

1994 Mazda MX-5 Miata

DIFFERENTIAL 1994 DRIVE AXLES Mazda - Differential

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AXLE RATIO & IDENTIFICATION

See [AXLE RATIO SPECIFICATIONS](#) . To determine axle ratio, divide number of ring gear teeth by number of pinion teeth.

AXLE RATIO SPECIFICATIONS

Application	Number Of Teeth Pinion/Ring Gear	Ratio
Miata	N/A	4.10:1

DESCRIPTION

A Limited Slip Differential (LSD) is optional on Miata. Rear axle uses CV joints to connect differential to axle hubs.

LUBRICATION

CAPACITY

DIFFERENTIAL CAPACITY SPECIFICATIONS ⁽¹⁾

Application	Qts. (L)
Miata	1.06 (1.00)

(1) Fill to lower edge of filler plug hole.

FLUID TYPE

DIFFERENTIAL LUBRICATION SPECIFICATIONS ⁽¹⁾

Application	Specification
Warmer Than 0°F (-18°C)	GL-5/SAE 90W
Cooler Than 0°F (-18°C)	GL-5/SAE 80W

(1) Fill to lower edge of filler plug hole.

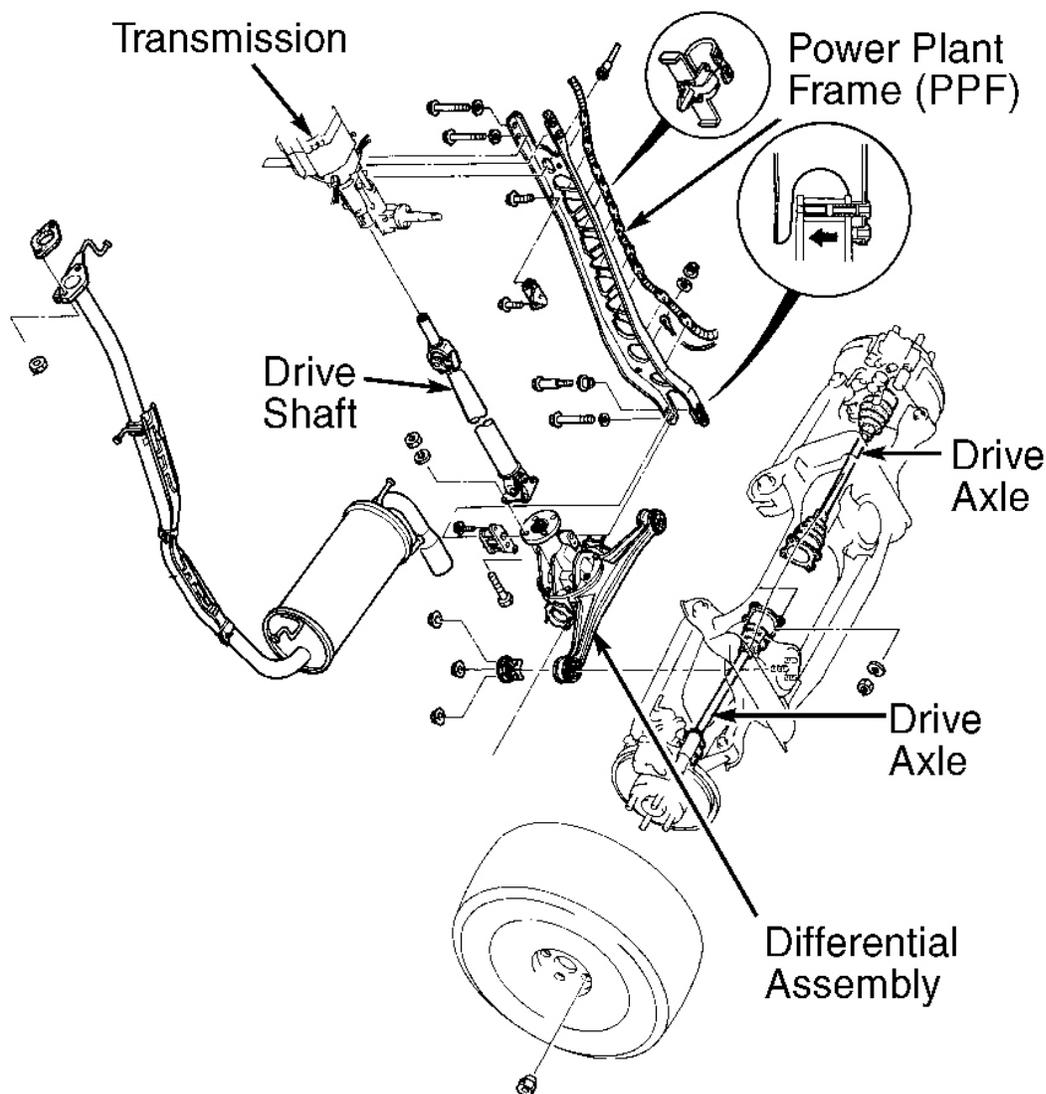
TROUBLE SHOOTING

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

REMOVAL & INSTALLATION

DIFFERENTIAL ASSEMBLY**Removal**

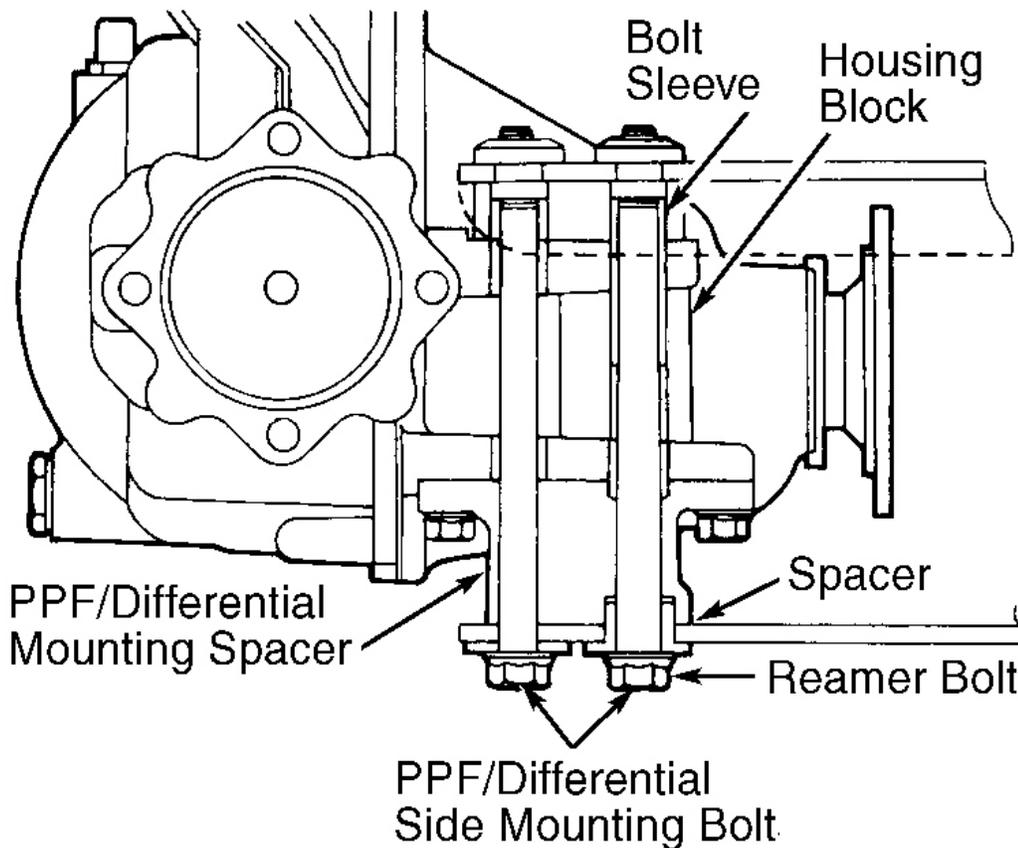
1. Raise and support vehicle. Remove wheel and tire assembly. Drain differential. Remove differential mounting pipe. Remove exhaust pipe. Mark drive shaft flange for reassembly reference and remove drive shaft from differential carrier. See **Fig. 1** . Disconnect speedometer cable from transmission. Noting locations, disconnect wiring harness from Power Plant Frame (PPF).



