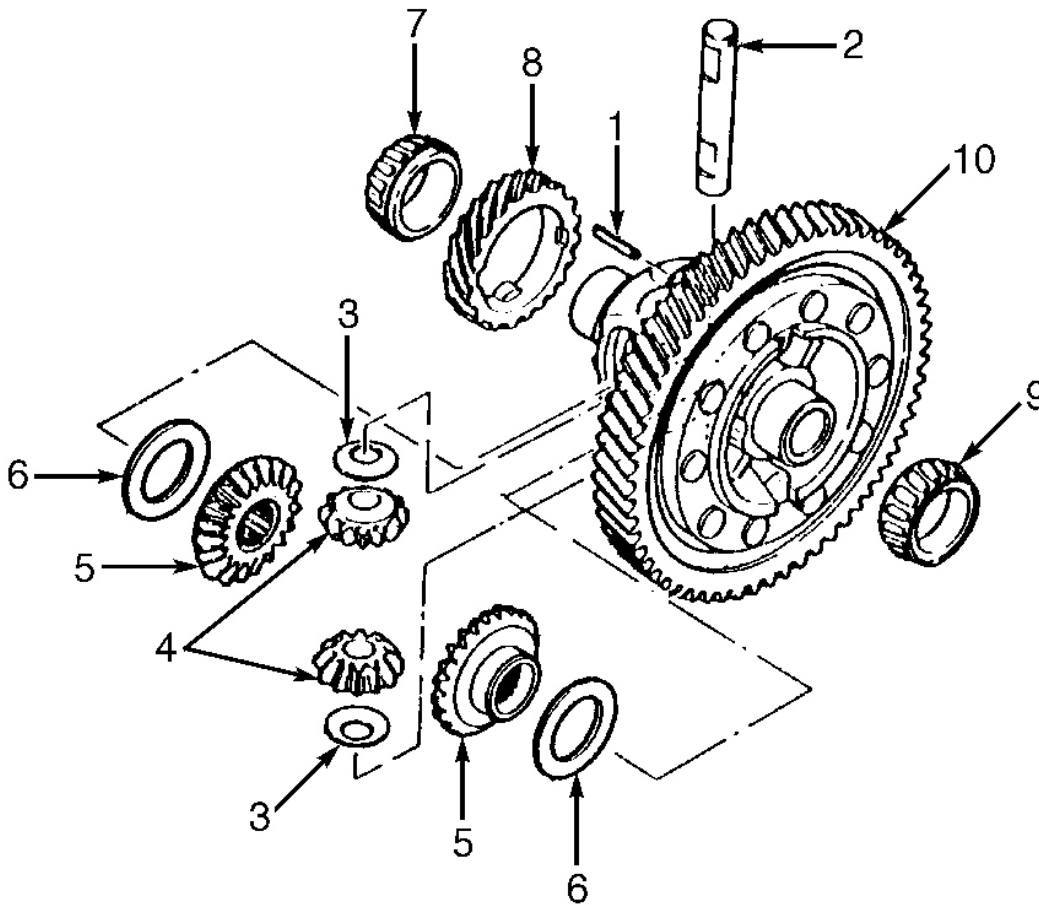
Disassembly

1. Remove roll pin and pinion shaft. See **Fig. 10** . Remove pinion gears and rotate thrust washers out of differential housing.

- Remove side gears and thrust washers. Using appropriate bearing puller, remove side bearings. DO NOT remove speedometer drive gear unless damaged.

Reassembly

Install speedometer drive gear (if removed) and bearings. Install thrust washers, pinion gears and side gears. Install pinion shaft. Install and crimp roll pin.



- | | |
|------------------|---------------------|
| 1. Roll Pin | 6. Thrust Washer |
| 2. Pinion Shaft | 7. Side Bearing |
| 3. Thrust Washer | 8. Speedometer Gear |
| 4. Pinion Gear | 9. Side Bearing |
| 5. Side Gear | 10. Ring Gear |

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Fig. 10: Exploded View Of Differential
Courtesy of MAZDA MOTORS CORP.

ADJUSTMENTS

BEARING PRELOAD (F25M-R)

Primary Shaft

1. Install primary shaft assembly into clutch housing. Install transaxle case into clutch housing and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
2. Mount dial indicator to clutch housing and place plunger on end of primary shaft. See **Fig. 11** . Zero dial indicator. Pull primary shaft upward and record measurement.
3. Ensure thrust clearance is within specification. See **TRANSAXLE COMPONENT SPECIFICATIONS (F25M-R)** or **TRANSAXLE COMPONENT SPECIFICATIONS (G25M-R)** table. Select appropriate shim to adjust clearance. Shims are available in the following thicknesses: 0.004-0.024" (0.10-0.60 mm) in 0.004" (0.10 mm) increments.

