Drive Axles

MERCEDES-BENZ INTEGRAL CARRIER

240D, 300 Series, 380 Series

DESCRIPTION

Axle assembly is of integral carrier housing, hypoid gear type in which centerline of drive pinion is mounted below centerline of ring gear. Removable rear cover permits inspection and service of differential. Some models may be equipped with limited slip differential.

Two center housings are used. The small center housing, used on smaller vehicles, has a breather mounted on end cover and side covers are secured with 6 attaching bolts. The larger center housing, used on larger vehicles, has a breather located on the right side and side covers are secured with 8 attaching bolts.

All adjustments, except pinion bearing preload, are performed using shims. Pinion bearing preload is set using a collapsible spacer.

AXLE RATIO & IDENTIFICATION

All models use integral carrier rear axle with semi-trailing arm rear suspension. To determine axle ratio, divide the number of ring gear teeth by the number of pinion gear teeth.

REMOVAL & INSTALLATION

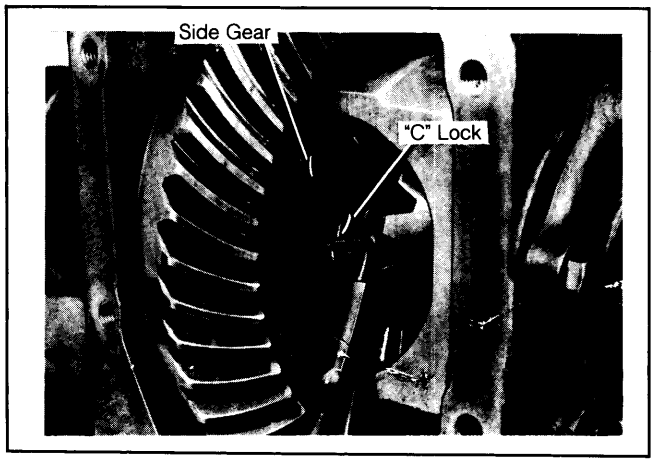
AXLE SHAFTS

Removal

1) Drain lubricant from rear axle. Remove brake caliper and suspend with wire. Remove axle shaft-to-axle shaft flange bolt. Force axle shaft out of axle shaft flange. If additional clearance is required to aid in axle shaft removal, remove upper shock absorber mount and lower suspension arm to stop.

2) Support axle housing and remove rubber mount from body. Lower axle housing slightly. Clean housing and remove rear cover plate. Remove and discard "C" lock holding axle shaft to differential side gear. Pull shaft from gear along with spacer.

Fig. 1: Axle Shaft "C" Lock Removal



Always use new "C" lock for installation.

Installation

1) Face of universal joint spider carries a stamped "R" for right or "L" for left. Make sure that correct axle is used on correct side. Place old spacer ring on constant velocity joint. Slide axle shaft into differential side gear and install new "C" lock onto shaft.

2) Check end play between inner universal joint and axle housing. There should be no perceptible end play. In addition, lock ring should still turn in groove. If necessary, install a thicker or thinner lock ring to achieve desired results.

3) Completely telescope axle shaft and install axle shaft flange. Tighten attaching nut. Mount end cover, with sealing compound, and tighten attaching bolts. Raise axle housing and install rubber mount to axle housing. Attach rubber mount to body.

CONSTANT VELOCITY JOINT

Removal

1) Remove axle shaft. Cut stop sleeve of constant velocity joint on beaded edge and pull sleeve from spider joint. Remove spider from hub along with 6 balls. Remove locking ring from groove in axle shaft. Press spider from shaft.

2) Pull stop sleeve and rubber sleeve from shaft. Loosen hose clamps and pull second rubber sleeve across disassembled end of axle shaft. Carefully clean joint. Inspect balls and other parts for wear or damage.

Installation

1) Slide new rubber sleeve onto shaft up to bead. Place assembly sleeve (115 589 01 63 00) on splines to protect against damage. Place new stop sleeve on shaft and press spider onto axle shaft. Install locking ring. Assemble universal spider and 6 balls using magnetic ball holders for assistance.

2) Place new sealing rings on universal spider and attach new protective sleeve. Insert complete axle shaft into beading tool (115 589 36 63 00) and install split supporting ring. Attach beading ring and bead edge of sleeve while tightening nuts against stop of beading tool.