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Fig. 1: Exploded View Of Differential Components
Courtesy of MAZDA MOTORS CORP.

2. Support transmission using a jack. Remove PPF bracket from rear transmission extension housing (M/T only). Remove PPF-to-differential side bolts. Pry out spacer. Remove PPF/differential mounting spacer. See **Fig. 2** . Install bolt (M14 X 1.5) into sleeve. See **Fig. 3** .
3. Twist bolt from side to side while pulling it downward. Install a metric bolt (M6 X 1) into hole in housing block to hold sleeve and remove long bolt (M14 X 1.5). Remove short bolt (M6 X 1).
4. Remove PPF-to-transmission side bolts and remove PPF. Mark and disconnect CV joint drive axles from differential assembly, and support aside. Support differential assembly and remove differential-to-chassis mounting nuts. Remove differential from vehicle. Remove drive axle output shafts from carrier. Remove differential carrier-to-housing bolts. Remove differential carrier.



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Fig. 2: View Of Power Plant Frame (PPF) Components
 Courtesy of MAZDA MOTORS CORP.

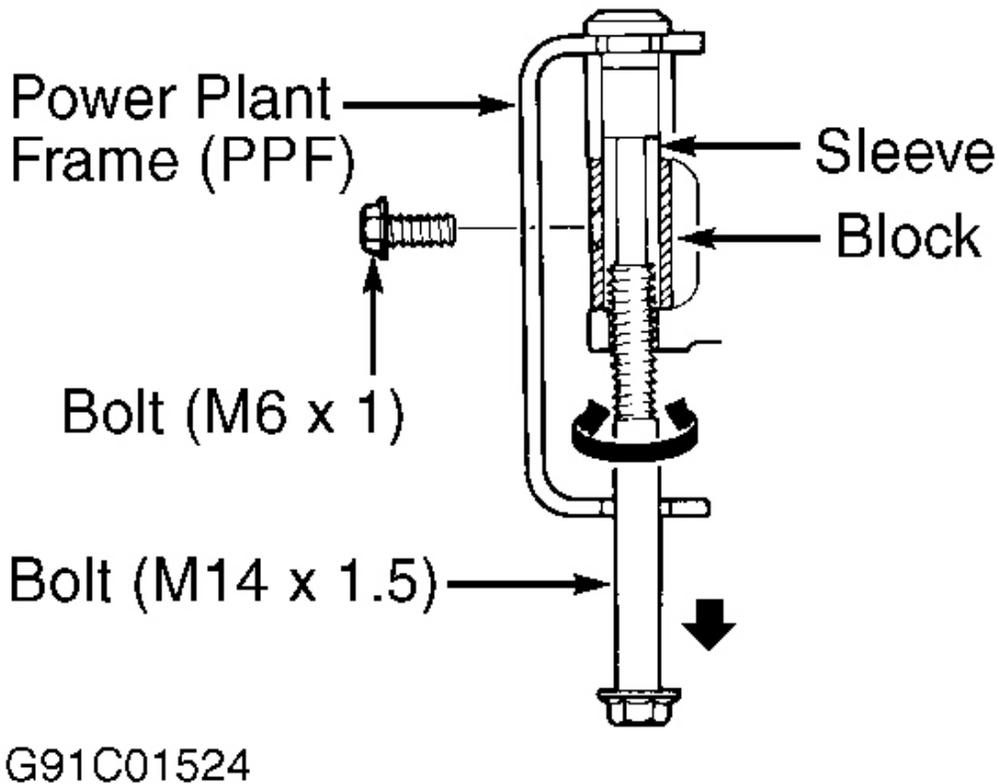


Fig. 3: Removing Reamer Bolt Sleeve
 Courtesy of MAZDA MOTORS CORP.

