

1991 Mazda MX-5 Miata

MANUAL TRANS OVERHAUL - MAZDA M TYPE MANUAL TRANSMISSIONS Mazda M-Type

MANUAL TRANS OVERHAUL - MAZDA M TYPE

MANUAL TRANSMISSIONS Mazda M-Type

APPLICATION

TRANSMISSION APPLICATION

Vehicle Application	Transmission Model
626 (RWD)	
1983	4 & 5-Speed
B2000	
4-Speed (1983-84, 1986)	4-Speed
5-Speed (1983-84, 1986)	5-Speed
4-Speed (1987)	M4M-D
5-Speed (1987)	M-Type
B2200	
4-Speed (1984 Diesel)	4-Speed
5-Speed (1984 Diesel)	5-Speed
4-Speed (1988-91)	M4M-D
5-Speed (1988-90)	M-Type
5-Speed (1991-92)	M5M-D
B2600	
5-Speed (1987)	5-Speed
5-Speed (1988)	M-Type
GLC Wagon (RWD)	
1983-84	4 & 5-Speed
Miata	
1990-92	M-Type
1993-94	M15M-D
RX7	
1983-86 (Non-Turbo)	5-Speed
1987-92 (Non-Turbo)	M-Type

LUBRICATION & ADJUSTMENTS

See appropriate TRANSMISSION SERVICING - M/T article in MANUAL TRANS SERVICE section.

- For 1983 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1984 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1985 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1986 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1987 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1988 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1989 B2200, see [TRANSMISSION SERVICING - M/T](#)
- For 1989 RX7, see [TRANSMISSION SERVICING - M/T](#)
- For 1990 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1991 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1992 Models, see [TRANSMISSION SERVICING - M/T](#)
- For 1993 Miata, see [TRANSMISSION SERVICING - M/T](#)
- For 1994 Miata, see [TRANSMISSION SERVICING - M/T](#)

TROUBLESHOOTING

See [TROUBLE SHOOTING - BASIC PROCEDURES](#) article in the GENERAL TROUBLE SHOOTING section.

REMOVAL & INSTALLATION

See appropriate [TRANSMISSION REMOVAL & INSTALLATION - M/T](#) article in MANUAL TRANS SERVICE section.

- For 1983 626, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1983 GLC Wagon, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1984 GLC Wagon, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1983 B2000, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1984 B2000, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1984 B2200 Diesel, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1986 B2000, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1987 B2000 & B2600, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For Miata, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1983 RX7, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)
- For 1984 RX7, see [TRANSMISSION REMOVAL & INSTALLATION - M/T](#)

- For 1985 RX7, see TRANSMISSION REMOVAL & INSTALLATION - M/T
- For 1986 RX7, see TRANSMISSION REMOVAL & INSTALLATION - M/T
- For 1987 RX7, see TRANSMISSION REMOVAL & INSTALLATION - M/T

TRANSMISSION DISASSEMBLY

4 & 5-SPEED MODELS

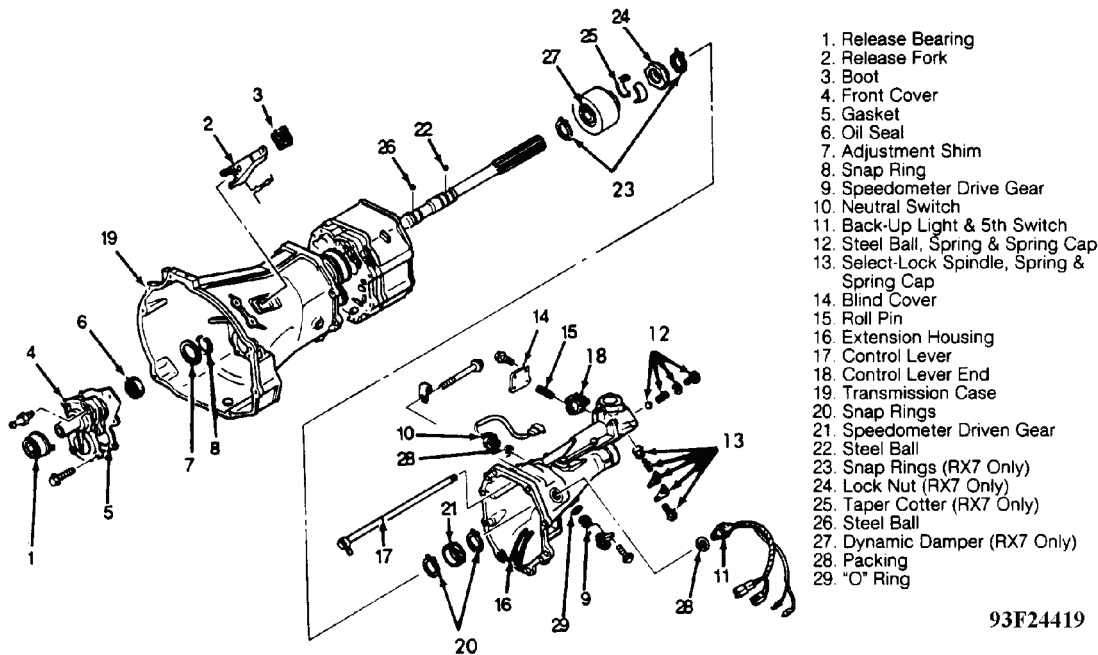
1. Remove clutch release bearing, release fork and dust boot. See **Fig. 1** . Remove front cover bolts, front cover, gasket, adjustment shim(s), snap ring and oil seal.
2. Remove snap ring, cover, bolt, spring and lock ball from extension housing. On RX7, remove cover, spring and select lock spindle. On B2200, remove control case cover to expose control rod end. Move control rod to neutral. On Miata and RX7, shift transmission into 1st gear.
3. On all models, remove extension housing attaching bolts. On RX7, remove bolt attaching control rod end to control rod. **DO NOT** remove control rod end. On B2200 and RX7, separate extension housing from intermediate housing by rotating control rod toward control case opening. On Miata, rotate extension housing clockwise and separate extension housing from intermediate housing.
4. Remove speedometer drive gear snap ring from mainshaft and slide drive gear off mainshaft. Remove steel ball and remaining snap ring. On RX7, remove snap ring, lock nut, taper cotters, dynamic damper and snap ring. On all models, separate transmission case from intermediate housing and gear assembly.
5. Drive out spring pins attaching shift rod ends to shift rods and shift forks. Remove shift rod ends. See **Fig. 2** and **Fig. 3** . Separate intermediate housing from bearing housing assembly by tapping with a soft mallet.
6. Remove cap plugs, springs and balls. On RX7 and Miata, remove clip from 1st-2nd and 3rd-4th shift rod. Remove spacer and spring. Remove all shift rods and forks. On 4-speed models, remove reverse idler gear shift lever. On all models, remove interlock pins, springs and balls from bearing housing assembly. Remove snap ring, washer, retaining ring and "C" washers. Remove mainshaft rear bearing.
7. Remove remaining "C" washer, retaining ring, thrust lock washer and lock ball. Shift clutch hub sleeves into 1st and reverse gears to lock rotation of mainshaft. Place Mainshaft Holder (490259440) on mainshaft and mount securely in vise. Remove counter-shaft lock nut. See **Fig. 4** . Using main bearing puller, remove counter-shaft rear bearing and mainshaft front bearing. Remove countershaft front bearing.