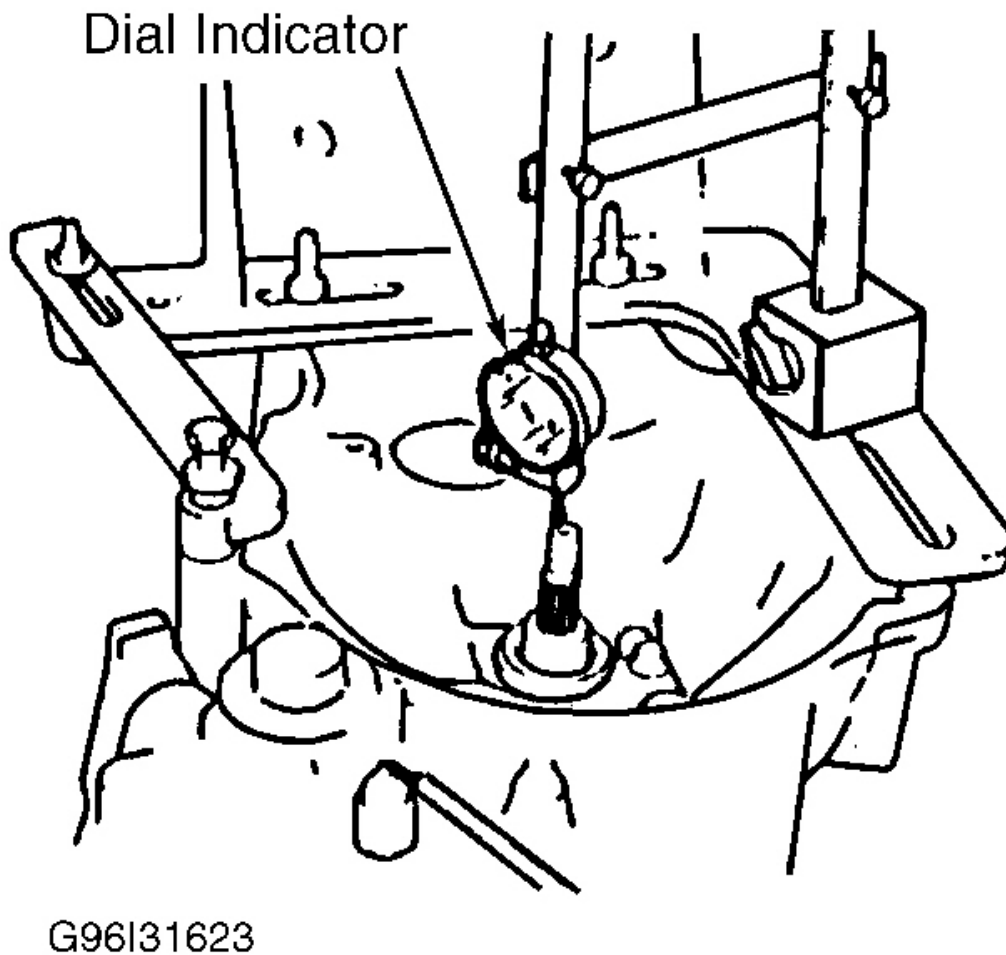


Fig. 11: Measuring Primary Shaft Thrust Clearance (F25M-R)
 Courtesy of MAZDA MOTORS CORP.

Secondary Shaft

1. Disassemble transmission case from clutch housing. Remove primary shaft. Install funnel and secondary bearing race in clutch housing. See **Fig. 4** . Install secondary shaft into transaxle case. Install transaxle case to clutch housing and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
2. Mount dial indicator to clutch housing and place plunger on end of secondary shaft. See **Fig. 12** . Zero dial indicator. Pull secondary shaft upward and record measurement. Add 0.0012" (0.03 mm) to measured thrust clearance and record. Add 0.0031" (0.08 mm) to thrust clearance and record. Select thickest adjustment shim in range determined by these two measurements. Shims are available in the following thicknesses: 0.006-0.020" (0.15-0.50 mm) in 0.002" (0.05 mm) increments.

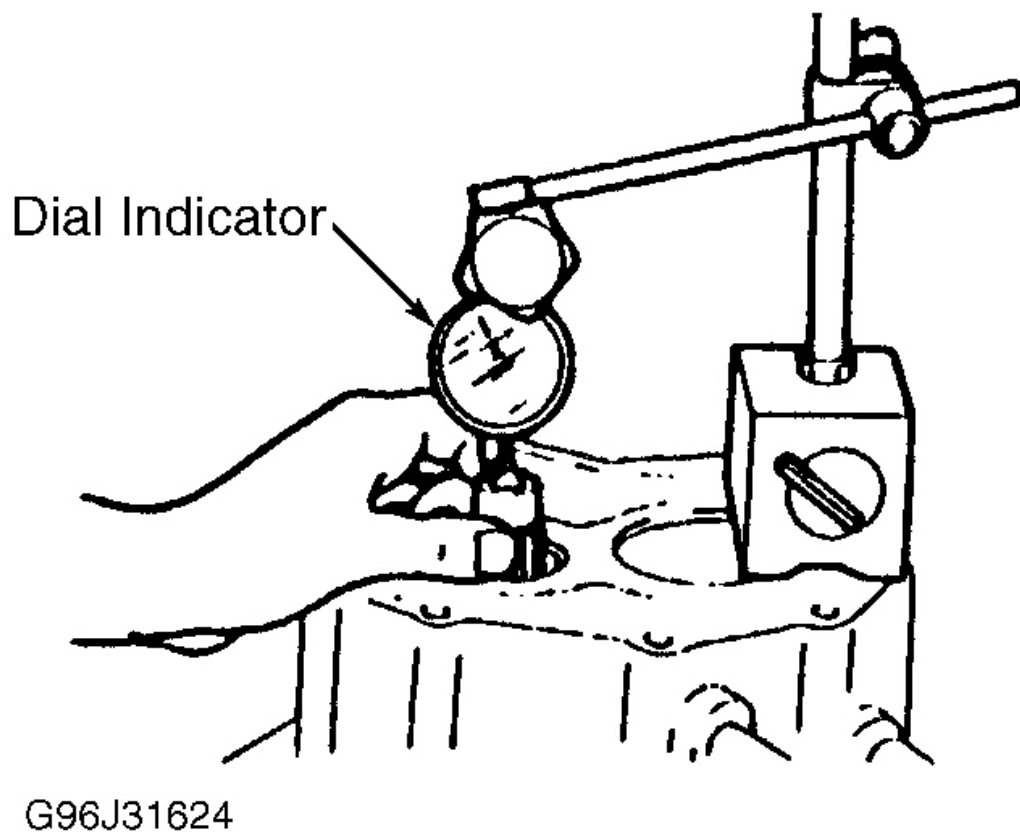


Fig. 12: Measuring Secondary Shaft Thrust Clearance (F25M-R)
 Courtesy of MAZDA MOTORS CORP.

