MERCEDES-BENZ INTEGRAL CARRIER

240D
280 Series
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 housing cover permits inspection and service of differential. Some models may also be equipped with limited slip differential. All adjustments, except pinion bearing preload, are performed using shims. Pinion bearing preload is set using a collapsible spacer.

AXLE RATIO & IDENTIFICATION

All of the above mentioned Mercedes-Benz models use the integral carrier rear axle with semi-trailing arm rear suspension. Some models also have limited slip differentials. To determine axle ratio, divide the number of ring gear teeth by the number of pinion gear teeth. Two different size center housings are used. The small center housing, generally used on smaller vehicles, has its breather mounted on the end cover. On the small center housing, the side covers are secured to the center housing with 6 attaching bolts. The larger center housing, generally used on larger vehicles, has its breather located on the right side of the center housing. On the large center housing, the side covers are secured to the center housing with 8 attaching bolts.

REMOVAL & INSTALLATION

AXLE SHAFTS

Removal — 1) Drain lubricant from rear axle. Remove brake caliper and suspend with a piece of wire. Remove bolt attaching axle shaft to axle shaft flange. 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 supsension 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 "C" lock holding axle shaft to differential side gear. Pull shaft from gear along with spacer ring.

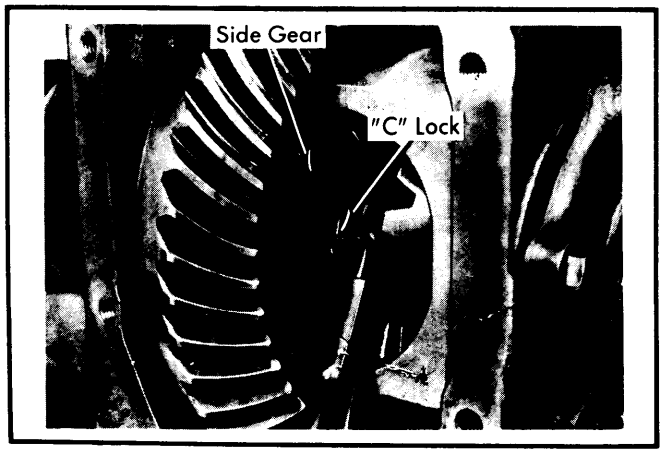


Fig. 1 Removing "C" Lock for Axle Shaft Removal

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 suitable sealing compound, and tighten attaching bolts. Raise axle housing and install rubber mount to axle housing. Attach rubber mount to body.

AXLE SHAFT RUBBER SLEEVES

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 joints. 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. Assembly universal spider and 6 balls using magnetic ball holders (115 589 05 63 00) 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.