3) Remove axle shaft from tool and fill constant velocity joint with 8.1 ozs. (230 grams) of constant velocity joint oil (supplied with rubber sleeve repair kit). Attach rubber sleeve to stop sleeve and axle shaft with new hose clamps.

AXLE SHAFT FLANGE & BEARING

Removal

1) Remove bolt and force axle shaft out of axle shaft flange. Pull axle shaft up out of way and support with wire. Do not allow axle shaft to hang down. Remove brake caliper and rotor. If necessary, remove parking brake shoes.

2) Hold axle shaft flange and remove slotted nut from axle shaft flange. Remove sealing rings from support housing. Knock axle shaft flange out of support housing. Remove bearing inner race along with spacer sleeve.

3) Force outer sealing ring from support housing. Remove outer bearing and outer bearing race from support housing. Knock outer bearing race for inner bearing out of support housing. Force outer bearing inner race from axle shaft flange.

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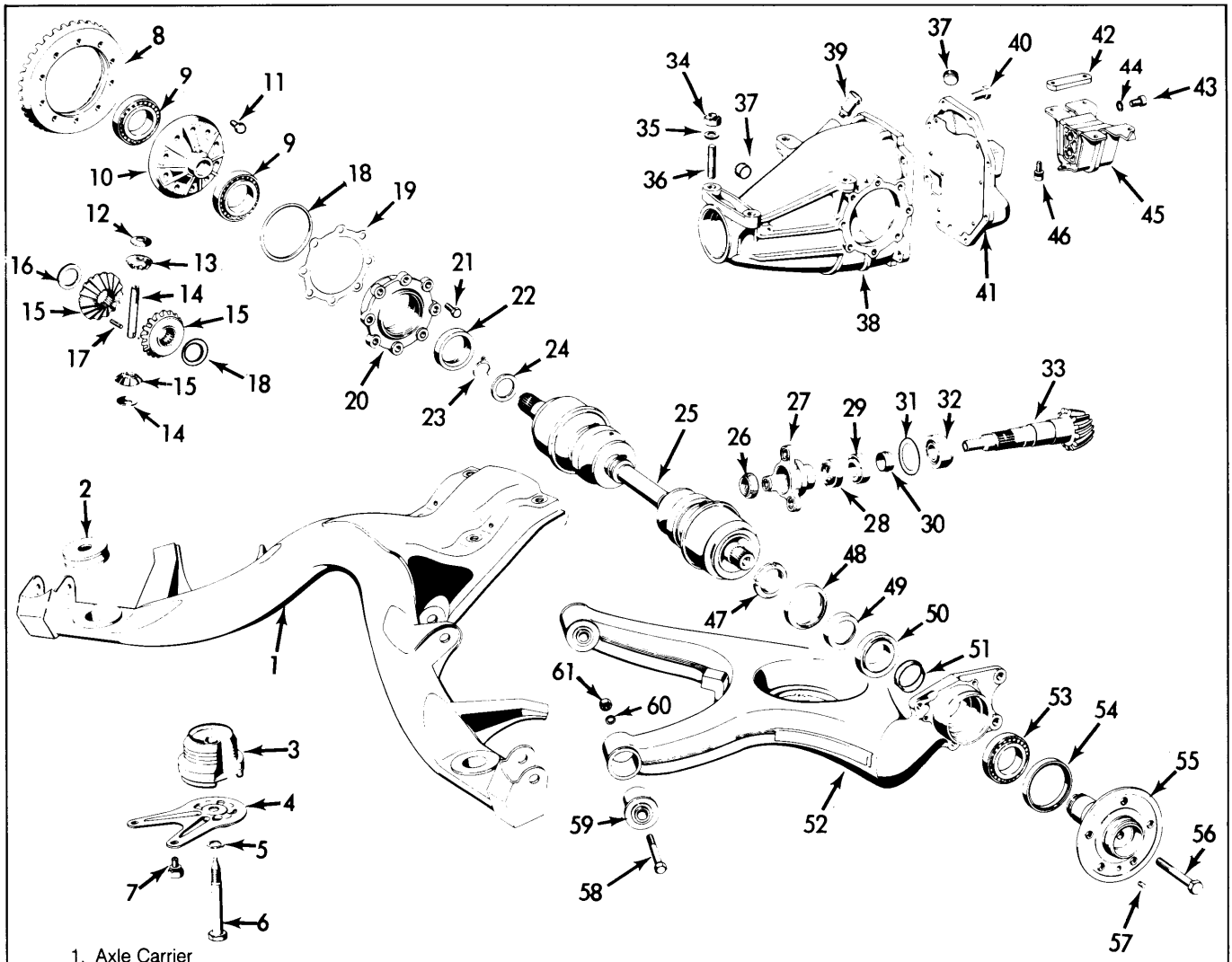
Fig. 2: Exploded View of Mercedes-Benz Drive Axle Assembly