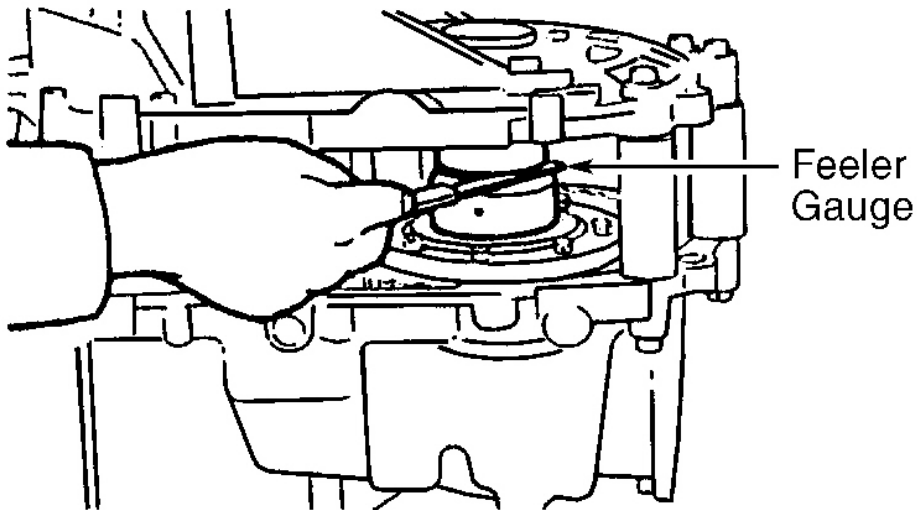
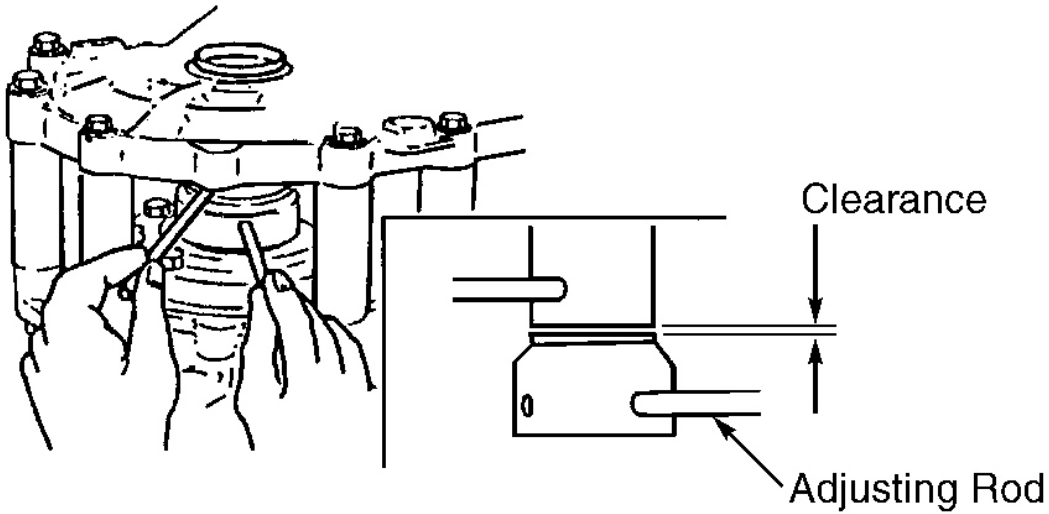
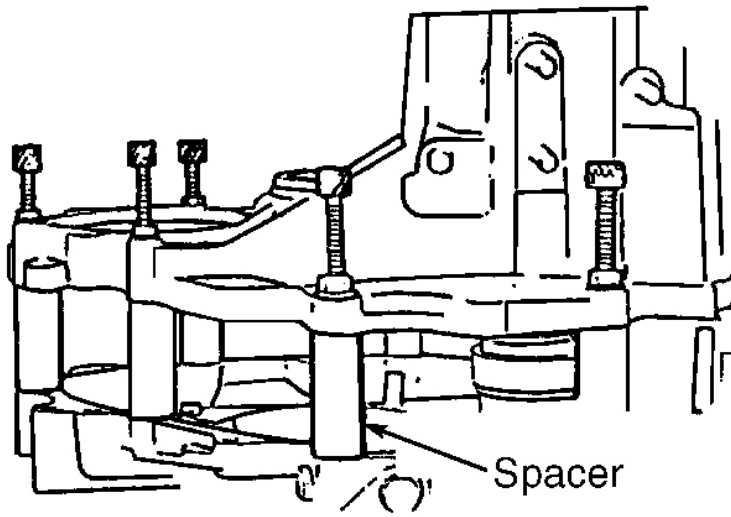
Differential Assembly

1. Remove bearing outer race and adjustment shims from transaxle case. Mount differential assembly in converter housing (with race installed). Install bearing outer race onto Selector Gauge (49 F401 381B-Shim Selector Tool Set). Set selector gauge on differential. Set transaxle case on selector gauge.
2. Eliminate gap on selector gauge by turning collars of selector gauge. Mount spacing collars between transaxle case and clutch housing. See **Fig. 13** . Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
3. Using rods on collars of selector, turn selector in a direction which widens gap between collars of selector. Turn selector (to widen gap) until it no longer turns. This will seat bearing race.
4. Turn selector collars in opposite direction until gap is closed. Mount preload adapter into differential until it contacts pinion shaft. Using INCH-lb. torque wrench, rotate differential. See **Fig. 14** . Turn selector collars until turning torque is 0.26-6.59 INCH lbs. (0.03-0.74 N.m).