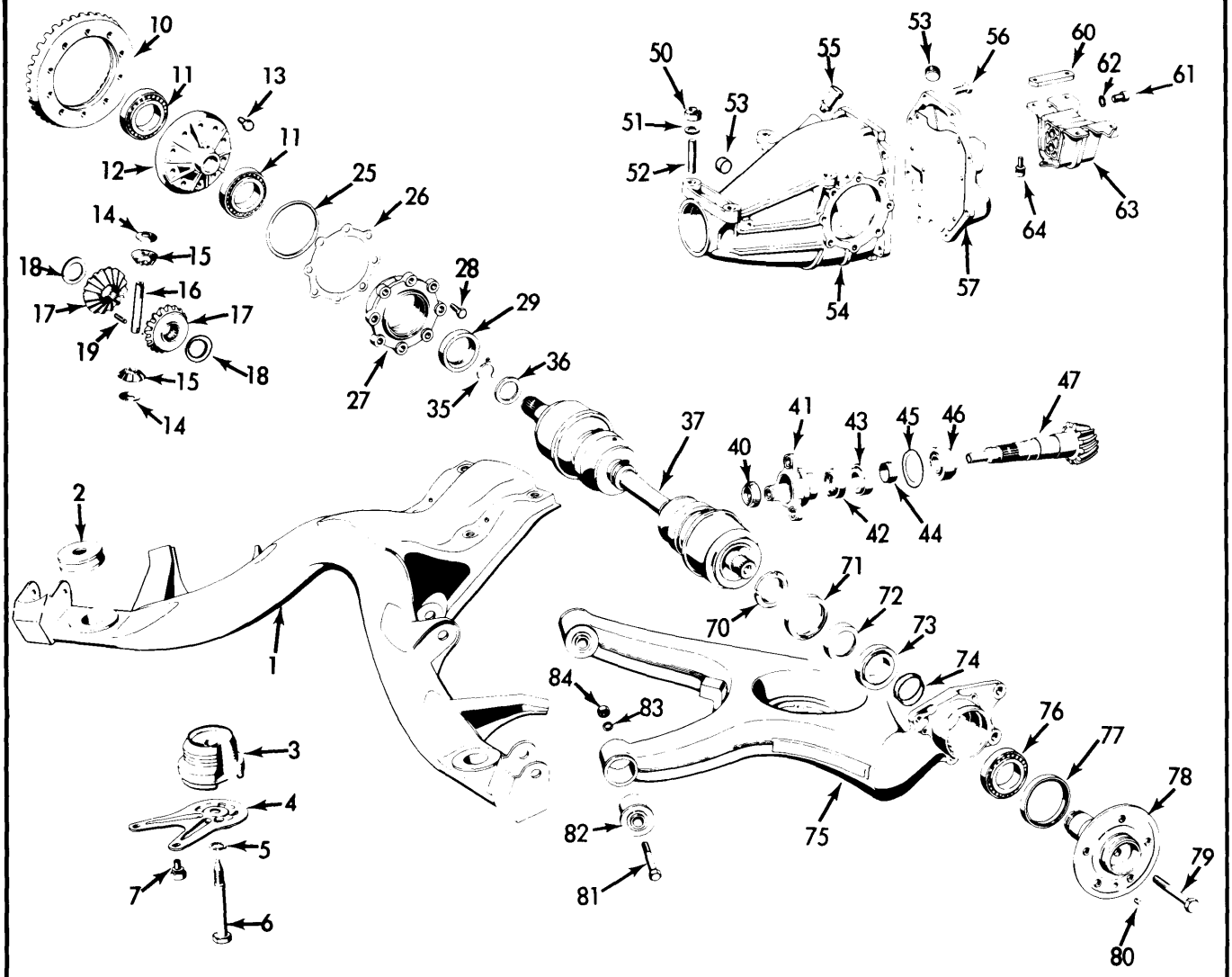
AXLE SHAFT FLANGE & BEARING

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

2) Remove slotted nut from axle shaft flange, while holding the axle shaft flange with an axle shaft flange holder (136 589 05 31 00). 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.

MERCEDES-BENZ INTEGRAL CARRIER (Cont.)



1 — Axle Carrier
2 — Rubber Stop
3 — Rubber Mounting
4 — Support Plate
5 — Snap Ring
6 — Bolt
7 — Bolt
10 — Ring Gear
11 — Bearing
12 — Differential Case
13 — Bolt
14 — Spherical Washer
15 — Differential Pinion
16 — Pinion Shaft
17 — Side Gear
18 — Thrust Washer
19 — Pin
25 — Seal
26 — Gasket
27 — Bearing Cover
28 — Bolt
29 — Seal
35 — Lock Ring
36 — Shim
37 — Axle Shaft
40 — Self-Locking Slot Nut
41 — Flange
42 — Seal
43 — Bearing
44 — Collapsible Spacer
45 — Shim
46 — Bearing
47 — Drive Pinion
50 — Lock Nut
51 — Washer
52 — Stud
53 — Plug
54 — Axle Housing
55 — Breather
56 — Bolt
57 — Rear Cover
60 — Threaded Plate
61 — Allen Bolt
62 — Circlip
63 — Rubber Mounting
64 — Bolt
70 — Slot Nut
71 — Seal
72 — Thrust Ring
73 — Bearing
74 — Sleeve
75 — Semi-Trailing Arm
76 — Bearing
77 — Seal
78 — Axle Shaft Flange
79 — Bolt
80 — Notched Pin
81 — Bolt
82 — Rubber Mounting
83 — Circlip
84 — Nut

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

MERCEDES-BENZ INTEGRAL CARRIER (Cont.)

Installation — 1) Insure that axle shaft flanges are installed on correct sides. Press inner race for outer bearing onto axle shaft flange. Install both outer bearing races in support housing. 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 1.8 ozs. (50 grams) of multi-purpose grease.

2) 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 bearing grease and coat with sealing compound on outside diameter. Press inner race and sealing ring into housing. Install seal running ring and install new slot nut.