1. Axle Carrier
2. Rubber Stop
3. Rubber Mounting
4. Support Plate
5. Snap Ring
6. Bolt
7. Bolt
8. Ring Gear
9. Bearing
10. Differential Case
11. Bolt
12. Spherical Washer
13. Pinion Gear
14. Pinion Shaft
15. Side Gear
16. Thrust Washer
17. Lock Pin
18. Seal
19. Gasket
20. Bearing Cover
21. Bolt
22. Seal
23. Lock Ring
24. Shim
25. Axle Shaft
26. Self-Locking Slot Nut
27. Flange
28. Seal
29. Bearing
30. Collapsible Spacer
31. Shim
32. Bearing
33. Drive Pinion Gear
34. Lock Nut
35. Washer
36. Stud
37. Plug
38. Axle Housing
39. Breather
40. Bolt
41. Rear Cover
42. Threaded Plate
43. Allen Bolt
44. Circlip
45. Rubber Mounting
46. Bolt
47. Slot Nut
48. Seal
49. Thrust Ring
50. Bearing
51. Sleeve
52. Semi-Trailing Arm
53. Bearing
54. Seal
55. Axle Shaft Flange
56. Bolt
57. Notched Pin
58. Bolt
59. Rubber Mounting
60. Circlip
61. Nut

Installation

1) Ensure axle shaft flanges are installed on correct sides. Right flange is marked with "R" and left flange is marked with "L". Press inner race for outer bearing onto axle shaft flange. Install both outer bearing races in support housing.

2) Coat seat for outer sealing ring on support housing with sealing compound and install seal. Make sure that seal rests straight against chamfer at bottom of housing. Fill cavity between bearing races in support housing with grease.

3) Attach new spacer sleeve to axle shaft flange and install into carrier housing. Attach inner race for inner bearing to axle shaft. Fill new sealing ring with anti-friction grease and coat outer edge with sealing compound. Press inner race and sealing ring into housing. Install seal running ring and install new slot nut.

4) Attach dial indicator to support housing and adjust end play of axle shaft flange while rotating axle shaft flange back and forth. If slot nut is overtightened, reducing end play to zero, install new spacer sleeve and retighten slot nut.

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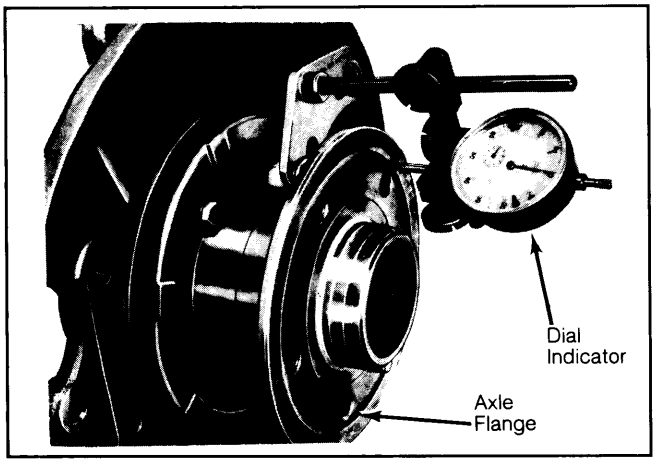
Fig. 3: Checking Axle Shaft Flange End Play



New spacer sleeve must be used if end play is zero.

5) Lock slot nut in place by bending in axle shaft flange at 2 points. Install axle shaft and brake components. Bleed brake system.

PINION FLANGE & SEAL

Removal

1) Remove exhaust system and shielding plate, if necessary. Loosen clamping nut and unscrew propeller shaft intermediate bearing from frame. On 3-piece propeller shaft, loosen front clamping nut only. Remove propeller shaft from axle and push forward out of centering alignment.