5. Using feeler gauge, measure gap between selector collars. See **Fig. 13** . Take measurements around entire circumference of selector. Select shims equal to maximum clearance measured. Shims range in thickness from 0.008" (0.20 mm) to 0.022" (0.55 mm) in increments of 0.002" (0.5 mm).
6. Unbolt converter housing from transaxle case. Remove selector gauge. Install selected shims in transaxle case. Install bearing race. Set differential in transaxle case. Install converter housing. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
7. Position preload adapter into differential until in contacts pinion shaft. Measure bearing preload with INCH-lb. torque wrench. See **Fig. 14** . Differential bearing preload should be 0.26-6.59 INCH lbs. (0.03-0.74 N.m). If bearing preload is not within specification, repeat steps 1 -5 .

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Fig. 13: Determining Differential Side Bearing Preload Shims
 Courtesy of MAZDA MOTORS CORP.

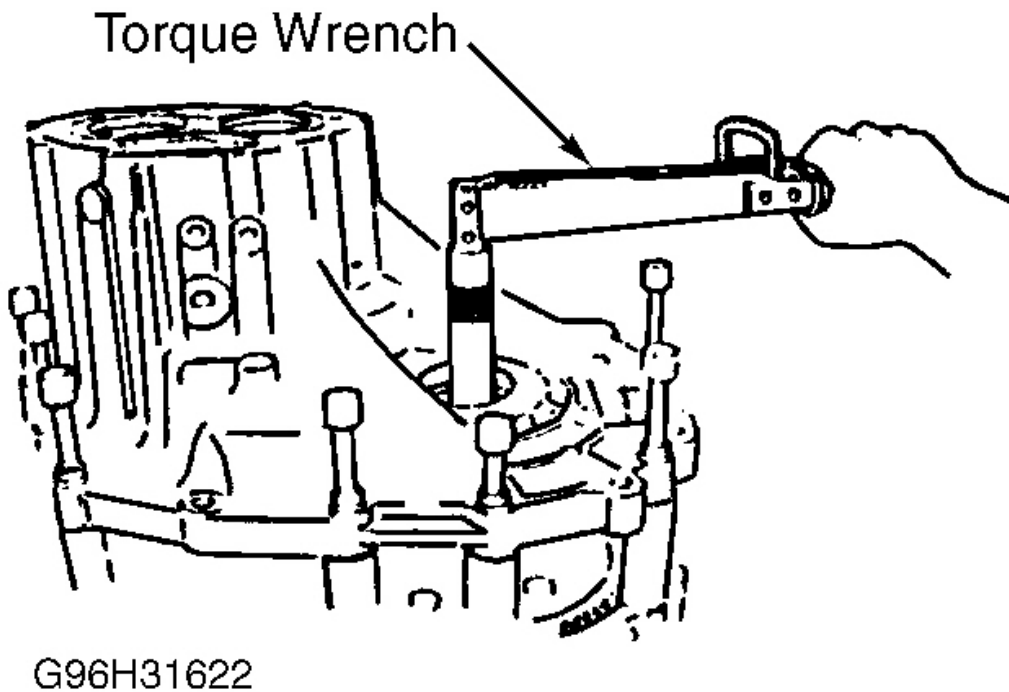


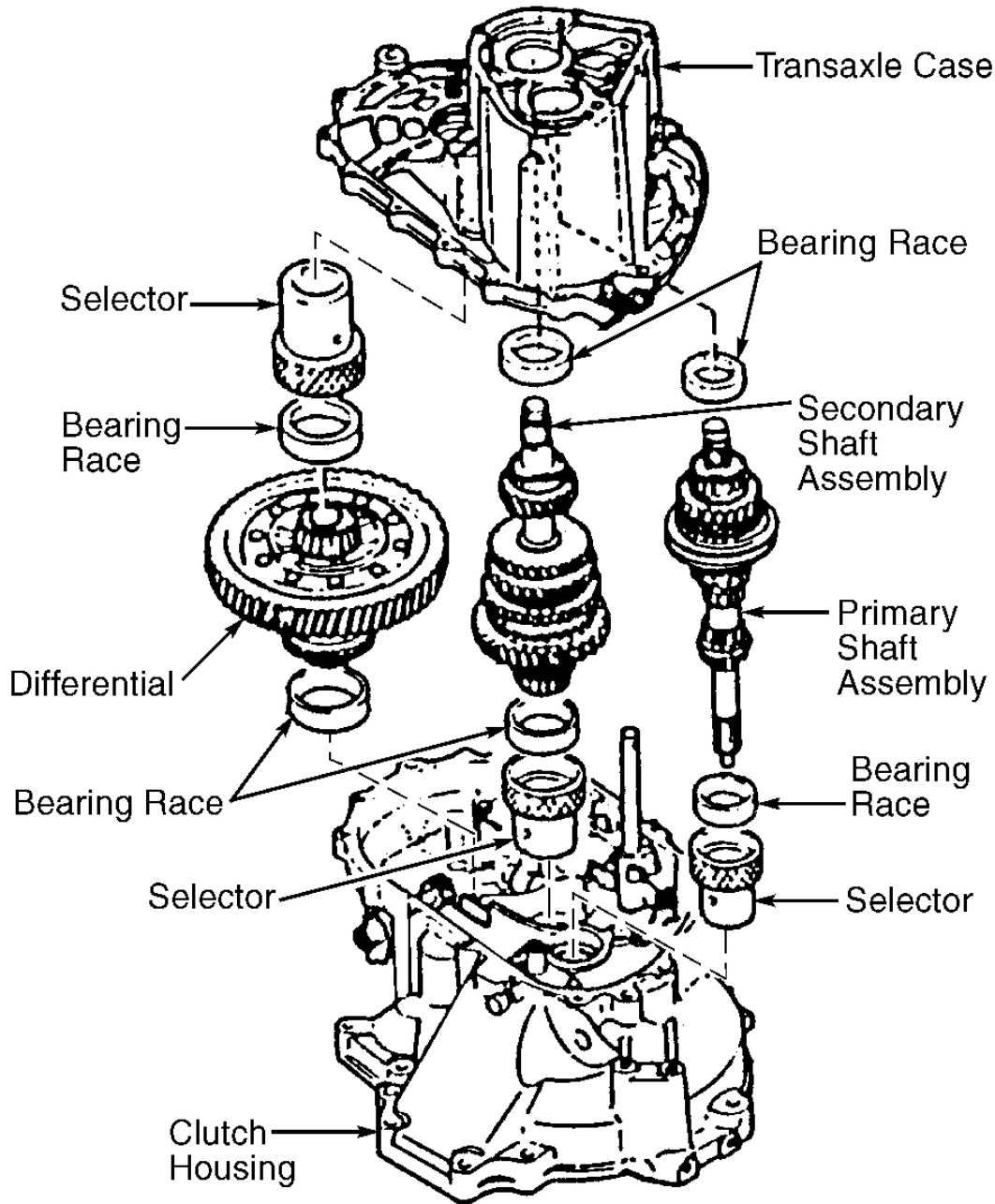
Fig. 14: Measuring Differential Side Bearing Preload
 Courtesy of MAZDA MOTORS CORP.

BEARING PRELOAD (G15M-R/G25M-R)