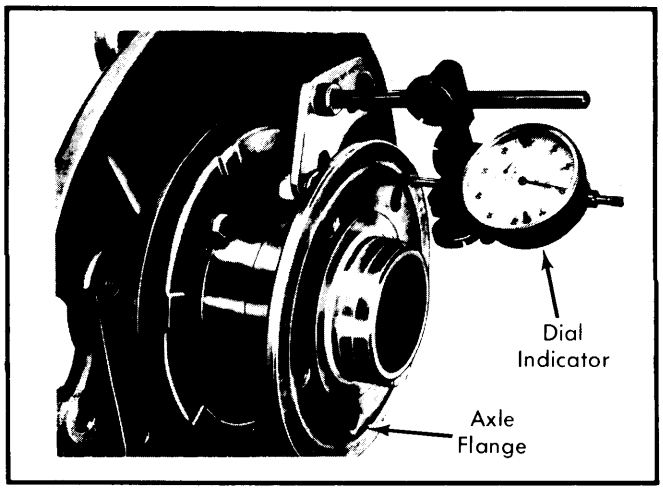


Fig. 3 Checking Axle Shaft Flange End Play

3) Attach dial indicator to support housing and check end play of axle shaft flange while while rotating axle shaft flange back and forth. End play should be .0016-.0024" (.04-.06 mm). If slot nut is overtightened, reducing end play to zero, install new spacer sleeve and retighten slot nut. Lock slot nut in place by bending into grooves in axle shaft flange at 2 points. Install axle shaft and brake components, then 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 three-piece propeller shaft, loosen front clamping nut only. Unflange 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 (116 589 10 07 00) to flange and remove slotted nut with wrench (115 589 01 07 00).

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 (116 589 12 61 00). 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 necessary.

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. On all models, disconnect axle shafts from axle shaft flange on both sides.

2) If necessary, remove exhaust system and shielding plate. Loosen clamping nut and unscrew propeller shaft intermediate bearing on frame. On three-piece propeller shaft, loosen front clamping nut only. Disconnect propeller shaft and push forward out of way. Support axle assembly with jack and suitable holding fixture (115 589 35 63 00 for small center housing, 116 589 02 63 00 for large center housing).

3) Unscrew rear rubber mounting on frame floor, or unscrew socket bolt for rubber mounting on cover of axle housing. On 240D and 280 Series, fold back rubber mat in trunk and remove rubber plugs. Unscrew axle housing from rear axle carrier. 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 and 280 series, 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. 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.

3) Fill axle with oil to level of filler hole, lower vehicle. Rock back and forth several times, then 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 from housing and axle shafts from side gears. 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.

MERCEDES-BENZ INTEGRAL CARRIER (Cont.)

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 (123 589 08 33 00). Knock holding pin for pinion shaft out of case and remove pinion shaft.

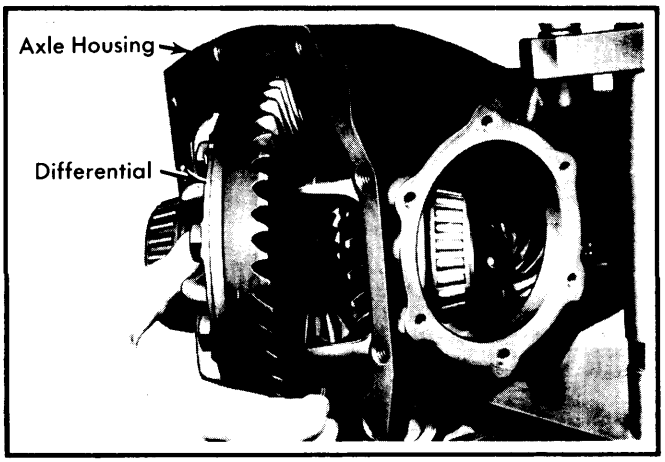


Fig. 4 Removing Differential Assembly from Housing

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. Force pinion out of housing using pinion remover (116 589 12 61 00). Pry seal out of housing with screwdriver. Press front bearing outer race out of housing using press and mandrel (001 589 36 33 00). Pull rear bearing outer race out of case using adapter (116 589 12 61 00). Press roller bearing inner race from pinion using press plate (001 589 36 33 00).

REASSEMBLY & ADJUSTMENT

Case Assembly (Standard Differential) — 1) Place thrust washers on side gears and insert 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 (115 589 03 61 00 for small center housing or 116 589 07 61 00 for large center housing) into case to locate pinion gears and spherical washers.

2) Check torque required to rotate side gears. Specified torque is 22-66 ft. lbs. (30-90 N.m) and up to 74 ft. lbs. (100 N.m) at restraining points, permitted with no end play. If necessary, change side gear thrust washers to obtain the specified torque value. 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 (115 589 18 61 00 for small center housing and 116 589 18 61 00 for large center housing).