2) Make sure that axle shafts are horizontal and that brakes are not dragging. Measure and record torque required to rotate entire rear axle assembly. Attach holding wrench to flange and remove slotted nut.

3) Pull flange from pinion using puller if required. Force seal out of housing using a screwdriver. Check running surface for seal on flange and replace flange if surface is worn.

Installation

1) Coat outside diameter of new seal with sealing compound. Install seal into axle housing using a seal installer. Attach flange and carefully tighten slotted nut until rotating torque for rear axle is the same as measured before removal. Do not overtighten or a new collapsible spacer will have to be installed on pinion.

2) Reconnect propeller shaft and lightly tighten propeller shaft intermediate bearing. Fill axle housing with oil, lower vehicle and move back and forth several times. Tighten clamping nut on universal and propeller shaft intermediate bearing. Reinstall shielding plate and exhaust system, if removed.

AXLE ASSEMBLY

Removal

1) Drain oil from rear axle. On vehicles without starting torque compensation, remove right brake caliper and suspend out of way. On vehicles with starting torque compensation, disconnect brake control cable, remove holding bracket on support housing, remove rubber sleeve and push cover back.

2) On all models, disconnect axle shafts from axle shaft flange on both sides. If necessary, remove exhaust system and shielding plate. Loosen clamping nut and unscrew propeller shaft intermediate bearing on frame.

3) On 3-piece propeller shaft, loosen front clamping nut only. Disconnect propeller shaft and push forward out of way. Support axle assembly with jack and holding fixture.

4) On all models, unscrew rear rubber mounting on frame floor, or unscrew socket bolt for rubber mounting on cover of axle housing. On 240D, fold back rubber mat in trunk and remove rubber plugs. Unscrew axle housing from rear axle carrier.

5) On all models, lower rear axle and remove along with axle drive shafts. Use care not to let axle drive shafts droop. Unscrew rubber mounting from housing and replace if worn or damaged.

Installation

1) Attach rubber mounting to axle housing. Place axle assembly on jack and holding fixture. Raise axle up under vehicle. Mount axle housing to rear axle carrier and tighten nuts. On 240D, install rubber plugs and install trunk rubber floor mat. Install both axle shafts into axle shaft flanges and tighten attaching bolts.

2) Lift axle housing up to frame floor and attach rubber mounting to frame. Reconnect propeller shaft and lightly attach propeller shaft intermediate bearing. On vehicles without starting torque compensation, mount brake caliper using new lock washers.

3) On vehicles with starting torque compensation, mount holding bracket for brake cable control to support housing, slide on cover and rubber sleeve, attach cable control and adjust parking brake.

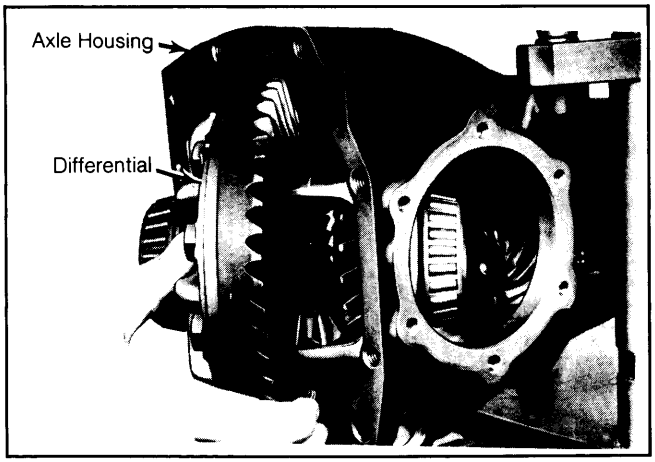
4) On all models, fill axle with oil to level of filler hole, lower vehicle. Rock vehicle back and forth several times. Tighten clamping nut on propeller shaft and tighten propeller shaft intermediate bearing. Install exhaust system and shielding plate if removed.

OVERHAUL

DISASSEMBLY

1) Clamp axle housing in a support so that axle shafts are fully supported. Remove rear cover and axle shafts. Remove bolts and push bearing side covers out of housing along with seal rings and shims. Mark all parts for correct right and left side assembly.