1. Install primary and secondary shaft bearing outer races (with shims removed) into transaxle case. Mount clutch housing onto transaxle hangar. Install differential bearing outer race into clutch housing, and tap into place.
2. Remove primary and secondary shaft outer race from clutch housing. Remove differential bearing outer race from transaxle case. Note selector arrangement. See **Fig. 15** .
3. Install differential assembly into clutch housing. Install outer bearing race on differential bearing. Install appropriate selector from Shim Selector Tool Set (49 G030 380D) on outer bearing race. Install selector in primary and secondary outer bearing race bore. Place outer bearing races in selector and set shaft into appropriate selector. Install transaxle case, spacers and bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Seat bearings by turning selector to widen measuring gap. See **Fig. 16** . Turn selector with adjuster bars until selector cannot be turned by hand. Reverse direction to eliminate measuring gap. Expand selector by

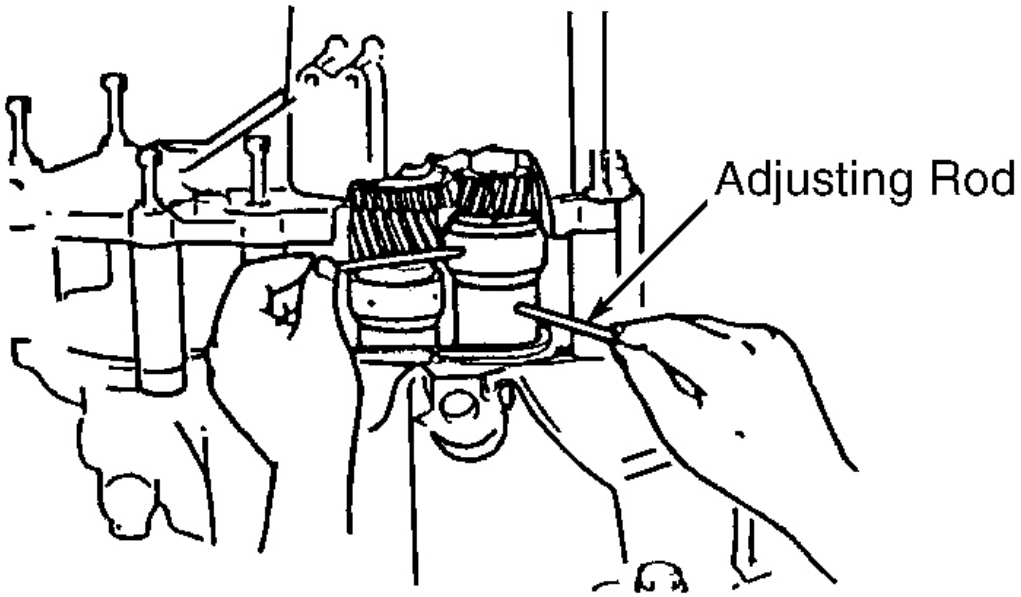
hand until selector no longer turns. Ensure shafts turn smoothly.