Installation

1. To install, reverse removal procedure. Apply sealant to carrier mating flange. Align marks made during removal and install drive axles. Install differential. Raise transmission until engine and transmission are level.
2. Position Power Plant Frame (PPF) in place. Install PPF/differential mounting spacer. Tighten bolts to 27-38 ft. lbs. (37-52 N.m). Install and tighten PPF-to-transmission side mounting bolts.
3. Ensure sleeve is installed into PPF housing block. Install spacer and bolts. Ensure reamer bolt is installed into front hole and tighten bolt. See **Fig. 2**.

NOTE: Front PPF-to-differential side mounting bolt is reamer bolt which aligns PPF. See **Fig. 2**.

4. Install transmission-to-PPF bracket (M/T only). Install remaining PPF bolts. Refill differential with

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lubricant. Tighten all nuts and bolts to specification. See **TORQUE SPECIFICATIONS** . To complete installation, reverse removal procedure.

OVERHAUL

DIFFERENTIAL

NOTE: Mark positions of all components before disassembly.

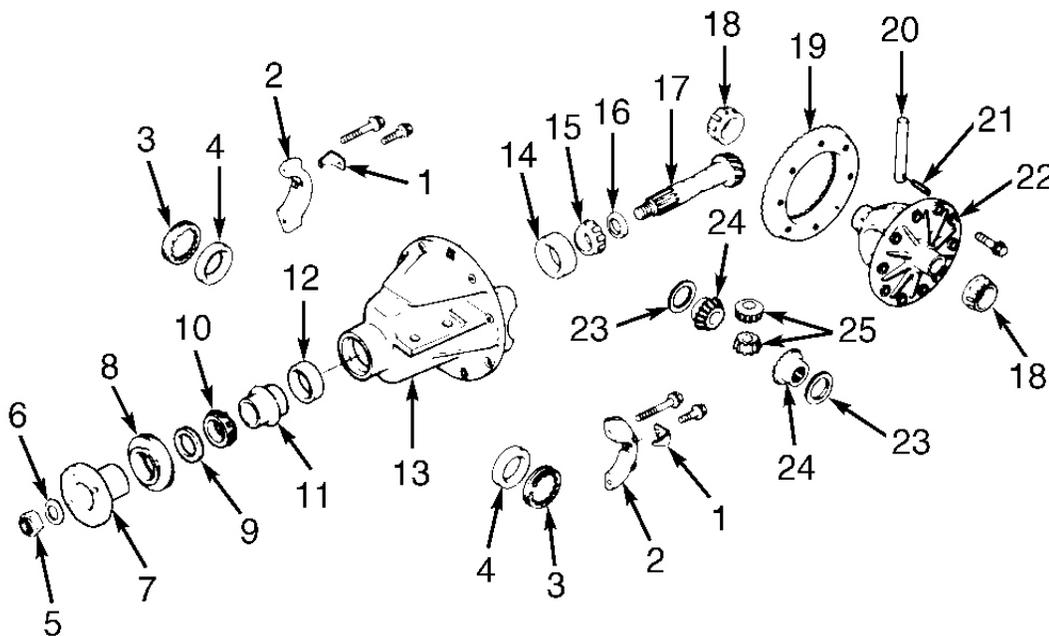
NOTE: Overhaul of Limited Slip Differential unit (if equipped) is not recommended. Replace if defective. Overhaul procedures listed below are for Standard type only.

Disassembly

1. Mount carrier in Differential Carrier Hanger (49-M005-561). Mark side bearing caps for reassembly reference. Remove adjuster lock plates (if equipped). See **Fig. 4** .
2. Loosen side bearing cap bolts and slightly back off adjusters. Remove side bearing caps. Remove differential assembly from carrier. Mark side bearing races for reassembly reference. Remove adjusters and side bearing races from differential.
3. Remove drive pinion lock nut and washer. Remove companion flange using Puller (49-0839-425C). Remove oil seal, spacer, front bearing and collapsible spacer from carrier. Remove drive pinion, spacer and rear bearing assembly from carrier. Remove bearing races using a drift and hammer in slots provided on inner lip (as necessary).
4. Remove ring gear retaining bolts. Separate ring gear from differential case. Mark side bearings for reassembly reference. Using Puller (49-0839-425C), remove side bearings from differential case. Remove knock pin. Remove pinion shaft, pinion gears, thrust washers, and side gears. See **Fig. 4** .