Fig. 4: Removing Differential Assembly from Housing



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2) Tilt differential case slightly and remove from housing. Mark relative position of ring gear to differential case. Remove ring gear attaching bolts and carefully remove ring gear from case. To disassemble case, pull roller bearings from case using a puller. Knock pinion shaft lock pin out of case and remove pinion shaft.

3) On limited slip differentials, insert assembly mandrels (115 589 04 61 00) through case and side gears. Remove pinions and spherical washers. Remove right side gear and friction discs, then repeat procedure for left side. On standard differentials, lift out side gears, thrust washers and spherical washers.

4) To remove drive pinion, remove flange nut and flange. Drive pinion out of housing. Pry seal out of housing with screwdriver. Press front bearing outer race out of housing using press and mandrel. Pull rear bearing outer race out of case using adapter. Press roller bearing inner race from pinion using press plate.

REASSEMBLY & ADJUSTMENT

Case Assembly (Standard Differential)

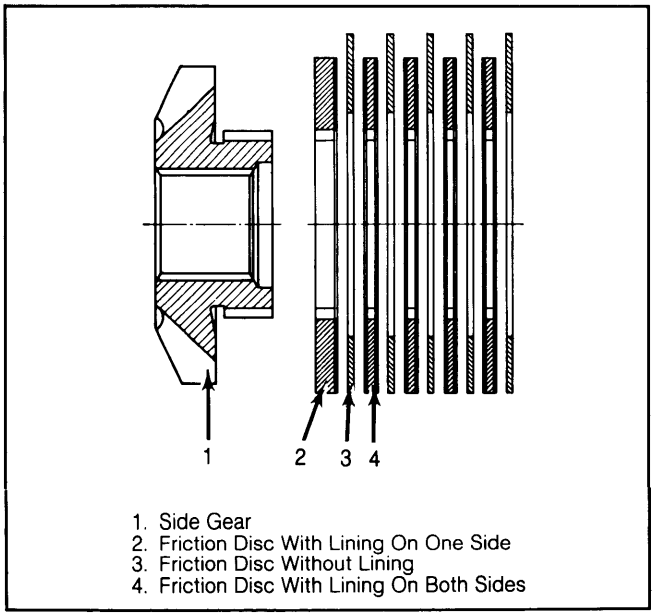
1) Place thrust washers on side gears and insert assembled gears in case. Insert assembly mandrels (116 589 18 61 00) into side gears and mount both pinions along with spherical washers. Insert dummy pinion shaft into case to locate pinion gears and spherical washers.

2) Check torque required to rotate side gears. If necessary, change side gear thrust washers to obtain specified torque. When side gear preload is correct, insert pinion shaft in place of mandrel. Install new clamping sleeve and press bearing inner races on case using a mandrel.

Case Assembly (Limited Slip Differential)

1) Mount friction discs on side gears in correct order. *See Fig. 5.* Install left side gear (ring gear side) with discs and insert assembly mandrel (116 589 18 61 00). Make sure that disc lugs align properly in case. Repeat procedure for right side gear. Install pinions with new spherical washers.

Fig. 5: Friction Disc Installation Sequence



Assemble components in order.

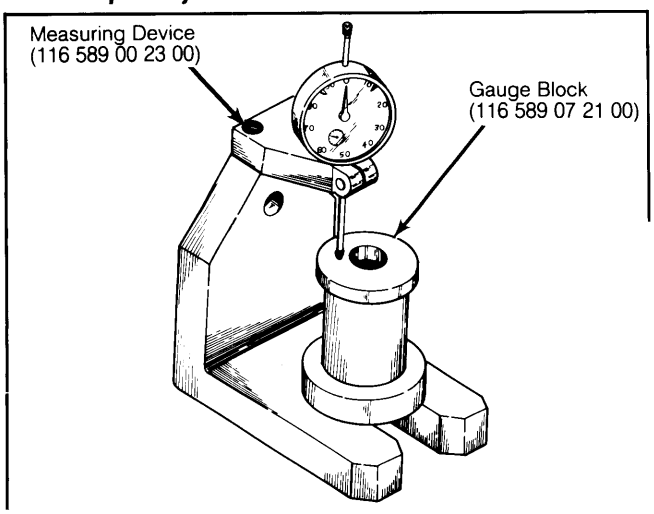
2) Insert mandrel (116 589 07 61 00) through case, pinions and spherical washers. Check torque required to rotate side gears. If necessary, change side gear thrust washers to obtain specified torque.