5. Measure gap with feeler gauge. See **Fig. 17** . Take measurements around entire circumference of selector. Select thinnest allowable shim to obtain standard clearance (primary shaft) or bearing preload (secondary shaft).
6. Primary shaft bearing clearance is 0.0-0.002" (0-0.05 mm). Shims range in thickness from 0.008" (0.20 mm) to 0.028" (0.70 mm) in increments of 0.002" (0.05 mm).
7. Secondary shaft bearing preload is selector clearance plus 0.001-0.003" (0.03-0.08 mm). Shims range in thickness from 0.008" (0.20 mm) to 0.028" (0.70 mm) in increments of 0.002" (0.5 mm).
8. Turn differential selector collars in opposite direction until gap is closed. Mount preload adapter into differential until in contacts pinion shaft. Using INCH-lb. torque wrench, rotate differential. See **Fig. 14** . Turn selector collars until turning torque is 13-17 INCH lbs. (1.4-1.9 N.m).
9. Using feeler gauge, measure clearance of gap between selector collars. See **Fig. 13** . Take measurements around entire circumference of selector. Select shims equal to maximum clearance measured plus 0.006" (0.15 mm). Shims range in thickness from 0.004" (0.10 mm) to 0.047" (1.20 mm) in increments of 0.002" (0.05 mm).
10. Disassemble transmission case. Remove selectors. Remove bearing races and install selected shims. See **Fig. 4** . Install primary shaft and differential. Install transaxle case to clutch housing. Tighten bolts in crisscross pattern to specification. See **TORQUE SPECIFICATIONS** .
11. Using INCH-lb. torque wrench and appropriate adapter, measure turning torque (preload) of differential and primary shaft. See **Fig. 14** and **Fig. 18** . Differential preload should be 13-17 INCH lbs. (1.4-1.0 N.m). Primary shaft preload should be 0.9-2.1 INCH lbs. (0.1-0.2 N.m). If preload is not as specified, repeat adjustment procedure.
12. Disassemble transmission case. Remove primary shaft and differential. Install secondary shaft. Install transaxle case to clutch housing. Tighten bolts in crisscross pattern to specification. See **TORQUE SPECIFICATIONS** .
13. Using INCH-lb. torque wrench and appropriate adapter, measure turning torque (preload) of secondary shaft. See **Fig. 18** . Secondary shaft preload should be 1.8-6.5 INCH lbs. (0.2-0.7 N.m). If preload is not as specified, repeat adjustment procedure.



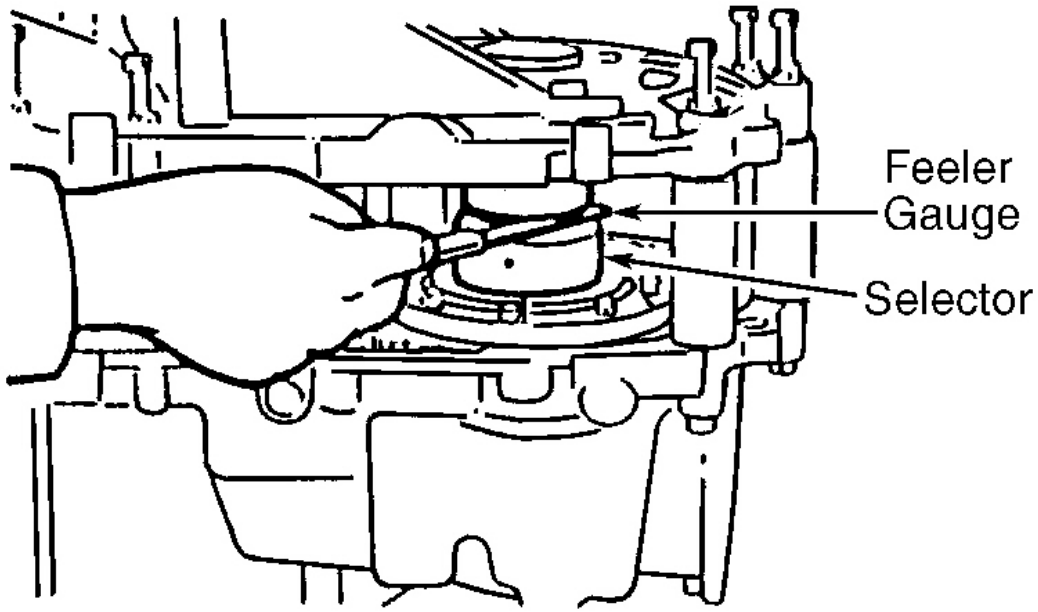
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Fig. 15: Identifying Selector Location
Courtesy of MAZDA MOTORS CORP.