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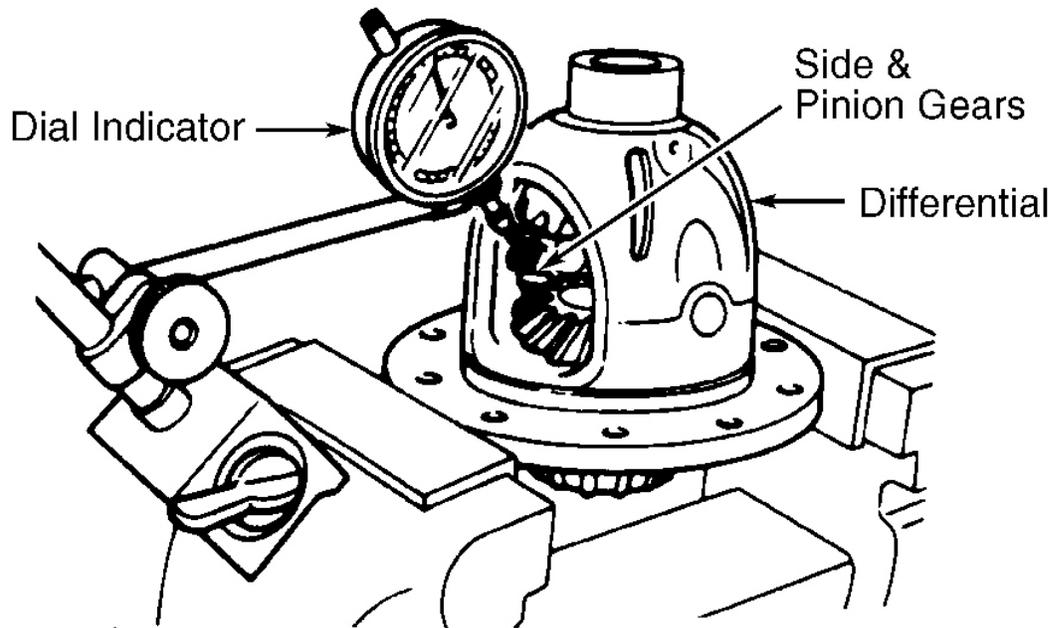
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|------------------------|--------------------------|
| 1. Lock Plate | 13. Differential Carrier |
| 2. Bearing Cap | 14. Bearing Race |
| 3. Adjuster | 15. Rear Bearing |
| 4. Side Bearing Race | 16. Spacer |
| 5. Lock Nut | 17. Drive Pinion |
| 6. Washer | 18. Side Bearing |
| 7. Companion Flange | 19. Ring Gear |
| 8. Oil Seal | 20. Pinion Shaft |
| 9. Spacer | 21. Knock Pin |
| 10. Front Bearing | 22. Differential |
| 11. Collapsible Spacer | 23. Thrust Washer |
| 12. Bearing Race | 24. Side Gear |
| | 25. Pinion Gear |

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Fig. 4: Exploded View Of Standard Differential & Carrier Assembly
Courtesy of MAZDA MOTORS CORP.

Reassembly & Adjustment

1. Install side gears, thrust washers, pinion gears and pinion shaft. Position dial indicator against pinion gear. See **Fig. 5** . Secure one side gear.



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Fig. 5: Measuring Side Gear & Pinion Gear Backlash
 Courtesy of MAZDA MOTORS CORP.

2. Check side gear and pinion gear backlash. If backlash exceeds .004" (.10 mm), replace thrust washers. See **THRUST WASHER SPECIFICATIONS** . Install and stake knock pin. Noting marks made during disassembly, press side bearings onto differential assembly using Bearing Installer (49-G030-338 or 49-UB71-525) and Body (49-F401-331). Apply locking compound to rear face of ring gear. Install ring gear and tighten ring gear retaining bolts to 51-61 ft. lbs. (69-83 N.m).