NOTE: **DO NOT re-use lock nuts after removing.**

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8. On 5-speed models, remove 5th gear and synchronizer ring. Wrap bearing housing with rag and secure in vise. Uncrimp tabs of lock nut and remove using Lock Nut Wrench (491243465A). Discard lock nut.
9. Remove 5th-reverse clutch hub assembly, reverse gear, needle bearing, inner race and thrust washer. Remove reverse counter-gear. On B2200, remove reverse idler gear shaft. On RX7, remove snap ring. On all models, remove adjustment washer, reverse idler gear and thrust washer.
10. Using plastic-faced hammer, tap rear end of mainshaft and countershaft assemblies and remove from bearing housing. Remove bearing cover, bearings and adjusting shims from bearing housing.

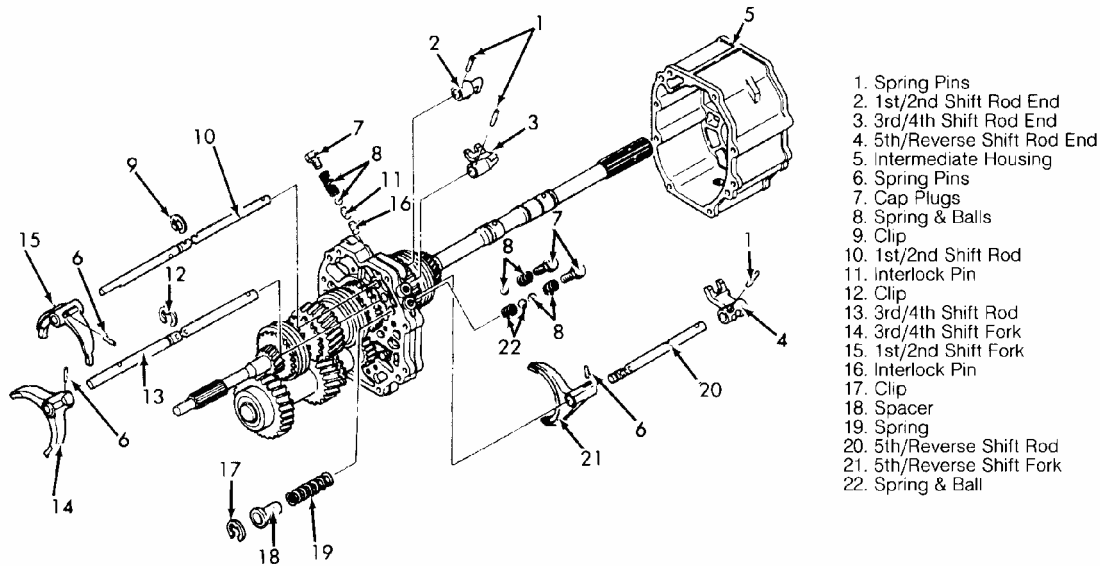


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Fig. 1: Transmission Case, Intermediate Housing & Extension Housing
Courtesy of MAZDA MOTORS CORP.

1991 Mazda MX-5 Miata

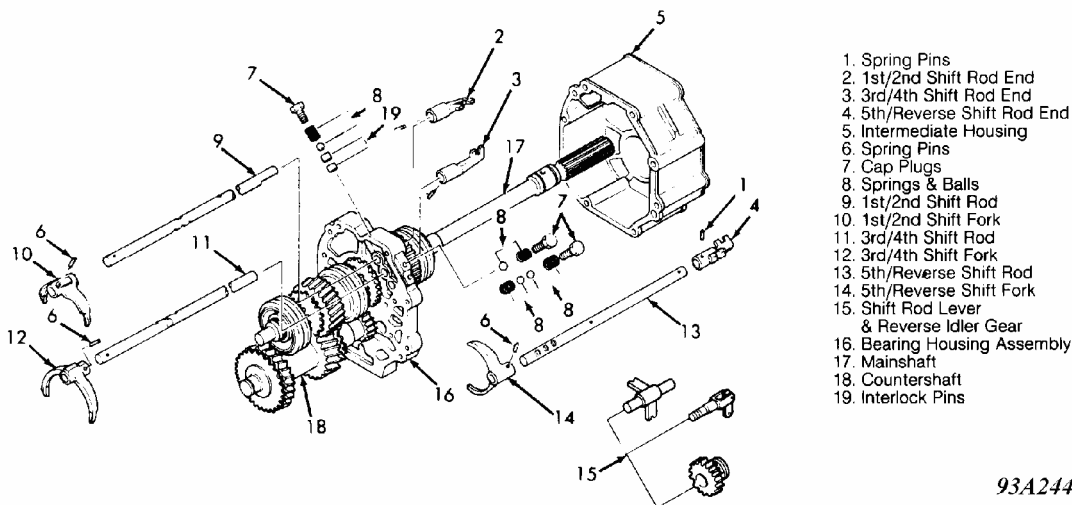
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1. Spring Pins
2. 1st/2nd Shift Rod End
3. 3rd/4th Shift Rod End
4. 5th/Reverse Shift Rod End
5. Intermediate Housing
6. Spring Pins
7. Cap Plugs
8. Spring & Balls
9. Clip
10. 1st/2nd Shift Rod
11. Interlock Pin
12. Clip
13. 3rd/4th Shift Rod
14. 3rd/4th Shift Fork
15. 1st/2nd Shift Fork
16. Interlock Pin
17. Clip
18. Spacer
19. Spring
20. 5th/Reverse Shift Rod
21. 5th/Reverse Shift Fork
22. Spring & Ball

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Fig. 2: Mainshaft, Countershaft & Shift Linkage (RX7 Non-Turbo)
 Courtesy of MAZDA MOTORS CORP.