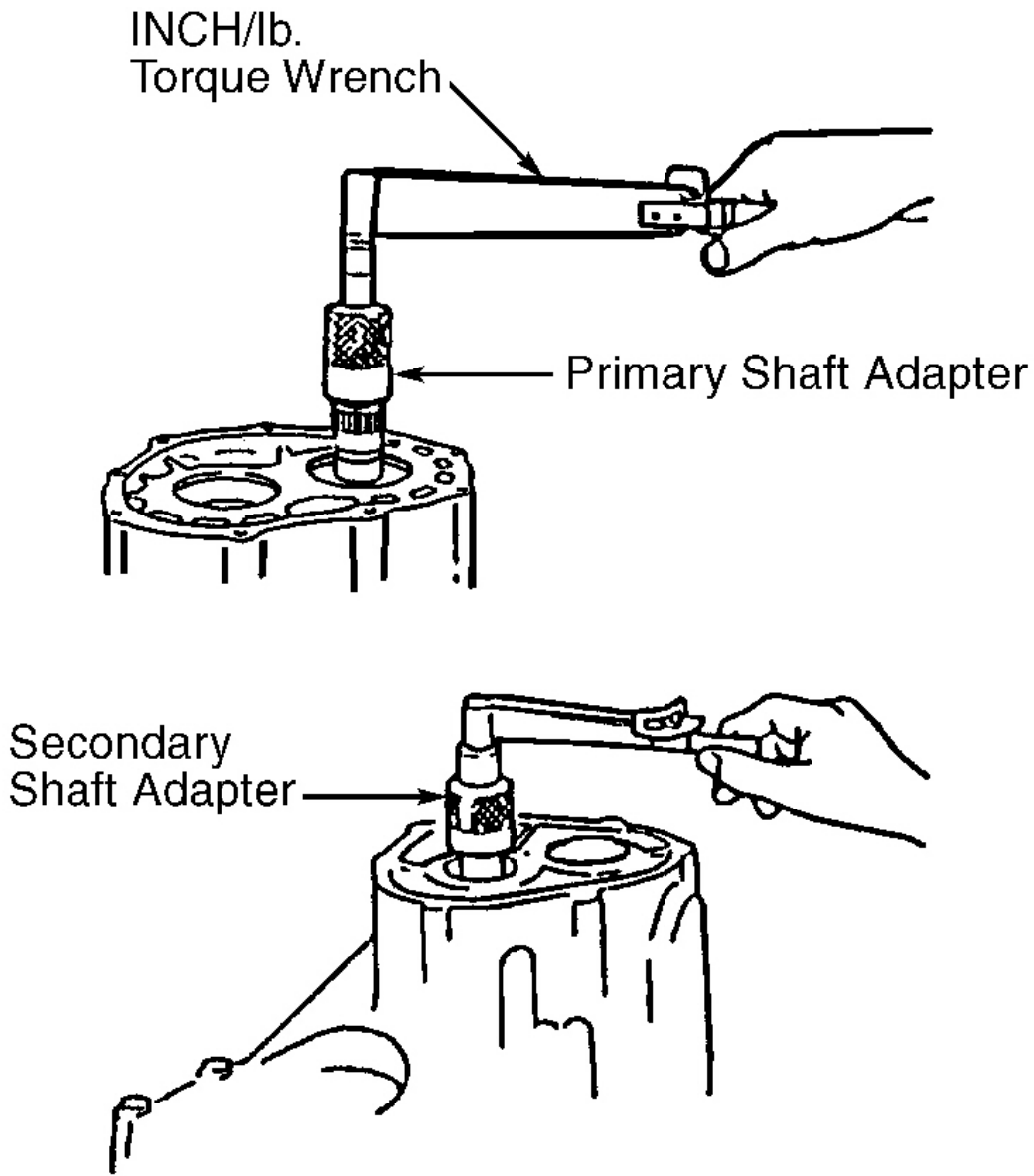
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Fig. 16: Expanding Selector Tool
Courtesy of MAZDA MOTORS CORP.



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Fig. 17: Measuring Selector Gap
Courtesy of MAZDA MOTORS CORP.



G96D31628

Fig. 18: Measuring Primary & Secondary Turning Torque (G15M-R/G25M-R)
Courtesy of MAZDA MOTORS CORP.

TRANSAXLE REASSEMBLY

1. To reassemble, reverse disassembly procedure. Place primary and secondary shaft assemblies into clutch

housing. Shift to 2nd gear and install shift fork and shift rod assembly.

2. Insert spring seat and spring into reverse lever shaft. Install steel ball and place scraper so that ball contacts steel ball. See **Fig. 19** . With edge of control end against scraper, rod will line up with shift rod coupling hole in clutch housing.
3. Set each clutch hub sleeve to neutral position, and tap shift rod from above so steel ball goes into center groove. Pull steel ball section of control end forward so steel ball goes into detent in groove.
4. Fit crank lever between change arm and control end. Connect crank lever shaft and clutch housing. Align pin holes of crank lever shaft and clutch housing. Insert new retaining pin. See **Fig. 20** .
5. Install 5th-reverse shift rod and rod end. Install reverse idler gear and idler shaft. Attach magnet to clutch housing. Align end of interlock sleeve with control lever and point reverse idler shaft screw hole toward outside of transaxle case. Apply sealant to case mating surfaces, and install clutch housing to transaxle case. Install 5th-reverse clutch hub assembly and shift fork. Shift transmission into 1st gear. Tighten lock nuts on primary and secondary shafts to specification and stake into place. See **TORQUE SPECIFICATIONS** .

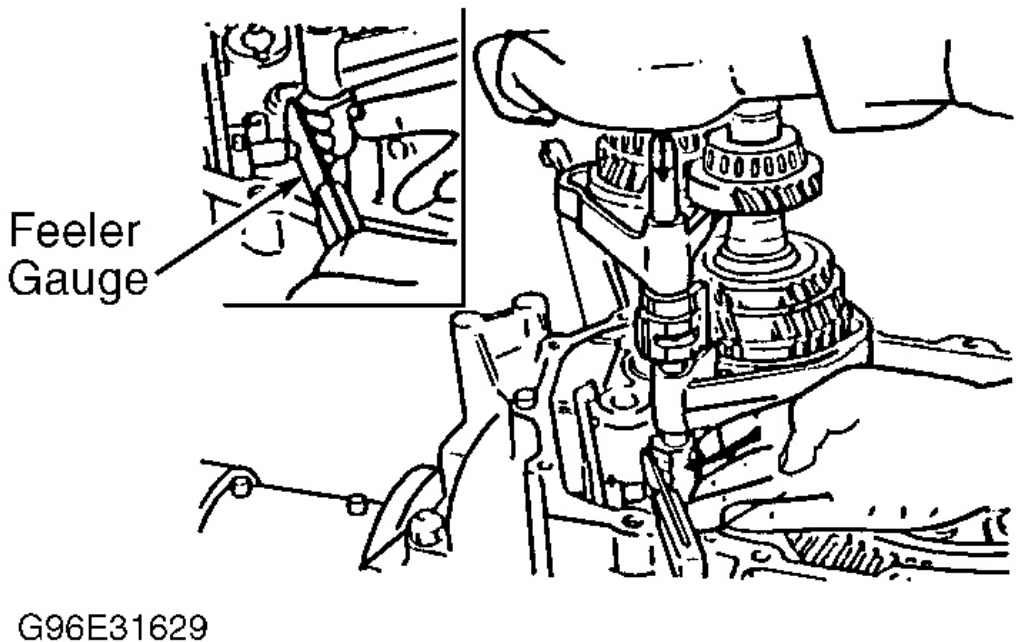


Fig. 19: Installing Shift Shaft Assembly
Courtesy of MAZDA MOTORS CORP.