THRUST WASHER SPECIFICATIONS

Identifying Mark	Thickness - In. (mm)
0	.0787 (2.000)
05	.0807 (2.050)
1	.0827 (2.100)
15	.0846 (2.150)
2	.0866 (2.200)

3. Using Bearing Installer Set (49-F027-0A1) and press, install drive pinion bearing races in differential carrier.
4. Put original spacer, rear bearing and Collar (49-H027-001) on Dummy Drive Pinion (49-8531-565). See **Fig. 6** . Secure collar with "O" ring. Install assembly into differential carrier.

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5. Install front bearing and collar (49-8531-567) on dummy drive pinion. Install companion flange, washer and original drive pinion lock nut. Tighten drive pinion lock nut so dummy drive pinion assembly can be turned by hand.

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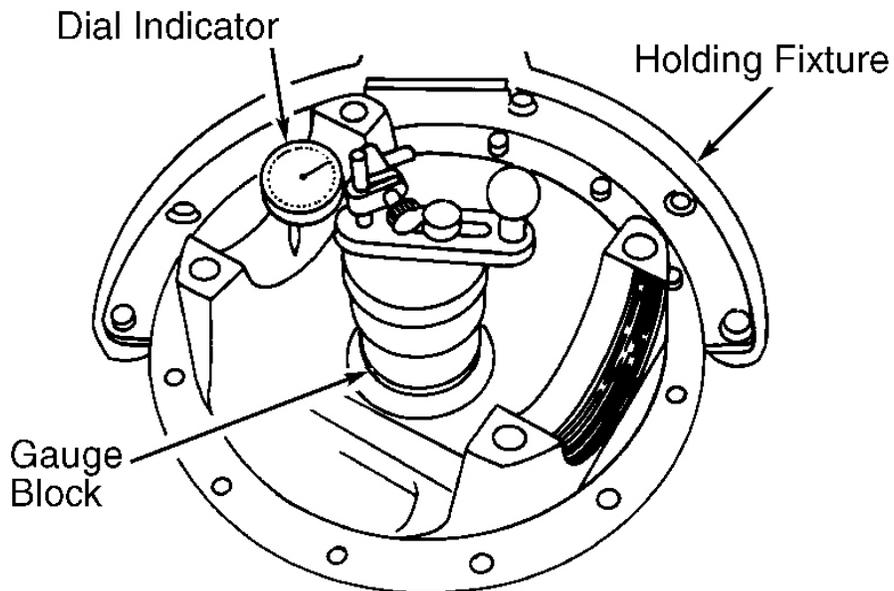
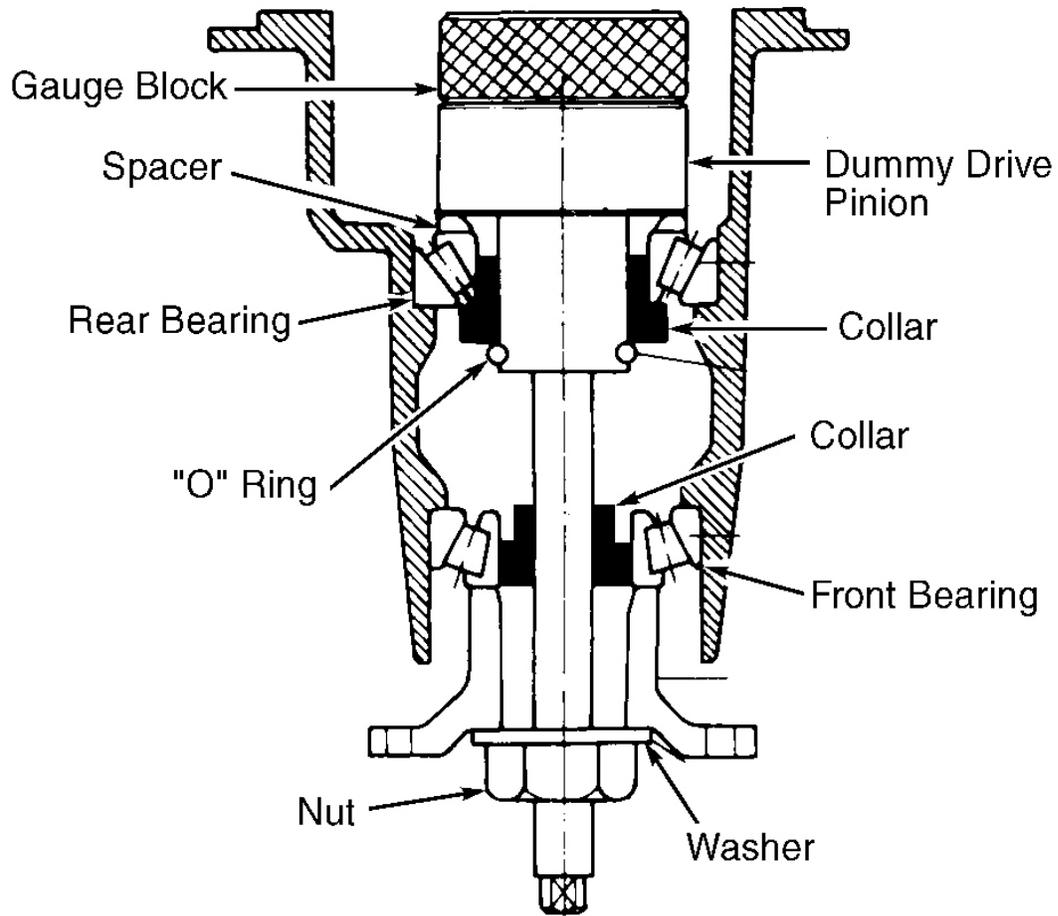