1. Spring Pins
2. 1st/2nd Shift Rod End
3. 3rd/4th Shift Rod End
4. 5th/Reverse Shift Rod End
5. Intermediate Housing
6. Spring Pins
7. Cap Plugs
8. Springs & Balls
9. 1st/2nd Shift Rod
10. 1st/2nd Shift Fork
11. 3rd/4th Shift Rod
12. 3rd/4th Shift Fork
13. 5th/Reverse Shift Rod
14. 5th/Reverse Shift Fork
15. Shift Rod Lever & Reverse Idler Gear
16. Bearing Housing Assembly
17. Mainshaft
18. Countershaft
19. Interlock Pins

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Fig. 3: Mainshaft, Countershaft & Shift Linkage (B2200)
 Courtesy of MAZDA MOTORS CORP.

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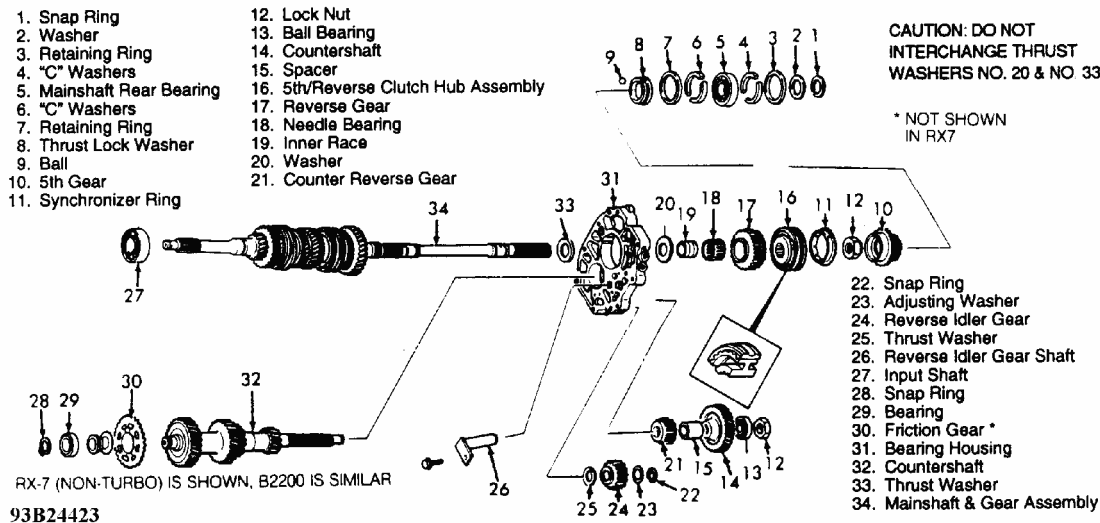


Fig. 4: Exploded View Of Mainshaft & Countershaft
Courtesy of MAZDA MOTORS CORP.

COMPONENT DISASSEMBLY & REASSEMBLY

MAINSHAFT

Disassembly

1. On 4-speed models, remove thrust washer, 1st gear and gear sleeve. Remove needle bearing and inner race. Remove 1st gear synchronizer, 1st-2nd clutch hub assembly and 2nd gear snap ring. Remove snap ring from front of mainshaft.
2. Install puller between 2nd and 3rd gears. Press 3rd-4th clutch hub and sleeve assembly, synchronizer ring and 3rd gear from front of mainshaft. Reposition mainshaft in press. Remove 1st-2nd clutch hub and sleeve assembly, synchronizer ring and 2nd gear from rear of mainshaft.
3. On 5-speed models, remove snap ring from mainshaft. Remove 3rd-4th synchronizer hub assembly, synchronizer ring, 3rd gear, thrust washer and synchronizer ring. Remove 1st gear, needle bearing, inner race, 1st-2nd synchronizer hub assembly, synchronizer ring and 2nd gear.

Inspection

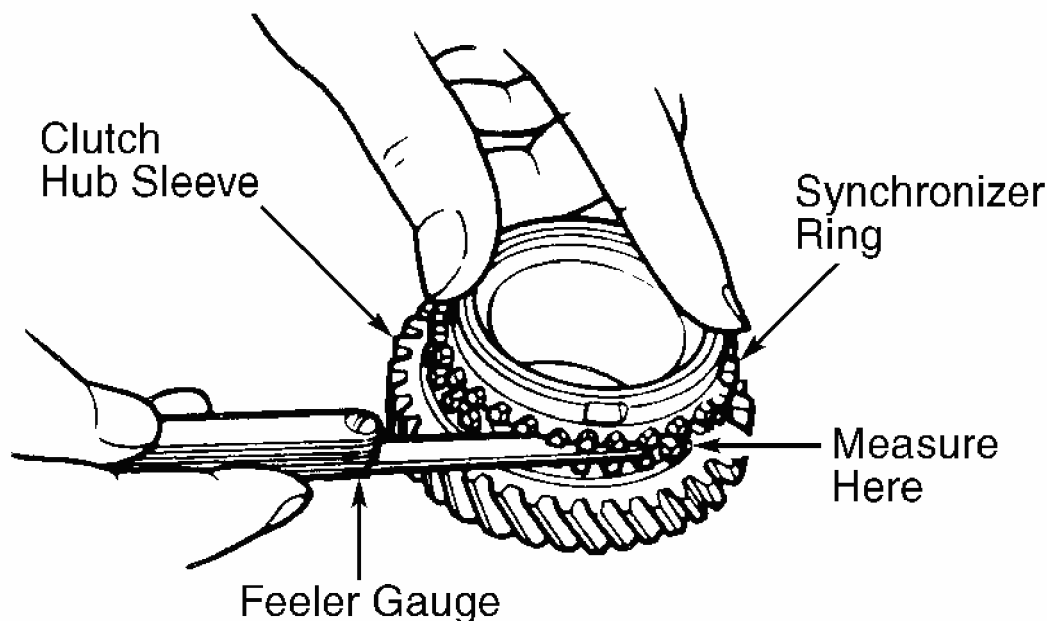
Inspect mainshaft for runout by positioning a dial indicator along the shaft, mounted in "V" blocks. If runout exceeds .001" (.03 mm), replace mainshaft. Inspect all other surfaces and splines for wear and/or damage. On Miata and RX7, measure detent and shift rod spring free length. Specification not available on other models. See SPRING FREE LENGTH table.