3) When side gear preload is correct, insert pinion shaft in place of mandrel. Install new clamping sleeve and press bearing inner races on case using press and mandrel.

Drive Pinion Depth

1) Mount dial indicator in measuring device. Insert gauge block. Place tip of dial indicator on top of gauge block. Allow dial indicator tip to depress about .12" (3 mm) on gauge block and zero dial indicator.

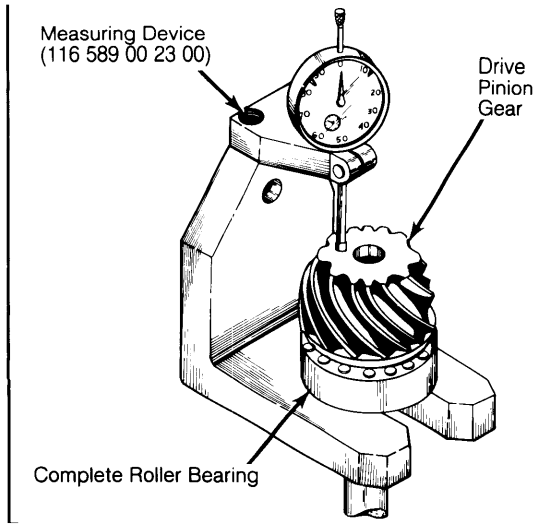
Fig. 6: Zeroing Dial Indicator for Pinion Depth Adjustment



Zero dial indicator after preloading with .12" (3 mm).

2) Press inner tapered roller bearing on drive pinion and place bearing outer race on roller cage of bearing. Insert pinion assembly into measuring device. On pinions from large center housings, place magnetic plate (116 589 01 21 00) on top of pinion. Place indicator stem on head of pinion and note reading.

Fig. 7: Measuring Pinion Height



Add or subtract pinion deviation value on pinion.

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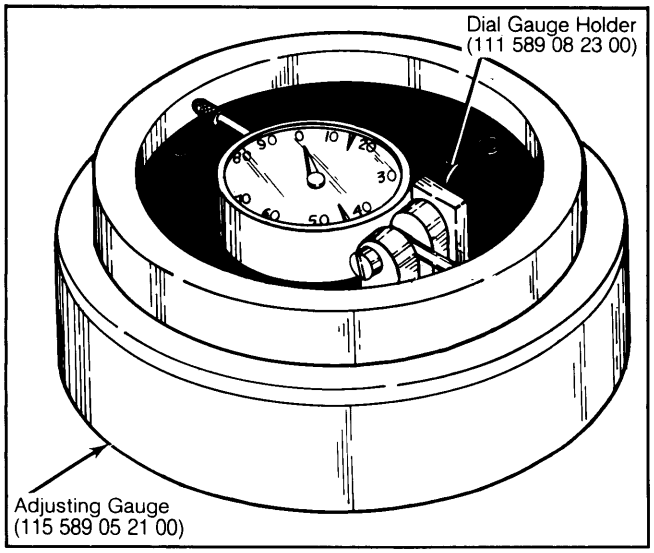
3) Note deviation value engraved on pinion shaft in tenths of millimeters (example: + 20 = + .20 mm). From value measured above, add adjustment value if plus and subtract value if minus.

4) Insert gauge block holder into axle housing and screw on appropriate gauge block. Insert dial gauge holder into adjusting gauge and zero indicator with stem depressed about .12" (3 mm).