Fig. 6: Checking Drive Pinion Installation & Position
 Courtesy of MAZDA MOTORS CORP.

6. Install dial indicator on Pinion Height Gauge (49-0727-570). Place pinion height gauge on a flat surface and zero dial indicator. Position gauge block (49-0305-555) on top of dummy drive pinion assembly.
7. Place pinion height gauge on top of gauge block. Position dial indicator to measure distance to a point where side bearing sits. Measure lowest point. See **Fig. 6** . Measure both sides. Add both measurements together and divide by 2.
8. If result is not zero, replace pinion spacer. Spacers are available in a range of .1213-.1366" (3.080-3.470 mm) in .001" (.03 mm) increments. Remove dummy drive pinion. Press rear bearing on drive pinion.
9. Install drive pinion, spacer, front bearing, collapsible spacer and companion flange in differential carrier. **DO NOT** install pinion oil seal yet. **DO NOT** exceed one-ton force; collapsible spacer will be damaged.
10. Install washer and drive pinion lock nut. Temporarily tighten drive pinion lock nut. Turn companion flange by hand to seat bearing. Using torque wrench, tighten drive pinion lock nut to specification. See **TORQUE SPECIFICATIONS** . Check pinion bearing preload at drive pinion lock nut. See **PINION PRELOAD SPECIFICATIONS** . If pinion bearing preload is not as specified, replace collapsible spacer and recheck preload.

PINION PRELOAD SPECIFICATIONS

Application	INCH Lbs. (N.m)
Miata	7.8-12.1 (0.9-1.3)

11. Remove drive pinion lock nut, washer and companion flange. Install pinion oil seal. Lubricate oil seal lip with differential oil. Install companion flange and washer. Install NEW drive pinion lock nut and tighten to specification. See **TORQUE SPECIFICATIONS** . Recheck pinion bearing preload. Lubricate end of companion flange with grease.
12. Position differential assembly into differential carrier. Install side bearing adjusters. Position side bearing caps. Align marks made during disassembly. Install side bearing cap bolts and hand-tighten bolts.
13. Tighten side bearing adjusters equally until adjusters contact bearing races. Mark ring gear in 4 locations, 90 degrees apart. Position dial indicator against ring gear to check ring gear backlash.
14. Check backlash at all 4 locations. Tighten side bearing adjusters equally until backlash is .0035-.0043" (.09-.11 mm). Minimum backlash at any point is .002" (.05 mm). Difference between minimum and maximum backlash should not exceed .0028" (.07 mm).
15. To set differential bearing preload, tighten adjusters equally until distance between measuring points on carrier bearing caps is within specification. See **Fig. 7** . See **DIFFERENTIAL CARRIER DIMENSIONS** .
16. Ensure backlash did not change when preload was set. Tighten side bearing cap bolts to specification. See **TORQUE SPECIFICATIONS** . Check ring gear tooth patterns. See the **GEAR TOOTH CONTACT PATTERNS** article in the GENERAL INFORMATION section.
17. To complete reassembly, reverse disassembly procedure. Tighten all nuts and bolts to specification. See **TORQUE SPECIFICATIONS** .