SPRING FREE LENGTH (MIATA & RX7)

Application	In. (mm)
5th-Reverse Shift Rod Spring	2.953 (75.00)
1st-2nd & 3rd-4th Detent Ball Spring	.886 (22.50)
5th-Reverse Detent Ball Spring	.669 (17.00)

Synchronizer Inspection

1. Inspect unit for worn or damaged parts. Install synchronizer ring evenly to gear cone and measure clearance between side faces of ring and gear with feeler gauge. Standard clearance is .059" (1.50 mm). Minimum clearance is .031" (.80 mm), replace synchronizer ring or gear if not within specifications. See **Fig. 5**.



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Fig. 5: Checking Synchro Ring & Hub Sleeve Clearance
 Courtesy of MAZDA MOTORS CORP.

2. Inspect contact between ring and gear. Check synchronizer key spring for tension. Ensure clutch sleeve slides easily on clutch hub. Check clearance between hub sleeve and release fork groove using feeler gauge. Standard clearance is .008-.012" (.20-.30 mm). Clearance limit is .020" (.51 mm). Replace if not within specifications. On Miata and RX7,

intermediate housing locator pin height measurement is .354-.394" (9.00-10.00 mm).

NOTE: Ensure synchronizer ring and clutch hub are aligned during pressing operation.

Reassembly

1. Place 3rd gear and synchronizer ring on mainshaft. Press 3rd and 4th clutch hub assembly using arbor press and Pulley-Boss Puller (490636145). Install snap ring. Install 2nd gear, synchronizer ring, 1st-2nd clutch hub and sleeve assembly on mainshaft using arbor press.
2. Ensure clutch hubs are facing correct direction. See **Fig. 6**. Install gear sleeve, 1st gear and washer to mainshaft. Install needle bearing, synchronizer ring and input shaft. Reverse disassembly procedures to complete reassembly.

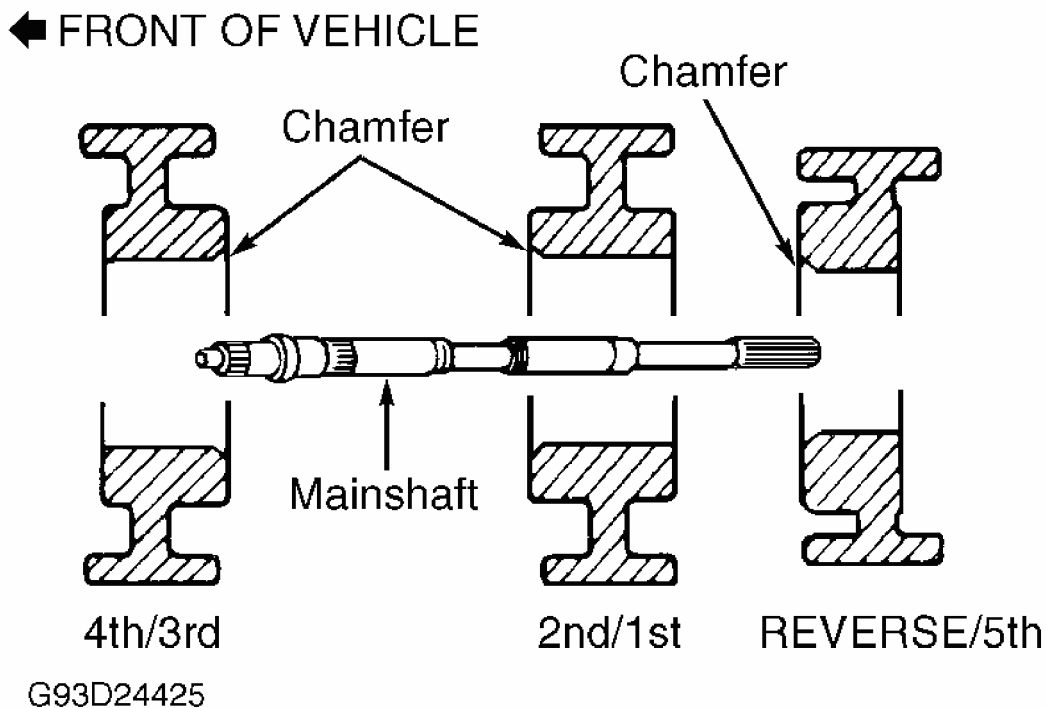
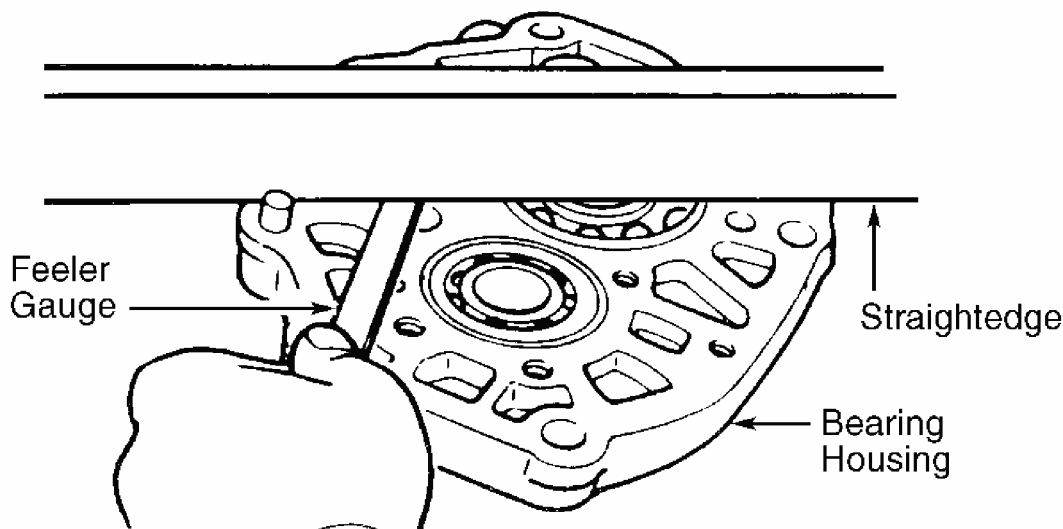


Fig. 6: Checking Proper Hub Alignment
Courtesy of MAZDA MOTORS CORP.