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 this procedure for right side gear. Install pinions with new spherical washers.

2) Insert mandrel (116 589 07 61 00) through case, pinions and spherical washers. Check torque required to rotate side gears. Specified torque is 59-103 ft. lbs. (80-140 N.m) with no end play. If necessary, change side gear thrust washers to obtain the 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 press and mandrel (116 589 08 61 00).

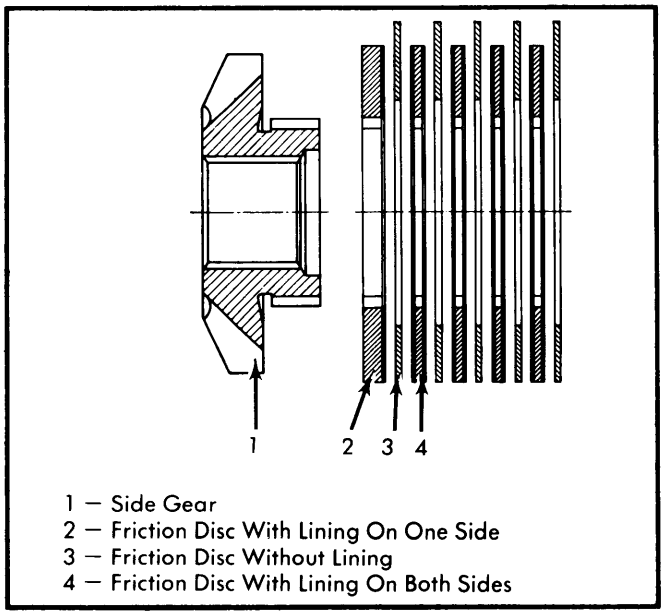


Fig. 5 Friction Disc Installation Sequence

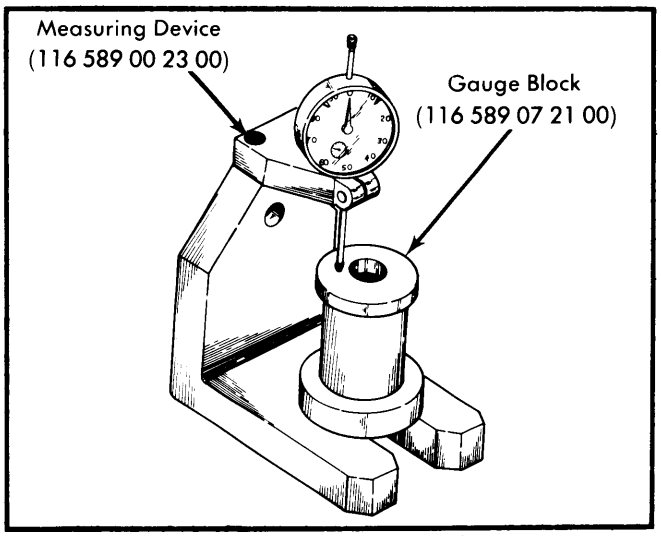


Fig. 6 Zeroing Dial Indicator for Pinion Depth Adjustment

Drive Pinion Depth — 1) With dial indicator depressed about .12" (3 mm) by gauge block (116 589 07 21 00), zero dial indicator. 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.

MERCEDES-BENZ INTEGRAL CARRIER (Cont.)

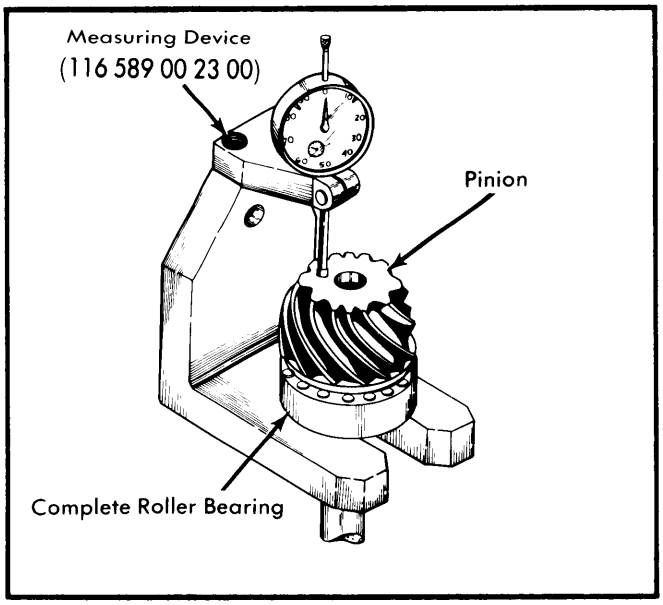


Fig. 7 Reading Pinion Height

2) Now note adjustment 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. (example: 1.50 + .20 = 1.70 mm). Insert gauge block holder into axle housing and screw on appropriate gauge block. Insert dial gauge holder (111 589 08 23 00) into adjusting gauge (115 589 05 21 00) and zero indicator with stem depressed about .12" (3 mm).