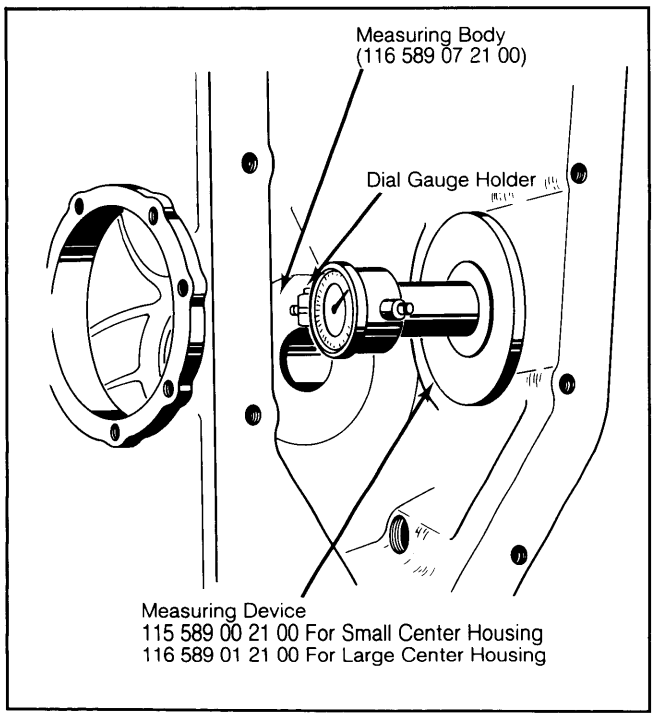
Fig. 8: Zeroing Dial Indicator



Add or subtract value from pinion height reading.

5) Insert adjusting gauge together with dial gauge holder into right bore of housing and screw down. Read indicator reading difference between adjusting gauge and gauge block face end.

Fig. 9: Measuring Housing Depth



Measure depth with calculated shim installed.

6) If value is plus, it must be subtracted from result obtained in step **3)** and if minus, must be added to above result (example: If measured deviation is +.16 mm, subtract this value from 1.70 mm to obtain 1.54 mm). This result is thickness of required shim.

7) Remove all tools from axle housing. Insert shim of calculated thickness into axle housing. If necessary, a thicker washer may be ground down to required thickness. Install outer races of bearings in housing. Lubricate bearings on drive pinion with hypoid gear oil and insert pinion and new collapsible spacer into housing.

8) Install front bearing inner race. Coat new seal on circumference with sealing compound and press into cover using mandrel. Coat running surface of pinion flange with molybdenum disulphide paste and slide flange on drive pinion, making sure alignment marks are lined up.

Pinion Bearing Preload

1) Check that runout of pinion flange does not exceed specification. If runout is excessive, reposition flange. Hold flange and install new locking slot nut. Gradually tighten nut while turning pinion and applying light hammer blows to axle housing. Continue tightening nut until specified pinion turning torque is obtained.

2) Do not exceed specified preload. If preload is exceeded, remove pinion from housing and replace collapsible spacer.

3) Insert measuring device and dial indicator holder into right bore of housing. Place magnetic measuring plate on head of pinion. Dial indicator should read value engraved on pinion shaft. Maximum error is .0008" (.02 mm). If error is higher, disassemble pinion and install correct shim.

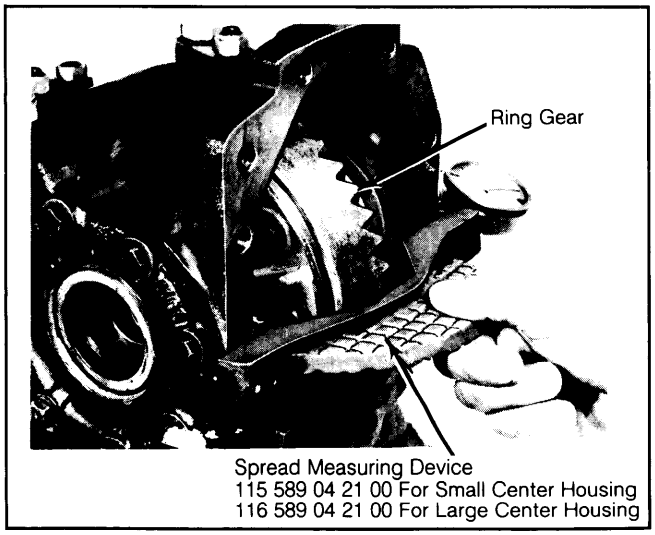
Backlash & Side Bearing Preload

1) On small center housing axles, press out sealing rings and outer bearing bores from side covers using a mandrel. On large center housing axles remove sealing rings from covers. Remove bearing outer race.

2) On all axles, press in new outer races with sleeve (116 589 04 43 00 part 5) and, on small center housing only, disc (115 589 00 61 00).