TRANSMISSION REASSEMBLY

4-SPEED MODEL

1. Press countershaft and mainshaft rear bearings into bearing housing. Check clearance between bearing housing surface and bearing height. See **Fig. 7** . If clearance exceeds .002" (.05 mm), replace adjusting shim. Adjustment shims of .004" (.10 mm) and .012" (.30 mm) are available. Install and tighten bearing cover to bearing housing. Using arbor press, install countershaft and mainshaft assembly into bearing plate.



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Fig. 7: Checking Bearing-To-Bearing Housing Clearance
 Courtesy of MAZDA MOTORS CORP.

2. Install reverse idler gear shaft. Mount bearing housing securely in a soft-jawed vise. Slide clutch hub sleeves onto 1st and reverse gears to lock mainshaft in gear. Install reverse idler gear, Woodruff key, plain washer and lock nut onto mainshaft. Secure mainshaft with Holder (490259440). Install and tighten lock nut.
3. Bend over lock washer tab. Install countershaft reverse gear and snap ring. Install reverse shift spring and locking ball into bearing housing. Push ball down using screwdriver and Interlock Pin Guide (490187451A). Install reverse shift rod, shift fork and reverse idler gear at same time. Ensure interlock pin is installed correctly. See **Fig. 8** .

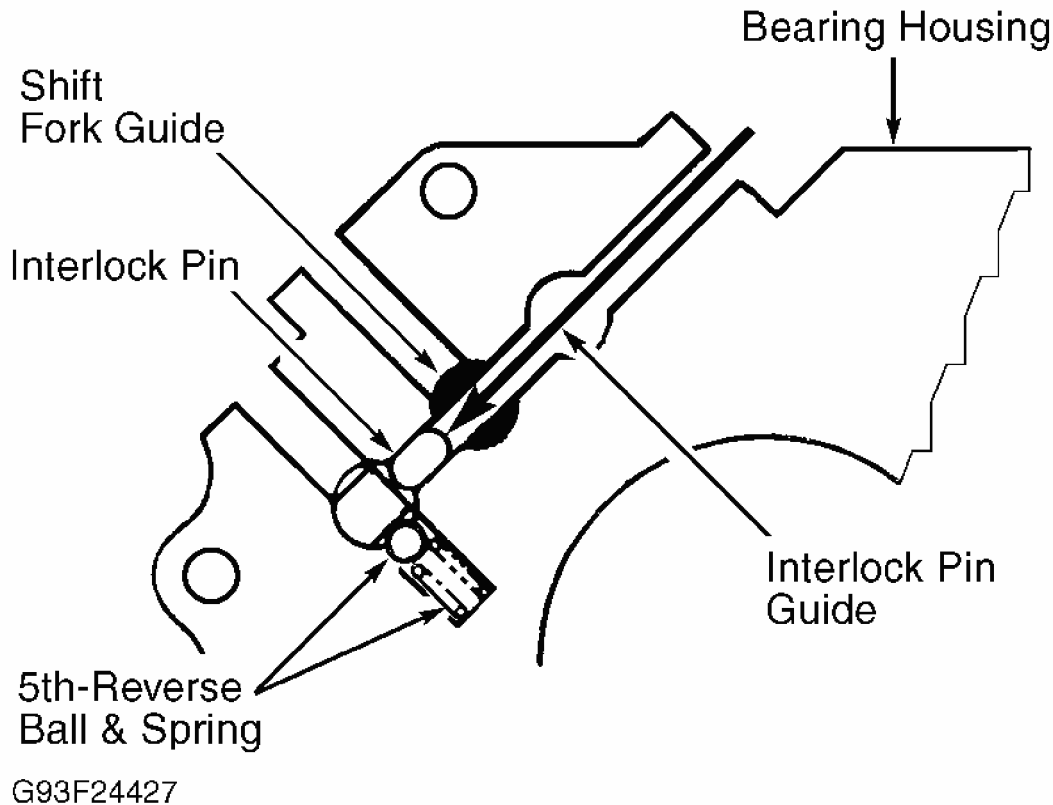


Fig. 8: Identifying Correct Positioning Of Interlock Pin
 Courtesy of MAZDA MOTORS CORP.

4. Install 3rd-4th and 1st-2nd shift forks onto clutch sleeves. Using Guides (490862350 and 490187451A), install each shift fork rod and interlock pin. See **Fig. 8** . Install all springs, balls and plugs. The looser wound spring is for the 5th-reverse shift rod. Align holes in both shift forks and rods. Install NEW roll pins.
5. Ensure the shift fork-to-synchronizer hub sleeves are aligned correctly. Adjust position of shift fork as shown. See **Fig. 9** . To adjust, install proper thrust washer between 1st gear and mainshaft bearing and between reverse gear and mainshaft bearing. Thrust washers are available in thicknesses of .087, .106, .118, .126 and .146" (2.20, 2.70, 3.00, 3.20 and 3.70 mm). Total combined thickness of both front and rear thrust washers should be .232-.236" (5.90-6.00 mm).