3) Insert measuring device (115 589 00 21 00 part 3 for small center housing or 116 589 01 21 00 part 1 for large center housing) 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. If value is plus, it must be subtracted from result obtained in step **2)** 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.

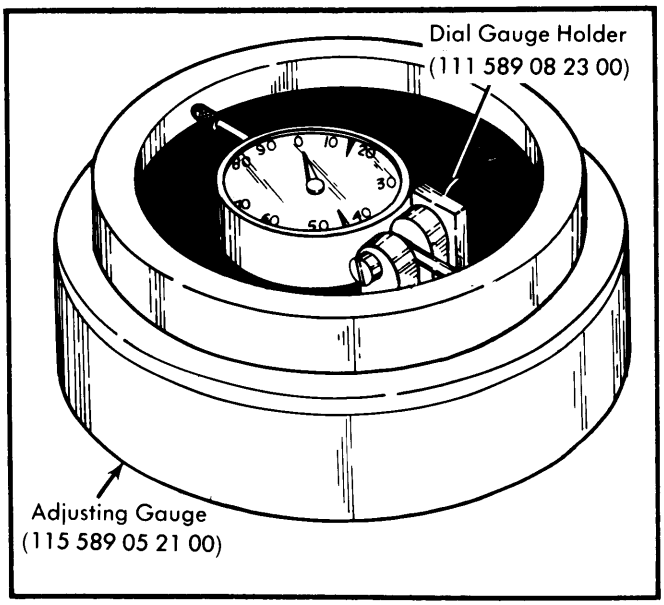


Fig. 8 Zeroing Dial Indicator

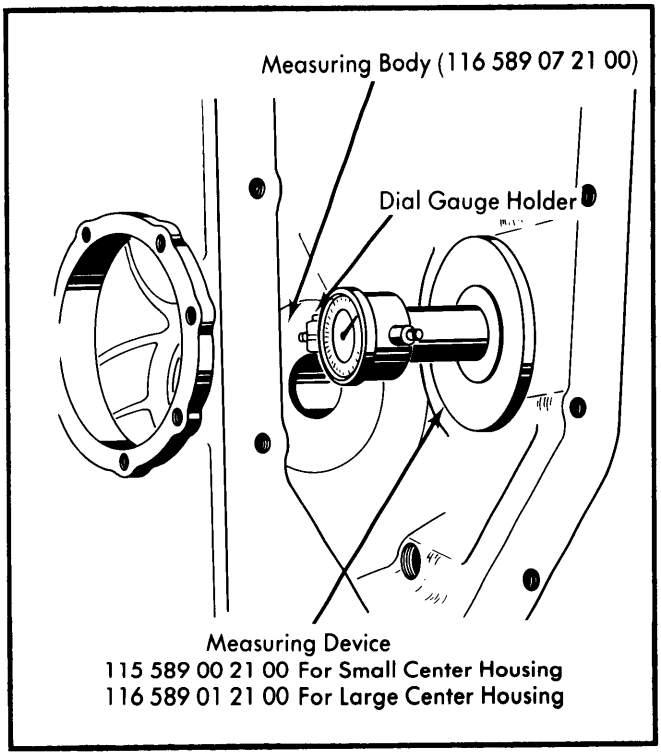


Fig. 9 Measuring Housing Depth

4) 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 using suitable installation tool (116 589 11 61 00). Lubricate bearings on drive pinion with hypoid gear oil and insert pinion and new collapsible spacer into housing.

5) Install front bearing inner race using suitable tools. Coat new seal on circumference with sealing compound and press into cover using suitable 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 .001" (.03 mm). If runout is excessive, reposition flange. Attach holding wrench to flange and screw on new locking slot nut. Gradually tighten slot nut while turning pinion and applying light hammer blows to axle housing. Continue tightening nut until torque required to rotate pinion is 10.6-12.4 INCH lbs. (1.2-1.4 N.m) for new bearings or 4.4-8.9 INCH lbs. (0.5-1.0 N.m) for used bearings.