DIFFERENTIAL CARRIER DIMENSIONS

Application ⁽¹⁾	In. (mm)
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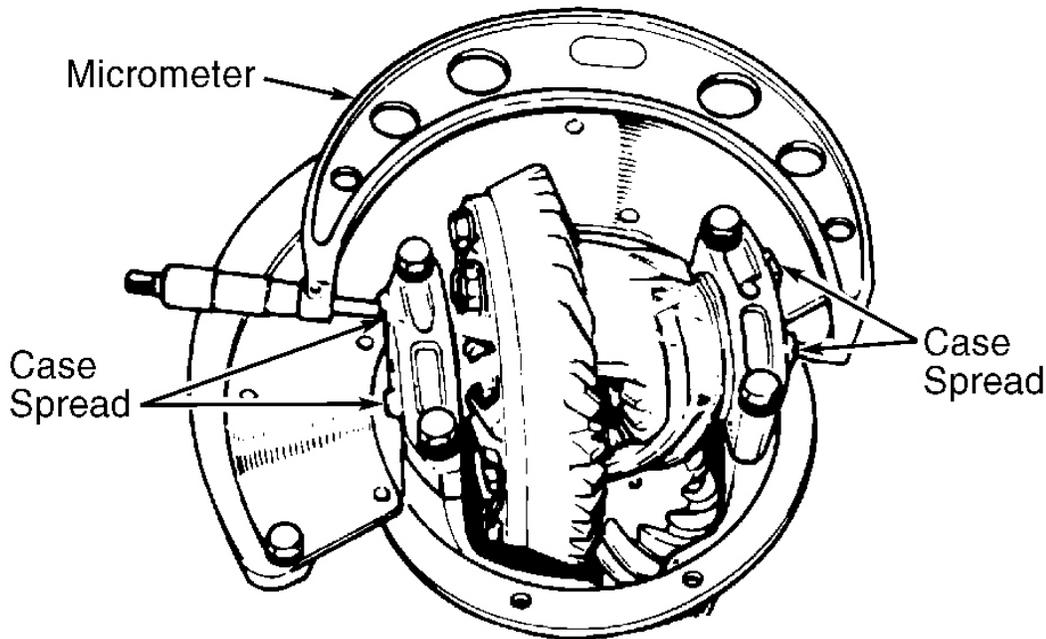
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Miata

7.300-7.303 (185.43-185.50)

(1) See illustration for measuring point. See **Fig. 7** .



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Fig. 7: Measuring Carrier Case Spread
Courtesy of MAZDA MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Differential Carrier Bearings Cap Bolts	27-38 (37-52)
Differential Carrier Bearings Lock Plate Bolt	13-19 (18-26)
Differential Carrier-To-Housing Bolts	17-20 (23-27)
Differential-To-Chassis Mount Nuts	
Inner Nut	61-72 (83-98)
Outer Nuts (2)	13-20 (18-27)
Drive Axle Inner CV Joint Flange Nuts	40-47 (54-64)
Drive Pinion Lock Nut	87-130 (118-176)
Drive Shaft Companion Flange Nuts	20-22 (27-30)
Exhaust Pipe Mount Nuts	30-41 (40-55)

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Filler Plug	29-40 (39-54)
Power Plant Frame Bracket	
To-Power Plant Frame Bolt (M/T)	77-91 (104-123)
To-Transmission Bolts (M/T)	27-40 (37-54)
Power Plant Frame-To-Differential	
Side Mounting Bolts (Long)	77-91 (104-123)
Spacer Bolt (Short)	27-38 (37-52)
Power Plant Frame-To-Transmission Side Mounting Bolts (Long)	77-91 (104-123)
Ring Gear Retaining Bolts	51-61 (69-83)
Wheel Lug Nuts	65-87 (88-118)