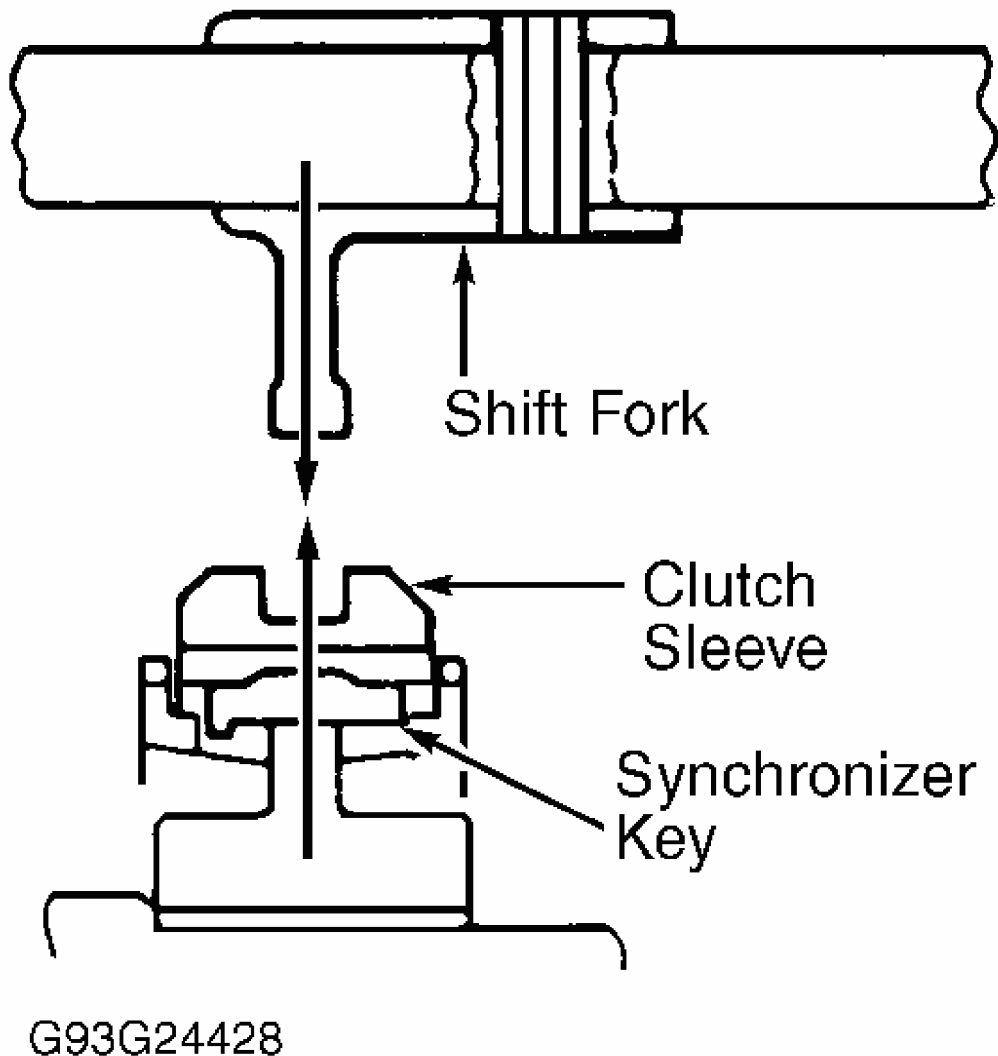
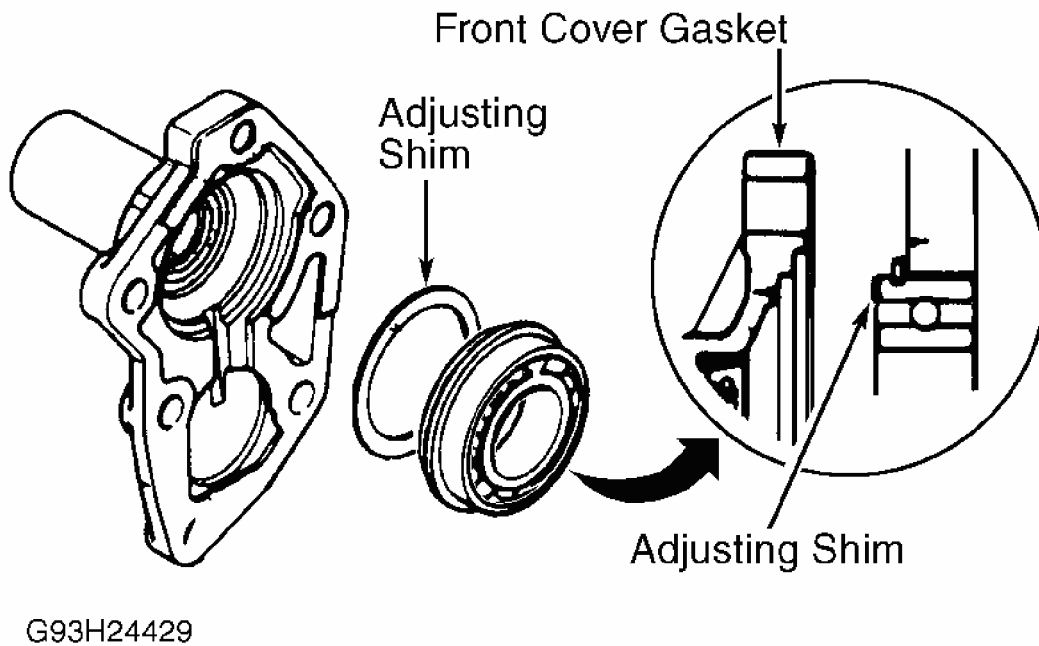


Fig. 9: Adjusting Shift Fork-To-Synchronizer Hub Sleeve
Courtesy of MAZDA MOTORS CORP.

- Using a soft mallet, install intermediate housing-to-bearing housing. Install shift rod end on each shift rod. Install speedometer drive gear and snap ring onto mainshaft. Apply sealant to mating surfaces of extension and intermediate housings. While turning control rod end to the left, mount extension housing to intermediate housing. Apply sealant to mating surfaces of transmission case and bearing housing.

7. Install transmission case and mounting bolts. Install control lever end, control lever and tighten bolt. Install back-up light switch. Ensure control rod operates properly. Install gearshift lever retainer and gasket to extension housing.
8. Lubricate lip of oil seal inside front cover and install front cover to transmission case. Check clearance between bearing outer race and front cover. See **Fig. 10** . If clearance exceeds .004" (.10 mm), replace adjusting shim. See **ADJUSTING SHIM SPECIFICATIONS** table. Install clutch release bearing, release fork and dust boot.



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Fig. 10: Locating Front Bearing Shim
 Courtesy of MAZDA MOTORS CORP.