2) Use care not to exceed specified preload. If preload is exceeded, remove pinion from housing and replace collapsible spacer. Again insert measuring device and dial indicator holder into right bore of housing. Place magnetic measuring device plate (116 589 01 21 00) 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.

MERCEDES-BENZ INTEGRAL CARRIER (Cont.)

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 using a suitable tool, then remove bearing outer race. On all axles, press in new outer races with suitable sleeve (116 589 04 43 00 part 5) and, on small center housing only, disc (115 589 00 61 00).

2) Coat new seals on outside diameter with sealing compound and press into bearing covers with a suitable punch. Place previously used shims on bearing covers and install new sealing rings in grooves of covers. Carefully clean bore of ring gear and seat on differential case as ring gear is removed from case. Heat ring gear to about 140-158°F (60-70°C) and install gear on case making sure installation markings are lined up if old ring gear and case is being used. If necessary, tap gear on case using rubber hammer. Tighten ring gear bolts uniformly and in a crosswise pattern.

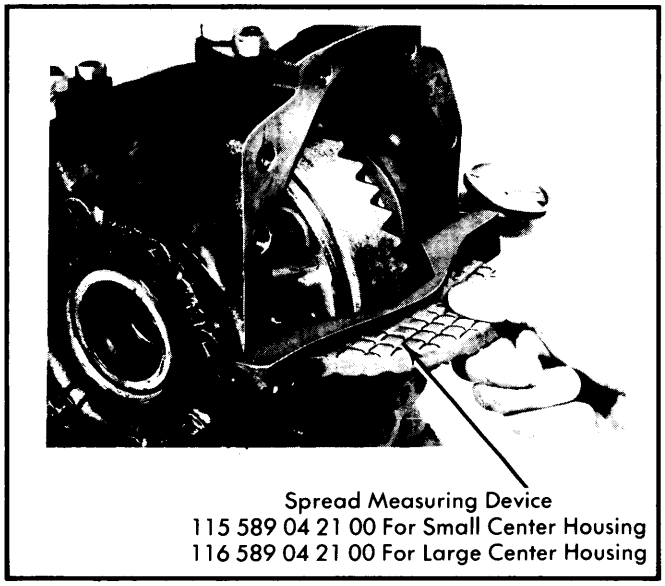


Fig. 10 Measuring Housing Spread

3) 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. Remove assembly fixture and install cover attaching bolts, but do not tighten. Mount case spread measuring device (115 589 04 21 00 for small center housing or 116 589 04 21 00 for large center housing) and support blocks on housing and zero dial indicator.

4) Tighten bearing cover bolts to 15 ft. lbs. (20 N.m). Place spread measuring device on support blocks and measure spread of axle housing. Spread should be .004-.006" (.10-.15 mm) for small center housing or .006-.008" (.15-.20 mm) for large center housing. Adjust size of shims as necessary to obtain the specified case spread. Install backlash measuring device (115 589 03 23 00) into right side bearing bore and clamp down.

5) Measure backlash at four points on ring gear. The lowest measured value of backlash should be .003-.0055" (.08-.14 mm). Adjust shims from side to side as necessary to achieve specified backlash. When preload and backlash is correct, install both axle drive shafts with new "C" lock rings. Clean sealing surface on end cover and axle housing and coat with sealing compound. Install cover and tighten bolts.

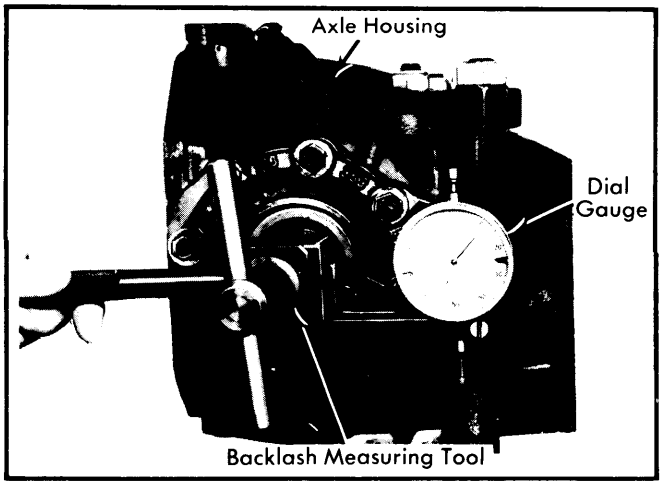


Fig. 11 Measuring Ring-to-Pinion Gear Backlash

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)
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)
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)

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)