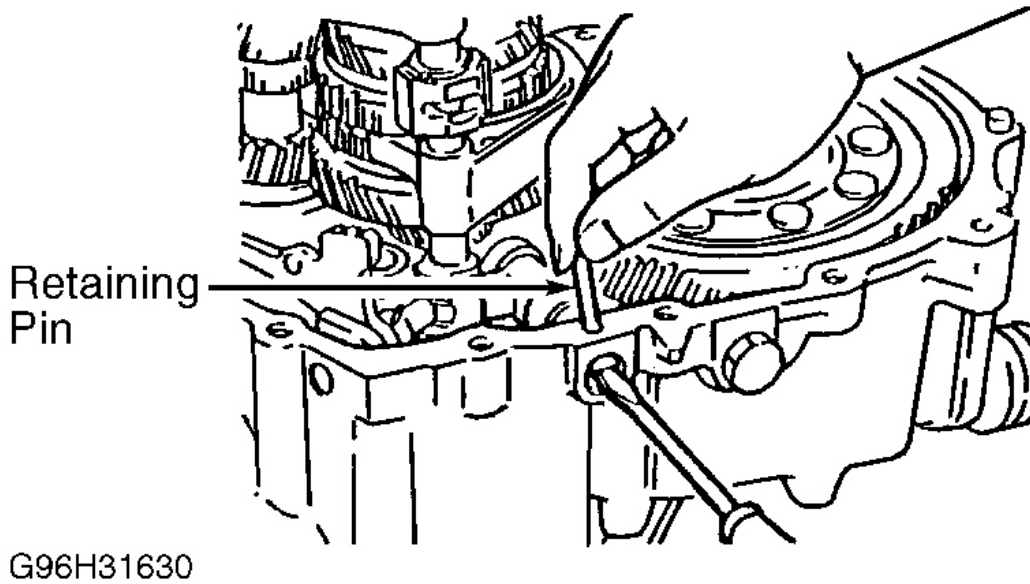


Fig. 20: Install Crank Lever Shaft Retaining Pin
 Courtesy of MAZDA MOTORS CORP.

TORQUE SPECIFICATIONS

F25M-R

TORQUE SPECIFICATIONS (F25M-R)

Application	Ft. Lbs. (N.m)
Back-Up Light Switch	15-18 (20-24)
Drain Plug	N/A
Guide Plate Bolt (Long)	17-24 (23-32)
Neutral Safety Switch	15-18 (20-24)
Primary & Secondary Shaft Lock Nut	94-152 (128-205)
Transaxle Case-To-Clutch Housing Bolt	14-18 (19-25)
	INCH Lbs. (N.m)
Bleeder Cover Bolt	61-95 (6.9-10.7)
Change Arm Joint Bolt	104-138 (11.8-15.6)
Change Arm-To-Change Rod Bolt	105-121 (11.8-13.7)
Guide Plate Bolt (Short)	70-99 (7.9-11.2)
Lever Set Spring Bolt	106-124 (12-14)
Oil Guide Bolt	79-121 (8.9-13.7)

2003 Mazda Protege Mazdaspeed

2001-03 MANUAL TRANSMISSIONS Mazda F25M-R, G15M-R & G25M-R 5-Speed Overhaul

Oil Passage Bolt	70-99 (7.9-11.2)
Rear Cover Bolt	N/A
Speedometer Driven Gear	N/A
Top Cover-To-Clutch Housing Bolt	69-97 (7.8-11)
5th-Reverse Shift Rod Bolt	104-121 (11.8-13.7)

G15M-R/G25M-R

TORQUE SPECIFICATIONS (G15M-R/G25M-R)

Application	Ft. Lbs. (N.m)
Back-Up Light Switch	15-21 (20-29)
Drain Plug	30-43 (40-58)
Guide Plate Bolt (Long)	17-24 (23-32)
Neutral Safety Switch	15-21 (20-29)
Primary & Secondary Shaft Lock Nut	95-140 (130-190)
Transaxle Case-To-Clutch Housing Bolt	28-38 (38-51)
	INCH Lbs. (N.m)
Bleeder Cover Bolt (F25M-R)	61-95 (6.9-10.7)
Change Arm-To-Change Rod Bolt	105-121 (11.8-13.7)
Guide Plate Bolt (Short)	79-121 (8.9-13.7)
Lever Set Spring Bolt	106-124 (12-14)
Oil Guide Bolt	79-121 (8.9-13.7)
Oil Passage Bolt	70-99 (7.9-11.2)
Rear Cover Bolt	69-97 (7.8-11)
Speedometer Driven Gear	70-99 (7.9-11.2)
Top Cover-To-Clutch Housing Bolt	69-97 (7.8-11)
5th-Reverse Shift Rod Bolt	104-121 (11.8-13.7)