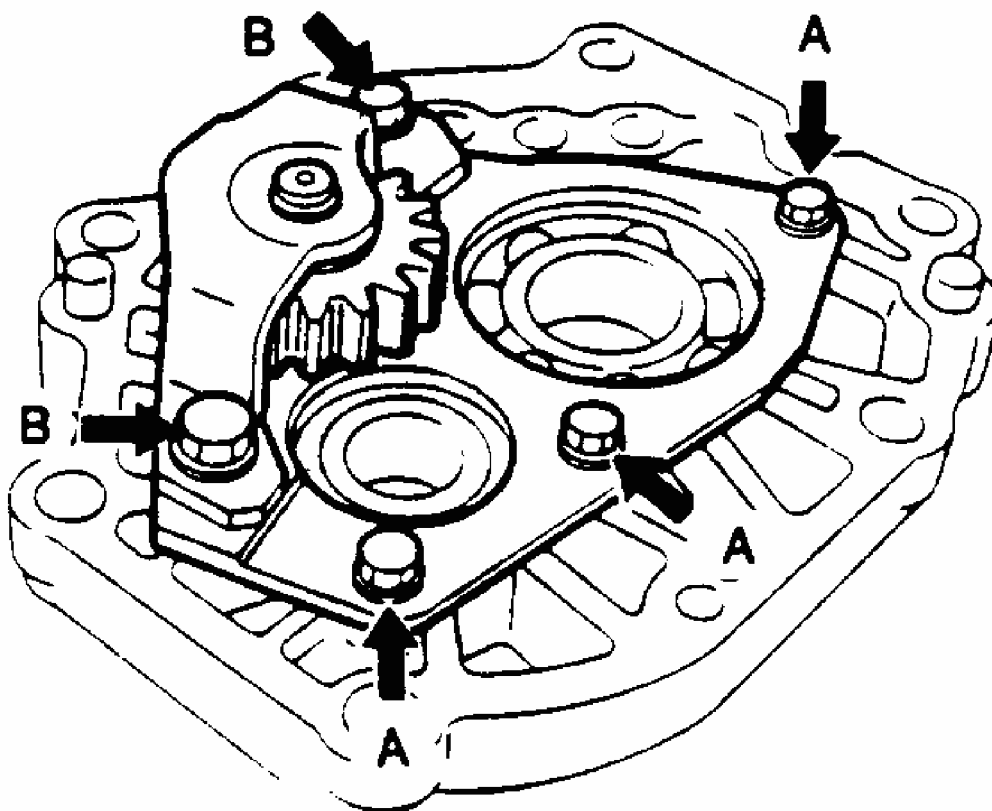
ADJUSTING SHIM SPECIFICATIONS

Washer No.	In. (mm)
1 (Miata & RX7 Only)	.004 (.10)
2 (All Models)	.006 (.15)
3 (All Models)	.012 (.30)

5-SPEED MODEL

1. Press countershaft and mainshaft rear bearings into bearing plate. Check bearing height

above bearing plate with straight edge and feeler gauge. See **BEARING HEIGHT SPECIFICATIONS** table. If clearance exceeds specifications, replace adjusting shim. See **CENTER BEARING SELECTIVE SHIM** table. See **Fig. 7** . Install and tighten bearing cover to bearing housing. On some RX7 the idler gear is installed with bearing cover. See **Fig. 11** . Using arbor press, install countershaft and mainshaft assembly into bearing plate.



A: 12-17 ft. lbs. (16-23 N.m)

B: 27-40 ft. lbs. (36-54 N.m)

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Fig. 11: Installing Bearing Cover (RX7)
Courtesy of MAZDA MOTORS CORP.

BEARING HEIGHT SPECIFICATIONS

Application	In. (mm)
Mainshaft & Countershaft	

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Miata & RX7	.004 (.10)
All Others	.002 (.05)

CENTER BEARING SELECTIVE SHIM

Application	In. (mm)
Countershaft	.004 & .012 (.10 & .30)
Mainshaft	
B2200	.004 & .012 (.10 & .30)
Miata & RX7	.004, .006 & .012 (.10, .15 & .30)

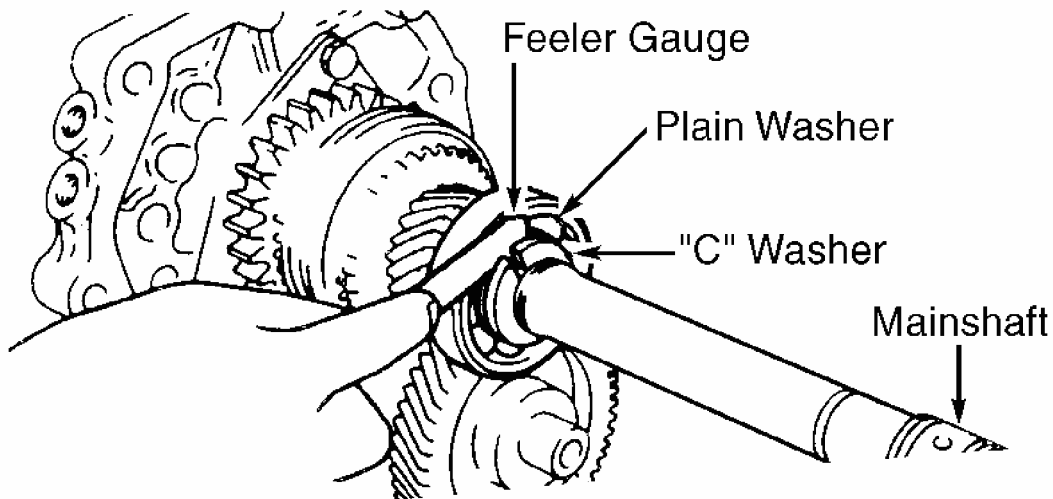
2. Secure reverse idler gear and 2 washers to reverse idler gear shaft. Install counter reverse gear, washer, inner race, needle bearing, reverse gear and 5th-reverse clutch hub assembly. Install reverse idler gear shaft into bearing housing and install lock plate. Install thrust washer, reverse idler gear, adjusting washer and snap ring. Measure clearance between adjusting washers and snap ring. Standard clearance should be .004" (.10 mm). Adjusting washers are available in thicknesses of .083, .087, .091 and .094" (2.10, 2.20, 2.30 and 2.40 mm) for all models except Miata. For Miata, adjusting washers are available in thicknesses of .102, .110 and .118" (2.60, 2.80 and 3.00 mm).
3. Secure bearing housing in vise with protector covers in place. Slide clutch hub sleeves into 1st and reverse gear to lock mainshaft. Tighten lock nut with Lock Nut Wrench (491243365A). Bend lock washer tab. Install 5th gear and synchronizer ring on mainshaft. Install ball and thrust lock washer for 5th gear. Install "C" washers and hold them with retaining ring. Check clearance between 5th gear thrust lock washer and "C" washers using feeler gauge. See **Fig. 12** . If clearance exceeds .004-.012" (.10-.30 mm), replace thrust lock washer. See **THRUST LOCK WASHER THICKNESS** table.

CAUTION: Use .118" (3.00 mm) "C" washers to begin clearance adjustment procedure; otherwise the rear "C" washer may not be able to be installed . When clearance adjustment is complete, the two "C" washers must be the same thickness or bearing failure will result. See the "C" WASHER THICKNESS table.