3) Coat outer edge of new seals with sealing compound and press into bearing covers with a punch. Place previously used shims on bearing covers and install new sealing rings in grooves of covers. Carefully clean

Fig. 10: Measuring Housing Spread



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bore of ring gear and seat on differential case as ring gear is removed from case.

4) Heat ring gear to about 140-158°F (60-70°C) and install gear on case. Make sure installation markings are lined up if old ring gear and case are being used. If necessary, tap gear on case using rubber hammer. Tighten ring gear bolts uniformly and in a criss-cross pattern.

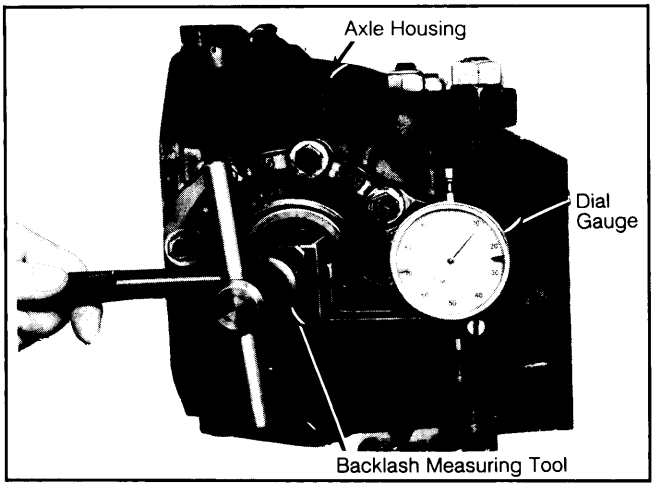
5) Place differential case into housing. Place assembly fixture (116 589 06 61 00) into housing. Place both bearing covers with shims on centering surface of fixture and slide into housing on same side from which they were removed. Turn both covers so that marking "bottom" ("unten") faces downward.

6) Remove assembly fixture and install cover attaching bolts, but do not tighten. Mount case spread measuring device and support blocks on housing. Zero dial indicator.

7) Tighten bearing cover bolts. Place spread measuring device on support blocks and measure spread of axle. Spread should not exceed specification. Adjust size of shims as necessary to obtain the specified case spread. Install backlash measuring device into right side bearing bore and clamp down.

8) Measure backlash at 4 points on ring gear. Adjust shims from side-to-side as necessary to obtain specified backlash. When preload and backlash are correct, install both axle drive shafts with new "C" lock rings. Clean end cover mating surfaces and coat with sealing compound. Install cover and tighten bolts.

Fig. 11: Measuring Ring-to-Pinion Gear Backlash



Adjust shims from side-to-side to obtain specified backlash.

AXLE ASSEMBLY SPECIFICATIONS

Application	Specification
Axle Shaft	
Flange End Play	.0016-.0024" (.04-.06 mm)
Housing Spread	
Small Center Housing	.004-.006" (.10-.15 mm)
Large Center Housing	.006-.008" (.15-.20 mm)
Pinion Flange Runout	.001" (.03 mm)
Ring Gear Runout	.0008" (.02 mm) Max.
Ring & Pinion Backlash	.0030-.0055" (.08-.14 mm)
Side Gear Turning Torque	
Standard Differential	22-66 Ft. Lbs. (30-90 N.m)
Limited Slip	
Differential	59-103 Ft. Lbs. (80-140 N.m)
Pinion Turning Torque	
New Bearings	10.6-12.4 INCH Lbs. (1.2-1.4 N.m)
Used Bearings	4.4-8.9 INCH Lbs. (0.5-1.0 N.m)

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Axle Housing-to-Axle Carrier	74 (100)
Axle Shaft-to-Axle Shaft Flange	22 (30)
Bearing Cover-to-Axle Housing	15 (20)
Brake Caliper Bolt	15 (20)
Front Rubber Mount-to-Frame	37 (50)
Housing Rear Cover	33 (45)
Propeller Shaft Clamping Nut	
2-Piece Shaft	22-30 (30-40)
3-Piece Shaft	
Front	22-30 (30-40)
Rear	148 (200)
Rear Rubber Mount-to-Frame	18 (25)
Ring Gear Bolts	
Small Center Housing	
Standard Bolt	59 (80)
Self-Locking Bolt	74 (100)
Large Center Housing	89 (120)
Rubber Mount-to-Axle Housing	89 (120)