"C" WASHER THICKNESS

"C" Washer No.	In. (mm)

1st	.114 (2.90)
2nd	.118 (3.00)
3rd	.122 (3.10)
4th	.126 (3.20)



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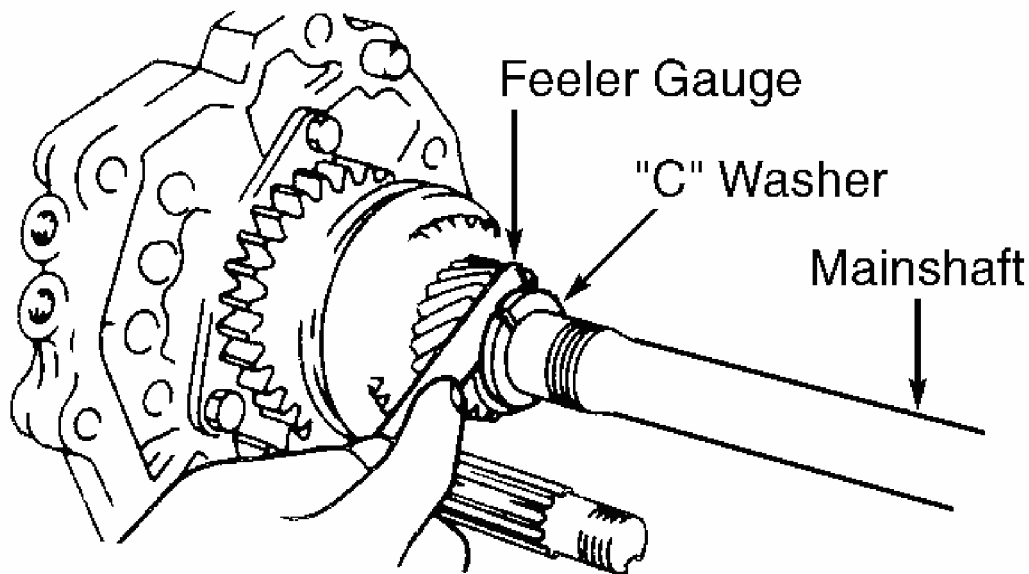
Fig. 12: Checking Clearance Between "C" Washers & Thrust Lock Washer
 Courtesy of MAZDA MOTORS CORP.

THRUST LOCK WASHER THICKNESS

Lock Washer No.	In. (mm)
1st (1)	.244 (6.20)
2nd (1) (2)	.252 (6.40)
3rd (1) (2)	.256 (6.50)

4th (1) (2)	.260 (6.60)
5th (2)	.264 (6.70)
(1) Miata and RX7	
(2) B2200	

4. Tighten mainshaft drive gear bearing. Install proper "C" washers, retaining ring, washer and snap ring. Check clearance between mainshaft "C" washers and washer using feeler gauge. See **Fig. 13** . If clearance exceeds .004" (.10 mm), replace "C" washer. Refer to the **"C" WASHER THICKNESS** table.



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Fig. 13: Checking Clearance Between "C" Washer & Plain Washer
Courtesy of MAZDA MOTORS CORP.

NOTE: Ensure no clearance exists between mainshaft bearing washer and "C" washers.

5. Install countershaft rear bearing. Shift clutch hub sleeves to 1st gear and reverse, to lock

mainshaft. Install and tighten lock nut. Press 5th-reverse spring and ball with interlock pin assembly and screwdriver to install shift rod. See **Fig. 8** . Install 5th-reverse shift fork and rod into bearing housing. Position interlock pin into bearing housing with Shift Fork Guide (490862350) and Interlock Pin Guide (490187451A).

NOTE: **There are 2 types of springs; be sure to install them correctly. The looser wound spring is for the 5th-reverse shift rod.**

6. Install 3rd-4th and 1st-2nd shift forks onto clutch sleeves. Install each shift fork rod and interlock pin. Ensure interlock pin is installed correctly. See **Fig. 8** . Align holes in both shift forks and rods. Install roll pins. Install shift rod locking balls and springs into respective bores in bearing plate. Install and tighten spring cap bolts. On Miata and RX7, install 5th-reverse spacer, spring and clip. Install clips on 1st-2nd and 3rd-4th shift rods.
7. Ensure shift fork-to-synchronizer hub sleeve is aligned correctly. Adjust position of shift fork as shown. See **Fig. 9** . Install proper thrust washer between 1st gear and mainshaft bearing or between reverse gear and mainshaft bearing. Thrust washers are available in .087, .106, .118, .126 and .146" (2.20, 2.70, 3.00, 3.20 and 3.70 mm) sizes.

NOTE: **Total thrust washer thickness should be .232-.236" (5.90-6.00 mm).**

8. Apply sealer on bearing housing and intermediate housing contact surface and assemble. Install shift rod ends to shift rods and install roll pins. See **Fig. 2** and **Fig. 3** . Install speedometer drive gear, lock ball and snap ring on mainshaft. Apply sealer on bearing housing and transmission case contact surface and assemble. On RX7, install snap ring, steel ball, dynamic damper, taper cotters and lock nut.
9. Install control lever through holes in extension housing. Apply thin coat of sealant on mating surfaces of bearing housing and extension housing and assemble with control lever positioned as far left as possible. Install and tighten bolts to specification. Install input shaft bearing and snap ring. Align main drive gear synchronizer ring groove with synchronizer key. Install countershaft front bearing and snap ring.
10. Check clearance between bearing outer race and front cover. See **Fig. 10** . If clearance exceeds .004" (.10 mm), replace adjusting shim. See **ADJUSTING SHIM SPECIFICATIONS** table. Install gasket and front cover. Install clutch release bearing, release fork and dust boot.

TORQUE SPECIFICATIONS

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Application	Ft. Lbs. (N.m)
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Bearing Cover	13-19 (18-26)
Countershaft Lock Nut	94-145 (128-197)
Dynamic Balancer Lock Nut	116-152 (157-206)
Extension Housing	12-17 (16-23)
Input Shaft Front Cover	13-19 (18-26)
Mainshaft Lock Nut	
B2200	94-152 (128-206)
Miata & RX7	94-173 (128-235)
	INCH Lbs. (N.m)
Interlock Pin Plug	89-133 (10-15)
Reverse Idler Gear	71-97 (8-11)
Shift Fork Bolts	106-142 (12-16)
Spring Cap Bolts	89-133 (10-15)
Shift Rod End Bolts	71-106 (8-12)
Speedometer Driven Gear Bolt	69-97 (7.8-11)